

**ST. JOHNS COUNTY UTILITY DEPARTMENT
WATER, WASTEWATER, AND RECLAIMED WATER
STANDARDS MANUAL**



JANUARY 2023

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SUMMARY OF CHANGES

Part II – Design Standards

1. Section 1.4.2.9.D.1.g. - Capped, lateral stub-outs with marker balls are installed, initially, and clean-outs are added by the home builder.
2. Section 1.4.3.11.L. - Utilities shall not be dedicated to SJC until Final as-built drawings are submitted.
3. Section 2.2.6 – The Hazen-Williams “C” Factor for all pipe materials shall be 120.
4. Section 2.13.5 – Manholes which must be lined may be constructed of alternative materials.
5. Section 2.16.3 – Wetwells for flows greater than 100 and equal to or less than 1,000 gpm shall be a minimum of 8’ in diameter.
6. Section 2.16.5 – Requirements for “Small Pump Stations”.
7. Section 2.17.1.C – Pump station panels shall be at least 6” above the 100-year flood elevation.
8. Section 2.17.1.E – Maximum velocity through pump station piping and discharge forcemain.
9. Section 2.17.4.B. – At pump stations in reuse areas, reclaimed water AND potable water static pressure monitoring are required.
10. Section 2.18.A.1. – Approved pumps are found in the Approved Materials Checklist.
11. Section 2.18.11 – Paint type and color for ferrous metals is specified.
12. Section 2.24 – A reclaimed water control valve (Detail R-3) to be installed where shown on the approved drawings.

Part III – Construction Specifications

1. Section 3.14.3.E.4 – The invert of laterals shall be above the centerline or springline of the main sewer. The EOR shall review the gravity sewer video prior to SJCUD submission and stamp the report “APPROVED”, “APPROVED AS NOTED”, or “REJECTED”.
2. Section 3.15.2.A.7 – Angle limits on influent pipes.
3. Section 3.15.3.C. – A ten (10) year non-pro-rated warranty shall be provided for each structure liner.
4. Section 3.15.4 – As an option, a polymer concrete manhole may be installed at a pump station.
5. Section 3.16.2.C. -

Part IV – Approved Materials

1. Submersible Pump – Grundfos and Sulzer – Added two manufacturers.
2. Structure coating – Tentatively adding Engineered Spray Solutions “Sprayroq” while monitoring performance.

Part V – Standard Details

1. PS-01 has been updated including detail S-16, Stainless Steel Pipe to Ductile Iron Transition, on sheet D-06.
2. The pump station backflow preventer installation detail has been created as W-13.
3. The pump station static potable/reclaimed water line connection detail has been created as W-14.
4. Updated W-10, Large Meter Installation.
5. Reclaimed water details moved to newly created D-07.
6. Created R-03, Reclaimed Water Control Valve Installation to be installed where reclaimed water enters a development to control reclaimed water demand, if needed.
7. Created R-04, Reclaimed Water Large Meter installation for master meter customers.

PART I - PROCEDURES

1.1 APPLICATION AND SCOPE**1.1.1 General**

- A. The standards and specifications set forth in this Manual shall apply to all new public water, wastewater, and reclaimed water systems and to all alterations, additions, or extensions to any new or existing public water, wastewater, or reclaimed water system.
- B. A “new” system is any development submitted after these standards are adopted for which design drawings have not been approved. If design plans have been approved but construction has not begun, the standards at the time of design plan approval shall apply.
- C. The standards and specifications prescribed by this Manual constitute minimum requirements for the protection of public health and safety.
- D. The standards and specifications prescribed by this Manual shall comply with all applicable federal, state, and local laws, rules and applicable regulations which are currently enacted or that may be revised, updated or added. In the event of a conflict between these standards and an Applicable Regulation, the more restrictive of the two shall control.
- E. Any approval issued by SJCUD as provided in this Manual shall be based solely on compliance with the standards set forth in this Manual and with all Applicable Regulations. No approval issued by SJCUD under this Manual shall be construed as a waiver of any of the standards set forth in this Manual or of any Applicable Regulations. It is the sole responsibility of the Developer or Owner to ensure that all Work complies with all Applicable Regulations.
- F. All materials furnished and used in the construction shall be new and conform to the standards and specifications listed herein, unless otherwise approved by SJCUD.
- G. Nothing in this Manual shall be construed as repealing or superseding provisions of other County ordinances and building codes when such provisions are not inferior to those set forth in this Manual.
- H. The requirements established by this Manual are not intended to be discriminatory against materials, products, or construction techniques of demonstrated capabilities.
- I. When field conditions dictate, or where good engineering practices indicate, appropriate variations of these standards which produce an equal or better end-product may be submitted to SJCUD for review on a case by case basis. Any request for such a variation must be submitted in writing to the Utility Director and accompanied by supporting documentation and calculations. The Utility will evaluate and make the final decision regarding the variation.
- J. The County has the authority to update and publish these standards as needed and allow modifications to the standards on a case by case basis based on good engineering judgement, long-term impact on the Utility, worker and public safety, and to address any procedural modifications that may result over time.

1.1.2. Exceptions

This Manual shall not apply to:

- A. A system used solely for the sale, distribution, or furnishing of bottled water;
- B. Manufacturers providing service solely in connection with their on-site operations;
- C. Public lodging establishments providing service solely in connection with service to their guests;
- D. Landlords providing service solely for specific compensation for the service.
- E. Restaurants, shopping centers, retail stores, or other commercial establishments providing service solely to their employees and customers on premises owned or leased by such establishments; or
- F. The utility systems owned and/or operated by the City of St. Augustine, Homeowners’

Utilities, North Beach Utilities, Wildwood Water, and JEA.

1.1.3. Objectives

The following objectives are intended to be accomplished by this Manual:

- A. To promote uniformity in construction of water, wastewater, and reclaimed water systems to facilitate the future option of incorporating such systems into the County Utility System.
- B. To promote water conservation and protect the limited supply of water, the water supply must be regulated and controlled and subjected only to reasonable and beneficial use. This is to help ensure an adequate supply of water and adequate wastewater treatment capacity for all members of the public.
- C. To prevent the construction of water, wastewater, or reclaimed water systems of inferior quality, which would most likely result in abandonment, and creates an environmental hazard and unreasonable economic and administrative burdens to customers served by the system and the County.
- D. To protect customers of each system from increased costs of maintenance and repair of water, wastewater, or reclaimed water systems that are poorly constructed.
- E. To promote and protect the public health, safety and welfare.
- F. To comply with the provisions of the Safe Drinking Water Act (43 U.S.C), Clean Water Act [33 U.S.C. 1251 et seq] and other applicable federal and state laws and regulations.
- G. Establish policies and procedures to protect St John's County potable water supply from cross-connection in accordance with Chapter 62-555.360, FAC.

1.1.4. Definitions

Except where specific definitions are used within a specific section, the following terms, phrases, words, and their derivation shall have the meaning given herein when consistent with the context. The word "shall" is mandatory, and the word "may" is permissive.

- A. AASHTO - means American Association of State Highway and Transportation Officials. Any reference to AASHTO standards shall be taken to mean the most recently published version unless otherwise specified.
- B. ADF – means Average Daily Flow, expressed in gallons per day.
- C. ANSI - means American National Standards Institute. Any reference to ANSI standards shall be taken to mean the most recently published version unless otherwise specified.
- D. APPLICABLE REGULATION – means any federal, state, or local law, ordinance, code, rule, or regulation that applies to any given project, facility, or system.
- E. ASTM - means American Society for Testing Materials. Any reference to ASTM standards shall be taken to mean the most recently published version unless otherwise specified.
- F. AWWA - means American Water Works Association. Any reference to AWWA standards shall be taken to mean the most recently published version unless otherwise specified.
- G. BOCC – means the St. Johns County Board of County Commissioners.
- H. COMPREHENSIVE PLAN - means the St. Johns County Comprehensive Plan adopted by the St. John's County Board of County Commissioners. Any reference to the "Comprehensive Plan" shall mean the most recently adopted version of the Comprehensive Plan, unless otherwise specified.
- I. CONTRACTOR - means the person, firm, or corporation with whom the contract for work has been made by the owner, the Developer, or the County.
- J. COUNTY - means the St. Johns County Board of County Commissioners, St. Johns

- County, Florida, and/or its designated representative(s).
- K. COUNTY UTILITY SYSTEM - The water, wastewater, and/or reclaimed water systems owned and/or operated by the County.
- L. DEVELOPER - means the owner, person, firm, or corporation engaged in developing or improving real estate for use or occupancy.
- M. DEVELOPER'S ENGINEER - means an Engineer or engineering firm registered with the State of Florida Department of Professional Regulation, retained by the Developer to provide professional engineering services for a project.
- N. DEVELOPMENT - means the execution of any building activity or mining operation, the making of any material change in the use or appearance of any structure or land, or the dividing of land into three or more parcels.
- O. DIPRA - means Ductile Iron Pipe Research Association.
- P. DIRECTOR - means the Director of SJCUD of St. Johns County, Florida, acting directly or through an assistant or other representative authorized by the Director.
- Q. DRAWINGS - means engineering drawings prepared by an Engineer to show the proposed construction.
- R. ENGINEER - means a Professional Engineer registered in Florida, or other person exempted pursuant to the provisions of chapter 471, Florida Statutes, who is competent in the field of engineering.
- S. ENGINEER OF RECORD (EOR) – responsible person for design and construction phases of a project.
- T. ERC - means Equivalent Residential Connection, consisting of 350 gallons per day of water or 280 gallons per day of sewer capacity.
- U. FAC – means the Florida Administrative Code.
- V. FDEP - means the Florida Department of Environmental Protection.
- W. FDOT - means the Florida Department of Transportation.
- X. FEC - means the Florida East Coast Railway Company.
- Y. FORCEMAIN - means a conduit (pipe) that transports wastewater under pressure.
- Z. GEOTECHNICAL ENGINEER - means a Registered Florida Engineer who provides services related to terrain evaluation and site selection, subsurface exploration and sampling, determination of soil and rock properties, foundation engineering, settlement and seepage analysis, design of earth and earth retaining structures, the design of subsurface drainage systems and the improvement of soil properties and foundation conditions, and testing and evaluation of construction materials.
- AA. LDC – means the Land Development Code, those regulations adopted by St. Johns County governing the development of land within the unincorporated area of the County.
- BB. LIFT STATION – See “Pump Station”.
- CC. MANUAL - means this Manual of Water, Wastewater, and Reuse Design Standards and Specifications, and all amendments thereof.
- DD. MULTI-FAMILY DEVELOPMENT – Development that is not individually platted and does not have individual owners for each unit (i.e. apartments).
- EE. NEMA - means National Electric Manufacturers Association. Any reference to NEMA Standards shall be taken to mean the most recently published version unless otherwise specified.
- FF. NSF - means National Sanitation Foundation. Any reference to NSF Standards shall be taken to mean the most recently published version unless otherwise specified.
- GG. OSHA - means the Federal Occupational Safety and Health Administration.
- HH. OWNER - means the person, firm, corporation, or governmental unit holding right of possession of the real estate upon which development is to take place.

- II. PHF – means Peak Hourly Flow, calculated by multiplying the ADF by a determined peaking factor, expressed in gallons per day.
- JJ. PLANS - See “Drawings”.
- KK. PRETREATMENT - means the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater to a treatable level, prior to or in lieu of discharging or otherwise introducing such pollutants into a wastewater system.
- LL. PUMP STATION – means a facility (with pumps and all associated appurtenances) that collects and pumps wastewater from a collection system to a treatment facility.
- MM. RECLAIMED WATER – means treated wastewater effluent that could be land applied per Chapter 62-610, FAC.
- NN. RECLAIMED WATERMAIN - means a conduit (pipe) that transports reclaimed water under pressure and includes reclaimed water transmission and distribution mains, fittings, valves, and miscellaneous related appurtenances.
- OO. REUSE – see “Reclaimed Water”.
- PP. SEWER – see “Wastewater System”.
- QQ. SJCUD – means the St. Johns County Utility Department.
- RR. SJCUD ORDINANCE – means St. Johns County Ordinance 2013-13, as may be amended from time to time.
- SS. SPECIFICATIONS – means the specifications contained in this Manual.
- TT. STANDARDS - means the minimum design standards contained in this Manual.
- UU. STANDARD DRAWINGS - means the detailed drawings in this Manual related to water, wastewater, and reclaimed watermain materials and installation.
- VV. TRAFFIC CONTROL AND SAFE PRACTICES MANUAL - means the State of Florida Department of Transportation Manual on Traffic Control and Safe Practices for Street and Highway Construction, maintenance and Utility Operation, latest edition.
- WW. UTILITY ACCOMMODATION MANUAL - means the State of Florida Department of Transportation Utility Accommodation Manual, latest edition.
- XX. UTILITY DEPARTMENT – means the St. Johns County Utility Department (SJCUD).
- YY. UTILITY - Any person, business entity, or association owning and/or operating a water, wastewater, and/or reclaimed water system, or proposing construction of a system, who is providing, or proposes to provide, water, including non-potable water, wastewater, and/or reclaimed water services to the public within the unincorporated area of St. Johns County.
- ZZ. UTILITY (PRIVATE) - Any Utility owned or operated by any person, business entity, or association, but excluding any Utility owned and/or operated by St. Johns County, a municipality, or other unit of local government.
- AAA. UTILITY (PUBLIC) - Any Utility owned or operated by St. Johns County, a municipality, or other unit of local government.
- BBB. WASTEWATER MAIN - means wastewater gravity sewers, forcemains, fittings, valves, service laterals, and miscellaneous related appurtenances.
- CCC. WASTEWATER SYSTEM - Wastewater system shall mean and shall include any plant, system, facility or property, and additions, extensions and improvements thereto at future times constructed to acquire as part thereof, useful or necessary or having a present capacity for future use in connection with the collection, treatment, purification and disposal of sewage of any nature or originating from any source, and without limiting the generality of the foregoing definition, shall embrace treatment plants, pumping stations, valves, forcemains, intercepting sewers, laterals, pressure

lines, mains and all necessary appurtenances and equipment, all wastewater mains and laterals for the reception and collection of sewage from premises connected therewith, and shall include all real and personal property and any interest therein, rights, easements and franchises of any nature whatsoever relating to any such system and necessary or convenient for the operation thereof.

- DDD. WATERMAIN - means a conduit (pipe) that transports potable water under pressure and includes water transmission and distribution mains, fittings, valves, and miscellaneous related appurtenances.
- EEE. WATER SYSTEM - Water system shall mean and include any plant system, facility or property, and additions, extensions and improvements thereto at future times, constructed or acquired as part thereof, useful or necessary or having the present capacity for future use in connection with the development of sources, treatment or purification and distribution of water, and, without limiting the generality of the foregoing, shall include dams, reservoirs, storage tanks, mains, lines, valves, pumping stations, laterals and pipes for the purpose of carrying water to the premises connected with such system, and shall include all real and personal property and any interest therein, rights, easements and franchises of any nature whatsoever relating to any such system and necessary or convenient for the operation thereof.
- FFF. WORK - means the labor, materials, equipment, supplies, services and other items necessary for the execution, completion and fulfillment of the contract.

1.2 PLANNING PROCESS

1.2.1 Letter of Availability

- A. All residential and commercial developments that desire the provision of water, wastewater, and/or reclaimed water by SJCUD shall request a letter of availability (LOA) from SJCUD. The letter will provide the connection point location(s) of the respective utility service by treatment plant and will indicate if the development has concurrency for water, wastewater and/or reclaimed service per the SJC LDC.
- B. If concurrency is not available, the LOA will summarize the required upgrades and/or improvements to meet the respective water, wastewater, and/or reclaimed water concurrency.
- C. The LOA request form is available on SJCUD website at: [Water/Sewer Availability Request Form](#).
- D. A LOA is valid for 180 calendar days.

1.2.2 Commitment of Capacity

The commitment of water, wastewater, and/or reuse transmission and treatment capacity will be limited to the actual number of Equivalent Residential Connections (ERC's) committed by the County through issuance of a Concurrency Certificate.

1.2.3 Utility Line Reimbursements

Water, wastewater, and reclaimed water mains in SJCUD-designated "transmission" corridors are required to be installed by a Developer of the size and length directed by SJCUD. Transmission mains and facilities installed by Developers are eligible for Utility Connection Fee (UCF) reimbursement. Such reimbursement shall be made per SJCUD Utility Ordinance 2022-37 Section 25.G.

1.2.4 Pre-Design Conference

A pre-design conference between the Developer/Owner, their Engineer, and SJCUD is mandatory for each development consisting of 500 or more dwelling units and/or 100,000

square feet or more of commercial space. For all other developments, a pre-design conference is recommended but is not mandatory.

1.2.5 Modification of Approved Development Plans

- A. Modifications to design plans which only affect SJCUD can be accommodated in the as-built drawings. SJCUD shall be notified of any changes before they are implemented.
- B. Major modifications that impact utilities or other infrastructure must apply for Development Review Committee (DRC) Modification of Construction Plans.

1.2.6 Connection to Existing System

Connections to the County Utility System are subject to this Manual, as well as other Applicable Regulations as they pertain to water, wastewater, and reuse systems and/or facilities.

1.2.7 Conveyance of Extension to County Utility System

- A. The Developer shall retain ownership and be responsible for all physical maintenance and repairs for a constructed extension until the BOCC accepts the conveyed infrastructure. Meters may be issued for a development phase after all of the following conditions are met:
 - a. All related utility installations are completed according to approved plans.
 - b. Inspections including pressure and bacteriological tests are satisfactorily completed.
 - c. The pump station(s), if applicable, is(are) satisfactorily started up.
 - d. Associated FDEP permits are finalized and cleared for service.
 - e. An Interim Service Agreement is executed by the Developer and approved and executed by the SJCUD Director.
- B. Notwithstanding the foregoing, acceptance of any extension by the County is at the sole discretion of the BOCC, which may decline to accept any proposed conveyance for any reason. Nothing in this Manual shall be construed as an obligation, whether expressed or implied, on the part of the County to accept the conveyance of any extension.

1.2.8 Developer's Right to Connect

The Developer has the right to connect to the utility system provided that the Developer's extension is installed with the approval of all public, governmental or other agencies having supervision, regulation, direction or control of such water, wastewater, and/or reclaimed water utility systems, including fees the County shall charge the Developer or its successor-in-title to connect the Developer's extension into the County utility system.

1.2.9 Right to Refuse or Terminate Service

In the event Developer defaults or fails to comply with any of the requirements of this Manual and fails to cure such defaults within thirty (30) calendar days following the receipt by the Developer of County's notice of such default or failure to comply, the County has the right to refuse service and/or terminate service to any building or lot within the Developer's property.

1.2.10 Information Request

Prior to submitting design plans or specifications to SJCUD for review, the Engineer for a proposed development shall contact SJCUD and request the as-built information for the development's connection point and all relevant utility information for any permit applications.

1.3 DESIGN PROCESS

1.3.1 Plan and Specification Requirements

1.3.1.1 General

- A. All submitted plans shall be standard size sheet 24" x 36" with title block. A graphic scale(s) shall be provided on each sheet and all lettering shall be 1/8" or larger to permit photographic reproduction. All plan sheets and the title page of submitted specifications must be signed, sealed and dated by the EOR. The north arrow shall, generally, point toward the top of the drawing or toward the left side for smaller sections.
- B. All cover sheets shall clearly indicate the Developer's name, address and phone number. The checklist included in Part VI of this Manual shall be provided and signed by the EOR.

1.3.1.2 Master Plan

The water, wastewater, and/or reuse system for all phases of the proposed development shall be shown on a single Master Development Plan (MDP) map. The MDP map shall indicate the general locations of all existing and proposed water, sewer, and reuse mains, manholes, valves, hydrants, pump stations and service laterals. Separate MDP maps shall be submitted for water, sewer and reuse utilities, if needed. The MDP maps shall be prepared at a scale not to exceed 1" to 200' and shall include main sizes. The scale shall be selected such that all items on the plan are clearly legible. If necessary, MDP maps shall be scaled to fit on no more than four (4) sheets with an appropriate scale. MDP maps that are not legible shall be rejected.

1.3.1.3 Plan and Profile

- A. Off-site gravity sewers, wastewater forcemains, watermains, and reclaimed watermains shall be shown on the same sheet in plan at a maximum 1" = 40' horizontal scale and profile at 1" = 4' vertical scale. SJCUD's preference is for offsite facilities to be drawn at 1" = 20' horizontal scale and profile at 1" = 2' vertical scale.
- B. On-site water, wastewater, and reclaimed water system plan and profiles shall be shown on the same sheet in plan at a maximum of 1" = 40' horizontal scale and 1" = 4' vertical scale. Where on-site water or reuse mains cross other utilities, the water or reuse main shall be shown in the profile for 20' either side of the crossing. As a minimum, the plan and profile drawings shall include the following information:
 1. General information such as north arrow, names of designer and Engineer, revision block with dates, graphic scale(s) and sheet number.
 2. Profile with elevations at 100-foot intervals, or more frequently if required by good design practice.
- C. Development layout with horizontal and vertical controls.
- D. All conflicts with other utility and drainage systems.
- E. All locations and rim elevations for manholes.
- F. Pipe data including size, lengths, material, pressure class, and slopes (i.e., 400' of 8" SDR26 PVC @ 0.40%; 200' of 12" DR11 HDPE; etc.).
- G. Size, type, and locations of fittings, valves, hydrants, air release/vacuum relief, and other related appurtenances.
- H. Limits of special exterior coatings.
- I. Limits of special bedding requirements.
- J. Pipe restraint requirements.
- K. Details of connection to existing systems.
- L. Location(s) and general layout of wastewater pumping stations.
- M. Construction notes regarding cover, horizontal and vertical control, special construction

- requirements, and references to standard and special details.
- N. Existing and proposed street names.

1.3.1.4 General Notes

The plans shall include “General Notes” for the installation of water, sewer and reuse facilities. General notes shall be as provided on the following webpage: [General Notes](#). Other notes shall be prepared by the Developer’s Engineer as required.

1.3.1.5 Details

The plans shall include all applicable SJCUD standard drawings, which are included on the following webpage: [Design Details](#). Special details shall be prepared by the Developer’s Engineer for aerial and underwater crossings of rivers, streams, canals and ditches. Other special details shall be prepared by the Developer’s Engineer as required.

1.3.1.6 Identification of Plan Components

- A. All proposed piping, fittings, valves, structures and appurtenances related to water, sewer and reuse facilities shall be located by baseline, stationing and offsets in order to establish their exact proposed locations.
- B. Proposed development with a single connection may utilize tie down dimensions from the property line and/or ROW to establish the exact location of the proposed utilities.
- C. All plans shall show a match line or key map for continuity to the next plan sheet. Graphical presentation of the plan sheet for identification to the overall master plan is preferred but not mandatory.

1.3.1.7 Conformity with Other Standards

- A. Designs shall be compliant with all relevant St Johns County Standards and Requirements, as well as with all Federal, State, and Local regulations.
- B. Layout of all utilities shall conform to the standard roadway cross-section provided in the [SJC Land Development Code](#) (unless otherwise shown or pre-approved).
- C. At times, when the standard layout conflicts with other requirements of the County, the Engineer shall implement good engineering practices and provide a 5’ utility easement as shown in the roadway cross-section in the [SJC Public Works Engineering Standards and Detail Manual](#), as amended.
- D. Where there is a discrepancy, the most stringent regulation shall apply as determined by SJCUD.

1.3.1.8 SJCUD Review

All engineering plans and specifications prepared by the Developer's Engineer shall be reviewed by SJCUD. The Developer's engineering designs, plans and specifications shall conform to the requirements of this Manual. SJCUD shall complete the design review within fifteen (15) business days excluding County holidays or as identified by the County Development Services Department.

1.3.2 Engineering Calculations

All engineering calculations used for the design of the proposed utility system are required to be submitted for review along with the plans and specifications. The engineering calculations shall comply with Part II of this Manual.

1.3.3 Pre-Construction Statement

The applicant and/or applicant’s representative of a proposed development shall include a

letter in the design submittal stating that the applicant is aware that SJCUD requires a mandatory pre-construction meeting with the Utility Department prior to any water, sewer, and/or reuse utility construction.

1.3.4 Architectural Floor Plans

To comply with Section 25 of SJCUD Ordinance (2013-13 or as amended), architectural floor plans for non-residential uses (commercial, industrial, etc.) (with dimensions), including a plumbing plan, and E911 address are required to be submitted prior to construction plan approval.

1.3.5 Permitting

All permitting from external agencies including but not limited to the Florida Department of Environmental Protection (FDEP) and/or the Florida Department of Transportation (FDOT) is required prior to SJCUD final approval. All permit applications which require SJCUD signature shall be filled in completely, including signatures prior to SJCUD signing the application. Utilities for Developments will be permitted initially as private systems, which upon successful conveyance by the Developer and acceptance by the BOCC, will be transferred to the County for perpetual ownership and maintenance.

1.4 CONSTRUCTION PROCESS

Forms needed prior to, during, and to close out the construction and dedication processes are located in Section 1.5 of this Manual.

1.4.1 Pre-Construction

1.4.1.1 *Approved Construction plans*

All development projects which intend to connect to the County Utility System are required to have construction plans approved by SJCUD.

1.4.1.2 *Shop Drawing Submittal*

- A. No shop drawing submittal is required for those items in the approved materials manual (see Section IV) that are proposed to be used on the project except as identified in B below. Items proposed for use shall be identified on the approved materials checklist.
- B. Two (2) hard copies (no e-mail) of shop drawing submittals are required for manholes, wetwells, pumps, and pump associated equipment with both the Contractor's and EOR's stamp of approval. SJCUD approval does not relieve the Contractor and/or Engineer from liability if incorrect materials are approved and subsequently installed. The replacement of incorrect materials shall be required unless pre-approved in writing by SJCUD.
- C. SJCUD will review and return comments within ten (10) business days of receipt of the first submittal. SJCUD will review and return comments within five (5) business days for any subsequent submittals. Each review period is exclusive of County holidays.
- D. Certified Factory Pump Curve - Each pump shall be tested in the manufacturer's shop to demonstrate the proper operation of all components. A certified factory pump curve shall be provided for each pump prior to placement into operation. A representative pump shall be acceptable for the factory testing of any pump less than 15 horsepower. A specific factory test of the pump to be installed shall be required for all pumps 15 horsepower and greater.
- E. The acceptance of drawings returned marked "APPROVED" or "APPROVED AS NOTED" shall not constitute approval of dimensions, quantities, and details of the materials, equipment, device or items shown and shall not relieve the Contractor of any

responsibility for errors or deviations from the requirements.

- F. Unapproved items found to have been installed will be replaced with approved materials at no cost to SJCUD. SJCUD shall not be responsible or liable for items missed as part of the review or project delays due to installation of unapproved items.
- G. The Contractor shall furnish one (1) hard copy and one (1) electronic set of operation and maintenance manuals for each piece of equipment at a pump station. Manuals shall be specific for the equipment and provide complete repair, maintenance, and parts guide.

1.4.1.3 Pre-Construction Meeting

- A. It is the responsibility of the Developer's Engineer to schedule the pre-construction meeting with SJCUD a minimum of five (5) business days excluding County holidays prior to start of construction.
- B. The Developer's Engineer shall ensure the Contractor's Superintendent brings the approved plans to the meeting for verification with SJCUD that the plans are the official set. Failure to bring the approved plans will result in rescheduling the pre-construction meeting to a later date.
- C. The Developer's Engineer shall also bring one additional 11" x 17" plan set for SJCUD Inspector. Any changes to the construction plans discussed at the pre-construction meeting will be noted on the Contractor's and Inspector's plans.

1.4.1.4 Unit Connection Fees

The Unit Connection Fees will be presented to the Applicant or Representative within ten (10) business days excluding County holidays of the pre-construction meeting. The fees are required and calculated as provided in SJCUD Ordinance, or by resolution of the BOCC as provided in SJCUD Ordinance. SJCUD requires payment of all fees in full prior to any meters being released.

1.4.1.5 Electrical and Control System Fee

- A. Each new pumping station shall be equipped with a new telemetry system remote terminal unit (RTU) for remote monitoring and control from the existing SJCUD supervisory control and data acquisition (SCADA) system.
- B. The telemetry system equipment, including RTU, antenna and antenna mast, shall be provided and installed by SJCUD after payment of the SCADA fee.
- C. An electrical system analysis shall be performed by SJCUD using data provided by the Contractor as described in Section 2.29 after payment of the Electrical Systems Analysis fee. The arc flash study is required by the NFPA 70E Standard for Electrical Safety in the Workplace to comply with OSHA 1910 Subpart S which is the OSHA electrical safety requirements for the workplace.
- D. The fee as shown in Schedule G of the SJC Utility Ordinance shall be paid by the Contractor to SJCUD within 60 calendar days after the pre-construction meeting.

1.4.2 Construction Milestones

The construction process has been outlined on the Construction Milestone Checklist. The Milestone Report will be completed by the Inspector and provided to the Contractor at the pre-construction meeting. The Checklist identifies which milestone items pertain to each specific project.

1.4.2.1 General Field Inspection

- A. The Developer's water, wastewater, and/or reuse systems shall be installed in accordance with the engineering plans and specifications approved by SJCUD. SJCUD shall have

the right, but not the obligation, to make inspections as installation progresses. The inspectors shall maintain field notes of any general field inspection performed.

- B. SJCUD recommends that the Contractor take pre-construction photos or videos to document pre-existing conditions on site. SJCUD may delay or reject acceptance of a project in the event the Contractor fails to adequately restore damaged property (including, but not limited to grading, landscaping, structures, etc.), or fails to resolve a claim from a property Owner.

1.4.2.2 Inspection and Testing

- A. SJCUD has several mandatory inspections which require the presence of the Contractor and SJCUD inspector. The EOR, who may also be present, shall request a SJCUD inspection by completing the [Construction Inspection Request](#) form and emailing it to the assigned inspector whose contact information is listed at the bottom of the form.
- B. The mandatory inspections are as follows:
 1. Connection to the Utility System
 2. Setting Wetwell Base
 3. Setting Receiving Manhole Base
 4. Flushing Test
 5. Pressure Test
 6. Pump Station Startup
 7. Preliminary Walk Through
 8. Approval Walk Through - EOR and Contractor shall sign off that all utility systems are complete and ready for inspection. If inspection is terminated due to incomplete work, subsequent inspections will be delayed.
 9. Acceptance Walk Through - Contractor or Maintenance Entity to provide maintenance records, and jointly inspect facilities prior to BOCC's Acceptance to document any repair or warranty items that will need to be addressed. Major repair items identified shall be addressed prior to BOCC acceptance. Inspection shall take place at least thirty (30) calendar days excluding County holidays prior to the Board Meeting for the proposed BOCC acceptance.
- C. SJCUD requires a minimum of a five (5) business day notice excluding County holidays to schedule a mandatory inspection.
- D. The Developer/Contractor shall pay all costs of locating leaks and associated repairs deemed necessary by SJCUD as a result of tests. All testing and related conditions shall comply with the standards set forth in this Manual.

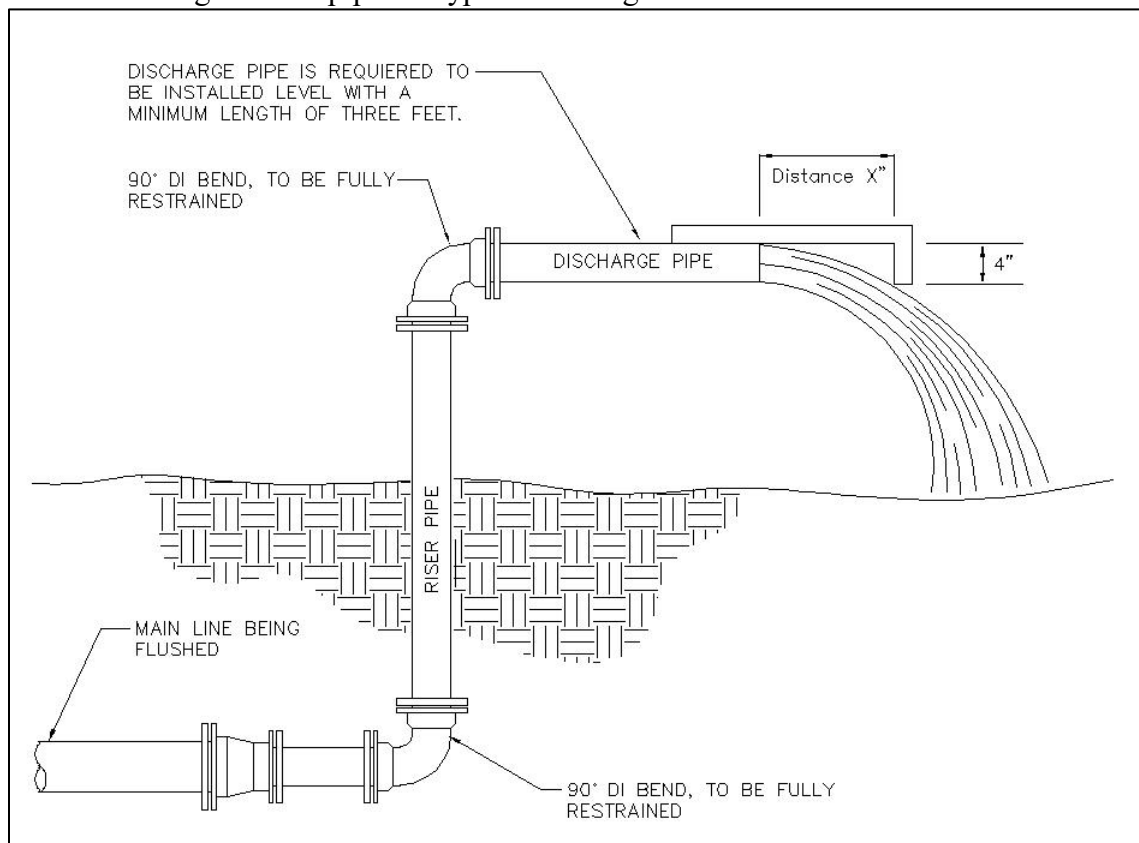
1.4.2.3 Connection to Utility System

- A. SJCUD inspection of system connections is mandatory. Failure to schedule connections will, at a minimum, require Developer/Contractor to uncover and expose the connection for inspection, at the sole cost to the Developer/Contractor, or potentially require a new connection to be performed.
- B. If the connection requires an existing water system shut down, the contractor shall coordinate with SJCUD Inspector to schedule a time/date approved by SJCUD. The Inspector will provide door tags with the boil water notice to the Contractor to distribute to the impacted customers. SJCUD reserves the right to reject proposed plans to shut down systems for connections if it is determined to have significant technical and or customer impact concerns. In these cases, alternate methods for connection will need to be prepared by the EOR, approved by SJCUD, and constructed at the cost of the Developer.
- C. A SJCUD Inspector and Lines & Taps personnel must be present at the project site prior

- to the work commencing. Lines & Taps personnel shall be responsible for operating all isolation valves.
- D. SJCUD will collect two (2) successive days of bacteriological water samples and send to an approved laboratory for testing. If the samples pass, the Inspector provides the Contractor door tags to distribute to the impacted customers. These door tags end the boil water notice.
- E. The Contractor shall retrieve and submit the pipe coupon from all wet taps on SJCUD pipelines. Failure to retrieve coupons during a wet tap will require the Contractor to take measures, which are reviewed and approved by SJCUD, to retrieve the coupon at the Contractor's expense.

