# HERNANDO COUNTY UTILITIES DEPARTMENT (HCUD)

# WATER, RECLAIMED WATER AND WASTEWATER CONSTRUCTION SPECIFICATIONS MANUAL

# JANUARY 2013 EDITION

# SPECIFICATIONS MANUAL CONTENTS

# LIST
# OF
# CHANGES

# LIST OF CHANGES

**SECTION 1: GENERAL INFORMATION**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| 1.4.2 | ADDED EASEMENTS |
| 1.9 | ADDED PUBLIC SERVICE ANNOUNCEMENT (PSA)<br>CHANGE 48 HOURS TO 5 WORKING DAYS |
| 1.23.2 | CHANGED 24 HOURS TO 48 HOURS |

**SECTION 2: PLANS PREPARATION**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| 2.3.1.13 | ADDED CERTAINTEED CERTA-LOK OPTION, ADDED FUSIBLE PVC OPTION. |
| 2.3.2.1 | REMOVED POURED IN PLACE THRUST BLOCK OPTION |
| 2.3.4.1 | REMOVED POURED IN PLACE THRUST BLOCK OPTION |
| 2.3.5.1 | REMOVED POURED IN PLACE THRUST BLOCK OPTION |

**SECTION 3: SPECIFICATIONS FOR POTABLE WATER DESIGN AND INSTALLATION**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| 3.1.2 | ADDED NSF/ANSI 372 REQUIREMENTS |
| 3.4.3.4 | ADDED RPDA REQUIREMENT |
| 3.7.3.1 | CHANGED TO PUBLIC SERVICE ANNOUNCEMENT (PSA)<br>CHANGED 48 HOURS TO 5 WORKING DAYS |
| 3.8.1 | CHANGED FIRE HYDRANT SPACING TO REFER TO THE FIRE MARSHAL AND FLORIDA ADMINISTRATIVE CODES. |
| 3.8.3.3 | REVISED 24 INCH PUMPER NOZZLE TO READ MAXIMUM CLEARANCE OF 24 INCHES |
| 3.9.1 | CHANGED C909 TO C905 |
| 3.9.3.7 | ADDED CERTAINTEED CERTA-LOK OPTION IN LIEU OF PVC WITH RESTRAINED JOINTS |
| 3.10.1.3 | CHANGED AMERICAN FLOW CONTROL TRENCH ADAPTOR TO PENTEK ROADWAY VALVE BOX |
| | CHANGED 30 TO 36 |
| 3.10.2.3 | CHANGED AMERICAN FLOW CONTROL TRENCH ADAPTOR TO PENTEK ROADWAY VALVE BOX |

| | |
|---|---|
| | CHANGED 30 TO 36 |
| 3.10.6.1 | ADDED NSF/ANSI 372 REQUIREMENT |
| 3.10.10.2 | CHANGED AMERICAN FLOW TRENCH ADAPTOR TO PENTEK ROADWAY VALVE BOX |
| 3.11.1.4 | CHANGED 36 INCHES TO MINIMUM 30 INCHES AND MAXIMUM 42 INCHES |
| 3.11.7 | REVISED METERS |
| 3.15.2 | ADDED COPPERHEAD INDUSTRIES TRACER WIRE<br>REMOVED LOCATOR BALL OPTION<br>ADDED CONTINUITY TEST BY CONTRACTOR |
| 3.16.3 | ADDED THREADLESS HOSE BIBS |

**SECTION 4: SPECIFICATIONS FOR WASTEWATER COLLECTION/TRANSMISSION SYSTEMS DESIGN AND INSTALLATION**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| 4A.10 | ADDED DUMPSTER DRAINS |
| 4B.2.6 | REMOVED THIS SECTION IT'S INCLUDED IN SECTION 4B.7 - TESTING |
| 4B.3.5 | ADDED LATERAL LENGTH |
| 4B.5.1.6 | ADDED LF MANUFACTURING |
| 4B.5.1.7 | ADDED LF MANUFACTURING |
| 4B.7.1 | CHANGED TAPE TO INSPECTION |
| 4B.7.3 | CHANGED VIDEOTAPE TEST TO VIDEO INSPECTION |
| 4B.7.3.1 | CHANGED TAPED TO INSPECTED; CHANGED DEVELOPER TO CONTRACTOR;<br>ADDED NO VHS TAPES ACCEPTED |
| 4B.7.3.2 | CHANGED VIDEOTAPE TEST TO VIDEO INSPECTION |
| 4B.7.3.2.4 | CHANGED TAPING TO INSPECTIONS |
| 4B.7.3.2.7 | CHANGED TAPED TO INSPECTED |
| 4B.7.3.2.8 | CHANGED VIDEOTAPE TO DVD OR CD; CHANGED TAPE TO DVD |
| 4C.1.3 | CHANGED C909 TO C905 |
| 4C.2.1 | CHANGED BROWN TO GREEN |
| 4C.2.5 | REMOVED LAST SENTENCE |
| 4C.2.6 | REMOVED LAST SENTENCE |
| 4C.3.1 | CHANGED BROWN TO GREEN |
| 4C.4.1 | CHANGED BROWN TO GREEN |

| | |
|---|---|
| 4C.4.2 | ADDED COPPERHEAD INDUSTRIES TRACER WIRE<br>REMOVED LOCATOR BALL OPTION |
| 4C.5.4 | UPDATED SECTION |
| 4C.5.4.1 | ADDED SUB-SECTION: INLINE ARV MANHOLE OPTION |
| 4C.5.4.2 | ADDED SUB-SECTION: OFFSET ARV MANHOLE OPTION |
| 4C.5.5.2 | ADDED PENTEK ROADWAY VALVE BOX |
| 4D.3 | ADDED SECTIONS 4D.3.4, 4D.3.5, AND 4D.3.6 TO THE ODOR CONTROL SYSTEMS |
| 4D.8.1.6 | CHANGED 35 TO 30 |
| 4D.8.2.4 | CHANGE HATCH DOOR SIZE FOR DUPLEX STATIONS |
| 4D.9.2.6 | ADDED HOMA OR BARNES PUMPS |
| 4D.10.1 | REMOVED AIR-FILLED |
| 4D.14.5 | REMOVED CONCRETE AND MORTAR PIERS, ADDED STAINLESS STEEL STAND |

**SECTION 5: SPECIFICATIONS FOR RECLAIMED WATER DISTRIBUTIONS SYSTEMS DESIGN AND INSTALLATION**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| 5.8.1 | CHANGED C909 TO C905 |
| 5.8.4.2 | ADDED COPPERHEAD INDUSTRIES TRACER WIRE<br>REMOVED LOCATER BALL OPTION |
| 5.8.5.1.3 | CHANGED TRENCH ADAPTOR TO PENTEK VALVE BOX |

**SECTION 6: EMERGENCY POWER GENERATOR SYSTEMS (EPGS)**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| 6.1.3.1 | ADDED TRADEWINDS AND MTU ONSITE ENERGY<br>REMOVED CUMMINS, CATERPILLAR, AND KOHLER |
| 6.2.1.10.2.1 | ADDED CANNOT EXCEED 500 GALLONS CAPACITY |
| 6.3.1.1.1 | ADDED SOUND ATTENUATION REQUIREMENTS FOR ENCLOSURES |
| 6.3.1.1.2 | ADDED SOUND ATTENUATION REQUIREMENTS FOR EXHAUST SILENCERS |
| 6.4.1 | ADDED THOMPSON TECHNOLOGY AND ONAN |
| 6.5.6.2 | REMOVED APPLICABLE TREATMENT PLANTS |

**SECTION 7: TRENCHLESS PIPE INSTALLATION (HDD)**

REVISED SECTION, ADDED FUSIBLE PVC OPTION, ADDED RESTRAINED JOINT PVC OPTION,

ADDED CERTAINTEED CERTA-LOK OPTION (for water mains only),

7, A, B, C, D ADDED COPPERHEAD INDUSTRIES TRACER WIRE TO ALL SUBSECTIONS

**SECTION 8: JACK AND BORE**

COMBINED SECTION ON CASING SPACERS AND JACK AND BORE

**SECTION 10: BACKFLOW PREVENTION ASSEMBLIES SPECIFICATIONS**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| 10.1.1 | REVISED AMES AND CONBRACO MODELS |
| 10.2.4 | ADDED TEST PORTS WITH THREADED CAP OR PLUG. |
| 10.4.5 | ADDED TESTED BY STATE CERTIFIED TESTER. |

**SECTION 11: ELECTRICAL SPECIFICATIONS**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| 11.2.1 | ADDED TCU INSTALLED IN CONTROL PANEL<br>ADDED NO EXTENAL ENCLOSURES ALLOWED |
| 11.2.4 | REMOVED ENTIRE SECTION AND REPLACED WITH NO EXTERNAL ENCLOSURES ALLOWED |
| 11.3.5.1 | CHANGED FAL TO H OR J FRAME |
| 11.3.5.19 | CHANGED FAL TO H OR J FRAME |
| 11.3.5.24.2 | CHANGED FAL TO H OR J FRAME |
| 11.4 | CHANGED FAL TO H OR J FRAME |
| 11.8.6 | CHANGED FLOWMETER TYPE FROM UNIMAG TO ROSEMOUNT |

**SECTION 12: CHECK LIST**

| PARAGRAPH | REVISIONS/ADDITIONS |
|---|---|
| SECTION 12 | REVISED ENTIRE SECTION |

**LIST OF DETAILS**

| DETAIL | REVISIONS/ADDITIONS |
|---|---|
| 3 | INCLUDED COMMERCIAL APPLICATIONS, ADDED 1 INCH MINIMUM FOR COMMERCIAL APPLICATIONS, ADDED NO LEAD REQUIREMENT |
| 4 | ADDED NO LEAD REQUIREMENT |
| 5 | ADDED NO LEAD REQUIREMENT |
| 7 | ADDED 2 SPOOL PIECES AND STRAINER. MOVED BYPASS LINE CONNECTION. ADDED RPDA. |
| 8 | ELIMINATED OPTION B, ADDED BYPASS METER, ADDED PIPE SUPPORTS. ADDED RESIDENTIAL APPLICATION |
| 9 | REVISED BOLLARD SPACING |
| 12 | CHANGED DETAIL |
| 14 | CHANGED DETAIL |
| 24A | INLINE SEWER FORCE MAIN ARV DETAIL |
| 24B | OFFSET SEWER FORCE MAIN ARV DETAIL |
| 25 | WATER ARV DETAIL |
| 32 | CLARIFIED INTERIOR/EXTERIOR SPECIFICATIONS |
| 34 | CHANGED ITEMS ON DETAIL |
| 38 | ADDED CONDUIT FOR PRESSURE TRANSDUCER CABLE |
| 39 | ADDED CONDUIT FOR PRESSURE TRANSDUCER CABLE |
| 45 | ADDED PVB BPA DETAIL |
| 46 | ADDED OCS PIPING DETAIL |

