

The City of



DAYTONA BEACH UTILITIES DEPARTMENT TECHNICAL PROVISIONS

THE CITY OF DAYTONA BEACH
UTILITIES DEPARTMENT
125 BASIN ST., STE. 130
DAYTONA BEACH, FL 32114

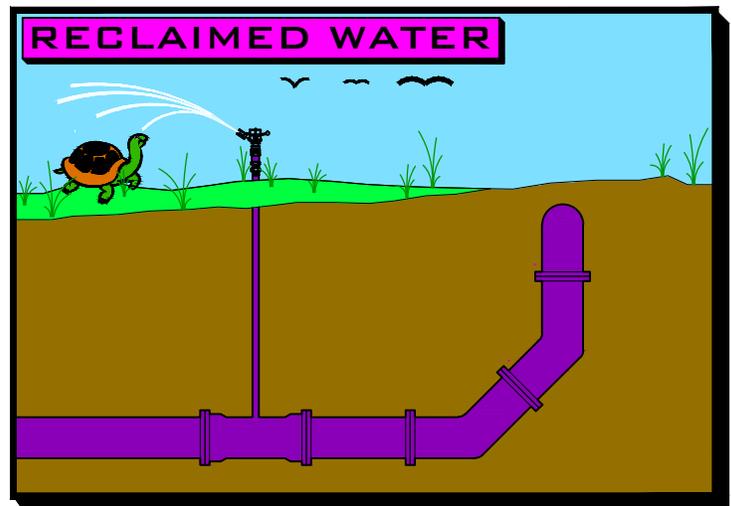
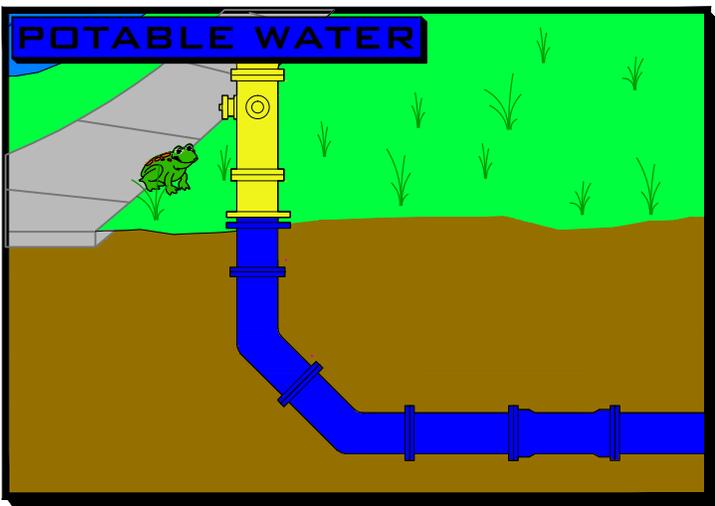
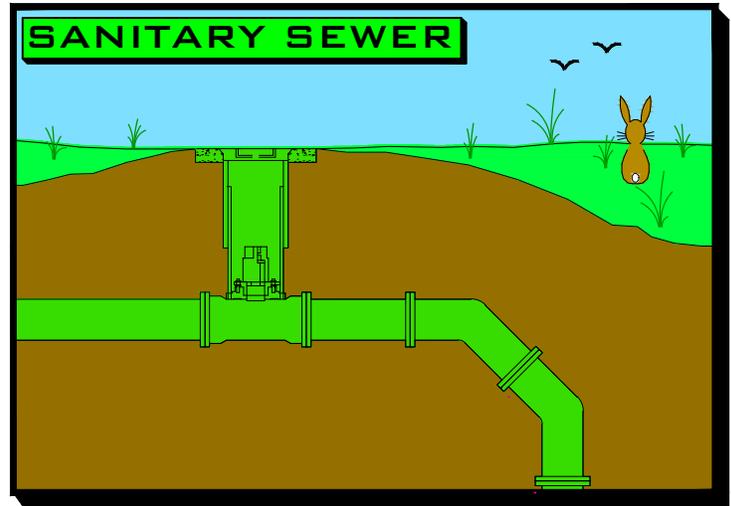
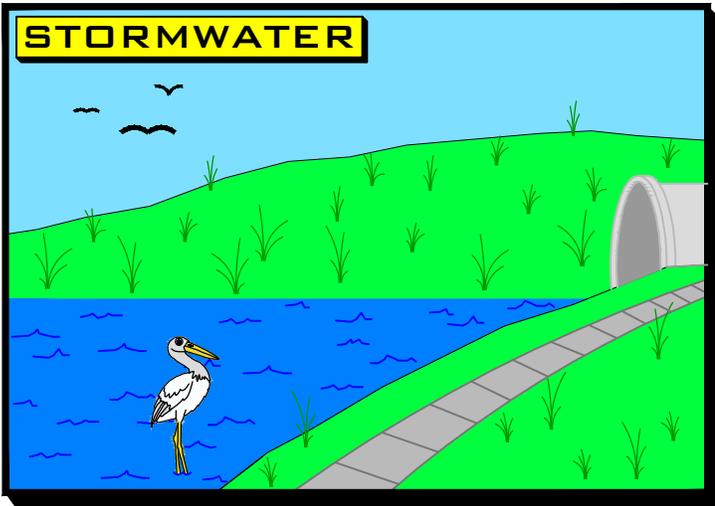


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**SECTION 01010
SUMMARY OF WORK**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

Work under the contract for the **[Identify the project and limits. Fill in the project work overview with emphasis/specifics as needed on significant aspects]**

The secondary work will include maintenance of traffic and all other ancillary construction support services including coordination with other facility and property owners within and adjacent to the project site that are affected by constructions activities and the restoration and or replacement of all improvements above, on and below ground that are disturbed by construction activities. All work, materials, means and methods involved in the construction work shall be acceptable to the CITY and in accordance with the CITY Utilities Department Standard Details (latest edition and amendments), CITY Specifications and the applicable sections of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition, and the Florida Department of Transportation Design Standards, 2010 edition.

A. REQUIRED NOTICES TO AGENCIES AND PUBLIC:

The CONTRACTOR shall adequately inform in advance the affected business, property owners and utility customers of scheduled temporary utility service disruptions and changes in access. CONTRACTOR shall provide alternative accommodations when required by CITY.

B. SALVAGED MATERIALS:

Unless otherwise noted in the contract, materials, equipment or supplies that are removed or that are no longer needed as a result of the contract work will become the property of the CONTRACTOR and shall be removed from the project and disposed of by the CONTRACTOR in areas provided by the CONTRACTOR

PART 2 PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 EXECUTION

The CONTRACTOR shall be responsible for reviewing the site conditions, reviewing the Bid Documents, verifying the Summary of Quantities and Bid Schedule and the inclusion of all items and costs necessary to complete the work prior to preparing and submitting a balanced and responsive bid.

END OF SECTION

SECTION 01014
MAINTENANCE OF OPERATIONS

PART 1 – GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the requirements for scheduling and performing the work to keep existing essential facilities in continuous dependable operation.

1.2 GENERAL CONSTRAINTS

- A. The CONTRACTOR shall keep existing essential facilities in operation at the performance levels specified unless otherwise specifically permitted in these specifications or approved by the CITY in writing. Coordinate any system shutdowns with the CITY sufficiently in advance to provide alternative service. Allowable shutdown times will be at the CITY's discretion.
- B. Any temporary work, facilities, roads, walks, protection of existing structures, piping, blind flanges, valves, equipment, etc. that may be required within the CONTRACTOR'S work limits to maintain continuous and dependable operation of existing systems shall be furnished and maintained by the CONTRACTOR at no extra cost to the CITY.
- C. The CONTRACTOR shall schedule the work in such a manner so that all existing systems are maintained in continuous operation unless otherwise directed by CITY. All short-term system or partial system shutdowns shall be approved in writing by the CITY. If, in the opinion of the CITY/ENGINEER, a shutdown is not required in order for the CONTRACTOR to perform the work, the CONTRACTOR shall utilize alternative methods to accomplish the work. CITY shall be provided a minimum of thirty (30) days notice of CONTRACTOR'S need for any system shutdown.
- D. Required shutdowns shall not begin until all materials are on-hand, pre-assembled, as possible, and ready for installation. Upon commencement of the shutdown period the CONTRACTOR shall proceed with the work continuously, start to finish, until the work is completed and the system is tested, cleared for service, and ready for operation. If the CONTRACTOR completes all required work before the specified shutdown period has ended the CITY may immediately place the system back in service.
- F. The CITY reserves the right to cancel scheduled shutdowns if conditions warrant. Delays to the CONTRACTOR caused by cancellations will be considered in evaluating requests for a time extension. They will not be considered an entitlement to additional compensation. However compensation may be considered at CITY's sole discretion.

1.3 SUBMITTALS

A. Submit a detailed schedule for and process description of proposed testing.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 – EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

**SECTION 01025
MEASUREMENT AND PAYMENT**

PART 1 – GENERAL REQUIREMENTS

1.1 SUMMARY

A. This Section sets forth supplemental measurement and payment conditions.

1.2 REFERENCE

B. The General Conditions, the Summary of Quantities and the Bid Schedule.

1.3 TYPICAL PAYMENT ITEM COSTS

A. No separate payment will be made for the following items. The cost of such work shall be included in the unit price of applicable pay items listed in the Bid Schedule unless otherwise noted in the construction plans:

1. Clearing and grubbing including removal and disposal of all above and below ground improvements such as but not limited to trees, brush, residential commercial and bridge structures, septic tanks and drain-fields, roadway pavement and concrete, drainage and utilities systems, etc... unless otherwise specified.
2. Trench and roadway excavation, including rock and cemented coquina excavation and disposal, excavation and removal of unsuitable soils and unsuitable materials of any nature unless otherwise specified.
3. Structure excavation including rock and cemented coquina excavation and disposal, excavation and disposal of unsuitable materials of any nature except as otherwise specified.
4. Dewatering and disposal of surplus water, prevention of sediment and erosion pollution and prevention of flooding
5. Structural fill, backfill, including furnishing, placement, compaction and final grading of suitable fill material, pipe bedding and compacted granular material.
6. The temporary removal and replacement of fences and walls.

7. Foundation and borrow materials, except as otherwise specified.
9. Paved and unpaved roadway restoration or replacement including but not limited to all disturbed improvements within the right of way, adjacent traffic signal system components included within the limits of lump sum work, unless otherwise specified.
10. Maintenance of vehicular and pedestrian traffic including detours and haul routes.
11. Shoring, sheeting and worksite safety.

1.3 SPECIAL BID/PAY ITEM MEASUREMENT & PAYMENT LIST
(Not Applicable)

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 – EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

SECTION 01026

SCHEDULE OF VALUES & PAYMENT APPLICATIONS

PART 1- GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section specifies preparation and submittal requirements for Pay Applications and a Schedule of Values.

1.2 SCHEDULE OF VALUES (FOR LUMP SUM ITEM CONTRACTS ONLY)

- A. Coordination: Coordinate preparation of the Schedule of Values on Lump Sum Item Contracts with preparation of CONTRACTOR'S Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets, Submittals Schedule and CONTRACTOR'S Construction Schedule.
 - 2. Sub-Schedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Bid Schedule as a guide to establish line items for the Schedule of Values on Lump Sum Item Contracts. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values or unit price pay item Bid Schedule , whichever is applicable, that accompanies the Pay Application:
 - a. Project name and location & Purchase Order Number
 - b. Name of CITY project manager.
 - c. CITY's project number.
 - d. CONTRACTOR's name and address.
 - e. Date of submittal.
 - 2. Submit draft of AIA Document G703 Continuation Sheets.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Pay Applications and progress reports. Coordinate with the Project

Bid Schedule. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Pay Applications may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the work.
7. Each item in the Schedule of Values and Pay Applications shall be complete and include the total cost.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at CONTRACTOR's option.
8. Schedule Updating: On Lump Sum Item Contracts update and resubmit the Schedule of Values before the next Pay Applications when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 PAY APPLICATIONS

- A. Each Pay Application shall be consistent with previous applications and payments as certified by ARCHITECT/ ENGINEER and or CITY.
 1. CONTRACTOR to prepare Pay Application after confirming quantities or percent of work completed with CITY's construction field representative in draft form.
- B. Pay Application Work Periods: The period of construction work covered by each Application for Payment is the period indicated and agreed to on the Pay Application.
- C. Pay Application Submittal Times: Progress payments shall be submitted to CITY on average at one per thirty day period.
- D. Pay Application Forms: Use AIA Document G702/CMa and AIA Document G703 Continuation Sheets or City acceptable equivalents as a format for Applications for Payment.
- E. Application Preparation: A company logo should be at the top. Complete every entry on form. Place the CITY Purchase Order number on the form near the top. Notarize and execute by a person authorized to sign legal documents on behalf of CONTRACTOR. CITY will return incomplete applications without action.

1. Entries shall match data on the Bid Schedule and Construction Schedule and if it is a Lump Sum Item Contract, the Schedule of Values. Provide updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit two (2) signed and notarized original copies of each Pay Application to CITY by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information pertaining to the application such as work progress projections, CITY's Minority and Women Owned Business Enterprise Usage form, certified payrolls, etc...
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Pay Application include the following if applicable to the work.:
1. List of SUBCONTRACTORS.
 2. Schedule of Values (For Lump Sum Contract).
 3. CONTRACTOR's Construction Schedule (preliminary if not final).
 4. Bid Schedule of unit prices.
 5. Submittals Schedule (preliminary if not final).
 6. List of CONTRACTOR's principal consultants.
 7. Copies of building permits.
 8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 9. Initial progress report and projected work forecast.
- H. Pay Application at Substantial Completion: After issuing the Certificate of Substantial Completion, submit a Pay Application showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting that the Work is substantially complete
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for CITY occupancy or use of designated portions of the Work.
- I. Final Pay Application: Submit final Pay Application in accordance with the requirements of the General Conditions, and may also include the following:
1. Updated final statement, accounting for final changes to the Contract Sum.
 2. Evidence that claims have been settled.
 3. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when CITY took possession of and assumed responsibility for corresponding elements of the Work.

4. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

SECTION 01200
PROJECT MEETINGS AND VIDEO

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

This Section sets for the requirements and responsibilities for conducting project meetings and the videoing of the project area to document the pre-construction conditions.

1.2 PRE-CONSTRUCTION CONFERENCE

A pre-construction conference will be held prior to beginning work in accordance with section 3.5 of the General Conditions

1.3 PROGRESS MEETINGS

Regular progress meetings to be scheduled by CITY shall be held during the construction period at which the CONTRACTOR shall submit updated progress schedules, discuss significant events that have or will affect the progress and discuss the work to occur in the upcoming work period.

1.4 INSTALLATION / DEMOLITION & SPECIAL EVENT CONFERENCES

Well in advance of the installation/demolition of every major unit of work or special event that requires coordination with other work, CONTRACTOR will schedule a meeting with CITY, installers and representatives of manufacturers and fabricators, utility owners and or facility owners who are involved in or affected by the unit of work, and in its coordination or integration with other work which has preceded or will follow. Advise the CITY three (3) working days in advance of scheduled meeting dates. At each meeting review the progress of other work and preparations for the particular work under consideration, including the requirements of the contract documents, options, related change orders, purchases, deliveries, shop drawings, product data, quality control samples, possible conflicts, compatibility problems, time schedules, weather limitations, temporary facilities, space and access limitations, structural limitations, governing regulations, safety, inspection and testing requirements, required performance results, recording requirements, and protection. Record the significant discussions of each conference along with the final place of action. Distribute record of meeting promptly to everyone concerned.

1.5 PROJECT VIDEO AND PHOTOGRAPHY

Video (photograph for additional detail as necessary) all improvements and existing conditions within and adjacent to the project rights of way as well as all line work, water, sanitary sewer, drainage, etc. CONTRACTOR shall make provisions at his expense for DVD video of all line work just prior to construction, and during construction. The video will show pertinent physical features along the line of construction including significant trees and buildings. The purpose of the video is to determine any damage to private or public property during construction. For some projects, such as parking lots, building structures, water, wastewater facilities, etc., a combination of photographs and DVD video will be required. A copy of the video and photographs shall be provided to the CITY.

PART 2 - PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

**SECTION 01300
GENERAL SUBMITTALS**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

This Section sets forth the general requirements for various types of submittals including but not necessarily limited to product and process data, samples and miscellaneous work.

1.2 SUBMITTALS

Submittals shall be clear and legible, printed or typed. Submittals received that are not so, shall be returned to be resubmitted when in legible form.

1. Product data includes standard printed information on materials, products and systems, not custom-prepared for this project, other than the designation of selections from available choices.
2. Samples include both fabricated and not fabricated physical examples of materials, products and work: both as complete units and as smaller portions of units of work, either for limited visual inspection or (where indicated) for more detailed testing and analysis.
3. Miscellaneous submittals related directly to the work (non-administrative) include warranties, guarantees, maintenance agreements, workmanship bonds, project photographs/videos, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the work and not defined as shop drawings, product data or samples.
4. Five (5) copies of each submittal shall be submitted with (3 copies returned) unless otherwise approved.

1.3 GENERAL SUBMITTAL REQUIREMENTS

- A. Coordination and Sequencing: Coordinate the preparation and processing of submittals with the performance of the work so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for the same work, and for interfacing units of work, so that one will not be delayed for coordination with another. No extension of time will be allowed because of failure to properly coordinate and sequence submittals. Do not proceed with purchasing, fabrication and delivery of work related to a submittal until submittal procedure has been successfully completed.

- B. Preparation of Submittals: Provide permanent marking on each submittal to identify it by project, date, CONTRACTOR, sub-CONTRACTOR, submittal name and similar information to distinguish it from other submittals. **Show CONTRACTOR's approval marking and provide space for review marking by CITY's Representative. This will reduce the time required to re-stamp each submittal with the review stamp of the CITY.** Package each submittal appropriately for transmittal and handling. Submittals that are received directly from sources other than through the CONTRACTOR's office will be returned without review. **The following statement will be considered having been attached to each submittal even though the statement has not been physically placed on the submittal:**

Engineer's review is for general conformance of the design concept and contract documents. Markings or comments shall not be construed as relieving the CONTRACTOR from compliance with the project drawings and specifications nor departures. The CONTRACTOR remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, and for performing his work in a safe manner.
 CITY OF DAYTONA BEACH

BY _____ DATE: _____

Circle: No exceptions taken Rejected Note Markings

Comments Attached Resubmit with Modifications

Approved submittals will have the CITY/ ENGINEER signature as appropriate for responsibility. Should a supplier demand more formal approval the CONTRACTOR can request the traditional approval which will include a red stamped statement on each sheet which includes limitations of responsibility

PART 2 - PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

SECTION 01340
SHOP DRAWING PROCEDURES

PART 1 – GENERAL REQUIREMENTS

1.1 SUMMARY

This Section sets for the Shop Drawing submittal procedures shall conform to the general requirements of Section 01300, and as described in this Section.

PART 2 – PRODUCTS

- A.** CONTRACTOR shall initially submit to CITY /ENGINEER a minimum of five (5) copies of all submittals that are on 11-inch by 17-inch or smaller sheets (no less than 8 1/2-inch by 11-inch), and one unfolded Mylar and 2 prints made from that Mylar for all submittals on sheets larger than 11-inch by 17-inch.

PART 3– EXECUTION

- A.** Shop drawings include custom-prepared data of all forms including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns reports, calculations, instructions, measurements and similar information not in standard printed form applicable to other projects.
- B.** Submit Shop Drawings to: CITY /ENGINEER as directed at the Pre-construction meeting .
- C.** A letter of transmittal shall accompany each submittal. If data for more than one Section of the Specifications is submitted, a separate transmittal letter shall accompany the data submitted for each Section
- D.** At the beginning of each letter of transmittal provide a reference heading indicating the following:
1. CITY and Department
 2. Project Name
 3. Contract Number & Project Number

- 4. Transmittal Number
- 5. Section Number

- E.** If a Shop Drawing deviates from the requirements of the Contract Documents, CONTRACTOR shall specifically note each variation in his letter of transmittal.
- F.** All Shop Drawings submitted for approval shall have a title block with complete identifying information satisfactory to CITY and or Engineer of Record.
- G.** All Shop Drawings submitted shall bear the stamp of approval and signature of CONTRACTOR as evidence that they have been reviewed by CONTRACTOR. Submittals without this stamp of approval will not be reviewed by CITY/ENGINEER and will be returned to CONTRACTOR. CONTRACTOR'S stamp shall contain the following minimum information:

Project Name/ CODB Contract No.: _____

CONTRACTOR'S Name: _____

Date: _____

-----Reference-----

Item: _____

Specifications: _____

Section: _____

Page No.: _____

Paragraph No.: _____

Drawing No.: _____ of _____

Location: _____

Submittal No.: _____

Approved By: _____

- H.** A number shall be assigned to each submittal by CONTRACTOR starting with No. 1 and thence numbered consecutively. Re-submittals shall be identified by the original submittal number followed by the suffix "A" for the first re- submittal the suffix "B" for the second re-submittal, etc.
- I.** For CITY/ENGINEER review purposes the following statement will be considered having been attached to each submittal even if the statement has not been physically placed on the submittal:

Engineer's review is for general conformance of the design concept and contract documents. Markings or comments shall not be construed as relieving the CONTRACTOR from compliance with the project drawings and specifications nor departures. The CONTRACTOR remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, and for performing his work in a safe manner. CITY OF DAYTONA BEACH

BY _____ DATE: _____

Circle: Approved as submitted Rejected Note Markings

Comments Attached Resubmit with Modifications

Approved submittals will have the CITY/ ENGINEER signature as appropriate for responsibility. For shop drawings approved with comments there will only be initials with the reviewer's comments: "Approved with following comments: _(List)_"

After CITY /ENGINEER completes' the review, the Shop Drawings will be marked with one of the following notations:

1. Approved (approval may include comments)
2. Rejected
3. Revise and Resubmit

- J.** If a submittal is acceptable, it will be marked "Approved" or "Approved as Corrected". Three (3) prints or copies of the submittal will be returned to CONTRACTOR unless otherwise agreed upon.
- K.** Upon return of a submittal marked "Approved" which may include comments", CONTRACTOR may order, ship or fabricate the materials included on the submittal, provided it is in accordance with the corrections indicated.
- L.** If a Shop Drawing is approved with extensive corrections or corrections affecting other drawings or work, CITY/ ENGINEER may require that

CONTRACTOR make the corrections indicated thereon and resubmit the Drawings for record purposes. Such drawings will be noted to re-submit.

- M.** If a submittal is unacceptable, three (3) copies will be returned to CONTRACTOR with one of the following notations:
1. "Revise and Resubmit"
 2. "Rejected"
- N.** Upon return of a submittal marked "Revise and Resubmit", CONTRACTOR shall make the corrections indicated and repeat the initial approval procedure. The "Rejected" notation is used to indicate material or equipment that is not acceptable. Upon return of a submittal so marked, CONTRACTOR shall repeat the initial approval procedure utilizing acceptable material or equipment.
- O.** Shop Drawings shall be submitted well in advance of the need for the material or equipment for construction and with ample allowance for the time required to make delivery of material or equipment after data covering such is approved.
- P.** It is CONTRACTOR's responsibility to review submittals made by his suppliers and SUBCONTRACTORS for conformance to the contract requirements and to ensure that they include the required information before transmitting them to CITY/ENGINEER for review.
- Q.** CONTRACTOR shall furnish required submittals with complete information and accuracy in order to achieve required approval of an item within three submittals. All costs to CITY/ENGINEER involved with subsequent submittals of Shop Drawings will be back charged to CONTRACTOR, at the rate of 3.0 times direct technical labor cost, by deducting such costs from payments due CONTRACTOR for work completed. In the event that CONTRACTOR requests a substitution for a previously approved item, the CITY/ENGINEER's costs for the review and approval of the substitution may be back-charged to CONTRACTOR unless the need for such substitution is beyond the control of CONTRACTOR.
- R.** Close-out Submittals: Refer to General Conditions and Section 01700 for related requirements on the submittal of closeout information, materials, tools, and similar items.

END OF SECTION

**SECTION 01500
TEMPORARY UTILITY FACILITIES**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A.** This section specifies the minimum requirements for temporary utility facilities to be brought to and operated at the project site in conjunction with the project work. The providing and operation of temporary utilities facilities is the CONTRACTOR's sole responsibility, and is not limited by the requirements of this Section.

- B.** The types of utility service facilities required for temporary use at the project site include: Potable and reclaimed water, sanitary sewer, stormwater drainage/run-off control facilities, electric power service, Information Technology communications service and telephone service. Other site specific services may be required for prosecution of the work.

1.2 QUALITY ASSURANCE

- A.** Comply with local, state and federal regulatory requirements and utility company regulations and recommendations for the construction of temporary utility services; including (but not necessarily limited to); code compliance, permits, inspections, testing, and health and safety compliance.

- B.** Comply with pollution and environmental protection regulations for the use of water and other services, and for the discharge of wastes and stormwater drainage from the project site. Comply with all environmental impact commitments of record that have been made by the CITY or previous owners of the site in securing approval to proceed with the construction of the project.

- C.** CONTRACTOR must control turbidity in rivers or canals so that it does not exceed established background turbidity by more than 50 Jackson Units at a distance greater than 100 feet from the point of work. This shall be done by the use of a "diaper" or floating or anchored turbidity barriers or other methods approved by the environmental agency or CITY.

- D.** Safety compliance at a minimum shall be in accordance with the "Manual of Accident Prevention in Construction" by AGC or other similar accident prevention organization.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

3.3 OPERATIONS

- A. Inspections: Prior to placing temporary utility services into use, inspect and test each service and arrange for governing authorities required inspection and test, and obtain required certifications and permits for use thereof.
- B. Supervision: Enforce strict discipline in the use of utility services. Limit availability to essential uses, so as to minimize wastes. Do not allow the installations to be abused or endangered.
- C. Protection: Prevent water filled piping from freezing, by ground cover or insulation or by keeping drained, or by temporary heating. Maintain distinct markers for underground lines, and protect from damage during excavating operations.
- D. Public Safety: The CONTRACTOR shall at all times so conduct his work as to insure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the work, and to insure the protection of persons and property, in a manner satisfactory to the CITY. **No road or street shall be closed to the public, except with the prior permission of the CITY and proper governmental authority. (Contact the CITY to complete special form so adequate public announcement can occur.)** 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 insure that sidewalks are usable and A.D.A compliant and that all gutters, sewer inlets, drainage ditches, and irrigation ditches are properly functioning. CONTRACTOR shall provide adequate drainage facilities, tie-downs, or other preventative measures for the work to protect the CITY and other properties from damage that occurs during severe weather events. **At first notice of a “SPECIAL WEATHER ALERT” the CONTRACTOR is hereby required to make the works area as safe as possible. This may mean filling excavations and removing all equipment at no extra cost to the CITY. The use of barricades during excessive winds should be avoided by installing in-the-ground mounted construction activity warning signs.**

END OF SECTION

**SECTION 01541
PROTECTION OF THE WORK AND PROPERTY**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY:

- A. This Section sets forth the requirements and responsibilities to protect the work and all public and private property and improvements above and below ground from aesthetic and structural damage during the performance of the work.

1.2 TREE AND PLANT PROTECTION:

- A. CONTRACTOR shall protect unique species, significant and or historical existing trees adjacent to the site that are shown or designated to remain in place against unnecessary cutting, breaking or skinning of trunk, branches, bark or roots. The CONTRACTOR shall utilize the services of a Florida licensed arborist for protective services if so directed by the CITY.
- B. Materials, fuels, lubricants, chemicals, fire or equipment shall not be stored or parked within the drip line.
- C. Temporary fences or barricades in keeping with regionally recognized damage prevention practices shall be installed to protect trees and plants in areas subject to construction traffic.
- D. Within the limits of the work, water trees and plants that are to remain or that have been temporarily relocated, in order to maintain their health during construction operations.
- E. Cover all exposed roots with burlap that shall be kept continuously wet. Cover all exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, run-off or noxious materials in solution
- F. If branches or trunks are damaged, prune branches immediately and protect the cut or damaged areas with emulsified asphalt compounded specifically for horticultural use in a manner approved by the CITY.
- G. All damaged trees and plants that die or suffer permanent injury shall be removed when ordered by the CITY and replaced by a specimen of equal or better quality.