1.4.2.4 Flushing of All Pressure Mains

- A. Prior to pressure testing and placing into service, sections of installed pressure mains (water, sewer, reuse) 10" and smaller shall be flushed (full diameter) at a flow velocity of at least 2.5 feet per second to remove any solids or contaminated material that may have become lodged in the pipe. A typical flushing detail is show below.



- B. All taps required for chlorination or flushing purpose or for temporary or permanent release of air shall be provided for by the Contractor as a part of the construction of water mains. After the disinfection, all such taps shall be sealed to the satisfaction of SJCUD Inspector.
- C. Contractor and the EOR shall submit a flushing plan to the Inspector for review.
- D. All flushing piping should be installed prior to scheduling the flushing inspection. The Contractor should take precautions to minimize anticipated damage to nearby surface features, and plan for storage of the discharged water and path of travel. The discharged water is not allowed to enter private property or enter any surface waters. If the discharged water is not controlled to SJCUD Inspector's satisfaction, SJCUD Inspector may terminate the test at any time.

- E. SJCUD inspector will be responsible for contacting the water treatment plant operators to verify that the flushing test will not adversely affect the treatment facilities. In the event the treatment facilities cannot support the flushing at the scheduled time, the test will be rescheduled at no additional cost. In some cases, flushing operations may be required to be performed at night during low demand periods at no additional cost. A SJCUD representative shall be present during all flushing activities.
- F. All pipes 12" and larger shall require pigging or swabbing in lieu of flushing to clean the line. Pigging/swabbing may also be required in areas where the required flushing velocity cannot be achieved.
- G. Reuse water (if available) may be used to flush reuse or sewer lines in lieu of potable water only with prior approval by SJCUD and FDEP.

1.4.2.5 Pressure and Leakage Testing

A. PVC, FPVC, and DI Pipe

1. General - Hydrostatic testing shall consist of a pressure test and leakage test. Hydrostatic tests shall be conducted on all newly installed pressure pipes, joints, hydrants and valves including all service lines to the curb stops. Air testing of pressure pipes shall not be permitted under any circumstance. Tests shall be made on sections not exceeding 3,000'. Contractor shall furnish all necessary equipment and material, make all taps, and furnish all closure pieces in the pipe as required. Equipment to be furnished by the Contractor shall include graduated containers, pressure gauges, hydraulic force pumps, and suitable hoses and piping. SJCUD or its designated representative shall monitor and approve a satisfactory test. The basic provisions of AWWA C-600 shall apply to ductile iron pipe and AWWA C-605 shall apply to PVC pipe.
2. The Contractor may conduct hydrostatic tests after the trench has been partially backfilled with the joints left exposed for inspection for informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified.
3. Testing Criteria - All pipe sections to be pressure tested shall be subjected to a hydrostatic pressure equal to the pressure rating printed on the pipe. At a minimum, water and reclaimed water mains will be tested at 150 psi and forcemains at 100 psi. If there are multiple pressure rated pipes or pipe material types on the project, it will be the Contractor's responsibility to isolate the different pipes from each other. The duration of each pressure test shall be for a period of two (2) hours. The duration of each pressure test shall be a maximum of eight (8) hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section. If during the test, the integrity of the tested line is in question, SJCUD may require other pressure tests at no expense to SJCUD. All line valves shall be hydrostatically tested for 15 minutes to ensure a tight seal when closed.
4. Procedure for Pressure Test - Each section of pipe to be tested, as determined by SJCUD, shall be slowly filled with water, and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. It shall be standard practice to verify that isolation valves for fire hydrants on potable water systems are in the open position prior to hydrostatic testing to verify that the operating valves on newly installed hydrants do not leak. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves, or hydrants are discovered during the pressure test, all such items shall be removed and replaced by the Contractor with

SJCUD approved material, and the test shall be rescheduled and repeated until satisfactory results are obtained. SJCUD does not guarantee that existing system valves will hold pressure under pressure testing conditions. Contractors are recommended to perform pressure testing prior to permanent connection to system stub-outs. In no case will a pressure loss greater than 5 psi during any two-hour pressure test be accepted. Prior to scheduling SJCUD witnessed pressure test, the Contractor shall preliminarily test the main to ensure it will pass when SJCUD Inspector or representative is present.

B. HDPE Piping

1. **General - Hydrostatic testing shall consist of a pressure test and leakage test.** Hydrostatic tests shall be conducted on all newly installed pressure pipes, joints, hydrants and valves including all service lines to the curb stops. Air testing of pressure pipes shall not be permitted under any circumstance. Tests shall be made on sections not exceeding 3,000'. Contractor shall furnish all necessary equipment and material, make all taps, and furnish all closure pieces in the pipe as required. Equipment to be furnished by the Contractor shall include graduated containers, pressure gauges, hydraulic force pumps, and suitable hoses and piping. SJCUD or its designated representative shall monitor and approve a satisfactory test. The basic provisions of ASTM F2164 – “Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure” shall apply.
2. The Contractor may conduct hydrostatic tests after the trench has been partially backfilled with the joints left exposed for inspection for his informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified.
3. **Testing Criteria - All pipe sections to be pressure tested shall be subjected to a hydrostatic pressure equal to the pressure rating printed on the pipe.** At a minimum, water and reclaimed water mains will be tested at 150 psi and forcemains at 100 psi. If there are multiple pressure rated pipes or pipe material types on the project, it will be the Contractor’s responsibility to isolate the different pipes from each other. The duration of each pressure test shall be for a period of three (3) hours. The duration of each pressure test shall be a maximum of eight (8) hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section. If during the test, the integrity of the tested line is in question, SJCUD may require other pressure tests at no expense to SJCUD. All line valves shall be hydrostatically tested for 15 minutes to ensure tight seal when closed.
4. **Procedure for Pressure Test - Each section of pipe to be tested, as determined by SJCUD, shall be slowly filled with water, and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner.** Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made and appropriate valves installed to ensure bleeding of all air from the main. During the initial expansion phase, gradually pressurize the test section to test pressure and maintain the test pressure for three (3) hours; continue to add water to the test section to account for the expansion of the pipe.

- C. Failed Tests - If defective pipes, fittings, valves, or hydrants are discovered during the pressure test, all such items shall be removed and replaced by the Contractor, at no expense to SJCUD, with approved material, and the test shall be repeated until satisfactory results are obtained.** SJCUD does not guarantee that existing system valves will hold pressure under pressure testing conditions. Contractors are recommended to perform pressure testing prior to permanent connection to system stub-outs. Prior to

scheduling SJCUD witnessed pressure test, the Contractor shall preliminarily test the main to ensure it will pass when SJCUD is present.

1.4.2.6 Disinfection of Watermains

- A. General - Before being placed in service, all new watermains shall be chlorinated in accordance with the specifications below and the procedures outlined in AWWA C-651 "Standard Procedure for Disinfecting Watermains," Chapter 62-555, FAC, and a Certification of Completion shall be approved by FDEP.
- B. Flushing – Flushing shall be accomplished in accordance with Section 1.4.2.4 of this Manual.
- C. Disinfection Criteria - Before being placed into service, all new mains and repaired portions of or extensions to existing mains shall be chlorinated so that the initial chlorine residual shall be not less than 50 mg/L and a chlorine residual of not less than 25 mg/L remains in the water after standing 24 hours in the pipe.
- D. Form of Applied Chlorine - Chlorine may be applied as liquid chlorine or a mixture of water and calcium hypochlorite. The Contractor shall assume responsibility for safe handling of chlorine and shall meet requirements of OSHA and other regulatory agencies for safe handling of chlorine.
- E. Point of Application - The preferred point of application of the chlorinating agent shall be at the beginning of the pipeline extension or any valve section of it and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine bearing water into the pipe shall be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of applications may be used when approved or directed by SJCUD.
- F. Operation of Valves - Valves shall be operated by SJCUD personnel so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water.
- G. Retention Period - Treated water shall be retained in the pipe at least 24 hours. After this period the chlorine residual at pipe extremities and at other representative points shall be at least 25 mg/L.
- H. Chlorinating Valves and Hydrants - In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.
- I. Final Flushing and Testing
 - a. Following chlorination, all treated water shall be thoroughly flushed from the newly installed pipe at its extremity until the replacement water indicates a free chlorine residual not in excess of that normally carried in the system. Contractor shall take appropriate measures to dechlorinate treated water used for disinfection to not negatively impact the environment.
 - b. After flushing, water samples shall be collected on two successive days from the treated piping system as directed by SJCUD and shall show acceptable bacteriological results. At least one set of samples shall be collected from every 1,000' of the new watermain, plus one set from the end of the line and at least one set from each branch. All bacteriological testing shall be performed and paid for by the Contractor. All such bacteriological analysis shall be performed by a laboratory certified by the State of Florida.
 - c. Proper chain of custody procedures shall be followed and samples shall only be collected by certified laboratory personnel. Copies of testing results and all related correspondence with the FDEP shall be submitted to SJCUD.
- J. Repetition of Flushing and Testing - Should the initial treatment result in an

unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained at no additional expense to SJCUD.

1.4.2.7 ***Pump Station Startup***

- A. All pump stations which will be SJCUD owned and maintained shall undergo a full startup test prior to acceptance by SJCUD. Upon completion of installation, the Contractor shall perform an operational test of the system, in the presence of SJCUD and a representative of the manufacturer, to ensure that all component parts meet the specifications.
- B. Prior to requesting a pump station startup, the Contractor is responsible for completing all testing of the proposed utility system. **The inspection request form must be signed by the EOR and the Contractor prior to the startup which states that power has been properly connected and the pump station is ready for inspection. The startup will not take place without this signed form.** The pump station startup checklist may be used as a guide for preparing for the pump station inspection.
- C. SJCUD Inspector shall be responsible for completing SJCUD Pump Station Startup Report. The Contractor shall be responsible for providing the Manufacture's Startup Report which shall include the pump curve for the station. Appropriate O&M manuals for the equipment shall also be provided by the Contractor at the start up. The SJCUD Startup Report and the Manufacture's Startup Report cover different information and both reports are required for the acceptance of the pump station.
- D. The Contractor is required, as part of the Electrical System Analysis, to provide the following information to the Inspector which is entered on the startup checklist and as shown in Section 2.29.
- E. Pump Station Startup with a generator will not be allowed by SJCUD. The central power must be available to perform the startup test.

1.4.2.8 ***Preliminary As-Built Drawings***

Preliminary as-built drawings conforming to Section 1.4.3.10 of this Manual shall be submitted to SJCUD prior to requesting a walk-through inspection. Items C, G, and I do not apply for Preliminary As-built drawing requirements.

1.4.2.9 ***Walk-Through Inspection***

- A. Prior to requesting a walk-through, the Contractor is responsible for completing all testing of the proposed utility system and submitting the preliminary as-built drawings to SJCUD. **The inspection request form must be signed by the EOR and the Contractor prior to the walk-through. Signing this states that the development is ready for final inspection. The walk-through will not take place without this signed form.**
- B. Upon completion, SJCUD will provide the Contractor with an itemized punch list, if necessary, to complete the project. However, SJCUD reserves the right to request further items until the project's final acceptance by the County.
- C. The following resources are required to be available from the Contractor during the walk-through inspections:
 - 1. ladder,
 - 2. fire hydrant wrench,
 - 3. valve key,
 - 4. curb stop key,
 - 5. minimum one million candle watt spot light,
 - 6. mirror and pole for lamping, and

7. personnel to operate all items.
- D. The following conditions are required to be completed by the Contractor prior to the walk-through inspections :
 1. Sanitary sewer items:
 - a. manhole lids marked “sanitary sewer”,
 - b. lids cleaned of asphalt and dirt,
 - c. inside of manholes must be properly concreted with smooth flow channels,
 - d. inside of manholes must be coated with bituminous waterproofing material, if not lined with a specialty liner,
 - e. inverts completed and cleaned of debris,
 - f. curb etched and painted green to show location of sewer service lateral, and
 - g. lateral stubs and marker balls need to be located within 5’ and inside of the ROW.
 2. Public fire hydrants:
 - a. paint chrome yellow,
 - b. place blue reflector on centerline of roadway to show location of hydrant,
 - c. 24” x 24” x 6” concrete pad around hydrant,
 - d. grease hydrant caps, and
 - e. isolation valve cap to fire hydrant is to be painted chrome yellow.
 3. Private fire hydrants:
 - a. paint chrome red,
 - b. place blue reflector on centerline of roadway to show location of hydrant,
 - c. 24” x 24” x 6” concrete pad around hydrant,
 - d. grease hydrant caps, and
 - e. isolation valve cap to fire hydrant is to be painted chrome red.
 4. Watermain, Forcemain, and Reclaimed watermain valves:
 - a. valve jackets to be flush with grade,
 - b. curb etched and painted blue for water, green for sewer, and purple for reuse to show location,
 - c. valve box cap painted blue for water, green for sewer, and purple for reuse,
 - d. 24” x 24” x 6” concrete pad around all valves,
 - e. color-coded locator ball placed at each valve, and
 - f. locate wire test log(s).
 5. Water and Reuse services:
 - a. meter box flush with grade level,
 - b. curb stop facing up with no poly visible in box, and
 - c. curb etched and painted blue for water and purple for reuse to show location.
 6. Flushing hydrant & leak detector boxes:
 - a. bottom level of box filled with #57 stone,
 - b. box flush with grade level, and
 - c. curb etched and painted to show location.

1.4.2.10 Construction Water Meters and Permanent Water and Reuse Meters

SJCUD shall not provide water for construction on an unmetered basis. All charges, including all minimum charges for water service, shall be paid by the Developer from the date of meter installation in accordance with SJCUD's approved rate schedule. A construction hydrant meter can be made available upon request at SJCUD Billing Office. The meter will be installed by SJCUD personnel at an existing hydrant preferable to the Contractor. If a private hydrant (or a hydrant that has not been accepted) is selected for a hydrant meter installation, then the contractor shall provide a letter from the hydrant owner allowing SJCUD to access the hydrant and install the meter, and shall include a statement

releasing SJCUD from liability from potential damage to the hydrant due to use. A refundable deposit will be required for the installation. Contractors found to be using unmetered water shall be fined by code enforcement, and may have materials used in the theft of water confiscated permanently, and/or job site shut down until appropriate provisions are made.

1.4.2.11 Permits and Meters for Model Home

A. Permits for Model Homes:

- A. If the project has been platted (completed in WATS), any number of model homes can be built. The clearance sheets will contain language stating that SJCUD is the Water/Sewer/Reclaimed Water provider, and that there will be no Certificates of Occupancy (CO) until Unit Connection Fees have been paid. Clearance Sheets through Permitting can be pulled to build the model homes.
- B. If the project has not yet been platted, only 10% of total homes can be built. In order to permit these model homes, a “Certification of Public Water and Sewer” letter from SJCUD is required and can be obtained by emailing [SJCUD's Construction Technician](#). Addresses and lot numbers for these model homes must be included.

B. Meters for Model Homes - No meters will be released until the following closeout documents/procedures have been received/completed:

1. Bacteriological tests (Bac-Ts)
2. Drill Logs, if applicable
3. Sewer DVD and Report
4. Pump station start up report, if applicable
5. Two (2) copies of Preliminary As-built drawings required for Walkthrough
6. Walkthrough inspection form
7. FDEP Clearance for water and sewer
8. Original Warranty
9. Original Release of Lien
10. Original Bill of Sale
11. Original Schedule of Values
12. Interim Service Agreement allowing SJCUD to access and maintain meters until successful dedication and acceptance by the Board
13. Permanent Utility Easement Document, if applicable
14. Final As-built drawings through Development Services, together with CAD disc and Electronic submittal form.

1.4.2.12 Common Area Meters

Potable water meters for common areas intended for irrigation use only will generally not be allowed by SJCUD as a provision to conserve the County’s water resources for potable uses. Developments shall take measures to utilize reclaimed water, if available, or an alternate lower quality water sources for irrigation of common areas. The County may allow meters for irrigation use in cases where using alternate water sources are documented to be technically or financially infeasible. Meters used to provide irrigation shall pay the sewer charge associated with the potable water used.

1.4.2.13 Alternate Water Source

Developer or Contractor shall not construct any well, pond, lake or source of water for the purposes of obtaining construction water, future domestic use, or fire protection without prior approval of SJCUD.

1.4.2.14 Cross Connections

There shall be no cross connection between SJCUD water system and any other possible source of contamination such as a non-potable water system or non-permitted water system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or sprinkler system. See the SJC Manual for Cross-Connection Control and Backflow Prevention Manual (CCC Manual) for all requirements.

1.4.2.15 Connection of Buildings

The Developer shall, at their sole expense, connect the private property water pipes and the private property sewer pipes of each dwelling or other building constructed on Developer's property to the meters and sewer laterals of Developer's extension as reflected in plans and specifications approved by SJCUD. Where the Developer is required to replace or modify existing mains, the Developer will pay for the existing services to be transferred to the new main.

1.4.3 Closeout and Dedication**1.4.3.1 Inspection Reports**

Inspector sends copies of reports to the Contractor and EOR after each inspection. It shall be the Contractor's responsibility to keep a copy of all test reports performed on the system. The reports shall include, but not be limited to: water system bacteriological testing, sewer system video log with DVD, pressure testing, flushing of mains, locate wire test form, HDD log(s), and pump station startup reports. The HDD log(s) shall include the name and certification number of the technician fusing the pipe.

1.4.3.2 Sewer Video Inspection

- A. Prior to video inspection, all manhole inverts must be constructed, road base must be installed and final density tests must be completed. For gravity sewer mains deeper than ten feet, sub-grade densities may be substituted for the final density test. Gravity sewer in easements must be backfilled and at final grade. If repairs are required on a main, a mandrel must be pulled during the post-repair video inspection.
- B. Inspection Guidelines
 1. For all video inspections, water must be added to indicate low areas or dips in piping. Sufficient water must be added to flow from the downstream end of the pipe. During the video inspection, the camera operator shall stop the camera and pan the lens towards the service to provide an unobstructed view of the service. On the recorded and written copies of the inspection, the operator shall call out any leaks, dips, deflections, discoloration, reverse fall, external debris protrusions or indentions, and any other visual abnormalities.
 2. The contractor shall provide a copy of the video inspection, accompanied by a written report, within 10 business days of the test. The assigned SJCUD Inspector will review the written and recorded inspection reports and make a determination if repairs or replacement of any pipe segments are required.
 3. Paving should not be installed prior to review and approval of the video inspection results by SJCUD. If the contractor chooses to install paving prior to Inspector's review, the contractor proceeds with full knowledge of the associated risk that the sewer system may need to be repaired or replaced. SJCUD will not overlook defects or accept inferior sewer systems which have been paved over prior to the SJCUD's video review.
 4. Any pipe found to have defects, including but not limited to leaks, cracks, pipe deflection from external pressures, rolled or pinched gaskets, joint gaps, or holding

water (a “dip”) or otherwise defective shall be repaired or removed and replaced with new pipe at no additional cost to SJCUD.

5. A dip is defined as any water holding depth which is deeper than ½” for pipe 8” to 12” in diameter or deeper than 1” for pipe greater than 12” in diameter. There shall not be more than one (1) dip between manholes regardless of the depth or distance. A maximum ¾” dip for pipe 8”, 10”, or 12” in diameter *may* be allowed IF there are at least 67, 105, or 151 equivalent residential connections upstream of the sewer section in question as certified by the EOR. The defective pipe section(s) shall be repaired or replaced at no cost to SJCUD.

1.4.3.3 FDEP Completion of Construction

- A. Prior to placing any new potable water, sewer, or reclaimed water system into service, the appropriate Certificate of Completion form shall be submitted through SJCUD and approved by the FDEP in accordance with Chapters 62-555 and 62-604, FAC.
- B. Construction of all water, sewer and reclaimed water facilities shall be completed per phasing schedule set on the approved construction plans. Partial clearances for one or more utilities shall not typically be allowed, but exceptions will be considered on a case by case basis.
- C. Certifications of Completion forms shall be submitted to SJCUD with all sections of the form completed and signed. All testing and punch list items shall be completed prior to SJCUD approval of the Certification of Completion.
- D. SJCUD requires that the potable water, sewer, and reclaimed water systems are certified at the same time. In cases where a development relocates an existing main that is in service, or has unique provisions of an existing treatment system (water, sewer, and/or reclaimed water) in service, then SJCUD may consider separate certification of either the potable water, sewer, and/or reclaimed water system separately as is deemed technically appropriate to accommodate phasing.

1.4.3.4 Backflow Certification

- A. Relevant elements of the SJC Manual for Cross-Connection Control and Backflow Prevention (CCC Manual) are summarized below. Refer to the CCC Manual as adopted by Resolution 2018-151.
- B. Residential reclaimed water customers shall have a dual check valve on the potable water connection installed and maintained by SJCUD.
- C. Multi-family dwellings such as apartments where there is a single owner of all of the units and commercial, industrial, and/or government developments shall have a Reduced-Pressure Zone (RPZ) Backflow Prevention (BFP) device installed downstream of the meter. Based on the Consumptive Use Permit issued by the SJRWMD, each apartment or commercial unit shall be individually metered.
- D. Installation of the RPZ BFP shall be by a licensed plumber and certified by a certified backflow assembly tester approved by the State of Florida.
- E. The meter will not be placed until the BFP device is installed and all lines are approved. A copy of the test results shall be forwarded to SJCUD Inspector within thirty (30) days of meter placement or before final approval by SJCUD. SJCUD has adopted the testing procedure from the University of Florida TREEO Center.
- F. BFPs for fire protection shall be as outlined in the CCC Manual.

1.4.3.5 Utility Construction Values

The Contractor shall be responsible for providing SJCUD a Schedule of Values (SOV) for all parts of the Developer’s utility system which will be dedicated to SJCUD. The SOV is

required to be completed on the standard SJCUD forms, and shall be indicative of the installed value of the system (i.e. materials and installation labor).

1.4.3.6 Release of Lien

The Contractor shall provide SJCUD a release of lien in the amount of the total listed in the SOV. The Release of Lien shall be signed by an authorized signee per sunbiz.org and notarized. The original signed document must be provided to SJCUD.

1.4.3.7 Bill of Sale

The Developer (Owner) of the utility system shall provide SJCUD a Bill of Sale. The Bill of Sale shall be signed by an authorized signee per sunbiz.org and notarized. The Bill of Sale cannot be accepted by SJCUD until the Developer (Owner) owns the utility system free and clear of any outstanding bills. SJCUD must receive the Release of Lien from the Contractor prior to accepting the Bill of Sale. The original signed document must be provided to SJCUD.

1.4.3.8 Warranty Letter

- A. Developer shall warrant the installed utility system(s) which are to be dedicated to the County and hold County harmless against all costs, expenses and losses, including, without limitation, incidental and consequential damages, resulting from any defects in the Developer's installation, including, without limitation, defects in design material and construction workmanship, which are discovered or arise within a period of one (1) year following the date of Final Acceptance by the County. Developer shall provide an original of this letter signed by an authorized signee per sunbiz.org to SJCUD.
- B. Operational control of the potable water, sewer, and reclaimed water (if installed) systems shall not be transferred to SJCUD until Final Acceptance of the project and infrastructure is approved by the BOCC. Until such transfer, interim service may be achieved upon execution of an Interim Service Agreement which defines operational and maintenance responsibilities until final acceptance by the BOCC. All systems shall be re-inspected as noted in Section 1.4.2.2.B.9. at least 30 days prior to BOCC acceptance of the infrastructure and any repairs that are critical to the functionality of the system shall be considered major and shall be completed prior to the acceptance. Repairs deemed minor by SJCUD Inspector may be addressed as a warranty item. The warranty period as described in 1.4.3.8.A applies.
- C. For all projects where assets will be dedicated to SJC, the warranty period, if applicable, begins at the date of final acceptance by the SJC BOCC.

1.4.3.9 Easement Documentation

- A. Prior to SJCUD providing service to the development, Developer shall execute a grant or grants of easement, in recordable form to be approved by SJCUD. The easement shall **not** be recorded by the Developer/Owner. The Developer shall provide all easement documentation to SJCUD for approval. Following SJCUD approval, it shall be the responsibility of SJCUD to forward the easement documentation to the Real Estate Department for approval and submission to the BOCC.
- B. The easement document shall be completed without modification and returned to SJCUD along with the appropriate Attachment(s). Each Attachment must have the full legal description or survey of the subject easement property(ies).
- C. No work installed whether or not it is in service shall be accepted for dedication by SJCUD until all necessary easements have been recorded.

1.4.3.10 Warranty Deed for Pump Station Sites

Prior to SJCUD providing service to the development, Developer shall execute a Special Warranty Deed for any pump station property where said pump station will be owned and maintained by SJCUD. Said document shall be executed and returned to SJCUD **unrecorded** for approval. After approval it will be sent to the Real Estate Division for submission to the BOCC for acceptance.

1.4.3.11 Final As-Built Drawings

As-built drawings shall be provided based on the following criteria:

- A. All engineering design drawings as released for construction and shall include all detail sheets and depict any deviations. Re-drafting for the purpose of as-built drawings will not be accepted unless specifically approved by SJCUD. As-built drawings shall match the approved plat.
- B. Each sheet must be labeled “AS-BUILT” in 1” high bold letters in the bottom right hand corner. The following dimensional references must be depicted on as-built drawings:
 1. Station Numbers with offsets.
 2. Ties.
 3. Lot Numbers.
 4. Street Names.
 5. North Arrow.
 6. Scale.
 7. Location, elevation and datum of the Benchmark used.
 8. Easements as shown on approved paving and drainage drawings.
- C. As-Built drawings must be prepared and certified by either a Florida Registered Land Surveyor or a Florida Professional Engineer, and his/her name, address, and registration number should be included on the drawings. The certification block to be placed on each drawing sheet is found in Part VI.
- D. Locations, elevations, sizes, types, and materials of the following must be accurately shown and labeled (as applicable) on the as-built drawings:
 1. Manholes (include specialty lining material, pipe invert, manhole rim and bottom elevations).
 2. Potable and reclaimed watermain and forcemain valves.
 3. Potable and reclaimed water and sewer services.
 4. Fire Hydrants and all associated structures.
 5. Fittings.
- E. All potable and reclaimed water and sewer mains must be identified on the as-built drawings by their size, material, and class/DR/SDR classification. Horizontal locations and top of pipe elevations must also be labeled every 100’.
- F. The requirements listed in the “SJC Development Services - As-Built Survey Requirements and Acceptance Procedures” will also apply.
- G. Electronic file requirements are listed on the documents titled “SJC Utility Department Electronic File Standards” and “SJC Utility Department Electronic File Submittal Form,” both of which are included in Part VI of this Manual. The Contractor must complete and comply with the Electronic File Submittal Form, which is to be submitted with the electronic as-built files.
- H. In addition to the electronic files, Contractor shall provide two (2) sets of signed and sealed "Water/Sewer/Reclaimed Water" blackline As-Built drawings.
- I. The As-Built Certification form, included in Section 1.5 must be completed by the project EOR.
- J. All new fire hydrant locations shall be identified based upon the Florida State Plane

Coordinate System. Submit an electronic file containing this data to the SJC Fire-Rescue Department.

- K. As-Built drawings for pump stations shall include the following:
 1. Wetwell size and location indicated and located to property lines and/or ROW lines.
 2. Elevations indicated at inverts, wetwell top and bottom, and at ground adjacent to wetwell.
 3. All types and sizes of lines and fittings.
 4. All schedules that show pump, motor, and electrical data are corrected to show the as-built condition.
 5. The following located within the pump station boundaries: water spigot and RPZ, wetwell, emergency pump-out, control panel, bends, fittings, manholes, generator and fuel tank, fence, and auxiliary electrical enclosures, as applicable.
- L. Utilities shall not be dedicated to SJC until Final as-built drawings are submitted.

1.4.3.12 Approval by Governmental Agencies

SJCUD's obligations are contingent upon Developer obtaining all necessary approvals for water, wastewater, and/or reuse systems from all concerned governmental agencies. Developer assumes the risk of loss as a result of the denial or withdrawal of the approval of any concerned governmental agency, or caused by an act of any governmental agency which affects the ability of SJCUD system to provide water, wastewater, and/or reclaimed water service to the Developer not within the sole control of SJCUD and which, by exercise of due diligence, it is unable to overcome.

1.4.3.13 Final Acceptance

Final acceptance by SJCUD of the completed County owned and/or operated water, wastewater, and/or reclaimed water system shall occur at such time as Developer has met all of the requirements of this Manual and all required engineering submittals have been completed and approved by SJCUD. The Final Acceptance Date will be the approval of acceptance by the BOCC.

1.4.3.14 Ownership and Dedication of Utilities

- A. Per Section 14 of SJCUD Ordinance, latest edition, as amended, all water, wastewater, and reclaimed water lines installed by the Developer and dedicated to the County as outlined in this Manual shall be the property of the County. Deeds transferring water, wastewater, and/or reclaimed water mains and appurtenances to the County or these utilities installed in County ROW may be approved by the BOCC, and shall be recorded in the County's official public records at the Developer's expense. As noted in Section 1.4.3.7.B., the Developer shall own, operate, and maintain utility infrastructure until successful dedication and Final Acceptance is approved by the BOCC.
- B. In circumstances where utilities are installed in private roadways in residential developments, an easement and restoration agreement will be required. The easement and restoration agreements will be provided by SJCUD.
- C. Utilities installed in all other developments, including but not limited to commercial and industrial developments that are privately owned, shall not be deeded to the County and will remain the property of that development. In such cases, all mains shall be clearly labeled, on as-built drawings, as private with "PW" for water, "PS" for sewer, and/or "PR" for reuse notation along each respective main. An ingress and egress easement shall be provided to the County for maintenance of serviceability of the water meters, boxes, and related appurtenances. The easement and restoration agreements will be provided by SJCUD.

- D. All pump station sites adjacent to County ROW shall be deeded fee simple to the County. All pump station sites in privately owned land that are dedicated to the County will be identified as separate tracts or parcels. The County will not accept partial sections of a system.
- E. Installation of water, sewer and reclaimed water facilities between individual lots is, generally, prohibited; but may be allowed if the criteria in Section 2.2.1C. are met. If accepted, such installation shall be provided in an exclusive, unencumbered easement as described in Section 2.2.1..., 2.10.1.C, or 2.12.1.

1.5 FORMS

[Water/Sewer Availability Request Form](#)

[1A - Pre-construction - Checklist](#)

[1B - Pre-construction - Meeting Agenda](#)

[1C - Pre-construction - Meeting Sign-in](#)

[2A - Construction Milestone Checklist](#)

[2B - Inspection Request](#)

[2C - Inspection – Wet Tap](#)

[2D - Inspection – Main Flushing](#)

[2E - Inspection – PVC and DI Pressure and Leakage Test](#)

[2F - Inspection – HDPE Pressure and Leakage Test](#)

[2G - Inspection – Pump Station Startup](#)

[2H - Inspection – Compaction-Gravity Sewer](#)

[2I - Inspection – Compaction-Pressure Pipe](#)

[2J - Inspection – Locate Wire](#)

[2K - Inspection – Walk-through Requirements](#)

[2L - Inspection – Walk-through Checklist](#)

[2M - Inspection – Warranty Checklist](#)

[2N - Inspection - Private Pump Station](#)

[2O - Affidavit - Private Pump Station](#)

3A – Interim Service Agreement

[3B - Close out – Backflow Preventer Certification](#)

[3C - Close out – Release of Lien](#)

[3D - Close out – Schedule of Values \(Excel\)](#)

[3E - Close out – Warranty](#)

[3F - Close out – Bill of Sale](#)

[3G - Close out – Electronic As-built Drawing Submittal](#)

[3H - Close out – As-built Drawing Certification](#)

[3I - Close out – Special Warranty Deed](#)

[3J - Close out – Easement \(Request from SJCUD Project Inspector\)](#)

- End of Part I -

PART II - DESIGN STANDARDS

2.1 POTABLE WATER BASIS OF DESIGN**2.1.1 Potable Water Design Flows**

Watermains and extensions shall be sized to accommodate the maximum day demand plus fire flow requirements or peak hour demands, whichever is greatest. An average daily demand as shown on Schedule A should be used for single-family and multi-family residential developments, respectively. For all residential developments using reclaimed water, the average daily potable water demand may be as shown on Schedule A. Average daily demand for commercial/industrial development shall be calculated by referencing the flow factors outlined in Schedule A. Maximum day and peak hour water flow rates shall be calculated by using peaking factors specific to the subject area when available. Maximum day and peak hour demand and method of computation shall be subject to review and approval by SJCUD.

2.1.2 Fire Flow

Fire flow requirements shall be determined in accordance with applicable Regulations, including, but not limited to, SJC LDC and/or the SJC Fire Department Codes. Where fire flow requirements exceed the anticipated available fire flow from the central water system, on-site fire protection system or other Fire Department approved mitigation measures shall be utilized. The County Fire Marshall's Office shall perform its own review.

2.1.3 Water System Pressure

A minimum residual pressure of 20 psi shall be maintained throughout the distribution system under all flow conditions. The system shall also meet the minimum level of service listed in the SJC Comprehensive Plan. Higher pressures may be required at commercial, industrial, or high-density residential areas.

2.1.4 Water System Design Calculations

- A. The Engineer must clearly state all design flows and pressure conditions and submit to the County signed, sealed, and dated design calculations that include the following:
 1. ERCs,
 2. Maximum Day Flow,
 3. Average Day Flow,
 4. Peak Hour Flow,
 5. Peaking Factors,
 6. Fire Flow Requirements,
 7. Nominal Pipe Size, Material, and Class
 8. Velocity (using SJCUD approved C factors), and
 9. Minimum Residual Pressure.
- B. All hydraulic calculations shall be based on a connection pressure provided by SJCUD at a set point along the existing system adjacent to the proposed development. All joints shall be designed to resist thrust through the use of restrained joint fittings. The pressure rating of the pipe shall be used as the design basis for thrust restraint. All joints shall be restrained for changes in directions, including tees, bends, valves and dead ends. The use of 90 degree bends shall be minimized and use of bends that are 45 degrees or less are preferred.
- C. Head losses through meters and backflow devices shall also be included in calculations. For residential and commercial developments that have over 100 ERC's, the Engineer will be required to provide a computer generated hydraulic model. All water model calculations shall be presented in tabular format indicating system pressure, demand

nodes and other pertinent information on a plot that is clearly legible. All nodes shall be annotated to identify water demand. Both Peak Hour and Max Day plus Fire Flow scenarios shall be presented.