# LIST OF ABBREVIATIONS

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| | |
|---|---|
| AASHTO | American Association of State Highway and Transportation Officials |
| AC | Alternating Current |
| ADF | Average Daily Flow |
| AMPS | Amperes |
| ANSI | American National Standards Institute |
| ARV | Air Release Valve |
| ASSE | American Society of Sanitary Engineers |
| ASTM | American Society for Testing Materials |
| ATS | Automatic Transfer Switch |
| AVK | Fittings Manufacturer |
| AWG | American Wire Gauge |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| BOA | Blow-Off Assembly |
| BPA | Backflow Prevention Assembly |
| BV | Butterfly Valve |
| CCR | Code Compliance Review |
| CMH | Collector Manhole |
| CSV | Curb Stop Valve |
| DC | Direct Current |
| DCDA | Double Check Detector Assembly |
| DFS | Data Flow Systems Inc. |
| DIP | Ductile Iron Pipe |
| DLW | Detector Locating Wire |
| DR | Dimension Ratio |
| EBBA | Joint Restrainer Manufacturer |
| ELW | Electronic Locator Wire |
| EOR | Engineer of Record |
| EPA | U.S. Environmental Protection Agency |
| EPDM | Ethylene Proplylene Diene Monomer |
| EPGS | Emergency Power Generator System |
| ERU | Equivalent Residential Unit |
| FAC | Florida Administrative Code |
| FDEP | Florida Department of Environmental Protection |
| FDOT | Florida Department of Transportation |
| FHA | Fire Hydrant Assembly |
| FLA | Full Load Amps |
| FM | Force Main |
| FPS | Feet per Second |
| FRP | Fiberglass Reinforced Plastic |
| FT. LBS | Foot Pounds of Torque |
| GFI | Ground Fault Interrupter |
| GPM | Gallons |
| GPM | Gallons per Minute |
| GPD | Gallons per Day |
| GPR | Ground Penetrating Radar |
| GV | Gate Valve |
| HCBD | Hernando County Building Department |
| HCBOCC | Hernando County Board of County Commissioners |
| HCDD | Hernando County Development Department |
| HCDPW | Hernando County Department of Public Works |
| HCHD | Hernando County Health Department |
| HCPD | Hernando County Purchasing Department |
| HCUD | Hernando County Utilities Department |

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|---|---|
| HDD | Horizontal Directional Drilling |
| HDPE | High Density Polyethylene |
| HP | Horsepower |
| IN | Inch |
| IPS | Iron Pipe Size |
| J&B | Jack and Bore |
| LED | Light Emitting Diode |
| MJ | Maximum |
| MGS | Magnetic Guidance System |
| MIN | Minimum |
| MH | Manhole |
| MIP | Male Iron Pipe |
| MLT | Magnetic Locator Tape |
| NEC | National Electric Code |
| NEMA | National Electrical Manufacturers Association |
| NFPA | National Fire Protection Association |
| NELAP | National Environmental Laboratory Accreditation Program |
| NSF | National Sanitation Foundation |
| NTP | Notice to Proceed-Letter |
| OCS | Odor Control System |
| OS&Y | Outside Stem and Yoke |
| OSHA | Occupational Safety and Health Act |
| PCU | Pump Control Unit |
| PE | Polyethylene |
| PET | Polyethylene Tubing |
| PH | Degree of Acidity |
| PLC | Programmable Logic Controller |
| PLS | Professional Land Surveyor |
| PSF | Pounds per Square Foot |
| PSI | Pounds per Square Inch |
| PSIG | Pounds per Square Inch Gauge |
| PVB | Pressure Vacuum Breaker |
| PVC | Polyvinyl Chloride |
| PWS | Public Water System |
| RMS | Root Mean Square |
| ROW | Right of Way |
| RPDA | Reduced Pressure Detector Assembly |
| RPM | Revolutions per Minute |
| RPZ | Reduced Pressure Zone |
| RTU | Remote Terminal Unit |
| RW | Reclaimed Water |
| SBR | Styrene-Butadiene Rubber |
| SDR | Standard Dimension Ratio |
| SRC | Subdivision Review Committee |
| SS | Stainless Steel |
| STS | Service Tapping Saddles |
| SWFWMD | South West Florida Water Management District |
| TAC Pack | Combination of Back Pack Ratio and Pump Control Unit |
| TCU | Telemetry Control Unit |
| TDH | Total Dynamic Head |
| TFS | Transient Film Shield |
| TGV | Tapping Gate Valve |
| TV | Tapping Valve |
| UL | Underwriters Laboratory Testing |
| USC | University of Southern California |
| USDA | U.S. Department of Agriculture |
| WTP | Water Treatment Plant |
| WWTP | Wastewater Treatment Plant |

# SECTION 1

# GENERAL INFORMATION

# SECTION 1: GENERAL INFORMATION CONTENTS

# SECTION 1

# GENERAL INFORMATION

## 1.1 INTRODUCTION

1.1.1 This technical manual has been prepared as a guide for use in the planning, design and construction of water, wastewater and reclaimed water systems, or systems extensions that shall be installed in the Hernando County Water and Sewer District area and administered by the Hernando County Utilities Department (HCUD).

1.1.2 The requirements, specifications and details contained within this technical manual shall provide minimum guidelines for uniformity, quality in design and construction. HCUD reserves the right to establish additional criteria for any project after plans review.

1.1.3 The developer, the Engineer of Record (EOR), and the contractor shall comply with all requirements of Federal, State and County and other laws, codes, ordinances and regulations that in any way affect those engaged or employed in the proposed construction, the materials or equipment used in or upon the site, or the conduct of the work. The developer or the EOR or the contractor shall obtain all permits and licenses, pay all charges and fees, and provide all notices necessary and incidental to the due and lawful prosecution of the work prior to the start of any construction.

1.1.4 All proposed water, wastewater, and reclaimed water facility project plans shall be signed and sealed by an EOR, a Professional Engineer registered in the State of Florida.

1.1.5 Final acceptance of the project by HCUD is outlined in sub-paragraph 1.23.

1.1.6 If at any time a conflict appears within the specifications, HCUD will make the final determination on which requirement shall govern; in most cases the more stringent requirement shall apply.

## 1.2 TERMINOLOGY

1.2.1 Developer - A person, company or corporation responsible for the construction, supervision and completion of a potable water, Reclaimed Water (RW) and/or wastewater system or facility, shall be subject to these standards.

1.2.2 Contractor - A person, company or corporation responsible for the construction of a potable water, RW and/or wastewater facility, shall be subject to these standards.

1.2.3 County - The County of Hernando, in the State of Florida, the Hernando County Utilities Department or the Hernando County Water and Sewer District, hereinafter referred to as "HCUD".

1.2.4 District - The Hernando County Water and Sewer District or Hernando County Utilities Department (HCUD).

1.2.5 Director - The Director of the HCUD or a designated representative.

1.2.6 Project Engineer - A Professional Engineer registered in the State of Florida, Engineer of Record (EOR), who shall be retained by the project owner or developer to design and guarantee that the project shall comply with the contents of this specifications manual.

1.2.7 Developer-installed project - Any project in which a private entity designs and constructs water, wastewater and/or reclaimed water facilities which will be owned, operated and maintained by the HCUD.

1.2.8 “As Builts” (Record Drawings) - Project Engineer (EOR) certified copies of project construction process, presenting to the owner, a record of the finished project as it is actually built.

## 1.3 WATER, SEWER AND/OR RECLAIMED WATER (RW) CONNECTION FEES AND AGREEMENTS

1.3.1 Developers involved in the construction of any residential, commercial or industrial future public utility system or systems within the unincorporated area of Hernando County must complete an application for “Water, Wastewater and/or Reclaimed Water Agreement” form. The agreement form is available in the customer service section of HCUD.

1.3.2 Developers shall then pay to HCUD, any applicable connection and/or other fee charges prior to the issuance of building construction permits.

## 1.4 USE OF EASEMENTS, RIGHTS-OF-WAY AND SODDING

1.4.1 The Developer or EOR shall take the initiative to notify, request and process agency applications involved in the project, requiring permits for right-of-way use from such agencies as Hernando County Department of Public Works (HCDPW), Florida Department of Transportation (FDOT) and the Southwest Florida Water Management District (SWFWMD).

1.4.2 Where rights-of-way usage shall be unobtainable or impractical, 15-foot wide easements shall be dedicated to HCUD for Utilities installation and maintenance; to include but not limited to pipe lines, ingress and egress to facilities, pump stations and well sites. These easements shall be granted and duly recorded prior to completion of the project. Copies of the recorded easements shall be provided to HCUD prior to acceptance by the Hernando County Water and Sewer District.

1.4.3 Sodding Requirements: After construction of potable water, reclaimed water and wastewater projects have been completed, the contractor shall supply and install a standard 2 ½ to 3-inch sod layer (full sod, not seed and mulch) over all surface areas disturbed during the construction activities. The contractor shall grade the site to accommodate the HCDPW and FDOT requirements that the top of the sod shall be 1-inch lower than the edge of pavement elevation. After sod installation, the contractor shall compact the sod layer with a sod roller/compactor machine, designed for such activity, rendering the freshly installed sod layer to be level and smooth in texture and appearance. The contractor shall obtain an HCUD hydrant meter and/or in some instances the contractor may need to provide a tanker truck in order to supply the necessary irrigation water for the project. The contractor shall furnish a written irrigation schedule to HCUD and immediately begin to apply irrigating water to the newly installed sod. The schedule shall cover twice a week water applications for six (6) weeks from the installation date of the new sod as a minimum. Dryer seasons may require additional watering. The construction areas for sodding shall be but are not limited to; public rights-of- way, dedicated utility easements and pump station sites. All sodding and grading in the county right-of-way shall require both HCDPW’s and HCUD’s approval.

## 1.5 AUTHORITY OF HCUD INSPECTORS

1.5.1 HCUD inspection personnel shall inspect all construction and materials, and may inspect preparation, fabrication or manufacture of supplies to be used on projects within HCUD franchise area. The HCUD inspector shall not revoke, alter or waive any requirements of the specifications, but shall alert the contractor and/or EOR of any failure of work or materials to conform to the plans or specifications.

1.5.2 The HCUD inspector shall have the authority to reject defective materials and may suspend work, if public health or personnel safety situations are involved.

1.5.3 The HCUD inspector shall not act as a foreman, perform other duties for the contractor, or interfere with the management of the project work.

1.5.4 Any advice the HCUD inspector may give shall in no way be construed as binding or releasing the contractor from carrying out the implied intent of approved plans and specifications.

## 1.6 USE OF CHEMICALS

1.6.1 Chemicals used during project construction or furnished for project operation, shall show approval of either the U.S. Environmental Protection Agency (EPA) or the U.S. Department of Agriculture (USDA).

1.6.2 Use of chemicals and disposal of residues and containers shall be in conformance with applicable Federal and State rules and regulations.