1.4 PROTECTION OF EXISTING IMPROVEMENTS

- A. Underground improvements are defined to include, but not limited to, all stormsewer, sanitary sewer, water, gas, and other piping, and manholes, chambers, electrical conduits, tunnels and other existing subsurface improvements located within or adjacent to the limits of the work.
- B. Surface improvements are defined as all existing buildings, structures and other facilities above the ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads and their dams, channels, open drainage, piping, poles wires, posts, signs, markers, curbs, pavers, walks and all other facilities that are visible above the ground surface.

1.5 PROTECTION OF UNDERGROUND AND SURFACE STRUCTURES:

- A. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all underground and surface improvements located within or adjacent to the limits of the work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure. Before proceeding with the work of sustaining and supporting such structure, CONTRACTOR shall satisfy the CITY that the party owning same has approved the methods and procedures to be used.

1.6 PROTECTION OF FLOORS AND ROOFS:

- A. CONTRACTOR shall protect floors and roofs during the entire construction period. Floors that are affected by the construction activities will be restored to the satisfaction of the CITY at the CONTRACTOR's cost.
- B. Proper protective covering shall be used when moving heavy equipment, handling materials or other loads, when painting, handling mortar and grout and when cleaning walls and ceilings.
- C. CONTRACTOR shall restrict access to roofs and keep clear of existing roofs except as required by the new work.
- D. If access to roofs is required, roofing, parapets, openings and all other construction on or adjacent to roof shall be protected with suitable plywood or other approved means.

1.7 PROTECTION OF INSTALLED IMPROVEMENTS

- A. Provide protection of installed improvements to prevent damage. Remove protection when no longer needed, with CITY concurrence, prior to completion of work.
- B. Control construction traffic to prevent damage to equipment, materials and surfaces.

PART 2 - PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

**SECTION 01568
EROSION & SEDIMENTATION CONTROL**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the requirements for the control and containment and general prevention of pollution by erosion and sediment resulting from the project work in compliance with General Conditions of the contract and environmental regulations of the City, the County, Department of Environmental Protection and United States Environmental Protection Agency.
- B. The cost of all work, materials and coordination to implement and maintain an effective and regulatory compliant erosion and sediment control plan shall be included in the unit cost for the associated primary items of work unless otherwise provided for in the bid items.

1.2 SUBMITTALS

- A. CONTRACTOR shall upon request at the Pre-construction meeting submit an Erosion and Sedimentation Control Plan, prepared by an FDEP certified Stormwater Management Inspector, to the CITY for review and acceptance prior to beginning work. Each month a record of erosion control measures in place during the previous month will be provided.
 - 1. Should the CITY receive a warning letter from the Department of Environmental Protection, the CITY/ENGINEER will move to issue a Stop Work Order until the Department of Environmental Protection representative has re-inspected the work conditions and given a statement that the project now appears to be in compliance with Chapter 373 no additional work days will be allowed.
 - 2. The CONTRACTOR shall submit to CITY in writing the plan of action to prevent erosion and sedimentation problems cited during the project duration

JOB CONDITIONS

Prior to placing a bid for this project the bidder/contractor should prepare a draft plan of action for erosion and sedimentation control. The full cost for all materials, labor and equipment shall be considered within the bid items of the submitted bid. There will be no extra payment for any installation, maintenance or reinstallation of erosion control devices that the Department of Environmental Protection may order as part of a warning letter.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

3.1 GENERAL

- A. CONTRACTOR shall not start work until erosion and sediment control measures are fully in place to prevent pollution of air, water and adjacent property. It shall be the CONTRACTOR's responsibility to provide, construct and maintain all sediment and erosion control devices. The CONTRACTOR shall have an FDEP Certified Stormwater Management Inspector onsite to supervise installation and maintenance of all erosion and sedimentation controls. Best Management Practices shall be used where directed by the CITY.
- B. The CITY shall not be tasked with advising the CONTRACTOR of compliance, but should the CITY believe the Erosion and Sedimentation Control Plan proposed or installed by the CONTRACTOR to be inadequate the CITY will send a certified letter to the CONTRACTOR warning the CONTRACTOR of potential environmental concern. Should the Department of Environmental Protection conduct a field inspection and the CITY be put on notice the CITY will order the project closed until the erosion and sedimentation control devices are all in place and functioning properly.
- C. Two (2) primary types of silt barriers may be installed in accordance with an action plan prepared by the CONTRACTOR and as noted on the plans; silt barriers installed on the ground, and floating turbidity/silt-barriers.
- D. Silt barriers (filter fabric) shall be synthetic and contain ultraviolet ray inhibitors and stabilizers. Silt barriers shall be maintained and remain in-place until all risk of erosion has passed.
- E. Hay bales shall not be used for silt barriers, unless maintained during rain events.
- F. Inlet sediment protection barrier systems shall be maintained in place until all risk of erosion has passed.
- G. Sandbagging shall consist of furnishing and placing sandbags in a configuration that prevents or contains erosion.
- H. Sediment basins shall be constructed as necessary to prevent erosion from leaving the project limits.

- I. Berms with appropriate sod or all-weather coverings shall be constructed as necessary to divert the flow of water from causing erosion.
- J. Temporary grassing, chemical soil stabilizers or non-erodable coverings will be required to prevent erosion from soil surfaces with an anticipated unprotected exposure to sun and wind of more than 30 days.

3.2 CONTROL OF CONTRACTOR'S OPERATIONS

- A. In the event that it is necessary that the construction operations be suspended due to major storm events, the CONTRACTOR shall use due care secure the construction zone and do everything possible to prevent erosion at the same time preventing flooding of adjacent properties. Should such preventative measures fail, CONTRACTOR shall immediately take all action as necessary to effectively remediate erosion and sedimentation damage. Should the CITY be ordered by the Department of Environmental Protection to upgrade erosion control immediately after the major storm event the CONTRACTOR shall contact the CITY for further consideration of available options.

END OF SECTION

**SECTION 01570
TRAFFIC CONTROL**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

The work in this section includes the coordination, implementation and operation of a Maintenance of Traffic (MOT) plan, in accordance with the construction plans and permits, that provides for the safe execution of the work and the safety of the public while maintaining property access and an effective flow of pedestrian and vehicular traffic.

1.2 SUBMITTALS

The CONTRACTOR shall submit three maintenance of traffic plan sets complying with the M.U.T.C.D., Part IV and the Florida Department of Transportation (FDOT) Roadway and Traffic Design Standards, latest edition, Index No. 600 series as a project Shop Drawing submittal. The Plan must provide for the maintenance of vehicular and pedestrian traffic, including public safety and driveway access to properties on all roads and streets during the prosecution of the Work. The CITY shall have the right at any time to require revisions to the Plan and to require CONTRACTOR to take additional steps not reflected on the approved Plan, in order to ensure maintenance of vehicular and pedestrian flow and provide protection against damage to access routes and haul routes.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

- A. The CONTRACTOR shall be responsible for the implementation of the maintenance of traffic plan. Vehicular and pedestrian traffic including access to businesses and other properties shall be maintained on all roads and streets.
- B. The CONTRACTOR shall coordinate with the CITY's Project Manager and Traffic Operations Manager and the Owner of the road right of way in preparing the maintenance of traffic plan.
- C. The CONTRACTOR shall provide a Worksite Traffic Supervisor for the duration of the project, to supervise the implementation of the plan. The Supervisor must be trained and certified by a Florida Department of Transportation approved traffic

safety education provider. Contact information shall be provided at the Pre-Construction meeting.

- D. It shall be the CONTRACTOR's responsibility to restore work site access routes and material haul routes to their pre-construction condition when damages result from the CONTRACTOR's activities.
- E. The CONTRACTOR shall comply with the requirements and permits of the respective right of way owners while working within their right of ways.
- F. No additional compensation shall be made for compliance with these requirements.

END OF SECTION

**SECTION 01600
MATERIALS AND EQUIPMENT**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the general requirements for quality and uniformity of materials and equipment furnished by CONTRACTOR. Materials and equipment shall conform to applicable specifications, operating and performance standards and comply with the size, make, type and quality specified, or as specifically approved in writing by CITY and or Engineer of Record.

1.2 TRANSPORTATION AND HANDLING

- A. Materials and equipment shall be loaded and unloaded by methods affording adequate protection against damage. Every precaution shall be taken to prevent injury to the materials or equipment during transportation and handling. Suitable power equipment will be used and the materials or equipment shall be under control at all times. Under no condition shall the materials or equipment be dropped, bumped or dragged. When a crane is used, a suitable hook or lift sling shall be used. The crane shall be so placed that all lifting is done in a vertical plane. Materials or equipment skid loaded, palletized or handled on skid ways shall not be skidded or rolled against materials or equipment already unloaded.
- B. Materials and equipment shall be delivered to the job site by means that will adequately support it and not subject it to undue stresses. CONTRACTOR shall promptly inspect the products for damage and defects and conformance with the specification. Materials and equipment damaged or injured in the process of transportation, unloading or handling will be rejected and shall be immediately removed from the site.

PART 2 - PRODUCTS

- A. The CONTRACTOR shall provide anchor bolts and weather exposed structural attachments in stainless steel for each piece of equipment furnished unless otherwise directed.

PART 3 - EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

**SECTION 01611
STORAGE OF MATERIAL**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the requirements and provisions necessary for the storage of materials and equipment. Materials and equipment shall be kept neatly and compactly stored in locations that will cause a minimum of inconvenience to other contractors, public travel, adjoining Cities, tenants, and occupants.

1.2 UNCOVERED STORAGE

- A. The following types of materials may be stored out of doors without cover; masonry units, reinforcing steel, structural steel, piping, pre-cast concrete items, castings, hand-railing. Store the above materials on wood blocking so there is no contact with the ground.

1.3 COVERED STORAGE

- A. The following types of materials may be stored out of doors if covered with material impervious to water: rough lumber, filter media. Tie down covers with rope and slope to prevent accumulation of water on covers.

1.4 FULLY PROTECTED STORAGE

- A. Store all products not named above in buildings or trailers that have concrete or wooden floor, a roof, and fully closed walls on all sides. Provide heated storage space for materials that would be damaged by freezing. Protect mechanical and electrical equipment from being contaminated by dust, dirt and moisture. Maintain humidity at levels recommended by manufacturers for electrical and electronic equipment. Provide air conditioning areas as necessary.

1.5 MAINTENANCE OF STORAGE

- A. Maintain a periodic system of inspection of stored products on a scheduled basis to assure that the state of storage facilities is adequate to provide required conditions, that the required environmental conditions are maintained on a continuing basis and that products exposed to elements are not adversely affected.

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

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

SECTION 01660
UTILITY PIPING & EQUIPMENT- GENERAL FIELD TESTING

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section work includes the performance of general field testing to demonstrate that the new equipment and piping is constructed as specified, meets the manufacturer's and CITY's operating recommendations and is clean and safe to use for its intended purpose.

1.2 REFERENCES

- A. The CITY Utilities Department Standard Details, latest edition, AWWA C 651 and ancillary applicable standards and manufacturer's recommended standards shall apply.

1.3 SUBMITTALS

- A. The CONTRACTOR shall submit to the CITY the results of field tests.

1.4 PRELIMINARY TESTING

- A. The CONTRACTOR shall make preliminary field tests of all equipment and piping as conditions permit.
- B. Purpose of testing shall be to establish that the equipment and piping was delivered to the site in good condition, properly installed, complies with operating cycle, does not overheat or overload, vibrate or operate in an unacceptable manner.
- C. CONTRACTOR shall furnish all labor, materials, instruments, fuel, Incidentals and expendables required, unless otherwise provided.
- D. CONTRACTOR shall make all changes, adjustments and replacements required to place equipment in service and provide verification testing.
- E. The CITY shall be given sufficient prior notice to prepare for and witness tests.

1.5 JOB CONDITIONS

- A. CONTRACTOR shall review the field conditions prior to placing a bid for this project and evaluate the testing schedule that will be required. To the maximum extent possible the CONTRACTOR shall schedule field tests to allow portions of the project to be cleared for use and to allow pavement replacement final grassing to begin as soon as possible.
- B. Review any planned partial system disinfection with the CITY a minimum, of two weeks in advance to verify that a partial clearance or approval will be allowed.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

3.1 FINAL TESTING

- A. The CONTRACTOR shall perform final field tests of equipment and piping, provide install and remove test equipment and appurtenances and make all CITY required system adjustments and replacements resulting from failed tests at his cost prior to acceptance.
- B. The field tests shall clearly demonstrate that the equipment and piping meet the operational requirements and manufacture's recommended standards. The cost of all work and materials needed to perform the field tests shall be included in the applicable pipe and equipment items or included in the project lump sum bid value.
- C. The cost of all work and materials needed to perform the field tests shall be included in the applicable pipe and equipment items or included in the project lump sum bid value.
- E. All disinfection water shall be de-chlorinated and flushing, pigging and miscellaneous testing water shall be free of pollutants prior to discharge to any stormwater system, wetland, waterway or water-body.
- F. Pigging will be required for all pressure piping that has a 6" or greater inside diameter. At the CITY's direction flushing without pigging will be used on gravity systems and pipes with an inside diameter less than 6".

- G. CONTRACTOR shall seek approval from the CITY for scheduling tests at least three (3) business days in advance of the desired timeframe. In the case of flushing, disinfection or pigging operations and/or tests the Utilities Department Water System Manager will determine the time period (night or day) when these operations and tests are allowed to be conducted in order to minimize the negative impacts of additional water volume demands.

3.2 WATER MAINS

- A. **The CONTRACTOR shall provide an AWWA C651 compliant disinfection/de-chlorination/disposal plan for CITY approval a minimum of two weeks prior to the proposed disinfection test date.** The disinfection test date shall be scheduled in coordination with the CITY Utilities Department Testing Laboratory to ensure that adequate staff is available for sampling and analysis and to determine if the test will need to occur after normal daytime working hours.
- B. Pressure tests shall be conducted with the pipe system in-place after pigging has occurred and to the extent practicable before backfilling. Pressure piping and valves shall be statically tested at 150 psig. The test pressure shall be maintained for a minimum of four (4) uninterrupted hours and be measured at the high point in the line. Hydrostatic Testing per Section 5.2 ANSI/AWWA C600-99 (Contact the CITY for a copy of same) All air shall be expelled from the line before applying the test pressure. Exposed pipe, joints and other potential leak sources shall be carefully examined for leaks.
- C. Acceptance of the piping installation shall be determined on the basis of testing allowances for the pipe material used in accordance with the AWWA C600-99 standard. If any test of laid pipe discloses a testing allowance greater than that specified in Section 5.2.1.6, repairs or replacements shall be accomplished in accordance with these specifications
- D. The CITY will conduct random operational inspections of the in line valves and water services to be certain that the total water main has been fully pressure tested.

3.3 SANITARY, STORMWATER & RECLAIMED FORCE MAINS

- A. Force mains shall be pigged and subjected to a hydrostatic leakage test. This test measures the amount of water required to be supplied to newly laid pipe to maintain a specified pressure after the pipe has been

filled with water and the air expelled. The duration of this test shall not be less than two (2) uninterrupted hours and the test pressure shall be 100 psig as measured at the high point in the line. The maximum allowable leakage for the pipe material used shall not exceed the applicable limits specified in AWWA C-600.

- B. Acceptance of the piping installation shall be determined on the basis of testing allowances defined in the AWWA C600-99 standard. If any test of laid pipe discloses a testing allowance greater than that specified in Section 5.2.1.6, repairs, replacement and re-testing at the CONTRACTORS sole expense shall be accomplished in accordance with these specifications.
- C. The CITY will conduct random inspections and operational evaluations of the in line valves and blow off points to be certain that the total force main has been fully pressure tested

3.4 SANITARY & STORMWATER GRAVITY MAINS

- A. Acceptance of the sewer piping installation shall be determined on the basis of the CONTRACTOR conducting a televised inspection of the mains and laterals with a copy to be provided at no additional cost the CITY. CITY personnel will also conduct a visual inspection of all structures including manholes and piping. .
- B. Acceptance of the piping installation shall be determined on the basis of zero (0) infiltration or inflow being detected and no deflections or deviation from the design grade. When defects in sewer piping are discovered the CITY will advise the CONTRACTOR in writing of the most acceptable course of action which may include the total removal and replacement of the defective system installation.

END OF SECTION

SECTION 01700
SUBSTANTIAL COMPLETION OF FACILITIES

PART 1 - GENERAL REQUIREMENTS:

1.1 SUMMARY

The work in this section includes general requirements evidencing completion of the work in preparation for final acceptance not otherwise found in Section 01720 As-Built Record Documents and the General Conditions.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

3.1 COMPLETION PROCEDURES:

General operating/Maintenance Instructions: Arrange for each installer of work requiring continuing maintenance (by the CITY) or operation, to meet with the CITY's personnel, at the project site, to provide basic instructions needed for proper operation and maintenance of the entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up shutdown, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, and similar operations. Review maintenance and operations in relation with applicable guarantees, warranties, agreements to maintain, bonds, and similar continuing commitment.

3.2 FINAL CLEANING:

General: Provide final cleaning of the work, at the time indicated, consisting of cleaning each surface or unit of work to the normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturers' instructions for cleaning operations. The following are examples, but not by way of limitation, of the cleaning levels required:

1. Remove labels, which are not, required as permanent labels.
2. Wipe surfaces of mechanical and electrical equipment clean; remove excess lubrication and other substances.
3. Clean concrete floors in non-occupied spaces broom clean.

4. Clean project site (yard and grounds), including landscape, development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petrochemical spills and other foreign deposits. Rake grounds, which are neither planted nor paved, to a smooth even-textured surface.

3.3 Removal of Protection:

Except as otherwise indicated or requested by the CITY, remove temporary protection devices and facilities which were installed during the course of the work and dispose of them when no longer needed.

3.4 Compliancy:

- A. Comply with safety and erosion control standards and governing regulations for cleaning operations. Do not burn waste materials at the site, or bury debris or excess materials on the CITY's property, or discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of them in a timely and lawful manner.
- B. Where materials of value are to become CITY property after completion of the work the CONTRACTOR shall store them as directed by the CITY.

END OF SECTION

**SECTION 01720
AS-BUILTS/RECORD DOCUMENTS**

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section sets forth the requirements for preparing as-built/record drawings and documents for verification of construction and archiving for future use. CONTRACTOR shall secure the services of a Florida licensed surveyor to collect data and prepare as-built/record drawings.

1.2 REFERENCE

- A. The preparation work shall be in accordance with this Section and supplementary details in the City of Daytona Beach Utilities Department Standard Details, latest edition.

1.3 AS – BUILT/RECORD DRAWINGS

- A. As-built/record drawings are required for all public facilities constructed. Prior to construction completion these as-built/record requirements will be reviewed to be certain the Contractor's surveyor has a clear understanding of what is required for completion of this work.
- B. In order to ensure that the City's project records are maintained to the highest standards and the information can easily be added to the City's electronic records the following information is required on all as-built/record drawings:
 - 1. Pavement and curb widths shall be verified and dimensioned for each street at each block (for subdivisions) and as appropriate to confirm paving limits (on site plans).
 - 2. All radii at intersections shall be verified and dimensioned. This information is to be clearly indicated on the as-built/record drawings.
 - 3. Roadway elevations shall be recorded at all grade changes, 100' intervals along roadway, and other intervals as needed along all streets. Street centerline and curb invert elevations shall be recorded as noted.

4. The as-built centerline profile of all streets shall also be shown on the plan and profile so it may be compared to the design profile grade lines. In the event that the as-built centerline longitudinal grade does not meet the City minimum standards, additional longitudinal grades of the adjacent curbing and similar roadway cross-section surveys to verify the correct cross slope, shall be required to verify that the system will function as originally designed.
5. Storm drainage structures shall be located and/or dimensioned from centerlines or lot lines as appropriate. Each structure shall be located by sub-meter GPS with latitude, longitude and elevation data.
6. Storm drainage pipe invert and inlet elevations shall be recorded and clearly denoted as as-built information. Design elevations shall be crossed out and as-built information written next to it.
7. Storm drainage pipe material, length, and size shall be measured and/or verified. This information is to be clearly indicated as being as-built information.
8. All applicable topographic information pertinent to the on-site drainage system, such as ditches, swales, lakes, canals, etc. that are deemed necessary by the City to verify the functional performance of the storm water system, shall be noted. Normally, recording elevations every 100 feet at the top of bank and toe of slope will be required. Measurements shall be taken and recorded in order to accurately tie down these features to the roadway centerlines and to plat lines. Whenever possible, contour lines shall be utilized to graphically describe these topographic features.
9. Retention areas shall have their top of bank and bottom elevations recorded. Actual measurements shall be taken and dimensions recorded of the size of all retention areas. Measurements shall be done from top of bank with side slopes indicated. Separate calculations shall be submitted to indicate required and provided retention volumes.
10. Actual materials used and elevations and dimensions of overflow weir structures and skimmers shall be noted on the as-built.

11. Storm drainage swale centerlines shall be located and elevations of flow line and top of bank shall be recorded every 100 feet. Side slopes shall also be indicated.
12. Sanitary sewer manholes shall be verified and dimensioned from street centerlines or lot lines as appropriate. All rim and invert elevations shall be verified and recorded. This information shall be clearly indicated as being as-built information. Design Elevations shall be crossed out and as-built information written next to it.
13. For subdivisions, proposed design finish floor elevations shall appear on all subdivision lots on the appropriate plan and profile sheet as well as on the master drainage plan.
14. Sanitary Sewer line lengths, sizes, material, slope, etc., shall be verified and recorded, this information is to be clearly indicated as being as-built information.
15. Sewer Laterals shall be verified and recorded at their clean out locations, stationing and offset distances shall be measured from downstream manholes towards upstream manholes. Invert information at clean out shall be provided, and be located by sub-meter GPS with latitude, longitude and elevation data
16. Lift stations and force mains shall be verified and dimensioned from street centerlines or lot lines as appropriate. Force main depth and location including valves will be provided and tied to permanent above grade features. Dimensional and elevation information indicated on the approved plan shall be verified and recorded. This information shall be clearly indicated as being as-built information. Buried potable water lines and electrical service lines shall be clearly dimensioned, located, and labeled. Each lift station shall be located by sub-meter GPS with latitude, longitude and elevation data provided.
17. Curb cuts or metal tabs, used to mark sewer laterals, water services and water valves, shall be verified for presence and accuracy of location.

18. Potable and reclaimed water main lines shall be dimensioned off the baseline construction. Water main line material size, length and depth placed shall be noted. Locations of valves shall also be tied to baseline construction. This information shall be clearly indicated as being as-built information.
19. Potable and reclaimed water valves, tees, bends, all services, and fire hydrants shall be located by tying them to baseline construction (Sta. & Offset). Similarly, force main valves, tees and bends shall be located in the same manner. Stationing and offset distances shall be measured from downstream manholes to upstream manholes. All valves and hydrants shall be located by sub-meter GPS with latitude, longitude and elevation data provided.
20. For perpendicular crossings of storm water, sanitary sewer, potable water, or reclaimed water, the as-built plans shall clearly indicate which utilities are located over or under other utilities, as necessary.
21. Any special features such as, concrete flumes, lake banks, walls, fencing, etc. which are a part of the approved construction drawings should also be located and dimensioned.
22. If an approved subdivision plat or site plan shows a conservation easement, the project surveyor should provide the exact location of the specimen tree(s) from the right-of-way or property lines and proposed easement boundaries on the as-built drawing. The as-built location of these trees will help verify the sufficiency of the conservation easement prior to plat recording or certificate of occupancy.
23. When storm water, potable water, reclaimed water, or sanitary sewer improvements are located within an easement, the as-built drawing will accurately depict the location of the easement itself as well as the exact location of the improvements within the easement. This is required in order to verify that the improvements have been properly located and to ensure that future subsurface excavation to perform remedial repair can be accomplished without disturbance beyond the easement.

24. As-built drawings are to be prepared by a Florida licensed surveyor and shall include a signed certification statement by the Florida licensed engineer of record. A Mylar set of as-built record drawings shall be provided with a digital copy in a compatible AutoCAD format.
25. Elevations shall be referenced to NGVD 1988 Data. As-built survey information shall be referenced to at least two Florida State Plane east coordinates NAD 83.
26. Benchmark Datum utilizes monumentation from the North American Vertical Datum of 1929 with elevations adjusted to NGVD 1988 data. Any NAVD 1929 monument with the limits of construction is to be protected.

1.2 SUBMITTALS

- A.** CONTRACTOR shall submit each month to CITY the Project Activity Summary that shows current construction activities and a copy of notices to agencies including the City regarding road closures; plus a record of events that will be needed in the future.
- B.** CONTRACTOR shall submit to CITY as required the proposed shut-off schedule, capping, temporary service scheduling, record of notices to customers and proposed roadway closings.
- C.** CONTRACTOR shall submit copies of published notices.
- D.** CONTRACTOR shall submit Record Drawings on CD and Mylar. When the As-Builts are delivered for clearance of water lines (two paper copies), they will be scheduled for chlorination. CITY will not release the drinking water bacteriological laboratory report to Volusia County Health Department until the As-built information meets CITY requirements. CONTRACTOR will have 60 days from the time the bacteriological samples are collected to submit the as-built Mylar and CD to CITY. Send the two paper copies for approval before making the Mylar. If CONTRACTOR goes past the 60 days re-chlorination will be required and pay for the bacteriological laboratory report will be required. Below are minimum detail samples of how the As-built drawing information will need to be presented
- E.** These are examples of how to display and label valves, fittings, and pipes on the plans. Include a location arrow going to the identified object

20" GATE VALVE
STA. 22+33 (LT.55.0')
LAT. = 29°12'53.009"N
LONG. = 81°04'03.355"W
TOP ELEV. = 27.50
FINISH GROUND ELEV. = 30.50

Pipes Example

20" DIP WATER MAIN
STA. 22+00 (RT.55.0')
LAT. = 29°12'50.009"N
LONG. = 81°04'26.355"W
TOP OF PIPE ELEV. = 27.50
FINISH GROUND ELEV. = 30.50

(All Bench Marks used must be shown on the plans)

Bench Mark Example:

BM#13
STA. 20+33 (LT. 85.5')
3/4" Iron Rod with Plastic Cap...
N = 1,774,373.4058
E = 634,602.7566
LAT. = 29°04'53.355" W
LONG. = 81°04'53.355" W
ELEV. = 32.55

PART 2- EXECUTION

2.1 GENERAL

All drawings shall be prepared to True State Plane Coordinates. CONTRACTOR shall provide all materials, equipment, labor needed to prepare and submit accurate As-built/Record Drawings.

- A.** It is acceptable to CITY if the surveyor utilizes an after the fact approach to collecting and verifying the location and depth by vertical PVC pipes placed by the CONTRACTOR as markers for this purpose. The surveyor shall verify to the accuracy defined in Florida Statutes the As-built conditions and certify the Record Drawings.
- B.** CITY shall not be considered the best source of information for valve locations that may have been lost during final grading, the surveyor or CONTRACTOR shall excavate and properly mark all valve boxes and each valve shall have a tag or color coded to define water, sewer or reuse water valves. The use of temporary PVC pipe markers color coded is acceptable so long as cross references are provided on the Record Drawings to prevent the tops from a water valve being placed on a sewer valve.
- C.** THE CONTRACTOR SHALL PROVIDE THE UTILITIES DEPARTMENT ENGINEERING DIVISION THE FINAL AS BUILT/RECORD DRAWINGS ON CD AND MYLARS. THE AS-BUILT RECORD DRAWINGS SHALL BE PREPARED USING AUTOCAD FORMAT 2010 OR LATER. IN MODEL SPACE THE DRAWING SHALL BE IN FL83-EF STATE PLANE COORDINATES AND SHALL BE ABLE TO BE INSERTED INTO THE CITY'S OVERALL GIS SYSTEM. THE RECORD DRAWINGS SHALL ALSO BE PRINTED ON MYLAR SIGNED AND SEALED AS ALLOWED BY STATE OF FLORIDA REGULATIONS. A DISCLAIMER MAY BE NOTED IN A TRANSMITTAL LETTER PLUS THE SURVEYOR MAY ADD A SPECIAL NOTICE ON EACH SHEET REGARDING THE LOCATION OF THE TRUE ORIGINAL RECORD DRAWINGS OR PLACE LIMITS ON RESPONSIBILITY SHOULD SOMEONE IN THE FUTURE SOMEONE NEED TO MODIFY THE MYLARS.
- D.** Identify the source markers for the survey used for Record Drawings.