2.2 POTABLE AND RECLAIMED WATER SYSTEM DESIGN CRITERIA

2.2.1 Location of Potable and Reclaimed Watermains

- A. Mains are required to be located in grass areas between the edge of pavement and the ROW line. However, if circumstances are not compatible for such installation, a minimum 5' utility easement adjacent to the ROW shall be provided. Water mains shall not be placed in the bottom of a ditch.
- B. Mains under sidewalks and/or multi-use paths may be allowed if the following criteria are met:
 1. PVC and HDPE pipe shall have the DR rating as outlined in Section 3.6.2 and 3.6.3, and
 2. Taps are generally not allowed on pipe under sidewalks and multi-use paths, limited exceptions may be granted upon request in cases of special right of way conditions or conflicts.
- C. Pavement crossing shall be accomplished using restrained joint PVC or DI pipe within a casing as shown in Plate G-5, Casing Detail or DR11 HDPE or DR18 FPVC pipe with fused joints and no casing. The HDPE pipe shall be upsized appropriately to match or exceed the DR18 PVC pipe internal diameter. FPVC pipe shall only be used to cross roadways designated "Local" by SJC PW. Installation of FPVC shall be limited to straight runs (horizontally and vertically) and the road crossing only. Installation of DI pipe shall be limited to potable and reclaimed water.
- D. Mains shall be located in dedicated ROW or utility easements. When installed in ROW, mains shall maintain a consistent alignment with respect to the centerline of the road.
- E. All mains located outside of dedicated ROW shall require a minimum 20' easement.
- F. Mains shall not, generally, be located in between properties in residential subdivisions unless specifically pre-approved by SJCUD. For mains to be approved to be installed between lots, the following criteria must be met:
 1. a minimum 20' wide, unencumbered easement is provided between the lots for a single pressure utility and all joints in the easement shall be restrained,
 2. for each additional pressure utility, the FDEP preferred distance between utility types shall be provided plus an additional 10' beyond the outermost main on either side and all joints in the easement shall be restrained,
 3. additional width for gravity sewer shall be provided based on the formula $2 * (\text{Depth} - 4) + 4 + 5$, and
 4. pressure pipe shall be color-coded, DR18 PVC with restrained joints, FPVC, or appropriately sized DR11 HDPE.
- G. Additional technical requirements including additional easement widths may be necessary due to pipe size, depth of cover requirements, adjacent utilities, or as additional site conditions warrant.
- H. Mains shall not be placed on private property unless sufficient easements are provided for operation and maintenance.
- I. Mains shall not be placed in the bank of or under retention ponds or other structures as described in Section 2.10.3.
- J. Pressure pipe joints shall be restrained as described in Section 3.9.
- K. Other utilities such as telephone and cable may co-locate in the above described easement as long as their specific location is documented. Electric, gas, and drainage shall secure a

separate easement.

2.2.2 Watermain Separation Requirements

- A. The contractor shall install all mains and meet separation requirements that are in accordance with the requirements of Chapters [62-555.314](#), F.A.C., [62-604.400](#), F.A.C., [62-610.469](#), F.A.C., as well as the FDEP interpretation to make the reuse separations consistent with the water separations. The contractor shall notify SJCUD in any instance where these requirements cannot be met prior to installation of pipe.
- B. Horizontal Separation
1. At least 3' outside of the watermain to the outside of any existing or proposed gravity or pressure storm sewer or reclaimed watermain. Where the crown of the watermain is more than 1' below the crown of the adjacent stormwater pipe, the horizontal distance between the two pipes is increased 2' for every additional 1' depth of bury below the minimum depth of bury of the watermain described in Section 2.2.10. (Example: Watermain has 5' of cover. Stormwater has 3' of cover and the crown is 2' above the watermain. A 1' difference is allowed. The additional 1' of depth requires an additional 2' of horizontal distance; equaling 5'.)
 2. At least 3' and preferably 10' outside of the watermain to the outside of any existing or proposed vacuum-type sanitary sewer.
 3. At least 6' and preferably 10' outside of the watermain to the outside of any existing or proposed gravity pressure sewer main. The minimum horizontal separation distance between watermains and gravity sewers shall be reduced to 3' where the bottom of the watermain is laid at least 6" above the top of the sewer.
 4. At least 10' outside of the watermain and all parts of any existing or proposed "on-site sewage treatment and disposal system" as defined in Section 381.0065(2), F.S., and Rule 64E-6.002, F.A.C.
- C. Vertical Separation
1. The outside of the watermain is at least 6" and preferably 12" above or at least 12" below the outside of any existing or proposed gravity, vacuum, or pressure wastewater, stormwater, or reclaimed water main. It is preferable to lay the watermain above other pipes.
 2. At the utility crossings described above, one full length of watermain pipe shall be centered above or below the other pipeline so the watermain joints will be as far as possible from the other pipeline.
- D. For new development sites, watermains shall not pass through, or come into contact with, any part of a sewer or stormwater manhole. Conflict manholes may be allowed for existing infrastructure if other technical, not financial, options are not available.
- E. Fire Hydrants - New or relocated fire hydrants with underground drains shall be located so that the drains are at least 3' from any existing or proposed storm sewer, stormwater force main, or pipeline conveying reclaimed water regulated under Part III of Chapter 62-610, F.A.C.; at least 3', and preferably 10', from any existing or proposed vacuum-type sanitary sewer; at least 6', and preferably 10', from any existing or proposed gravity- or pressure-type sanitary sewer, wastewater force main, or pipeline conveying reclaimed water not regulated under Part III of Chapter 62-610, F.A.C.; and at least 10' from any existing or proposed "on-site sewage treatment and disposal system" as defined in Section 381.0065(2), F.S., and Rule 64E-6.002, F.A.C.

2.2.3 Set Back Limits for Potable and Reclaimed Watermains

- A. Landscaping - No mains shall be constructed within 7.5' horizontal of existing or

proposed planted landscaped areas unless specifically approved by SJCUD. No mains shall be constructed within the Protected Area of a Protected Tree which is the tree's dripline as specified in the SJC LDC Section 4.01.05, specifically Paragraph G, unless specifically approved by the SJC Administrator.

- B. Easements - No mains shall be constructed within 5' horizontal of an existing or proposed easement and/or tract line unless specifically approved by SJCUD.
- C. Structures - No mains shall be constructed within 5' horizontal of any existing or proposed above ground structures or drainage structures, unless specifically approved by SJCUD.
- D. Deeper Mains - For mains deeper than 5', the horizontal distance between the utility and the landscaped area shall be based on the depth of the pipe invert rounded to the next nearest foot. For example, if the pipe invert is 8.5' below grade, the minimum horizontal distance to the landscaped area, easement line, or structure shall be 9'.

2.2.4 Potable and Reclaimed Watermain Materials

Only the pipe diameters (in inches), materials, and pressure classes as shown in Section 3.6 shall be allowed. These diameters and associated fittings and valves shall be ductile iron pipe size. Mains that are 2" shall be SDR9 HDPE copper tube size (CTS). Other pipe sizes *may* be approved for private systems. If HDPE pipe is used, the nominal pipe size will be larger so the internal diameter (ID) of HDPE pipe shall be equal to or greater than the ID of the required PVC pipe. This will usually require the pipe diameter to be the next larger approved pipe diameter. All water and reclaimed watermain materials must be identified with blue and purple markings, respectively.

2.2.5 Potable and Reclaimed Watermain Velocity

Maximum velocity for maximum day, non-fire flow conditions shall not exceed 8 feet per second. Maximum velocity for maximum day plus fire flow conditions for the potable water system shall not exceed 10 feet per second.

2.2.6 Potable and Reclaimed Watermain Friction Loss Factors

Friction losses through potable and reclaimed watermains shall be based on the Hazen-Williams formula. The design value for the Hazen-Williams friction loss constant (C) shall be 120 for DI, PVC, FPVC, and HDPE pipe.

2.2.7 Fire Hydrants

- A. As a minimum, specifications outlined in the latest edition of SJC LDC and applicable SJC Fire Department Codes, whichever is more stringent, shall apply. Hydrants shall be placed in accordance with SJC LDC Part 6.03.00, typically at a maximum of 660 foot intervals (or as amended in the Fire Department Codes).
- B. Fire hydrants shall be located:
 1. in easily visible and accessible locations
 2. a minimum one foot away from ROW/property line
 3. outside the clear zone as established by FDOT standards
 4. adjacent to lot corners, whenever possible,
 5. more than 5' from driveways and fences,
 6. outside swales/ditches,
 7. 3' to 5' from the back of curb,
 8. at least 100' from street intersections, and
 9. to minimize vulnerability to traffic.

- C. If hydrants are located on the backside of swales or ditches, access across the swale must be provided using RCP culvert with a minimum 10' wide stabilized driveway.
- D. Fire hydrants shall conform to the latest AWWA specifications C502 and shall be of the traffic-model type. The hydrant branch shall be 6" in diameter and have a 6" isolation gate valve on the branch as close as possible and restrained to the main.
- E. Fire hydrants shall be placed such that the largest opening is directed towards the street or parking area for accessibility.
- F. Hydrants shall be furnished with a breakaway feature that will break cleanly upon impact.
- G. In commercial/industrial districts, hydrants shall be installed on a minimum 8" main and hydrants in residential districts installed on a minimum 6" main. The maximum length of a 6" dead end watermain with one (1) fire hydrant shall be 600'.
- H. Each fire hydrant shall be capable of delivering a flow required per the LDC or SJC Fire Department Codes with a residual pressure of not less than 20 psi.

2.2.8 Potable and Reclaimed Looping and Dead Ends

- A. For system reliability and to minimize the number of people affected by a system shutdown, potable or reclaimed water systems shall be looped wherever practical.
- B. Mains of 8" diameter or greater shall be designed to "stub out" to the project boundaries to serve adjacent unserved properties. This shall include mains in all ROW stubs, across the entire project frontage on existing roads without existing mains, and to the property boundary via easement providing point(s) of new connection(s) for the adjacent unserved properties.
- C. The restriction on single-feed (dead end) lines is intended to maintain water quality by eliminating stagnant zones within the distribution system, and provide more consistent water pressure (characteristic of looped systems). When single-feed lines are used, they shall be provided with a flushing hydrant at the terminus.

2.2.9 Potable and Reclaimed Water Valves

- A. Sufficient valves shall be provided on mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located at not more than 500-foot intervals in commercial, industrial, and high-density residential developments and at not more than 800-foot intervals in other areas. Appropriate valving shall also be provided at all areas where mains intersect to ensure effective isolation of mains for repair, maintenance, or future extension. Valves shall not be installed in pavement unless specifically approved by SJCUD. Installation of valves close to fire hydrants is preferred.
- B. Valves shall be installed on all watermain branches as follows: two directions on a tee and three directions on a cross.
- C. Valves shall be installed 20-40' from the terminus of a main extension. Joint restraints shall be installed as needed.
- D. All valve covers shall be surrounded by a poured in place concrete pad.
- E. Valves shall be installed vertically unless pre-approved by SJCUD. The pressure main shall be installed with sufficient cover to protect the valve.

2.2.10 Potable and Reclaimed Watermain Cover

For watermains equal to or less than 12", the minimum and maximum cover shall be 30" and 36", respectively, in unpaved areas and 36" and 42", respectively, in paved areas. For watermains 16" and greater, the minimum and maximum cover shall be 42" and 54", respectively, in unpaved and paved areas. Cover requirements may change as required

within FDOT or railroad ROW. Exceptions may be made for conflicts. Additional depth may be required for the installation of valves. The EOR is responsible for ensuring adequate depth is provided.

2.2.11 Surface Water Crossings for Potable and Reclaimed Watermains

Surface water crossings are, generally, not acceptable. All mains crossing any type of water body, wetland, pond, or ditch shall be pre-approved by SJCUD before final plans are prepared.

- A. Above Grade – Proposed pipelines must be adequately supported on an acceptable foundation/support. Pipe material for potable and reclaimed water shall be Class 53 ductile iron or welded, SCH80, 316SS. Pipe material for forcemains shall be welded, SCH80, 316SS. The DI or SS pipe shall start at least 5’ below grade. Plans must be signed and sealed by an Engineer registered in the State of Florida. The installation must be protected from damage and must be accessible for repair or replacement. Valves shall be placed at both ends of the crossing at the normal main depth, so that section of main can be isolated. A combination air release/vacuum valve and crossing guards shall be provided. All above grade ductile iron piping shall be painted in accordance with [Chapter 62-555.320 F.A.C.](#)
- B. Below Grade
 1. Sub-aqueous pipe crossings shall be HDDed using material as specified in Section 3.6.4 and shall be at least 10’ below the bottom of the water body or deeper based on the geotechnical borings collected at the beginning, middle, and end of the proposed HDD. The HDD shall be at least 20’ below the bottom of the water body if no geotechnical investigation is conducted. In cases where the crossing is greater than 1,000’, a steel casing may be provided and HDPE may be used as the carrier pipe.
 2. Valves shall be installed at each end of the sub-aqueous crossing to isolate the sub-aqueous section of the main.
- C. Other Requirements
 1. It shall be the responsibility of the Developer to obtain all applicable regulatory permits. When the aerial crossing is accomplished by attachment to a bridge or drainage structure, the Developer shall meet all requirements of the Agencies who own or have jurisdiction over the structures.
 2. For aerial stream crossings, impact of flood waters and debris shall be considered. The bottom of the pipe shall be at least 1’ above the 100 year flood elevation.
 3. Expansion joints shall be provided between the aerial and buried sections of the pipe. Appropriate guards shall be installed at both ends of the crossing to prevent pipe access to the public.
 4. Sub-aqueous crossings shall be clearly marked by permanent warning signs placed on the banks of canals, streams, and rivers clearly identifying the nature and location (including depths below design or natural bottom) of the crossings. Crossings of lakes, bays and other large bodies of water shall be similarly identified at the shore and, with suitably fixed signs, in any area where anchoring may normally be expected. Signs shall have characteristics compatible with surrounding land use, while serving the intended purpose.
 5. Specifications shall be as provided in Part III of this manual.
 6. Mains shall be color identified: BLUE-Potable Water, GREEN-Sewer, and PURPLE-Reclaimed Water.

2.2.12 Roadway Crossings for Potable and Reclaimed Watermains

Pressure mains crossing County and State roadways shall be bore and jacked or HDDed in accordance with [FDOT Utility Accommodation Manual](#) and FDOT Standard Specifications.

2.2.13 Potable and Reclaimed Water Air Release Valves

At high points in potable and reclaimed watermains where air can accumulate and restrict flow, provisions shall be made to remove the air. This shall be accomplished in distribution systems by use of strategically placed automatic air release valves. Automatic air release valves shall not be used in situations where flooding of the valve or valve box may occur. The open end of an air release pipe from automatic valves shall be extended to at least 1' above grade and be provided with a screened, downward-facing elbow or as otherwise indicated by SJCUD.

2.2.14 Chamber Drainage

Chambers, valve boxes, pits, manholes containing valves, air release valves, blow-offs, meters, or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer.

2.2.15 Disinfection Following Repair or Replacement

Any potable water system that has been out of service for repair, alteration, or replacement shall be disinfected as outlined in [Chapter 62-555.340, FAC](#).

2.2.16 Existing Potable and Reclaimed Watermains

- A. All existing mains in County ROW that fall under pavement or are not directly accessible due to proposed roads, sidewalks, structures, additions, or modifications will be required to be relocated and installed as new mains meeting requirements of this manual.
- B. All main relocations shall be implemented with minimal interruption of service. Construction that requires interruption of service shall be planned and scheduled at low peak demand hours or as approved by SJCUD.
- C. In cases where transmission mains are required to be relocated, interruptions in service may not be viable. The use of line stops or similar technology may be required to facilitate transferring of service to a relocated main and the corresponding abandonment of the existing main being replaced.

2.2.17 Transmission Mains versus Distribution Mains

- A. Transmission mains are major mains that transmit potable or reclaimed water to the distribution mains and are typically capable of supplying over 2,000 gpm as verified by SJCUD. Most transmission mains have a diameter of 16" or greater. Transmission mains are generally located along the major corridors within the county and are regionally significant within the Utility Service Area. The required size of transmission mains shall be determined by SJCUD in conjunction with the Master Water Plan. Transmission main sizing will be established for the benefit of the County as a whole, not based on individual development needs. Per section 25 of SJCUD Ordinance and as amended; all transmission mains are eligible for reimbursement. Details of the refund agreement are provided in the Ordinance. Service connections smaller than 4" are prohibited on transmission mains. Exceptions will be made on a case by case basis. A parallel distribution main shall be installed to accommodate service connections.
- B. Distribution mains supply potable and reclaimed water service to one or more developments, and are capable of supplying up to 2,000 gpm as verified by SJCUD.

Most of the distribution main diameters are 12" or less. Distribution mains are not eligible for reimbursement agreements.

2.3 POTABLE AND RECLAIMED WATER SERVICES AND CONNECTIONS

- A. Pipe materials, fittings, joints, inspections and testing shall conform to the applicable provisions of this section and the Standard Drawings. Only 1", 1-1/2", 2", 4", 6", 8", 10", and 12" services will be permitted. Where water services greater than 12" are required, dual services shall be provided. All potable or reclaimed water services and connections made to SJCUD system, either existing or new, shall be made only after approval by SJCUD and after payment of applicable fees and charges. All taps and connections shall be inspected by SJCUD.
- B. Individual service taps, smaller than 4", shall not be placed within 36" of another tap, joint, and/or appurtenance. An individual service tap shall be constructed with an approved saddle or sleeve and corporation stop. Services shall not exceed 100' in length to the meter with the meter generally placed at the property line at an accessible location.
- C. A maximum of five (5) services are allowed on a 2" watermain.
- D. A maximum of three (3) services are allowed on a 2" reclaimed watermain.
- E. Services shall have a minimum 30" of cover. Proper sizing of non-residential meters and services is the responsibility of the Developer's Engineer subject to SJCUD approval. Dual metering of a single building service (i.e. two, 1" meters instead of one, 2" meter) shall not be permitted. Potable and reclaimed water services, where required, shall be provided to each lot, building or parcel requiring a separate meter. The services shall be smaller than the main size that they are connecting to. Refer to section 2.6.3 for backflow prevention devices for private property where reclaimed water is available.

2.4 POTABLE AND RECLAIMED WATER METERING

All service connections shall be metered. The method of metering shall follow the guidelines listed below. However, the Developer's Engineer shall obtain approval from SJCUD before finalizing the design of the metering system. Meter boxes shall not be located within driveways or sidewalks unless specifically approved by SJCUD prior to installation.

2.4.1 Potable and Reclaimed Water Meter Sizing

The Developer shall determine the size of all meters. The Developer's Engineer shall provide sufficient information on estimated peak flows and minimum flows in order that meter size can be determined. The Developer's Engineer shall include head losses through the metering device when designing the water system. Meter bypasses shall be required for meter sizes 3" and greater.

2.4.2 Meters for Single Family Developments with Private ROW

Single family developments such as townhomes or condominiums shall be individually metered. The private streets shall be designed to County Standards and easements and restoration agreements are dedicated over the entire private street common areas. In addition, sufficient area shall be available outside of paved areas to locate mains, services, and meters.

2.4.3 Meters for Multi-Family Residential and Commercial Developments with Private ROW

- A. Multi-family, commercial, industrial, and/or government developments may provide dual systems for service (separate domestic and fire line). Private potable systems shall be metered by a single meter and shall require installation of a reduced pressure zone (RPZ)

backflow prevention device. Private fire systems shall at a minimum utilize the installation of a Dual Check Detector Assembly (DCDA) back flow device to isolate the fire line from the public water system. Meters shall be located in the public ROW at the ROW line, or in appropriate SJCUD approved meter easements. Private systems may independently sub-meter users as they deem necessary.

- B. When site conditions prohibit meters from being located in the public right of way, meters may be located in an easement and should be located as reasonably close to the public right of way as possible. Typical easements for meter access and maintenance in private ROWs should include ingress and egress easements to the meter location and sufficiently sized (5' x 5' to 10' x 10' depending on the meter size) restoration easement around the individual meter. Utility mains within private property in such instances will remain private.

2.4.4 Water Meter Installation in Public ROW

- A. All meters shall be installed underground in an approved meter box. Meters shall be located within the public ROW or in an easement located adjacent to the public ROW, as approved by SJCUD.
- B. Potable water meter boxes shall have black bodies and blue lids. Reclaimed water meter boxes and lids shall be purple.
- C. A separate meter attached to the potable water system for irrigation is, typically, prohibited.

2.4.5 Meter Installation

Meters which are larger than 2" in diameter shall be installed by the Developer. Meters which are 2" in diameter or smaller shall be installed by SJCUD. Meters shall be installed underground in an approved meter box. Meters 3" or larger shall be located in an easement located adjacent to but outside of the public ROW per the standard drawings.

2.5 MAIN LOCATION AND IDENTIFICATION

A means for locating and identifying all watermains and valves shall be provided in accordance with Section 3.4.7 and the details of Part V of this manual.

2.6 CROSS CONNECTION CONTROL

To protect the potable water supply system from contamination due to cross connections, the Developer shall install approved backflow prevention devices where there is the potential of a non-potable substance coming into contact with the public water system. The types of backflow prevention devices shall be in accordance with SJCUD Manual for Cross-Connection Control and Backflow Prevention and be located as indicated on the drawings.

2.6.1 Backflow Prevention for Commercial, Industrial, and Multi-Family

All commercial, industrial, and multi-family residential projects shall require installation of a reduced pressure backflow preventer assembly. All projects with fire sprinkler and standpipe systems, and projects with yard on-site fire protection systems shall be required to install an appropriate backflow preventer device as defined in SJCUD Manual for Cross-Connection Control and Backflow Prevention.

2.6.2 Backflow Prevention for Irrigation Systems

An atmospheric vacuum breaker, a pressure vacuum breaker assembly, or a reduced pressure principle backflow prevention assembly shall be required on all irrigation systems. Irrigation

systems that have chemical agents or additives shall install a reduced pressure backflow prevention assembly. Installations shall be in compliance with F.A.C. 62-555.360 and Florida Building Code, and subsequent revisions thereof.

2.7 PRESSURE PIPE RESTRAINTS AND CONNECTIONS

2.7.1 Pressure Pipe Restraints

Pressure mains shall be restrained at all valves, bends, tees, crosses and dead ends for distances specified in Plate G-4 unless a table is provided by the EOR. The EOR shall design the pipe restraint distance in accordance with the specific conditions or circumstances on each pipeline design project. Determination of distances shall occur during design and be specified on the construction drawings by means of a restrained joint schedule, which is to be located in the details section of the construction plans. The use of concrete thrust blocks and tie rods is prohibited unless pre-approved by SJCUD. Restraint devices must be approved by SJCUD prior to installation.

2.7.2 Connections

- A. All new connections to and transfer of services within SJCUD utility systems shall be performed by a Florida Licensed Master Plumber or Florida Licensed Underground Utility Contractor and be inspected by SJCUD personnel.
- B. All connections to existing SJCUD mains shall be made by the Contractor only after the connection procedure and his work scheduling has been reviewed and approved by SJCUD. The Contractor shall submit a written request to SJCUD a minimum of five (5) business days prior to scheduling said connections. The request shall outline the following:
 1. Points of Connection, fittings to be used, and method of flushing and disinfection.
 2. Estimated construction time for the connections.
- C. SJCUD shall review the submittal within three (3) business days after receiving it and inform the Contractor regarding approval or denial of the request. If the request is rejected by SJCUD, the Contractor shall resubmit the request modifying it in a manner acceptable to SJCUD.
- D. All connections shall be made on the agreed upon date and time. If the connection work is not initiated and completed in the agreed upon manner, the Contractor shall be required to reschedule the connection by following the procedure outlined above.
- E. Only SJCUD personnel shall operate system valves.
- F. Pressure connections of 4" or larger shall be performed using a tapping sleeve and valve and must have a minimum separation of 5' along the main being tapped from either the nearest pipe joint or other 4" or larger tap. No more than two 4" or larger taps shall be made on any 20' length of pipe.
- G. Tap sizes shall be as outlined in Section 3.10.1.H.
- H. All water service connections (new and taps into existing mains) shall have a brass corporation stop at the main and connected directly into the tapping sleeve. All small diameter taps (2" and smaller) on watermains 6" and larger must have a minimum separation of 36" along the main being tapped from the nearest pipe joint or tap. Small diameter taps on 4" diameter mains or smaller must maintain a 5' separation from pipe joints or other taps. In no case shall there be more than three (3) taps total along any 20' length of watermain.

2.8 WATER SUPPLY, TREATMENT, AND PUMPING FACILITIES

If a new water treatment facility is required for a project, coordinate with SJCUD staff to

ensure correct specifications are followed for design.

2.9 FORCEMAIN BASIS OF DESIGN

2.9.1 Forcemain System Design Period

Forcemain systems shall be designed for the estimated ultimate contributing population, as applied to the development. For transmission corridors, forcemains shall be designed for projected flow in the corridor and should be coordinated with SJCUD and is as delineated in the approved SJCUD Wastewater Master Plan (latest edition), over a 25-year minimum period.

1.9.2 Wastewater Design Flows

- A. Average daily flow (ADF) for residential, commercial, and industrial development shall be calculated by referencing the flow factors outlined in Schedule A of SJCUD Utility Ordinance and as amended.
- B. Peak hour flows (PHF or Q_{PEAK}) shall be calculated using Table 2.9-1 or the “population formula” (Peak factor = $(18 + \sqrt{\text{population in 1,000s}}) / (4 + \sqrt{\text{population in 1,000s}})$) as presented in Ten States Standard for Wastewater Facilities, Section 11.243.
- C. Peak flows shall be based on the flows discharged by the respective pump stations as indicated from design calculations or as shown on sewer system hydraulic models.
- D. Flows for transmission mains shall be coordinated with SJCUD and as supported by hydraulic modeling results.

Table 2.9-1: Peak Flow Factors based on Flow (One Pump Station)

Design ADF (GPD)	Minimum Peaking Factor
Flows to 100,000	4.0
100,000 to 250,000	3.5
250,000 to 1,000,000	3.0
Flows greater than 1,000,000	2.5

2.9.3 Forcemain System Design Calculations

- A. Developer shall submit design calculations with the plans for all forcemain projects. Calculations shall show that forcemains shall have sufficient hydraulic capacity to transport all design flows. Calculations shall meet the requirements of [Chapter 62-604, F.A.C.](#) or Ten State Standards, whichever is more restrictive.
- B. All joints shall be designed to resist thrust through the use of restrained joint fittings. The pressure rating of the pipe shall be used as the design basis for thrust restraint. All joints shall be restrained for changes in directions, including tees, bends, valves and dead ends. 90 degree bends shall be minimized and use of bends that are 45 degrees or less is preferred.

2.10 FORCEMAIN SYSTEM DESIGN CRITERIA

2.10.1 Forcemain Location

Forcemains shall be located as described in Section 2.2.1.

2.10.2 Forcemain Separation Requirements

Horizontal and vertical separations for new forcemain construction shall be in accordance with Section 2.2.2.

2.10.3 Forcemain Set Back Limits

A. Set back limits shall be as described in Section 2.2.3.

2.10.4 Forcemain Materials

Only the pipe diameters (in inches) and pressure classes as shown in Section 3.6 are approved. These diameters of pipe, fittings, and valves shall be ductile iron pipe size. Pipe materials for forcemains shall be PVC, HDPE, or FPVC depending on the location, use, size and approval by SJCUD. If HDPE pipe is used, the nominal pipe size will be larger so the internal diameter (ID) of the HDPE pipe shall be equal to or greater than the ID of the required PVC pipe. This will usually require the pipe diameter to be the next larger diameter in the approved list of sizes. In certain cases where flow dictates, 2" SDR9 HDPE copper tube size (CTS) forcemains may be utilized. All forcemain materials must be identified with green markings. The minimum nominal diameter for forcemains dedicated to SJCUD shall be 2". Private forcemains may be 3" SDR9 HDPE iron pipe size (IPS).

2.10.5 Forcemain Velocity

At design pumping rates, a minimum cleansing velocity of 2.0 feet per second (2.5 fps preferred) shall be maintained. Maximum velocity shall not exceed 8 feet per second based on Section 49.1 of Ten States Standards.

2.10.6 Forcemain Minimum Cover

See Section 2.2.10 of this manual. Exceptions may be made for conflicts.

2.10.7 Forcemain Friction Loss Factors

The friction loss factor shall be as described in Section 2.2.6.

2.10.8 Forcemain Design Pressure

The forcemain and fittings, including all restrained joint fittings, shall be designed to withstand working pressures of 100 psi. Operational pressure shall typically be limited to 60 psi.

2.10.9 Forcemain Termination

Discharge of forcemains to manholes is, generally, prohibited. Forcemains shall not connect directly into a gravity sewer line. All forcemains shall be required to be manifolded. Variations to this rule may be allowed on a case by case basis. If approved by SJCUD, forcemains may terminate at a receiving manhole located within a pump station site; but the receiving manhole must be lined. Forcemains shall enter the gravity sewer system through a receiving manhole at a point where the bottom of the forcemain is not more than 1' above the flow line of the receiving manhole. Odor control systems may be required in these cases.

2.10.10 Forcemain Air Release and Vacuum Relief Valves

Air release valves, or combination air release and vacuum relief valves, shall be provided, as necessary, to prevent air locking and vacuum formation. All such valves shall be clearly delineated on the forcemain profile on the drawings. Forcemains shall be designed to reduce or minimize high points. However, at a minimum, air release valves shall be provided on all forcemain high points and when changes in elevation are 2' or greater.

2.10.11 Wastewater Valves

Sufficient valves shall be provided on forcemain systems to facilitate effective isolation of

the pipe system for repairs, maintenance, or future extension. On straight runs of forcemain, valve spacing shall not exceed 1,000'. Additional valves shall be provided where forcemains intersect to facilitate isolation of pipe segments. Valves shall not be installed in pavement unless specifically approved by SJCUD. Valves shall be installed on all forcemain branches as follows: two directions on a tee and three directions on a cross.

2.10.12 Locating and Identifying Forcemains

A means for locating and identifying all forcemains and valves shall be provided in accordance with the Section 3.4.7.

2.10.13 Additional Requirements for Forcemain System Design

The design of forcemain systems shall consider potential future pump station connections. This requirement shall be reviewed with SJCUD prior to finalization of the design.

2.10.14 Surface Water Crossings for Forcemains

If pre-approved by SJCUD, Sections 2.2.11 and 3.5.3 of this manual shall apply. In addition, forcemains which are to cross above waterbodies must be adequately supported on an acceptable foundation/support. The pipe material for above-grade forcemains shall be welded, SCH80, 316SS and shall start and end at least 5' below grade.

2.10.15 Existing Forcemains

A. Mains shall be as described in Section 2.2.1.

2.10.16 Pipe Restraints & Connections

Pipe and fitting restraints and connections shall be as described in Section 2.3 and 2.7. All connections to existing facilities shall be made in accordance with Sections 3.4 and 3.5 of this manual.

2.10.17 Transmission Mains versus Collection Mains

- A. Collection mains collect wastewater from one or more developments and carry less than 2,000 gpm as verified by SJCUD. Most of the collection mains have a diameter of 12" or less. Transmission mains are major mains that collect wastewater from the collection mains and are capable of carrying more than 2,000 gpm as verified by SJCUD to be regionally significant to the service area. Most transmission mains have a diameter of 16" or greater.
- B. All transmission mains installed by a Developer will be required to be sized as indicated on the Utility Wastewater Master Plan or as directed by SJCUD. Per section 25 of SJCUD Utility Ordinance and as amended; all transmission mains are eligible for reimbursement. Details of the refund agreement are provided in the Ordinance.

2.11 GRAVITY SEWER BASIS OF DESIGN

- A. Sewage collection systems and system extensions shall be designed as separate systems to accommodate the conveyance of wastewater. The system shall be designed to prevent the introduction of precipitation, runoff, and ground water into the system.
- B. Gravity sewer is the preferred method for wastewater collection, and exceptions may be made for other systems on a case by case basis. Low pressure will only be accepted if site-specific conditions, such as geology and high groundwater, make gravity sewer infeasible.

2.11.1 Wastewater Design Flow

See Section 2.9.2 of this manual.

2.11.2 Gravity Sewer Design Calculations

Developer shall submit design calculations with the plans for all gravity sewer main projects. Calculations shall show that gravity sewer mains shall have sufficient hydraulic capacity to transport all design flows. Calculations shall meet the requirements of Chapter 62-604, F.A.C. or Ten State Standards, whichever is more restrictive.

2.12 GRAVITY SEWER DESIGN CRITERIA**2.12.1 Gravity Sewer Location**

- A. Gravity mains shall be located in dedicated ROW, utility easements, and/or tracts and shall maintain a consistent alignment with respect to the centerline of the road.
- B. Gravity sewer located outside of dedicated ROW, within 20' of the outside top of bank of, under the normal high water level of, or under retention ponds or other structures, or in between properties in residential subdivisions shall be in an exclusive, unencumbered easement with a minimum width of $4 + 2x(D - 4) + 5$, in feet, rounded up to the nearest foot, where D is the depth of the deepest part of the pipe. Additional easement widths shall be provided when the pipe size, depth of cover, or soil conditions dictate. Minimum easement width shall be 30'. Additional width is required if other utilities are present in the same corridor as described in Sections 2.2.1.F. and 2.10.1.G. Maximum depths as found in Section 2.12.4 apply here.
- C. Gravity mains proposed along or across roads designated "collector" or "arterial" as designated by SJC or any maintained by FDOT, must be reviewed and pre-approved by SJCUD, and approvals shall consider conditions to allow reasonable access for maintenance and repairs, and mitigate severe impacts to traffic and vehicular access. Segments of the system that are approved in these areas shall not have service laterals nor be deeper than 15'.
- D. Gravity mains in roads that cross wetlands or any water body, especially roads that provide the only emergency services ingress/egress to homes or businesses may be allowed if the following criteria are met:
 1. The gravity sewer is designed to be offset into one travel lane so that at least one travel lane is not impacted by repair efforts.
 2. A manhole shall be placed on the upstream and downstream side of the proposed crossing to limit potential repair to pipe only.
 3. Pipe shall be DR18 PVC.
 4. The minimum width of the utility corridor (ROW from the road centerline plus utility easement) shall be 30' which provides for the trench to be open cut and allows space for placing spoils.

2.12.2 Gravity Sewer Pipe Separation Requirements

Horizontal and vertical separations for new gravity sewer pipe construction shall be in accordance with Section 2.2.2 of this manual.

2.12.3 Gravity Sewer Pipe Size and Material

- A. All gravity sewer mains shall be at least 8" in diameter SDR26 PVC.
- B. Gravity sewer in designated locations shall be DR18 PVC with restrained joints.

2.12.4 Gravity Sewer Cover and Depth

- A. Minimum cover over gravity sewers and all laterals shall be 3' below the finished grade. Variations to this requirement may be made for a short length of pipe where structural considerations are incorporated into the design and pre-approved by SJCUD.
- B. The maximum manhole depth (rim or top to lowest invert elevation) is 18' and no laterals are allowed deeper than 15'. Variations to this requirement may be accommodated if access, life safety, and long term maintenance concerns can be reasonably addressed and shall be pre-approved by SJCUD.

2.12.5 Minimum Slope and Pipe Velocities

- A. All sewers shall be designed and constructed to give minimum velocities, when flowing full, of 2 fps, and a maximum of 4 fps. Velocity calculations shall be based on Manning's formula, using an "n" of 0.012 for PVC. Minimum slope shall be as specified in Table 2.12-1 which is shown in Ten State Standards for Wastewater Facilities, Section 33.41:

Table 2.12-1: Minimum Slope for Gravity Sewer

Sewer Size [inches]	Minimum Design Slope [feet per 100 feet of pipe]	Min/Max Built Slope [feet per 100 feet of pipe]
6 (Lateral only)	1.000	
8	0.400	0.360/0.440
10	0.280	0.260/0.300
12	0.220	0.210/0.230
15	0.150	0.140/0.160
18	0.120	0.110/0.130
21	0.110	0.100/0.120
24	0.080	0.070/0.090

- B. Gravity sewer mains shall be installed with uniform slope between manholes. Slope changes shall not occur between manholes.
- C. The constructed slope for 8" through 12" gravity sewer shall not deviate from the design to be outside of the Minimum/Maximum Range that is shown in Table 2.12-1. If the slope is found to deviate from this allowable range, the EOR shall evaluate the installation and provide adjustment recommendations or prove that the installation is sufficient.
- D. Pipe sizes shall not be increased to reduce slope unless warranted due to flow. An 8" gravity sewer at 0.4% can hydraulically carry 300-350 ERCs.