## 1.7 PROTECTION AND RESTORATION OF PROPERTY

1.7.1 The contractor shall not illegally enter upon or alter public or private property. After receiving proper permits or written permission, work shall be performed on private property, public rights-of-way or on dedicated easements. After receiving permits or written permission from property owners, ingress and/or construction shall begin after owners are notified 24 hours in advance of construction.

1.7.2 Should damage occur to public or private property, the contractor shall restore such property, at his expense, to a condition equal to or better than the existing state before such damage occurred.

1.7.3 HCUD shall require the contractor to video-tape the job site and pertinent offsite areas that are near or adjacent to the construction activities, providing a copy of the video records of pre-construction conditions to HCUD before construction begins.

## 1.8 PUBLIC CONVENIENCE AND SAFETY

1.8.1 Materials and equipment shall be stored on the project site, so as to allow minimal disruption to vehicular or pedestrian traffic. No public roadway shall be closed or opened without written permission from HCDPW or other authorizing public agencies.

1.8.2 The safety provisions of applicable laws, including the Occupational Safety Health Act (OSHA), and building and construction codes shall be observed for the protection of person(s) and property.

1.8.3 The contractor shall provide and maintain safety barricades, signals and/or signs on streets, highways or in other locations as required by the HCDPW or FDOT specifications for the protection of the work and safety to the public. Barricades which encroach on or are adjacent to public rights-of-way shall be provided with lights, which shall be kept burning at times between sunset and sunrise and during periods of low visibility. Traffic control or flag personnel shall be provided by the contractor where safety conditions require such.

1.8.4 Projects involving excavations in areas where the public safety may be an issue will be required to have a temporary safety fence installed during construction.

1.8.5 Access to public and private properties during stages of construction shall be provided by the contractor. There shall be no construction work causing service interruptions to "online" utilities customers, unless advance written approval is secured from the affected utility authority.

1.8.6 The contractor shall provide for the safe operation of traffic in streets where work shall be in progress. Work shall be planned and scheduled to result in the least interference with normal traffic flow and such operations shall be pre-approved in writing by the Traffic Operations Section of HCDPW.

1.8.7 Construction hours of operation shall occur between 7:00 a.m. and 7:00 p.m., Monday through Friday. Except for pre-approved abnormal times or in case of emergencies, unauthorized work shall not be allowed. The official Hernando County holiday schedule shall be observed when planning normal construction schedules.

1.9 DISRUPTION TO EXISTING SYSTEM OPERATION: The contractor shall request HCUD to schedule connection operations so as to keep customer service disruption to a minimum. The request to HCUD shall be made 5 business days prior to the proposed time of connection to existing utilities systems. The Utilities Department will require a Public Service Announcement (PSA) to be issued for all scheduled interruption of services lasting four (4) hours or longer and/or affects 250 customers or more. A scheduled PSA must be submitted by Utilities staff to the County's Community Relations Department no less than one (1) work week prior to the interruption of service.

1.10 SILTATION, EROSION AND WATER CONTROL: The contractor shall provide a means or methods for erosion prevention and silt migration. Such means or methods shall be approved by the EOR for silt and erosion control, de-watering, or other operations involving the use and disposal of water.

1.11 DISTURBED REFERENCE POINTS: Survey monuments, benchmarks or other reference points, which must be disturbed by construction operations, shall be witnessed, removed and replaced by a Professional Land Surveyor (PLS), registered in the State of Florida.

1.12 CONSTRUCTION STAKES AND SURVEY MONUMENTS

1.12.1 The contractor shall provide, install and maintain construction stakes for grades and measurements necessary for execution and control of the work.

1.12.2 The plans shall show or describe the reference points, bench marks or survey monuments from which the contractor shall lay out the work.

1.13 SANITARY PROVISIONS (PORTABLE TOILETS): The contractor shall provide and maintain sanitary accommodations (to include portable toilets) for employees and official site visitors, to comply with the requirements and regulations of the State of Florida, Hernando County Health Department (HCHD) or other regulatory agencies.

1.14 PLANS AND ALLOWABLE DEVIATIONS: (See Sub-paragraph 2.2 and 2.3)

1.14.1 The project shall be constructed in accordance with the approved plans and HCUD specifications with requested deviations from the approved plans requiring the prior approval of the EOR and HCUD.

1.14.2 If the plans and specifications do not conform to HCUD requirements, HCUD will notify the EOR or Developer of the changes, corrections or modifications required. Once the HCUD determines the plans are in general compliance with HCUD standards, the EOR and/or the Developer shall be notified in writing that the plans shall be stamped “Approved for Construction”.

1.14.3 For Hernando County projects, once “Approved for Construction” plans shall have been signed, sealed and delivered, there shall be no changes of project design, materials or construction allowed or compensated for. Should any changes become necessary, an official “Change Order” shall be submitted by the EOR/Contractor to HCUD for approval by the Hernando County Board of County Commissioners (HCBOCC), prior to the initiation of any proposed or requested change.

1.15 INSTALLATION OF "HCUD APPROVED EQUALS": Materials or devices shall be specified for the purpose of establishing a minimum standard of quality acceptable to HCUD. Material or devices other than specified shall be considered equal and/or satisfactory when approved in writing by the EOR and HCUD.

1.16 DEFECTIVE WORK AND MATERIALS: Defective work or materials shall be repaired or removed from the project site at contractor expense. Failure to notice the defective work or materials during construction shall not prevent future rejection of such work or materials upon discovery, prior to final HCUD acceptance of project.

1.17 CONSTRUCTION PLANS AND HCUD INSPECTIONS: The contractor shall be required to work from a set of plans stamped “Approved for Construction” by the EOR. All project work shall be inspected by HCUD inspection personnel. For scheduling inspections, the contractor shall notify HCUD a minimum of 48-hours prior to the requested date. The approved set of plans shall be located on the construction site at all times.

1.18 WARRANTIES

1.18.1 EIGHTEEN MONTHS WARRANTY PERIOD - If, within 18-months after the date of acceptance by HCUD or by the terms of any special guarantee or provision of the contract documents, any work shall have been found defective, the contractor shall correct such defective work at no cost to the County. If the contractor does not promptly comply with these terms, HCUD shall have the defective work corrected and costs incurred shall be paid by the contractor or deducted from the contract retainage. If a particular item of equipment shall be placed into service before project completion, the warranty period for that item shall start from the earlier date and shall be covered by special written amendments as submitted by the EOR.

1.18.2 EMERGENCY REPAIRS - An emergency shall be defined as a situation which develops suddenly and demands immediate action to halt a worsening condition. During the time that a project shall be under construction or in a warranty period, emergencies shall be handled as to the following guidelines; upon notification of an emergency situation, HCUD shall contact the Contractor, who shall make repairs immediately. In the event the Contractor is unable to respond, HCUD shall make the repairs and submit a bill to the Contractor for labor and materials incurred to correct the emergency problem.

1.19 PRE-CONSTRUCTION CONFERENCE

1.19.1 A Pre-Construction Conference shall be held prior to construction activities, for the purpose of reviewing the plans and specifications of the project. The meeting shall include the developer, contractor, subcontractor(s), utility company representatives, the EOR, and HCUD representatives.

1.19.2 HCUD shall receive two sets of “Approved for Construction” plans, sized 24" x 36" (signed, sealed and dated by the EOR), with one project specification book, at least five work days prior to the Pre-Construction Conference meeting date.

1.19.3 HCUD shall be given a minimum of 48 hours notice prior to the pre-construction conference.

1.20 COMMENCEMENT OF WORK ("NOTICE TO PROCEED"): For HCUD projects, a "Notice to Proceed" (NTP) letter shall be issued during the pre-construction conference by the Hernando County Purchasing Department (HCPD) to establish the official contact commencement date for construction activities.

1.21 INSPECTIONS BY OTHER AGENCIES: Federal, State and County agencies shall have access to the project site for inspecting materials and work. Instructions or suggestions resulting from these inspections shall be given to the contractor through the EOR.

1.22 INTERMEDIATE INSPECTIONS: Intermediate inspections shall be conducted by HCUD to observe construction techniques and compliance with plans and specifications. The contractor shall keep HCUD informed of the project construction progress and/or changes in the construction schedule, insuring the opportunity for inspection of underground work prior to backfilling. Work results that have not been inspected shall be subject to rejection by HCUD.

1.23 HCUD REQUIREMENTS FOR PROJECT ACCEPTANCE

1.23.1 Final acceptance of a water distribution system, water main extension, reclaimed water distribution system, reclaimed water main extension, and/or wastewater collection/transmission system and release of the performance bond shall be made after all inspections have been made the improvements are certified by the EOR to be in accordance with the applicable regulations of HCUD, Florida Department of Environmental Protection (FDEP), SWFWMD, the Hernando County Health Department (HCHD), and other Federal, State, County, and City standards, ordinances, regulations and laws.

1.23.2 INSPECTIONS AND PUNCH LIST ITEMS: The Contractor shall request the EOR to schedule a "Pre-Final" inspection with HCUD, allowing 48-hours advance notification.

1.23.2.1 Should the "Pre-Final" inspection results be acceptable, the inspection shall be classified as a "Final Inspection", and the project advances to a "Close Out".

1.23.2.2 Should the results be unacceptable, upon agreement of the noted project deficiencies by representatives of HCUD and the EOR, a "Punch List" of items or deficiencies shall be forwarded to the contractor by the EOR for timely corrective action.

1.23.3 RE-INSPECTION PROCEDURES: After the "Punch List" items have been corrected, the contractor shall request the EOR to reschedule a "re-inspection" with HCUD, allowing another 48-hours advance notification.

1.23.3.1 Should the inspection results be acceptable, the inspection shall be classified as a "Final Inspection" and the project advances to "Close Out".

1.23.3.2 Should the results again be unacceptable, the process of re-inspection shall recur until all items on the "punch list" are corrected.

1.23.4 "CLOSE OUT" OF PROJECTS

1.23.4.1 The EOR shall provide to HCUD, two signed, sealed and dated, 24" x 36" sized copies of "As Builts" (Record Drawings) and for HCUD projects, two complete sets of computerized "As Builts" (Record Drawings), prepared in the appropriate ".dwg" and ".pdf" format. The "As Builts" (Record Drawings) shall include distances and dimensions between taps, gate valves, manholes, water and sewer service lines, mains from edges of pavement, street names and other necessary information for future item location purposes.

1.23.4.2 Water meter installation shall occur after acceptable bacteriological analysis results are received by HCUD and the project is "finalized" by the permitting agency and a "Letter of Acceptance" is issued.

1.24 NEW UTILITIES PRODUCT REVIEW

1.24.1 New utilities product review is an ongoing procedure conducted by HCUD Facilities Maintenance personnel (technical and/or management positions), through academic research and field evaluation. New and existing products are evaluated for efficient and economical utilization within the HCUD systems.

1.24.2 On a specific case basis, HCUD shall consider a one-time substitute approval of an alternate material or manufacturer through a detailed shop drawing submittal.

1.24.3 A manufacturer or manufacturer's representative may request a demonstration presentation for products not currently approved by HCUD. The manufacturer shall supply information requested and HCUD may approve the demonstration project with specific conditions and timelines. The manufacturer's presentation shall be provided to HCUD at no charge to the County.