END OF SECTION

01720-7

**SECTION 02051
TANK REMOVAL AND DISPOSAL**

PART I – GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the permitting, work and material requirements for the complete removal of elevated storage tanks to ground elevation.
- B. The unit cost for tank removal and disposal shall include all necessary permitting, work and materials such as but not limited to associated fill, supply, return, vent piping, all steel tank structure components, regulatory permits, site safety and security and work site restoration . No additional compensation shall be made for compliance with these requirements.

1.2 QUALITY COMPLIANCE

- A. CONTRACTOR's personnel shall be qualified and experienced with the demolition and disposal of elevated welded field erected steel tanks that have been used to store the same type of materials originally stored in this tank. .
- B. The CONTRACTOR shall prepare for and acquire all regulatory permits unless otherwise provided by the CITY. All regulations established for the control of such work including disposal of tank materials shall be followed completely. Upon completion of the work the site will be left safe and presentable as directed by CITY.
- C. The elevated tank materials after loading on the CONTRACTOR's trucks by the CONTRACTOR shall be considered delivered and no longer the CITY's property.
- D. The CITY may take photos of the removal process and the condition of loaded trucks leaving the site. The CITY may present a form to the truck driver advising him that the materials contained on said truck are no longer the CITY of Daytona Beach Property and all transport of said materials are outside this contract.

1.3 SUBMITTALS

- A. Certificate of Insurance meeting the CITY of Daytona Beach requirements.
- B. Submit to the CITY a copy of the CONTRACTOR's license to operate in the State of Florida.

- C. Proposed disposal methods for liquids and sludges found in the storage tank.
- D. Copies of all necessary permits.
- E. Statement that the Elevated Tank purchased and removed from the site has been purchased in the AS IS CONDITION including condition and type of existing coatings internal or external and that such purchase is final and all materials have been removed from the site. (This Statement must be a signed and notarized statement from the purchaser.)

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

**SECTION 02202
EXCAVATING, BACKFILLING AND COMPACTING**

PART 1 – GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section includes the requirements for furnishing equipment, labor and materials, and performing all operations necessary and incidental to complete the required work.
- B. Payment for all work described in this Section shall be included in the unit prices for the associated primary items of work such as pipe, utility and stormwater system components, jack and bore, horizontal and vertical drilling operations, etc... unless otherwise noted in the plans.

1.2 REFERENCES

- A. The requirements of the CITY Utility Department Standard Details, latest edition, The Florida Department of Environmental Protection-Stormwater Erosion and Sedimentation Control Inspector's Manual, latest edition and Section 01200, 01568.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

3.1 CONSTRUCTION

- A. Clearing: The site of the work shall be cleared of all trees, shrubs, improvements and objectionable material that interfere with the completion of the proposed work. The CONTRACTOR shall be responsible for the offsite disposal of all clearing debris. Trees and shrubs that will not interfere with construction shall be protected from damage. Clearing shall be considered as an incidental item with the cost to be included in the applicable primary items of work unless otherwise noted in the plans.
- B. Excavation: Perform excavation of all soils and materials encountered to the dimensions and depths specified or shown on the drawings as necessary to construct the associated applicable items of work. Undercutting will not be

permitted, except when ordered by the CITY. Material suitable for backfill shall be stockpiled near the site. Rock and cemented coquina shall be the property of the CITY and be spoiled outside the area in a neat manner, as directed by the CITY. Other soils and materials unsuitable for backfill shall be disposed of by the CONTRACTOR in areas provided by him. Where it is necessary to cut roots projecting into an excavation or where it is necessary to trim branches for equipment clearance, all severed root ends or cuts to branches over ½” diameter shall be treated with an asphalt base pruning paint. Backfill over exposed roots as soon as possible.

C. Rock and Cemented Coquina: Where rock and cemented coquina are encountered, the trench bed shall be excavated to a depth of 1/4 of the pipe diameter but in no case less than 4” below the bottom of the pipe. All undercut trench excavation shall be backfilled with suitable materials and made firm and unyielding as specified in the following paragraphs under Unstable Soils and Materials.

D. Unsuitable Soils and Materials: In the event that unsuitable soils and material is encountered at or below the excavation depth specified or shown on the drawings, the CITY shall be notified. Such material shall be removed, disposed of and replaced with suitable material. The CITY shall determine the methods and materials to be used, based upon the condition of the excavation, the pipe or structure to be supported, and the availability and character of stabilizing materials.

1. Methods and materials used for replacement shall be one of the following as directed by the CITY in writing:

a. Suitable earth or sand compacted in the trench. Materials shall be furnished and paid for as a part of the pipe or structure bid item.

b. Gravel or crushed limerock compacted in the trench. Materials shall be furnished and paid for as part of the pipe or structure bid item.

c. Existing materials, stabilized after removal and then replaced and compacted in the trench and paid for as part of the pipe or structure bid item.

E. Trenching:

1. Keep pipe laying operations as close to the excavation operation as possible during the prosecution of the work. The CITY reserves the right to stop the excavation-at any time when, in its opinion, the excavation is not properly safe-guarded or is opened too far in advance of the pipe laying.

2. Pipe trenches shall be excavated to a depth that will insure a minimum of 36” of cover for all types of pipe, except service laterals. Trenches shall be only of sufficient width to provide a free working space on each side of the pipe. The maximum width of trench at the top of the pipe and at the bottom of the trench shall not be greater than two feet wider than the greatest exterior diameter of the pipe. If this maximum width is exceeded, it shall be the CONTRACTOR's responsibility to provide, at no additional cost to the owner, such additional bedding or select backfill materials as the CITY may require. The excavation below the spring line shall be made to conform as near as possible to the shape of the lower third of the pipe. To protect the pipe lines from unusual stresses, all work shall be done in open trenches. Excavation shall be made for bells of all pipes and of sufficient depth to permit access to the joint for construction and inspections. In no case will the bells be used to support the body of the pipe.
3. In order to avoid existing utilities, at times it may be necessary for the pipe to be laid deeper than the minimum cover specified in the preceding paragraph. At such time, the CONTRACTOR will not be allowed extra compensation for additional excavation involved.
4. In case excavation has been made deeper than necessary, a layer of concrete, fine gravel or other material satisfactory to the CITY shall be placed, at no extra cost, to secure a firm foundation for the lower third of each pipe. Where possible, excavated material shall be placed so as not to interfere with public travel. Bridging shall be provided for public travel and to afford necessary access to public or private premises. Bridging shall be considered as part of the excavation operation and shall be supplied at no additional cost to the Owner.

F. Structures Excavation: (For inlets, manholes, valve pits and similar structures)

1. Remove sufficient material to allow proper space for erecting and removing forms. The elevations of the bottoms of footings, if shown on the drawings, shall be considered as approximate only, and the CITY may order, in writing, such changes in dimensions or elevations of footings as may be deemed necessary to secure a satisfactory foundation. Excavation for structures shall be sufficient to leave at least 12” in the clear between their outer surfaces and the embankment or timber that may be used to protect them. Backfill of earth under structures will not be permitted. Excess excavation for structures shall be filled with thoroughly compacted sand, gravel, or concrete at the expense of the CONTRACTOR.
2. After excavation for a structure is completed, the CONTRACTOR shall notify the CITY to that effect. No concrete or reinforcing steel shall be

placed until the CITY has inspected the depth of the excavation and the character of the foundation material. Materials for roadways, road shoulders, alleys, or driveways, shall be compacted to a minimum of 98% of the maximum density as determined by AASHTO Method T-180.

G. Sheeting and Shoring:

1. The CONTRACTOR shall provide all trench and structural bracing, sheeting or shoring necessary to construct and protect the excavation, existing utilities, structures and private property of all types and as required for the safety of the employees. Sheeting shall be removed or cut off by the CONTRACTOR during backfilling operations as directed by the CITY.
2. Removal of shoring for structures shall be done in such a manner as not to disturb or mar finished masonry or concrete surfaces.

H. Drainage: Grading shall be controlled in the vicinity of excavations so that the surface of the ground will be properly sloped to prevent water from running into trenches or other excavated areas. Any water that accumulates in the excavations shall be removed promptly by well point or by other means satisfactory to the CITY in such a manner as to not create a nuisance to adjacent property or public thoroughfare. Trenches shall be kept dry while pipe is being laid. Bridging of dewatering pipe shall be provided where necessary. Pumps and engines for well point systems shall be operated with mufflers, and at a minimum noise level suitable to a residential area. The CONTRACTOR will not be allowed to discharge water into the owner's storm drainage system without the written approval of the CITY. Approval will be subject to the condition that the storm sewer be returned to its original conditions.

I. Backfill:

1. Trenches shall be backfilled immediately after the pipe is laid unless other protection for the pipe line is provided. Clean earth, sand, crushed limerock, or other material approved by the CITY shall be used for backfill. Backfill material shall be selected, deposited and compacted so as to eliminate the possibility of lateral displacement of the pipe. Backfill material shall be solidly tamped around the pipes in six (6) inch layers up to a level at least one foot above the top of the pipe. Backfilling shall be carried out simultaneously on both sides of the pipe.
2. The remainder of the backfill shall be deposited and compacted by puddling water, flooding or mechanical tampers except in areas where paving is to be placed over the backfilled trench. In these areas, the entire depth of backfill shall be deposited in six (6) inch layers and compacted by

hand or mechanical tampers. Compaction shall be carried out to achieve a density of at least 98% of the maximum density as determined by ASSHTO Method T-180. Under areas to be paved, puddling may be used for backfill consolidation after tamping to one foot over the pipe, as specified, provided the method is first approved by the CITY and the density requirements are met.

3. In areas to be paved, density tests for determination of the specified compaction shall be made by a testing laboratory and spaced one in every 300 feet of trench cut. Density tests shall be considered a part of the backfill operation. It is the intent of this specification to secure a condition where no further settlement of trenches will occur. When backfilling is completed, the roadway base for pavement replacement may be placed immediately.

- J. Structures Backfill: After completion of foundation footings and walls and other construction below the elevation of the final grades, and prior to backfilling, all forms shall be removed, and the excavation shall be cleared of all trash and debris. Material for backfilling shall consist of the excavated materials, borrow sand or other approved materials, and shall be free of trash, lumber or other debris. Backfill shall be placed in horizontal layers not to exceed a nine (9) inch thickness and have a moisture content such that a density may be obtained to prevent excessive settlement or shrinkage. Each layer shall be compacted by hand or approved machine tampers with extreme care being exerted not to damage pipe or structures. Backfill shall be placed and compacted evenly against the exposed surfaces to prevent undue stress on any surface.

K. Restorations of Areas Disturbed by Construction:

1. All improvements and natural systems on public or private property which have been damaged, altered or removed during construction, shall be restored in accordance with the respective owner's permit requirements or CITY requirements to conditions equal to or better than conditions existing prior to beginning work unless otherwise noted in the plans. Restoration of shoulders shall consist of stabilizing, grading and sodding as directed by the CITY. The cost of doing this work shall be included in the cost of the various applicable primary items unless otherwise directed in the plans. Photographs as specified in Section 01200 will be used as an aid in determining existing condition details prior to construction.
2. Materials for roadways, road shoulders, alleys, or driveways, shall be compacted to a minimum of 98% of the maximum density as determined by ASSHTO Method T-180. The cost of this work and furnishing new materials shall be included in the cost of the applicable items of work as no separate payment will be made unless a separate bid item is provided.

L. Grading:

1. The CONTRACTOR shall within a maximum of two (2) weeks from date of excavation, rough grade existing surfaces disturbed by construction to provide surfaces suitable for proper use of moving machines.
2. Finished areas around structures shall be graded smooth and hand raked. All finished areas shall be safely traversable by pedestrians and meet the elevations and contours shown on the drawings. Lumber, earth clods, rocks and other undesirable materials shall be removed from the site.

M. Disposal of Materials: Such portions of the excavated soils and materials as needed and as suitable shall be used for backfilling and grading about the completed work to the elevations as shown on the drawings or as directed. Unsuitable soils and materials and suitable excavated material in excess of the quantity required for completion of the work shall belong to the CONTRACTOR and be disposed of by the CONTRACTOR in areas provided by the CONTRACTOR unless otherwise directed in the plans and specifications.

N. Sediment, Erosion and Dust Control: It shall be the responsibility of the CONTRACTOR to take all necessary steps to prevent soil from eroding onto all paved areas and into all natural watercourses, ditches, private properties and the public sewer systems. Streets and haul roads shall be swept by an automatic, self-contained mechanical sweeper. Prevent air and water pollution through dust and dirt control to the satisfaction of the CITY in the following areas:

1. Streets, sidewalks and drives within the limits of the contract and all construction material stockpile and field office site locations.
2. Any haul roads leading to or away from the project that are used by the CONTRACTOR, his sub-contractors and his material suppliers.

The CONTRACTOR shall comply with the above requirements on a daily basis. If the CONTRACTOR fails to perform the above work in a satisfactory manner, all work, except cleanup operations, will be stopped immediately until the CONTRACTOR has complied with the above requirements to the satisfaction of the CITY.

O. Cleanup: Debris and waste materials shall be lawfully removed from the site and disposed of as work progresses.

END OF SECTION

**SECTION 02489
GRASSING**

Rev. 05-26-11

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section set forth the work to establish and maintain a thriving stand of grass, as determined by the CITY, within the areas disturbed by construction operations. Disturbed areas shall be sodded unless they are indicated in the plans to be seeded and mulched

1.2 REFERENCES

- A. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition sections 570, 575, 981, 982 and 983 deference to the CITY requirements of this Section.

1.3 SUBMITTALS

- A. At the CITY's discretion the CONTRACTOR shall provide a certification of quality from the supplier that the materials are free from invasive species and noxious pests and meet or exceed the specification and referenced requirements.

1.4 JOB CONDITIONS

- A. The CONTRACTOR shall have photographs of the before conditions to ensure that the grassing is properly installed to meet or exceed the pre-construction condition.

PART 2 - PRODUCTS

2.1 GRASS SOD

- A. Sod shall comply with the requirements of Section 575, 981, and 983 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition with the exceptions that all required water, fertilizer, slope pegging and maintenance will be included in the unit cost of the sod and the sod type shall not be limited to the three types or the CONTRACTOR's option as set forth in Sub-section 981-2.1.
- B. Sod shall match the adjacent existing type or shall be Argentina Bahia if the existing sod is weedy and unidentifiable. Sod shall be installed within 5 days after cutting.

- C. Sod shall be in good health, have adequate moisture at the time of delivery and installation and be free from weeds, other objectionable vegetation, fungus, insects and disease of any kind.

2.2 SEED AND MULCH

- A. Seeding and mulching shall comply with the requirements of Section 570, 981, 982 and 983 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition with the exception that all work and the cost of all seed types, mulch, water, fertilizer will be included in the unit cost of the seed and mulch pay item.

PART 3 - EXECUTION

3.1 INSTALLATION AND MAINTENANCE

- A. Seed, mulch and sod shall be placed to achieve a smooth and easily traversable finish. Portions of unhealthy sod shall be removed and replaced within 10 days of placement at no additional cost.
- B. Seed, mulch and sod shall be watered as necessary to keep it alive and healthy until the CITY accepts the project. For areas of sod placed adjacent to well maintained lawns the CONTRACTOR shall see to it that the property owner is pleased with the work and that the property owner's irrigation system has not been broken. Excessive storage of sod within the street right of ways is prohibited. Each area of the project that is completed and ready for grassing acceptance should be listed in an attachment to the periodic pay estimate.
- D. Fertilizer, water and or mowing will be required for the grassed areas, as directed by the CITY, throughout the duration of the project to ensure that they are green, thriving and of good appearance on the day the CITY accepts the project. One month prior to the end of the warranty period all sod that is not fully established shall be replaced.
- E. CONTRACTOR may secure a fire hydrant meter following payment of established fees to provide for a source of water. The cost of all water used by the project shall be the responsibility of the CONTRACTOR. If the CONTRACTOR fails to allow the Utility Billing personnel to record the Fire Hydrant meter volumes, the Fire Hydrant meter shall be returned immediately. No partial or final project payments will be allowed if the outstanding water meter use fees are unpaid.

END OF SECTION

**SECTION 02607
PRECAST CONCRETE WET WELL**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section sets forth the requirements for the materials and work to construct pre-cast concrete wet wells.

1.2 REFERENCES

- A. FDOT Standard Specifications for Road and Bridge Construction, 2000 edition, section 346, FDOT Design Standards, 2010 edition, index 200 with deference to CITY specification Section 03300 and Utilities Department Standard Details where more restrictive.

1.2 SUBMITTALS

- A. The CONTRACTOR shall submit shop drawings prior to the manufacturer of the pre-cast concrete wet well.

1.3. JOB CONDITIONS

- A. CONTRACTOR prior to placing a bid shall confirm the soil conditions and provide for excavating whatever materials that exist including rock and cemented coquina and provide new foundation materials.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE WET WELLS

- A. Pre-cast wet wells shall be considered to be moderately to extremely aggressive environments with Type II Portland cement and FDOT Class II concrete (3,400 minimum psi @28days) required.
- B. Except where otherwise specified pre-cast components shall consist of reinforced concrete pipe sections especially designed for wet well construction and manufactured in accordance with ASTM C 478 except as modified herein. The base shall be monolithic with the first wall section, or constructed by use of a water stop with construction key joint between base and first wall section.

- C. Pre-cast, reinforced concrete bases, riser sections, flat slabs and other components shall be manufactured by wet cast methods only, using forms which will provide smooth surfaces free from irregularities, honeycombing or other imperfections.
- D. Joints between components shall be the tongue and groove type and shall conform to AWWA C302. The circumferential and longitudinal steel reinforcement shall extend into the bell and spigot ends of the joints without breaking the continuity of the steel.
- E. All pre-cast components shall be of CITY and or Engineer of Record approved design and of sufficient strength to withstand the loads imposed upon them. They shall be designed for a minimum earth cover loading of 130 pounds per cubic foot, an H-20 wheel loading, and an allowance of 30 percent in roadways and 15 percent in rights-of-way for impact. Bases shall have two cages of reinforcing steel in their walls, each of the areas equal to that required in the riser sections. Wall thickness shall not be less than 8 inches. Concrete top slabs shall not be less than 8 inches thick.
- F. Lifting holes, if used in components, shall be tapered, and no more than two shall be cast in each section. Tapered, solid rubber plugs shall be furnished to seal the lifting holes. The lifting holes shall be made to be sealed by plugs driven from the outside face of the section only.
- G. The barrel of the wet well shall be constructed of various lengths of riser pipe manufactured in increments of one foot to provide the correct height with the fewest joints. Openings in the barrel for sewers or drop connections will not be permitted closer than one foot from the nearest joint. Special base or riser sections shall be furnished as necessary to meet this requirement.
- H. Sealing compound for pre-cast concrete wet joints shall be preformed plastic joint sealer conforming to Federal Specification SS-S-00210, "Ram-Nek" as manufactured by K. T. Snyder Co. Inc. or equal.
- I. Surface Coating: EW-1 Aquapoxy as manufactured by Pro-Tech Coatings, Inc, Coal Tar Epoxy Bitumastic No. 300 M, as manufactured by KOP-COAT, Inc. or CITY accepted equal.

PART 3 - EXECUTION

3.1 WET WELL BASES

- A. Pre-cast bases shall be set at the proper grade and carefully leveled and aligned on a crushed stone or gravel foundation.

3.2 PRECAST SECTIONS

- A. Set each pre-cast section plumb on a bed of sealant to make a watertight joint with the preceding unit. Point the joints and wipe off the excess sealant.
- B. Install sections, joints and gaskets in accordance with manufacturer's recommendations.
- C. Lifting holes shall be sealed tight with a solid rubber plug driven into the hole from the outside of the barrel and the remaining void filled with 1 to 2 cement-sand mortar.

3.3 WET WELL FILL CONCRETE

- A. Fill concrete shall be properly formed to the sizes, cross sections, grades and shapes shown or as ordered.

3.4 INTERIOR FINISH

- A. The interior of the wet well shall be acid etched with a 25% muratic acid solution and then neutralized prior to installing the fiberglass liner. The fiberglass liner AGRU-SURE fiberglass lining or approved equal. All surfaces shall be covered with fiberglass liner including the bottom of the wet-well.

3.5 STUBS FOR FUTURE CONNECTIONS

- A. Provide pipe stubs for future connection to the wet well as noted on the plans.

3.6 WATERTIGHTNESS

- A. There shall be no visible signs of leakage prior to placing the fiberglass liner. The tightness of the rubber boots at the manhole pipe connections shall be confirmed prior to backfilling of the area around the wet well.

3.7 PIPE CONNECTIONS

- A. Installation of pipe into wet well: The joining of pipe to wet well shall be by casting a sleeve or by core and seal method using a rubber type sleeve that extends at least 3 inches outside the walls. The pipe to rubber sleeve shall be secured to the pipe by stainless steel bands

END OF SECTION

SECTION 02610
PAVING, MILLING & RESURFACING

SUMMARY

This Section sets forth the material and work requirements necessary to construct a complete finished compacted structural support base, stabilized subgrade and flowable fill.

REFERENCE

FDOT Standard Specifications for Road and Bridge Construction 2000 edition, Sections 300 through 334 for material and process requirements with deference to CITY requirements in the Public Works Roadway Details latest edition unless otherwise noted in the Contract Bid Documents.

END SECTION

O2610-1

SECTION 02611

BASE, STABILIZED SUBGRADE AND FLOWABLE FILL

SUMMARY

This Section sets forth the material and work requirements necessary to construct a complete finished compacted structural support base, stabilized subgrade and flowable fill.

REFERENCE

The FDOT Standard Specifications for Road and Bridge Construction 2000 edition for material and process requirements with deference to CITY requirements in the Public Works Roadway Details latest edition unless otherwise noted in the Contract Bid Documents.

FDOT BASE SECTIONS

Sections 200 (@ LBR 100), 204 (in the form of recycled concrete @ LBR 130)
and 280 (@ LBR 100)

FDOT STABILIZED SUBGRADE SECTION

Section 160 (Type B stabilizing only)

FDOT FLOWABLE FILL SECTION

Section 121

END SECTION

02611- 1

**SECTION 02616
FITTINGS FOR PRESSURE SERVICE**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

This Section sets forth the requirements for materials and methods to furnish and install buried fittings on ductile iron water mains, ductile iron stormwater force mains, ductile iron wastewater force mains and PVC reclaimed water mains.

1.2 REFERENCE

Utility Department Standard Details latest edition and Sections 15050, 15066, 15067, 15100, 15101 and 15110

1.2 CONTRACTOR RESPONSIBILITIES

The CONTRACTOR shall review the field conditions prior to placing a bid for this project and evaluate the need for required fittings and split restraint joint systems such as Megalug or there equivalent.

1.4 JOB CONDITIONS

Field conflicts may require additional fittings and minor adjustments not shown on the plans. The Contractor shall provide and install fittings unless directed to deflect the pipe to avoid the need.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

3.1 FITTINGS:

- A. Fittings 3-inch through 24-inch diameter shall be mechanical joint ductile iron conforming to the requirements of ANSI/AWWA C153/A21.53 or, cast iron fittings conforming to the requirements of ANSI/AWWA C110/A21.10. Fittings and joint systems shall be compatible with the pipe system and provided at a Pressure Class that matches or exceeds the pipe with which they are to be installed.
- B. Restrained joints shall be of the essentially boltless type which relies on metal lugs, rotating retainer rings, or stainless steel gaskets for joint restraint. Joint restraints connecting ductile-iron pipe to ductile iron pipe or fittings shall be a split retainer type band or ring made of ductile iron. Split restrained joint systems shall be the preferred Megalug joint restraint as manufactured by EBBA Iron, Inc on the CITY approved product list or its equivalent as approved by CITY.
- C. Buried fittings shall have bituminous coating approximately 1 mil thick applied to the outside. The finished coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun and shall be strongly adhered to the fitting.
- D. Cement Mortar Lining or Ceramic Epoxy Lining typical of fittings in water, sewer or reuse water systems is required.

END OF SECTION

SECTION 02622 - HORIZONTAL DIRECTIONAL DRILLING

PART 1 – GENERAL

SCOPE OF WORK

The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration. For the supply of domestic water during construction, the CONTRACTOR shall utilize an CITY supplied meter assembly (meter & backflow device) and pay for all water consumed except in the case where the new water main is connected directly into the active water system for line filling and flushing operation. Un-metered reclaimed water may be utilized for flushing and testing of new reclaimed water mains. Un-accountable domestic water quantities shall be minimized, where possible.

REQUIREMENTS

CONTRACTOR shall provide a structurally sound, leak-proof, monolithic PVC or HDPE pipe for all piping identified for installation by HDD. The selected pipe material inside diameter shall not be less than 95% of the ENGINEER's specified design diameter. Individual pipe lengths shall be assembled by butt-fusion unless otherwise specified. Connecting fittings shall be fused or mechanically joined to the piping as specified. CONTRACTOR shall also be responsible for all installation processes including drilling, back-reaming, management and disposal of all drilling fluid, dewatering, and leak testing the pipe and fittings in accordance with these specifications.

QUALITY ASSURANCE

The requirements set forth in this document specify a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper horizontal directional drilling installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification or within any associated permit.

Adherence to the specifications contained herein, or the CITY Representative's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the CONTRACTOR of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract. The HDD CONTRACTOR shall be responsible for the repair of all damage to private and/or public property (at no expense to CITY). Repair work shall meet all local and state rules and requirements.

PROJECT SCHEDULE AND COOPERATION

The project schedule shall be established on the basis of working a normal work schedule including five days per week, single shift, and eight hours per day or four days per week, single shift, ten hours per day. Unless approved otherwise by CITY normal or general items of work, such as bacteriological testing, leakage and pressure testing, density testing and final inspections, shall be scheduled during the normal work schedule. Due to operational and manpower limitations on the CITY's systems, CITY will require the CONTRACTOR to perform work outside of the normal work schedule. These operational and manpower limitations, including but not limited to, line filling and flushing operation, tie-in work, (cut-in work or other work) and other phases of the work which may impact the continued (non-interruptible) service to existing CITY customers. The CONTRACTOR shall plan and anticipate the cost impact of these systems limitations and provide such work or services at no additional cost to CITY.

In addition to the schedule requirements contained in the General and Special Conditions, the following tasks shall be included in the CONTRACTOR's detailed schedule: utility locate requests, utility locate verification, rig mobilization, pilot bore drilling, pre-reaming and reaming, layout and fusion of pipe, final reaming, pipe pullback, pressure testing, pig testing of installed pipeline, and restoration.

WARRANTY

The CONTRACTOR shall supply to CITY a two (2) year unconditional warranty. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications.

REFERENCED STANDARDS

The work shall conform to applicable provisions of the CITY Utilities Department Standard Details most current update, and the following standards, latest editions, except as modified herein.

American Water Works Association (AWWA) Standards:

AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution American Society for Testing and Materials (ASTM) Standards.
ASTM D618	Standard Methods of Conditioning Plastics and Electrical Insulating Materials for Testing.
ASTM D638	Standard Test Method for Tensile Properties of Plastics.
ASTM D1238	Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
ASTM D1248	Standard Specifications for Polyethylene Plastics Molding and Extrusion Materials.
ASTM D1505	Standard Test Method for Density of Plastics by the Density-Gradient Technique.
ASTM D1598	Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
ASTM D1599	Standard Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings.
ASTM D1603	Standard Test Method for Carbon Black in Olefin Plastics.
ASTM D1784-02	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Sch. 40, 80, and 120
ASTM D2122	Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings.
ASTM D2152	Test Method for Degree of Fusion of Extruded Poly (Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion
ASTM D2241	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
ASTM D2290	Standard Test Method for Apparent Tensile Strength or Tubular Plastics and Reinforced Plastics by Split Disk Method.
ASTM D2665	Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
ASTM D2839	Standard Practice for Use of a Melt-Index Strand for Determining Density of Polyethylene
ASTM D3035	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
ASTM E3261	Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
ASTM D3350	Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.

ASTM D4218	Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
ASTM F412	Standard Terminology Relating to Plastic Piping Systems.
ASTM F477	Elastic Seals (Gaskets) for Joining Plastic Pipe
ASTM F1057	Standard Practice for Estimating the Quality of Extruded Poly (Vinyl Chloride)(PVC) Pipe by the Heat Reversion Technique
ASTM F1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
UNI-PUB-6	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
UNI-PUB-8	Recommended Practice for the Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe (Nominal Diameters 6-12 Inch)
NSF-14	Plastics Piping System Components and Related Materials
NSF-61	Drinking Water System Components – Health Effects
PPI TR-2/2006	PVC Range Composition Listing of Qualified Ingredients

PERMITS

Permits for all work within the FDOT, local municipality, and Submerged Land of the State rights-of-way shall be obtained by the CITY. The CONTRACTOR shall verify the existence of all permits before commencing any work on the project.