2.12.6 Sewer Extensions

Sewer extensions for future connections shall terminate at a lined manhole. Compacted road base must extend at least 5' beyond future phase terminal manhole. Terminal manholes shall be lined.

2.12.7 Additional Requirements for Gravity Sewer Design

- A. Size and Alignments - Pipe must remain the same diameter between manholes, and any size conversion should be done at the manhole where crowns will be matched. All gravity sewers shall be laid with straight alignments between manholes.
- B. Prohibited Connections - Main drain and back wash systems for pools and spas and storm drain systems shall not connect to the gravity sewer system.

2.12.8 Sewer Service Connections

- A. General - Service connections shall be made via service laterals and appurtenances to connect the gravity sewer to the residence or establishment being served. All laterals and appurtenances shall be 6" or larger and not exceed 100' in length. Laterals shall have a minimum slope of one percent (1%).
- B. Connections - Service laterals shall not discharge into a sanitary manhole, except at terminal manholes or as pre-approved by SJCUD. SJCUD reserves the right to approve/disapprove service, physical and system location, and size of connections. Lateral invert in terminal manhole shall match manhole invert elevation. A maximum of three (3) lateral connections will be allowed into a terminal manhole. Terminal manholes shall be lined regardless of the number of lateral connections. For single family residential developments, it is preferred that sanitary services are installed in the center of the lot and perpendicular to the main.

2.13 MANHOLES**2.13.1 Manhole Location**

- A. Manholes shall be installed at the end of each gravity sewer, at all changes in grade, size or alignment, at all sewer intersections, and at distances not greater than 400' unless pre-approved by SJCUD.
- B. Private sewer systems must be separated from SJCUD sewage collection system by a manhole located at the ROW line.
- C. The Engineer shall locate manholes on the centerline of the roadway or in the center of a travel lane, unless pre-approved by SJCUD.
- D. Manholes shall not be located in the flow line of inverted crown roads or other areas where the flow line intersects with the manhole.
- E. Terminal manholes shall not be deeper than 5' unless pre-approved by SJCUD.

2.13.2 Manhole Type

Manhole type shall be as specified in Section 3.15.

2.13.3 Manhole Diameter

- A. For sewers 15" in diameter and smaller, the minimum inside diameter of manholes shall be 4' if the overall structure height is less than 14'. Larger sewers shall have manholes with diameters as provided by SJCUD.
- B. Manholes with an inside drop connection shall be a minimum of 5' in diameter.
- C. Only one drop connection shall be installed in any manhole. If two drop connections are needed in a single manhole, the sewer system shall be re-designed so only one drop connection is used per manhole.
- D. Pump station receiving manholes (adjacent to the pump station wetwell) shall be a minimum of 5' in diameter regardless of the depth. This is noted on PS-1.
- E. All manholes whose height from rim or top to invert elevation is 14' or greater shall be a minimum of 5' in diameter. A note for each of these manholes shall be placed on the plans and read "Type 'A' manhole – 5' diameter".
- F. Grade rings and a manhole ring and cover would be installed to bring the structure up to final grade.
- G. A minimum access cover diameter of 30" shall be provided.

2.13.4 Manhole Flow Channel

- A. The flow channel through manholes shall be made to conform in shape and slope to that

of the sewers. Benching using concrete or cement with no brick fill shall be provided for a smooth transition from influent pipe(s) to effluent pipe.

- B. There shall be a 0.1' drop required in a manhole between the incoming and outgoing sewer.
- C. Constructing the flow channels to be $\frac{3}{4}$ of the diameter of the outlet sewer deep, as shown on Detail S-2, S-4, S-6, and S-7, will be strictly enforced.

2.13.5 Manhole Materials

- A. Manholes shall be precast units as specified in Section 3.15.
- B. Brick manholes and the use of brick for grade adjustment are prohibited.
- C. Cast-in-place manholes may be accepted on a case by case basis for conflict resolution.
- D. Alternative material for manholes is shown on the Approved Materials List.

2.13.6 Manhole Castings

Cast iron frames and covers shall be as specified in Section 3.15.5. Bolt down and/or gasket covers shall be provided where manholes are located in areas subject to water accumulation or flooding as directed by SJCUD.

2.13.7 Manhole Access

A 10' wide access road shall be provided for all manholes which are located outside of County roadways. The top 8" of the access road shall be stabilized to a Florida Bearing value 50 psi, and compacted to 95% of AASHTO T-180.

2.14 GREASE TRAPS AND OIL WATER SEPARATORS

This section refers to facilities discharging to the SJCUD Wastewater System. Any facility that prepares food shall be required to install one or more approved grease trap(s) as outlined in the Pretreatment Section of the Utility Ordinance. Any automobile related facility shall be required to install an approved oil/water separator. All grease traps and oil/water separators shall be constructed, maintained and monitored according to provisions set forth in the SJC Oil and Grease Management Ordinance. Each facility shall be required to obtain a Wastewater Discharge Permit from SJCUD Pretreatment Division.

2.15 WASTEWATER PUMP STATIONS - GENERAL

- A. The goal of these standards is to provide dependable wastewater pumping facilities that protect human health and the environment, and provide reliability and uniformity in construction. These standards are for submersible wastewater pump stations that are connected to SJCUD wastewater system and have a 5 horsepower motor and greater. Requirements for stainless steel piping, telemetry, and specific pump manufacturers do not apply to private pump stations. For pump stations discharging more than 1,000 gpm, the type of pump station and Basis of Design shall be reviewed and approved by SJCUD before proceeding with the design. Design shall be in accordance with Chapter 62-604 of the F.A.C., Ten State Standards, and this manual.
- B. Pump stations which serve a variety of customer classifications may be accepted by SJCUD if the overall development has submitted a master development plan map indicating the various classifications being served and the residential flow component is the majority of the overall flow. Residential flow consists of single family homes, townhomes, and condominiums. The collection system upstream of the manhole leading to the pump station receiving manhole serving the commercial development shall be private.

- C. Head capacity curves shall be prepared and submitted to SJCUD along with the pump station plans. Head capacity curves shall verify that the pumps are suitable for the design flow application. Pump and motor selection and head capacity curves shall reflect the minimum (one pump station flow) and maximum case (all pump stations on) hydraulic operating conditions in cases where receiving forcemain systems manifold with other pumping stations. The pumps shall be capable of operating at any point on the specified pump curve without overloading the rated horsepower of the motor, consideration of safety factor, or cavitation. Total design head should be less than 150 feet (65 psi).
- D. No re-pump stations will be permitted without approval by SJCUD. If approved, all re-pumps shall be equipped with a stand-by pump system or emergency generator. Provide a Master pump station when flows exceed 1,000 gpm or when the number of pump stations within a development exceeds three (3).
- E. Pump stations within a subdivision may be re-pumped to a master pump station within the subdivision. Only one Master pump station forcemain shall be connected to SJCUD forcemain manifold system unless otherwise pre-approved by SJCUD.
- F. Provide isolation valves at all points of connections to existing wastewater forcemain manifold system.

2.16 WASTEWATER PUMP STATION DESIGN BASIS

2.16.1 Wastewater Design Flows

- A. See Section 2.9.2 of this manual for calculating the ADF.

2.16.2 Number of Pumps

- A. Pump stations with a PHF of 1,500 gpm or less, a minimum of two pumps shall be provided (1 operating, 1 standby). Where the PHF exceeds 1,500 gpm, three or more pumps shall be provided (1 or more operating, 1 standby). If 3 pumps are installed, each pump shall be capable of pumping the PHF with the largest pump out of service.
- B. If the PHF exceeds 1,500 gpm, the station shall be considered a “master”, require a 55’ x 55’ site, and install a pre-approved engine-driven pump and odor control system.

2.16.3 Wetwell Sizing Design

The design fill time and minimum pump cycle time shall be considered in sizing the wetwell. The storage volume shall be determined between the primary pump “on” elevation and the pump “off” elevations. The storage volume for submersible pump stations shall have a total cycle time no less than fifteen (15) minutes. The pump “off” level shall be at the top of the motor. The minimum wetwell diameter for pump rates of 100 gpm or more shall be 8’ unless 2.16.5 below applies.

$$\text{Minimum Storage Volume (V min)} = [T \text{ min} * Q \text{ out}] / 4, \text{ where}$$

$$T \text{ min} = \text{Minimum Cycle Time between Pump Starts} = 10 \text{ minutes and}$$

$$Q \text{ out} = \text{Pump Discharge Rate, gpm (under manifolded conditions)}$$

The minimum storage volume shall be calculated between the lowest influent pipe invert elevation and the “All Pumps Off” elevation which shall be a minimum of 2’.

2.16.4 Pump Station Design Calculations and Procedures

The following procedures shall be followed during pump station design:

- A. Request minimum and maximum forcemain manifold pressures from SJCUD.
- B. Provide to SJCUD hydraulic modeling calculations of the existing wastewater forcemain manifold system, analyzing the impact to the existing pumping stations. Calculations shall be performed based on existing pump curve data of each of the existing pump

- stations.
- C. Submit to SJCUD a Master Development Plan (MDP), in accordance with the SJC LDC. The MDP must show land tract(s) and location(s) of connections to SJCUD system.
 - D. Submit to SJCUD signed, sealed, and dated design calculations for all pump stations (specify private or SJCUD owned on cover). Calculations shall include the following:
 1. Basis of Flow (Residential/Commercial), ADF, PHF;
 2. Size, velocity, and pressure of connecting forcemain;
 3. Wetwell design, including assumptions and pump mix-flush valves;
 4. Wetwell buoyancy calculations (1.2 or 20% safety factor, ground water elevation at grade, including assumptions);
 5. Static head (pump on/off level versus highest elevation of forcemain);
 6. Min/Max Total Dynamic Head (TDH) based on friction head and static head;
 7. Pump Selection - including type, manufacturer, model number, size, impeller size, flow in gpm, TDH, efficiency, NPSH, system head curves, HP, RPM; and
 8. Total cycle times for ADF and PHF (number of minutes “on” and “off”).

2.16.5 Small Pump Stations

- A. Design Basis - Applies to pump stations with a peak flow rate of less than 100 gpm which will be owned by SJCUD. Specification for small diameter forcemain (2” public or 3” private) can be found in Section 3.6.7.
- B. Pump Station Details - Design and construction of small pump stations shall be as described in Sections 2.16.3 and 2.16.4. Where no specific guidance is offered below or in the case of a conflict, the standard pump station design and construction standards shall be followed. A minimum 5’ diameter fiberglass or alternative approved material wetwell shall be used. See Detail Small PS.

2.17 PUMP STATION DESIGN CRITERIA

2.17.1 Site Selection

- A. In addition to requirements outlined in the SJC LDC and Ordinances, site selection for the pumping station shall be based on the following criteria:
 1. Proximity to existing/future gravity line and forcemain (consider hydraulic capacity);
 2. Land ownership and easements, existing land tracts;
 3. Site location and size;
 4. Vehicular access;
 5. Site and surrounding conditions such as flood potential and drainage issues;
 6. Landscaping and setback requirements;
 7. Existing utilities availability;
 8. Zoning and permitting;
 9. Operation and maintenance considerations;
 10. Geotechnical and environmental considerations;
 11. Noise and odor control; and
 12. Security fencing and lighting.
- B. A minimum 40’ by 40’ tract of land is required for all pump station sites, except master pump station site which require a 55’ by 55’ site. The location of specific structures/facilities within the pump station site shall be per the standard details included on drawing PS-01 included as Part V of this manual. Wetwell sizing shall depend on the design capacity (as indicated on the plans), type of station, number and type of pumps. In addition, future expansion issues shall be evaluated prior to determining the site size. Developer-constructed station sites and access roads shall be dedicated by tracts to

- SJCUD. Ingress/egress easements shall be required around the pump stations located on private roads. If possible, access from county roads should be a consideration, rather than through the development.
- C. The pumping station shall be located so that it is readily accessible by maintenance vehicles during all weather conditions. The access road to the pump station shall be paved with either asphalt or concrete suitable for an H-20 truck loading. The pump station site dimensions and elevations shall be as shown on the pump station drawings. Per Chapter 62-604 F.A.C., the electrical and mechanical equipment shall be protected from physical damage by being at least 6" above the 100-year flood elevation. The pump station shall be designed to remain fully operational and accessible during a 25-year flood. Design considerations (water surface elevations, forces arising from water movement, etc.) shall be based upon available information. Where site-specific information is unavailable, sound engineering practices shall be used in siting and design of pump station facilities.
 - D. A 6' vinyl coated chain link fence with privacy slats shall fully enclose the pump station. Master pump stations shall have an 8' high fence. Access shall be provided through a 12' double-leaf gate with locking capability. Exceptions to this requirement may be made for pump stations serving residential areas on a case by case basis and subject to sufficient landscape screening. Should the fence material be changed, a signed maintenance agreement with SJCUD shall be provided prior to acceptance by SJCUD. Landscape screening outside of the PS tract may be desired by the home owners association or apartment complex management in addition to fencing. Landscaping may be installed and maintained by a private entity after consultation with SJCUD.
 - E. The velocity through the discharge piping and valves shall be no greater than ten feet per second (10 fps) based on the nominal pipe diameter. Velocity shall be reduced to that allowed in Section 2.10.5 by increasing the diameter of the discharge piping below the 2nd tee on the discharge piping as shown on PS-01.

2.17.2 Wetwell

- A. The wetwell design shall comply with the specifications in Part III of this manual. The wetwell shall have a diameter as specified in Section 2.16.3 and minimum depth of 5' below the lowest invert. Additional wetwell diameters and depths shall be provided based on flow and cycle time.
- B. The interior surface of the wetwell shall be lined with a SJCUD approved liner as specified in 3.15.3 prior to the installation of the pump, their bases and rails, and discharge piping, in accordance with manufacturer's recommendations and approved shop drawings unless the wetwell is polymer concrete.
- C. Fillets between the wetwell wall and floor shall be as shown on the pump station drawing.
- D. Low Level Alarm water levels shall provide adequate submergence to prevent pump inlet vortexing and/or air binding. The Low Level alarm shall be 6" below "All Pumps Off" level and a minimum of 2' above the wetwell bottom.
- E. High Level Alarm water level shall be 6" below the lowest invert elevation of the influent pipe(s).
- F. The wetwell shall be equipped with a 4" minimum, SCH40, 316SS type L, quick disconnect pump out pipe connection (male end with cap) and drop pipe. The size of the quick disconnect shall be based on the capacity of the pump station.
- G. Buoyancy conditions shall be considered in the wetwell design and provisions made to prevent uplift by groundwater conditions at ground surface. The weight of the concrete

and soil **shall** and the weight of interior filleting, pumps and piping, and exterior surface friction **shall not** be included in the buoyancy calculations. Groundwater shall be considered at ground level unless wet weather geotechnical borings indicate otherwise. The boring information shall be submitted with the pump station calculations.

- H. If a wetwell larger than 6' in diameter is used, the wetwell shall be placed adjacent to the driveway. The static water line and pressure transmitter conduit routing may need to be adjusted.

2.17.3 Pumps

Submersible wastewater pump stations shall comply with Section 2.18.5. Submersible pumps and motors shall be designed specifically for raw sewage and be capable of being totally submerged during operation. The pumps shall be capable of passing solids of at least 3" diameter. The pump suction and discharge openings shall be a minimum of 4" in diameter. A minimum 2" discharge is required for pumps described in Section 2.16.5.

2.17.4 Water/Reclaimed Water Supply

- A. All wastewater pump stations shall have two, 1" water services. One shall be capable of providing adequate capacity and pressure for pump station wash down. The second shall be used for SCADA monitoring by measuring the static pressure of the potable water system. The water service for wash down shall be separated from the potable water supply by means of an approved reduced pressure backflow preventer. The static line for the SCADA does not require a backflow preventer and shall be a direct connection between the watermain and the SCADA panel as shown on the pump station drawing.
- B. In locations where reclaimed water is available, a third connection shall be used for SCADA monitoring by measuring the static pressure of the reclaimed water system instead in addition to the potable water system. A purple 1" SDR9 HDPE (CTS) shall be used for this connection.

2.17.5 Flow Monitoring

Each wastewater pumping station, designed to pump more than 1,000 gpm, shall be equipped with a magnetic flow meter and instrumentation for indication, totalizing and recording of the flow, transmitter, electronic recording receiver, and miscellaneous related accessories able to be connected to SJCUD's SCADA system. It shall be the Developer's responsibility to provide and install such equipment resulting in a completely operational flow monitoring system. The specifications and details for flow meter installation shall be provided by SJCUD when needed.

2.17.6 Electrical Equipment, Power Supply and Controls

All specifications related to pump station electrical supply, conduit, wiring, lighting, telemetry, controls, and instrumentation shall comply with the provisions provided in Section 2.19 of this manual.

2.17.7 Emergency Pumping

- A. All pumping stations shall be provided with an emergency pump out connection. Fixed, stand-by, emergency power generators or stand-by, engine driven pumps shall be provided at master pump stations and at all pumping stations which are at critical points in the sewer system, which receive flow from one or more pump stations through a forcemain, which have a peak design capacity of 500 gpm or more, or which discharge through a 12" or larger forcemain. Additional details are provided in Sections 2.18 and

2.19 of this manual.

2.17.8 Site Grading and Concrete

- A. To minimize the chance of inflow and/or infiltration, the pump station site shall be graded to slope toward the driveway and road drainage system as shown on PS-01 in Part V of this manual.
- B. If a sidewalk is to be installed between the pump station and the road, the sidewalk should be 10” thick for the width of the driveway and should be isolated from the sidewalk on either side of the driveway using expansion joint material. **The sidewalk cross-slope in the driveway shall not exceed 1:12.** The driveway should slope from the pump station pad to the sidewalk and from the sidewalk to the curb.
- C. Concrete
 1. All concrete shall be proportioned, mixed, placed, finished and cured in accordance with the requirements of Standard Specifications of the American Concrete Institute, ACI 301-66.
 2. Cement shall be Type I or II.
 3. Concrete and its reinforcing for the driveway and the remainder of the site shall be as described and installed as shown on PS-01 using approved materials.
 4. All cement to be used in the work shall be subject to testing to determine whether it conforms to the requirements of these specifications. The concrete shall be sampled half way through the pour for the driveway and half way through the pour for the two side slabs on-site.
 5. Cement which is partially set or which is lumpy or caked will be considered defective and shall not be used. The entire contents of the cement truck which contains defective cement will be rejected for use.
 6. Both fine and coarse aggregate shall conform to the requirements of ASTM Standard Specification C33. The Contractor shall submit clearly labeled samples of aggregates to the Engineer when requested.
 7. The concrete shall be discharged into forms within 1½ hours after water was first added to the mix and shall be mixed at least 5 minutes after all water has been added.
 8. Concrete for slabs on grade shall have a compressive strength greater than 3,000 psi at 28 days.
 9. For each pour (driveway and side pieces), SJCUD Inspector shall receive a copy of the concrete delivery ticket.
 10. For each pour (driveway and side pieces), one set of three cylinders shall be made by the Testing Laboratory which has been hired by the Contractor. One of these cylinders shall be tested at the age of 7 days and one at the age of 28 days, to determine the compressive strength of the placed concrete. The costs for performing such tests or re-tests due to material failures shall be paid for by the Contractor. It shall be the responsibility of the contractor to schedule and coordinate the materials testing with the Testing Laboratory.
 11. All concrete work shall be protected against damage from the elements and defacement of any kind during construction operations.
 12. All concrete shall be treated immediately after concreting or cement finishing is completed to provide continuous moist curing for at least 7 days, regardless of the adjacent air temperature. Concrete slabs shall be kept continuously saturated wet by means approved by the Contractor.
 13. Any work not formed as indicated on drawings or that is out of alignment or level or shows a defective surface shall be corrected in a manner satisfactory to SJCUD up to

and including removal and replacement.

2.17.9 Odor Control

All pump stations shall have a passive vapor phase odor control unit attached as shown on PS-01 and listed in Part IV of this Manual. Master Pump Stations, or required improvements to existing pump stations located in odor prone areas of the system, may require active odor control systems as specified and approved by SJCUD.

2.18 WASTEWATER PUMP STATION DESIGN SPECIFICATIONS

2.18.1 General

- A. This section includes materials and installation standards and Contractor responsibilities associated with the furnishing of all labor, materials, equipment and incidentals required to install, complete and make ready for operation all wastewater pumping stations as shown on the drawings and as specified herein. This section also includes the modifications to existing pumping stations. Wastewater pump stations shall be submersible or submersible grinder type with consideration given to the operation, maintenance, standardization, durability, and future expansion of the collection system served by the pumping station.
- B. Qualifications - All equipment and materials shall be furnished by a manufacturer who is fully experienced, reputable and qualified in the manufacture of items to be installed.
- C. Workmanship - All work shall be proved to be in first class condition and constructed in accordance with the drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor at no additional compensation.
- D. Materials
 - 1. All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified.
 - 2. Unless indicated otherwise on the drawings, all metal components in the wetwell, with the exception of pumps and motors shall be anodized aluminum or 316SS.
 - 3. The pumps, motors and guide rail system shall be supplied by the pump supplier to ensure unit compatibility.

2.18.2 Project Work Schedule and Sequencing

- A. The project schedule shall be established on the basis of working a normal work schedule including five days per week, single shift, eight hours per day or four days per week, single shift, ten hours per day. Unless approved otherwise by SJCUD, normal or general items of work such as setting wetwell (base and riser sections), field pump test, density testing, connections to existing piping, and final inspections, shall be scheduled during the normal work schedule.
- B. SJCUD may require the contractor to perform work outside of the normal work schedule for tasks such as tie-in work (cut-in work or other work) and work that may impact the continued (non-interruptible) service to existing SJCUD customers. The contractor shall plan and anticipate the cost impact of these work schedule limitations. A SJCUD representative shall be present during tie-in work. Contractor shall notify SJCUD at least five (5) business days prior to scheduling work.
- C. Unless approved otherwise, a SJCUD representative shall be present to observe the excavated area prior to setting (installing) the wetwell and receiving manhole base. The date and time for setting the wetwell and receiving manhole base shall be reviewed and approved by SJCUD, at least five (5) business days prior to the actual work.

2.18.3 Submittals

Submittals shall be in accordance with Section 1.4.1.2 of this manual.

2.18.4 Above-Ground Wastewater Pump Stations

Above-ground pumps for new development are prohibited. If an above-ground wastewater pump station is involved in the project, coordinate with SJCUD staff to ensure correct specifications are followed for retrofitting or modification.

2.18.5 Submersible Wastewater Pump Stations**A. Submersible Pumps**

1. Pumps shall be of the non-clog, submersible type for sewage service as manufactured by those found in the Approved Materials Checklist.
2. Pumps shall be complete with a submersible electric motor, floor-mounted discharge base and elbow, guide-rails, motor electrical cable (minimum 50' in length) to connect at the demarcation box (no splicing allowed) and all other appurtenances specified or otherwise required for proper operation.
3. Operating conditions and unit sizes shall be shown on the drawings. The pump design operating conditions shall be within +/- 20% of the best efficiency point, unless otherwise approved by SJCUD. When possible, the pump selection shall be made in the center of the family of curves.
4. Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at minimum suction submergence. Pump shall be designed so that reverse rotation at rated head will not cause damage to any component.
5. The pumps shall have the necessary characteristics and be properly selected to perform under the required operational conditions to include:
 - a. Gallons per Minute (GPM) at Total Dynamic head (TDH).
 - b. Horsepower (HP) (non-overloading).
 - c. Maximum operating head to be 90% of shut off head.
6. The openings and passages of the pump shall be large enough to pass solids, fibrous materials, heavy sludge, stringy materials, and other matter which can pass through the average house collection system.
7. The pump casing shall be easily removed from the motor for full inspection of the impeller.
8. At least one pump in each station must have a mix/flush valve installed on the volute. The hatch opening shall be sized accordingly for the pump with the mix/flush valve to be removed easily from the wetwell.
9. Impeller - The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The impeller shall be a semi-open or enclosed one-piece casting with not more than two non-clog passages. Screw or vortex impellers shall not be acceptable. The interior water passages shall have uniform sections and smooth surfaces and shall be free from cracks and porosity. The impeller shall be dynamically balanced, manufactured of high chrome wear resistant cast iron and securely locked to the shaft. Fasteners shall be non-corroding.
10. Spare Parts - Spare parts shall be provided per manufacturer's recommendation.

2.18.6 Private Pump Stations

- A. All private pump stations shall be in accordance with Chapter 62-604, F.A.C.

- B. For private pump stations greater than 5 HP, all SJCUD standards shall apply except requirements for stainless steel piping, telemetry, and SJCUD approved pumps.
- C. For private pump stations less than 5 HP and peak flow less than 25 gpm, SJCUD standards may be used as guidance; however, the following requirements shall apply:
 - 1. Wetwell top and pump-out box shall each be a minimum of 10" above the finish grade and surrounded grading.
 - 2. Control panel shall be a minimum of 5' from the edge of the wetwell.
 - 3. Isolation valve and check valve on the owner's side shall be adjacent to ROW or easement that connects to the service connection.
 - 4. Emergency generator receptacle in all pump stations with 2 HP or greater motors.
 - 5. No drains from pump-out vaults or valve vaults shall drain back into the wetwell.
 - 6. The water supply for the pump station site must be equipped with an approved RPZ backflow device.
 - 7. Conversion of existing septic tanks for use as a wetwell is prohibited.

2.18.7 Standby Engine-Driven Pump

Where shown on the drawings, the Contractor shall furnish and install a standby engine-driven self-priming centrifugal pump. The standby pump shall be a complete, pre-assembled unit to include a solids handling pump, engine, priming system, external fuel tank and piping, sound attenuated canopy, automatic start & stop system, and junction box with terminals to facilitate connection to SJCUD pump station SCADA system. Specifications for this unit shall be provided by SJCUD.

2.18.8 Pre-Cast Concrete Wetwell

- A. Wetwells shall conform to the latest ASTM C-478 Specification for pre-cast reinforced concrete manholes, with the exclusion of Section 10(a), except as modified herein. Cement shall meet the requirements of ASTM C-150 latest, specification for Portland cement, Type II. Steel reinforcement shall conform to ASTM A-615 and ASTM A-185, Latest Revisions. Rings shall be custom made with openings to meet the indicated pipe alignment conditions and invert elevations. Openings shall be adequately sealed with an approved flexible coupling installed in strict conformance with the manufacturer's recommendations so that there shall be zero leakage around pipes and joints. Approval by SJCUD shall be obtained before placing orders for wetwells. This does not remove liability from the Contractor for incorrect materials purchases.
- B. Base of the wetwell shall be cast integrally with the bottom section and shall be set on 8" of rock (#57 Stone) and 6-94 lb. bags of dry cement mixed together for a leveling course directly on the prepared subgrade as shown on the standard detail drawings. The number of cement bags increases to 9 for wetwells greater than 6' and equal to or less than 8' in diameter. In order to permit adjustment of the pre-cast base section and insure full bearing on the Class C concrete leveling course, the section shall be placed just prior to the initial set of the concrete.
- C. Joint contact surfaces shall be formed with machined castings and shall be exactly parallel with a 2 degree slope and nominal 1/16" clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket or pre-molded butyl joint sealer with joints pre-primed.
- D. The interior surfaces of the wetwell above the bottom slab including the underside of the top slab shall be lined with a material specifically designed to resist hydrogen sulfide (H₂S) corrosion. The lining shall be as specified in 3.15.3 and approved by SJCUD. The lining shall be applied in accordance with the manufacturer's recommendations after

- wetwell installation and prior to the installation of the grout fillet and pumps and associated equipment.
- E. The exterior and top and bottom mating surface of the wetwell shall be coated with an approved water proofing material applied at the place of fabrication. Additional coatings or touch up work shall be applied after wetwell installation as necessary if so directed by and at no additional cost to SJCUD. No concrete or wetwell seams shall be left unprotected. Exterior joints shall have an approved joint wrap material applied.
 - F. The wetwell shall have a concrete top with a pad lockable diamond plate aluminum hatch cover (1/4" thick, minimum), with flush mounted pull up hasp and frame with 316SS hardware. The hatch shall be capable of withstanding a 150 lb. per square foot static load or 300 lb. per square foot static load in traffic areas. Each cover shall have a locking safety handle to retain the covers in an open position. Cover shall be sized and located to allow for unobstructed vertical removal of all equipment.
 - G. A 316SS float chain holder with four (4) hooks shall be mounted inside the wetwell hatch with 316SS anchors.
 - H. The top of the receiving manhole and wetwell shall be set at the same elevation.

2.18.9 Pressure Transducer

- A. The discharge downstream of each set of submersible pumps shall be equipped with a SJCUD approved pressure transducer with display.

2.18.10 Discharge Piping

- A. The wetwell piping shall be SCH40, 316SS Type L flanged pipe. Vertical piping in the wetwell shall be supported from the wetwell wall. The pump base shall be fastened to the wetwell bottom using threaded rod and epoxy anchors. The elbow shall be sized and provided by the manufacturer.
- B. Below grade piping shall be PVC or HDPE.
- C. A 4" minimum male quick couple connection for pump out shall be provided at all pump stations.

2.18.11 Painting

Pumps, bases, and non-stainless steel piping in the wetwell shall be primed and painted gray with an oil based semi-gloss enamel. Non-stainless steel valves and piping outside the wetwell shall be primed and painted with an oil based semi-gloss enamel as shown in Approved Materials Checklist. Above ground stainless steel piping should not be painted.

2.18.12 Check and Plug Valves

- A. Each pump discharge shall have an approved check and plug valve installed.
- B. The check valve shall have a lever and spring. The lever and spring shall be located facing outward to facilitate maintenance.
- C. Plug valves shall be installed with their stems oriented horizontally with the plug in the top of the body when in the open position.

2.18.13 Inspection and Testing

- A. Upon completion of installation, the Contractor shall perform an operational test of the system, in the presence of SJCUD and a representative of the manufacturer, to insure that all component parts meet the specifications.
- B. After the system is ready for full operation, full operating test shall be performed in the presence of SJCUD and a manufacturer's representative. The Contractor shall furnish all

labor, materials and equipment required for such test and shall correct any deficiencies noted, by repairing or replacing the defective component, and re-testing as required until the equipment meets the requirements of the specification. An appropriate drawdown test shall be performed by the pump vendor as part of the startup procedures.

- C. SJCUD shall be trained in operation and maintenance of equipment at start-up. Instruction shall be given in operation, service, adjustments, and routine maintenance. Recommended spare parts and maintenance schedules shall be provided.

2.18.14 Accessories

The pump supplier shall provide a vinyl or aluminum placard or tag which indicates all operating conditions of the pumps, including name plate data, impeller size and part number, design flow, TDH, and other pump related data. The tag shall be placed (with adhesive) inside the front panel of the pump control panel or as directed by SJCUD.

2.19 WASTEWATER PUMP STATION ELECTRICAL

2.19.1 General

- A. This section includes materials and installation standards and Contractor responsibilities associated with furnishing of all labor, material, auxiliaries, and services necessary to install complete and properly operating electrical systems, including all fees, charges, and permits necessary. *Where these specifications differ from the electrical drawings, the electrical drawings take precedence. Otherwise, SJCUD shall be contacted for clarification.*
- B. All material shall be new and shall conform to the standards of the Underwriter's Laboratories, Inc., American National Standards Institute, National Electrical Manufacturers' Association, Insulated Power Cable Engineers Association, and Institute of Electrical and Electronic Engineers in every case where such a standard has been established for the particular type of materials in question.
- C. The installations shall be in accordance with the regulations of the latest editions of the National Electrical Code, National Electrical Safety Code, applicable city, state, and local codes and regulations and other applicable codes, including utility company codes.
- D. All permits required by state or local ordinances shall be obtained and after completion of the work, a certificate of final inspection and approval from the electrical inspector shall be furnished to the Owner. All permits for installation, inspections, connections, etc., shall be taken out and paid for as part of the work under this section.
 - 1. Classified Areas
 - a. Electrical systems and components in raw wastewater wetwells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class I, Group D, Division 1 locations.
 - b. The pump station control panel and all electrical equipment located outside of the wetwells and classified areas shall be protected by permanent conduit seals to prevent the atmosphere of the wetwells and classified areas from gaining access to the electrical equipment.
 - c. Terminal boxes shall be provided outside the wetwell such that all equipment located within the wetwell may be electrically disconnected and removed without breaking the permanent conduit seals. Terminal boxes shall be 316SS, UL rated minimum Class I, Zone 2 explosion protected, with stainless steel or aluminum conduit hubs at each conduit connection. Terminal block size, quantity and numbering within the terminal boxes shall match the field terminals located in the

- pump station control panel. Terminal blocks shall accommodate minimum #12 AWG conductors.
- d. Conduit connections between the terminal boxes and the wetwell shall be PVC coated rigid aluminum conduit. Each wetwell conduit shall be sealed at the terminal box with malleable non-conductive duct sealing compound.
2. Submittals - The Contractor shall provide electrical equipment and installation shop drawing submittals in accordance with the requirements of Section 3.9.1.2. The electrical equipment and installation shop drawings shall include, but not be limited to, the following:
 - a. Electrical service entrance equipment
 - b. Pump station control panel (wiring diagrams, component bill of materials, dimensions, weight, etc.)
 - c. Wetwell level controls
 - d. Basic materials and methods (conduit, wire, support channel, terminal boxes, sealing fittings, lighting, etc.)
 3. Testing
 - a. Upon completion, the Contractor shall provide all necessary instruments and special apparatus to thoroughly test the complete installation and shall conduct all tests that may be required to insure system is free of all improper grounds and short circuits, and that all the feeders are properly balanced. Prior to energization, the electrical system ground resistance shall be tested. All electrical equipment shall be tested to determine proper polarity, phasing, relay settings, and operation. System shall be checked for quality and completeness. Any objectionable noise, heating, voltage drop, or excessive current draw, after being placed in operation, shall be identified and corrected.
 - b. Each motor starter overload element, and each motor circuit protector, shall be selected and adjusted to coordinate with the nameplate full-load current and service factor of the actual motors installed. Improper units shall be replaced.
 4. As-Built Documentation - As-built documentation shall be submitted in accordance with the requirements of Section 1.4.3.10. In addition to the as-built drawings, the electrical as-built documentation shall include a tabulation of the final electrical test data (ground resistance tests, full load current and voltage measurements for each phase of each motor, motor nameplate current rating, overload element rating, and motor circuit protector settings) and a tabulation of all as-left device settings (wetwell level controller, solid state soft start motor starters, variable frequency drives, automatic transfer switches, etc.).
 5. Equipment Supplier - To ensure coordination, compatibility, and maximum interchangeability with existing SJCUD pump station facilities, the following electrical equipment shall be furnished by the pump supplier:
 - a. Pump Station Control Panel
 - b. Wetwell Level Controls
 - c. Service Entrance Main Disconnect Switch
 - d. Explosion Protected Terminal Boxes

2.19.2 Electrical Service

- A. The Contractor shall provide complete new electrical service for each pumping station, including coordination of electrical service selection and approval by SJCUD and the serving electrical utility company. Each pumping station electrical service shall include complete primary and secondary electrical service equipment, metering and installation

- in accordance with the electrical utility company requirements and these standards.
- B. Unless specifically unavailable from the serving electrical utility company, the electrical service to each pumping station shall be three phase. The basis of design pumping station electrical service to be requested from the serving electrical utility company shall be as follows:
1. 20 HP and below: 240 volt, 3 phase, full voltage motor starting, 15 starts per hour.
 2. 21 HP thru 40 HP: 480 volt, 3 phase, full voltage motor starting, 15 starts per hour
 3. 41 HP and above: 480 volt, 3 phase, solid state reduced voltage motor starting, 10 starts per hour
- C. Documentation of Coordination with the Electrical Utility Company
1. The pumping station electrical design Engineer shall contact the serving electrical utility company and obtain written documentation of the availability of the service requested. The electrical service documentation to be obtained from the serving electrical utility company shall identify each of the following basis of design issues:
 - a. Electrical service voltage and phase
 - b. Electrical service point of connection
 - c. Type of motor starting required (full voltage or reduced voltage)
 - d. Maximum number of starts per hour permitted
 - e. Maximum available fault current
 2. The electrical service documentation to be obtained from the serving electrical utility company shall identify all applicable electrical utility company rules, regulations and fees. Additionally, the pumping station electrical design Engineer shall obtain a schedule that identifies when the requested electrical service would be available from the electrical utility company.
 3. If it is determined that the requested electrical service is not available from the electrical utility company, the electrical design Engineer shall submit an alternate basis of design recommendation for review and approval by SJCUD before proceeding with the pumping station electrical design.
 4. For locations where the serving electrical utility company can only provide 240/120 volt single phase service, the pump motors shall be limited to a maximum of 5 HP. Three phase pump motors shall be provided. Variable frequency drive motor starters shall be used to operate the three phase motors from the single phase electrical service.
- D. Service Entrance Main Disconnect Switch - Each pump station electrical service shall be equipped with a UL service entrance rated, heavy duty, fused disconnect switch, 600V, 3 pole with NEMA 4X stainless steel enclosure. Each service entrance main disconnect switch shall be equipped with Class RK5 time delay current limiting fuses with solid state visual open fuse indicators. The service entrance main disconnect switch shall be installed outdoors in a location that meets the National Electric Code and is acceptable to both the local authority having jurisdiction and SJCUD. The Contractor shall provide one complete set of replacement fuses for each service entrance main disconnect switch.