## 1.25 SPECIFICATIONS MANUAL REVISION PROCEDURE

1.25.1 As material specifications and technical criteria change to meet changing needs and technology, it shall become necessary to revise and update this manual.

1.25.2 All approved manual revisions shall be available through e-mail in a timely manner to registered recipients of the previous edition of this technical manual. The effective date of such changes shall be 30-days from the date of approval.

1.25.3 This manual should be accurate, consistent, and free from errors and conflicts. In the unlikely event that a conflict and/or errors exist in this manual, HCUD shall send a written letter of clarification of the conflict and/or errors to all registered recipients of this manual. The effective date of "conflict and/or error revisions" will be the noted HCUD approval date. The resolution of design problems related to criteria conflicts in this manual will be handled on a case-by-case basis by HCUD.

1.25.4 Correction of any typographical errors contained herein that do not materially and/or significantly affect criteria shall not require immediate attention.

# SECTION 2

# PLANS PREPARATION

# SECTION 2: PLANS PREPARATION CONTENT

# SECTION 2

# PLANS PREPARATION

2.1 DESIGN CRITERIA: Design criteria, standards and specifications presented in this manual shall be used in the preparation of project plans and specifications packets. See section 12 for check list sheets.

2.2 PLANS FORMATTING

2.2.1 Computerized drawings created for HCUD projects shall be generated with digital file formats of Autodesk/AutoCAD drawing format file (.dwg) and Adobe (.pdf). Digital drawings shall be provided on a compact disc (CD) or other approved digital media, formatted for Windows 2000/XP personal computers. All utility infrastructure design for HCUD shall be drawn (horizontally and vertically, if applicable) in the NAD 83 state plan coordinate system.

2.2.2 GENERAL CONSTRUCTION PLANS:

2.2.2.1 Plans shall be prepared on 24-inch x 36-inch bond sheets, unless otherwise approved by HCUD.

2.2.2.2 The cover sheet shall include a project vicinity map and an index of all page contents.

2.2.2.3 A title block shall be located in the right hand edge of each sheet, identifying the EOR, Engineering Firm, address, telephone number, page number, page content and all Parcel Key Numbers (assigned by the Hernando County Property Appraiser's Office) associated with the proposed project.

2.2.2.4 All pages of blue-line or black-line construction plans submitted for review and approval shall be signed, sealed and dated by the EOR, a Professional Engineer registered in the state of Florida.

2.2.2.5 All submittals shall be accompanied by a letter of transmittal to include the project name, general description, and name, address, telephone number and fax number of the EOR and shall be approved by HCUD and the EOR prior to installation.

2.2.2.6 If a pressure system shall be constructed, a copy of the manufacturer's pump performance curve overlaid on the system response curve shall be included in the submittal.

2.2.3 SITE PLAN: A general layout plan (at a maximum of scale 1-inch = 200-feet) shall accompany the construction plans and depict existing improvements in detail as to intent of design. Schematic diagrams, designs or "shop drawing" details for equipment and structures not clearly indicated on the plans, shall also be provided for approval by HCUD before commencing construction.

2.2.4 Utilities Plan Sheet: The Utilities Plan Sheet shall include drawings primarily pertinent to potable water and sewer service utilities placement. Elevation point notations, contour lines and project information other than utilities shall be minimal on this plan sheet.

2.2.5 DRAWINGS: Construction plans on gravity sewer systems shall include both plan and profile views. Plans with only on-site water, RW, and wastewater pressure systems shall not require profile views, but shall require a plan view. The horizontal scale may be 1-inch = 50-feet, down to but no less than, 1-inch = 20-feet. The vertical scale shall be 1-inch = 5-feet. When proposed construction shall be within areas of existing infrastructure, e.g., road rights-of-way, plan and profile views are required. The horizontal scale shall be 1-inch = 20-feet and the vertical scale shall be 1-inch = 5-feet, unless otherwise approved by HCUD prior to plan submission. All underground utilities, storm drains or other structures, which may cross or be located close to the proposed pipelines and structures shall be shown on the drawings in both plan and profile views. Plans shall show cross section details of all conflicting crossings, as well as location and elevation of all air release valves.

## 2.3 STANDARD ITEMS FOR CONSTRUCTION PLANS

### 2.3.1 ALL CONSTRUCTION PLANS

2.3.1.1 Original and “As Builts” (Record Drawings) plans shall be on 24-inch x 36-inch paper.

2.3.1.2 Plans shall be “to scale” and scale noted on each view.

2.3.1.3 Plans shall reflect the approved point of connection.

2.3.1.4 Plans shall show north arrow, abbreviations, notes, etc.

2.3.1.5 Plans shall be signed, sealed and dated by the EOR registered in the State of Florida (all sheets).

2.3.1.6 Plans shall show width and center line of each right-of-way indicated.

2.3.1.7 Plans shall show width of pavement and distance to property line shown for all streets.

2.3.1.8 Plans shall show street names or identifiers indicated (correct location on plan).

2.3.1.9 Plans shall show subdivision name, lot and block numbers.

2.3.1.10 Plans shall show, and locate with dimensioning, HCUD regulated utilities proximate to the design on the plan view.

2.3.1.11 Vertical and horizontal clearance for all for all wastewater, force mains, RW mains crossing under water lines shall follow criteria from Chapter 62-555, FDEP Regulations. See sub-section 3.5.

2.3.1.12 Plans shall show size, type, material, and length of pipes shown for all water, RW, and wastewater lines, for both on-site and off-site projects.

2.3.1.13 Where water, RW, or wastewater lines cross existing pavement, the plans shall specify the crossing method, i.e., “Open-Cut”, “Jack and Bore” (J&B, see Section 8), or “Horizontal Directional Drill” (HDD, see Section 7).

2.3.1.14 Plans shall specify the invert of all intersecting utilities on the plan or profile views of the plans sheets.

2.3.1.15 Plans shall show minimum pipeline clearance from property line to be 5-feet.

2.3.1.16 Plans shall include a master plan of water, sewer and reclaimed water utilities for the entire project shown on one sheet.

2.3.1.17 Plans shall show all underground utilities, storm drains, or other structures which cross or are located close to the proposed pipelines on the plan or profile views.

2.3.1.18 Plans shall include on one page, a key map, showing the overall layout of the entire project with construction phases clearly marked.

2.3.1.19 When pipeline conflicts occur, HCUD shall require a special pre-cast pipeline conflict structure to be installed. See Detail 20.

2.3.2 PLANS FOR POTABLE WATER MAINS: (See Section 3)

2.3.2.1 Joint restraints shall be specified at all water main bends, valves, fittings, Fire Hydrant Assembly (FHA), and tapping sleeves shall conform to HCUD standards. See Details 9 and 15.

2.3.2.2 Valves shall have roadway boxes for all branch connections, loop ends, FHA "stub-outs" or other locations, are required to facilitate flow operation and control of the distribution system. Valves shall be placed so that the maximum allowable length of water main required to shut down for repair work shall not be more than 500-linear feet in commercial, industrial or multi-family residential districts, or 1,000-feet in other areas. If construction shall be phased, a valve followed by one full length of pipe with plug and Blow Off Assembly (BOA) where applicable shall be installed at the end of each line that is to be continued in the next phase. See Detail 10.

2.3.2.3 Combination Air-vacuum Release Valves (ARV) shall be specified where the water, reclaimed or force main profile is such that air pockets or entrapment could occur resulting in flow blockage. See Details 24A, 24B, or 25.

2.3.2.4 Plans shall show FHA spacing and installation shall be in accordance with specifications in Section 3.

2.3.2.5 Plans shall show location of Polyvinyl Chloride (PVC) sleeve for use in connection with far side potable water service installation. See Detail 2.

2.3.2.6 Water mains in residential subdivisions shall be PVC, Class 150, Dimension Ration (DR) 18, per American Water Works Association (AWWA) C900, or Ductile Iron Pipe (DIP), minimum Class 50, American National Standard Institute (ANSI) A21.51. Plans shall show size and type of pipe material.

2.3.2.7 Plans shall have notes indicating PVC water mains shall have Electronic Locator Wire (ELW) attached to the top of the pipe and suitable magnetic locator tape buried 12-inches above the water main pipe. ELW shall be attached to pipe at 12 o'clock position with nylon cable ties or duct tape at 4-foot intervals and each side of each pipe joint. See Detail 21.

2.3.3 PLANS FOR GRAVITY SEWER MAINS: (See Section 4)

2.3.3.1 Plans shall show for the size, type of pipe, slope, and distance between manholes on both plan and profile views for gravity sewer projects.

2.3.3.2 Invert elevations and flow directions shall be specified for each pipe entering or exiting a Manhole (MH). Rim elevation(s) shall also be specified, identifying the lowest point in the gravity system.

2.3.3.3 All MH stubs and connections shall be shown on both the plan and profile view. All service or end of line "stub-outs" shall include line plug caps with restrainers.

2.3.3.4 Plans shall show MH structure and MH connection details.

2.3.3.5 "Inside Drop" MH and detail shall be required for gravity sewer line drops of 24-inches or more. See Detail 32.

2.3.3.6 Minimum pipe size and material for gravity sewer main lines installed within county rights-of-way and dedicated easements shall be 8-inch PVC. All sewer service laterals shall be 6-inch PVC. Commercial and multifamily service wye connection fittings shall be 6 x 6-inch PVC. Residential service wye connection fittings shall be 6 x 4-inch PVC. The contractor shall furnish and install "clean-out" access fittings at finish grade and at property line. HCUD shall require a shallow "Collector Manhole" with cover, where three or more sewer service laterals converge. Where grade levels are uncertain at time of installation, lateral "cleanouts" may be temporarily installed at higher elevations. However, it shall be the responsibility of the building contractor to reinstall the lateral "clean-outs" to finished grade level before issuance of certificate of occupancy of residential units.

2.3.3.7 All installed manholes shall have water-tight MH cover inflow-protectors. See Detail 32.

2.3.4 PLANS FOR WASTEWATER FORCE MAINS (FM): (See Section 4)

2.3.4.1 Joint restraints shall be specified at all Force Main (FM) bends, valves, fittings, and tapping sleeves. Joint restraint detail shall conform to HCUD standards. See Detail 15.

2.3.4.2 Valves with roadway boxes shall be provided for all branch connections. In-line flow control or isolation valves shall be provided at intervals not to exceed 1,000-feet.

2.3.4.3 Combination ARV shall be specified where the force main profile is such that air entrapment could occur resulting in flow blockage. See Detail 24A.

2.3.4.4 Notes on the plan to indicate the FM shall have a suitable magnetic locator tape and Electronic Locator Wire (ELW) buried over the FM. ELW shall be attached to pipe at 12 o'clock position with nylon cable ties, at each joint and at 5-feet intervals.