SUBMITTALS

HDD Bore Plan Submittal – All calculations and responses shall be based on the geotechnical data and other information provided in the Bid Documents. Generic assumptions will be acceptable only when site specific data is not available. Acceptable responses will be required prior to beginning any HDD work. CONTRACTOR shall provide a bore plan of each HDD segment for this project that is compatible with the pipe characteristics, site conditions, and HDD equipment.

CONTRACTOR Calculations - shall be signed and sealed by a professional ENGINEER registered in the State of Florida and provided (in accordance with ASTM F 1962 or equal) for pull back force required and the resulting rig size proposed for this project. CONTRACTOR shall provide calculations (in accordance with industry standards) predicting the expected annular pressure and identify areas subject to hydro-fracture. CONTRACTOR shall provide calculations demonstrating that the pipe will not be overstressed. CONTRACTOR shall verify that the information and calculations presented herein will be fully incorporated into the work plan

Calculation Submittal - The following calculations shall be submitted prior to beginning any HDD work:

- Safe Pullback Force calculations (straight run and bends)
- SafeTensile Stress calculation
- Rate of penetration
- Maximum allowable drilling fluid pressure calculation
- Safety Factor against collapse

CONTRACTOR shall confirm that the design parameters do not result in installation stresses that exceed allowable pipe stresses.

CONTRACTOR shall identify which, if any, items of the basis of design that the CONTRACTOR proposes to change (entry/exit angles, depth, radius, etc.). These changes shall be reflected in the calculations and information required in these evaluation criteria.

Work Plan - Prior to beginning work, the CONTRACTOR must submit to the CITY Representative a work plan detailing the procedure and schedule to be used to execute the project. The work plan should include a description of all equipment to be used, down-hole tools, a list of personnel and their qualifications and experience (including back-up personnel in the event that an individual is unavailable), list of sub-CONTRACTORS, a schedule of work activity, a safety plan (including MSDS of any potentially hazardous substances to be used), traffic control plan (if applicable), an environmental protection plan and a contingency plan. The work plan should be comprehensive, realistic and based on actual working conditions for this particular project. Plan should document the thoughtful planning required to successfully complete the project. The HDD CONTRACTOR shall submit and obtain CITY's approval of a pre-construction bore-log depicting a plan and profile (horizontal and vertical alignment) of the proposed bore path. The bore-log shall show all utility crossings and existing structures. All deviations from the drawings included in the contract documents shall be clearly identified. The work plan shall specifically address the following potential problems:

- A Frac-Out and Surface Spill Contingency Plan
- Loss of returns and fluid containment
- Obstructions along bore-path during reaming or pullback
- Drill pipe or product pipe cannot be advanced
- Deviations in design line and grade exceeding tolerances
- Drill pipe or product pipe broken off in borehole
- Collapse or product pipe or excessive deformation
- Damage to a utility
- Excessive subsidence or heave

Existing Utilities - Provide a plan to locate and protect all adjacent utilities and infrastructure.

Record Drawing -Submit for the CITY's approval the record drawings in duplicate to the CITY's Representative within ten days after completing the pull back for review and approval. The drawings (24 x 36 (min.) and Auto CAD disk of the drawing, 20 horizontal max scale with 2 foot vertical max scale) shall include a plan, profile (data every 25 LF of main, at a minimum), and all information recorded during the progress of the work. The entry and exit points shall be located with GPS coordinates based on a locally available reference system (lat/long, state plane coordinates, etc.). The HDD CONTRACTOR shall certify the accuracy of all record drawings. Final record drawing submittals shall meet the requirements of Specification Section 01720.

Pipe Product Data Submittal – In addition to any other submittal requirements, the following data shall be provided:

1. The name of the pipe manufacturer and a list of the piping and quantities to be provided by manufacturer.
2. Product data and pipe supplier data indicating conformance with this specification and applicable standards, including written documentation regarding any intended variance from this specification and applicable standards.
3. Experience of pipe supplier by years and number of projects.
4. Warranty information; and independent laboratory testing certification.
5. Material and pipe property testing in conformance with this specification and applicable standards indicating conformance from the pipe extruder per AWWA C900, C905, or C906: dimensional checks, pipe burst, flattening, extrusion quality (acetone immersion).
6. Test results will be prepared and made available from the pipe extruder to the CITY or ENGINEER upon request, for each extrusion run.
7. Fusion joint data and fusion technician data indicating conformance with this specification and applicable standards, including written documentation regarding any intended variance from this specification and applicable standards. This will include fusion joint warranty information and recommended project specific fusion parameters, including criteria logged and recorded by data logger.

NOTIFICATION

The CITY's representative must be notified 48 hours (minimum) in advance of starting the drilling work. The HDD work shall not begin until the proper preparations (see work plan) for the operation have been completed and approved.

SITE PREPARATION

Video - Prior to any alterations to work-site, CONTRACTOR shall photograph or video tape entire work area. One copy of which shall be given to the CITY's Representative and one copy to remain with CONTRACTOR for a period of two (2) years following the completion of the project.

Protection of Existing Utilities - CONTRACTOR shall abide by the Common Ground Alliance, Best Practices Version 1.0 or latest, unless exceptions are specifically agreed to by CITY. The CONTRACTOR shall coordinate utilities locates with the state one-call. Once the locate service has field marked all utilities, the CONTRACTOR shall verify each utility (including any service laterals, i.e. water, sewer, cable, gas, electric, phone, etc.) and those within each paved area. Verification may be performed utilizing Ground Penetrating Radar, hand dig, or vacuum excavation. Prior to initiating drilling, the CONTRACTOR shall record on the drawings both the horizontal and vertical location of the utilities off of a predetermined baseline. The CONTRACTOR shall manage and control drilling practices to prevent damage to existing utilities. The CONTRACTOR shall be responsible for all losses and repairs as a result of damage to underground utilities resulting from drilling operations. The CONTRACTOR shall make a reasonable effort to locate evidence of any other potential subsurface obstructions such as piles or piers.

Work Site Grading - Grade and fill to provide a level working area. No alterations beyond what is required for operations are to be made. CONTRACTOR shall confine all activities to designated work areas.

Following Drilling Operations - CONTRACTOR will de-mobilize equipment and restore the work-site to original condition unless otherwise shown in the plans. Drilling operation entrance and exit tunnels under or in close proximity to non-earthen surfaces and other improvements such as asphalt, concrete, pavers, walls, footers, etc... shall be back-grouted with flowable fill around the pipe to a sufficient distance, as determined by the CITY, to ensure lasting support and prevent subsidence of the surface improvements. All excavations will be backfilled and compacted to 95% of original density (at a minimum), or as otherwise specified.

ENVIRONMENTAL PROTECTION

CONTRACTOR shall place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. CONTRACTOR shall place hay bales, or approved protection, to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. CONTRACTOR shall adhere to all applicable environmental regulations stated in local, state and federal permits.

SAFETY

CONTRACTOR shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

PERSONNEL QUALIFICATIONS CERTIFICATION

Directional Drilling - All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each person must have been fully trained for over 1,000 hours on all facets of directional drilling, including, but not limited to machine operations, mud mixing, locating, and material fusion.

An onsite representative with a minimum of 5 years of progressively responsible drilling and supervisory experience on projects with similar diameters, pipe materials, length and site conditions and who is thoroughly familiar with the equipment and type of work to be performed, must be in direct charge and control of the operation at all times.

In all cases the supervisor must be continually present at the job site during the actual HDD operation. The CONTRACTOR shall have a sufficient number of experienced competent workers on the job at all times to insure the HDD work is made in a timely and satisfactory manner.

Pipe Assembly - Joints between plain end pipes and pipe fittings shall be made by butt fusion when possible. The on-site welder making the joints shall have received specific training from the manufacturer of the fittings and/or pipe being welded and shall have written proof of proper training/certification from the associated manufacturers. Only certified welders who have written training certifications from the fitting and/or pipe manufacturer will be allowed to perform this work. That is, to weld a fitting in place, the on-site welder (employee) must be trained and certified by the fitting manufacturer. To butt weld pipe, the on-site welder (employee) must be trained and certified by the pipe manufacturer. The fusion work shall be accomplished (welding and cool-down/closing times) in accordance with the fitting and pipe manufacturers' recommendations, at a minimum. External and internal beads shall not be removed unless approved by CITY.

PART 2 – MATERIALS

HIGH DENSITY POLYETHYLENE (HDPE, PE) PIPE AND FITTINGS

Materials - The manufacturer of polyethylene pipe and fittings shall require PE3408 high density polyethylene meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting Manufacturer in PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F per ASTM D-

2837. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

Polyethylene Pipe (4 inch and larger) - HDPE Pipe shall conform to AWWA C906, DR-11, Ductile Iron Pipe (DIP) size and NSF 61 Standard. HDPE pipe for water or reclaimed water piping (not approved for sewer force mains) with pipe size 4 inch through 12 inch shall be DR-11 unless otherwise noted in the plans and Bid Schedule conforming to AWWA C906 and NSF 61. The HDPE pipe may be IPS size, DR 11 for sizes 24 inch and larger, unless otherwise noted in the plans and Bid Schedule. Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter and shall be so marked.

Each production lot of pipe shall be tested for (from material or pipe) melt Index, density, % carbon, dimensions and either quick burst or ring tensile strength (equipment permitting). A minimum working pressure of 160 psi will be required unless otherwise noted in the plans.

Service Identification - Permanent identification of piping service shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. The striping material shall be the same material as the pipe material except for color. The following colors shall be used to identify piping service (pressure service):

Blue – potable water
Green – wastewater or force main
Purple – reclaimed water
Black – raw water

Polyethylene Fittings and Custom Fabrication - Products shall be molded or fabricated by the pipe manufacturer or trained personnel. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Fabricated fittings must have the same working pressure as the mating pipe.

Molded Fittings - Products shall be manufactured in accordance with ASTM D3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the test required under ASTM D3261.

Fabricated Fittings - Products shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe. Directional fittings 16" and larger such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets.

Polyethylene Flange Adapters - Products shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooved to provide gasketless sealing, or to restrain the gasket against blow-

out. Below ground flange adapters may only be utilized when specified and when MJ adapters are not commercially available in the required size. Adapters for 30 inch and smaller pipe shall utilize an MJ adapter (see below).

Back-up Rings and Flange Bolts - Products shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. Convolute style backup rings preferred over the flat stock rings. The lap joint flange bore shall be chamfered to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

Manufacturer's Quality Control - The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control.

Polyethylene Mechanical Joint (MJ) Adapters - Mechanical connections of HDPE pipe (4" and larger) to Ductile Iron or PVC piping, mechanical joint fittings, or valves shall be through a self-restraining, fusible mechanical joint adapter with or without an integral, internal stainless steel insert. Mechanical joint adapter shall be of the same SDR rating as the pipe. A separate, loose stainless steel type insert will only be allowed for pipe sizes 4 inch through 8 inches.

Provide the mechanical joint adapter, including but not limited to longer tee bolts or all thread rods with nuts at the mechanical joint bell. Note that PE flanged adapters may only be utilized for pipe sizes where MJ adapters are not commercially available.

Cast Transition Couplings - HDPE to MJ cast transition coupling may only be utilized for 8 inch and smaller pipe size. A stainless steel stiffener is required sized at proper ID of HDPE pipe. The transition coupling must be epoxy lined (3 mils minimum for water use and 12 mils minimum for sewer use). Acceptable is a Power Seal model 3520 or approved equal.

Electro fusion Couplings and Fittings: Electro fusion joining procedures shall not be used in any location or application on this project.

Polyethylene service line tubing shall be Endotrace or CITY approved equivalent conforming to AWWA C901-latest.

FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE

Materials - Fusible PVC pipe shall be used as manufactured under the trade names Fusible C-900, Fusible C-905, and FPVC, for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusion process shall be as patented by Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051. CITY and ENGINEER are aware that currently there is no other supplier or fusible polyvinyl chloride pipe that is an equal to this specified pipe supplier and product. Fusible PVC plastic material for pipe shall conform to AWWA

C900 or C905, ASTM D1784, and cell classification 12454. Pipe shall be in accordance with ASTM D2241 for IPS standard dimensions as indicated in these specifications. Compound formulation shall be in accordance with PPI TR-2/2006. A minimum working pressure of 160 psi will be required unless otherwise specified. Pipe shall be manufactured with 100% virgin resin.

Fusible PVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

Fusible PVC pipe shall be manufactured in standard 20', 30', or 40' nominal lengths. Pipe shall be marked per AWWA C900 or AWWA C905, and shall include as a minimum: nominal size, PVC, DR, SDR, Schedule, AWWA pressure class or rating, AWWA Standard designation number, NSF-61 mark verifying suitability for potable water service, extrusion production-record code, trademark or trade name, cell classification 12454 and or PVC material code 1120 may also be included. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, and other deleterious faults.

Fusion Joints – Unless otherwise specified, fusible PVC pipe lengths shall be assembled in the field with butt-fused joints. The CONTRACTOR shall follow the pipe manufacturer's written instructions for this procedure. Joint strength shall be equal to the pipe as demonstrated by testing requirements. All fusion joints shall be completed as described in this specification by experienced fusers that meet the FPVC manufacturer's certification requirements.

CONNECTIONS & FITTINGS FOR PRESSURE APPLICATIONS

Connections - shall be defined in conjunction with the linking of project piping, as well as the tie-ins to other piping systems.

Ductile Iron Mechanical Joint Fittings – Acceptable fittings for use with fusible PVC pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10 and AWWA/ANSI C111/A21.11.

Restrained connections - to fusible PVC pipe may be made using a restrained retainer gland product for DIPS or IPS sizing, as well as for MJ or flanged fittings. Example manufacturers include: EBAA Iron Megalug Series 2000PV, 2000SV, 2100, or Series 2200; Smith-Blair Cam-Lok, 111/120 series; or approved equal.

Bends, tees, and other ductile iron fittings - shall be restrained with the use of thrust blocking as noted on the drawings.

Ductile iron fittings and retainer glands -- must be installed per the manufacturer's recommendations.

Sleeve-type couplings -- shall be manufactured for use with PVC pipe, and may be restrained as indicated on the drawings or in the specifications.

Acceptable sleeve-type mechanical couplings include Smith-Blair Omni-Coupling, Dresser Style 253 or Long Style 253, or approved equal. Acceptable sleeve-type mechanical couplings shall include for restrained coupling EBAA Iron Series 3800 or approved equal.

Pipe Pull Heads – Pipe pull heads shall be utilized that employ a positive through-bolt design assuring a smooth wall against the pipe cross-section at all times. Pipe pull heads shall be specifically designed for use with fusible PVC pipe, and shall be as recommended by the pipe supplier.

DELIVERY, STORAGE, AND HANDLING OF MATERIALS

Inspect materials - All materials delivered materials shall be inspected for damage immediately upon delivery to the site. Pipe and fittings found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay. Store materials in accordance with manufacturer recommendations. Do not store directly on the ground. Keep all materials free of dirt and debris.

Fluids - CONTRACTOR is responsible for obtaining, transporting and sorting any fluids, including water, to the work site. Disposal of fluids is the responsibility of the CONTRACTOR. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations.

The bentonite drilling slurry should be recycled for reuse in the hole opening operation, or shall be hauled by the CONTRACTOR to an approved location or landfill for proper disposal. CONTRACTOR shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants and sod damaged, discolored or stained by drilling fluids.

Locate Wire - Locate wire shall be UF rated 12 AWG copper-clad carbon steel with 30 mils (min) insulation rated and installed with all pipe. The external color shall be either white or yellow, unless noted otherwise.

PART 3 – INSTALLATION

GENERAL EQUIPMENT SYSTEM

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the pilot hole, reaming, and pullback the pipe; a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill; a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used; a guidance system to accurately guide boring operations; a vacuum truck of sufficient capacity to handle the drilling fluid volume; and trained, competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

DRILLING SYSTEM

Drilling Rig - The directional drilling machine shall consist of a power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The power system shall be self contained with sufficient pressure and volume to power drilling operations. The hydraulic system shall be free of leaks. The rig shall have a system to monitor maximum pull-back force during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drilling string and an audible alarm which automatically sounds when an electrical current is detected.

Drill Head: The drill-head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

Mud Motors: (if required): Mud motors shall be of adequate power to turn the required drilling tools.

Drill Pipe: Shall be constructed of high quality heat-treated, forged alloy steel.

GUIDANCE SYSTEM

Accuracy and Operation - The position of the drill head shall be continuously tracked and recorded by a down-hole wire-line tracking locator system unless otherwise approved by CITY/ENGINEER and shall be supplemented by a "TruTracker" or equivalent tracking system installed between the entry point and the exit point. The coordinates of the surface wire grid system shall be surveyed and recorded. The guidance system shall be capable of tracking at all depths up to eighty feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction) The guidance system shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 1.5 meters horizontally.

The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

At all times during the pilot bore the CONTRACTOR shall provide and maintain a bore tracking system that is capable of accurately locating the position of the drill head in the x, y, and z axes. The CONTRACTOR shall record these data at least once per drill pipe length or every twenty-five (25) feet, whichever is most frequent.

Down-hole and Surface Grid Tracking System - CONTRACTOR shall monitor and record x, y, and z coordinates relative to an established surface survey bench mark. The data shall be continuously monitored and recorded at least

once per drill pipe-length or at twenty-five (25) feet, whichever is more frequent. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed plus or minus 5 feet (horizontal or vertical deviation) from the design path, such occurrences shall be reported immediately to CITY. The CONTRACTOR shall undertake all reasonable and necessary measures to correct deviations and return to design line and grade.

DRILLING FLUID & PRESSURE MONITORING SYSTEM

Mixing System - A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

Drilling Fluid Pressures and Flow Rates - Drilling fluid pressures and flow rates shall be continuously monitored and recorded by the CONTRACTOR. The pressures shall be monitored at the pump. These measurements shall be made during pilot bore drilling, reaming, and pullback operations.

Down-hole Annular Pressure Monitoring System - The CONTRACTOR shall use a down-hole annular pressure monitoring system that will provide instantaneous and continuous operating pressures. This system shall incorporate a data recorder that will store the down-hole annular pressure data for the entire drilling operation. This data shall be maintained and provided to the ENGINEER upon request or at the completion of the project. The data (x, y & z) shall be presented in a format easily referenced to the contract drawings. Pressure shall be indicated in psi at a specified datum.

Drilling Fluids - Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material maybe used in drilling fluid.

Delivery System - The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage and recycling facilities.

Drilling Fluid Recycling System & Control of Drilling Fluids - The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal. The CONTRACTOR shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling

fluid weights, drilling speeds, and any other operational factors required to avoid hydro-fracture fluid losses to formations, and control drilling fluid spills. This includes any spillages or returns at entry and exit locations or at any intermediate point.

All inadvertent returns or spills shall be promptly contained and cleaned up. The CONTRACTOR shall maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming and pullback operations and shall be capable of quickly removing spoils. The CONTRACTOR shall immediately notify CITY of any inadvertent returns or spills and immediately contain and clean up the return or spill.

MISCELLANEOUS EQUIPMENT

Pipe Rollers - Pipe rollers, if utilized, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

Pipe Rammers - Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of the CITY's Representative.

Restrictions - Other devices or utility placement systems for providing horizontal thrust other than those defined above in the preceding sections shall not be used unless approved by the CITY Representative prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage to maintain line and grade within the tolerances prescribed by the particular conditions of the projects.

PIPE DELIVERY AND OFF-LOADING

All pipes shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the CITY or ENGINEER.

Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify CITY or ENGINEER immediately if more than immaterial damage is found.

Each pipe shipment should be checked for quantity and proper pipe size, color, and type.

PVC pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23.

A forklift with chisel forks shall be used to off-load the pipe. The fork chisel should be checked to be sure it is not thicker than the gap between the units of pipe

strapped together for shipping and handling purposes. Extend forks to remove each top unit from the truck. When unloading 20' lengths remove the chisel. Do not run forks too far under the units, as fork ends striking adjacent units may cause damage. Insure that the forks are fully engaged. The 30' and 40' lengths are shipped in single length units. Because these are longer, the packages will flex or bend more than the 20' length units. If left bundled in units, unloading can be done with a single forklift so long as it is of sufficient capacity to handle the load. If sag exceeds recommendation (see the table below as to allowable sag), then each piece of pipe should be unloaded individually. The forks should be placed as far apart as possible to provide support to the unit. When unloading individual pieces of pipe, the pipe should be supported at approximately the 1/3 point measured from each end of the pipe.

Nom. Pipe Size (inches)	DIPS Segment Height (Sag)		IPS Segment Height (Sag)	
	30' Length	40' Length	30' Length	40' Length
	(inches)	(inches)	(inches)	(inches)
4	13	23 ½	14	25 ½
6	9	16 ½	9 ½	17
8	7	12 ½	7 ½	13
10	5 ½	10	6	10 ½
12	4 ½	8 ½	5	9
14	4	7 ½	4 ½	8
16	3 ½	6 ½	4	7
18	3	5 ½	3 ½	6
20	2 ½	5	3	5 ½
24	2 ½	4	2 ½	4 ½
30	2	3 ½	2	3 ½
36	1 ½	3	1 ½	3
42	1	2 1/2	1 ½	2 ½
48	1	2	1	2

Sag is the measurement of the pipe ends relative to the pipe center. With a pipe raised on the forklift, a string line can be pulled from the bottom of one end of the pipe to the bottom of the other end of the pipe. The distance in the center from the string to the bottom of the pipe is the sag.

If a forklift is not available, a spreader bar with fabric straps capable of handling the load should be used. Recommended lift points when using fabric slings are at the point approximately 1/3 of the length measured from each end.

Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited. During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.

If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

In preparation for pipe installation, placement of pipe should be as close to the fusion area as practical.

HANDLING AND STORAGE

Any length of pipe showing a crack or which has received a blow that may have caused an incidental fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the CITY. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the CITY.

Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way. Use of hooks, chains, wire rope or any other handling device which creates the opportunity to damage the surface of the pipe is strictly prohibited.

After delivery to the project site, fusible polyvinylchloride pipe shall be stored at ambient temperature and protected from ultraviolet light degradation. If pipe is to be stored for periods of 6 months or longer, the pipe must be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe red to prevent excess heat accumulation.

Racks or dunnage used to prevent damage to the bottom of the pipe during storage should support the pipe lengths. Supports should be spaced to prevent

pipe bending and deformation. The pipe shall be stored in stacks no higher than that given in the following table:

Pipe Diameter (inches)	Max. No. of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3
33 to 48	2

DRILLING PROCEDURES

Drill Path - Prior to drilling CONTRACTOR shall utilize all verified locate information to determine drill pathway. Marked up drawings (see Site Preparation paragraph) shall be on site at all times, and referred to during the drill operation.

Guidance System - CONTRACTOR shall provide and maintain a down-hole wire-line system to accurately locate the pilot hole (both horizontal and vertical position). A Tru-Tracker energized surface grid, or equivalent, shall be installed and used to supplement the wire-line system. The CITY Representative shall have access to instrumentation and readings at all times during operation.

Drilling fluid pressures and flow rates - Drilling fluid pressures and flow rates shall be continuously monitored and recorded.

Subsidence and Heave - Subsidence or heave of utilities, roads, or other features above the HDD centerlines and within the zone influenced by the HDD construction shall be limited to values that avoid damage. These values shall be determined by the utility or right-of-way CITY. The CONTRACTOR shall repair any damage resulting from settlement or heave caused by HDD activities at no additional cost to CITY. The CONTRACTOR shall grout any voids caused by or encountered during drilling.

Pilot Hole - The pilot hole shall be drilled along the path shown on the plans and profile drawings. Unless approved otherwise by CITY/ENGINEER, the pilot-hole tolerances shall be as follows:

Elevation: As shown on the plans.

Alignment: ± 2 feet and within 2 feet of right-of-way or easement boundary.

Curve Radius - The pilot hole radius shall be no less than 150% of the minimum bending radius as recommended by the pipe manufacturer of the pipe being installed.

Entry Point Location - The exact pilot hole entry point shall be within ± 2 feet of the location shown on the drawing or as directed by the CITY Representative in the field.

Exit Point Location - The exit point location shall be within ± 2 feet of the location shown on the drawing or as directed by the CITY Representative in the field.

Water Main and Non-Water Main Separation Requirements - The minimum separation requirements between a water main and a non-water main shall be as defined in 62-555, F.A.C.

Pull Back - After successfully reaming bore hole to the required diameter, CONTRACTOR will pull the pipe through the bore hole. In front of the pipe will be a swivel and reamer to compact bore hole walls. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations CONTRACTOR will not apply more than the maximum safe pipe pull pressure at any time.

Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe manufacturer's safe pull (or tensile) strength.

Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly.

CONTRACTOR shall handle the pipe in a manner that will not over-stress the pipe prior to insertion. Vertical and horizontal curves shall be limited so that the pipe does not over-deflect, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced.

External pressure shall be minimized during installation of the pullback section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the CITY.

Locate wire shall be attached to the leading end of the pipe pulling head and shall extend the full length of the installed pipe.

Buoyancy modification shall be at the discretion of the CONTRACTOR and shall be approved by the CITY's Representative. The CONTRACTOR shall be responsible for any damage to the pull section resulting from such modifications.

In the event that pipe becomes stuck, CONTRACTOR will implement the submitted and approved contingency plan. If pipe remains stuck, CONTRACTOR will notify CITY Representative. The CITY's Representative and CONTRACTOR will discuss options and then work will proceed accordingly.

The CONTRACTOR shall cease operations if the pipe is damaged and shall remove the pipe from the bore hole and repair the pipe using the manufacturer's recommended procedure or replace the damaged pipe before resuming installation.

FUSIBLE PVC PIPE ASSEMBLY

Fusible PVC pipe will be handled in a safe and non-destructive manner before, during and after the fusion process and in accordance with this specification and pipe supplier's recommendations.

Fusible PVC pipe will be fused by qualified fusion technicians, as documented by the pipe manufacturer and supplier. Training records for qualified fusion technicians shall be available to CITY / ENGINEER upon request.

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine. Joint data shall be submitted as part of the AS-RECORDED information, in accordance with this specification.

The fusible PVC pipe will be installed in a manner so as not to exceed the recommended bending radius.

Where fusible PVC pipe will be installed by pulling in tension, the recommended Safe Pulling Force, according to the pipe supplier, will not be exceeded.

Only appropriately sized, and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following properties, including the following elements:

Heat Plate - shall be in good condition with no deep gouges or scratches within the pipe circle being fused. Plates shall be clean and free of any contamination. Heater controls shall properly function, and cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's recommendations.

Carriage - shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

General Machine – Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

Data-logger - The current version of the pipe supplier's recommended and compatible software shall be used. Protective case shall be utilized for the hand held wireless portion of the unit. Data-logger operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life. The following information shall be recorded for each fusion joint: pipe size and dimensions; machine size; fusion technician identification; job identification number; fusion number; fusion, heating and drag pressure settings; heat plate temperature; time stamp; heating and cool down time of fusion; and ambient temperature.

Other equipment specifically required for the fusion process shall include the following:

Pipe rollers shall be used for support of pipe to either side of the machine.

A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement and/or windy weather.

Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

Facing blades specifically designed for cutting fusible PVC pipe.

Joint Recording - Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of thermoplastic pipe. The software shall register and/or record the parameters required by the manufacturer and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

HDPE PIPE ASSEMBLY

Pipe shall be fused together in one length, if space permits. Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. For pipe sizes larger than 12 inch, mechanical scrapers (per the fitting manufacturer's recommendation) shall be utilized during the fusion work. It is critical that all original oxidized pipe surface be removed in order for fusion to take place. The scraping process requires that approximately .10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier.

Acceptability of Damaged Pipe - Cuts or gouges that reduce the wall thickness by more than 10% are not acceptable and must be cut out and discarded.