2.19.3 Pump Station Control Panel

- A. Each pump station control panel shall be a UL service entrance rated power distribution and pump motor control panel with NEMA 3R stainless steel door-in-door enclosure with aluminum dead front inner door. Each pump station control panel shall be complete with the following features:
1. Main circuit breaker
 2. Emergency power circuit breaker

3. Main service transient voltage surge suppressor
 4. Three phase power monitor
 5. Pump motor protection and controls for each pump
 6. Control power transformer (480 volt services)
 7. Control power transient voltage surge suppressor
 8. Branch circuit breaker to serve the pump controls
 9. Branch circuit breaker to serve GFI receptacle
 10. Branch circuit breaker to serve remote SCADA system RTU
 11. Branch circuit breaker to serve remote site lighting
 12. Low voltage control power transformer (120-24V)
 13. Wetwell level controls
 14. Alarm light, alarm horn and alarm silence pushbutton
- B. Main and Emergency Circuit Breakers - The main circuit breaker and emergency power circuit breaker shall be molded case thermal magnetic circuit breakers, operable from the control panel dead front inner door, and mechanically interlocked to prevent both breakers from being closed at the same time. The main and emergency power circuit breakers shall be identical, and shall be fully rated for the electrical service maximum available fault current.
- C. Transient Voltage Surge Protection - Each pumping station electrical service shall be equipped with transient voltage surge protection. Main service transient voltage surge suppressors (TVSS) shall be designed, manufactured, tested and installed consistent with NEC 285. The main service TVSS unit shall provide LN, LG, NG and LL suppression modes, with minimum 200kA UL short circuit current rating, minimum 50kA per phase surge capacity rating, and maximum 0.5 nanosecond response time. The main service TVSS unit shall be equipped with individually fused suppression modes, thermal cutout for each mode, and AC sinewave tracking filter with EMI/RFI filtering.
- D. Each pumping station control panel shall be equipped with a 120 VAC control power transient voltage surge suppressor to protect the control panel control components and the SCADA system RTU branch circuit. The 120 VAC control power TVSS unit shall be 3-stage hybrid, solid-state power line protector with noise filtering, common mode and normal mode suppression, minimum 10kA peak surge current, less than 5 nanosecond response time, power line tracking, and compression screw terminations.
- E. Three Phase Power Monitor - Each pumping station control panel shall be equipped with three phase power monitoring to protect the pump motors from single phasing, voltage imbalance and phase reversal. Three phase power monitors shall be automatic reset solid state encapsulated phase and voltage monitoring relays with DPDT output contacts and LED status indication. One output contact shall be interconnected to disable the pump motors during abnormal electrical service conditions. One output contact shall be used for remote monitoring by the SCADA system RTU.
- F. Motor Power Distribution, Protection and Control
1. The pump station control panel shall be equipped with motor power distribution, protection and control equipment for each pump motor including circuit breaker type motor circuit protector (MCP), automatic motor starter with ambient temperature compensated overload unit, panel inner door mounted Hand-Off-Automatic selector switch, motor winding over-temperature protection interlock, and three phase power monitor protection interlock. Additionally the pump motor controls shall include pump run status and pump fail status contacts for remote monitoring by the SCADA system RTU.
 2. Motor circuit breakers shall be instantaneous-trip magnetic-only circuit breakers with

adjustable trip settings. Motor starters shall be NEMA rated full voltage motor starters designed for operation at 600 VAC. Motor overload protection shall be ambient temperature compensated bimetallic quick trip overload relays selected to coordinate with the operating characteristics of the protected motor.

3. Solid-state reduced voltage motor starters where required shall be serve duty rated with 3 phase temperature-compensated solid-state motor overload protection relay, individually adjustable acceleration (0-180 seconds) and deceleration (0-60 seconds) control, pump control option to reduce water hammer, 115% FLA continuous duty and 300% FLA for a minimum of 30 seconds. Each starter shall be equipped with a fault indication pilot light and auxiliary contact for remote indication of fault condition. Each solid-state motor starter shall include fully rated isolation contactor and bypass shorting contactor. Each solid-state motor starter shall automatically resume normal operation following a power outage.

G. Wetwell Level Controls

1. Each pumping station control panel shall be equipped with a self-contained solid-state programmable pump controller to provide adjustable automatic wetwell level control, automatic pump alternation, and continuous wetwell level monitoring. Each pump controller shall provide visual indication of pump station status including wetwell level, high level alarm, pump run status, pump running hours, pump number of starts, and pump motor current. Each pump controller shall be equipped with an intrinsically safe submersible pressure transducer installed within the wetwell to provide a continuous wetwell level signal to the pump controller. Each pump controller shall be field programmed by the pump supplier to provide proper control of the complete pumping system including sequential restart time delays to prevent simultaneous starting of more than one pump. The pump manufacturer shall provide for approval a level transducer for pump control.
2. In addition to the automatic pump controller with continuous wetwell level signal, each pumping station wetwell shall be equipped with a backup high level float control system including 24 volt control power, wetwell high level alarm/pump start float switch, wetwell high level reset/pump stop float switch, and wetwell low level alarm float switch. In the event of a high level alarm condition, the backup high level float control system shall be connected to the pump station control panel pump controls to bypass the pump controller and automatically start each pump, and to provide a high level alarm contact for remote monitoring by the SCADA system RTU.

- H. Alarm Monitoring - Each pumping station control panel shall be equipped with all necessary equipment for indication of all associated alarms including Transducer High Level Alarm, Backup Float High Level Alarm, and Backup Float Low Level Alarm. The panel shall be equipped with an external flashing alarm light, Sonalert audible alarm horn, silence push button, and dry contracts for remote monitoring by the SCADA system RTU.

2.19.4 Master Pump Station Electrical Equipment

If a master wastewater pump station is needed for a project, coordinate with SJCUD staff to ensure correct specifications are followed for design.

2.19.5 Basic Materials

- A. Unless otherwise noted, all exposed conduit, couplings, conduit fittings, etc., shall be SCH80 PVC rigid non-metallic conduit. Underground service entrance conduit segments

shall be direct buried SCH80 PVC rigid conduit. Conduit sealing fittings, and conduit segments on the field side of conduit sealing fittings, shall be rigid aluminum. Conduit containing variable frequency drive output power or control conductors shall be SCH80 PVC conduit.

- B. Low voltage wire and cable shall be as shown on the electrical drawings
- C. Electrical conduits and equipment shall be mounted on a system of minimum 1-5/8" x 1-5/8" heavy wall aluminum or 316SS channel. Support system hardware shall be aluminum or 316SS.

2.19.5.1 Grounding

Each pumping station grounding system shall consist of a grounding electrode system in accordance with NEC specifications, bonded to a main ground bus interconnecting all power distribution equipment. Ground rods shall be located at each service connection, transformer pad, generator pad, outdoor electrical equipment pad, and as indicated or required, and shall be bonded to the main ground bus. Grounding rod diameters, lengths, locations, and connections to the grounding ring shall be as shown on the electrical drawings.

2.19.5.2 Lighting

Each pumping station shall be equipped with a minimum of one site light pole located to illuminate the pump station control panel and wetwell, without conflicting with the access clearances required for overhead lifting and installation of the pumping equipment. The site light pole and light shall be as specified and located as shown on the electrical drawings.

2.19.6 Fixed Standby Emergency Power Generator

If a fixed standby emergency power generator is needed for a project, coordinate with SJCUD staff to ensure correct specifications are followed for design.

2.20 WASTEWATER TREATMENT FACILITIES

If a new wastewater treatment facility is required for a project, coordinate with SJCUD staff to ensure correct specifications are followed for design.

2.21 RECLAIMED WATER DESIGN STANDARDS

2.21.1 General

Reclaimed water may be utilized, when available, for irrigation and other approved uses that do not require potable water and encourage the conservation and efficient use of potable water. Use of reclaimed water shall be in accordance with the most current edition of SJC Utility Ordinance, FDEP regulations (Chapter 62-610, Reuse of Reclaimed Water and Land Application, Part III, F.A.C.), St. Johns River Water Management District rules and regulations and the SJC LDC. Reclaimed water facilities shall be independent of all potable water, raw water supply, wastewater, and storm water systems.

2.21.2 Development Reuse Feasibility

- A. New developments will be evaluated to determine if the use of reclaimed water is appropriate. Based on the evaluation, availability or non-availability of reclaimed water will be addressed via a LOA. The LOA will state the specific conditions for a development utilizing reclaimed water.
- B. Options for service to developments may include pressurized, non-interruptible service, or non-pressurized, interruptible service. Non-pressurized interruptible service requires the execution of a reuse service agreement with the development and qualifies the User

for a defined rate class, usually at a lower cost per gallon. Non-pressurized, interruptible service will require the development to receive reclaimed water through a delivery station into a storage structure or pond, and to distribute water for irrigation via a privately owned, operated, and maintained pumping and distribution system. During high demand periods when reclaimed water supply is limited, delivery to the development may be curtailed.

2.22 RECLAIMED WATER BASIS OF DESIGN

2.22.1 General

Reclaimed water systems shall be designed to promote efficient reclaimed water usage. Reclaimed water mains shall be designed for the estimated ultimate irrigation demand, based on planned development build-out. The Developer is responsible for sizing of the mains for their development. The information provided in this section is for design only and is not intended to dictate usage of reclaimed water by customers.

2.22.2 System Design Conditions

- A. The Engineer must clearly state all design flows and pressure conditions and submit to SJCUD signed, sealed, and dated design calculations that include the following:
 - 1. Equivalent Residential Connections,
 - 2. Peak Hour Flow,
 - 3. Pipe Size,
 - 4. Velocity, and
 - 5. Minimum Pressure.
- B. All hydraulic calculations shall be based on a connection pressure provided by SJCUD at a set point along the existing system adjacent to the proposed development. Head losses through meters and backflow devices shall also be included in calculations.
- C. For residential and commercial developments that have over 100 ERC's, the Engineer shall provide a computer generated hydraulic model. All water model calculations shall be presented by a tabular format indicating system pressure, demand nodes and other pertinent information on a plot that is clearly legible. All nodes shall be annotated to identify reclaimed water demand. Computer model scenarios for Peak Hour conditions as established in this manual shall be presented.

2.22.3 Minimum Main Sizing for Single-Family Residential Developments

- A. All reclaimed water mains shall be designed for peak hourly demand as the highest demand on the system. The peak hourly demand of reclaimed water shall be based on the Maximum Month Average Daily Flow as shown in Schedule A. With the usage occurring over an 8 hour period, the Peak hourly demand calculates to be 3.83 gpm per lot. This reclaimed watermain design rate shall be utilized for all single family lots and recreational areas in the development. Multifamily residential, commercial, and industrial flow demand shall be developed on a case-by-case basis. A minimum average daily irrigation rate of 3,900-gpd per acre of irrigable area is acceptable unless deemed otherwise by the SJRWMD, FDEP, or SJCUD.
- B. For planned subdivisions where the reclaimed water mains become so large they are not financially feasible, the Developer may have to install reclaimed water storage and re-pump facilities in accordance with this manual. In these cases, alternate peak demand strategies may be implemented, which include but are not limited implementing irrigation schedules and incorporating automated valving to control peak demands. 2" reclaimed water mains will only be allowed to serve a maximum of three (3) homes.

2.22.4 Main Sizing for Commercial and Industrial Developments

The Developer's Engineer shall submit signed, sealed and dated design calculations with the final construction plans for all reclaimed water distribution projects. Calculations shall show that reclaimed water mains will have sufficient hydraulic capacity to transport peak hourly flows. Flows shall be based on actual irrigation demand. As a design basis, a flow of 0.083gpd/sf of irrigated area will be used.

2.22.5 Distribution of Demand

The demand should be distributed within the model to reflect actual conditions. On all dead-end distribution mains, the usage for any given pipe segment shall be placed at the downstream node of the pipe. On all looped pipes the usage shall be applied to the closest node or demand point.

2.22.6 Pressure

All reclaimed water mains shall be designed to maintain a minimum pressure of 40 psi at the furthest meter connection. The starting pressure for all developments will be system dependent. Prior to modeling the system the Developer's Engineer shall contact SJCUD to receive the starting connection pressure for the individual development.

2.22.7 Velocity

Section 2.2.5 of this manual shall apply.

2.22.8 Friction Losses

Section 2.2.6 of this manual shall apply.

2.22.9 In-line Booster Stations & Storage

- A. In-line booster stations or other similar devices shall not be used as methods to increase the hydraulic grade of the reclaimed water. In-line booster stations may be allowed on a case by case basis or for a temporary setup where future storage will be made available.
- B. On-site storage tanks and accompanying high service pumps and pump buildings shall be required when the number of lots is greater than 1,000 or when SJCUD reclaimed water transmission system cannot provide the necessary connection pressure to maintain minimum pressure adopted as a part of this manual or other County regulation.
- C. All storage tanks shall be constructed on a minimum two (2) acre property in a location that is conducive to the efficient operation of the reuse system, provides buffer from noise, and is centrally located. Site size requirements may vary based on the specific conditions (i.e. tank size, location, access, buffering), but shall be sufficient to adequately address operational and buffering concerns.

2.23 RECLAIMED WATER DESIGN CRITERIA

For this section that refers to sections of the Water System Design Criteria, the word "reuse" or "reclaimed water" shall be substituted for "water" or "potable water". In addition, the reuse main shall be purple and/or marked in accordance with Federal, state and local regulations and standards.

2.23.1 Reclaimed Watermain Location

Section 2.2.1 of this manual shall apply.

- 2.23.2 Reclaimed Watermain Separation Requirements**
Section 2.2.2 of this manual shall apply.
- 2.23.3 Reclaimed Water Setback Requirements**
Section 2.2.3 of this manual shall apply.
- 2.23.4 Reclaimed Watermain Diameters**
Section 2.2.4 of this manual shall apply.
- 2.23.5 Reclaimed Watermain Looping and Dead Ends**
Section 2.2.6 of this manual shall apply.
- 2.23.6 Reclaimed Watermain Valves**
Section 2.2.7 of this manual shall apply.
- 2.23.7 Reclaimed Watermain Cover**
Section 2.2.8 of this manual shall apply.
- 2.23.8 Surface Water Crossings for Reclaimed Watermains**
Section 2.2.9 of this manual shall apply.
- 2.23.9 Roadway Crossings for Reclaimed Watermains**
Section 2.2.10 of this manual shall apply.
- 2.23.10 Reclaimed Water Air Release Valves**
Section 2.2.11 of this manual shall apply.
- 2.23.11 Chamber Drainage**
Section 2.2.12 of this manual shall apply.
- 2.23.12 Existing Reclaimed Watermains**
Section 2.2.14 of this manual shall apply.
- 2.23.13 Transmission Mains versus Distribution Mains**
Section 2.2.15 of this manual shall apply.
- 2.23.14 Signage and Public Notice**
- A. Each development using reclaimed water shall install reclaimed water use warning signs at the entrance or any other street or driveway entering any properties which use reclaimed water. The signs shall meet the requirements of SJCUD Detail R-1 and Chapter 62-610, F.A.C. The signs shall be a requirement whether shown on plans or not.
 - B. The Developer shall be responsible for all cost incurred and installation of reclaimed water signage in accordance with FDEP regulations, SJRWMD rules and regulations, and SJCUD standards. The Owner responsible for operation and maintenance of the private irrigation system shall also be responsible for maintenance of the signage.
- 2.24 RECLAIMED WATER SERVICES AND CONNECTIONS**
- A. Section 2.3 of this manual shall apply.
 - B. Each subdivision with reclaimed water shall install the reclaimed water control valve as

shown on Detail R-3.

2.25 RECLAIMED WATER METERING

2.25.1 General

All reclaimed water service connections shall be metered. In general, the method of metering will follow the guidelines listed below. SJCUD shall have the final judgment on how best to meter reclaimed water use in any new development. Unless specifically approved by SJCUD, meter boxes shall not be installed in sidewalks, driveways or areas subject to vehicular traffic. Meters subject to vehicular traffic shall be installed in a traffic rated meter box.

2.25.2 Single Family (individually platted) Development with Public ROW

- A. Each unit shall be individually metered. Meters shall be installed within the ROW in individual meter boxes as indicated in the approved drawings.
- B. Multi-family subdivisions and town homes shall install a master meter for individual buildings or groups of buildings.
- C. On-site reclaimed water systems shall be maintained by the Owner.

2.25.3 Single Family and Multi-Family Subdivisions/Town Homes with Private ROW

- A. If easements are dedicated over the entire private street common areas, individual meters may be permitted in accordance with Section 2.4, "Potable and Reclaimed Water Metering". Additionally, private streets shall meet County standards and sufficient area must be available outside of paved areas to locate watermains, services, and meters.
- B. All on-site reclaimed water systems shall be maintained by the owner.

2.25.4 Large Reclaimed Water Customers

If the average daily demand is 100,000 gpd or greater, a reclaimed water agreement shall be required. In general, shopping centers and associated out parcels shall require installation of a single meter to service the entire development unless out parcels are adjacent to public ROW or otherwise approved by SJCUD.

2.25.5 Meter Installation

Section 2.4.5 of this manual shall apply.

2.25.6 Meter Sizing

Section 2.4.2 of this manual shall apply.

2.26 CROSS CONNECTION CONTROL

Section 2.6 of this manual shall apply.

2.27 APPROVED USES OF RECLAIMED WATER

Refer to Chapter 62-610, FAC.

2.28 PROHIBITED USES OF RECLAIMED WATER

Refer to Chapter 62-610, FAC.

2.29 ELECTRICAL SYSTEMS ANALYSIS

The Contractor is required to provide certain information to SJCUD so an electrical system analyses can be performed. This information must be provided before a pump station startup

is considered FINAL. The information to be provided is shown in the Tables below.

FOR 100A, 240V STATIONS		Conduit		Conductor Size, Gauge		
From	To	Size, in	Length, ft.	Phase	Neutral	Ground
Transformer	Service Meter					
Service Meter	Fused Disconnect Switch					
Fused Disconnect Switch	Control Panel					
Control Panel	Wetwell Terminal Box					
Wetwell Terminal Box	Pump Motors					

FOR 200A, 240V STATIONS		Conduit		Conductor Size, Gauge		
From	To	Size, in	Length, ft.	Phase	Neutral	Ground
Transformer	Service Meter					
Service Meter	Fused Disconnect Switch					
Fused Disconnect Switch	Control Panel					
Control Panel	Wetwell Terminal Box					
Wetwell Terminal Box	Pump Motors					

FOR 480V STATIONS		Conduit		Conductor Size, Gauge		
From	To	Size, in	Length, ft.	Phase	Neutral	Ground
Transformer	Service Meter					
Service Meter	Fused Disconnect Switch					
Fused Disconnect Switch	Control Panel					
Control Panel	Wetwell Terminal Box					
Wetwell Terminal Box	Pump Motors					

- End of Part II -

PART III - CONSTRUCTION SPECIFICATIONS

3.1 GENERAL CONSTRUCTION REQUIREMENTS

3.1.1 Grades, Survey Lines, and Protection of Monuments

A. Grade

1. All work shall be constructed in accordance with the lines and grades shown on the approved construction drawings. The full responsibility for keeping alignment and grade shall rest upon the Contractor.
2. Prior to beginning work, the contractor shall establish the centerline of construction, bench marks and any other base line controlling points that may be required. Reference marks for lines and grades as the work progresses will be located to cause as little inconvenience to the prosecution of the work as possible. The Contractor shall so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. Contractor shall remove any obstructions placed contrary to this provision.

B. Surveys - The Contractor shall furnish the labor and materials necessary to install and maintain stakes, reference marks, and other such materials to the satisfaction of the EOR. The Contractor shall establish all working or construction lines and grades as required from the reference marks and shall be solely responsible for the accuracy thereof. All costs for this work shall be paid for by the Contractor.

C. Reference Point Preservation - The Contractor shall preserve and protect all reference points, property corners, bench marks and survey monuments. If a reference point, property corner bench mark or survey monument is disturbed or destroyed during construction, whether by accident, careless work, or required to be disturbed or destroyed by the construction work, said reference point, property corner, bench mark or survey monument shall be restored by a land surveyor registered in the state of Florida. All costs for this work shall be paid for by the Contractor.

3.1.2 Utility Coordination

A. Location of Utilities

1. Prior to proceeding with any excavation, the Contractor shall contact all utility companies in the area to aid in locating their underground services. It shall be the Contractor's responsibility to contact utility companies at least two (2) business days before starting construction. Furthermore, the Contractor shall coordinate utility locates with Sunshine State One-Call of Florida, Inc. (www.callsunshine.com) and the Contractor shall comply with all applicable federal, state, and local utility locate requirements. The Contractor shall proceed with caution in the excavation so that the exact location of underground utilities may be determined.
2. The Contractor shall take all reasonable precautions against damage to existing utilities and all above ground or below ground improvements. However, in the event of damage to existing improvements or a break in an existing watermain, gas main, sewer main, electric main, phone cable, cable TV, irrigation, lighting, signage or any other underground cable, or other piping, the Contractor shall immediately notify the responsible official of the organization operating the damaged utility or the owner of the damage improvement. The Contractor shall lend all possible assistance in restoring services and shall assume all cost, charges, or claims connected with the interruption and repair of such services or improvements.

B. Deviations from the Approved Construction Drawings / Specifications - The water, sewer, and/or reuse system shall be constructed in accordance with SJCUD approved construction drawings and specifications. If there is any deviation from the approved construction drawings or specifications without prior authorization and consent from

SJCUD, the Contractor shall remove the deviation and restore it to the approved construction drawing configuration at no expense to SJCUD. Any deviations from the approved documents may require material replacement and may delay project clearance. The Contractor shall be solely responsible for any cost associated with delays in project clearance due to unapproved deviations.

- C. Test Pits - Test pits for the purpose of locating underground pipeline, utilities, or structures in advance of the construction shall be excavated and backfilled by the Contractor. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the EOR. All costs for this work shall be paid for by the Contractor.

3.1.3 Maintenance of Traffic and Closing of Streets

- A. The Contractor shall perform all work in such a manner which will cause a minimum of interruption to traffic. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways. The Contractor shall post suitable signs indicating that a street is closed and provide the necessary detour signs for the proper maintenance of traffic. Prior to closing of any streets, the Contractor shall notify and obtain the approval of responsible authorities and the County.
- B. Unless permission to close a street is received in writing from the proper authority (County, City, FDOT, etc.), all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, the Contractor shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the County or other responsible authority having jurisdiction.
- C. Detours around construction will be subject to the approval of the authority having jurisdiction and the County. Where detours are permitted, the Contractor shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured the Contractor shall expedite construction operations. Periods when traffic is being detoured will be strictly controlled by the County or other responsible authority having jurisdiction.
- D. It shall be the sole responsibility of the Contractor to take precautions to prevent injury to the public due to open trenches. Night watch personnel may be required where special hazards exist, or police protection provided for traffic while work is in progress. The Contractor shall be fully responsible for damage or injuries whether or not police protection has been provided.

3.1.4 Protection of Public and Property

- A. Barricades, Guards, and Safety Provisions
 - 1. The Contractor shall be solely responsible for adhering to the rules and regulations of OSHA and any other appropriate authorities regarding safety provisions as well as meeting any applicable ADA requirements, Federal, State and local. The Contractor shall protect persons from injury and avoid property damage, provide and maintain adequate barricades, construction signs, lights, temporary access facilities and guards as may be required during the progress of the work and until it is safe for traffic and or pedestrians to use the roads and streets. All construction material, piles, equipment, pipe, or any other item used during construction, which may serve as obstructions to traffic or pedestrians shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. All costs associated with this work shall be paid for by the Contractor.

2. All signage and barricades shall be in accordance with the Manual on Uniform Traffic Control Devices and the Traffic Control and Safe Practices Manual.
- B. Protection of Utility Structures - The Contractor shall furnish temporary support, adequate protection and maintenance of all existing improvements, including but not limited to underground and surface utility structures, including drains, sewers, manholes, hydrants, valves, valve covers, power poles, electric, phone, catv, gas, irrigation, lighting, signage and miscellaneous other utility structures or other above ground or below ground improvements encountered in the progress of the work. Any such structures, which may have been disturbed, shall be restored upon completion of the work. All costs associated with this work shall be paid for by the Contractor.
 - C. Open Excavation - All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents or injury to persons and damage to property. The Contractor shall provide suitable and safe bridges with handrails and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. The length of open trench will be controlled by the particular surrounding conditions, but shall be limited unless otherwise approved by the EOR. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the EOR may require special construction procedures, such as limiting the length of open trench, fencing, prohibiting excavated material in the street and requiring that the trench shall not remain open overnight. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches excavated material, equipment or other obstacles, which could be dangerous to the public, shall be well lighted at night. All costs associated with this work shall be paid for by the Contractor.
 - D. Protection of Trees and Shrubs - The Contractor shall protect all trees and shrubs not shown to be removed on the plans. No excavated materials shall be placed so as to injure such trees or shrubs. The Contractor shall replace all trees or shrubs destroyed or damaged by construction operations or by negligence of the Contractor with new stock of similar size and age. Furthermore, it shall be the Contractor's responsibility to ensure that all replaced trees or shrubs are maintained until survival is assured. All costs associated with this work shall be paid for by the Contractor.
 - E. Protection of Lawn Areas - The Contractor shall ensure that lawn areas be left in as good or better condition as before starting of the work. Where sod is to be removed, the Contractor shall carefully restore it with new sod of the same type. All costs associated with this work shall be paid for by the Contractor.
 - F. Restoration of Fences and Retaining Walls - The Contractor shall repair or replace any fence or retaining wall, or part thereof, that is damaged or removed during the course of the work and shall be left in as good a condition as before the starting of the work. The manner in which the fence or retaining wall is repaired or replaced and the materials used shall be subject to the approval of the EOR. All costs associated with this work shall be paid for by the Contractor.
 - G. Protection against Siltation and Bank Erosion - The Contractor shall arrange and conduct construction operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches. The Contractor shall remove any siltation deposits and restore to original grade. All costs associated with this work shall be paid for by the Contractor.
 - H. SJCUD recommends that the Contractor take preconstruction photos or videos to document preexisting conditions on site. SJCUD may delay or reject acceptance of a project in the event the Contractor fails to adequately restore damaged property

(including, but not limited to grading, landscaping, structures, etc.), or fails to resolve a claim from a property Owner.

3.1.5 Access to Public Services

Neither the materials excavated nor the materials or equipment used in the construction of the work shall be placed so as to prevent free access to public services. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing streets, sidewalks and driveways. Excavated material suitable for backfilling shall be stockpiled separately on the site. No material shall be placed closer than 2' from the edge of excavation. Fire hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage. Natural water courses shall not be obstructed or polluted. Surplus material and excavated material unsuitable for backfilling shall be transported and disposed of off the site in legal disposal areas obtained and paid for by the Contractor.

3.1.6 Public Nuisance

The Contractor shall not create a public nuisance including but not limited to encroachment on adjacent lands, flooding of adjacent lands, or excessive noise or dust. The Contractor shall eliminate noise to as great an extent as practicable at all times.

3.1.7 Construction Hours

No work shall be done between the hours of 7:00 p.m. and 7:00 a.m., on Saturdays and Sundays, or on County recognized holidays unless the proper and efficient prosecution of the work requires operations during these times and days. Written notification for doing the work outside of the approved hours stated above shall be provided to SJCUD a minimum of one (1) business day before starting such items of the work.

3.1.8 Construction in Easements and ROW

- A. Construction in Easements - In easements across private property, the Contractor shall confine all operations within the easement area and shall be responsible and liable for all damage outside of the easement area. Trees, fences, shrubbery or other type of surface improvements located in easements will require protection during construction. The Contractor shall take precautions by adequate sheeting or other approved method to prevent any cave-in or subsidence beyond the easement limits or damage to improvements within the easement. In general, the easement area is intended to provide reasonable access and working area for efficient operation by the Contractor. Where easement space for efficient operation is not provided, the Contractor shall be responsible for organizing and conducting construction operations to perform within the restrictions shown on the plans.
- B. Construction in FDOT ROW - The Contractor shall strictly adhere to the requirements of the FDOT where construction work is in a ROW under the jurisdiction of the State of Florida and shall take care to avoid any unreasonable traffic conflicts due to the work in the ROW.
- C. Construction in SJC ROW - This work shall be governed by the SJC LDC, as amended.

3.1.9 Shop Drawings and Submittals

Shop drawings shall be submitted based on the requirements of Section 1.4.1.2 of this manual.

3.1.10 Pre-Construction Meetings

Pre-Construction meetings shall be held in accordance with Section 1.4.1.3 of this manual.

3.1.11 As-Built Drawings

As-built drawings shall be submitted based on the requirements of Section 1.4.3.10 of this manual.

3.1.12 Material Inspection and Testing

- A. SJCUD may inspect all pipe and fittings at any time before, during, and/or after installation. If the inspection determines that any materials do not meet or exceed specifications, materials shall be rejected. Rejected material shall be removed by the Contractor at the Contractor's expense. The collection of water samples, all leak and pressure tests, and any connection to existing SJCUD lines shall be witnessed by an authorized SJCUD representative.
- B. SJCUD may perform random testing of all materials furnished for conformance to the standards herein. The entire product of any manufacturer or of any one plant may be rejected when, in the opinion of SJCUD, the methods of manufacture fail to secure uniform results acceptable to the requirements of these specifications.
- C. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. Pipe which is not marked clearly is subject to rejection. All rejected pipe shall be promptly removed from the project site by the Contractor. The Contractor shall be responsible for all costs associated with removal and replacement of rejected pipe.
- D. All pipe and accessories to be installed shall be inspected and tested at the place of manufacture by the manufacturer as required by the standard specifications to which the material is manufactured.
- E. Each length of pipe shall be subject to inspection and approval at the factory, point of delivery, and site of work. If requested by the EOR or SJCUD, a sample of pipe to be tested shall be selected at random for testing at a laboratory hired by the EOR. When the specimens tested conform to applicable standards, all pipe represented by such specimens shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed in the project.
- F. In the event that any of the test specimens fail to meet the applicable standards, all pipe represented by such tests shall be subject to rejection. The Contractor may furnish two additional test specimens from the same shipment or delivery, for each specimen that failed and if the pipe samples meet the applicable standards the pipe will be considered acceptable. All such retesting shall be at the Contractor's expense. Pipe which has been rejected by the EOR or SJCUD shall be removed from the site of the work by the Contractor and replaced with pipe which meets these specifications with all expenses paid by the Contractor.

3.1.13 Developer Warranty

The Developer, through the Contractor, shall provide SJCUD a warranty as described in Section 1.4.3.8.

3.2 SITE PREPARATION, SURFACE REMOVAL AND RES'TORATION**3.2.1 General**

The Contractor shall clear and grub the area within the limits of construction as shown on the

plans and approved by the EOR prior to the beginning of any work. All site work shall conform to the applicable site clearing ordinance, as well as landscaping and tree ordinances of SJC.

3.2.2 Clearing and Grubbing

- A. Clearing - The surface of the ground for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other objectionable obstructions resting on or protruding through the surface of the ground. However, trees and shrubs shall be preserved as specified in Section 3.1.4 of this manual. Clearing operations shall be conducted so as to prevent damage to existing structures, installed structures and structures under construction. These clearing operations shall be conducted in such a manner so as to provide for the safety of employees and others.
- B. Grubbing - Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2" in diameter, matted roots, brush, timber, logs and any other organic or metallic debris not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18" below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface or to density specified in the project geotechnical report, whichever is more stringent.
- C. Stripping - In areas designated, topsoil shall be stripped and stockpiled. Topsoil stockpiled shall be protected until it is placed as specified. Any topsoil remaining after all work is in place shall be disposed of and paid for by the Contractor.
- D. Disposal of Cleared and Grubbed Material - The Contractor shall legally dispose of and pay for all material and debris from the clearing and grubbing operation in accordance with all applicable ordinances.

3.2.3 Dust Control

The Contractor shall control dust resulting from clearing and grubbing operations to prevent nuisance to adjacent property owners and the general public. The Contractor shall use dust control methods and materials approved by the EOR.

3.2.4 Surface Control

Along the proposed pipe lines as indicated on the plans, the Contractor shall remove the surface materials only to such widths as will permit a trench to be excavated which will afford sufficient room for proper efficiency and proper construction. All applicable County and FDOT regulations shall be followed. Where sidewalks, driveways, pavements and curb and gutter are encountered, care shall be taken to protect against fracture or disturbance beyond reasonable working limits. The Contractor shall pay for and restore to their original condition all fractured, broken or disturbed surfaces prior to completion of the work.

3.2.5 Restoration

- A. The Contractor shall restore all surfaces including road subbase, soil cement, lime rock base, asphaltic concrete surface, and concrete pavement, driveways, sidewalks, and curbs in strict accordance with road construction specifications, including all applicable SJC and FDOT specifications, standards and regulations. All grassing and mulching shall be done as specified in the road construction specifications.
- B. The Contractor shall place solid sod on all slopes greater than 4:1, within 10' of all proposed structures and where existing sod is removed or disturbed by the work. In

addition, the Contractor shall restore all storm drains, culverts, inlets and storm manholes to equal or better condition in accordance with the road construction specifications. The Contractor shall use the road construction specifications prepared by either SJC or other responsible authority having jurisdiction. All costs associated with this work shall be paid for by the Contractor.

- C. SJCUD highly recommends that Contractors take preconstruction photos or videos to document preexisting conditions on site. See Section 3.1.4.