2.3.4.5 Plans shall provide detail of any FM connecting to a "Collector Manhole".

2.3.5 PLANS FOR RECLAIMED WATER (RW) MAINS: (See Section 5)

2.3.5.1 Joint restraints shall be specified at all RW main bends, valves and tapping sleeves. Plans shall show detail illustrating joint restraint that conforms to HCUD standards. See Detail 15.

2.3.5.2 Valves with roadway boxes for all branch connections or other locations shall be required to facilitate flow operation and control of the distribution system. Valves shall be placed so that the maximum allowable length of water main required to shut down for repair work shall not be more than 1,000-linear feet in commercial, industrial or multi-family residential districts; 2,000-feet on distribution systems in residential districts and 2,000-feet on transmission systems. If construction shall be phased, a valve followed by one full length of pipe shall be installed at the end of each line that is to be extended in the next phase.

2.3.5.3 Combination ARV(s) shall be specified where the RW main profile is such that air entrapment could occur resulting in flow blockage.

2.3.5.4 RW distribution mains within residential subdivisions shall be PVC, Class C900, DR 18, per AWWA C900, or DIP, minimum Class 50, ANSI A21.51. Size and type of material shall be noted on plans.

2.3.5.5 A flow meter(s) shall be installed on each service line that shall be connected to a RW transmission main. Note location and anticipated size of meter on plans. See Detail 6.

2.4 WASTEWATER PUMP STATIONS (TO BE PRIVATELY OWNED): (See Section 4)

2.4.1 Plans shall show location of pump station on private property.

2.4.2 Plans shall show design capacity (average daily/peak flows) and system response/curve calculations.

2.4.3 Plans shall show pump identification, all nameplate data and pump curve for selected pump.

2.4.4 Plans shall show wet well operating elevations, inverts, and slab elevations.

2.4.5 Plans shall show identification of fittings and valves on private property.

2.5 WASTEWATER PUMP STATIONS (TO BE OWNED AND MAINTAINED BY HCUD): (See Section 4).

2.5.1 Plans shall show dimensions of site, service driveway, location and materials, and fencing with double entry gates, location of wet well and valve vault. Fencing shall be grounded per National Electric Code (NEC) standards.

2.5.2 Plans shall show utilities required for operation and maintenance of the pump station.

2.5.3 Plans shall show valve vault with valves and piping identified.

2.5.4 Plans shall show Reduced Pressure Zone (RPZ) type of Backflow Prevention Assembly (BPA) for potable water protection. See Detail 8.

2.5.5 Plans shall show individual pump identification, all nameplate data and pump curve for selected pump(s).

2.5.6 Pump station design capacity (average daily/peak flows) and system response/curve calculations shall be included on plans.

2.5.7 Wet well design criteria and pump control level settings shall be noted on profile view on plans.

2.5.8 Plans shall show electrical load calculations included on electrical sheet and noted as same as provided on electrical sheet shop drawing submission.

# SECTION 3

# SPECIFICATIONS FOR POTABLE WATER DISTRIBUTIONS SYSTEMS DESIGN AND INSTALLATION

## SECTION 3: SPECIFICATIONS FOR POTABLE WATER DISTRIBUTION

## SYSTEMS DESIGN AND INSTALLATION CONTENTS

# SECTION 3

# SPECIFICATIONS FOR POTABLE WATER

# DISTRIBUTION SYSTEMS DESIGN AND INSTALLATION

## 3.1 GENERAL

3.1.1 SPECIFICATIONS: The following specifications shall cover the design, review of plans and specifications for the installation, inspection, testing, and acceptance of drinking (potable) water distribution systems, water main extensions, and all project appurtenant items which shall be constructed by private enterprise and shall be owned and maintained by HCUD upon project completion and acceptance.

3.1.2 DEVELOPMENT REVIEW COMMITTEE: All improvements and modifications made to the HCUD water system shall be done in accordance with plans approved by the HCUD section of the Code Compliance Review (CCR) in the Hernando County Development Department and the Hernando County Planning Department. Material and workmanship shall conform to the specifications that appear in this document. All pipeline and appurtenance materials in contact with potable water shall be certified by National Sanitation Foundation (NSF) standard # 61 and NSF/ANSI 372.

3.1.3 PIPE COLOR GUIDE: For standardized identification purposes, all pipelines and appurtenances installed within Hernando County shall meet the Color Marking Standards for Underground Utilities, as outlined in Detail 13.

3.1.4 It shall be the developer's responsibility to locate existing utilities for design and the contractor's responsibility to locate existing utilities for connection.

## 3.2 PLANS PREPARATION

3.2.1 DESIGN: All potable water distribution systems, water main extensions, and all appurtenant items shall be designed in accordance with the applicable regulations, standards and specifications of Hernando County, HCUD and the standards established herein.

3.2.2 LOCATION OF UTILITIES: HCUD shall own and maintain all portions of the water system up to and including the water meter installed within the HCUD franchise area. The water distribution system or water main extension or any portion thereof, which is to become the property and sole responsibility of HCUD, shall be designed to be constructed within any public Rights-Of-Way (ROW) and/or dedicated easements.

## 3.3 PLANS REVIEW AND "AS BUILTS" (RECORD DRAWINGS)

3.3.1 RESIDENTIAL DEVELOPMENT: For Residential Development, the standards, procedures and requirements are primarily set forth in the "Subdivision Regulations" policies, available through the Hernando County Development Department (HCDD). The developer or authorizer representative shall submit plans and associated documents to the HCDD for initial review and distribution to affected departments. Plans review concerning utilities shall be forwarded to and conducted by HCUD in close cooperation with the HCDD. See section 12 for check list sheets.

3.3.2 COMMERCIAL AND INDUSTRIAL DEVELOPMENT: For commercial and industrial development, the standards, procedures and requirements are primarily set forth in "Site Development Regulations" policies available through the Hernando County Building Department (HCBD). The developer or authorizer representative shall submit plans and associated documents to the CCR division of the HCBD for initial review and distribution to affected departments. Plans review concerning utilities shall be forwarded to and conducted by CCR

member of HCUD, in close cooperation with the HCBD. See section 12 for check list sheets.

3.3.3 CCR PLANS APPROVAL (COMMERCIAL OR INDUSTRIAL SYSTEMS): For Commercial or Industrial Development, the Developer or authorized representative shall submit plans and associated documentation to the CCR for review. The CCR member shall review the plans and make comments for required corrections.

3.3.4 After project construction is complete, the EOR shall mark up, sign, date and seal two sets of approved construction plans as "As Builts" (Record Drawings) and two complete sets of electronic "As Builts" (Record Drawings), prepared in ".dwg" format and ".pdf" format, for final submission to HCUD.

## 3.4 SYSTEM DESIGN, CONSTRUCTION STANDARDS AND FLOW CRITERIA

3.4.1 GENERAL REQUIREMENTS: The provisions of this sub-section set forth the general requirements for design of potable water distribution systems and facilities, and provide criteria for determining flow demands. The EOR shall comply with all the requirements of the HCHD in addition to the criteria contained herein.

3.4.2 SERVICE CONNECTION AVAILABILITY:

3.4.2.1 Connection to HCUD water and sewer systems shall be determined by Article VI, Section 28-210, sub-section (E) of the latest revision of the Hernando County Code. See Detail 12.

3.4.2.2 Any subdivision dedicating utilities to HCUD shall be required to have a minimum of two feeds into a subdivision. At least two of the connections shall be on opposing sides of the property or as determined by HCUD. If a second hook up location is not possible at the time of connection, the subdivision is to make provisions to allow for future hookup from at least one adjoining property (as determined by HCUD) for when water becomes available.

3.4.3 FLOW CRITERIA:

3.4.3.1 Residential Flow Demand: Flow demands for design shall be calculated based on full or projected ultimate development. The Average Daily Flow (ADF) for single family and master-metered residential developments shall be based on 390 gallons per day (GPD) per unit as determined in the latest HCUD Water Master Plan Study. A peak factor of 2 shall be applied for design purposes.

3.4.3.2 Commercial Flow Demand: Flow demands for design shall be based on 390 GPD per Equivalent Residential Unit (ERU). Peaking factors for design shall be based on total ERU's from the following Table 3-1.

***TABLE 3-1***

WATER FLOW PEAKING FACTORS

| Unit/ERU | Populations | Peak Factor |
|---|---|---|
| 1 | 2.7 | 4.46 |
| 10 | 27.0 | 4.36 |
| 100 | 270.0 | 4.10 |
| 200 | 540.00 | 3.96 |
| 300 | 810.00 | 3.86 |
| 500 | 1,350.0 | 3.71 |
| 1000 | 2,700.0 | 3.48 |
| 2000 | 5,400.0 | 3.21 |
| 5000 | 13,500.0 | 2.82 |

3.4.3.3 Fire Flow: Fire flows shall be calculated in accordance with the fire flow requirements outlined in FAC 62-555.320(15), based on population, density, and hazardous features of the proposed construction. See also sub-section 3.8 for FHA specifications.

3.4.3.4 All fire suppression sprinkler system lines serving commercial and industrial facilities shall be equipped with RPDA. Low flow detection meter type shall be as indicated in Table 3-4. Compound water meter is not necessary for dedicated fire suppression system mains. Installations shall be per HCUD specifications and inspected by HCUD after installation (See Detail 7).

3.4.4 PIPE SIZING

3.4.4.1 The EOR shall be responsible for properly sizing the water distribution system piping.

3.4.4.2 The pipe sizing design criteria for water distribution systems shall provide for at least 100% of the combined peak hour, maximum day demand rate, plus fire flow. The allowable minimum service residual pressure shall be 20 PSI in a transmission line. Design flows for fire suppression sprinkler systems demand and method of computation shall be submitted by the EOR to the HCUD for review.

3.4.4.3 The minimum pipe size for distribution mains shall be 4-inches, with the exception of the minimum size for distribution mains serving fire hydrants which shall be 8-inches. Dedicated fire hydrant branches shall be a minimum of 6-inches in diameter for mains less than 150-feet.

3.4.5 LINE ROUTING: The primary feed for the water distribution system of a residential or commercial subdivision shall be routed within County road ROW or dedicated utility easement, unless otherwise approved. HCUD may require the off-site infrastructure of a project to be extended beyond the development point(s) of connection.

3.4.6 DEPTH OF COVER: Cover depth is measured from finished grade to the top of the pipeline; it shall be a minimum of 36-inches to a maximum of 48-inches for water mains constructed along local streets and a minimum of 48-inches to a maximum of 60-inches for water mains constructed along arterial streets or roads, unless authorized by HCUD. There will be exceptions made for conflicts that the pipeline has to cross. Horizontal Directional Drilling (HDD) does not apply.

3.4.7 EMERGENCY POWER GENERATOR SYSTEM (EPGS): See Section 6.

3.5 SEPARATION AND CROSSINGS OF POTABLE WATER, RECLAIMED WATER AND SEWER LINES: See Chapter 62-555.314 of Florida Administrative Code (FAC), also see Detail 17.