Fusion Testing - When requested by the CITY, fusion testing will be performed. The test fusion shall be allowed to cool completely, and then fusion test straps shall be cut out. The test strap shall be 12" (min) or 30 times the wall thickness in length with the fusion in the center and 1" (min) or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new test fusion shall be made, cooled completely and tested. No more than one passing test will be required per pull section.

Mechanical Joining - Polyethylene pipe and fittings may be joined together or to the materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with

manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

Mechanical Joint and Flange Installation - Mechanical joints and flange connections shall be installed in accordance with the Manufacturer's recommended procedure. Flange faces shall be centered and aligned to each other before assembling and tightening bolts. In no case shall the flange bolts be used to draw the flanges into alignment. Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least 1 hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be as recommended by the Manufacturer.

DISINFECTION TESTS

Potable water pipe and fittings - shall be thoroughly disinfected prior to being placed in service. Disinfection shall follow the applicable provisions of the procedure established for the disinfection of water mains as set forth in AWWA - Standard C651 entitled "AWWA Standard for Disinfecting Water Mains". Bacteriological testing of the water main shall be scheduled and completed by the CITY. CITY will collect the water samples and be responsible for completing the water analysis (lab testing).

Temporary blow-offs - shall be installed for the purpose of cleaning the water main. Blow-offs installed on water mains up to and including 12" shall be the same diameter as the water main. Blow-offs installed on 16" water mains and larger may be the next smaller size, in diameter, than the water main being tested. Temporary blow-offs shall be removed and plugged after the main is cleared. The CITY shall be present prior to and during the operation of blow-offs. The main shall be flushed prior to disinfection.

Disinfected water main - shall be connected to the existing water main at one point only for flushing purposes (no looping). The new main MUST have a blow off on the end as required previously. After the new main is thoroughly flushed, the open end shall be sealed and restrained and the main shall be thoroughly disinfected. Anytime the new line is reopened (to repair defective joints or pipe, defective fitting or valve) the complete disinfection process shall be repeated. Once bacteriological clearance has been received from the regulatory authority, the new main may be pressure tested.

PVC PRESSURE AND LEAKAGE TESTS

Hydrostatic and leakage testing - shall comply with AWWA C605. For a simultaneous hydrostatic and leakage test, following installation, a pressure equal to 150% of working pressure at point of test, but not less

than 125% of normal working pressure at highest elevation is applied. The duration of the pressure test is for two (2) hours. If hydrostatic testing and leakage testing are performed at separate times, follow procedures as outlined in AWWA C605.

In preparation for pressure testing the following parameters must be followed:

All air must be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation Stop valves, vent piping in the testing hardware or end caps, or any other method which adequately allows air to escape the pipeline at all high points. Venting may also be accomplished by 'flushing' the pipeline in accordance with the parameters and procedures as described in AWWA C605.

The pipeline must be fully restrained prior to pressurization. This includes complete installation of all mechanical restraints per the manufacturer's instructions and recommendations, whether permanent or temporary to the final installation. This also includes the installation and curing of any and all required thrust blocking.

All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to the beginning of the test.

Temporary pipeline alignments that are being tested, such as those that are partially installed in their permanent location shall be configured to minimize the amount of potentially trapped air in the pipeline.

HDPE PRESSURE AND LEAKAGE TESTS

CONTRACTOR shall test pipelines installed under this Contract in accordance with these specifications prior to acceptance of the pipeline by the CITY. All field tests shall be made in the presence of the CITY. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by CITY, all fusible or butt weld joints shall be tested, including MJ adapter fittings associated with the new construction. All piping to operate under liquid pressure shall be tested in sections of approved length.

The pressure testing of an HDPE line section shall be performed separately from the PVC and DIP line sections. Where impractical, the HDPE test section shall include only a minimum amount of PVC and ductile iron pipe within the test section. If at all possible, the PVC and D.I.P. test sections shall be left exposed during the pressure test for visual leakage observation. For these tests, the CONTRACTOR shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment, and all labor required. If the CONTRACTOR chooses to pressure test against an existing CITY water main/valve, the new water main must be disinfected prior to connection to the CITY's line. The CITY will not be responsible for failure of the pressure test due to the existing valve leaking.

The CITY may elect to furnish suitable pressure gauges for these tests. If not, the CONTRACTOR will furnish suitable pressure gauges, calibrated by an approved testing laboratory, with increments no greater than 2 psi. Gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves.

Fill the section of pipe to be tested with potable water and expel the air from the pipe. Reclaimed water may be utilized only for filling new reclaimed water, stormwater or sewer force main installations. If blow offs or other outlets are not available at high points for releasing air, the CONTRACTOR shall provide 1 inch (minimum) taps and blow-off valves (at the 12:00 position), as necessary. The cost of constructing blow-off valves and plugging them, after a successful pressure test, shall be included in the unit price bid amount for the HDPE pipe.

For mains larger than 20" diameter, it is highly recommended that the CONTRACTOR profile (line and grade) the main after installation and prior to pressure and leakage test to accurately locate all high points. Field survey instrument (Level equipment) shall be utilized for this task. Blow off valves shall be installed (at a minimum) at all high points which offset vertically more than two pipe diameters in length (at a minimum). The CONTRACTOR shall consult the design ENGINEER on any technical questions or concerns.

Hydrostatic testing shall consist of a 150 psig test pressures, based on the elevation of the highest point of the line or section under tests. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the CITY's Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the CONTRACTOR and shall be subject to the approval of the CITY's Representative.

Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, and then allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

Initial Phase of Pressure Testing - First, all air must be removed from the test section. The pressure test shall be completed after the line is backfilled. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection.

If possible all PVC and D.I.P. test sections shall be left exposed for visual leak inspection. Initially, the pressure within the test section should be raised to approximately 160 psi and then allowed to be idle (no additional make-up water/pressure to be injected), for approximately 3 hours. During this 3 hour period, the test section shall be allowed to stabilize and come to an equilibrium stage.

No additional make-up water/pressure shall be applied to the test section during this 3 hour stabilization period unless the line pressure drops

below 140 psi. In this case, make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 psi (during the 3 hour stabilization period).

Final Phase of Pressure Testing - The final phase of the pressure test shall involve applying make-up water/pressure to achieve an "initial test pressure" of 150 psi (minimum)/155 psi (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to re-establish the "initial test pressure". The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the table below. If the actual make-up water is equal to or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails. CONTRACTOR shall submit results on a standard Florida industry test form.

Table 1: Allowable Make Up Amount	
Nominal Pipe Size (inches)	Make-up Water Allowance (Gallons/Linear feet of Pipe) 2-hour test
6	0.003
8	0.005
10	0.0065
12	0.0115
14	0.014
16	0.0165
18	0.0215
20	0.0275
22	0.035
24	0.044
26	0.05
28	0.0555
30	0.0635
32	0.0715
34	0.081
36	0.09
42	0.1155
48	0.1350
54	0.1570

In the event a section fails to pass the tests, the CONTRACTOR shall do everything necessary to locate, uncover (even to the extent of uncovering the entire section), and replace the defective pipe, valve, fitting or joint. Visible leaks shall be corrected regardless of total leakage. Lines which fail to meet these tests shall be retested as necessary until test requirements are complied with. All testing shall be performed at the CONTRACTOR's expense.

If, in the judgment of CITY, it is impracticable to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made with

approval; but, in any event, the CONTRACTOR shall be responsible for the ultimate tightness of the piping within the above requirement. Re-disinfection shall be required if the line is de-pressurized for repairs.

TAPPING PVC PRESSURE PIPE

Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Taps may be performed while the pipeline is filled with water and under pressure, or when the pipe is empty. Tapping shall be performed only with the use of tapping saddles or sleeves. **NO DIRECT TAPPING WILL BE PERMITTED.** Tapping shall be performed in accordance with the applicable sections for Saddle Tapping per Uni-Pub-8.

Tapping sizes shall be limited to the following maximum diameters for the nominal pipe diameters as indicated: Nominal pipe diameters 14" and less – max. 1" tap, nominal pipe diameters 16" to 18" – max. 2" tap, nominal pipe diameters 20" to 24" – max. 4" tap, and 30" and larger diameter pipe shall be limited to a max. tap of 6". All other connections requiring a larger diameter shall be made with a pipe connection as specified and indicated on the drawings.

Equipment used for tapping shall be made specifically for tapping PVC pipe. Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe. 'Hole saws' made for cutting wood, steel, ductile iron, or other materials are strictly prohibited. Manually operated or power operated drilling machines may be used.

LOCATE WIRE

Locate wire shall be provided on all installations. Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations" and all "exit point locations". There is no maximum length or interval between locate wire stations.

END SECTION 02622

**SECTION 02641
PRESSURE PIPE CLEANING**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

This Section sets forth the requirements for materials and methods to clean new potable water, reclaimed water, raw water, sanitary and stormwater pressure pipe lines.

1.2 REFERENCES

The City Utilities Department Standard Details, latest edition and Section 01660.

1.3 SUBMITTALS

The CONTRACTOR shall submit planned procedures to the CITY for review prior to beginning work. The CITY Utilities Department staff will advise as to whether or not the pipe cleaning and pigging procedures will be acceptable.

1.4 CONTRACTOR RESPONSIBILITIES

A. The CONTRACTOR shall provide and pay for all necessary labor, materials and equipment, including cleaning pigs as required, to ensure the pipe is cleaned. Potable water pipe cleaning shall be completed and accepted by the CITY before any effort is made to disinfect the piping.

1.5 JOB CONDITIONS

A. The CONTRACTOR shall review the field conditions prior to placing a bid for this project and evaluate the cleaning schedule that will be required.

B. The CITY's approval is required to clean a segment of the new piping system prior to moving on to another section.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

3.1 PREPARATION:

The CONTRACTOR shall request approval from CITY a minimum of three (3) business days in advance for coordination of the pigging and flushing operation due to the additional water resource demand on the CITY system. At CITY discretion night time operations may be specified.

3.2 PIGGING & FLUSHING:

- A.** Cleaning of lines less than 6 inches inside diameter shall be accomplished by thorough flushing of the line using a CITY approved water source. Cleaning of lines 6 inches inside diameter or greater shall be accomplished using a flexible polyurethane foam pipeline cleaner, commonly known as a "pig", manufactured for cleaning pressure lines. The pig shall be new and have a turning pattern, for use in water systems. It shall have a resilient peripheral surface that engages with the inner cylindrical wall of the pipe to maintain a sliding seal. The pig may have one or more sealing surfaces. This seal is maintained for propelling and must be abrasive resistant.
- B.** When necessary, the pig shall also have abilities to scratch, scrape, plow and jet to assist in cleaning and flushing the pipe of debris. The pig shall rotate for longer wear and be able to reduce itself to a minimum of 65% of its original cross-sectional area. It must then be able to return to its original form while maintaining its seal and ability to clean.
- C.** The pig shall have the ability to negotiate- fabricated mitered bends, short radius bends, short radius elbows, tees, crosses, and multi-dimensional pipe sizes and valves.
- D.** Follow manufacturer's recommendations for use of "pig" in cleaning the line and conduct flushing and cleaning with CITY's representative in attendance. After passing through the pipeline the CITY's representative shall determine if subsequent pigging and flushing must be performed.
- E.** The field pigging operation shall clearly establish that the piping is adequately cleaned.
- F.** All pipe and fittings used to launch and receive the pigs shall be removed at no additional cost to the CITY. The cost for constructing the pig launch and receiving piping shall be included as part of the pipe installation cost unless a separate line item is found in the bid form.

END OF SECTION

SECTION 02650
DISINFECTION OF WATER MAINS

Rev. 01/30/12

PART 1 - GENERAL

1.1 SCOPE OF WORK

This Section sets forth the specific requirements including materials and methods to disinfect potable water mains, document the process and acquire a State of Florida Department of Environmental Protection/Volusia County Health Department clearance for use.

1.2 REFERENCES

Section 01660, Section 02641, CITY Utilities Department Standard Details, latest edition, AWWA C 651 and ancillary applicable standards shall apply.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

3.1 PROCESS

- A. Upon completion of new pipe line it shall be cleaned and pressure tested in accordance with the latest edition of the CITY Utilities Department Standard Details and Sections 01660 and 02641
- B. Provide two paper copies of the water as-built/Record Drawings and one CD of the AutoCAD file for approval ***before*** disinfection/chlorination can be scheduled.
- C. Once the as-built/ Record Drawings have been approved disinfection/chlorination can be scheduled and will be coordinated through the Utility Inspector and Utilities Department Laboratory. CITY staff will operate all existing system valves.
- D. The CONTRACTOR is responsible for the installation of sampling points and onsite work associated with testing and sampling points.

- E. The CITY Utilities Department staff will collect samples only for water mains within the right of way or utility easements that will be public. Private water systems will not be sampled by CITY staff.
- F. Once the samples have passed in accordance with State of Florida Department of Environmental Protection/Volusia County Health Department regulations, a PDF copy of the bacteriological test report will be sent to the Engineer of Record. The Engineer of Record will then fill out a water main clearance application for the CITY's Utilities Department to file for water main clearance.
- G. Furnish 1 Mylar set of the Water As-Builts/ Record Drawings to the City's Utilities Department.
- H. Upon clearance by Volusia County Health Department, the water line may be placed in service by CITY.

3.2 JOB CONDITIONS

- A. The CONTRACTOR shall review the field conditions prior to placing a bid for this project and evaluate the testing schedule that will be required. To the maximum extent possible the CONTRACTOR shall schedule field tests as soon as possible to allow segments of the system to be cleared for use and to allow pavement replacement to begin.
- B. The CONTRACTOR shall submit a chlorination/disinfection testing plan to the CITY for each segment of the new system to be tested prior to moving on to another section. The plan shall be coordinated with and found to be acceptable by the CITY a minimum of two (2) weeks in advance of the requested testing time to verify that a partial clearance or approval will be allowed.

3.3 FINAL FIELD TESTING

The CONTRACTOR shall notify the CITY at least three (3) business days in advance of beginning tests. In the case of water main pigging operations, chlorination operations and tests the CONTRACTOR must secure advance approval from the Utilities Department Water System Manager. (NOTE: BECAUSE WATER MAIN FLUSHING INCREASES WATER DEMANDS THE WATER MANAGER MAY NOT ALLOW TESTS TO BE PERFORMED DURING NORMAL WORKING HOURS.)

3.4 FIELD TEST STANDARDS FOR WATER MAINS

- A. The CONTRACTOR shall take adequate regulatory agency compliant precautions to prevent water pollution from the discharge of pigging and disinfection water offsite. Appropriate treatment shall be provided onsite. **A plan for de-chlorinating the super-chlorinated disinfection water shall be provided to the CITY for review and acceptance a minimum of seven (7) days prior to disinfection taking place.** The super-chlorinated disinfection water shall not be allowed to remain in the water main for more than seventy-two (72) hours. If the super-chlorinated disinfection water remains in residence for more than seventy-two (72) hours the water main system will be considered damaged and will require replacement and re-testing by the CONTRACTOR at no additional cost to the CITY.

- B. Pressure tests shall be conducted after laying and to the extent practicable on the entire system before backfilling. **Pressure piping and valves shall be statically tested at 150 psig. The test pressure shall be maintained for an uninterrupted minimum time period of four (4) hours and be measured at the high point in the line. Hydrostatic Testing per Section 5.2 ANSI/AWWA C600-99** All air shall be expelled from the line before applying the test pressure. Exposed pipe, joints and other potential leak sources shall be carefully examined for leaks.

- C. Acceptance of the piping installation shall be determined on the basis of testing allowances defined in the AWWA C600-99 standard. If any test of laid pipe discloses a testing allowance greater than that specified in Section 5.2.1.6, repairs or replacements shall be accomplished in accordance with these specifications

- D. The CITY will conduct random reviews of the in line valves and water services to be certain that the total water main has been fully pressure tested.

END OF SECTION

**SECTION 03300
CONCRETE**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY:

A. This Section sets forth the requirements for concrete, grout and related work required to furnish and install cast-in-place reinforced and unreinforced concrete.

B. GENERAL:

1. Reinforced concrete shall be steel reinforced and includes:
 - a. Precast manholes and wet wells.
 - b. Other reinforced concrete structures.
 - c. Encasements, etc.
2. Steel Reinforcement: Includes bars, ties and supports.

1.2 QUALITY ASSURANCE

A SOURCE QUALITY CONTROL:

1. Concrete Testing Service:
 - a. CONTRACTOR shall employ acceptable testing laboratory to perform materials evaluation, testing and design of concrete mixes.
 - b. CONTRACTOR's laboratory shall also evaluate concrete delivered to and placed at the site.
2. Certificates, signed by concrete producer and CONTRACTOR may be submitted in lieu of material testing when acceptable to CITY and or Engineer of Record.
3. Quality Control: Perform sampling and testing during concrete placement as follows:
 - a. Sampling: ASTM C 172.
 - b. Slump: ASTM C 143, one test for each load at point of discharge Air Content: ASTM C 31, one for each set of compressive strength specimens.
 - d. Compressive Strength: ASTM C 39, one set for each 50 cubic yards or fraction thereof of concrete; 1 specimen tested at 7 days, 1 specimens tested at 28 days.

4. Report test results in writing to CITY and or Engineer of Record on same day tests are made.
- B. REFERENCE STANDARDS: Comply with the applicable provisions and recommendations of the following, except as otherwise shown or specified:
1. ACI 301, Specifications for Structural Concrete for Building (includes ASTM Standards referred to herein except for ASTM A 36).
 2. ACI 304, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 3. ACI 305, Hot Weather concreting.
 4. ACI 306, Cold Weather Concreting.
 5. ACI 315, Manual of Engineering and Placing Drawing for Reinforced Concrete Structures.
 6. ACI 318, Building Code Requirements for Reinforced Concrete.
 7. ACI 347, Guide to Formwork for Concrete.
 8. ACI 350, Environmental Engineering Concrete Structures.
 9. ASTM A 36, Specification for Structural Steel.
Concrete Reinforcing Steel Institute Manual of Standard Practice, include ASTM Standards referred to herein.

1.3 SUBMITTALS

- A. Samples: Submit samples of materials as specified and may be requested by CITY and or Engineer of Record, including names, sources and descriptions.
- B. Shop Drawings: Submit for approval the following:
1. Copies of manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.
 2. Drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315, Chapters 1 thru 7. Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies, as required for the fabrication and placement of concrete reinforcement.
 3. List of concrete materials and concrete mix designs proposed for use. Include the results of all tests performed to qualify the materials and to establish the mix designs in accordance with ACI 301, 3.9. Submit written report to

CITY and or Engineer of Record for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to CITY and or Engineer of Record. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by CITY and or Engineer of Record.

- C. Laboratory Test Reports: Submit copies of laboratory test reports for concrete cylinders, materials and mix design tests. CITY and or Engineer of Record review will be for general information only. Production of concrete to comply with specified requirements is the responsibility of CONTRACTOR.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery concrete reinforcement materials to the site bundled, tagged and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
- B. All materials used for concrete must be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard clean surfaces shall be provided for storage. Suitable means shall be taken during hauling, piling and handling to insure that segregation of the coarse and fine aggregate particles does not occur and the grading is not affected.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Aggregates: ASTM C 33.
 - 1. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank run sand and manufactured sand are not acceptable.
 - 2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:

- a. Crushed stone, processed from natural rock or stone.
 - b. Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted
- C. Coarse Aggregate Size: Size to be ASTM C 33, Nos. 57 or 67, unless permitted otherwise by CITY and or Engineer of Record.
- C. Water: Clean, drinkable.
- D. Air-Entraining Admixture: ASTM C 260.
- F. Water-Reducing High Range Admixture: ASTM C 494, Type F/G. Only use admixtures which have been tested and accepted in mix designs
- G. Slump Limits:
 - l. Proportion and design mixes to result in concrete slump:
 - a. Not more than 4 inches prior to adding high range water-reducer.
 - b. Not more than 8 inches at point of placement after adding high range water-reducer.

2.2 FORM MATERIALS

- A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.
- B. Exposed Concrete Surfaces: Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces. Use largest practical sizes to minimize form joints.
- C. Unexposed Concrete Surfaces: Suitable material to suit project conditions.

2.3 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60.
- B. Steel Wire: ASTM A 82.

- C. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place.
 - 1. Use wire bar type supports complying with CRSI recommendations, except as specified below. Do not use wood, brick, or other unacceptable materials.
 - 2. For slabs on grade, use supports with sand plates or horizontal runners where base materials will not support chair legs.
 - 3. For all concrete surfaces, where legs of supports are in contact with forms, provide supports (Either hot-dip galvanized, plastic protected or stainless steel legs) complying with CRSI, Manual of Standard
 - 4. Over waterproof membranes, use precast concrete chairs.

2.4 RELATED MATERIALS

- A. Waterstops:
 - 1. Flat dumbbell or center bulb type, size to suit joints, uniform minimum thickness of 3/8-inch by 9 inches minimum width of Polyvinyl Chloride.
 - a. Manufacturer: Provide waterstops of one of the following:
 - 1. W.R. Meadows, Incorporated.
 - 2. A.C. Horn, Incorporated.
 - 3. Or equal.
- B. Membrane-Forming Curing Compound: ASTM C 309, Type I.
- B. Epoxy Bonding Agent:
 - 1. Two-component epoxy resin bonding agent.
 - a. Product and Manufacturer: Provide one of the following:
 - 1. Sikadur Hi-Mod, as manufactured by Sika Chemical Corporation.
 - 2. Epoxite Binder (Code No. 2390), as manufactured by A.C. Horn, Incorporated.
 - 3. Or Equal.

2.5 GROUT

- A. Non-shrink, Nonmetallic Grout:
 - 1. Prepackaged nonstaining cementitious grout requiring only the addition of water at the job site.
 - 2. Product and Manufacturer: Provide one of the following:
 - a. Euco N-S, as manufactured by the Euclid Chemical Company.
 - b. Masterflo 713, as manufactured by Masters Buildings Company.
 - c. Or equal.

- B. Non-shrink, Nonmetallic 100% Solids, High Strength Epoxy Grout:
 - 1. Use prepackaged solvent-free, moisture-insensitive, 3-component epoxy grouting system.
 - 2. Product or Manufacturer: Provide one of the following:
 - a. Euco High Strength Grout, as manufactured by the Euclid Chemical Company, Cleveland, Ohio.
 - b. Sikadur 42, Grout-Pak, as manufactured by the Sika Chemical Company, Lyndhurst, NJ
 - c. Or equal.

- C. Ordinary Cement-Sand Grout:
 - 1. Except where otherwise specified use 1 part cement to 3 parts sand complying with the following:
 - a. Cement: ASTM C 150, Type II.
 - b. Sand: ASTM C 33.

PART 3 - EXECUTION

3.1 INSPECTION

- A. CONTRACTOR and his installer shall examine the foundation for and the conditions under which work is to be performed and notify CITY of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to CITY and or Engineer of Record.

3.2 FORMWORK

- A formwork: Construction so that concrete members and structures are correct size, shape alignment, elevation, and position, complying with ACI 347.
- B. Provide openings in form work to accommodate work of other trades. Accurately place and securely support items built into forms.
- C. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during and after concrete placement if required to eliminate mortar leaks.

3.3 REINFORCEMENT, JOINTS, AND EMBEDDED ITEMS

- A. Comply with the applicable recommendations of specified codes and standards and CRSI. Manual of Standard Practice, for details and methods of reinforcement placement and supports
- B. Clean reinforcement to bright metal surface unless otherwise directed by City. Remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
- C. Position, support, and secure reinforcement against displacement during formwork construction or concrete placement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
 - 1. Place reinforcement to obtain the minimum concrete coverage as shown and as specified in ACI 18. Arrange, space, and securely tie bars and bar supports together with 16 gage wire to hold reinforcement accurately in position during concrete placement operations. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
 - 2. Reinforcing steel shall not be secured to forms with wire, nails or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.
- D. Provide sufficient numbers of supports of strength required to carry reinforcement. Do not place reinforcing bars more than 2

inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

- E. Splices:
1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown for minimum lap of spliced bars.
- F. Concrete shall not be placed until the reinforcing steel is inspected and permission for placing concrete is granted by CITY/ENGINEER. All concrete placed in violation of this provision will be rejected.
- G. Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair the strength and appearance of the structure. Place isolation and control joints in slabs on ground to stabilize differential settlement and random cracking.
1. In mats and slabs on grade locate joints at a spacing of approximately 40 feet. Place concrete in a strip pattern.
- H. Installation of Embedded Items: Set and build into the work anchorage devices and embedded items required for other work that is attached to, or supported by cast-in-place concrete. Use setting diagrams, templates and instructions provided under other Sections for locating and setting.

3.4 CONCRETE AND PLACEMENT

- A. Proportioning and Design of Mix:
1. Minimum compressive strength at 28 days: 3000 psi.
 2. Maximum water cement ration by weight: 0.45.
 3. Minimum cement content: 564 pounds per cubic yard.
 4. Normal weight: 145 pounds per cubic foot.
 5. Use air-entraining admixture in all concrete: provide not less than 4 percent or more than 8 percent entrained air for concrete.
 6. Calcium Chloride: Do not use calcium chloride in concrete, unless otherwise authorized in writing by CITY

and or Engineer of record. Do not use water or admixtures containing calcium chloride.

- C. Job-Site Mixing: Use drum type batch machine mixer, mixing not less than 1 ½ minutes for one cubic yard or smaller capacity. Increase mixing time at least 15 seconds for each additional cubic yard or fraction thereof.
- D. Ready-Mixed Concrete: ASTM C 94.
- E. Concrete Placement: Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.
- F. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into all parts of forms.
- G. Protect concrete from physical damage or reduce strength due to weather extremes during mixing, placement and curing.
 - 1. In cold weather comply with ACI 306.
 - 2. In hot weather comply with ACI 305.

3.5 QUALITY OF CONCRETE WORK

- A. Make all concrete solid, compact and smooth, and free of laitance, cracks and cold joints.
- B. All concrete for liquid retaining structures, and all concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
- C. Cut out and properly replace to the extent ordered by CITY, or repair to the satisfaction of CITY, surfaces which contain cracks or voids, are unduly rough, or are in any way defective. Patches or plastering will not be acceptable.
- D. Repair, removal, and replacement of defective concrete as ordered by CITY shall be at no additional cost to CITY.

3.6 CURING

- A. Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protection as required to prevent damage to exposed concrete surfaces.

3.7 FINISHES

- A. Finish:
 - 1. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently. Use a wood float only. Check and level the surface plane to a tolerance not exceeding ¼ inch in 10 feet when tested with a 10 foot straightedge placed on the surface at not less than 2 different angles. Cut down high spots and fill all low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat the surface to a uniform, smooth granular texture.
 - 2. Apply a non-slip broom finish of neat appearance to exterior concrete slabs. Use fiber-bristle broom unless otherwise directed. Coordinate the required final finish with CITY/ ENGINEER before application.

3.8 GROUT PLACEMENT

- A. General:
 - 1. Place grout as shown and in accordance with manufacturer's instructions. If manufacturer's instructions conflict with the Specifications do not proceed until CITY provides clarification.
 - 2. Drypacking will not be permitted.
 - 3. Proprietary product manufacturers shall make the services of qualified, full-time employees available upon 72 hours notification to assure that the product is properly used.
 - 4. Placing grout shall conform to the temperature and weather limitations described in Article 3.4 above.

END OF SECTION

**SECTION 03400
PRECAST CONCRETE MANHOLES**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the requirements for materials and installation of pre-cast reinforced concrete manholes shown on the drawings

1.2 REFERENCES

- A. Florida Department Of Transportation Design Standards latest edition with deference to the CITY Utilities department Standard Details latest edition

1.3 SUBMITTALS

- A. Submit shop drawings for the following:
 - 1. Pre-cast manhole (including reinforcing and joint materials)
 - 2. Manhole to pipe connections
 - 3. Manhole lining systems
 - 4. Frame and cover

1.4 DELIVERY AND HANDLING

- A. Components of the manhole shall be free of fractures, cracks and undue roughness. Concrete shall be free of defects that indicate improper mixing or placing, and surface defects such as honeycomb or spalling. Cracks or broken ends due to improper handling will not be acceptable.
- B. Lift holes will be allowed to penetrate the entire wall thickness to facilitate handling of these structures. All lift holes shall be plugged with a non-shrink leak proof grout.