3.2.6 Erosion Control

The Contractor is responsible for designing, providing, and maintaining effective erosion and sediment control during construction. The control measures must ensure erosion and sedimentation will either be eliminated or maintained within acceptable limits as established by SJC.

3.3 EXCAVATION, BACKFILL, COMPACTION, AND GRADING

3.3.1 General

The Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill, compaction, grading and slope protection required to complete the work shown on the approved construction drawings and specified herein. The work shall include, but not necessarily be limited to: pump stations, manholes, vaults, conduit, pipe, roadways and paving; all backfilling, fill and required borrow; grading; disposal of surplus and unsuitable materials; and all related work such as sheeting, bracing and water handling.

3.3.2 Soil Borings and Subsurface Investigations

The Contractor shall examine the site and undertake subsurface investigations, including soil borings, before commencing the work. The EOR will not be responsible for presumed or existing soil conditions in the work area.

3.3.3 Existing Utilities

- A. The Contractor shall locate existing utilities in the areas of work. Furthermore, the Contractor shall coordinate utility locates with Sunshine State One-Call of Florida, Inc. (www.callsunshine.com). If utilities are to remain in place, the Contractor shall provide adequate means of protection during earthwork operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, the Contractor shall consult the owner of such piping or utility immediately for directions. The Contractor shall be responsible for payment related to damage and repair of such piping and/or the additional utility coordination requirements.
- B. All utility relocations shall be constructed per standards and specifications that are included in this manual. In cases where the Contractor has to cut or repair an existing main, extra care should be provided to identify if existing Utilities are provided with restraining mechanisms. All existing mains that are not restrained will be restrained per Section 3.9 of this manual.
- C. The EOR shall not be responsible for uncharted or incorrectly charted water and wastewater mains or other utilities. It is the Contractor's responsibility to ensure that such facilities exist at the presumed point prior to commencing construction.

3.3.4 Materials

- A. General - Materials for use as bedding and backfill, whether in-situ or borrow, shall be as

- described under this section. The Contractor shall, upon request by the EOR, make an appropriate sample of this material available for testing.
- B. Structural Fill - Materials for structural fill shall be bedding rock or select common fill as specified herein or other suitable material as approved by the EOR.
 - C. Common Fill
 - 1. Common fill shall consist of suitable mineral soil that is substantially free of clay, organic material, loam, wood, trash and other objectionable material which may be compressible or which cannot be compacted properly. Common fill shall not contain stones larger than 3" in any dimension, asphalt, broken concrete, masonry, rubble, or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Additionally, common fill shall be no more than 12% by weight finer than No. 200 mesh sieve unless finer material is approved for use in a specific location by the EOR.
 - 2. Material falling within the above specifications, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of SJCUD is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials.
 - D. Select Common Fill - Select common fill shall be as specified above from common fill, except that the material shall contain no stones larger than 1-1/2" in largest dimension, and shall be no more than 5% by weight finer than the No. 200 mesh sieve.
 - E. Bedding Rock - Bedding rock shall be 3/16" to 3/4" washed and graded stone (FDOT #67). This stone shall be graded so that 90 to 100 percent will pass a 3/4" screen and 95 - 100% will be retained on a No. 8 screen. No stones larger than 1" in any dimension shall be accepted.

3.3.5 Sheeting and Bracing in Excavations

- A. General - If required to support the sides of excavations, to prevent any earth movement which could in any way diminish the width of the excavation below that necessary for proper construction and to protect adjacent structures, existing piping and/or foundation material from disturbance, undermining or other damage, and to protect workers and the work, the Contractor shall construct, brace and maintain cofferdams consisting of sheeting and bracing. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted.
- B. Miscellaneous Requirements
 - 1. For trench sheeting for pipes, no sheeting is to be withdrawn if driven below mid-diameter of any pipe and no wood sheeting shall be cut off at a level lower than one foot above the top of any pipe. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given by the EOR for an alternate method of removal. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities, existing piping or property. Unless otherwise approved or indicated on the approved Construction Drawings or in the Specifications, all sheeting and bracing shall be removed after completion of the substructure. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by compacting with tools specially adapted for that purpose, by watering or otherwise as may be directed.
 - 2. The decision of the EOR to order sheeting and bracing left in place shall not be construed as creating any obligation on its part to issue such orders, and its failure to exercise its right to do so shall not relieve the Contractor from liability for damages to

persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

3. The Contractor shall construct the cofferdams and sheeting outside the neat lines of the foundation unless indicated otherwise to the extent the Contractor deems it desirable for the methods of the operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing and cofferdams shall be adequate to withstand all pressures to which the structure will be subjected. Pumping, bracing and other work within the cofferdam shall be done in a manner to avoid, disturbing any construction already performed. Any movement or bulging, which may occur, shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.

3.3.6 Dewatering, Drainage, and Flotation

A. General

1. The Contractor shall excavate, construct and place all pipelines, concrete work, fill, and bedding rock, in-the-dry. In addition, the Contractor shall not make the final 24" of excavation until the water level is a minimum of one foot below proposed bottom of excavation. For purposes of these specifications, "in-the-dry" is defined to be within 2% of the optimum moisture content of the soil. The EOR reserves the right to ask the Contractor to demonstrate that the water level is a minimum of 1' below proposed bottom of excavation before allowing the construction to proceed.
2. Discharge water shall be clear, with no visible soil particles. Discharge from dewatering shall be disposed of in such a manner that it will not interfere with the normal drainage of the area in which the work is being performed, create a public nuisance, or form ponding. The operations shall not cause injury to any portion of the work completed, or in progress, or to the surface of streets, or to private property. The dewatering operation shall comply with the requirements of appropriate regulatory agencies. Additionally, where private property will be involved, advance permission shall be obtained by the Contractor.

B. Additional Requirements

1. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.
2. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavations.
3. It is expected that well points will be required for pre-drainage of the soil prior to final excavation for some of the deeper in-ground structures, or piping and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged. Well points shall be surrounded by suitable filter sand and negligible fines shall be removed by pumping.
4. The Contractor shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems for handling groundwater and surface water encountered during construction of structures, pipelines and compacted fills.

5. During backfilling and construction, water levels shall be measured in observation wells located as directed by the EOR. Continuous pumping will be required as long as water levels are required to be below natural levels.

3.3.7 Excavation

A. General

1. Excavation consists of removal, storage and disposal of material encountered during construction of the proposed utilities. All excavation shall be determined based on the established required grade elevations and shall be in accordance with the notes shown on the approved Construction Drawings. All work associated with this item shall be paid for by the Contractor.
 2. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of the EOR. Unauthorized excavation as well as remedial work directed by the EOR shall be at the Contractor's expense.
 3. If requested by the EOR, when excavation has reached required subgrade elevations, a Geotechnical/Soils Engineer shall make an inspection of conditions. If the subgrade is unsuitable, the Contractor shall carry the excavation deeper and replace excavated material with select common fill or bedding rock, as directed by the EOR. All work associated with this item shall be paid for by the Contractor.
 4. If the Contractor excavates below grade through error or for the Contractor's convenience or through failure to properly dewater the excavation or disturbs the subgrade before dewatering is sufficiently complete, the Contractor may be directed by the EOR to excavate below grade and refill the excavation using select common fill or bedding rock. All work associated with this item shall be paid for by the Contractor.
 5. Slope sides of excavation shall comply with local codes and ordinances, and with OSHA requirements. Contractor shall shore and brace where sloping is not possible due to space restrictions or stability of the material excavated. Sides and slopes shall be maintained in a safe condition until completion of backfilling. All work associated with this item shall be paid for by the Contractor.
 6. Contractor shall stockpile satisfactory excavated materials at a location approved by the EOR until required for backfill and fill. When needed in the work, material shall be located and graded at the direction of a Geotechnical/Soils Engineer. Stockpiles shall be placed and graded for proper drainage. All soil materials shall be located at least 2' away from the edge of excavations. All surplus and/or unsuitable excavated material shall be legally disposed of by the Contractor. Any permits required for the hauling and disposing of this material shall be obtained and paid for by the Contractor prior to commencing hauling operations.
- B. Excavation for Structures - All such excavations shall conform to the elevations and dimensions shown on drawing within a tolerance of plus or minus 0.10' and extending a sufficient distance from footings and foundations to permit placing and removing formwork, installation of services and other construction, inspection or as shown on the approved Construction Drawings. When excavation is required for footings and foundations, the Contractor shall exercise care so as not to disturb the bottom of the excavation. Bottoms shall be trimmed to required lines and grades to leave a solid base

to receive concrete.

C. Trench Excavation

1. Excavation for all trenches required for the installation of utility pipes shall be made to the depths indicated on the approved Construction Drawings and in such manner and to such widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting and for pumping and drainage facilities.
2. The bottom of the excavations shall be firm and dry and in all respects acceptable to the EOR. Excavation shall not exceed normal trench width as specified in the standard drawings. Any excavation, which exceeds the normal trench width, shall require special backfill requirements as determined by the EOR.
3. Where pipes are to be laid in bedding rock, select common fill or encased in concrete, the trench may be excavated by machinery to or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
4. Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated by machinery. The last of the material being excavated shall be done manually in such a manner that will give a shaped bottom, true to grade, so that pipe can be evenly supported on undisturbed material, as specified in the standard drawings. Bell holes shall be made as required.
5. Contractor is responsible for compliance with the State of Florida (Chapter 90-96) Trench Safety Act.

3.3.8 Bedding and Backfill

A. General

1. Material placed in fill areas under and around structures and pipelines shall be deposited within the lines and to the grades shown on the approved Construction Drawings or as directed by the EOR, making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces, which have been inspected and approved by the EOR. If sufficient select common or common fill material is not available from excavation on site, the Contractor shall provide fill as may be required.
2. Fill shall be brought up in substantially level lifts starting in the deepest portion of the fill. The entire surface of the work shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section.
3. Fill shall be placed and spread in layers by a backhoe or other approved method, unless otherwise specified. Prior to the process of placing and spreading, all materials not meeting those specified in Section 3.3.4 of this manual shall be removed from the fill areas. The Contractor shall assign a sufficient number of employees to this work to ensure satisfactory compliance with these requirements.
4. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.
5. All fill materials shall be placed and compacted "in-the-dry". The Contractor shall dewater excavated areas as required to perform the work and in such a manner as to preserve the undisturbed state of the natural inorganic soils. Before compaction, material shall be moistened or aerated as necessary to provide the optimum moisture content. Material, which is too wet, shall be spread as required and permitted to dry, assisted by harrowing or other methods, if necessary, until the moisture content is reduced to allowable limits. If added moisture is required, water shall be applied by

sprinkler tanks or other sprinkler systems, which will insure uniform distribution of the water over the area to be treated and give complete and accurate control of the amount of water to be used. If too much water is added, the area shall be permitted to dry before compaction is continued. The Contractor shall supply all hose, piping, valves, sprinklers, pumps, sprinkler tanks, hauling equipment and all other materials and equipment necessary to place water in the fill in the manner specified. The Contractor shall compact each layer to the required percentage of maximum dry density or relative dry density in accordance with Section 3.3.9 of this manual. Backfill or fill material shall not be placed on surfaces that are muddy, frozen or contain frost or ice.

B. Bedding and Backfilling for Structures

1. Backfilling shall be carried up evenly on all walls of an individual structure. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength.
2. In locations where pipes pass through building walls, the Contractor shall take precautions to consolidate the fill up to an elevation of at least 1' above the bottom of the pipes. Structural fill in such areas shall be placed for a distance of not less than 3' either side of the center line of the pipe in level layers not exceeding 8" in depth.
3. The surface of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the approved engineering drawings. No soft spots or uncompacted areas will be allowed in the work.
4. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

C. Bedding and Backfilling for Pipes

1. Bedding for pipes shall be as shown on the approved engineering plans and detailed on SJCUD standard drawings. The Contractor shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed.
2. Backfilling over and around pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected. All backfilling shall be prosecuted expeditiously and as detailed on SJCUD standard drawings.
3. Any space remaining between the pipe and sides of the trench shall be carefully backfilled and spread by hand or approved mechanical device and thoroughly compacted with a tamper as fast as placed, up to a level of 1' above the top of the pipe. The filling shall be carried up evenly on both sides. Compaction shall be in accordance with Section 3.3.9 of this manual.
4. The remainder of the trench above the compacted backfill, as just described above shall be filled and thoroughly compacted in uniform layers. Compaction shall be in accordance with Section 3.3.9 of this manual.

3.3.9 Compaction

A. General

1. The Contractor shall control soil compaction during construction so as to provide the percentage of maximum density specified herein. The Contractor shall provide the EOR copies of all soil testing reports, prepared by a Geotechnical Engineer, demonstrating compliance with these specifications. All costs for this work as well as all testing that is required as part of this work shall be paid for by the Contractor.

2. When existing trench bottom has a density less than that specified, the Contractor shall break up the trench bottom surface, pulverize, moisture-condition to the optimum moisture content and compact to required depth and percentage of maximum density.
- B. Percentage of Maximum Density Requirements
1. Fill or undisturbed soil under or around the bottom of the pipe trench to 1' above the pipe shall be densified to a minimum density 95% of the maximum dry density as determined by AASHTO T-180.
 2. Backfill from 1' above utility pipes to grade shall be densified to a minimum density of 95% of the maximum dry density as determined by AASHTO T-180.
 3. Fill or undisturbed soil under and around structures, and to the extent of the excavation shall be densified to a minimum density of 95% of the maximum dry density as determined by AASHTO T-180.
- C. Compaction Tests
1. For gravity sewer installations, one compaction test location shall be required half way between manholes and for every 100 square feet of backfill around manholes or other structures as a minimum. For pressure pipe installations, one compaction test shall be required for each 300' of pipe. The EOR may determine that more compaction tests are required to certify the installation depending on field conditions.
 2. The locations of compaction tests within the trench shall be in conformance with the following schedule:
 - a. At least one test for each 12" layer of backfill within the pipe bedding zone and at least one test at the bottom of the pipe trench.
 - b. One test at the spring line of the pipe.
 - c. One test at an elevation of one foot above the top of the pipe.
 - d. One test for each 12" lift of backfill placed from one foot above the top of the pipe to finished grade elevation.
 3. If based on Geotechnical Engineer testing reports and inspection, fill, which has been placed, is below specified density the Contractor shall provide additional compaction and testing prior to commencing further construction.
 4. Compaction results shall be recorded on the appropriate form. SJCUD recommends the results are submitted, at least monthly, to SJCUD Inspector. All results including a copy of the testing company's results shall be submitted prior to and as part of project close-out.

3.3.10 Grading

- A. All areas within the limits of construction, including transition areas, shall be uniformly graded to produce a smooth uniform surface. Areas adjacent to structures or paved surfaces shall be graded to drain away from structures and pavement ponding shall be prevented. After grading, the area shall be compacted to the specified depth and percentage of maximum density.
- B. No grading shall be done in areas where there are existing pipelines that may be uncovered or damaged until such lines have been relocated. Relocations of utilities required due to grading modifications shall be completed at the Developer's expense.

3.3.11 Maintenance of Graded Areas

- A. The Contractor shall protect newly graded areas from traffic and erosion and keep them free of trash and debris. The Contractor shall repair and reestablish grades in settled, eroded and rutted areas.

- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, the Contractor shall scarify the surface, and reshape and compact those areas to the required density prior to further construction.

3.3.12 Inspection and Quality Assurance

The Contractor shall examine the areas and conditions under which excavating, filling and grading are to be performed, and not proceed with the work until unsatisfactory conditions have been corrected.

3.4 PRESSURE PIPE INSTALLATION

3.4.1 Pipe Handling

- A. Lifting or rigging tools shall not be used on the inside of any lined pipe or fitting during handling and installation. The handling and installation of pipe and fittings shall be done in such a manner as to prevent any damage occurring to pipe, the lining inside of pipes, machined surfaces, fittings and the exterior pipe coating. Liner manufacturer's recommendations shall be followed to repair any damaged pipe liners.
- B. If a pipe is visibly cracked it shall be rejected and removed from the site. Cutting off the visibly cracked portion and using the remainder of the pipe is prohibited.
- C. If a fitting is cracked it shall be rejected and immediately removed from the site.
- D. Any pipe or fitting which is suspected of being fractured due to improper handling or receiving a severe blow, regardless of if there is a visible crack, shall be rejected and removed from the site immediately.
- E. Joint gaskets shall be stored in a clean, dark, and dry location prior to use.

3.4.2 Pipe Installation

- A. General Requirements
 - 1. Watermains, forcemains, and reclaimed watermains shall be constructed of the materials specified herein and as shown on the approved Construction Drawings.
 - 2. Watermains shall be cleaned, tested, disinfected, and have a satisfactory bacteriological survey performed per AWWA, FDEP, and SJCUD standards.
 - 3. Ductile iron pipe for potable and reclaimed watermain shall be installed in accordance with AWWA C600.
 - 4. PVC C900 and C905 pipe shall be laid in accordance with AWWA C605 and ASTM D2774.
 - 5. HDPE pipe shall be installed in accordance with the manufacturer's requirements. A qualified joining technician as trained and certified by the manufacturer shall perform all joint fusions.
 - 6. Only suitable soils shall be utilized in the backfill operation up to 12" above the pipe.
 - 7. The maximum joint deflection shall be limited to 80% of the pipe manufacturer's recommendation. All precautions shall be taken to prevent sand or other foreign material from entering the pipe during installation.
 - 8. When the pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by SJCUD.
 - 9. Pipe installation is prohibited when trench conditions (standing water, excess mud, etc.) or the weather is unsuitable for such work, except by approval of SJCUD.
 - 10. Any main that has its grade or joint disturbed after installation shall be removed and re-laid. All such re-installation and re-alignments are subject to re-inspection by both the EOR and SJCUD prior to acceptance.

3.4.3 Disinfection of Watermains

Flushing, disinfection, and bacteriological testing of watermains shall be in accordance with Section 1.4.2.6 of this manual.

3.4.4 Pressure and Leakage Testing of Pressurized Piping

Pressure and leakage testing of potable and reclaimed watermains and forcemains shall be in accordance with Section 1.4.2.5 of this manual.

3.4.5 Certification of Completion

See Section 1.4.3.3.

3.4.6 Pipe Separation Requirements

Horizontal and vertical separations for watermain, forcemain, reclaimed watermain, and stormwater pipe construction shall be in accordance with Chapter 62-555, FAC which is included in Section 2.2.2 of this manual.

3.4.7 Pipe Marking, Tape, Locate Marker, and Locate Wire**A. Pipe Marking**

1. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, design pressure, service and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel.
2. All pipes shall have a homing mark on the spigot provided by the manufacturer. On field cut pipe, the Contractor shall provide homing mark on the spigot in accordance with manufacturer's recommendations.

B. Pipe Color Coding

1. PVC and FPVC pipe shall be color coded for the service being provided by using pigmented PVC resin. Potable water shall be "BLUE". Sewer (both pressure and gravity) shall be "GREEN". Reclaimed water shall be "PURPLE".
2. HDPE pipe shall be color coded by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. Potable water shall be "BLUE". Sewer (both pressure and gravity) shall be "GREEN". Reclaimed water shall be "PURPLE".
3. Color-coded pipe can only be used for the service for which it is color-coded. For example, blue or blue striped pipe cannot be used with green or purple pipe regardless of where it installed (open cut or HDD) or material (PVC, FPVC, or HDPE). Paint, colored tape, or any other method shall NOT be used to change the color of pipe. For example, green tape cannot be placed over blue stripes to use potable pipe for a forcemain.

C. Locate Marker

1. Markers shall be installed near each valve, sewer lateral, and other locations as needed for efficient locate of assets.
2. Potable water markers shall be blue, sewer (both pressure and gravity) markers shall be green, and reclaimed water markers shall be purple.

D. Marking Tape

1. Utility marking tape shall be 3" wide and 4 mil (min.) thick per ASTM D2103 with a 2750 psi tensile strength per ASTM D882.
2. Tape shall have adhesive backing and industrial standard repeatable message.
3. Tape shall be buried no deeper than 18" below ground and located directly over all pipes.

E. Locate Wire Installation and Testing

1. General

- a. Service color-coded locate wire shall be installed on all PVC, FPVC, DI, and HDPE piping and services 4" and larger. No wire shall be installed on above ground installations or water services smaller than 4".
- b. External color of locate wire shall be blue for potable water, green for sewer, and purple for reuse.

2. Locate Wire Installation for Open Cut Mains

- a. Locate wire shall be 10 gauge, single strand, UF rated (direct burial), copper wire with 30 mil (minimum) insulation.
- b. Contractor shall furnish and install locate wiring on all pressurized pipelines and on pressurized service mains 4" size and greater. Locate wire shall be brought to grade within a valve box or Locating Station box at 475' intervals or less. Locate wire shall be installed in box and along pipeline. Locate wire shall be installed in either the 4:00 or 8:00 position relative to the pipe, but shall not be attached to the pipe. Connection or splices underground which are not inside a locate box or valve box shall not be allowed.

3. Locate Wire Installation for HDDed Pipelines

- a. Locate wire shall be as specified in Section 3.4.7.E.2.a above.
- b. The Contractor shall furnish and install locate wiring on all HDDed pipelines and services 4" and larger. Locate wires must be attached to HDDed watermains and services with duct tape at maximum intervals of 10' along the pipeline. Locate wire shall be brought to grade within a valve box or locate wire station box. Locate wires shall be brought to grade at locate stations at each end of HDDed watermain installations. There is no maximum length interval for locating stations for HDDed watermains unless specified by the Engineer. The Contractor shall furnish and install a minimum of two locate wires on HDDed watermains to help ensure a successful pull back with functioning locate wire. In a case where the locate wires do not function after the pull back the Contractor shall take any actions necessary as approved by SJCUD to ensure the main is locatable. Locate wire shall be installed as detailed in SJCUD standard details. Where possible, locate wires shall be installed on 4:00 and 8:00 positions on the HDPE pipe. Underground connections or splices are prohibited and shall be brought to grade in either a valve box or locate station box.

4. Testing Equipment - Testing technology shall include variable frequency controls, digital depth read-out, and tone continuity approved by SJCUD.

- a. Tester - Testing shall be performed by a person or company that has been certified by the manufacturer of the approved testing equipment as proficient in the use of the equipment and has six months experience in the use of the equipment including documented proof of past performance.
- b. Locate Wire Testing Requirements - Locate wiring shall be tested by the Contractor using a certified tester and approved testing equipment. The Certified Tester shall be pre-approved by SJCUD. SJCUD field representative may elect to be present during the testing period. The Contractor shall provide the Certified Tester a copy of the project drawings. The technician shall trace the entire length of the installed wire and mark the location at 100' intervals along the route. The depth of pipe shall be tested at 200' intervals. The Certified Tester shall report where the pipe has less than the allowable minimum cover or more than the maximum allowable cover. All laterals shall be marked and recorded. A final

Locate Wire Report shall be submitted to SJCUD for review and approval. The report shall include a signed statement from the certified tester which certifies that all installed wire was successfully sounded and traced with no open breaks. The report shall also include a copy of the project drawings which indicate all field notes, breaks found/repaired, depths and other applicable field remarks by the Certified Tester. A certified copy of the report and marked-up drawings shall be furnished prior to final acceptance of the project.

3.4.8 Main Abandonment

Abandonment of water, sewer, or reuse mains within the boundaries of road, alley, highways and utility easements shall be performed as follows:

- A. Transfer all existing service and lateral connections to new mains prior to classifying any main as abandoned.
- B. All abandoned mains where called for on approved Construction Drawings as approved by SJCUD shall be grout filled or physically removed. Fill pipes with cement grout by pumping into the low end of the main. Prior to filling, proof of pipe cleaning and proper disposal of contents, if any, shall be required.

3.4.9 Piping Supports

The Contractor is responsible for furnishing and installing all supports necessary to hold the piping and appurtenances at the lines and grades indicated on the approved construction drawings or as specified.

- A. Supports
 1. Piping shall be adequately supported from floors by approved saddle stands, suitable concrete piers or other pre-approved method.
 2. Pipe saddles shall be adjustable (via screw adjustment) and shape fitted to the pipe.
 3. Concrete piers shall conform accurately to the bottom one-third to one-half of the pipe. Pipe and support shall be separated using 1/8" neoprene over all contact surfaces.
 4. Supports shall be located as required, and in no case shall they exceed 8' on centers for DI pipe and 4' on centers for SCH40 316SS pipe.

3.5 TRENCHLESS TECHNOLOGY

3.5.1 General

Water, wastewater, and reuse mains under roadways may and under railroads shall be installed using a steel casing pipe by the boring and jacking method. In some cases, installation of a steel casing may be required for HDD installations. The casing and carrier pipes shall be of the size shown on the approved Construction Drawings under the highway at the elevations and locations shown. The Contractor shall be required to acquire all applicable permits and contracts to perform this work. Bore and jack operations and horizontal directional drilling shall be performed by fully qualified personnel.

3.5.2 Boring & Jacking

- A. General - The installation of a casing pipe by the method of boring and jacking shall be covered by these specifications. The overall work scope shall include, but not limited to, boring and jacking pits and equipment, sheeting, steel casing pipe, skid, steel straps, coatings, location signs as required, miscellaneous appurtenances to complete the entire Work as shown on the Standard Drawings, and restoration. Boring and jacking operations shall be performed within the ROW and/ or easements. This work shall

include all services, equipment, materials, and labor for the complete and proper installation, testing, disinfection and environmental protection and restoration.

B. Pipe Material

1. Steel casing shall conform to the requirements of ASTM Designation A139 Grade "B" with minimum yield strength of 35,000 psi. The casing pipes shall have the minimum nominal diameter and wall thickness as shown on Plate G-4 in Part V of this manual.
2. Field and shop welds of the casing pipes shall conform to the American Welding Society (AWS) standard specifications. Field welds shall be complete penetration, single-bevel groove type joints. Welds shall be airtight and continuous over the entire circumference of the pipe and shall not increase the outside pipe diameter by more than 3/4".

C. Carrier Pipe Support - The carrier pipes shall be supported within the casing pipes so that the pipe bells do not rest directly on the casing. Casing spacers shall be bolt on style split shells made of either T-304SS or fusion-coated steel (a minimum 0.010" thick coating of PVC shall be provided over the entire band). The shell shall be lined with a PVC liner 0.90" thick with 85-90 Durometer. All nuts and bolts shall be high strength, low alloy meeting AWWA C111. Runners shall be made of a high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction.

D. Casing Spacers

1. Casing spacers shall be a two piece prefabricated unit by a single manufacturer.
2. Casing spacers shall have a shell made from either 304SS, 14 gauge steel with heat fusion coated PVC plastic (0.01 mils thick) or high density polyethylene.
3. Casing spacer bands:
 - a. 12" wide steel bands required on 20" or larger carrier pipe.
 - b. 8" wide steel bands on carrier pipe that is 16" or smaller.
 - c. Polyethylene bands shall be used on HDPE spacers.
4. Casing Spacer Risers and Runners:
 - a. All carrier pipe 16" or greater shall use six (two top and four bottom)-10 or 14 gauge steel risers with runners on casing spacers.
 - b. All carrier pipe 16" and smaller shall use four-10 or 14 gauge steel risers with runners on casing spacers
 - c. Carrier pipe using HDPE spacers will have one riser for each diameter inch of carrier pipe.
 - d. HDPE or UHMW polymer shall be used for runners (risers).
 - e. All risers over 2" in height shall be reinforced.
 - f. All nuts, bolts, and washers shall be 316SS.

E. Casing End Seals - Casing ends shall be sealed in a manner that provides a water tight and earth load bearing seal. Casing end seals shall be pre-fabricated by an SJCUD approved manufacturer. Casing end seals are typically made of a synthetic rubber to provide a tight seal and can be either a sleeve or link-seal type end seal. Masonry plugs shall not be used to seal casings unless specified by the Engineer and pre-approved by SJCUD.

F. Jacking Pits - Excavation adjacent to the roads shall be performed in a manner to adequately support the roads. Bracing, shoring, sheeting or other supports shall be installed as needed. The Contractor shall install suitable reaction blocks for the jacks as required. Jacking operations shall be continuous and precautions shall be taken to avoid interruptions which might cause the casing to "freeze" in place. Upon completion of jacking operations, the reaction blocks, braces, and all other associated construction

- materials shall be completely removed from the site.
- G. Excavation Support Systems - Design shaft excavation support systems to withstand lateral earth pressures, ground loads, unrelieved hydrostatic pressures, bottom heave, equipment loads, applicable traffic and construction loads, and other surcharge loads to allow safe construction of shafts without appreciable movement or settlement of ground, and to prevent damage to or movement of adjacent structures, streets, utilities and trees. Design excavation support systems and casing installation equipment to be compatible with geologic conditions.
 - H. Grout Filling Voids Outside of Casing Pipe - Grout filling voids outside a casing pipe installed by jack and bore method shall be performed for all casing pipe with an interior diameter of 24" or greater.
 - I. Existing Utilities - The Contractor shall confirm location of all existing utilities prior to the start of shaft/pit excavation and pipe installation.
 - J. Shaft/Pit Installation
 1. The Contractor shall notify SJCUD not less than fifteen (15) business days before beginning shaft excavation.
 2. Methods of construction for shafts/pits shall be such as to ensure the safety of the work, the Contractor's employees, the public, existing utilities, and adjacent property and improvements.
 3. Before beginning construction of shaft/pit, the Contractor shall adequately protect existing structures, utilities, trees, shrubs, and other existing facilities.
 4. The Contractor shall provide complete groundwater control for excavations at all times.
 5. The Contractor shall perform shaft/pit excavations using appropriate excavation or large hole drilling methods, as required.
 6. The Contractor shall place fencing, gates, lights, and signs, as necessary around shafts and staging areas to provide for public safety.
 7. The Contractor shall inspect shaft/pit excavations daily to check safety of excavation and structural integrity of support system.
 - K. Equipment Selection - The Contractor shall select the necessary equipment and methods to install casing and carrier pipe as shown on approved construction drawings. The selected equipment shall be capable of accurate alignment and grade control, and shall protect against subsidence or other disturbance of ground, existing utilities, existing structures, road surface and railroad facilities when applicable
 - L. Casing Installation
 1. Casing exterior may be lubricated with bentonite slurry.
 2. The Contractor shall verify that the casing pipe minimum wall thickness is adequate for anticipated jacking loads.
 3. The hole diameter shall not exceed outside diameter of casing pipe by more than 1".
 4. Where unstable soil conditions are found to exist, the Contractor shall conduct boring operations in a manner that will not be detrimental to facility being crossed.
 5. Line and Grade tolerances shall be 2", maximum.
 6. The Contractor shall provide means of checking line and grade at least once a day to confirm allowable tolerance has been achieved.
 7. The Contractor shall provide means of steering casing to ensure allowable tolerance can be achieved.
 8. If necessary to abandon a bored hole, remedial measures shall be taken by the Contractor, subject to review by the EOR, approval of SJCUD and owner of facility being crossed.

3.5.3 Horizontal Directional Drilling (HDD)

- A. General - The work specified in this section consists of furnishing and installing an underground pipeline (forcemain, watermain, or reclaimed watermain) using the HDD method of installation. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, disinfection, and environmental protection and restoration.
- B. Submittals - Drilling Logs & As-built Drawings: The Contractor shall maintain a daily project log of drilling operations and a guidance system log. A copy of this log shall be submitted to SJCUD representative with the final As-built Drawings at completion of the project. As-built drawing submittals shall meet all requirements as detailed in these standards.
- C. Pipe Material - Only HDPE Pipe as specified in these standards shall be used for HDD pipeline installations.
- D. HDD Procedures
 1. Safety: The Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.
 2. Pilot Hole: The Contractor shall be responsible for drilling the pilot hole on bore path with no deviations greater than 5% of depth over a length of 100'. In the event that pilot does deviate from bore path more than 5% of depth in 100', the Contractor shall notify SJCUD Representative. SJCUD Representative may require the Contractor to pull-back and re-drill from the location along bore path before the deviation. The Contractor shall be responsible for restoring any damage caused by a drilling fluid fracture.
 3. Reaming: Upon successful completion of pilot hole, the Contractor shall determine the borehole size needed and ream the borehole to a minimum diameter of the pipe needed using the appropriate tools. The Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.
 4. Pullback: After successfully reaming bore hole to the required diameter, the Contractor will pull the pipe through the borehole. Carrier pipe may be filled with potable water prior to the pullback. In front of the pipe will be a swivel and reamer to compact borehole walls. Once pull-back operations have commenced, operations shall continue without interruption until pipe is completely pulled into borehole. During pull-back operations, the Contractor will not apply more than 90% of the pipe manufacturer's safety pull (or tensile) strength. A breakaway flange shall be used during pull back to ensure that the maximum pull back force is not exceeded.

3.5.4 Alternate Trenchless Technology

Alternate trenchless technology such as jack and bore and micro-tunneling may be allowed only on a case-by-case basis and shall be approved by SJCUD prior to installation.

3.5.5 State/County Highway Crossings

Permits for all work within the State/County ROW shall be obtained by the EOR and/or the Contractor. The Contractor shall verify the existence of the applicable ROW permits prior to commencing the work. All work located in a State Highway ROW shall be in full compliance with the requirements of the Florida Department of Transportation (FDOT) permits and in accordance with the FDOT Utility Accommodation Guide and standard specifications. County/State highway crossings shall be made by boring and jacking a steel pipe casing or by HDD, of the size shown on the approved construction drawings under the highway at the elevations and locations shown. The water, wastewater, or reclaimed water

main shall be placed in the casing with the approved casing spacers as specified in Section 3.4.9 of this manual. All joints within the carrier pipe shall be mechanically restrained. After inspection the ends of the casing shall be sealed as detailed in the approved design and as permitted by the FDOT and SJCUD. Where allowed by the FDOT, a single HDPE carrier pipe may be installed by HDD in lieu of a carrier pipe inside a casing pipe.

3.5.6 Railroad Crossings

Permits for all work within the railroad ROW shall be obtained by the EOR and/or the Contractor. The Contractor shall verify existence of the applicable railroad ROW permits prior to commencing work. All work related to the railroad crossings shall be in full compliance with the terms of these permits and AREA Specifications for Pipeline Crossings Under Railway Tracks for Non-Flammable Substances. The water, wastewater, or reuse main shall be placed in steel casing pipe under all railroad crossings whether installed by open cut, bore and jack, or HDD. The water, wastewater, or reuse main shall be placed in the casing with approved casing spacers. All joints within carrier pipe shall be mechanically restrained or fused. After inspection by SJCUD, the ends of the casing shall be sealed as detailed in the approved design and as permitted by the railroad permits and SJCUD. Upon completion and prior to final acceptance, the Contractor shall place crossing markers of a type acceptable to the Railroad Company at each end of the crossing at the railroad ROW. A casing leak detector may be required by the railroad company.

3.6 PRESSURE PIPE MATERIALS, VALVES, AND APPURTENANCES

3.6.1 General

- A. Pipe for watermain, forcemains, and reclaimed watermains shall be manufactured of PVC or HDPE. All HDPE pipes shall be upsized to provide the required internal diameter of DR18 PVC pipe. DI pipe may be used for potable and reclaimed water. FPVC may only be used to cross "local" roads as defined by SJC PW. FPVC shall be installed in straight runs horizontally and vertically only. FPVC shall not be used for HDD.
- B. All material shall be free from defects impairing strength and durability, shall be of the best commercial quality for the purpose specified, and shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
- C. All materials coming in contact with potable water shall be NSF approved.
- D. The Contractor shall be responsible for all materials furnished and storage of same, until the date of substantial completion. The Contractor shall replace all materials found to be defective or damaged in handling or storage. The Contractor shall, if requested by SJCUD, furnish certificates, affidavits of compliance, test reports, or samples. All costs associated with replacement, storage and handling of materials shall be at the Contractor's expense.
- E. SJCUD reserves the right to perform testing of any or all materials furnished for conformance to the standards, herein. SJCUD reserves the right to reject any materials which do not conform to these standards, or where in the opinion of SJCUD the methods of manufacture fail to secure uniform results acceptable to the requirements in the following standards.