3.5.1 SEPARATION

3.5.1.1 HORIZONTAL SEPARATION: A minimum horizontal separation of 6-feet, outside of pipe to outside of pipe, shall be maintained between water mains, RW, sanitary sewers, or sanitary force mains.

3.5.1.2 VERTICAL SEPARATION: A minimum vertical separation of 6-inches, outside of pipe to outside of pipe, shall be maintained between water mains, RW, sanitary sewers, or sanitary force mains.

3.5.1.3 Potable water, wastewater gravity/force, or RW lines shall not be placed in the same trench.

3.5.1.4 In cases where it is not practical to maintain a 6-foot separation, the pipe shall be laid in a separate trench or on an undisturbed earth shelf located on one side of the other main and at an elevation so that the bottom of the pipe is at least 6-inches above the top of the other main.

3.5.1.5 If it is impossible to obtain proper horizontal and vertical separation as described above, the water line shall be constructed of DIP and the wastewater line shall be C900 PVC. Both lines to be pressure tested to 150 PSI for 2-hours to insure water tightness.

3.5.2 PIPELINE CROSSINGS

3.5.2.1 At pipeline crossings, one full length of pipe shall be located so both pipe joints shall be equidistance as possible from the other main joints.

3.5.2.2 Where wastewater or RW mains shall cross a water main with less than 6- inches of vertical clearance, the RW and potable water main shall be constructed of ductile iron pipe at the crossing. A wastewater gravity or force main shall be constructed with C900 PVC at the crossing. HCUD shall consider one of the crossing mains to be enclosed within a 20-foot long steel or PVC casing centered on the crossing.

3.5.2.3 Water Mains: Typically water mains shall cross above wastewater or reclaimed water lines. Where a water main shall cross under a wastewater gravity main, adequate structural support shall be provided for the gravity main to maintain designed alignment and grade.

3.5.2.4 Reclaimed Water (RW) Mains: RW mains shall cross below water mains and above sanitary sewers or sanitary force mains.

3.5.2.5 Wastewater mains shall cross below all potable or RW water mains.

3.6 CROSS-CONNECTION CONTROL

3.6.1 There shall be no physical cross connection between a public and a private potable water supply or between a tested and non-tested system.

3.6.2 There shall be no physical cross connection or condition where sewage, wastewater or RW shall be allowed to enter a public or private water system.

3.6.3 All rules, regulations and procedures necessary to administer and enforce the provisions of cross connection control are established in the Hernando County Cross Connection and Backflow Prevention Control Ordinance.

3.7 CONNECTION TO EXISTING WATER MAINS

3.7.1 All connections to existing HCUD water mains shall be made after approval and under the direct observation of HCUD.

3.7.2 The developer shall submit a request to HCUD to schedule a waterline tap a minimum of 48-hours prior to proposed connection to the water main. Existing valves on existing mains shall be operated by or under direct supervision of HCUD personnel.

3.7.3 Existing water mains shall be tapped in such a manner as to avoid disturbance or disruption of service and to protect the potable water supply from contamination. When service shall be interrupted to existing customers during construction of a tap or addition of appurtenances the following conditions apply:

3.7.3.1 The contractor shall request HCUD to schedule connection operations so as to keep customer service disruption to a minimum. The request to HCUD shall be made 5 business days prior to the proposed time of connection to existing utilities systems. The Utilities Department will require a Public Service Announcement (PSA) to be issued for all scheduled interruption of services lasting four (4) hours or longer and/or affects 250 customers or more. A scheduled PSA must be submitted by Utilities staff to the County's Community Relations Department no less than one (1) work week prior to the interruption of service.

3.7.3.2 The contractor shall be ready to proceed with as much material preassembled as possible at the site to minimize the length of time of service interruption. Typically such connections shall be made at night to minimize the negative effects of service disruption.

3.7.3.3 HCUD shall postpone a pre-arranged or scheduled wet tap procedure if the contractor is not prepared to proceed on schedule.

3.7.4 WATERLINE CONNECTION PROCEDURES: Prior to the tap, the contractor shall assemble all materials, tools, equipment, labor and supervision necessary to make the tap connection. The contractor shall excavate sufficiently to insure the proposed wet tap is not performed within 36-inches of a pipe joint or fitting. The contractor shall excavate and maintain a dry and safe working area pit of sufficient size to facilitate the wet tap procedure. The contractor shall pressure test the tapping saddle or sleeve and valve installation under the observation of the HCUD Inspector. The test pressure shall be 150 PSI for 15-minutes. The contractor shall be responsible for properly backfilling and compacting the work area pit after the work is completed. The HCUD Inspector shall witness the tapping saddle pressure test, the line tap and the bore plug ("Coupon") retrieval. See Detail 1.

3.7.5 WATERLINE CONNECTION MATERIALS: The contractor shall furnish and install approved tapping saddles or sleeves with valves and perform wet taps on existing water mains larger than 2-inches. HCUD shall furnish the tapping machine tools, fittings and shall perform the wet tap for 2-inch and smaller diameters.

3.7.5.1 Tapping saddles (TS) shall be an epoxy coated malleable iron body, with stainless steel (SS) nuts and bolts or a SS body with SS bolts and nuts. Tapping saddles for "size on size" wet taps shall be full circle SS sleeve type, similar to Romac SST/DI,JCM#432 or HCUD approved equal.

3.7.5.2 Tapping gate valves shall be epoxy coated iron body, resilient wedge or seat, non-rising stem, opening to the left, with a 2-inch operating nut on top. The tapping gate valve flange end shall be mechanical joint for use with cast iron pipe on one side and standard flanged (Class 125) on the other side. The tapping gate valve shall conform to AWWA C-500, for Type II Class A Valves.

3.8 FIRE HYDRANT ASSEMBLIES (FHA) (See Detail 9) AND FIRE PROTECTION:

3.8.1 Spacing and location

3.8.1.1 MANUFACTURING AND INDUSTRIAL AREAS: FHA(s) shall be placed as required by Hernando County Fire Marshall office. The required fire flow shall be determined by the Hernando County Fire Marshal Office. Fire hydrant locations shall be approved by HCUD.

3.8.1.2 COMMERCIAL AND APARTMENT AREAS: FHA(s) shall be placed as required by Hernando County Fire Marshall office. The required fire flow shall be determined by the Hernando County Fire Marshal Office.

3.8.1.3 RESIDENTIAL AREAS: FHA(s) shall be placed as required by the Florida Administrative Codes for fire prevention.

3.8.1.4 OTHER AREAS: FHA(s) shall be placed a maximum of 1000-feet apart, along the ROW of rural roads or other areas as approved by HCUD.

3.8.1.5 FHA(s) shall be located within 12-inches of the side lot lines, between adjacent properties and a minimum of 24-inches from edge of ROW in areas without sidewalks and at 12-inches from edge of ROW with sidewalks (see Detail 30).The pumper discharge nozzle shall face the nearest roadway unless approved plans show details of locations other than the above. No object(s) may be placed or constructed near a FHA that would obscure the hydrant from full view or would in any other manner hinder the Fire Department from gaining immediate access to a FHA.

3.8.1.6 FHA(s) shall be a minimum of 4-feet from back of valley gutter (Miami curb) and 2-feet from back of upright curb in urban sections. For rural sections, FDOT Index 700 Clear Zone Criteria shall be met. FHA(s) shall be a minimum of 10-feet from edge of pavement.

3.8.1.7 FHA(s) in paved areas shall be protected by four bollards; 4-inch diameter steel pipe, 3-feet above and below grade filled with concrete and set in concrete, placed as required. See Detail 9.

3.8.1.8 The location of a new FHA shall be identified with a blue reflective pavement marker installed on the roadway. The reflective marker shall be located perpendicular to the hydrant, in the center of the lane closest to the hydrant.

3.8.2 Fire Protection Service Lines

3.8.2.1 Systems installed within Public rights-of-Way:

3.8.2.1.1 Compound water meter not required by HCUD.

3.8.2.1.2 Reduced Pressure Zone-Backflow Prevention Assembly (RPZ-BPA) not required by HCUD.

3.8.2.2 Systems installed on Private Property:

3.8.2.2.1 HCUD requires an HCUD approved Reduced Pressure Zone-Backflow Prevention Assembly (RPZ-BPA) (See Section 10) to be installed at the Property Line, on Private Property.

3.8.2.2.2 Applicable Installations are the responsibility of the Developer and shall meet or exceed HCUD specifications.

3.8.2.2.3 On-site fire protection systems (lines and components) shall be installed, owned, maintained and tested by the property owner.

3.8.2.2.4 The RPZ-BPA shall be tested and approved annually by certified BPA tester.

3.8.2.2.5 In the event reclaimed water is available within 200 feet of the property line, this may be used, with authorization by HCUD, in lieu of potable water.

3.8.3 FIRE HYDRANT ASSEMBLIES (FHA): See Detail 9.

3.8.3.1 Fire hydrants shall be of the “Traffic Model”, dry barrel, compression type closing with the line pressure and shall comply with AWWA Standard C502 "Standard for Dry-Barrel Fire Hydrants".

3.8.3.2 Fire hydrants shall open left with an arrow clearly cast on the top showing the direction of opening. Hydrants shall have a 1¼ -inch pentagonal operating nut with an anti-friction washer and bushing above the thrust collar. The operating nut, main stem, coupling and main valve assembly shall be capable of withstanding input torque of 200 ft.-lbs. in opening or closing directions.

3.8.3.3 Fire hydrants shall have two 2 ½ -inch hose nozzles and one 5 ¼ -inch with National Standard Hose Threads. Hose nozzles shall have a minimum 18-inch and a maximum of 24 – inch clearance from their center line to the bury line. Hose nozzle caps shall be securely chained to the hydrant barrel with heavy duty 3/0 twist link, non-kinking chain and shall have durable neoprene nozzle cap gaskets. Nozzle caps shall be cast with a 1¼-inch pentagonal nut for cap removal.

3.8.3.4 Fire hydrants shall have a traffic feature consisting of a breakable safety flange and steel or cast-iron stem coupling located below the break line of the hydrant and which allows 360-degree positioning. For vehicle collision protection, FHA(s) in paved areas shall be protected by a "bollard" system.

3.8.3.5 Fire hydrant shall have a 250 PSI working pressure and 400 PSI test pressure. Fire hydrants shall be AWWA Traffic Models meeting the above stipulations and as manufactured by AVK, American Flow (American Darling B-84-B) or HCUD approved equal.

3.9 PIPES AND FITTINGS: Water distribution mains for residential subdivisions and all transmission mains shall be constructed of DIP, PVC or HDPE. Pipe larger than 24-inches in diameter shall be approved on a case-by-case basis.