1.5 PRE-CAST MANHOLE MATERIALS

- A. Concrete: 4,000 psi, See Section 03300, Concrete for materials and reinforcing.
- B. Flexible Plastic Gasket: Conform to SS-S-00210, Type 1, Rope Form
- C. Epoxy Coating: Coal Tar epoxy (exterior an interior surfaces)

- D. Manhole concrete adjusting rings
- E. Frame and cover: Traffic type conforming to ASTM A48-74, 30,000 psi Tensile strength. U.S. Foundry 170 E or equal.
- F. The interior of the manhole shall be protected with two coats of tar epoxy. The first coat shall be thinned according to the manufacturer's instructions. The two coats shall total 16 mil dry film thickness. One coat of tar epoxy shall also be applied to the exterior surface to a thickness of no less than 8 dry mils.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

3.1 MANHOLE CONSTRUCTION

- A. Manholes shall be constructed of pre-cast reinforced concrete. Reinforcing for the base section and top shall be as shown on the drawings. Reinforcing for the wall sections shall be as specified in ASTM C478-75 (or later additions) and shall extend into the tongue and groove of the joints. There shall be a #4 continuous rebar hoop around openings. The base shall be monolithic with the first wall section and the first joint shall be as high as possible to reduce the likelihood that infiltration will enter the first joint.
- B. Joints shall be tongue and groove suitable for flexible plastic gasket material.
- C. A shallow type manhole shall be constructed at locations shown where the Difference in elevation from the invert of lowest line to grade does not exceed 5 feet.
- D. Manholes shall be set to the pipe grade firm and plumb in the locations shown on the drawings. Compaction of the base soil is an important step of construction to reduce the future settlement. The contractor should consider placing rock materials below the base should compaction efforts fail.
- E. Joints between sections shall be cleaned, primed and the gasket applied as recommended by the manufacturer. Excess material shall be smoothed flat with a roller. Voids remaining in the joint shall be caulked with a water- tight joint sealing material. The inspector may order the section removed if the joint material was placed poorly such that there is concern about the seal
- F. The joining pipe to manholes shall be by casting a rubber boot or by inserting

a rubber boot by core n seal method. Each boot shall protrude at least 4 inches beyond the wall to allow the installing of a stainless steel clamp to provide a water-tight connection.

END OF SECTION

**SECTION 09900
PAINTING AND PROTECTIVE COATINGS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide all labor, materials, apparatus, scaffolding, and all appurtenant work in connection with painting and protective coatings, complete as indicated, specified and required.
- B. Principle items include, but are not limited to:
1. All exposed piping, conduits, tanks, equipment and other metal surfaces, interior and exterior, except as hereinafter specifically excluded.
 2. All submerged and intermittently submerged metal surfaces, except stainless steel.
 3. All structural and miscellaneous steel.
 4. Equipment furnished without factory finished surfaces.
 5. Equipment, on which factory applied finishes have been marred, abraded, scratched, nicked, or otherwise damaged.
 6. The interior of concrete tanks, manholes, and similar structures, unless otherwise lined.
 7. Paint coatings on scheduled interior concrete walls and undersides of slabs.
 8. Plasterwork, gypsum drywall surfaces, woodwork, and other architectural work as specified or shown on the Drawings.
 9. Exposed steel lintels.
 10. Interior and exterior CMU walls unless otherwise specified.
 11. Undersides of aluminum access hatches and aluminum checkered plate.
 12. Fire hydrants, valve box lids, meter box lids, bollard/ guard post above ground meter and backflow assemblies.
 13. All exterior wall surfaces of existing concrete tanks and structures from 6-inches below grade to the top of the wall or structure.

C. The following surfaces, in general, shall not be painted:

1. Concrete surfaces subject to pedestrian or vehicular traffic, except as herein specified.
2. Nonferrous metals and stainless steel unless otherwise noted or indicated. Galvanized metal shall not be considered as a nonferrous metal.
3. Mechanical equipment with factory finish as specified herein.
4. Electrical and instrumentation equipment with approved factory finish or of stainless steel/nonferrous metal construction, unless otherwise specified.
5. Water proofing, damp proofing and roof covering work.
6. Anodized aluminum.
7. Aluminum handrails and ladders.
8. Fiberglass grating and tread plate.

D. Related work not included in this Section:

1. Pavement striping.
2. Sealants and caulking.
3. Waterproofing and damp proofing.

E. The Contractor shall furnish to the Engineer, at no charge for use during this project, one dry film thickness (DFT) gauge and one electrical flaw detection equipment system.

1.02 GUARANTEE

A two (2) year guarantee which commences on the date of acceptance against failure of all coatings shall be provided, unless more stringent requirements are specified hereinafter. Failure of any coating during the guarantee period shall be repaired by the Contractor who shall absorb all costs related to the repair of the coating. Failure shall be defined as peeling, blistering, de-lamination or loss of adhesion of any of the coatings.

1.03 REFERENCE SPECIFICATIONS AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all cleaning, surface preparation, and coating shall conform to the applicable requirements of the referenced portions of the standards specified herein to the

extent that the requirements therein specified are not in conflict with the provisions of this Section.

- B. Unless otherwise specified, all work and materials for the preparation and coating of all metal surfaces shall conform to the applicable requirements specified in the Steel Structures Painting Manual, Volume 2, Systems and specifications Revised, latest edition, published by the Steel Structures Painting Council.
- C. STEEL-The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this Section.
 - 1. White Metal Blast Cleaning (SSPC-SP5): Removal of all visible rust, mill scale, paint, and foreign matter by blast cleaning by wheel or nozzle (dry) using sand, grit, or shot (For very corrosive atmosphere).
 - 2. Near-White Blast Cleaning (SSPC-SP10): Blast cleaning nearly to White Metal Cleanliness, until at least 95 percent of each element of surface area is free of all visible residues (For high humidity, chemical atmosphere, marine or other corrosive environment).
 - 3. Commercial Blast (SSPC-SP6): Blast cleaning until at least 67 percent of each element of surface area is free of all visible residues.
 - 4. Brush-Off Blast Cleaning (SSPC-SP7): Blast cleaning of all except tightly adhering residues of mill scale, rust and coatings, exposing numerous evenly distributed flecks of underlying structure substrate.
 - 5. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, dirt, soil, salts, and contaminants by cleaning with solvent, vapor, alkali, emulsion or steam.
- D. CONCRETE-Unless otherwise specified, all work and materials for the preparation and coating of all concrete surfaces shall conform to the applicable requirements specified in Joint Surface Preparation Standard SSPC-SP13/NACE No.6 and SSPC-SP 12/NACE No.5 latest editions and ASTM D4258, ASTM D4259 and ASTM D4263 latest editions and the paint/coating product manufacturer's recommendations.
- E. Quality Assurance. Evaluation of surface preparation for ferrous metals will be based upon NACE Standard TM-01-Visual Standard for Surface Preparation

1.04 SUBMITTALS

Submittals shall be in accordance with the following:

- A. Samples. Prepare and submit for Engineer's approval copies of color samples on 8-1/2" x 11" size cards for each paint and protective coating system. Each sample card shall clearly show each coat of the finish system, and shall be clearly marked with the manufacturer's name and product identification, and shall be submitted in

sufficient time to allow for approval and, if necessary, disapproval and re-submittal without causing any delay of the project.

B. Coating Materials List.

1. The Contractor shall provide copies of a paint/coating materials list which indicates the manufacturer and paint number, keyed to the coating schedule herein, for approval by the Engineer prior to or at the time of submittal of samples required herein.
2. The Contractor shall include with his submittal, his protective paint/coating schedule for shop and field coatings of items to receive protection. The schedule shall conform to the specified requirements for surface preparation, priming, and coating for items covered, and shall follow the same requirements for similar work where such work has not been specifically called-out. No bare ferrous nonworking surfaces shall be omitted from the schedule. Particular care shall be taken to cover in sufficient detail the coating of mechanical joints and other mechanical devices which shall conform to the recommended practice of the manufacturer of the joint or other mechanical devices.
3. Paint/coatings to be used on plastic and fiberglass materials shall be certified acceptable by all plastic and fiberglass manufacturers whose products are to be coated. Certification copies shall be submitted to the Engineer. The Contractor shall be certified in writing by the painting and coating material manufacturers as a qualified applicator of their products with copies of the certification submitted to the Engineer.
4. Product Data Sheets. Contractor shall submit paint/coatings material manufacturers' printed technical data sheets for products intended for use in each paint and coating system. Data sheets shall fully describe material as to its intended use, makeup, recommended surface preparation and application conditions, primers, material mixing and application (including recommended dry mil thickness [DFT] recoat time), precautions, safety and maintenance cleaning directions.
5. Material Safety Data Sheets. Material Safety Data Sheets (MSDS) shall accompany all paint submittals and shall be prominently displayed at the job site during all painting activities.

1.05 PROTECTION OF WORK

The Contractor shall be responsible for any and all damage to his work or the work of others during the time his work is in progress.

1.06 EXTRA STOCK

Five (5) gallons of each type and color of finish paint and coating used on the project shall be provided as extra stock. Extra stock paint shall be supplied in appropriate sealed one gallon containers and be clearly labeled as to paint type, formula, and color.

1.07 RIGHT OF REJECTION

The Engineer shall have the right to reject all material or work that is unsatisfactory, and require the replacement of either or both at the expense of the Contractor.

1.08 ONE MANUFACTURER

To the maximum extent possible, all products shall be the product of one manufacturer unless a specific specialty coating system is specified. Without exception, all paint/coatings for any service condition specified herein shall be by one manufacturer. Once a paint/coating manufacturer has been selected by the Contractor and approved by the Engineer, the Contractor shall ensure that all equipment manufacturers prime their equipment with the same or a compatible primer. If this cannot be or is not done for any reason, the Contractor shall apply a "universal primer" and recoat with the approved manufacturer's product in the field.

1.09 JOB CONFERENCE

Prior to commencing painting work a pre-job conference shall be held for the purpose of reviewing the painting and coating requirements of the project. The Owner, Engineer, Contractor, Applicator, and the Coatings and Paint Manufacturer shall be present. A schedule of work to be accomplished will be established.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Surfaces to receive paint and protective coating materials as herein specified in this Section shall be coated in conformance with the applicable paint/coating systems specified herein. All materials specified by name and/or manufacturer or approved for use under these Specifications, shall be delivered unopened at the job site in their original containers and shall not be opened until inspected by the Engineer.
- B. Whenever a manufacturer's brand name is specified, it is intended to define the preferred type and quality of paint/coatings desired. Other paint/coatings of equal quality as approved by the Engineer may be used. Coating/paint materials shall be a product of TNEMEC or approved equal, unless otherwise specified. All paint/coatings shall be produced and applied as specified herein. If not otherwise specified paint/coatings shall be applied in accordance with the manufacturer's printed recommendations as approved by Engineer. So far as possible, all paint and coating materials shall be provided by a single source supplier. Coating materials

shall meet Volatile Organic Compounds (VOC) requirements of not more than 3.5 lb/gal. as applied after thinning. Paint and protective coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use. Pigmented paints shall be furnished in containers not larger than five (5) gallons. Materials shall conform to the specifications shown herein and to the requirements hereinafter specified.

- C. Products shall be a standard of a recognized manufacturer engaged in production of such materials for essentially identical or similar applications in the water and wastewater treatment industry.
- D. Compatibility. Only compatible materials shall be used in the work. Particular attention shall be directed to compatibility with underlying paint that is to be repainted and primers and finish coats. If necessary, subject to approval of the Engineer, a compatible barrier coat shall be applied between all existing paint/coatings and or prime coat and subsequent field coats to ensure compatibility.
 - 1. Ductile iron pipe that has an exterior bituminous coating shall not be painted unless the bituminous coating is removed by sand blasting or an appropriate, compatible, intermediate coat is applied before top coating in accordance with this specification
- E. Colors. All colors and shades of colors of all coats of paints and protective coating material shall be as identified in the architectural sketches or schedules or as modified/selected by the Engineer. Each coat shall be of a slightly different shade, as directed by the Engineer to facilitate inspection of surface coverage of each coat.

2.02 SERVICE CONDITION A

- A. Ferrous and galvanized metals, other than stainless steel, within wet wells or similar corrosive atmospheres, submerged or intermittently submerged in sludge, sewage, chemical mixtures or similar corrosive liquids shall be prepared and coated in accordance with the following requirements.
 - 1. All metal surfaces shall be field sandblasted in accordance with Steel Structures Painting Council Specification SSPC-SP10 (Near White Blast Cleaning). Weld surface, edges, and sharp corners shall be ground smoothly and all weld splatter removed per SSPC-SP3 "Power Tool" or SP2 "Hand Tool" Cleaning. Galvanized metals shall be cleaned per SSPC SP-7 (brush off blast cleaning).
 - 2. Application shall be in strict conformance with the manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.
- B. Except as otherwise noted, the prime coat shall have a minimum DFT of 3 mils and the two finish coats shall have a minimum total (DFT) of 13 mils. If the finish coat is

not applied within manufacturer's recommended time period, an intermediate special surface conditioner shall be applied in advance of finish coats or a light brush blast. The total system shall have a minimum DFT of 16 mils:

TNEMEC System: Shop Primer - Series 66-1211
Field Primer - Series 104
Finish Coats - Series 104

2.03 SERVICE CONDITION B

Ferrous and galvanized metals, other than stainless steel, subject to seacoast salt air exposures or equivalent chemical attack, shall be prepared and coated in accordance with the following requirements.

- A. All surfaces shall be free of dirt, dust, grease, or other foreign matter before coating. Ferrous surfaces shall be cleaned in accordance with the Steel Structures Painting Council Specification SSPC-SP7 (Brush-Off Blast Cleaning), and galvanized surfaces shall be cleaned in accordance with SSPC-SP1 (Solvent Cleaning). Weld surface, edges and sharp corners shall be ground smooth and all weld splatter shall be removed per SSPC-SP3 or SP2. Galvanized metal shall be cleaned per SSPC SP-7 (brush off blast cleaning).
- B. Application shall be in strict conformance with the manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.
- C. Except as specified below, the prime coat shall have a minimum DFT of 3 mils, the intermediate coat shall have a minimum DFT of 4 mils and including one or more finish coats the entire system shall be a minimum total DFT of 10.0 mils:

TNEMEC System: Primer - Series 66
Intermediate Coat: Series 66
Finish Coats: Series 73

2.04 SERVICE CONDITION C

Ferrous and galvanized metals, other than stainless steel, subject to mild to moderately severe air exposures or equivalent chemical attack, shall be prepared and coated in accordance with the following requirements.

- A. All surfaces shall be free of dirt, dust, grease, or other foreign matter before coating. Ferrous surfaces shall be cleaned in accordance with the Steel Structures Painting Council Specification SSPC-SP7 (Brush-Off Blast Cleaning), and galvanized surfaces shall be cleaned in accordance with SSPC-SP1 (Solvent Cleaning). Weld surface, edges and sharp corners shall be ground smooth and all weld splatter shall be removed per SSPC-SP3 or SP2. Galvanized metal shall be cleaned per SSPC SP-7 (brush off blast cleaning).

- B. Application shall be in strict conformance with the manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.
- C. Except as specified below, the prime coat shall have a minimum DFT of 3 mils, intermediate coat shall have a minimum DFT of 4 mils and including one or more finish coats the entire system shall be a minimum total DFT of 10.0 mils:

TNEMEC System: Primer - Series 66

Intermediate Coat: Series 66

Finish Coats: Series H2

or

PORTER System: Primer – PP286 or PP296

Intermediate Coat: 2200

Finish Coat: 2200

2.05 SERVICE CONDITION D

Coating aluminum and non-ferrous metal surfaces, including undersides of aluminum access hatches, frames, and checkered plate, subject to corrosive atmosphere and condensation shall be prepared and coated in accordance with the following requirements.

- A. Clean non-ferrous surfaces in accordance with SSPC-SP7 (brush-off blast cleaning).
- B. Application shall be in strict conformance with manufacturer's printed recommendations, as approved by the Engineer.
- C. The prime coat shall have a minimum 3.0 mil DFT and finish coats shall have a minimum 4 mil DFT for an entire system minimum total DFT of 7 mils:

TNEMEC System: Primer - Series 66 Finish Coats - Series 66

2.06 SERVICE CONDITION E

Plastic and fiberglass reinforced plastic (FRP) products subject to seacoast salt air exposures shall be prepared and coated in accordance with the following requirements. Coatings to be used for piping and appurtenances shall be certified by the manufacturer to be completely acceptable and non-injurious.

- A. Clean surfaces with SSPC-SP1 solvent cleaner. Lightly sand all surfaces.
- B. Application shall be in strict conformance with manufacturer's printed recommendations.
- C. The prime coat shall have a minimum 3.0 mil DFT and finish coat shall have a minimum 3.0 mil DFT for an entire system minimum total DFT of 6 mils:

TNEMEC System: Primer - Series 66

Finish Coat - Series 73

2.07 SERVICE CONDITION F

Concrete which is subject to submergence and intermittent submergence in water and Groundwater and concrete potable water storage tank poured wall and dome exteriors shall be prepared and coated in accordance with the following requirements.

- A. All surfaces whether previously coated or uncoated shall be cleaned of all dirt, dust, mildew/algae, oil, curing compounds and other deleterious compounds and aggressive staining. In general, the concrete shall be reasonably smooth and free of pockets, cavities and loose materials. All wall and dome surfaces shall be cleaned by brush-off blast cleaning NACE #4 / SSPC-SP7 with reference to NACE#6 / SSPC-SP13 unless otherwise specified. Where a waterproofing/sealant is applied the surface shall be cleaned by commercial blast cleaning NACE#3/SSPC-SP6. For painting/coating of existing structures, in addition to above, patch concrete with non-shrink grout, replace damaged stucco, and repair cracks in exterior concrete wall surfaces by epoxy injection. Stripe coat all repaired areas and visible hairline cracks by roller or spray with Series 6 TNEME CRYL at 2.5 mils minimum DFT prior to application of final paint/coating system. All surfaces shall be completely dry before application of each paint/coating.
- B. Application shall be in strict conformance with the manufacturer's printed recommendations. All coats shall be applied within 24 hours of the previous coat.
- C. The waterproofing/sealant shall have a minimum DFT of 1/16 inch, the prime coat shall have a minimum DFT of 3 mils and the intermediate and the finish coats shall have a minimum total DFT of 2.5 mils. The entire system total minimum DFT will vary dependent upon the need for the waterproofing/sealer and primer:

THOROSEAL : Waterproofing/Sealant (as exterior base coat on water tank dome only)

TNEMEC System: Primer - Series 66 - (Not required on repainted or sealed concrete)

Intermediate Coat - Series 6 TNEME CRYL

Finish Coat - Series 6 TNEME CRYL

2.08 SERVICE CONDITION G

Concrete sanitary sewer manholes or similar corrosive atmospheres which are subject to submergence and intermittent submergence in domestic sewage, water and groundwater shall be prepared and coated in accordance with the following requirements.

- A. All surfaces whether previously coated or uncoated shall be cleaned of all dirt, dust, oil, curing compounds, and other deleterious compounds. In general, the concrete shall be reasonably smooth and free of pockets, cavities and loose materials. Allow new concrete to cure for 28 days. All surfaces shall be cleaned by commercial blast cleaning SSPC-SP6 with reference to NACE#6/SSPC-SP13). For painting/coating of existing structures, in addition to above, patch concrete with non-shrink grout,

repair cracks in concrete wall surfaces by epoxy injection. All surfaces shall be completely dry before application of the coating.

- B. Application shall be in strict conformance with the manufacturer's printed recommendations. All coats shall be applied within 24 hours of the previous coat.
- C. A prime coat is not required on concrete. Coating can be applied in one or two coats. When applied in two coats each coat shall have a minimum DFT of 8 to 10 mils. The entire system shall have a total minimum DFT of 15 to 20 mils.

TNEMEC System: Primer – Series 66
Intermediate Coat - Series 46H-413
Finish Coat – Series 46H-413

2.09 ARCHITECTURAL PAINT FINISHES

- A. Manufacture. Unless otherwise noted, products listed below are the products of TNEMEC coatings. Engineer approved equivalent products will be acceptable.
- B. Interior Finishes:

1. Interior Wetted Concrete Surfaces (Non-Aggressive Areas)

Surface Preparation: Prefer SSPC-SP7: Brush-off Blast Cleaning. If brush-off Blast Cleaning is not possible, a double acid etching is recommended. Properly prepared surface should have a profile similar to 100 grit sandpaper. A test patch is recommended when applying epoxy coatings over old, existing coatings.

Materials:

Primer: TNEMEC Series 66 at 3.0 - 5.0 mils

2nd Coat (optional): TNEMEC Series 66 at 4.0 - 6.0 mils DFT

Finish: TNEMEC Series 66 at 4.0 - 6.0 mils DFT

The entire system will have total minimum DFT of 11.0 - 17.0 mils

2. New Concrete Block Walls (Non-aggressive Environment)

Surface Preparation: Cure 14 days. Remove mortar spatter. Surfaces must be clean and dry.

Materials:

Filler: TNEMEC Series 130 or 54-562 at 80 SF/Gal

Finish Coat: TNEMEC Series 113 or 114 @ 4.0 - 6.0 mils DFT

3. New Poured Concrete Walls (Non-aggressive Environment)

Surface Preparation: Cure for 28 days. All surfaces must be clean and dry.

Materials:

Primer: TNEMEC Series 113 or 114 @ 4.0 - 6.0 mils DFT.
Finish: TNEMEC Series 113 or 114 @ 4.0 - 6.0 mils DFT.

C. Concrete in aggressive areas (CBW)

1. Surface Preparation. Surfaces shall be cured for 28 days, clean, dry and free from curing compounds, oil, grease, dirt or chalk.

Materials:

Filler: TNEMEC Series 54-660 (block walls only).

Prime Coat: One coat of TNEMEC Series 66 applied at 5 mils DFT.

Finish Coats: Two coats of TNEMEC Series 66 applied at 5 mils DFT per coat

D. Concrete Sealed (ECB)

Huls Chem-Trete PB or approved equivalent at a rate of between 50 and 100 SF/gal. Application shall be sufficient to guarantee complete water repelling for five (5) years.

E. Concrete Waterproof (CWP)

Apply one base coat of Thoroseal by Thoro System Products or approved equal at a minimum 2 lbs. per square yard for a 1/16 inch DFT.

2.10 PATCH COAT FOR GALVANIZED SURFACES

All galvanized surfaces which are scratched, marred, or otherwise damaged shall be patched with TNEMEC Series 90-97 or approved equivalent at 2.5 - 3.5 mils DFT.

2.11 PRIMER OVER BITUMINOUS COATING

Two coats, TNEMEC Series 66, at 4 mils DFT each. Allow bituminous coating to bleed through on first coat. Apply second coat, third coat shall be per service condition schedule.

2.12 UNIVERSAL PRIMER

The "universal-primer" shall be a primer which can be applied over any other type of solvent based primer, and be compatible with alkyds, epoxies and urethane finish coats.

PART 3 - EXECUTION

3.01 MANUFACTURER'S RECOMMENDATIONS

Unless otherwise specified herein, the paint and coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protection of his coating materials; for preparation of surfaces for coating; and for all other procedures relative to coating shall be strictly observed. No substitutions or other deviations will be permitted without written permission of the Engineer.

3.02 DELIVERY AND STORAGE

Materials shall be delivered in manufacturer's original, sealed containers, with labels and tags intact. Paint/coating materials and equipment shall be stored in designated areas. Coating containers shall be opened only when required for use. Coatings shall be mixed only in designated areas and in the presence of the Engineer, unless otherwise directed. Coatings shall be thoroughly stirred or agitated to uniformly smooth consistency and prepared and handled in a manner to prevent deterioration and inclusion of foreign matter. Unless otherwise specified or approved, no materials shall be reduced, changed, or used except in accordance with the manufacturer's label or tag on container.

3.03 SAFETY REQUIREMENTS

- A. In accordance with the requirements of applicable OSHA Regulations for Construction, the Contractor shall provide and require the use of personal protective equipment for all persons working in or about the project site.
- B. Respirators shall be worn by all persons engaged in, and assisting in, spray painting. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices meeting the requirements of A7NSI Z87.1 latest revisions, and approved OSHA Regulations for sand blasting operations and equipment including approved air-purifying, half-mask or mouthpiece respirator with appropriate filter.
- C. Where ventilation is used to control potential exposure to workers as set forth in Section 1910.94 of the OSHA Regulations for Construction, ventilation shall be adequate to reduce the concentration of the air contaminant to the degree that a hazard to the worker does not exist. Methods of ventilation shall meet the requirements set forth in ANSI-Z9.2, latest revision.
- D. In accordance with Sections 1926.52 and 1926.101 of OSHA Regulations for Construction, whenever the occupational noise exposure exceeds maximum sound levels as set forth in Table D-2 ear protective devices shall be fitted and used, and a continuing, effective hearing conservation program shall be administered.
- E. Cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each workday

3.04 STORAGE, MIXING AND THINNING

Paint/coating materials shall be protected from exposure to cold weather, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Materials of different manufacturers shall not be mixed together. Packaged materials shall be thinned immediately prior to application in accordance with the manufacturer's directions.

3.05 WORKMANSHIP

- A. Skilled craftsmen and experienced supervision shall be used on all work.

- B. All paint and coatings shall be applied in a workmanlike manner so as to produce an even film of specified uniform thickness. Edges, corners, crevices, and joints shall receive special attention to ensure that they have been thoroughly cleaned and that they receive an adequate thickness of paint. The finished surfaces shall be aesthetically pleasing `free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat of paint would not increase the hiding. All coats shall be applied so as to produce a film of uniform thickness.

Special attention shall be given to ensure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other approved precautionary measures.

3.06 PREPARATION FOR PAINTING AND PROTECTIVE COATING

- A. All surfaces to receive paint/coatings shall be cleaned as specified herein prior to application of coating materials. The Contractor shall examine all surfaces to be coated, and shall correct all surface defects before application of any paint/coating material. Beginning the work of this Section without reporting unsuitable conditions to the Engineer constitutes acceptance of conditions by the Contractor. Any required removal, repair, or replacement of this work caused by unsuitable conditions shall be done at no additional cost to the Owner. All marred or abraded spots on shop-primed and factory-finished surfaces shall receive touch-up restoration prior to any other coating application.
- B. Mildew shall be removed and neutralized by scrubbing affected areas thoroughly with a solution made by adding two (2) ounces of tri-sodium phosphate and eight (8) ounces of sodium hypochloride to one (1) gallon warm water. Use a scouring powder, if necessary, to remove mildew spores. Rinse with clean water and dry thoroughly before painting.

3.07 ITEMS NOT TO BE COATED

Hardware, aluminum, stainless steel, switch and receptacle plates, escutcheons, hardware accessories, name plate data tags, machined surfaces and similar items shall be removed or masked prior to surface preparation and painting operations. Following completion of coating of each piece, removed items shall be reinstalled. Such removal and installation shall be done by workmen skilled in the trades involved.

3.08 SANDBLASTING

- A. All sand and water blasting shall be done in strict accordance with the referenced specifications of the Steel Structures Painting Council and SSPC-SP 13/NACE No.6 with reference to ASTM 4258 and 4259.
- B. When items are to be shop primed or shop primed and finish coated in the shop, surface preparation shall be as specified in this Section. The Owner or his

representative shall have the right to witness, inspect, and reject any sandblasting done in the shop.

- C. When sand or water blasting is done in the field, care shall be taken to prevent damage to structures and equipment. Pumps, motors, and other equipment shall be shielded, covered, or otherwise protected to prevent the entrance of sand. No sandblasting may begin before the Engineer inspects and approves the protective measures.
- D. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning.