3.6.2 PVC Pipe

- A. Service: Potable and Reclaimed Watermain and Forcemain
- B. Size and Pressure Rating:
 1. 4" through 16": AWWA C900, DR18, 235 psi.

2. 20" through 36": AWWA C905, DR25, 165 psi.
3. DR25 pipe whose buried depth, not cover, is greater than 10' shall be DR18.
- C. Material: Class 12454 A or B material per AWWA C900 and C905, ASTM D 1784, ASTM D 1785, and ASTM D 2241.
- D. Locate Wiring & Pipe Marking: Section 3.4.7 of this manual shall apply. Permanent identification shall be provided by using colored resin for the pipe. Color shall be: BLUE-Potable Water, GREEN-Sewer, and PURPLE-Reclaimed Water.
- E. Joints:
 1. Push on: Bell and spigot, gasketed in accordance with ASTM D3139. Gaskets shall conform to ASTM F477.
 2. Restrained: Restrainers shall be as approved by SJCUD and as described in Section 3.9 of this manual.

3.6.3 HDPE Pipe

- A. Service: Potable and Reclaimed Watermain and Forcemain
- B. Size: 4" through 36" per AWWA C906.
- C. Material: PE 4710 meeting cell classification 445574C per ASTM D3350.
- D. Pressure Rating:
 1. 4" through 36": 200 psi (DR11)
 2. HDPE pipe shall be upsized to provide the required internal diameter of DR18 PVC pipe.
- E. Locate Wiring & Pipe Marking: Section 3.4.7 of this manual shall apply. Permanent identification shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. Color shall be: BLUE-Potable Water, GREEN-Sewer, and PURPLE-Reclaimed Water.
- F. Joints: Thermal butt-fusion (HDPE to HDPE pipe) according to ASTM D3261 or mechanical adapter for valve, fitting, or dissimilar pipe to pipe connections.
- G. Minimum bending radius for all DR classifications shall be 15 times the pipe OD.

3.6.4 HDPE Tubing

- A. Service: Potable and Reclaimed water services and small diameter forcemains
- B. Size: ¾" – 2"
- B. Material: HDPE with UV inhibitors, manufactured of PE 3408 in accordance with AWWA C901, ASTM D2239, ASTM D2737, and ASTM D3350.
- C. Pressure Rating: SDR9
- D. Locate Wiring & Pipe Marking: Section 3.4.7 of this manual shall apply. Pipe shall have the normal size, pressure ratings, NSF seal, manufacturer's name or trade mark, standard dimension ratio and ASTM specification labeled at intervals not to exceed 4'. Permanent identification shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. Color shall be: BLUE-Potable Water, GREEN-Sewer, and PURPLE-Reclaimed Water.
- E. Joints: Heat fusion according to ASTM D3261 or coupling per manufacturer's recommendations. No couplings or fittings under asphalt.

3.6.5 Fusible PVC

- A. Service: Potable and Reclaimed Watermain and Forcemain
- B. Size: 4" through 24".
- C. Material: Class 12454 A or B material per AWWA C900 and C905, ASTM D 1784, ASTM D 1785, and ASTM D 2241.

- D. Pressure Rating:
 1. 4" through 12": AWWA C900, DR18, 235 psi.
 2. 16" through 24": AWWA C905, DR18, 235 psi.
- E. Locate Wiring & Pipe Marking: Section 3.4.7 of this manual shall apply. Permanent identification shall be provided by using colored resin for the pipe. Color shall be: BLUE-Potable Water, GREEN-Sewer, and PURPLE-Reclaimed Water.
- F. Joints: Fused only but adaptable to other DI pipe size pipe.

3.6.6 Ductile Iron Pipe

- A. Service - Watermain and Reclaimed Watermain
- B. Size: 4" through 48".
- C. Material: Centrifugally cast, grade 60-42-10 iron meeting requirements of AWWA C150, C151, and C111.
- D. Pressure Rating:
 1. 4" through 12": Pressure class 350.
 2. 16" through 20": Pressure Class 250.
 3. 24": Pressure Class 200.
 4. 30" through 48": Pressure Class 150.
- E. Lining: Cement mortar with sealcoat per ANSI A21.4/AWWA C104. Any type of lining shall be NSF61 approved.
- F. Exterior Coating - Below Ground
 1. Standard - Asphaltic, one mil thick per AWWA C151.
 2. Polyethylene Wrap - Shall conform to AWWA C105, high density polyethylene, 4 mils thick (min.) laminated type or 8 mils thick (linear low density) type. Wrap shall include industrial standard repeatable message "Potable Water" and be blue or "Reclaimed Water" and be purple. Use in corrosive soil conditions as described in AWWA C105, Appendix A.
- G. Joints
 1. Push-on - Bell and spigot, gasketed per AWWA C111.
 2. Flanged - Per AWWA C110 and AWWA C115, ANSI B16.1, Class 125. Gaskets shall be rubber ring type, 1/8" thick. Bolts and nuts shall conform to Grade B ASTM A 307.
 3. Restrained - Restrainers shall be ductile iron per AWWA C111 and ASTM A 536 and as approved by SJCUD. Twist-off nuts shall be provided. Restrainer shall have a working pressure of 250 psi minimum with a safety factor of 2:1. When a pipe joint is restrained adjacent to a fitting, a harness type restraint device shall be used. Section 3.9 of this manual shall apply.

3.6.7 Casing Pipe

- A. Steel
 1. Size: 14" through 66".
 2. Material: Steel casing shall be ASTM A139 Grade B, minimum yield strength of 35,000 psi. Casing pipe shall have minimum nominal diameter and wall thickness as shown on the table included on the standard detail in Part V of this manual.
 3. Wall Thickness: Meet the latest requirements of FDOT Standard Specification for Road and Bridge Construction and the American Railway Engineering Association Manual of Recommended Practice. See table included on the standard detail in Part V of this manual.
 4. Locate Wiring & Pipe Marking: Section 3.4.7 of this manual shall apply. Pipe

- furnished by manufacturer shall be cast and machined at one foundry location to assure quality control.
5. Lengths: Full pipe length shall be provided with a minimum length of 8'.
 6. Joints: Electric fusion (arc) welded by certified operators meeting the requirements of the American Welding Society Standard AWS D7.0 procedures and in accordance with AWWA C206. Field weld joints shall be tapered approximately 45 degrees.
 7. Joint Coating: Wire brush welded joints and paint with Koppers Inertol Primer 626 or equal.
- B. HDPE - Casings shall be AWWA C-906 (DR11) for pipe sizes between 4" through 30". The casing pipe shall be color coded to match the service of the carrier pipe. The casing shall be sized to accommodate the carrier pipe and casing spacer.

3.6.8 Brass Pipe

- A. Size: 2" and smaller
- B. Material: Schedule 40, Brass Pipe per ASTM B43-91
- C. Joints: Threaded
- D. Uses: Flushing hydrants, contaminated soils sites, and small diameter above ground applications.

3.7 FITTINGS

3.7.1 Ductile Iron Fittings

- A. DI fittings shall have a minimum working pressure of 250 psi.
- B. Fittings shall conform to ANSI Specification A21.10 (AWWA C110), A21.11 (AWWA C111), A21.15 (AWWA C115) and/or A21.53 (AWWA C153).
 1. Compact fittings shall normally be installed. Long body fittings shall be used when conditions warrant.
 2. Fittings shall be UL/FM approved and shall conform to NSF Standard 61 as applicable. Fittings furnished by the approved manufacturer shall be cast and machined at one foundry location to assure quality control. Fittings shall have cast on the outside body of the fitting the following: pressure rating, nominal diameter of openings, manufacturer's name, foundry location, plant code, and degrees or fraction of the circle.
 3. DI fittings for potable and reclaimed water service shall be coated and lined as specified in Section 3.6.2.
 4. DI fittings for forcemain service shall be externally coated with a standard asphaltic coating as supplied by the manufacturer and internally lined using a SJCUD approved product or pre-approved equal.

3.7.2 Polyethylene Fittings

- A. HDPE Mechanical Joint (MJ) Adapters
- B. Fittings shall be PE3408 HDPE, Cell Class 345464C per ASTM D3350
- C. Mechanical connections of HDPE pipe (4" through 24" diameter) to Ductile Iron or PVC piping, fittings, or valves shall be by a self-restraining, fusible mechanical joint adapter with or without an integral, internal stainless steel insert.
- D. Mechanical joint adapter shall be of the same DR rating as the pipe.
- E. A stainless steel type insert is required for pipe sizes through 12".
- F. Provide the mechanical joint adapter with longer tee bolts or stainless steel thread rods with nuts at the mechanical joint.
- G. Manufacturer's Quality Control

1. Manufacturers used to supply pipe and fittings shall have an established quality control program. This program must verify cell classification properties of the material.
2. The Contractor shall certify the cell classification properties of the material.
3. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination.

3.7.3 Brass Fittings

- A. Fittings for brass piping applications 2" diameter and smaller.
- B. Minimum working pressure of 200 psi.
- C. Fittings shall conform to ANSI B16.15, ANSI B2.1
- D. Fittings shall be threaded.

3.7.4 Connectors

- A. Flange Adapters
 1. Flange adapters shall be ductile iron manufactured to ASTM A536 standards.
 2. Bolt circles and bolt holes shall meet ANSI B16.1.
 3. Adapter flanges shall meet or exceed the test requirements of AWWA C900, ASTM D2241, and ASTM D1599.
- B. Pipe Couplings
 1. Couplings used to join two pieces of DI or PVC pipe shall be sized to match the outside diameter of the pipeline.
 2. Transition couplings shall be used to join pipes of different outside diameters.
 3. The coupling sleeve shall be manufactured of DI conforming to ASTM A536 and coated with 14 mils of epoxy. Bolts shall be manufactured of high corrosion resistant metal and shall conform to ANSI A21.11 (AWWA C111). Gaskets shall be wedge-type and manufactured of virgin SBR. Installation of couplings shall be in accordance with manufacturer's recommendations.
 4. Couplers and adapters for 2" or 3" HDPE pipe shall be brass conforming to AWWA C800 and shall be female IPT, pack joint, or compression nut.
- C. Full Circle Repair Clamps
 1. Full circle repair clamps shall have type 304 stainless steel shells, lugs and washers as per ASTM A193, A194, and A240. Bolts and nuts shall be 316SS.
 2. Gaskets shall be SBR per ASTM D2000.

3.8 VALVES AND APPURTENANCES

3.8.1 General

- A. All valves and appurtenances shall be supplied, installed and tested by the Contractor in accordance with the approved Construction Drawings and as herein specified. Unless otherwise specified any reference to Industry Standards will be to the latest revisions. All valves and appurtenances shall be products of well-established firms who are experienced and qualified in the manufacture of the product to be furnished.
- B. Rotation of Opening - All valves shall open by turning counter clockwise (or to the left), when viewed from the stem.
- C. Extension Stems - Extension stems shall be provided on all buried valves when the operating nut is deeper than 36" below the final grade. Sufficient stem extension shall be provided so that the nut will be no more than 36" below finished grade.
- D. Valve Markers
 1. In locations with curbs the valve location shall be marked with a "V" either cut or

etched in the curb.

2. As directed by SJCUD, valves located outside of paved areas shall have an above ground marker. Markers shall be as shown in the approved materials manual. Markers shall be colored coded to match the service of the valve they are marking (BLUE-Potable Water, GREEN-Sewer, and PURPLE-Reclaimed Water), and shall have reflective permanent decal with white font labeling the post as a valve marker. Markers shall extend a minimum of 3' above the ground and shall not be taller than 4.5'. Markers shall be installed in accordance with the standard detail drawing and per the manufacturer's recommendations.

3.8.2 Gate Valves

- A. General - The operating nut or wheel shall have an arrow cast in the metal indicating the direction of opening. All valves shall open by turning the operating nut counter-clockwise. Each valve shall have the manufacturer's distinctive marking, pressure rating, and year of manufacture cast on the body. Sealing mechanism shall provide zero leakage at the working pressure with the flow in either direction.
- B. Gate valves 12" and smaller shall be resilient seat gate valves and shall meet or exceed all applicable requirements of ANSI/AWWA C515, UL 262 Listed, FM 1120/1130 approved, and certified to ANSI/NSF 61 and 372; flanged end drilling complies with ASME/ANSI B16.1 class 125 and B16.42 class 150; mechanical joint end complies with ANSI/AWWA C111 Standard; ductile iron body with nominal 10 mils epoxy coating which meets or exceeds all applicable requirements of ANSI/AWWA C550 Standard; iron wedge, symmetrical & fully encapsulated with molded rubber; no exposed iron; non-rising stem; 2" square wrench nut; 350 psig maximum working pressure, 700 psig; UL Listed, FM Approved: 350 psig.
- C. Gate valves 16" to 24" shall be resilient seat gate valves and shall meet or exceed all applicable requirements of ANSI/AWWA C515, UL 262 Listed, FM 1120/1130 approved, and certified to ANSI/NSF 61 and 372; flanged end drilling complies with ASME/ANSI B16.1 class 125 and B16.42 class 150; mechanical joint end complies with ANSI/AWWA C111 Standard; ductile iron body with nominal 10 mils epoxy coating which meets or exceeds all applicable requirements of ANSI/AWWA C550 Standard; iron wedge, symmetrical & fully encapsulated with molded rubber; no exposed iron; non-rising stem; 2" square wrench nut; 16" - 250 psig maximum working pressure; 20" & 24" - 175 psig maximum working pressure.
- D. Above Ground Valves - Gate valves located above ground or inside structures shall be hand wheel operated, non-rising stem type with flanged ends and be of the same general construction as buried valves.
- E. Valve Joints - All gate valves shall have mechanical joint ends, flanged ends, or screw joints to fit the connecting pipe.

3.8.3 Check Valves

- A. Check valves shall have ductile iron bodies, outside lever and spring type, and shall meet the material requirements of ANSI/AWWA C508. The valves shall be ductile iron body, bronze mounted, single disc, 200 psi working water pressure, non-shock, and hydrostatically tested at 400 psi. Ends shall be class 125, ANSI B16.1 flanges.
- B. When there is no flow through the line the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway.
- C. Check valves shall have bronze seat and body rings, extended bronze hinge pins and 316SS nuts on the bolts of bolted covers.

- D. Valves shall be so constructed that disc and body seat may easily be removed and extended hinge arm with outside lever and weight.

3.8.4 Plug Valves

- A. All plug valves shall be installed so that the direction of flow through the valve is in accordance with the manufacturer's recommendations. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall meet AWWA C111, Class B.
- B. Valve bodies shall be ductile iron in compliance with ASTM A536 Grade 65-45-12. All exposed nuts, bolts, springs, washers, etc. shall be 316SS. Resilient plug facings shall be of Buna-N.
- C. Port area for valves 4" through 20" shall be at least 80 percent nominal pipe diameter. Port area for valves 24" and larger shall be at least 70 percent of nominal pipe diameter. All exposed nuts, bolts, springs, washers, etc., shall be 316 stainless steel.
- D. Valves shall be furnished with permanently lubricated stainless steel or oil impregnated bronze upper and lower plug stem bushings.
- E. Seats in 4" and larger valves shall have a welded in overlay of a high-nickel content on all surfaces contacting the plug face.
- F. Valve shaft seals shall be adjustable and comply with AWWA C507.

3.8.5 Air Release Valves

- A. Potable and Reclaimed Water - The body/base of these valves shall be made from high strength lightweight non-corroding fiberglass reinforced nylon, with total weight of no more than 3 lb., and all operating parts are to be made of engineered corrosion resistant plastic materials. The rolling resilient seal shall provide smooth positive opening, closing, and leak-free sealing over the fluctuation of pressure differentials. The valve shall be designed with a larger than normal automatic orifice to allow efficient air release and minimize potential debris build up and clogging. The working pressure shall be 200 psi and shall have a 3/4", 1", 2" threaded connection, or 3" and 4" flange connection. The connection to the system shall be a direct threaded connection, or flange, on the top of the pipe with a saddle, with an isolation valve. All ARVs must be ISO-9000 and NSF 61 certified.
- B. Sewer - The body of these valves shall be conical shaped to maintain maximum air gap with the spring loaded float and seal plug connection combining so that there is no contact between the sewage and the seal. The valve shall have a double float design with the upper float being enclosed in the upper section of the valve, and shall be constructed of foam polypropylene. The lower float shall be in the main body of the valve and shall be constructed of foam polypropylene. The body, cover flange, and lower flange shall be constructed of reinforced nylon, and shall have a funnel shaped lower body to automatically drain sewage back into the system. All internal metal parts are to be made from corrosion-resistant, 316SS with all operating parts in the upper and lower sections to be made of non-metallic plastic/rubber materials. The hinge for opening and closing the seal on the orifice shall be made of EPDM rubber. The valve components will provide smooth positive opening, closing, and leak-free sealing over the fluctuation of pressure differentials. The working pressure shall be 145 psi and tested to 230 psi. All hardware shall be made of stainless steel bolts and nuts, and the entire valve, except to upper outlet, shall be constructed of reinforced nylon material. All valves shall be equipped for back flushing maintenance with easy connection or disassembly. Valves with a total weight of

more than 10 lb. shall be anchored to relieve the weight to the saddle and PVC pipe. Those valves weighing less than 10 lb. will not be required to be anchored. The ARV shall not be taller than 19". Above ground ARVs shall be housed in a SJCUD approved enclosure.

3.8.6 Casing Leak Detectors

Casing leak detectors shall be furnished and installed on all casings. Leak detector systems shall consist of a ¾" SCH80 PVC piping that is either tapped into the top of the casing pipe with a service type saddle near the end of the casing pipe, or brought through the end of a casing through a custom link seal type casing end seal. The leak detector pipe shall be brought to the surface and terminated in a traffic rated meter box of sufficient size. The piping shall be terminated in the meter box in such a way that the vent pipe opening faces downward. Casing leak detector boxes shall be located at one end of the casing pipe and shall be placed outside of the roadway or any driveways. In the case where a casing pipe is not level, the leak detector system shall be installed at the higher end of the casing pipe. If the casing leak detector is located in an area where curbing exists, "LD" shall be carved in the curb closest/adjacent to the casing leak detector box. This "LD" shall be appropriately color coded (BLUE-Potable Water, GREEN-Sewer, and PURPLE-Reclaimed Water).

3.8.7 Valve Boxes

A. General

1. The Contractor shall furnish, assemble, and install a valve box for each buried valve. Each valve box installed in unimproved condition areas (unpaved areas) shall be installed with a 24" square 6" thick concrete collar with #4 reinforcing rebar rings poured around the top of the valve box cover. The concrete shall have a minimum strength of 3,000 psi. Concrete pad shall have flow line scribed on pad indicating direction of pipeline.
2. Grout shall be applied in the annular space between the valve box and concrete pad. The grout shall be placed in the entire 4" vertical annular area within the pad open hole space. The concrete pad shall be placed on compacted sand. The top of the concrete pad shall be level with the top of the cast iron valve box and level with grade.
3. A locator marker shall be installed under the concrete valve box pad on all SJCUD owned and operated valves. A 3" diameter bronze disc anchored in concrete shall be required for all valves. The bronze tag shall indicate size, type, service, direction and number of turns to open, and year installed. Where valves are approved to be installed in existing pavement (where concrete collar nut is required) the brass tag shall be affixed to the bottom of the valve box lid by epoxy or other approved method.

B. Valve Boxes

1. All buried valves shall have cast iron two-piece screw-type valve boxes. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at or slightly above finished grade. The barrel shall be two-piece, adjustable type, having 5-1/4" shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall have "WATER", "SEWER", or "REUSE" cast into the top for their specific service.
2. Valve boxes shall be constructed to ensure that valve stems are vertical and the cast iron box has been placed over the stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment

during backfilling. Contractor shall remove any sand or undesirable fill from valve box prior to final inspection. The top of the valve box lid and the inside of the top section of the valve box shall be painted blue for in-line valves and yellow for fire hydrant isolation valves.

3.9 PRESSURE PIPE RESTRAINT

3.9.1 General

Pipelines shall be restrained at all valves, bends, tees, crosses and dead ends for a specified distance. The use of concrete thrust blocks and tie rods is prohibited unless pre-approved by SJCUD. Approved restraint devices are listed on SJCUD approved materials list and shall be installed for a distance determined by the EOR.

3.9.2 Restrained Joint Construction

- A. Piping or fittings requiring restrained joints shall be capable of holding against withdrawal for line pressures 50 percent above the normal working pressure or a minimum of 150 psi.
- B. The design Engineer may also determine the minimum number of restrained joints required on each side of fittings or changes in direction of pipe to develop adequate friction with the soil for the length of restrained pipe.

3.9.3 Mechanical Restraining Devices

The restrainer shall be manufactured of ductile iron and shall meet or exceed all the requirements of ANSI A21.11 (AWWA C111) and ASTM A536. The restrainer system shall provide anchoring for ductile iron pipe and fittings, valves, and PVC pipe to mechanical joint pipe or fittings or bell to spigot PVC pipe joints. The restrainer shall accommodate the full working pressure rating of the pipe plus surge allowance. The restraining device shall not damage or lower the working pressure of the pipe installed. Restrainers shall be properly stored to minimize sand and debris build-up. Specifically, the twist-off-screws and associated threads shall be clean (free of sand) prior to installation.

3.9.4 Retainer Glands

Retainer glands shall be manufactured of ductile iron grade 64-42-10, ASTM A536, or SJCUD pre-approved equal and shall be designed to fit standard mechanical joint bells conforming to applicable sections of ANSI A21.10 (AWWA C110), ANSI A21.11 (AWWA C111), and ANSI A21.53 (AWWA C153). The restraining device shall be rated for the full working pressure of the pipe type used including surge allowance and a 2:1 safety factor and shall be as shown in SJCUD approved material manual. Mechanical restraints shall include a restraining mechanism which, when actuated, imparts a wedging action against the pipe, increasing its resistance as the pressure increases. The restraint shall be compatible with the type of joint being installed. The joint deflection shall not exceed 80% of the pipe manufacturer's recommended maximum deflection. Deflection, if necessary, shall be made before tightening the set screws. Bolts and set screws shall be tightened alternately, 180 degrees apart, to the torque recommended by the manufacturer. Retainer glands having set screws that make point contact with the pipe without using a pad to disperse point loading shall not be used on PVC pipe.

3.10 PRESSURE CONNECTIONS

3.10.1 Notification and Connection to Existing Mains

- A. All connections to SJCUD Water System and transfer of services shall be performed by

- the contractor under supervision of SJCUD representative.
- B. Contractor shall submit the name of the proposed tapping subcontractor.
 - C. All connections to existing SJCUD mains shall be made by the Contractor only after the connection procedure and the work scheduling has been reviewed and approved by SJCUD.
 - D. The Contractor shall submit a written request to SJCUD a minimum of five (5) business days prior to scheduling said connections. In the request, the Contractor shall outline the following:
 - 1. Points of Connection, fittings to be used, and method of flushing and disinfection.
 - 2. Estimated construction time for the connections.
 - E. SJCUD shall review the submittal within three (3) business days after receiving it and inform the Contractor regarding approval or denial of the request. If his request is rejected by SJCUD, the Contractor shall resubmit the request modifying it in a manner acceptable to SJCUD.
 - F. All connections shall only be made on the agreed upon date and time. If the Contractor does not initiate and complete the connection work in the agreed upon manner, then the Contractor shall be required to reschedule the connection by following the procedure outlined above.
 - G. Only SJCUD personnel shall operate system valves.
 - H. All large diameter taps 4" diameter and larger onto a pressurized main shall be performed using a tapping sleeve and valve and must have a minimum separation of 5' along the main being tapped from either the nearest pipe joint or large diameter tap. No more than two large diameter taps shall be made on any 20' length of pipe.
 - I. Tap Sizes
 - 1. Connections to mains shall be at least one nominal pipe diameter smaller as described in Section 2.2.4 than the main being connected to.
 - 2. If the size of the desired connection is the same size as the main being connected to, the main must be isolated and a tee and coupling installed. Surrounding joints as determined by the EOR may need to be restrained.
 - 3. Size-on-Size taps are typically prohibited and must be pre-approved by SJCUD. If allowed, a full circle tapping sleeve at least 12" wider on each side of the tap shall be used.
 - J. Contractor shall submit the coupon for all taps to SJCUD. In the event a coupon is not recovered from the tap, the Contractor shall pay for all costs associated with retrieving a lost coupon.

3.10.2 Tapping Sleeves

- A. Tapping sleeves shall be utilized only for pressure tap connections or where specifically approved by SJCUD.
- B. Stainless Steel - Tapping sleeves including the flange shall be 304SS and nuts and bolts shall be 316SS. The pilot flange shall be:
 - 1. Recessed for tapping in accordance with MSS SP-60.
 - 2. Rated Class D per AWWA C207 with a 125 lb. drilling conforming to ANSI B16.
- C. A fully encapsulated SBR gasket that is full circle for length of the sleeve and cloth reinforced with attached stainless steel bridges for support at the flange lugs shall be supplied and used for the body gasket. The flange shall be supplied with a gasket bonded to it. The tapping sleeve shall have a test port and plug located at the 12:00 position. The port and plug shall be 3/4" NPT and made of bronze or stainless steel. Tapping sleeves made of stainless steel shall be rated for a 150 psi and 200 psi minimum operating and

testing pressure, respectively. All welds shall conform to ASTM A380 and shall be passivated. The tapping sleeve shall be rated for the full working pressure of the pipe type used and shall be as shown in SJCUD approved material manual.

3.10.3 Tapping Valves

Tapping valves shall be ductile iron body, bronze mounted gate valves, non-rising stem, open left, resilient seat, 2" square operating nut, for vertical mounting on buried pipelines. The valve ends shall be mechanical joint for use with DI pipe on one side and standard flanged (Class 125) on the other.

3.10.4 Disinfection of Tapping or Drilling Machine

Prior to tapping a pressurized pipeline, the drilling machine's pilot drill, shell cutter, and cutter hub shall be disinfected with a minimum of 1% hypochlorite solution. The pilot drill, shell cutter, and cutter hub shall be swabbed until clean or totally immersed in the sterilizing solution and allowed to remain wet at least five minutes before tapping operation commences. The tapping sleeve shall be disinfected in accordance with AWWA C651. Rinsing the sterilizing solution from the tapping components prior to tapping is not required.

3.10.5 Hydrostatic and Leakage Test

A hydrostatic and leakage test shall be performed after the tapping sleeve and valve is installed, and prior to tapping of a pressurized watermain. The test shall be conducted by introducing water into a tap or test hole located at the neck of the outlet half of the sleeve and with the tapping valve in the closed position. Sleeves shall be provided with a test plug. The sleeve and valve shall be capable of maintaining a test pressure of 150 psi for 15 minutes duration with no sign of visible leaks. All leaks shall be repaired and the sleeve and valve shall be re-tested. Repair and re-testing shall be done until the installation passes the specified test. A bronze or stainless steel watertight plug shall then be inserted into the test hole.

3.10.6 Service Saddle

A service saddle shall be used for all service line taps 2" and smaller in diameter. Service saddles shall be wide dual band, anchored by a minimum four (4) bolt pattern on a fused epoxy coated ductile iron saddle body. Service saddles shall utilize the wide stainless steel band sized exactly to the pipe outside diameter. Sealing gaskets shall be BUNA-N rubber. All hardware shall be 316SS.

3.10.7 Installation

- A. Excavation, Backfill, Compaction, and Grading - The applicable provisions of Section 3.3 shall apply.
- B. Construction Details
 1. Sufficient length of main shall be exposed to allow for installation of the tapping sleeve and valve and the operation of the tapping machinery. The main shall be supported on concrete pedestals or bedding rock at sufficient intervals to properly carry its own weight, plus the weight of the tapping sleeve valve and machinery. Any damage to the main due to improper or insufficient supports shall be repaired at the Contractor's expense.
 2. The inside of the tapping sleeve and valve, the outside of the main, and the tapping machine shall be cleaned and swabbed or sprayed with 10% liquid chlorine prior to beginning installation for water system pressure connections.

3. After the tapping sleeve has been mounted on the main, the tapping valve shall be bolted to the outlet flange, making a pressure tight connection. Prior to beginning the tapping operation, the sleeve and valve shall be pressure tested at 150 psi to ensure that no leakage will occur.

3.10.8 Potable and Reclaimed Water Service Connections

Service connections (new and taps into existing mains) shall have a brass corporation stop at the main and connected directly into the service saddle. Tap sizes, locations, and proximity to other taps, joints, and fittings are as described in Section 2.7.2. A minimum 4" tap is required for transmission mains.

3.10.9 Water and Reclaimed Water Services

- A. The Contractor will furnish and install new services in accordance with the plans and contract documents. Installation of long side services shall be in a manner approved by SJCUD. Although boring is a permitted method of installation (when approved by SJCUD), water jetting is not allowed. The open cut method may only be used when the entire roadway is being reconstructed. SJCUD reserves the right to approve or disapprove all methods of installation of long side services.
- B. When a concrete curb is present, a 3" high "W" or "R" shall be etched or cut in the curb to designate the location of each potable water or reclaimed water service, respectively, otherwise the locations shall be marked in a method approved by SJCUD. The area around the "W" or "R" on the curb shall be painted blue or purple, respectively.
- C. New service piping with all necessary appurtenances between the main and each existing or new meter shall be installed by the Contractor when:
 1. A new main is installed.
 2. An existing main is relocated or replaced.
 3. It is necessary due to a direct conflict with proposed construction.
- D. All potable and reclaimed water services from corporation stop to curb stop shall be 1" HDPE or larger, as shown on the plans. A maximum of two ¾" water lines (after the meter) shall be served from one 1" water service.
- E. Customers that have reclaimed water service to their property shall have a SJCUD approved backflow preventer installed on the downstream side of the potable water meter. SJCUD provides this as part of the potable water meter package, upon meter installation.
- F. The maximum length of a service from the main to the meter shall be 100' unless otherwise approved by SJCUD.
- G. No more than five (5) potable or three (3) reclaimed water service connections will be allowed on a 2" main unless pre-approved by SJCUD.

3.11 POTABLE AND RECLAIMED WATER APPURTENANCES

3.11.1 Corporation Stops

Corporation stops shall be required on all services and shall be manufactured from cast bronze in accordance with AWWA C800 in sizes ¾" through 2". The inlet connection shall be AWWA corporation stop thread or CC thread. The outlet connection shall be a pack joint outlet for polyethylene tubing. Corporation stops shall be installed directly into the service saddle, no nipple between saddle and corporation stop shall be used. Use ¼ turn ball valves.

3.11.2 Curb Stop

Curb stops shall be manufactured from cast bronze in accordance with AWWA C800 in sizes

$\frac{3}{4}$ " through 2". Curb stop shall be full-port, $\frac{1}{4}$ turn ball valve with stop, combined cap and tee, with lock wing cast on stop body and operating tee cap to provide for locking the stop in closed position. Curb stops utilizing poly tubing shall have an inlet connection with a pack joint by yoke connection. Curb stops that are 1- $\frac{1}{2}$ " or 2" are to be flanged to connect directly to meter.

3.11.3 Meter Boxes

- A. Following are the requirements for all meter boxes:
 - 1. Boxes and lids for potable water services shall be black and blue, respectively.
 - 2. Boxes and lids for reclaimed water services shall be purple.
 - 3. Meter boxes shall be installed flush with grade and not in pavement.
 - 4. Lids shall have one 1- $\frac{3}{4}$ " port per meter which will accommodate touch read or automated meter read (AMR) systems. Ports shall be drilled through the lid and have a recessed area for the touch read pad or AMR antennae to sit flush with the top of the lid.
 - 5. Lids shall not have a locking mechanism or be bolted down in the field.
- B. HDPE meter boxes and lids shall be used for residential services located along curbed residential road ROW and within the ROW that are not paved or exposed to incidental traffic.
- C. Polymer concrete meter boxes and lids may be used in specific installations which must be pre-approved by SJCUD.
- D. Manufacturers for meter boxes and lids shall be as specified in Part IV of this manual.

3.12 WATER ONLY APPURTENANCES

3.12.1 Backflow Prevention Devices

- A. Reduced Pressure Type - The Reduced Pressure Principle Backflow Prevention Assembly shall be ASSE® Listed 1013 and supplied with full port ball valves on backflow prevention devices smaller than 2". The main body and access cover shall be epoxy coated ductile iron (ASTM A 536 Grade B); the seat ring and check valve shall be NORYL™, the stem shall be stainless steel (ASTM A276); and the seat disc elastomers shall be EPDM. The checks and the relief valve shall be accessible for maintenance without removing the device from the line. The Reduced Pressure Principle Backflow Prevention Assembly shall be approved by SJCUD. All backflow prevention devices shall be fitted with adequate and well secured freeze protection insulation.
- B. Reduced Pressure Detector Type - The Reduced Pressure Detector Backflow Prevention Assembly shall be ASSE® Listed 1047 and supplied with full port rising stem gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTM A 536 Grade B), the seat ring and check valve shall be NORYL™; the stem shall be 304 or 316SS (ASTM A 276); and the seat disc elastomers shall be EPDM. The checks and the relief valve shall be accessible for maintenance without removing the device from the line. The Reduced Pressure Detector Backflow Prevention Assembly shall be approved by SJCUD.
- C. Double Check Type - The Double Check Backflow Prevention Assembly shall be ASSE® Listed 1015 and supplied with full port gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTM A 536 Grade 4); the seat ring and check valve shall be NORYL™; the stem shall be stainless steel (ASTM A 276); and the seat disc elastomers shall be EPDM. The checks shall be accessible for maintenance without removing the device from the line. The Double Check Backflow Prevention Assembly shall be approved by SJCUD.

- D. Double Check Detector Type - The Double Check Detector Backflow Prevention Assembly shall be ASSE® Listed 1048 and supplied with full port gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTM A 536 Grade 4); the seat ring and check valve shall be NORYL™ (NSF Listed); the stem shall be stainless steel (ASTM A 276); and the seat disc elastomers shall be EPDM. The first and second check valves shall be accessible for maintenance without removing the device from the line. The Double Check Detector Backflow Prevention Assembly shall be approved by SJCUD.