3.9.1 PIPE MATERIALS: The following Table 3-2 lists the allowable pipe materials for various sizes of potable water main pipe:

**TABLE 3-2**

WATER MAIN PIPE OPTIONS

| Material | Diameter | General Specification |
|---|---|---|
| DIP | 4" to 24" | ANSI/AWWA C151/A 21, CL 50 |
| PVC | 4" to 12" | AWWA C900, Class 150, DR 18 |
| PVC | 14" to 24" | AWWA C905, DR 25, 165 psi |
| PVC | 6" to 12" | AWWA C-909, Class 150, "Ultra-Blue" |
| Horizontal Directional Drill (HDD) Pipe | | SEE SECTION 7 |
| JACK AND BORE | | SEE SECTION 8 |

3.9.2 DUCTILE IRON PIPE (DIP) AND FITTINGS

3.9.2.1 DIP shall conform to the requirements of ANSI A21.51, minimum Class 50, unless otherwise specified by the EOR. Pipe joints for DIP shall be mechanical or push-on joints. Pipe shall have an exterior bituminous coating in accordance with ANSI A21.51. Pipe interior shall have a cement mortar lining with an asphaltic seal coat conforming to ANSI/AWWA C104/A21.4. The weight and class designation shall be painted in white paint on the exterior surface of each pipe section. Manufacturer code or serial number shall be provided on the bell of each pipe joint. DIP shall be spirally wrapped by blue tape with adhesive backing. DIP will be furnished in 20-foot lengths or as specified by HCUD.

3.9.2.2 Fittings: All DIP fittings shall be mechanical joint, shall meet the requirements of ANSI/AWWA C110/A21.10, shall have a pressure rating of 250 PSI, and shall be full-radius fittings. All fittings shall be coated and lined as specified above for ductile iron pipe.

3.9.2.3 Mechanical Joints: Mechanical joints consisting of bell, socket, gland, gasket, bolts and nuts shall conform to ANSI Standard A21.11. Bolts shall be high strength low alloy steel, such as "Corten," or "U.S. Alloy," T-head type having hexagonal nuts. Bolts and nuts shall be machined true and nuts shall be tapped at right angles to a smooth bearing surface.

3.9.2.4 Push-on Joints: Single seal gasket push-on type joints shall conform to the requirements of ANSI A21.11 and shall be U.S. Pipe "Tyton," American Cast Iron Pipe Company "Fastite," CLOW Corporation "Super Bell Tite," or HCUD approved equal.

3.9.2.5 Restrained Joints: Restrained joints shall be installed where water main pipe alignment changes direction. Restrained joints shall not be of the type that requires field welding or grooves cut into the pipe barrel for restraint. The length of pipe sections to be restrained shall be determined by the EOR and noted on the drawings. Shop drawings from the manufacture shall be submitted to and approved by the EOR and HCUD prior to construction. The restraining joints for mechanical joint fittings and valves shall be ROMAC Industries Grip Ring, EBAA Iron MEGALUG, or HCUD approved equal. See Detail 15.

3.9.2.6 Gaskets: Pipe and fitting gaskets, conforming to ANSI A21.11, shall be made of viton (fluorocarbon elastomer), EPDM (Ethylene Propylene Diene Monomer) or SBR (Styrene-Butadiene Rubber).

3.9.2.7 Encasement: All DIP and fittings shall be encased in polyethylene in accordance with ANSI/AWWA C105/A21.5 when installed in hostile soil conditions.

3.9.3 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

3.9.3.1 All PVC pipe shall bear the approval seal of the National Sanitation Foundation (NSF) that will remain legible during normal handling, storage, and installation.

3.9.3.2 Pipe color shall be blue for potable water mains.

3.9.3.3 PVC pressure pipe 4-inches through and including 12-inches in diameter, shall meet the requirements of AWWA C900, shall have the same outside diameter (OD) as DIP and be compatible for use with ductile iron fittings. PVC pipe water mains less than 4-inches in diameter shall not be accepted by HCUD.

3.9.3.4 The pressure class and dimension ratio (DR) of PVC pressure pipe shall be 150 PSI, DR 18 and laying length of 20-feet.

3.9.3.5 Fittings for PVC Pressure Pipe (4-inches through 12-inches) shall be ductile iron with mechanical joints, with a minimum pressure rating of 250 PSI and shall conform to the requirements of ANSI A21.10 and A21.4.

3.9.3.6 Joints for PVC pressure pipe shall be of the compression rubber gasket type and the pipe line installation shall be as recommended by the pipe manufacturer.

3.9.3.7 Restrained Joints for PVC pipe shall be Uni-Flange Series 1350 for PVC-PVC joints and Uni-Flange Series 1300 or EBBA PV2000 fittings for PVC-DIP joints, or HCUD approved equal. The length of PVC pipe to be restrained shall be determined by the EOR and noted on the drawings. Shop drawings from the manufacturer shall be submitted to and approved by the EOR and HCUD prior to actual construction. See Detail 15. For watermain installations, Certainteed’s Certa-Lok systems DR18 may be used in lieu of PVC with restrainers.

3.9.3.8 HCUD may require pre-cast 500 pound concrete Thrust Blocks in addition to restrained joints. (See Detail 14)

3.10 VALVES AND APPURTANCES: All valves shall be the manufacturer's standard design for the service intended and shall bear the maker's name, pressure rating, size and flow direction arrow cast on the body. Valves shall open left (counter clockwise) with an arrow cast in the metal of operating hand wheels or nuts indicating the direction of opening.

3.10.1 Gate Valves (GV): See Detail 23.

3.10.1.1 A GV 2-inches in size shall have a full port opening, non-rising stem with hand wheel, thread to thread, and resilient wedge. Example is AVK, No. 03-063-43 with hand wheel.

3.10.1.2 GV 4-inch, up to and including 12-inch for in-ground applications, shall be of the resilient seat type (meeting the requirements of AWWA C515/C509) non-rising stems, with a 2-inch square AWWA style operating nut, and shall open when the nut is turned counterclockwise when viewed from above the activator nut. Valves shall have mechanical joint ends and shall be furnished complete with joint accessories. Exposed or above-ground GV(s) shall be Outside Stem and Yoke (OS&Y) flanged joint type. GV(s) shall be American Flow Control Series 2500, Kennedy KS-RW AWWA C 515, AVK, or HCUD approved equal.

3.10.1.3 The GV activator nut shall be protected by an adjustable cast iron valve case (similar or equal to Tyler, 2 piece, No. 461-S for short applications or 562-S for long applications) with a cast iron lid marked “WATER” on top. Valve cases shall be secured by a concrete pad; 24-inches by 24-inches by 6-inches thick, with #4 rebar inside the pad perimeter and shall conform to final grade and slope. If the GV activator nut is installed lower than 36-inches below grade, the contractor shall install a valve operation nut extension device, such as Pentek Roadway Valve Box (see section 3.10.10) or HCUD approved equal, the contractor shall modify the valve case to ensure soil does not enter the operating nut area, causing GV operational difficulties.

3.10.2 Butterfly Valves (BV): See Detail 22.

3.10.2.1 Valves 14-inches in size or larger shall be “Butterfly Valves” (BV), meeting AWWA C504 standards and shall be of the tight closing, resilient disk or seat type. BV disks shall rotate 90 degrees from the full open position to the tight shut position.

3.10.2.2 The BV shall open counterclockwise when viewed from above the activator stem nut. Manual BV operators shall be of the worm gear or traveling nut type and fully enclosed. Operators shall have adjustable mechanical stop limiting devices to prevent over-travel of disks. Underground applications shall be gasketed, grease packed and all BV(s) shall be furnished with 2-inch square operating nuts.

3.10.2.3 The BV activator nut shall be protected by an adjustable cast iron valve case (similar or equal to Tyler, 2 piece, No. 461-S for short applications or 562-S for long applications) with a cast iron lid marked “WATER” on top. Valve cases shall be secured by a concrete pad; 24-inches by 24-inches by 6-inches thick with #4 rebar inside the pad perimeter, and shall conform to final grade and slope. If the valve activating nut is installed lower than 36-inches below grade, the contractor shall install a valve operation nut extension device, such as Pentek Roadway Valve Box (see section 3.10.10) or HCUD approved equal, the contractor shall modify the valve case to ensure soil does not enter the operating nut area, causing BV operational difficulties.

3.10.3 Tapping Valves: The Tapping Valve shall be mechanical joint outlet, non-rising stem, and resilient seat meeting the applicable requirements of AWWA C515 or C509. The Tapping Valve shall be designed for pressure tapping with sufficient seat opening to allow full diameter taps to be made and shall be manufactured with an integral tapping flange having a raised lip design. See Detail 1.

3.10.4 Tapping Sleeves: Tapping sleeves for size-on-size connections shall be full circle stainless steel tapping sleeve and rated for 150 PSI working pressure. For less than size-on-size connections, tapping sleeve shall be fabricated steel units with a fusion-bonded epoxy coating or Stainless Steel and shall be pressure rated at 150 PSI. The contractor shall verify the outside diameter of the existing water main before ordering the tapping sleeve.

3.10.5 Service Tapping Saddles: Service tapping Saddles shall be malleable iron, ductile iron, stainless steel, or bronze bodies and secured with corrosion resistant coated double straps and nuts. The sealing gasket shall be the O-ring type suitable for the applicable service. Outlet flange shall be ANSI B16.1, 125 lbs. standard. Service saddles shall be Power Seal No. 3413 or HCUD approved equal. Outlet threads shall conform to AWWA Standard Corporation Stop or iron pipe threads and range in size from ¾ up to 2-inch. The diameter of the Service Tapping Saddles shall conform to the type and size of the pipe being tapped. Epoxy coated saddles will be required iron type saddles and in highly corrosive areas as determined by HCUD.

3.10.6 Combination Air-Vacuum Release Valve (ARV) Assembly (See Detail 25 B):

3.10.6.1 All potable water lines shall have air and vacuum release valves installed as they are indicated on the plans. 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 pounds, and all operating parts are to be made of engineered corrosion resistance 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 to allow larger than normal automatic orifice providing efficient air release and minimize potential debris build up and clogging. The working pressure shall be 200 psi and shall have a ¾ –inch, 1–inch, or 2 –inch threaded connection. All air and vacuum release valves shall be model ARI D-040 or approved HCUD equal. An isolation valve is required. All ARV valves must be ISO-9000 and NSF 61 certified. All components in contact with potable water must be NSF/ANSI 61 AND NSF/ANSI372 certified.

3.10.6.2 ARV Housing: All air release valves shall be enclosed above ground in Water Plus Model ARV-H-30 or HCUD approved equal. Enclosures shall be colored blue. For ARV's that are of a size larger than can be installed in the standard enclosure referenced above, other Water Plus or HCUD approved equal enclosure shall be used. All enclosures shall be constructed of quality, UV resistant poly-plastic with a galvanized stable bar in back; for aerial crossings, the stabilizing bar may removed. All enclosures shall be colored blue and be equipped with a locking device approved by HCUD. The Standard enclosures (H-30) shall be equipped with a Pin Allen lock and keys (Pin Allen) shall be provided with each installation.

3.10.7 Pressure Reducing Valves: Pressure Reducing Valves shall be manufactured by CLA-VAL Company or HCUD approved equal and be certified by the EOR and shall be reviewed and approved by HCUD.