3.09 APPLICATION OF PROTECTIVE COATINGS

- A. Shop Coating. Fabricated metalwork and equipment which requires coating shall be shop primed with specified primer. Any such work delivered to the job site with any other shop coat shall either have this coating removed or shall be recoated with "universal-primer", and the specified coating applied in the field. Manufactured equipment with approved corrosion resistant factory finishes and galvanized finishes shall be exempt from this requirement.
- B. Field Coatings
 - 1. Except where in conflict with the manufacturer's printed instructions, or where otherwise specified herein, the Contractor may use brush, roller, air spray, or so-called airless spray application; however, any spray painting must first have the approval of the Engineer. Rollers for applying enamel shall have a short nap. Areas inaccessible to spray coating or rolling shall be coated by brushing or other suitable means.
 - 2. The Contractor shall give special attention to the work to ensure that edges, corners, crevices, welds, bolts, and other areas, as determined by the Engineer, receive a DFT at least equivalent to that of adjacent coated surfaces.
 - 3. All paint/coating materials shall be applied and surface shall be prepared in strict accordance with the manufacturer's printed instructions.
 - 4. Prime coat shall be applied to all clean surfaces within a four hour period of the cleaning, and prior to deterioration or oxidation of the surface, and in accordance with the manufacturer's recommendations. Drift from sand-blasting procedures shall not be allowed to settle on freshly painted surfaces.
 - 5. All coatings shall be applied in dry and dust-free environment. No coating/paint shall be applied when the surrounding air temperature, measured in the shade, is below 40 degrees Fahrenheit (F). No coating/paint shall be applied to wet or damp surfaces and shall not be applied in rain, fog or mist, or when the relative humidity exceeds 90 percent. No coating/paint shall be applied when it is expected that the relative humidity will exceed 90 percent or that the air temperature will drop below 40 degrees F within 8 hours after the application of

the coating/paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, coating or painting shall be delayed until mid-morning to be certain that the surfaces are dry. The day's coating/painting shall be completed well in advance of the probable time of day when condensation will occur, in order to permit the film sufficient drying time prior to the formation of moisture.

6. Each coat shall be aesthetically pleasing, applied evenly, at the proper consistency, and free of brush marks, sags, runs, and other evidence of poor workmanship. Care shall be exercised to avoid lapping paint on glass or hardware. All paint/coatings shall be sharply cut to lines. Finished coated surfaces shall be free from defects or blemishes. Protective coverings shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent paint/coatings from being spattered onto surfaces from which it cannot be removed satisfactorily. Surfaces from which paint cannot be removed satisfactorily shall be painted or repainted as required to produce a finish satisfactory to the Engineer. Whenever two (2) coats of a dark colored paint are specified, the first coat shall contain sufficient powdered aluminum to act as an indicator of proper coverage, or the two (2) coatings shall be of a contrasting color.
7. Touch-up of all surfaces to the satisfaction of the Engineer shall be performed after installation.
8. All surfaces to be coated shall be clean and dry at the time of application.

C. Time of Coating.

1. Sufficient time shall be allowed to elapse between successive coats to permit satisfactory recoating, but upon commencement the entire coating operation shall be completed without delay. No additional coating of any structure, equipment, or other items designated to be painted shall be undertaken without specified permission of the Engineer until the previous coating has been completed for the entire structure, piece of equipment, or other items.
2. Piping shall not be finish coated until it has been pressure tested and approved.

D. Thickness of Coating. The dry film mil-thickness (DFT) specified shall be achieved and verified for each coat.

E. Safety Color Coatings. Existing surfaces to remain which have been previously safety-color coated to identify a potential tripping or low head-room area shall be prepared and recoated with a similar safety color scheme unless directed otherwise by the Engineer.

Any newly constructed areas which will present a potential tripping or low head-room area shall be coated safety yellow in accordance with the appropriate coating system as directed by the Engineer.

3.10 TESTING AND INSPECTION

- A. Inspection Devices. The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for detection of holidays and measurement of DFT of coatings and paints. The Contractor shall also furnish U.S. department of Commerce, National Bureau of Standards certified thickness calibration plates to test accuracy of the DFT gauge and certified instrumentation to test the accuracy. DFT gauges shall be made available for the Engineer's use at all times until final acceptance of application.
- B. The Contractor shall conduct DFT measurements and electrical inspection of the coated surfaces with equipment furnished by him and shall recoat and repair as necessary for compliance with the Specifications.
- C. After repaired and recoated ferrous metals areas have cured, final inspection tests will be conducted by the Engineer with equipment provide by the Contractor. Coating thickness specified in mils on ferrous substrates will be measured with a nondestructive magnetic type DFT gauge such as the Elecometer, manufactured by Gardner Laboratories, Inc. Discontinuities, voids, and pinholes in the coatings will be determined with a nondestructive type electrical holiday detector. Epoxy coatings and other thin film coatings will be checked for discontinuities and voids with a low voltage detector of the wet-sponge type, such as Model M1 as manufactured by Tinker and Razor. Use a non-sudsing type wetting agent, such as Kodak Photo-Flo, which shall be added to the water prior to wetting the sponge. A high voltage, low current, spark type detector such as Model EP, manufactured by Tinker and Razor, will be used for electrical inspection of only coal tar enamel.

Tape type coatings will be inspected for holidays using a device designed for detecting such flaws. All pinholes shall be marked, repaired in accordance with the manufacture's printed recommendations and retested. No pinholes or other irregularities will be permitted. Film thickness discrepancies shall be measured and verified with a micrometer or other approved measuring instrument with 5 readings taken every 100 square feet of painted surface. Paint/coatings not in compliance with the Specifications will not be acceptable and shall be replaced and re-inspected at Contractor's expense until the Specifications are met.

- D. On non-ferrous surfaces, DFT readings shall be taken at random locations with a Tooke Gauge at the rate of approximately five readings per 100 square feet of surface. Grooves cut into coatings shall be repaired by application of all coats of paint or coating film being tested. The average of all readings for a given area or surface shall be within required DFT range and no individual reading shall be more than 20 percent below the recommended DFT. Any areas that are found to be below standard shall be marked and recoated to obtain proper DFT.

3.11 CLEAN-UP

Upon completion of the work, staging, scaffolding, containers and all other construction debris shall be removed from the site or destroyed in an approved manner. Paint spots, oil, or stains upon adjacent surfaces shall be removed.

3.12 PAINT AND COATING SCHEDULE

- A. General. The following schedule shall indicate the coating systems to be used and applies to all new and renovated facilities, unless otherwise specified. Color selection shall be as selected by the Owner. The list shall not be construed as a complete list of all surfaces to be coated but rather as a guide as to the application of the various coating systems. All surfaces shall be painted except those specifically excluded herein. Where reference is made to ferrous metal in this schedule, it shall not include stainless steel.
- B. Coating System Applications. **Table I** indicates the paint/coating system application to be used by Service Condition and general Item type including examples of typical material types, typical structures their appurtenances and the types of environments (corrosive, non-corrosive, etc.) that influence protection levels. For the painting/coating systems, "Piping" shall be defined as all pipes, valves, fittings, supports, and guides. Mechanical equipment shall include all motors, pumps and accessory equipment requiring a protective paint/coating.

**TABLE I
COATING SYSTEM SCHEDULE**

<u>Item</u>	<u>Service Condition</u>
Exposed ferrous metals in clarifiers and other corrosive environments	A
Exposed ferrous and galvanized metal Piping, equipment (interior and exterior), etc	B
Exterior exposed ferrous metal, Fire hydrants, valve box lids, meter box lids, bollard/guard posts, above ground meter, backflow assemblies, etc... not exposed to a corrosive atmosphere	C
Exposed plastic and FRP pipe, conduit, tank appurtenances, etc.	E
Exterior of concrete manholes, storm inlets, interior/exterior of reject pond intake structures, etc.	F
Exterior wall and dome surfaces of concrete tank, walls of similar use poured concrete structures, etc.	F
Interior of concrete sanitary manholes and similar system structures	G

Guard posts (bollards) and hydrants	B
Interior concrete and concrete block wall surfaces	FDB
Exterior new and existing stucco surfaces	FDB

END OF SECTION

**SECTION 15050
WATER PIPING – GENERAL**

PART 1 – GENERAL REQUIREMENTS

1.1 SUMMARY

The work covered by this section consists of providing all labor, equipment, material and supplies, and performing all operations required to install the various piping, valves, accessories, and fire hydrant assemblies for potable, reclaimed and raw water lines as specified and shown on the drawings. The work includes all testing and sampling in accordance with governing agencies.

1.2 REFERENCES

Specification Sections 02641 Pressure Pipe Cleaning and Pigging, 15056 Ductile Iron Pipe - Water, Section 01650 Disinfection, Section 01660 Piping & Equipment-General Field Testing and the CITY's Utility Department Standard Details, latest edition shall apply

1.3 SUBMITTALS:

- A. Shop drawings or catalog cuts shall be submitted for all miscellaneous structures, valves, boxes, and restrained joints.
- B. The manufacturer shall furnish a sworn affidavit that the pipe, fittings, and lining furnished under the Contract or Agreement comply with all applicable provisions of the ANSI and/or AWWA Standards.
- C. Reports on pressure and leakage tests shall be submitted in duplicate by the CONTRACTOR.

1.4 JOB CONDITIONS:

Interruptions to water service shall be minimized. The CONTRACTOR shall submit plans and schedules to the CITY for approval before any interruption in service takes place.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3– EXECUTION

3.1 INSTALLATION:

- A. Pipe and fittings shall be strung out along the route of construction with the spigots pointing in the direction of the flow. Pipe shall be placed where it will cause least interference with traffic. Before the pipe is lowered into the trench, it shall be swabbed or brushed out to insure that no dirt or foreign material gets into the finished line. Trench waters shall be kept out of the pipe and the pipe kept closed by means of a test plug whenever work is not in progress. The CONTRACTOR shall provide the means for dewatering the trench and the cost thereof shall be included in the price for installing the pipe.
- B. Installation of the pipe shall be commenced immediately after the excavation is started. Every means must be used to keep pipe laying closely behind the trenching. The CITY may stop trenching if in its opinion, the trench is open too far in advance of the pipe laying operation. Damaged or unsound pipe or fittings will be removed and replaced by the CONTRACTOR at no additional cost to the CITY. Water lines shall be restrained to prevent movement of lines under pressure. Restraints shall be furnished by the CONTRACTOR. For ductile iron pipe, restrained joints shall be installed at all bends, tees, crosses, wyes, plugs, and reducers as shown in standard details of the drawings.
- C. Where there is no adequate natural foundation upon which to construct a pipe bed, the pipe shall be constructed on a prepared stabilized sub-grade or rock bedding of Class I materials as defined in ASTM D2321. Unsuitable sub-grade materials shall be replaced or stabilized as described in Section 02202.
- D. Where water mains are stubbed out with a reducer and valve, the stub-outs shall have restrained joints as indicated in the restraining schedule on the standard detail sheet.
- E. All joints and service connections shall be watertight and any leaks or defects discovered shall be immediately repaired to the satisfaction of the CITY. Any pipe which has been disturbed after being laid shall be taken up, the joints cleaned and the pipes properly re-laid. Installation of fittings and pipe joints shall be in strict accordance with the manufacturer's recommendations.

3.2 LOCATOR TAPE

A three inch wide metalized locator tape shall be used for all water mains installed. The locator tape shall be non-corrodible consisting of polyethylene film with a metallic film and shall be continuously marked to identify the referenced pipeline. The tape shall be installed eighteen inches directly above the pipe. In addition a #12 gage insulated UF single strand copper locator's wire shall

be wound continuously around all non-metallic pipe from valve box to valve box terminated in accordance with the CITY's standard detail.

3.3 WATER AND SEWER MAIN CROSSING:

Where water and sewer mains cross, the water main shall be installed with at least 18 inches vertical clearance or encase sewer main in concrete 10 feet each side of the water main. The cost of extra depth excavation or encasement is to be included in the cost of furnishing and installing the pipe.

3.4 HIGHWAY CROSSINGS:

All pipe under State and County highways shall be installed in accordance with the requirements of the permits issued by the respective agency.

3.5 CUT-IN CONNECTION TO EXISTING MAINS:

Where cut-in connections are required between new work and existing water mains, the cut-in connections shall be made by the CONTRACTOR. Proper specials and fittings to suit the actual conditions shall be furnished by the CONTRACTOR. The CONTRACTOR shall schedule his work so that digging and locating the existing line can be completed prior to starting trench work on the line. The CONTRACTOR shall verify the dimensions of all pipes before ordering special fittings and couplings.

3.6 OTHER UTILITIES:

The CONTRACTOR shall contact all utilities, private and public, a minimum of one (1) week prior to beginning construction so these utilities can be properly located.

3.7 PIPE CLEANING:

A. Cleaning of lines less than 6 inches inside diameter shall be accomplished by thorough flushing of the line using a CITY approved water source. Cleaning of lines 6 inches inside diameter or greater shall be accomplished using a flexible polyurethane foam pipeline cleaner, commonly known as a "pig", manufactured for cleaning pressure lines. The pig shall be new and have a turning pattern, for use in water systems. It shall have a resilient peripheral surface that engages with the inner cylindrical wall of the pipe to maintain a sliding seal. The pig may have one or more sealing surfaces. This seal is maintained for propelling and must be abrasive resistant.

B. When necessary, the pig shall also have abilities to scratch, scrape, plow and jet to assist in cleaning and flushing the pipe of debris. The pig shall rotate for longer wear and be able to reduce itself to a minimum of 65% of its original

cross-sectional area. It must then be able to return to its original form while maintaining its seal and ability to clean.

- C. The pig shall have the ability to negotiate- fabricated mitered bends, short radius bends, short radius elbows, tees, crosses, and multi-dimensional pipe sizes and valves.
- D. Follow manufacturer's recommendations for use of "pig" in cleaning the line and conduct cleaning with CITY's representative in attendance. After passing through the pipeline the CITYs shall determine if subsequent pigging must be performed.

3.8 WATER MAIN TESTS:

The CONTRACTOR shall furnish and install suitable temporary testing plugs, filling assemblies or caps for the pipe line, all necessary pressure pumps, hose, pipe connections, meters, gauges, and other similar equipment, and all labor required, all without additional compensation for conducting pressure and leakage tests, flushing and disinfections of the new water lines. All tests shall be coordinated in accordance with Section 01660 and shall be conducted with representatives of the CITY's Utilities Department in attendance. The CONTRACTOR is to coordinate the testing thru the CITY's Construction Representative. The CONTRACTOR shall de-chlorinate all water used for flushing and disinfection before discharge to the surrounding environment. The cost for de-chlorination shall be part of the testing work and included in the cost of the pipe installation.

3.9 PRESSURE TESTS:

Tests shall be made on the completed pipe installation. The test pressure shall be 150 psi maintained for a period of not less than four (4) hours Pressure shall not vary more than five pounds (5 lbs.). Allowable leakage shall be computed on the basis of AWWA Standard C600 latest edition.

END OF SECTION

**SECTION 15051
SANITARY PIPING GENERAL**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY:

- A. This Section sets forth the requirements for materials and performing all operations required to install the various piping systems for gravity sewers and force mains, as specified and shown on the drawings.

1.2 SUBMITTALS:

- A. Shop drawings shall be submitted for all pipe, valves, boxes, harnessing, manholes, frames and cover. The manufacturer shall furnish a certification that the pipe fittings and lining furnished under the Contract comply with all applicable provisions of the ANSI standards. Foundry reports may be required to confirm the quality of the products delivered.
- B. Product data include standard printed information on materials, products and systems, not custom-prepared for this project, other than the designation of selections from available choices.
- C. Samples include both fabricated and not fabricated physical examples of materials, products and work: both as complete units and as smaller portions of units of work, either for limited visual inspection or (where indicated) for more detailed testing and analysis.
- D. Miscellaneous submittals related directly to the work (non-administrative) include warranties, guarantees, maintenance agreements, workmanship bonds, project photographs/videos, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the work and not defined as shop drawings, product data or samples.

1.3 JOB CONDITIONS:

- A. All bidders shall evaluate the job site conditions before submitting a bid.

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

3.1 INSPECTION OF MATERIALS

- A. All materials shall be subject to inspection prior to delivery to the CITY. The CITY reserves the right to reject all materials not inspected prior to shipping and the CONTRACTOR shall immediately remove at no additional cost any materials that in the opinion of the CITY's Inspector do not meet typical standards. (For example if the pipe arriving is cracked, discolored, or appear used the CITY Inspector will refuse to allow the pipe to be unloaded at the job site unless there is proof that the pipe being delivered will not be used in the final project.) Special markings shall be plainly marked on the applicable pipe indicating the weight, proper location of the pipe or fittings in the line by reference to layout drawings and schedules, class of pipe, casting period, manufacturer's mark and year pipe was produced. No valve or other component that is otherwise new that is older than two years will be allowed to be part of the project.

3.2 CONSTRUCTION

- A. Excavation, trenching, and backfilling for the installation of underground piping systems shall be as specified in Section 02202. Laying of the pipe shall be commenced immediately after the excavation is started, an every means must be used to keep pipe laying closely behind the trenching. The CITY's project representative may order the trenching stopped when in this opinion the trench is open too far in advance of the pipe laying operation.
- B. The bottom of the sewer trench shall be shaped to give substantially uniform circumferential support to the lower one-third of each pipe. Where bell and spigot type pipe is used, holes shall be scooped out where the bells occur leaving the entire barrel of the pipe bearing on the pipe bed. Each pipe shall be inspected for defects prior to foreign material gets into the finished line. Water shall be kept out of the pipe and the pipe kept closed by means of a test plug whenever work is not in progress. Pipe shall be handled carefully to avoid breakage. Pipe may be laid in the best manner adapted to securing speed and good results. However, it shall be laid in accord with the manufacturer's instructions and recommendations. Pipe shall be laid with spigot ends pointing in the direction of flow. Installation of pipe and fittings, with factory made joints shall be accomplished in strict accord with the pipe manufacturer's recommendations and approval of the CITY. Pipe alignment shall conform to the standards for laying pipe as determined by the CITY's Inspector.
- C. All joints shall be watertight. Any leaks or defects discovered shall be immediately repaired. All cracked, broken and damaged piping shall be

removed and replaced. Any pipe which has been disturbed after being laid shall be taken up, the joints cleaned and the pipe properly replaced. Any superfluous material inside the pipe shall be flushed or removed by means of an approved follower, scraper or pigging device.

3.3 INSTALLATION CONDITIONS:

- A. Where it is necessary to cut the force main to place special castings, care must be taken not to crack the pipe and to cut straight and true around it. Force mains shall be restrained by restraining devices (thrust blocking is not permitted) to prevent movement of lines under pressure.
- B. Force main connections shall be constructed as shown on the detailed drawings or as is common practice should no detail be provided.
- C. Where there is no adequate natural foundation upon which to construct a pipe bed, the pipe shall be installed on a prepared stabilized sub-grade or rock bedding. Unsuitable sub-grade materials shall be removed and stabilizing materials shall be used. Gravel or graded lime rock may be used for pipe bedding where suitable material is not available. All stabilizing materials and work related to removing the unsuitable materials shall be provided at no additional cost to the CITY.
- D. Where a gravity sewer or force main crosses an existing or proposed water main the State of Florida Department of Environmental Protection requires 18-inch separation and for this reason the CONTRACTOR shall investigate well in advance of pipe or sewer construction to lower or raise the proposed piping to secure the 18-inch separation.
- E. Horizontal separation of force mains/gravity sewers from water mains is controlled by State of Florida Department of Environmental Protection but as a general rule the minimum desired separation is 10 feet but with approval of the CITY/ ENGINEER of Record may be reduced to the State standard.
- F. All pipe under State or County highways shall be installed in accordance with Requirements of these agencies at CITY direction whether or not they are made a part of this Specification.

3.4 BY PASS PUMPING

- A. **UNLESS THESE SPECIFICATIONS DEFINE SPECIAL ASSISTANCE BY THE CITY REGARDING REQUIRED BY PASS SEWAGE PUMPING, THE CONTRACTOR IS HEREBY ADVISED THAT ALL NECESSARY BY PASS PUMPING INCLUDING LABOR, MATERIALS AND ASSOCIATED COSTS IS THE FULL**

RESPONSIBILITY OF THE CONTRACTOR. THE ADVANCED APPROVAL BY CITY FOR ALL BYPASS PUMPING OPERATIONS IS REQUIRED. The approval of the by-passing system in advance by the CITY shall in no way relieve the CONTRACTOR of his full and complete responsibility. The pump and bypass lines shall be of adequate capacity to handle all flows.

END OF SECTION

**SECTION 15056
DUCTILE IRON PIPE- WATER**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets for the material and general requirements for ductile iron pipe in water systems.

1.2 SUBMITTALS

- A. The CONTRACTOR shall submit to the CITY each month a record of all ductile iron pipe installed including the manufacturer name and class rating. All ductile iron pipe used must be new and a purchase record may be required unless pipe is provided by CITY.
- B. A certified copy of the tests made by the manufacturer will be required.

1.3. JOB CONDITIONS

No Special Conditions Noted

PART 2 – PRODUCTS

(Not Applicable, General Conditions may apply)

PART 3 - EXECUTION

3.1 GENERAL

- A. Ductile iron pipe for water mains installed underground shall be manufactured in accord with ANSI/AWWA C151/1 21.51, the latest version thereof.
- B. Pipe shall be designed for thickness in accordance with ANSI/AWWA C 151/ A21.51, the latest version thereof subject to the following design criteria for both fittings and pipe: Pressure Class 350 for diameters less than 30” and Pressure Class 250 for 30” and greater diameters.
- C. The depth of cover for water mains shall be a minimum of 3 feet with no exceptions.

- D. Generally, joints for ductile iron pipe shall be push-on type designed in accordance with ANSI/AWWA C111/A 21.11, the latest version thereof.
- E. The manufacturer shall furnish adequate joint lubrication to ensure proper installation.
- F. At certain locations restrained joints such as Megalug™, Field Lok™, or Fast Grip™ or approved equal shall be used. Field Lok™ or Fast Grip™ restrained joint gaskets shall only be allowed within the limits of the restraint as indicated on the plans or as required for the length indicated in the restrained joint schedule on the detailed sheet. The length of restrained joint shall be adequate for the testing pressure and the conditions for the work area, even if this means extending the restrained joints beyond the chart value.
- G. Field Lok™ or Fast Grip™ restrained joint gaskets will not be allowed at the fitting itself, only Megalug™ or approved equal shall be used. Field Lok™ or Fast Grip™ restrained joint gaskets shall be UL FM approved, with a minimum pressure rating that matches or exceeds the pipe Pressure Class.
- H. At certain locations shown on the drawings, the joints shown on the drawings, the joints for the pipe connections shall be flanged. Flanged pipe shall conform to the requirements of ANSI/AWWA C115/A21.15, the latest version thereof.
- I. Gasket lubricant for push-on joints shall be labeled with the trade name and the pipe manufacturer's name. Fittings for ductile iron pipe shall be manufactured of ductile iron and shall conform to the requirements of ANSI/AWWA C153/A21.53, the latest version. Fittings shall be compatible with the pipe and designed the same Pressure Class rating as the pipe. The lining and coating of the fittings shall be as specified for the pipe. Joints for fittings 16" in nominal diameter and under shall be push-on type or mechanical joint, except above ground fittings as shown on the drawings, shall be flanged. All below ground mechanical joint connections shall be restrained type such as Megalug™ or approved equal. The interior of ductile iron pipe and fittings shall have cement lining and bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, the latest version thereof.

END OF SECTION

**SECTION 15058
DUCTILE IRON PIPE- SANITARY**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the material and ancillary item requirements for pipe, fitting & gasket work necessary to construct sanitary force mains.

1.2 REFERENCES

- A. The CITY Utilities Department Standard Details, latest edition and Sections 02616, 02641 and 15051.

1.3 SUBMITTALS

- A. The CONTRACTOR shall submit a record of all ductile iron pipe installed, including the manufacturer name and class rating, each month. A purchase record may be required.
- B. A maintenance of traffic plan is required a minimum of three weeks in advance of each requested road closure for City review and acceptance.
- C. A certified copy of the manufacturer's material quality and composition tests will be required.

1.4 SITE CONDITIONS

- A. Contractor shall visit and review the site prior to submitting the bid and incorporate the anticipated work condition needs in the bid.

I. PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ductile iron pipe for sewer mains installed underground shall be manufactured in accord with ANSI/AWWA C151/1 21.51, the latest version thereof. All ductile iron pipe used must be new.
- B. Pipe shall be designed for thickness in accordance with ANSI/AWWA C 151/ A21.51, the latest version thereof subject to the following design criteria for both fittings and pipe: Pressure Class 350 for pipes less than

- 30" in diameter and Pressure Class 250 for pipes 30" or greater in diameter.
- C. Generally, joints for ductile iron pipe shall be push-on type designed in accordance with ANSI/AWWA C111/A 21.11, the latest version thereof.
 - D. The manufacturer shall furnish adequate joint lubrication to ensure proper installation
 - E. At certain locations restrained joints such as Megalug™, Field Lok™, or Fast Grip™ or CITY acceptable equal shall be used. Field Lok™ or Fast Grip™ restrained joint gaskets shall only be allowed within the limits of the restraint as indicated on the plans or as required for the length indicated in the restrained joint schedule on the detailed sheet. The length of restrained joint shall be adequate for the testing pressure and the conditions for the work area, even if this means extending the restrained joints beyond the chart value.
 - F. Field Lok™ or Fast Grip™ restrained joint gaskets will not be allowed at the fitting itself, only Megalug™ or approved equal shall be used. Field Lok™ or Fast Grip™ restrained joint gaskets shall be UL FM approved, with a minimum working pressure that meets or exceeds the pipe Pressure Class.
 - G. At certain locations shown on the drawings, the joints shown on the drawings, the joints for the pipe connections shall be flanged. Flanged pipe shall conform to the requirements of ANSI/AWWA C115/A21.15, the latest version thereof.
 - H. Gasket lubricant for push-on joints shall be labeled with the trade name and the pipe manufacturer's name. Fittings for ductile iron pipe shall be manufactured of ductile iron compact fittings and shall conform to the requirements of ANSI/AWWA C153/A21.53, the latest version thereof. Fittings shall be compatible with the pipe and designed to meet or exceed the pipe Pressure Class. The lining and coating of the fittings shall be as specified for the pipe. Joints for fittings 16" in nominal diameter and under shall be push-on type or mechanical joint, except above ground fittings as shown on the drawings, shall be flanged. All below ground mechanical joint connections shall be restrained type such as megalug™ or approved equal.
 - I. The interior of ductile iron pipe and fittings shall have seal coat in accordance with ANSI/AWWA C104/A21.4, the latest version thereof. For ductile iron pipe used for Sanitary sewer mains a Fusion-Bonded Epoxy lining or approved equal shall be provided. (Fusion-Bonded Epoxy lining may be provided for fittings were noted) (Amine Cured Novalax Epoxy, i.e. Protecto 401™)

- J. Air Release Valves shall meet or exceed A.R.I models “D-020, D025, D-023, and S-20” Combination air Valve for sewage “SAAR” as approved by the City.

2.2 MANUFACTURERS

- A. Products shall be provided from manufacturers that utilize manufacturing processes that consistently produce pipe, fittings and appurtenances in compliance with national ANSI/AWWA quality standards and specifications.

PART 3– EXECUTION

3.1 QUALIFICATIONS OF INSTALLER

- B. Contractor and their subcontractors shall be experienced in all aspects of their assigned work and provide sufficient experienced personnel and appropriate equipment to perform quality work in a timely manner

3.2 INSTALLATION

- A. The depth of cover for sewer mains shall be a minimum of 4 feet or as directed in the construction plans.
- B. Resilient seat gate valves shall be installed on sanitary force mains unless otherwise noted in the contract Bid Documents. Tapping gate valves will be used at line taps.
- C. The CONTRACTOR shall install metallic locator tape 18 inches above the top of the installed pipe for the full length of the sewage force main. Tape shall be color coded green for all sanitary lines.
- D. Coordinate the co-location of CITY Information Technology PVC conduit with the sanitary main locations on the construction plans to minimize excavation and site disturbance.

END OF SECTION

**SECTION 15066
POLYVINYL CHLORIDE (PVC) PIPE AND CONDUIT**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

This Section sets forth the general requirements for PVC and FPVC pipe and pipe conduit work.

1.2 REFERENCES

The CITY's Utility Department Standard Details, latest edition and Section 16101 and C 900-97 and C 905 standards shall apply.

PART 2- PRODUCTS

1.4 PVC PIPE

- A. PVC gravity sanitary pipe shall be green SDR 26 ASTM, D-3034 where a minimum of 4 feet of cover is provided and the burial depth is less than 10 feet. For burial depths of 10 feet or greater C900/C905 DR-25 minimum Pressure Class 100 shall be used.
- B. PVC pressure potable water pipe shall be blue C900/C905 DR-18 pressure class 150. Reclaimed water pipe shall be purple C900/C905 DR-18 pressure class 150. All joints shall meet or exceed the Pressure Class of the pipe.
- C. At the City's discretion pressure class upgrades for pipe used in potable and reuse water distribution systems with multiple turns will be required at no additional cost to the City to meet the C900-97 burst protection standards if using pipe rated under the C900-07 standards.
- D. The joints for gravity sewer pipe and fittings shall be a rubber gasketed compression type designed to prevent infiltration. Joint lubrication shall be as furnished by the manufacturer
- E. Fittings and pipe shall be best quality meeting AWWA and ASTM recommended material, performance and manufacturing specifications. Wall thickness must meet established standard. Plugs

for use at the end of service pipe shall be PVC. Fittings shall meet or exceed the Pressure Class of the pipe.