3.12.2 Fire Hydrants

- A. General - Fire hydrants shall have a 5-1/4" valve opening, ductile iron body, fully bronze mounted, for 150 psi working pressure, complying with AWWA Standard C502. The inlet connection shall be mechanical joint type with harnessing lugs for 6" pipe. The hydrant foot shall be epoxy coated and have integral cast tie-back lugs. The integral shut-off valve shall be compression type opening against water pressure. Hydrant shall open by turning to the left (counter clockwise). The main valve seat and the threaded portion of the hydrant shall be bronze. The hydrant barrel drain valve and port shall be bronze. The hydrant barrel drain shall be actuated by operation of the main valve stem. The stem operating threads and thrust bearing shall be sealed by "O" rings and shall be provided with means for lubrication. The hose nozzles shall be bronze with National Standard fire hose coupling screw threads consisting of one, 4-1/2" pumper nozzle and two, 2-1/2" hose nozzles. The hydrant operating nut and nozzle cap nuts shall be 1-1/2" pentagonal. The nozzle caps shall be securely attached to the hydrant barrel by chains. The hydrant shall be "traffic" type with a traffic flange or lugs and operating stem section at the ground level. Fire hydrants shall be of ample length for a minimum 42" bury depth.
- B. Painting - All metal parts of the hydrant both inside and outside shall be painted, in accordance with AWWA C501. All inside surfaces and the outside surfaces below the ground line shall be coated with two (2) coats of asphalt varnish in compliance with NSF-61. The outside of the hydrant above the finished grade line shall be thoroughly cleaned and painted with one (1) coat of paint of a durable composition, and one (1) additional coat of chromium yellow. Paint shall be RUS-KIL enamel or equal and be reflective. Private fire hydrants shall be painted red.
- C. Installation - Hydrants shall be plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb. Hydrants shall be set so that the lowest hose connection is a minimum of 18" above the surrounding finished grade. All hydrants shall be inspected in the field upon delivery to the job to insure proper operation before installation. The resetting of existing hydrants and moving and reconnecting of existing hydrants shall be handled in a manner similar to a new installation. Hydrant "gradelok" for offset adjustments may be utilized. Include pavement location markers per the SJC LDC. A concrete pad using 3,000 psi concrete with nominal dimensions of 6" thick and 24" square shall be used.
- D. Location - Fire hydrants shall be located in the general location as shown on the approved Construction Drawings. Location of fire hydrants shall comply with the SJC Fire Department Codes (and as amended).

3.13 GRAVITY SEWER PIPE

3.13.1 General

- A. This section includes materials and specifications for pipe, fittings, joints, corrosion protection, linings, coatings, pipe wraps, piping supports, locating wire, and testing.

SJCUD will review and approve plans for gravity sewer systems and extensions only when such mains are designed and constructed in accordance with the criteria set forth in this manual. The specifications cover the pipe, fittings, and accessory items used for gravity sewer systems.

- B. The Contractor shall be responsible for all materials furnished and storage of same. The Contractor shall replace all materials found to be defective or damaged in handling or storage, all costs associated with this replacement shall be paid for by the Contractor. The Contractor shall, if requested by SJCUD, furnish certificates, affidavits of compliance, test reports, or samples for check or analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.
- C. All material shall be free from defects impairing strength and durability, shall be of the best commercial quality for the purpose specified and shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
- D. SJCUD reserves the right to perform testing of any or all materials furnished for conformance to the standards or reject any materials which do not conform to these standards.

3.13.2 PVC Pipe

- A. 15" Diameter and Smaller
 - 1. In accordance with ASTM D3034, SDR 26.
 - 2. Joints: Integral bell and spigot, in accordance with ASTM D3212.
 - 3. Minimum uniform pipe stiffness at five percent deflection shall be 46 psi.
 - 4. Cell Classification: 12454 B or 12454 C, as defined by ASTM D1784.
 - 5. Fittings: SDR26 minimum wall thickness.
 - 6. Gaskets: Factory fabricated rubber compression type with solid cross section in accordance with ASTM F477. Lubricant for joining pipe shall be as approved by pipe manufacturer.
- C. Pipe shall bear the NSF-DW seal. The minimum standard length of pipe shall be 13'.
- D. Gravity sewer pipe shall be SDR26 for all depths of installation.

3.14 GRAVITY SEWER INSTALLATION

3.14.1 General

- A. All gravity sewer pipes shall be installed in a trench via open cut construction methodology. Gravity sewer pipe installation via HDD technology is prohibited.
- B. Alternate trenchless technology such as jack & bore and micro-tunneling may be allowed on a case by case basis and shall be approved by SJCUD prior to installation.

3.14.2 Pipe Preparation and Handling

- A. Lifting or rigging tools shall not be used on the inside of any lined pipe or fitting during handling and installation. The handling and installation of pipe and fittings shall be done in such a manner as to prevent any damage occurring to pipe, the lining inside of pipes, machined surfaces, fittings and the exterior pipe coating. Liner manufactures recommendations shall be followed to repair any damaged pipe liners.
- B. If a pipe is visibly cracked it shall be rejected and removed from the site unless it appears that the crack does not continue internally to the pipe wall and SJCUD approves the repair of the pipe. The cracked portion plus at least 12" on both sides shall be removed using a power driven cut-off saw. All ends will be inspected for cracks and the

- Contractor shall form a ¼" bevel on all cut ends of the pipe.
- C. If a fitting is cracked it shall be rejected and immediately removed from the site.
 - D. Any pipe or fitting which is suspected of being fractured due to improper handling or receiving a severe blow, regardless of if there is a visible crack, shall be rejected and removed from the site immediately.
 - E. Joint gaskets shall be stored in a clean, dark, and dry location prior to use.

3.14.3 Testing and Inspection of Gravity Sewers

- A. General - All gravity sewers shall be tested for alignment, deflection, and integrity prior to acceptance. In addition, a leakage test may be required for gravity sewers, solely at the discretion of SJCUD. The leakage testing shall be performed by the Contractor who shall be responsible for furnishing all necessary labor and equipment to conduct such testing. Alignment, deflection, and integrity testing shall be performed by the Contractor with the EOR and an authorized SJCUD representative as witnesses.
- B. Gravity Piping
 - 1. The Contractor shall perform testing after service connections, manholes, and backfilling have been completed between stations to be tested.
 - 2. The Contractor shall determine groundwater level at time of testing by exploratory holes or other method acceptable to SJCUD.
- C. Hydrostatic Test for Gravity Sewers
 - 1. Testing Equipment Accuracy
Equipment used for hydrostatic testing of gravity sewers shall have an accuracy of plus or minus 0.5 gallon water leakage under specified conditions.
 - 2. Maximum Allowable Leakage
The maximum allowable leakage rate during a hydrostatic test of gravity sewers is 0.16 gallons per inch diameter per hour per 100'. Include service connection footage in test section, subjected to minimum head specified.
 - 3. Gravity Sanitary Piping
Leakage testing with 15' of water or less shall include the highest horizontal vent in filled piping. Where vertical drain and vent systems exceed 15' in height, these systems shall be tested in 15' vertical sections as piping is installed.
- D. Defective Piping Sections - All defective pipe sections that do not meet testing requirements shall be repaired or replaced as approved by SJCUD. All repaired/replaced piping sections shall be retested by the Contractor and shall be required to meet specifications herein. All costs associated with this work as well as re-testing shall be paid for by the Contractor.
- E. Inspection for Alignment, Deflection, and Integrity
 - 1. Prior to video inspection, the Contractor shall construct all manhole inverts, the road base must be installed and density test must be completed. When gravity sewer is located in non-paved areas, such as utility easements or utility tracts, the Contractor shall ensure that these areas are at the final grade and that they are properly compacted.
 - 2. Prior to final acceptance by SJCUD, lamping inspection will be required. The Contractor is to thoroughly flush and clean the gravity sewer system prior to lamping and video inspection. Lines will be lamped between manholes and other structures for alignment, obstructions, and deflection. Results of the lamping may require further inspection by video camera as determined by SJCUD. All costs for this additional inspection will be the responsibility of the Contractor.
 - 3. Pipe shall be tested with a mandrel for deformation or deflection. Any pipe found to

be deformed and/or deflected in excess of 5% of the nominal diameter of the pipe shall be removed and replaced with new pipe at no additional cost to SJCUD. All mandrels used in testing shall be available to be checked for proper sizing by use of truing rings at the request of a SJCUD Representative. Results of the test shall be submitted to SJCUD for review and approval. The use of a re-rounding device or other similar equipment is not permitted to correct deflected (egg shape) pipe.

4. The Contractor shall ensure that all gravity sewer mains are inspected using video recording equipment and shall include audio recording as well as a nine point go-no-go mandrel in front of the camera. Prior to video inspection, the gravity mains shall be thoroughly flushed and sufficient water shall be added to indicate low areas or dips. During this video inspection, the camera shall stop and pan the lens toward each service, so as to provide an unobstructed view of the service. Prior to final acceptance, SJCUD shall be provided with one copy of the inspection report (both written and video on DVD) showing the entire length of gravity sewer tested. The report shall contain, at a minimum, the date of the video report, the Contractor, the condition of pipe, including dips, deflections, leaks, discoloration, reverse fall, external debris intrusions, indentations or any other visual anomalies, type of pipe, depth, location of services, length, type joint, roundness, distance between manholes, and clock position. The invert of laterals shall be above the centerline or springline of the main sewer. The EOR shall review the video prior to SJCUD submission and stamp the report "APPROVED", "APPROVED AS NOTED", or "REJECTED". Any pipe found to be cracked, leaking, misaligned, bellied or otherwise defective shall be removed and replaced and retested at the Contractor's expense. All video inspections should be completed, reviewed and approved by SJCUD prior to placing pavement. If pavement is placed prior to review and approval by SJCUD, the Contractor assumes all risk and cost associated with replacement and/or repair of the sanitary gravity mains, if required by SJCUD.
5. Any pipe found to have defects, including but not limited to leaks, cracks, pipe deflection from external pressures, rolled or pinched gaskets, joint gaps, or holding water (a "dip") or otherwise defective shall be removed and replaced with new pipe at no additional cost to SJCUD.
6. A dip is defined in Section 1.4.3.2.B.5.
7. Prior to repair or replacement of failed sewer pipe, the method of repair or replacement shall be submitted to SJCUD for approval unless the repair is to excavate and re-install the pipe. Pressure grouting to raise a pipe or manhole is not an acceptable method of repair. If pavement is placed prior to review and approval by SJCUD, the Contractor will assume all risk and cost associated with replacement and/or repair of the sanitary gravity mains, if required by SJCUD.

3.15 MANHOLES

3.15.1 General

- A. Precast concrete manholes shall be Type II Cement and conform to specifications for Precast Reinforced Concrete Manhole Sections, ASTM Designation C478, except as otherwise specified herein.
- B. Cast iron manhole frames and covers shall conform to standard specifications for grey iron castings, ASTM A48 Class 30B.
- C. Each section of precast manholes shall be marked with manufacturer's name or trademark, ASTM designation, manufacturing serial number, date of manufacture, manhole total length, and installation assistance marks.

- D. A manhole will be considered a junction manhole when three or more sewer lines connect into the structure or when a forcemain discharges into the structure. A receiving manhole is defined as the manhole before the wetwell of a pump station. All precast concrete junction and receiving manholes shall have an approved interior coating specifically designed to resist hydrogen sulfide based corrosion (See 3.15.3). All manholes shall have an approved exterior joint wrap material applied.

3.15.2 Precast Concrete Sewer Manholes and Wetwells

A. Material

1. Concrete for manholes and wetwells shall be Type II, 4000 psi. Barrel, top and base sections shall have tongue and groove joints.
2. All jointing material shall be a butyl-base (not asphalt) pre-formed flexible joint sealant.
3. Sections shall be cured by an approved method for at least 28 calendar days prior to painting and shall not be shipped until at least 2 days after having been painted.
4. Precast concrete top slabs shall be used where cover over the top of the pipe is less than 4'. Lift rings or non-penetrating lift holes shall be provided for handling precast manhole sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the manhole sections.
5. Concrete surfaces shall have oil, curing compounds; dust, dirt and other interfering materials removed by brush or sand blasting and shall be fully cured prior to the application of any coatings. Interior and exterior surfaces of manholes shall have a protective acrylic based coating with a minimum 16 mil dry thickness which shall be applied in two (2) applications by the manhole manufacturer in strict accordance with the sealant manufacturer's recommendations.
6. Junction and receiving manholes and wetwells shall be lined with an approved material in accordance with Section 3.15.3.
7. The angle between adjacent influent pipes shall be great enough to provide a minimum of 6" of interior wall surface between openings.

B. Design Specifications

1. Riser Sections:
 - a. Minimum 48" in diameter.
 - b. Fabricate in accordance with ASTM C478.
 - c. Minimum Wall Thickness: 5" or 1/12 of the inside diameter, whichever is greater.
 - d. Top and bottom shall be parallel.
 - e. Joints shall be tongue-and-groove type.
2. Cone Sections:
 - a. Provide concentric cones for manholes with a diameter of 60" or less. Eccentric cones may be used for manholes with a diameter greater than 60" with the approval of or as directed by SJCUD.
 - b. Same wall thickness and reinforcement as riser section.
 - c. Top and bottom shall be parallel.
3. Base Sections and Base Slab:
 - a. The base section shall have a base slab that is integral with sidewalls.
 - b. Fabricate in accordance with ASTM C478.
 - c. Precast concrete manholes shall be constructed with a precast monolithic base structure as shown on the standard drawings. The minimum base thickness shall be 8".

4. Manhole Extensions
 - a. Grade rings shall be grooved to interlock and have a maximum height of 6”.
 - b. Concrete rings shall be fabricated in accordance with ASTM C478 and any test specimens shall be mate tested and meet permeability test requirements of ASTM C14.
 - c. An approved joint sealant shall be installed in the groove of the grade ring to waterproof the extension.
5. Source Quality Control:
 - a. Conduct tests at point of manufacture prior to delivery of any section.
 - b. Sections to be tested will be selected at random from stockpiled material to be supplied for the project.

3.15.3 Corrosion Resistant Liners

- A. General - The Work described within details a complete program for precast concrete manhole structure liners. This Section details the methods, procedures, materials and equipment required to produce “A Total System for Concrete Structures.” The completed system will provide a corrosion-resistant liner to prevent deterioration from hydrogen sulfide and other corrosive gases/acids within the wastewater stream.
- B. Liner shall be applied up to the bottom of the manhole ring. Liners that are damaged or cored prior to acceptance by SJCUD or during the warranty period shall be repaired by the original manufacturer of the liner at no cost to SJCUD. Liners that are damaged or cored after the expiration of the warranty period shall be repaired by the original manufacturer of the liner, if possible, or a SJCUD approved liner manufacturer at no cost to SJCUD.
- C. WARRANTY - The manufacturer warrants the liner and any repairs against failure for a period of 10 years.
 1. “Failure” will be deemed to have occurred if the protective coating fails to prevent the internal damage or corrosion of the structure or protect the substrate and environment from contamination by effluent.
 2. If any such failure occurs within 10 years of initial completion of work by the manufacturer on a structure, the manufacturer will repair the damage to the concrete and the liner and restore the coating at no cost to the Owner within 30 calendar days after written notification of the failure.
 3. “Failure” does not include damage resulting from mechanical or chemical abuse. Mechanical or chemical abuse means exposing the coated surfaces of the structure to any mechanical force or chemical substance not customarily present or used in connection with structures of the type involved.
 4. The manufacturer makes no warranties express or implied other than those specifically stated in this Section.
 5. Warranty shall be transferred to SJCUD if the structure is dedicated to SJC.
- D. Materials and Equipment
 1. The materials to be utilized in the lining of concrete structures shall be designed and manufactured to withstand the severe effects of hydrogen sulfide in a wastewater environment. Manufacturer of corrosion protection products shall have proven experience in the production of the lining materials and shall have a satisfactory installation record.
 2. Abrasive blasting equipment shall be suited to completely remove deteriorated concrete and hard contaminants from the existing concrete surfaces. A containment unit to capture spent abrasive material shall be provided. Spent abrasive material

shall be removed and disposed by the Contractor.

3. Equipment for installation of lining materials shall be high quality grade and be as recommended by the manufacturer.
4. The lining system to be utilized for concrete manhole structures shall be as shown in Parts IV and V of this manual.

3.15.4 Polymer Concrete Sewer Manholes

A. Material

1. Provide polymer concrete manhole sections, monolithic base sections and related components referencing to ASTM C478-Standard Specification for Precast Reinforced Concrete Manhole Sections. Barrel, top and base sections shall have tongue and groove joints.
2. Provide base riser section with monolithic floors, unless shown otherwise.
3. Provide riser sections joined with bell and spigot / ship-lap design seamed with butyl mastic and/or rubber gaskets (ASTM C990) so that on assembly, manhole base, riser and top section make a continuous and uniform manhole structure.
4. Construct riser sections for polymer concrete manholes from standard polymer concrete manhole sections of the diameter indicated on drawings. Use various lengths of polymer concrete manhole sections in combination to provide correct height with the fewest joints.
5. Design wall sections for depth and loading conditions with wall thickness as designed by polymer concrete manufacturer.
6. Provide tops to support AASHTO HS-20 or HL-93 or vehicle loading or loads as required and receiving cast iron frame covers or hatches, as indicated on drawings.
7. Polymer manholes will be designed based upon live and dead load criteria in ASTM C857 and ACI 350-06.
8. Precast concrete top slabs shall be used where cover over the top of the pipe is less than 4'. Lift rings or non-penetrating lift holes shall be provided for handling manhole sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the manhole sections.
9. Polymer Concrete Manhole risers, cones, flat lids, grade rings and manhole base sections shall be designed by manufacturer to meet loading requirements of ASTM C478, ASTM C857 and ACI 350-06 as modified for polymer concrete manhole design as follows:
 - a. Polymer Concrete Mix Design shall consist of thermosetting resin, sand, and aggregate. No Portland cement shall be allowed as part of the mix design matrix. All sand and aggregate shall be inert in an acidic environment.
 - b. Reinforcement – Shall use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design.
 - c. Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings. All precast base sections to be cast monolithically. Polymer bench and channel are to be constructed with all polymer concrete material, monolithically. Extended ballast slab requirements for buoyancy concerns can be addressed with cementitious concrete material.
10. Grouting - All materials needed for grouting and patching will be a polyester mortar compound provided by the manufacturer or an approved equal by the manufacturer.

B. Design Specifications

1. Riser Sections:
 - a. 4' or 5' in diameter for manholes as shown on the drawings depending upon sewer size, 14' depth or greater, drop manhole, or receiving manhole at a pump station.
 - b. Top and bottom shall be parallel.
 - c. Joints shall be tongue-and-groove type.
2. Cone Sections:
 - a. Provide concentric cones for manholes with a diameter of 60" or less. Eccentric cones may be used for manholes with a diameter greater than 60" with the approval of or as directed by SJCUD.
 - b. Top and bottom shall be parallel.
3. Base Sections and Base Slab:
 - a. The base section shall have a base slab that is integral with sidewalls.
 - b. Polymer concrete manholes shall be constructed with a precast monolithic base structure as shown on the standard drawings. The minimum base thickness shall be 8".
4. Manhole Extensions
 - a. Grade rings shall be grooved to interlock and have a maximum height of 6".
 - b. Concrete rings shall be fabricated in accordance with ASTM C478 and any test specimens shall be mate tested and meet permeability test requirements of ASTM C14.
 - c. An approved joint sealant shall be installed in the groove of the grade ring to waterproof the extension.

3.15.5 Manhole Accessories**A. Cast Iron Sewer Manhole Frames and Covers**

1. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, defects and any other pouring faults.
2. Cast Iron shall meet the specifications of ASTM A48 Class 30B.
3. Ductile Iron shall meet the specifications of ASTM A536, Grade 60 40 12.
4. Plane or grind bearing surfaces to ensure flat, true surfaces. Seating surfaces between frames and covers shall be machined to fit true. No plugging or filling will be allowed.
5. Lifting or pick holes shall be provided, but shall not penetrate the cover.
6. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings.
7. Frames shall be suitable for the future addition of a cast iron ring for upward adjustment of top elevations.
8. Manhole covers shall be true and seat within ring at all points with the word sewer in 2" raised letters. All manhole covers shall be traffic bearing to meet AASHTO H-20 loadings.
9. In certain locations (i.e. flood prone areas) bolt down covers and/or gasketed covers shall be provided.

B. Inspections

1. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by SJCUD. Such inspection may be made at the place of manufacture and at the site after delivery. Complete manholes and any section thereof shall be subject to rejection on account of failure to conform to any

specifications found or referred to herein; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for rejection and removed from the job immediately. All sections which have been damaged after delivery will be rejected and, if already installed, removed and replaced, entirely at the Contractor's expense.

2. At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

3.15.5 General Installation Specifications

- A. Excavation and Backfill - Excavation and backfill for the installation of manholes shall be in accordance with general construction requirements and those listed in Section 3.3 of this manual.
- B. Castings
 1. Castings shall be fully bedded in mortar with approved adjustment rings placed between the frame and manhole. An adhesive caulk recommended by the respective manufacturer shall be used for non-concrete grade rings.
 2. Top of manhole castings located in pavement, shouldered areas, and sidewalks shall be set flush with grade. Top of manhole castings located outside these areas shall be placed 2" above grade.
- C. Drop Assembly
 1. The Contractor shall install a drop assembly as shown on Plates S-4 and S-5 of the Sewer Details whenever the proposed drop of the influent sewer will be greater than 2'.
- D. Flexible Coupling
 1. Connections to manholes shall use a flexible connector as shown on the approved materials list. The flexible coupling shall be installed according to the manufacturer's specifications.
 2. If the manhole has been cored to make a connection, the inside of the cored hole shall be coated with an approved lining prior to installing the flexible coupling. A liner, if present, which has been cored shall be repaired in accordance with Section 3.15.3.B.
- E. Future Connections
 1. If additional connections are to be made to the proposed gravity sewer system, the Engineer shall design and Contractor install a run of SDR26 PVC pipe with an upstream terminal manhole to provide a future connection location. The terminal manhole shall be located at least 5' beyond the development phasing line. The run of pipe and terminal manhole shall be accessible along a compacted driveway. Terminal manholes shall be lined.
- F. Sewer Manhole Abandonment/Removal
 1. Prior to abandonment or removal of a sewer manhole, the Contractor shall ensure all service laterals and sewer mains connected to manhole have been removed from service or redirected to another sewer main and manhole.
 2. The Contractor shall clean interior contact surfaces of pipes to be cut off or abandoned as shown and completely grout fill pipes, laterals, and manholes.

3.15.6 Installation of Precast Manholes

- A. Precast Base - The Contractor shall place precast base on prepared bedding so as to be

fully and uniformly supported in true alignment and making sure that all entering pipes can be inserted on proper grade. The Contractor shall properly locate, ensure firm bearing throughout, and plumb first section.

B. Manhole Sections

1. The Contractor shall carefully inspect precast manhole sections to be joined.
2. The Contractor shall thoroughly clean ends of sections to be joined.
3. The Contractor shall not use sections with chips or cracks in the tongue or groove.
4. Precast manhole sections shall be handled by lift rings or non-penetrating lift holes. All lift holes shall be filled with manufacturer approved grout after installation of the manhole is complete.
5. An approved joint sealant shall be installed between sections in accordance with manufacturer's instructions.
6. The first precast section shall be placed and carefully adjusted to true grade and alignment by the Contractor. All inlet pipes shall be properly installed so as to form an integral watertight unit. The sections shall be uniformly supported by the base structure, and shall not bear directly on any of the pipes.
7. Precast sections shall be placed and aligned to provide vertical alignment with a ¼" maximum tolerance per 5' of depth. The completed manhole shall be rigid, true to dimensions, and watertight.

C. Rubber Gasketed Joints - The Contractor shall install in accordance with manufacturer's instructions.

D. Vertical Extensions

1. The Contractor shall provide on manholes in streets or other locations where a subsequent change in existing grade may be likely.
2. The Contractor shall install to height not exceeding 12".
3. The Contractor shall install grooved grade rings in accordance with the manufacturer's specifications with sides plumb and tops level.
4. The Contractor shall seal joints with adhesive caulk and mortar as specified for sections and make watertight.

3.15.7 Cleaning and Inspection for Acceptance

All newly constructed manholes shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection. No visible leakage in the manhole or at pipe connections will be permitted. All manholes shall be inspected by SJCUD prior to acceptance. All manholes failing to meet the specifications set forth or referred to in this section shall be reconstructed or replaced by the Contractor to comply with these specifications. Pressure grouting of manholes is not an acceptable method of repair. All costs for this work shall be paid for by the Contractor.

3.15.8 Forcemain Connections to Manholes

Forcemain connections to a manhole shall be as described in Section 2.10.9.

3.16 GRAVITY SEWER SERVICE LATERALS

3.16.1 General

A. Definition - Service connections shall be made via service laterals and appurtenances to connect the gravity sewer to the residence or establishment being served. A service lateral is a branch of gravity sewer with a minimum diameter of 6" which is constructed from the main gravity sewer to within 5' inside of the ROW or easement line or to a point established by SJCUD.

- B. Connections - Service laterals shall not discharge into a sanitary manhole, except at terminal manholes. SJCUD reserves the right to approve/disapprove requested service, location and size of connections.
- C. Pipe and Fitting Materials - Pipe Materials for service laterals shall be PVC. Long radius bends shall be used for changes in direction, unless approved otherwise by SJCUD.

3.16.2 Installation

- A. Service lateral connections shall conform to these specifications and standard drawings. All necessary approvals for service sewer construction shall be obtained prior to beginning work.
- B. Service Connection Installation
 1. In general, service connections shall extend to within 5' inside of the ROW or easement line or as directed by SJCUD.
 2. A minimum slope of one foot per 100' (1%) shall be maintained in service laterals.
 3. A minimum cover depth of 3' at property line or on private property within permanent sewer easement is required. The Developer's EOR will determine required depth at end of line.
 4. Laying and Jointing of Service Connection Pipe and Fittings:
 - a. Maximum deflection permissible with any one fitting shall not exceed 45 degrees and shall be accomplished with long radius curves or bends. Short radius elbows or curves will not be permitted.
 - b. The Contractor shall provide end of service connection line and fittings with standard watertight plug, cap, and stopper, suitably braced to prevent blow off during hydrostatic or air testing.
 - c. The first length of service lateral pipe from tee, wye, or lateral shall not be greater than 3' in length.
 5. The Contractor shall show locations, sizes, and depths of service connections on as-built drawings.
 6. The Contractor shall lay pipe uniformly between tee or top of riser section and end of service connection.
 7. The Contractor shall place a locate marker ball at end of each service connection as shown on Plate S-9 of the Utility Details found in Part V of this manual.
- C. Termination of Service Laterals - SJCUD obligation ends at the service lateral clean-out, which shall be located within 5' inside the ROW or easement line on the property as shown on Plate S-9 of the Utility Details found in Part V of this manual. The Contractor shall mark the location of each installed service lateral by installing a marker ball at the end of the capped lateral and by etching or cutting an "S" in the concrete curb. The Contractor shall install water-tight factory made plug at the end of each service lateral. The clean-out shall be installed by the home builder and be extended horizontally to the house and vertically to grade. The Contractor shall restrain all service laterals, plugs, and caps in such a manner so as to withstand air testing. SJCUD owns up to and including the cleanout fitting but is not responsible for the horizontal and vertical extensions or any damage associated with any repairs from the cleanout fitting to the sewer.
- D. Restoration, Finishing and Clean-Up - The Contractor shall restore all paved surfaces, curbing, sidewalks or other surfaces to their original condition in such manner as to meet the requirements established in this manual and SJC Road Construction Specifications. All surplus material and temporary structures, as well as all excess excavation shall be removed and the entire site shall be left in a neat and clean condition. All costs for this work shall be paid for by the Contractor.

3.17 FENCING**3.17.1 General**

- A. The work under this section includes furnishing all labor material, equipment, and the erection of chain link fencing complete with all appurtenances as indicated in the Contract Documents or as specified herein. All references to ASTM Specifications shall mean the latest edition published prior to contract date.
- B. Unless noted otherwise on the contract documents, the fencing shall be a minimum of 6' in height, 1" above slab, and meet the specifications as noted below.

3.17.2 Materials

- A. Base Metal – Fence fabric shall be No. 9 gauge core / 8 gauge finish galvanized steel wire, 2" mesh with black PVC coating with knuckle and knuckle finishes on top and bottom. All other appurtenances (posts, gate, and other appurtenances) shall be galvanized with black vinyl coating.
- B. Zinc Coating - Zinc coating shall be Class I, hot dipped galvanized with a coating of 1.2 ounces per square foot of fabric, per ASTM A392.
- C. Vinyl Coated Fabric - Class 2B, bonded PVC-coated wire shall have the PVC coating thermally fused and bonded to a primer which is thermally cured onto galvanized steel core wire. Galvanized steel core wire shall have been coated with zinc as per ASTM A641 (9 gauge-fabric.)
- D. Vinyl Privacy Slats - Slats shall be black vinyl or PVC material and provide a 75% wind load and privacy factor.
- E. Vinyl Coated Posts and Rails - All Framework shall conform to the requirements of ASTM A653. All gate, corner, and line posts as well as top and braces (center rails) shall be SCH40 or SS40. Polyvinyl coated framework shall have a PVC coating fused and adhered to the exterior zinc coating to the post or rail. PVC coating shall have a minimum thickness of 12 mils per ASTM F1043. Color to match the fabric.
- F. Posts - Posts shall be pipe of the following nominal sizes:
 - a. Gate posts shall be 4" outside dimension (OD) SCH40, 9' tall
 - b. Corner posts shall be 3" OD SCH40, 9' tall
 - c. Line posts shall be 2" OD SCH40, 8' tall
- G. Vinyl Coated Tension Wire - PVC coated steel tension wire: 7-gauge wire complying with ASTM F1664. Color to match the fabric.
- H. Vinyl Coated Fittings - In compliance with ASTM F626, minimum 2 mil polymer coating thickness fused and adhered to zinc coated fittings. Color to match the fabric.
- I. Selvage - Fabric 72" high shall be furnished with twisting on both the top and the bottom end.
- J. Fabric Connections - The chain link fabric shall be securely fastened to all terminal posts using 3/16" by 3/4" tension bars. All terminal posts shall use 14 gauge tension bands spaced no more than 12" apart. All connections shall have a finish applied which matches the fabric.
- K. Posts, Zinc Coating - All parts shall be zinc coated. The weight of zinc coat on the rail, post and brace with black vinyl exterior coating shall have at least 1.2 ounces per square foot. Zinc weight shall be determined in accordance with ASTM A90.
- L. Top Rails - Top rails shall be fitted with couplings or swedged for connecting the lengths into a continuous run. Suitable ties or clips shall be provided in sufficient number for attaching the fabric securely to the top rail at intervals not exceeding 24". Means shall be provided for attaching the top rail to each gate, corner, pull, and end posts. All fencing shall have a 1-5/8" OD top rail.

- M. Post Braces - Post braces shall be provided for each gate, corner, pull, and end post and shall consist of a 1-5/8" OD round tubular brace extending to each adjacent line post at approximately mid-height of the fabric, and a truss consisting of a rod not less than 5/16" nominal diameter from the line post back to the gate, corner, pull, or end post with a turnbuckle or other equivalent provision for adjustment. Truss rods may be eliminated in any line of fence where there is a continuous center rail. The braces and truss rods shall have the same finish as the posts.
- N. Post Tops - Posts shall be topped with a loop top. The top shall be provided with a hole suitable of the through passage of the top rail. The post top shall fit over the outside of posts and shall prevent moisture from entering posts.

3.17.3 Gates

- A. Frames - Gate Frames shall be constructed of tubular members welded at all corners. On steel, welds shall be painted with zinc-based paint. Gate leaves shall have vertical intermediate bracing as required and spaced so that no members are more than 8' apart. Gate leaves 10' or over shall have a horizontal brace or one 5/16" minimum diagonal truss rod.
- B. Size - Gate leaf shall be up to 6' wide with 1 Cross Brace and 1 Truss Rod.
- C. Fabric - Gate fabric shall be of the same type used in the fence construction. The fabric shall be attached securely to the gate frame at intervals not exceeding 24".
- D. Hinges - Gate Hinges shall be of adequate strength for gate, and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.
- E. Latches - Gate Latches, stops, and keepers shall be provided for all gates. Latches shall have a plunger-bar arranged to engage the center stop, except that for single gates of openings less than 10' wide, a forked latch may be provided. Latches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar of the latch of double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate when in the full open position.

3.17.4 Installation

- A. Posts shall be spaced equally distant in the fence line on a maximum of 10' centers. Posts shall be plumb with the tops of the posts and properly aligned. Corner posts shall be spaced as required for walk and roadway openings. All posts shall be set in concrete.
- B. Line posts shall be 30" deep below finished grade, with a minimum diameter of 9" at the top. Gate and corner post holes shall be 36" deep below finished grade with a minimum diameter of 12" at the top. All posts shall be set 24" (min) in the hole with 4" of concrete below the end of the posts. The top exposed surface of the concrete footing shall be sloped to shed water and provide a neat appearance when completed.

- End of Part III -

PART IV - APPROVED MATERIALS

[Table of Approved Materials](#)

[Approved Materials Checklist](#)

[Procedure for Inclusion of Materials in SJCUD's Approved List](#)

PART V - STANDARD DETAILS

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General Details (D-1)

- G-1 Gate Valve & Box for Unpaved Locations
- G-2 Gate Valve & Box for Paved Locations
- G-3 Plugged Dead End Mechanical Restraints
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- G-6 Type "A" Bedding & Trenching
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- G-10 Air Valve Assembly with Manhole
- G-11 Type "A" Pipe Crossing with Fittings
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- W-1 Fire Hydrant Installation Using Mechanical Joint Tee
- W-2 Fire Hydrant Installation Using Tapping Sleeve and Valve
- W-3 Limited Space Fire Hydrant Installation
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Water Details (D-4)

- W-9 3/4" Temporary Sample Tap Along Pipe
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- S-1 Sanitary Sewer Manhole Frame and Cover
- S-2 Sanitary Sewer Type “A” Manhole (8” - 12” Sewers)
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- S-9 Sanitary Sewer Service Lateral
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- S-11 Connection Detail of Private Lift Station to SJC Utilities
- S-12 Pump-out Assembly
- S-13 Oil/Grease Interceptor
- S-14 Sand/Oil Interceptor
- S-15 Oil/Grease-Sand/Oil Interceptor Sizing Table
- S-16 Stainless Steel Pipe to Ductile Iron Transition

Reclaimed Water Details (D-7)

- R-1 Reclaimed Water Sign
- R-2 Reclaimed Water Sign (Diminutive)
- R-3 Reclaimed Water Control Valve Installation
- R-4 Reclaimed Water Meter Installation

Standard Pump Station Details

- [PS-1](#) Pump Station Details
- [PSElecPlan240V100A](#) Pump Station Electrical Details (240V, 100 Amp)
- [PSElecPlan240V200A](#) Pump Station Electrical Details (240V, 200 Amp)
- [PSElecPlan480V](#) Pump Station Electrical Details (480V)
- [PS-F-1](#) Fencing for Pump Station

PART VI - FORMS

Planning/Design/Construction Forms – See Section 1.5 of this manual.

- Water/Sewer Availability Request Form
- 1A-Pre-construction - Checklist
- 1B-Pre-construction - Meeting Agenda
- 1C-Pre-construction - Meeting Sign-in
- 2A-Construction Milestone Checklist
- 2B-Inspection Request
- 2C-Inspection – Wet Tap
- 2D-Inspection – Main Flushing
- 2E-Inspection – PVC and DI Pressure and Leakage Test
- 2F-Inspection – HDPE Pressure and Leakage Test
- 2G-Inspection – Pump Station Startup
- 2H-Inspection – Compaction-Gravity Sewer
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- 3A-Close out – Interim Service Agreement
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- 3D-Close out – Schedule of Values
- 3E-Close out – Warranty
- 3F-Close out – Bill of Sale
- 3G-Close out – Electronic As-built Drawing Submittal
- 3H-Close out – As-built Drawing Certification
- 3I-Close out – Special Warranty Deed
- 3J-Close out – Easement (Request from SJCUD Project Inspector)