- F. Fusible PVC (FPVC) manufactured by Underground Solutions, Inc. using all virgin resin used in water main or sanitary force main Horizontal Directional Drilling (HDD) applications shall have a minimum working pressure of 160 PSI unless otherwise specified.
- G. PVC pipe used for conduit as the protective conveyance for fiber-optic lines, water services under pavement and wiring shall be Schedule 40 with a minimum of 36 inches of stable cover. Schedule 80 shall be used for HDD applications. The CONTRACTOR shall use the jointing system and pipe material recommended and warranted by the manufacturer for HDD applications unless otherwise directed.
- H. An easily accessible mule or pull tape with a minimum pull strength of 1250 pounds shall be installed in all empty conduits for post-construction use unless otherwise directed.
- I. Installed conduits shall have a smooth internal wall surface and be clean and free of sand and other debris that will interfere with their intended use.
- J. A #12 gage UF rated insulated single strand copper tracer wire shall be installed with and attached to buried non-metallic pipe and conduit in accordance with the Utility Department Standard Details. A 3" wide metallic tracer tape shall also be installed eighteen inches above and directly over all buried non-metallic pressure mains.

PART 3-EXECUTION

(Not applicable, General Conditions may apply)

END OF SECTION

**SECTION 15067
RECLAIMED WATER PIPE**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

This Section sets forth the requirements for materials and operations required to install the various piping for reclaimed water systems as specified and shown on the drawings. The work includes all testing and sampling in accordance with governing agencies.

1.2 REFERENCES

The requirements of the City's Utilities Department Standard Details, latest edition, Specification Section 02641 Pressure Pipe Cleaning and Pigging and Specifications Section 15110 Valves and Accessories – Reclaimed Water shall apply.

1.3 SUBMITTALS

- A. Submit shop drawing for all materials including pipe, valves and restraining devices. Shop drawings include custom-prepared data of all forms including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns reports, calculations, instructions, measurements and similar information not in standard printed form applicable to other projects.
- B. Product data include standard printed information on materials, products and systems, not custom-prepared for this project, other than the designation of selections from available choices.
- C. Samples include both fabricated and not fabricated physical examples of materials, products and work: both as complete units and as smaller portions of units of work, either for limited visual inspection or (where indicated) for more detailed testing and analysis.
- D. Miscellaneous submittals related directly to the work (non-administrative) include warranties, guarantees, maintenance agreements, workmanship bonds, project photographs/videos, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards,

record drawings, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the work and not defined as shop drawings, product data or samples

PART 2 – PRODUCTS

2.1 RECLAIMED WATER PIPE

- A. Polyvinyl Chloride (PVC) pipe shall conform to the requirements of AWWA C900 or C905 pressure Class 150 (DR-18) pipe with ductile iron pipe equivalent outside diameter so connection to ductile iron pipe can occur without special adapters. Ductile Iron Pipe (DIP) less than 30' in diameter shall be Pressure Class 350 and 30" or greater shall be Pressure Class 250 standard cement-lined with manufacturer applied purple outside finish coating. All pipe shall use a restrained joint method such as megalugs, boltless restraints or gripper gaskets in compliance with Ductile Iron Pipe Research Association (DIPRA) guidelines. Couplings and gaskets shall be furnished with the pipe. Gaskets shall conform to ASTM 03239. Nontoxic gasket lubricant as specified by the pipe manufacturer shall be provided. Joints on all pipe materials shall meet or exceed the Pressure Class of the pipe.
- B. A purple coloring agent shall be added to the PVC piping during the manufacturing process. The color of the pipe shall be protected during the project work.

2.2 LOCATOR TAPE AND WIRE

A three inch Metalized locator tape and # 12 gage insulated UF copper locator wire shall be used for all pipe installed. The locator tape shall be non-corrodible consisting of polyethylene film with a metallic film to allow detection by electronic means and shall be continuously marked to identify the use of the pipeline. The tape shall be installed eighteen inches directly above the top of the pipe. The locate wire shall be wound around the pipe terminating at each valve box in accordance with the CITY's standard detail.

2.3 FITTINGS

Fittings shall be ductile-iron conforming to the requirements of ANSI/AWWA C153/A21.53. Fittings shall meet or exceed the Pressure Class of the pipe.

PART 3– EXECUTION

3.1 INSTALLATION:

Pipe and fittings shall be strung out along the route of construction with the spigots pointing in the direction of the flow. Pipe shall be placed where it will cause least interference with traffic. Before the pipe is lowered into the trench, it shall be swabbed or brushed out to insure that no dirt or foreign material gets into the finished line. Trench waters shall be kept out of the pipe and the pipe kept closed by means of a test plug whenever work is not in progress. The CONTRACTOR shall provide the means for dewatering the trench and the cost thereof shall be included in the price for installing the pipe.

3.2 ROADWAY CROSSINGS:

All work within County and State rights of way shall be performed in accordance with the permitted requirements of the owning agency as directed by CITY.

3.3 CUT-IN CONNECTION TO EXISTING MAINS:

Where cut-in connections are required between new work and existing mains, the cut-in connections shall be made by the CONTRACTOR. Proper specials and fittings to suit the actual conditions shall be furnished by the CONTRACTOR. The CONTRACTOR shall schedule his work so that digging and locating the existing line can be completed prior to starting trench work on the line. Cut-ins into lines shall be done by the CONTRACTOR. The CONTRACTOR shall verify the dimensions of all pipes before ordering special fittings and couplings.

3.4 OTHER UTILITIES:

The CONTRACTOR shall contact all utilities, private and public, a minimum of forty-eight (48) hours prior to beginning construction so these utilities can be properly located on site.

3.5 RECLAIMED WATER MAIN TESTS:

The CONTRACTOR shall furnish and install suitable temporary testing plugs or caps for the pipe line, all necessary pressure pumps, hose, pipe connections, meters, gauges, and other similar equipment, and all labor required, all without additional compensation for conducting pressure and

leakage tests All tests to be conducted with the CITY in attendance. The CONTRACTOR is to coordinate the testing through the CITY.

3.7 PRESSURE TESTS:

Tests shall be made on the completed pipe installation. The test pressure shall be 150 psi maintained for a period of not less than 4 (4) hours Pressure shall not vary more than five pounds (5 lbs.). Allowable leakage shall be computed on the basis of AWWA Standard C600 latest edition.

3.8 RESTRAINED JOINTS

Restrained joints for use with PVC pipe shall consist of retainer glands fabricated of ductile-iron conforming to ASTM A536. The gland shall be such that it can replace the standardized mechanical joint gland and can be used with the standardized mechanical joint bell conforming to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21-53/C153. The retainer glands shall have a pressure rating equal to or greater than that of the PVC pipe on which it is used.

END OF SECTION

SECTION 15100
VALVES AND ACCESSORIES – POTABLE WATER

PART I – GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the requirements for materials and operations necessary to provide and install valves, taps, and various accessories. This Section will apply for the additional materials the CONTRACTOR is required to provide and install above and beyond materials provided by the CITY.

1.2 REFERENCES

- A. The CITY's Utilities Department Standard Details, latest edition and Section 02616.

PART 2 – PRODUCTS

2.1 GATE VALVES

- A. Gate valves 20" and less in diameter shall be ductile iron body resilient seated gate valve, fusion bonded on the interior and exterior of the valve in accordance with AWWA C509-87, 0-ring type with non-rising stem, and opening counterclockwise. Valves shall be manufactured in accordance with AWWA C-509-87 for NRS valves and designed for 250 psi working pressure. Valves for buried services shall have mechanical joint ends and operation nut in accord with AWWA C509. One socket valve wrench shall be provided with extension as required. Valves for above ground shall be American Standard flanged, with wheel operator. The provided valves shall be manufactured in the United States and be acceptable to the CITY.
- B. Gate valves 20" in diameter and larger shall be cast iron bodies, bronze mounted, double discs, 0-ring type with non-rising stem and opening counterclockwise. Valves shall be manufactured in accordance with AWWA C500-71 for NRS valves and designed for 150 psi working pressure. Valves for buried service shall have mechanical joints ends and operating nut in accord with AWWA C500. One socket valve wrench shall be provided with extension as required. Valves for above ground shall be American Standard flanged, with wheel operator.

2.2 VALVE BOXES

- A.** Valve boxes shall be provided for all buried valves. Valve boxes shall consist of cast iron base and adjustable top section with cover that shall be marked "Water". Extensions shall be provided as required to meet grade.

2.3 AIR RELEASE AND/OR COMBINATION VALVE ASSEMBLY

- A.** An air release valve assembly shall be furnished and installed on the water main as shown on the drawings. Air release valve assembly shall consist of a combination short body, air release vacuum breaker valve, installed in a manhole or vault with vented manhole cover, gate valve, fittings, tapping saddle and connecting piping to the main. The combination assembly will include air intake valving.
- B.** Air release or combination valves shall be 1" for 16" diameter pipe and smaller and 2" for 18" diameter and above pipe and shall be the automatic type installed in a concrete box or vault as shown on the drawing. Box and lid shall be sized to totally enclose the valve. Pipe, fittings, and valves for the assembly shall be as specified. A corporation stop shall be tapped into the main using the procedures as recommended by the pipe Manufacturer. The corporation stop shall be manufactured by Mueller, Hays, or CITY accepted equal. The valve shall be manufactured by Multiplex Manufacturing Company, A.R.I, Valve and Primer Corporation, or CITY accepted equal.

2.4 HOSE BIBB WITH VACUUM BREAKER:

- A.** Hose bibbs shall be Woodford Model Y24, Mueller, Crane, or CITY accepted equal, with inside I.P. thread and wheel handle. A vacuum breaker shall be installed on all hose bibbs. Hose bibb vacuum breaker shall be Woodford Model Nidel NH, Watts No. NFI, A. W. Cash type VB or CITY accepted equal.

2.5 SETTING VALVES AND BOXES:

- A.** Valves and valve boxes as specified in the preceding paragraphs shall be installed where shown on the drawings unless: otherwise directed. Valves shall be set plumb with the base of the valve box centered over the valve and resting on compacted backfill. The top section of the box shall be set to allow equal movement above and below finished grade. After being correctly positioned, fill shall be carefully tamped around the valve box for a distance of 4' on all sides of the box. In paved areas, top of the cover shall be flush with the finished paving. In off-street areas, the cover shall be set 1" above existing grade unless otherwise directed by the CITY

and a concrete pad shall be poured around the top of the box as shown in the standard details.

2.6 TAPPING SLEEVE AND TAPPING VALVE:

- A.** The tapping sleeve and valve shall be designed for making a wet tap on an existing water main. The tapping sleeve and valve shall be made of high quality ductile iron conforming to the material specifications of ANSI/AWWA C110/A21.10. The tapping sleeve shall be equipped with a molded rubber gasket to completely encircle the tapped opening thereby insuring a complete watertight connection. It shall be designed to withstand a working pressure of at least 200 psi. The outlet change of the tapping sleeve and valve shall be Class 125 (A.S.A.B16.1-1960). The tapping sleeve and valve shall be hot dipped Galvanized after fabrication. All internal threads shall be tapped or re-tapped after galvanizing. The tapping sleeve and valve shall include all necessary bolts, nuts and gaskets. The tapping sleeve shall be a mechanical joint type with a flanged outlet such as manufactured by MUELLER, American-Darling, or CITY accepted equal. The tapping valve shall be a resilient seat gate valve such manufactured by MUELLER, American-Darling, U.S. Pipe Metro Seal or CITY accepted equal.

PART 3– EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

**SECTION 15101
VALVES AND ACCESSORIES - SANITARY**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets for the requirements for valves and accessories to be installed as part of the project sanitary system work.

1.2 REFERENCES

- A. The CITY's Utilities Department Standard Details, latest addition and Section 02616

PART 2 – PRODUCTS

2.1 CHECK VALVES

- A. Check valves 3” and larger shall be of the iron body bronze mounted, full opening type with outside levers and weights. Check valves smaller than 3” shall be all bronze, screwed valves suitable for the service.

2.2 AIR RELEASE AND/OR COMBINATION VALVE ASSEMBLY

- A. An air release valve assembly shall be furnished and installed on the force main as shown on the drawings. Air release valve assembly shall consist of a combination short body, air release vacuum breaker valves, installed in a manhole with vented manhole cover, gate valve, fittings, tapping saddle and connecting piping to the main. Combination valves shall include air intake valving.
- B. The valve shall automatically function to release to atmosphere both large and small amounts of air that accumulate in the pipeline. Once the air has been exhausted, both valves shall seal tightly to prevent water leakage. The valve shall also function to admit air into a line, tank, or chamber under emergency conditions or when it is being drained. The valve body and cover shall be of semi-steel, stainless steel or reinforced nylon with resilient seats, rubber covered floats and no levers. Valves shall be corrosion resistant and suitable for sewage force main application. Valve shall be as manufactured by A.R.I model D-025, Val-Matic, model 48/301, Golden-Anderson or approved equal. Each valve shall have a backwash accessory.

2.3 PLUG VALVES

- A. Plug valves shall be suitable for sewage flows and for buried, submerged or above grade service. Plug valves shall be manually actuated straight way valves of the non-lubricated, eccentric type with resilient faced plugs, mechanical joint ends for buried service and flanged for lift station. Plug valves shall be full bore for valves through 20”.
- B. Valve bodies shall be semi-steel or cast iron with raised seats. The face of the seats shall be corrosion resistant nickel or epoxy coated. Upper and lower plug stem bushings shall be of stainless steel or isolated with O-rings and permanently lubricated. Valves shall be of the bolted bonnet design. Packing and valves shall be O-ring or adjustable type. Valves and actuator for submerged service shall have seals on all shafts, and gaskets on valve submersed service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, strings and washers for submerged valves shall be zinc plated or stained steel.
- C. Plug valve pressure ratings: Sizes through 12” 175 psi.
- D. Valves shall be capable of drip-tight shutoff up to the full valve rating with pressure in either direction.
- E. Buried valves shall have an AWWA, 2’ square actuating nut. One T-handle wrench shall be furnished. Manual valves for the lift station shall have lever actuators up to 10” in size. Valves 10” and larger shall have gear actuators. Plug valves in the vertical riser on the discharge side of the pump shall have chain wheel operators. All gearing shall be enclosed in semi-steel housing and be suitable for running in a lubricant with direct and waterproof Seals provided on shafts. Actuator shafts shall be supported by permanently lubricated bronze bearings. Plug valves shall be manufactured by Dezurik or Homestead or equal.

2.4 GATE VALVES

- A. Gate valves shall be resilient seated wedge type with ductile iron bodies conforming to ASTM A-536. The gate and rubber coat shall conform to ASTM D429. The Interior and exterior surfaces shall be

epoxy coated in accordance with ANSI/AWWA C550. Valves shall be manufactured to meet or exceed the requirements of ANSI/AWWA C509 & C-500 O-ring type with non-rising stem, and opening counterclockwise. Valves greater than 16" shall have a three inch (3") bypass with valve. Valves 3' thru 20" in diameter shall be manufactured and designed for 250 psi working pressure. Valves greater than 20" in diameter shall be bronze mounted double disc type designed and manufactured for 150 psi working pressure. Valves 24" or greater in diameter shall be equipped with gearing. Valves for buried laterals shall have mechanical joint ends and operation nut in accord with AWWA C509. One socket valve wrench shall be provided with extension as required. Valves for above ground shall be American Standard flanged, with wheel operator. The provided valves shall be manufactured by Clow, Mueller, Dresser (M&H) or approved equal that is acceptable to the CITY.

2.5 VALVE BOXES

Valve boxes shall be provided for all buried valves. Valve boxes shall consist of cast iron base and adjustable top section with cover that shall be marked "Sewer". Extensions shall be provided as required to meet grade.

PART 3- EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

**SECTION 15109
FIRE HYDRANT ASSEMBLIES**

PART 1 – GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section sets forth the general requirements for the products and work to construct fire hydrant assemblies. All material and work will be responsibility of the CONTRACTOR unless otherwise noted in the contract Bid Documents.

1.2 REFERENCE

- A. The CITY's Utilities Department Standard Details, latest edition and Section 15100.

PART 2 – PRODUCTS

2.1 FIRE HYDRANT ASSEMBLIES

- A. A fire hydrant assembly shall consist of a fire hydrant, the ductile iron pipe connecting the hydrant to the water main, the gate valve and box between the hydrant and the water main, accessories, gravel and pipe joint restraints.
- B. Fire hydrants shall be of the breakaway traffic type construction with a 6" pipe connection, 5¼" valve opening, two 2½" and one 4½" steamer connections. Hydrants shall be designed for 150 psi testing pressure and shall conform to AWWA specification C502-73. All working parts shall be bronze. All hose threads shall be National Standard threads. The 2½" outlets shall be V-threads, 7½" threads per inch and 3 1/6" outside diameter of the male thread. The 4½" steamer nozzle shall have four threads per inch and 5¾" outside diameter of the male threads. Fire hydrants shall be self draining. Design material and workmanship shall be of the latest stock pattern ordinarily produced by the Manufacturer.
- C. **Hydrants shall be silver from the manufacturer and only be painted by CITY personnel after CITY accepts ownership. The CITY personnel will assign an ID number and record data on each hydrant for CITY records. No old fire hydrants will be accepted. Hydrant shall be Mueller Centurian A 423, Kennedy K81 Guardian or American Darling model B84B.**
- D. Fire Hydrants shall be provided with a special lubricant sealed bonnet assembly to assure lubrication of operating parts and to seal operating thread from water when the hydrant is open.

PART 3– EXECUTION

3.1 SETTING VALVES AND BOXES

- A. This work and the product requirements shall be in accordance with the referenced Section 15100 and CITY Utilities Department Standard Details, latest edition.

3.2 SETTING HYDRANTS

- A. Fire hydrants shall be connected to the mains with mechanical joints, ductile iron pipe, and a gate valve, all part of the assembly. Provide Mega-Lug pipe restraint for mechanical joints from connection at water main to fire hydrant. No thrust blocks allowed. After connections are made, the hydrant shall be at such elevation that the connection pipe and the distribution main shall have the same depth of cover . All backfill around the hydrant shall be thoroughly compacted to the surface of the ground. Before installing any hydrant or valve, care shall be taken to see that all foreign material is removed from the interior of the barrel. Stuffing boxes shall be tightened and the hydrant or valve opened and closed to see that all parts are in working condition. Install fire hydrants 18”-21” from the centerline of the fire hose connection to finish grade (bury line on the fire hydrant).

END OF SECTION

**SECTION 15110
VALVES AND ACCESSORIES – RECLAIMED WATER**

PART I – GENERAL REQUIREMENTS

1.1 SUMMARY

This Section sets forth the requirements for materials and operations necessary to provide and install valves, taps, and various accessories. This Section will apply for the additional materials the CONTRACTOR is required to provide and install above and beyond materials provided by the CITY.

1.2 REFERENCES

The CITY's Utility Department Standard Details, latest edition and Sections 15100 and 02616.

PART 2 – PRODUCTS

2.1 GATE VALVES

- A. Gate valves 20" and less in diameter shall be ductile iron body resilient seated gate valve, fusion bonded on the interior and exterior of the valve in accordance with AWWA C509-87, O-ring type with non-rising stem, and opening counterclockwise. Valves shall be manufactured in accordance with AWWA C-509-87 for NRS valves and designed for 250 psi working pressure. Valves for buried services shall have mechanical joint ends and operation nut in accord with AWWA C509. One socket valve wrench shall be provided with extension as required. Valves for above ground shall be American Standard flanged, with wheel operator. The provided valves shall be manufactured in the United States and be acceptable to the CITY.
- B. Gate valves 20" in diameter and larger shall be cast iron bodies, bronze mounted, double discs, O-ring type with non-rising stem and opening counterclockwise. Valves shall be manufactured in accordance with AWWA C500-71 for NRS valves and designed for 150 psi working pressure. Valves for buried service shall have mechanical joints ends and operating nut in accord with AWWA C500. One socket valve wrench shall be provided with extension as required. Valves for above ground shall be American Standard flanged, with wheel operator.

2.1 VALVE BOXES

Valve boxes shall be provided for all buried valves. Valve boxes shall consist of cast iron base and adjustable top section with cover that shall be marked "Reclaimed Water". Extensions shall be provided as required to meet grade.

2.3 AIR RELEASE AND/OR COMBINATION VALVE ASSEMBLY

- A.** An air release valve assembly shall be furnished and installed on the water main as shown on the drawings. Air release valve assembly shall consist of a combination short body, air release vacuum breaker valve, installed in a manhole or vault with vented manhole cover, gate valve, fittings, tapping saddle and connecting piping to the main. The combination valve will include air intake valving.

- B.** Air release and or combination valves shall be 1" for 16" diameter pipe and smaller and 2" for 18" diameter and above pipe and shall be the automatic type installed in a concrete manhole or vault as shown on the drawing sized to totally enclose the valve. Pipe, fittings, and valves for the assembly shall be as specified. A corporation stop shall be tapped into the main using the procedures as recommended by the iron pipe Manufacturer. The corporation stop shall be Mueller H-10045, or Hays 5284, or equal. The valve shall be Type N, Crispin, as manufactured by Multiplex Manufacturing Company, or Model 200 APCO, as manufactured by Valve and Primer Corporation, or equal.

2.4 HOSE BIBB WITH VACUUM BREAKER

Hose bibbs shall be Woodford Model Y24, Mueller, Crane, or approved equal, with inside I.P. thread and wheel handle. A vacuum breaker shall be installed on all hose bibbs. Hose bibb vacuum breaker shall be Woodford Model Nidel NH, Watts No. NFI, A.W. Cash type VB or approved equal.

2.5 SETTING VALVES AND BOXES

Valves and valve boxes as specified in the preceding paragraphs shall be installed where shown on the drawings unless: otherwise directed. Valves shall be set plumb with the base of the valve box centered over the valve and resting on compacted backfill. The top section of the box shall be set to allow equal movement above and below finished grade. After being correctly positioned, fill shall be carefully tamped around the valve box for a distance of 4' on all sides of the box. In paved areas, top of the cover shall be flush with the finished paving. In off-street areas, the cover shall be set 1" above existing grade unless otherwise directed by the CITY/ ENGINEER and a concrete pad shall be poured around the top of the box as shown in the standard details.

2.6 TAPPING SLEEVE AND TAPPING VALVE

The tapping sleeve and valve shall be designed for making a wet tap on an existing water main. The tapping sleeve and valve shall be made of high quality ductile iron conforming to the material specifications of ANSI/AWWA C110/A21.10. The tapping sleeve shall be equipped with a molded rubber gasket to completely encircle the tapped opening thereby insuring a complete watertight connection. It shall be designed to withstand a working pressure of at least. 200 psi. The outlet change of the tapping sleeve and valve shall be Class 125 (A.S.A.B16.1-1960). The tapping sleeve and valve shall be hot dipped Galvanized after fabrication. All internal threads shall be tapped or re-tapped after galvanizing. The tapping sleeve and valve shall include all necessary bolts, nuts and gaskets. The tapping sleeve shall be a mechanical joint type with a flanged outlet such as MUELLER Model H-615, American-Darling, or approved equal. The tapping valve shall be a resilient seat gate valve, such as MUELLER Model H-665, American-Darling model 565, U.S. Pipe Metro Seal model 505860 or approved equal.

PART 3- EXECUTION

(Not Applicable, General Conditions may apply)

END OF SECTION

**SECTION 16101
ELECTRICAL AND FIBER-OPTIC CONDUIT**

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. This Section set forth the requirements for materials and operations necessary for the installation of steel and PVC electrical and fiber-optic carrier conduit.

1.2 REFERENCES

- A. CITY Utilities Department Standard Details latest edition, Section 01300, Section 15066 and:
1. American National Standards Institute (ANSI)
 2. National Electrical Manufacturers Association (NEMA)
 3. Underwriters' Laboratories (UL)
 4. Insulated Cable Engineers Association (ICEA)
 5. Institute of Electrical and Electronics Engineers (IEEE)

1.3 SUBMITTALS

- A. Submit shop drawings on all specified equipment and include at minimum sufficient information to indicate complete compliance with specifications. Such data shall include "cuts", catalog data sheets, drawings, and/or certifications as necessary. Submit additional information as directed by the CITY.

1.4 JOB CONDITIONS

- A. The CONTRACTOR shall visit the site prior to bidding and include all requirements dictated by site conditions in the Bid submittal

PART 2 – PRODUCTS

2.1 GENERAL

- A. All conduit shall be new.

2.2 RACEWAY SYSTEMS

- A. All conduit shall bear the UL label.
- B. Conduit sizes shown or called for are minimum requirements.
- C. Rigid steel conduits for installation in casing pipes, shall be mild steel galvanized inside and out with galvanized threads. Unless otherwise called for on the drawings, rigid galvanized steel conduit for direct burial shall be coated with an approved asphaltic paint. Where called for on the drawings, rigid galvanized steel conduit shall be of the 40 mil PVC bonded type with the bonded PVC jacket extending the full length of the pipe except the threads. Fittings for rigid steel conduit shall be threaded and galvanized malleable iron.
- D. Outlet bodies for rigid steel conduit shall be threaded and galvanized malleable iron.
- E. Rigid steel conduit sleeves, for 40 mil PVC bonded conduit shall have a 40 mil PVC bonded coating.
- F. For buried conduit Schedule 40 PVC conduit shall be used. PVC conduit shall be Schedule 40 PVC conduit manufactured from ASTM D 1784 PVC in compliance with NEMA TC-2. PVC conduit shall be UL listed. Joints shall be solvent cement type.
- G. Provide PVC long sweep elbows, bends, fittings, and adaptors as required for a complete installation. Provide solvent cement as recommended by the conduit manufacturer.

PART 3 - EXECUTION

3.1 RACEWAY SYSTEMS

- A. Conduits: Verify conduit sizes with the dimensions of the particular wires and cables to be installed.
- B. Exposed conduits shall be neatly installed and painted the same color as the adjacent surfaces.
- C. Runs shall be parallel and, in general, perpendicular or parallel to walls, floors or principal structural elements.

- D. To prevent motion in any direction conduits shall be supported and secured by galvanized wall bracket, ceiling trapeze or pipe clamps approved by the Engineer. Perforated metal strap hangers and wire hangers are not acceptable.
- E. All job cut threads shall be given a coat of rust-resistant paint, zinc chromate, or equivalent. All threaded joints shall be made watertight with a waterproofing compound. Conduits that have been cut shall have burrs removed by reaming.
- F. At conduits connections to enclosures or boxes, install locknuts inside and outside of the enclosure or box on all conduits. Install insulating bushings on all conduits.
- G. Liquid tight flexible metallic conduit shall be installed in such a manner that liquids tend to run off the surface and not drain toward the fittings. Sufficient slack shall be provided to reduce the effects of vibration. Where the fittings are brought into an enclosure with a knock-out, a gasket assembly consisting of an "O" rings and retainer, shall be provided on the outside.
- H. Set-screw conduit connectors and running thread couplings shall not be used. Conduit and equipment connected by conduit shall be so installed as to provide proper continuous grounding bonds, using bonding jumpers where required.
- I. Make joints in PVC conduit in compliance with the manufacturers instructions. Make all bends by means of an electrical heating unit approved by the conduit manufacturer where standard elbows and fittings cannot be used.
- J. Conduit ends shall be capped or plugged as soon as possible after installation.
- K. Separation of conduit from other pipes; Do not run conduit directly under cold water lines and separate from same in other directions by at least 3-inches or as shown on the drawings.
- L. Termination of empty conduit; Terminate empty conduits with smooth insulating bushings and/or cap.

- M. Installation and drawings: Follow the layout shown on the drawings. This layout is, however, diagrammatic only and where changes are necessary due to structural conditions, interference with other apparatus or other causes, make such changes without additional cost to the Owner. Install offsets in conduits as required by the conditions.
- N. Backfill for buried Conduit: When trenching and backfilling for conduit under proposed or existing pavement, the pavement replacement and backfill compaction shall be in accordance with Section 02202 and the CITY Utilities Department Standard Details, latest edition.

END OF SECTION