3.10.8 Pressure Sustaining Valves: Pressure Sustaining Valves shall be manufactured by CLA-VAL Company or HCUD approved equal and be certified by the EOR and shall be reviewed and approved by HCUD.

3.10.9 Blow-Off Assemblies (BOA)

3.10.9.1 A BOA shall be installed on all dead-end mains and at the end of cul-de-sac distribution mains. Construction plan and “As Builts” (Record Drawings) shall include blow-off assembly stationing on both the plan and profile views.

3.10.9.2 “Blow-off Hydrants” shall be maintenance free, traffic/tamper proof, and be of a 2-inch design, with brass ball valve, female connection (NSFT threads) operated with standard 2-inch operator’s key. Hydrant installation shall be below ground level, inside a 5 ¼-inch valve box secured in place with concrete valve pad. A non-draining ¼-inch brass ball valve that opens to the left and a pre-cast concrete thrust block that is accessible within the hydrant assembly valve box. The valve box riser section shall be 2-inch galvanized pipe. The outlet shall be brass 2 ½-inch diameter, hydrant threads with brass cap and brass chain. The assembly shall include one Diffuser Fitting and one Sampling Adapter Fitting (with individual storage cases), adaptable to the hydrant threaded outlet. One sampling rod shall be furnished with every 50 hydrants installed. The “Blow-off Hydrant” assembly and accessories shall be manufactured by Kupperle Foundry model number TF550, Valve Box manufactured by Tyler, Diffuser Fitting (Model No. 2BDIF1B), Sample Adaptor Fitting (Model No. 2BSA150), one Sampling Probe Rod (Model No. 150G) or HCUD approved equals. See Detail 10.

3.10.10 Valve Boxes: See Detail 23.

3.10.10.1 Valve box for valve operating nut 36 inches or less to finished grade:
Valve boxes for all valves installed below ground shall be made of cast iron. Valve boxes shall be adjustable to fit the depth of earth cover over the valve and shall be designed so as to prevent the transmission of surface loads directly to the valve or piping. Valve boxes shall have a minimum interior diameter of 5 ¼ -inches. Valve box extension shall be installed to reserve a minimum of 50% of the adjustment for a future extension. Valve boxes shall be supplied by Tyler MFG., two pieces, with cast iron lid, No. 461-S for short applications or 562-S for long applications. No ductile iron or pvc pipe allowed as part of the finished valve box assembly.

3.10.10.2 Valve box for valve operating nut 36 inches or greater to finished grade:
Highline 5¼" ROADWAY VALVE BOX: Valve Box shall be injection molded and commercially manufactured utilizing a proprietary Highline® compound known as SUPERFLEXON per ASTM D-2853-70, Class 1212. Material shall be a rigid combination of polyolefin with fibrous inorganic component reinforcing and U.V. stabilizer additives to assure resistance to material degradation from ultraviolet light. The entire upper section of the box shall be made of a POLYIRON® magnetically locatable material. The use of magnets will not be permitted. Box shall have a cast iron ring and a cast iron 4-pronged traffic lid. Cast iron shall have a minimum weight of 18 lbs. and must conform to ASTM-A-48, Class 20 specifications. Box shall be a Buffalo type (screw) and have a shaft diameter of 5¼". The bottom part of the box shall have a bell measuring 7⅝" high by 10 1/16" wide and have a knock out as standard equipment.

3.10.10.3 The cast iron cover of the valve box shall be marked “WATER”, painted blue, and shall be secured with a concrete pad to prevent tipping or moving.

3.10.11 ISOLATION VALVES AND LOCATIONS

3.10.11.1 ISOLATION VALVES: All isolation valves up to and including 12 inches shall be resilient seat gate valves. Isolation valves including 14 inches and larger shall be butter fly type.

3.10.11.2 Valves shall be placed so that the maximum allowable length of water main required to be shut down for repair work shall be no more than 1,000-feet.

3.10.11.3 The designer shall consider and incorporate maintenance considerations when placing isolation valve location. HCUD reserves the right to require additional isolation valves for efficient operation and maintenance.

3.10.11.4 Valves and valve boxes shall be provided for all branch connections (typically two valves on a tee, three valves on a cross or as determined by HCUD), FHA stub-outs or other locations as required to facilitate operation of the water distribution system.

3.10.11.5 Water main extensions or mains extending at a project phase line shall include a valve and one additional standard length of pipe with a cap and a temporary Blow-Off Assembly (BOA). See Detail 10.

3.10.12 Concrete Valve Pad and Brass Tag: Valve boxes located outside of paved areas shall be cast in a 24-inch x 24-inch x 6-inch thick 3000 PSI concrete slab. See Detail 23 for Standard Pad installation specifications. Brass tags shall read “WATER” for water mains, year of installation, diameter of pipe, and the number of turns to open or close the valve.

3.11 WATER SERVICE CONNECTIONS: Connections to existing water systems shall be made after written approval is obtained from the utility owner. The connections to existing HCUD water systems shall conform to approved plans and be witnessed by an HCUD representative. Water service connections shall be included as part of the distribution system and consist of: the service line, the corporation stop, the curb stop, and (for dual near-side connections) a dual service branch (U48-43-6.5 Ford 1” C.T.S. P.JX (2) ¾-inch Male Iron Pipe (MIP) outlets). The builder shall furnish and install water service connections as shown in Details 2, 3, 4 and 5.

3.11.1 GENERAL REQUIREMENTS:

3.11.1.1 Water service lines 2-inches and less in diameter shall be blue colored polyethylene tubing (PET) and conform to ASTM Standards D 1248 and 2239, DR 9, 200 PSI, with NSF approval for potable water service.

3.11.1.2 All near-side residential services shall be 1-inch PET for both single and dual services.

3.11.1.3 All far-side services shall be single 1-inch PET for both single and dual services.

3.11.1.4 Far-side service pipe (1-inch PET) crossing under pavement shall be installed in a 2-inch Schedule 40 PVC sleeve at a minimum depth of 30-inches and a maximum depth of 42-inches below pavement.

3.11.1.5 Services 2-inches or larger in diameter shall also meet the same requirements of the pipe, pipe fittings, and valve sections of this specification manual.

3.11.1.6 Water service lines (“Whips”) shall be staked to ensure that when the curb stop valve is installed it shall be within 2-feet from property line or edge of sidewalk.

3.11.1.7 Where water service lines conflict with fire hydrants and/or storm drainage structures, two single 1-inch service taps shall be installed 5-feet on each side of the obstruction.

3.11.2 POLYETHYLENE EXTRUSION TUBING (PET)

3.11.2.1 PET compound shall comply with the applicable requirements for the Type III, Grade P34, Class C, PE 3408, very high molecular weight polyethylene plastic material, as specified in ASTM D1248, a cell classification of 345434C or 355434C as specified in ASTM D3350.

3.11.2.2 PET shall be DR 9-200 PSI, type CTSVOD (copper tubing size) or HCUD approved equal.

3.11.2.3 PET shall have endured environmental stress cracking resistance testing, performed in by the manufacturer accordance with ASTM D1693, Condition C, and shall have no failures during 5000-hours test period.

3.11.2.4 PET service pipe or tubing shall be blue and identified with black lettering.

3.11.2.5 PET service lines and components shall be sized based on the following Table 3-3:

TABLE 3-3

POLYETHYLENE TUBING SERVICE LINES AND COMPONENTS SIZING

| Service | Meter Size | Corporation Valve Size | PET Service Line Size(s) | Curb Stop Size |
|---|---|---|---|---|
| Double | 5/8" X ¾" | 1" | 1" | 1" X ¾" X ¾" |
| Single | 5/8" X ¾" | 1" | 1" | 1" X ¾" |
| Single | 1" | 1" | 1" | 1" X 1" |
| Single | 1 ½" | 2" | 2" | 2" X 2" |
| Single | 2" | 2" | 2" | 2" X 2" |

3.11.3 CORPORATION STOP VALVES: Corporation Stop Valve (Corp. Stop Valve) bodies shall be bronze, with inlet connection to be 1-inch male NPT pipe thread. The outlet PET service line shall be secured by a compression fitting. Where PET inserts are required, the inserts shall be solid SS tube body type (not split). An acceptable Corp. Stop Valve example is; Ford F-1100-4, with SS insert examples being ¾-inch Mueller #504281 and 1-inch Mueller #504385.

3.11.4 DUAL SERVICES: The dual service branch piece shall be bronze body with a 1-inch C.T.S. P.J. X (2) ¾ "MIP" with 6 ½-inch outlet spacing, supplied by Ford MFG. No. UAV43-42W-65, with meter swivel nut.

3.11.5 SERVICE BOX LOCATION: In residential subdivisions HCUD shall install the individual service meter and meter box in response to the residential customer's application for service. The developer shall clearly identify the location of future service connections by the following:

3.11.5.1 Temporary identification: During construction, the location may be temporarily identified with a pressure treated 2" x 4" x 96" wood stake with the top 6-inches painted blue.

3.11.5.2 Permanent identification: When the service roadway is complete, the contractor shall mark the roadway curb with blue paint indicating the location of the service connection. The marking procedure shall be subject to approval by HCUD.

3.11.6 Upon completion of the installation of sub-division potable water service lines, the contractor shall supply and install individual curb stop valve lock seals tapered 93210121 and lock seal stud 93210141 manufactured by Highfield Manufacturing Company (or HCUD approved equal) for each of the potable water service line "Whips". Potable Water Service "Whips" installed by HCUD shall have lock seal and stud installed by HCUD.

3.11.7 METERS (See Table 3-4)

3.11.7.1 All new residential, irrigation and commercial accounts up to and including a 2" meter will require a Neptune T10 R900i radio read meter (Pit Version) supplied and installed by HCUD.

3.11.7.2 Commercial accounts requiring meters greater than two inch shall require a Neptune TRU/FLO R900i compound radio read meter with an E-Coder R900i Pit Version MIU or HCUD approved equal. The compound meter shall be supplied and installed by the developer. All meters three (3) inches and larger shall have a Neptune Meter Strainer installed directly before the meter assembly and the meter assembly shall be installed above ground.

3.11.7.3 All Neptune radio read meters, regardless of size, shall have an E-Coder R900i Pit Version MIU Register.

3.11.7.4 In instances where commercial developments, condos and apartments greater than four units are proposed, a compound master meter and BPA will be installed. The developer and/or association has the option to sub-meter these properties if they so choose. However, for billing purposes, HCUD will read only the master meter. A compound master meter will be installed in the right-of-way adjoining the property line. A backflow prevention assembly (BPA) will be installed on the property adjoining the property line. The offsite water infrastructure up to and including the meter will be owned and maintained by HCUD; the onsite water system including the BPA will be maintained privately.

Table 3-4
Water Meter Applications

| Meter Type *1* | Meter Size *2, 3* | Meter Application<br>Not Limited To |
|---|---|---|
| | | |
| Displacement Type<br>Neptune T-10 | ⅝" to and including 2" | Residential, Irrigation, and Some Commercial |
| Neptune TRU/FLO Compound<br>(High/Low Flow) | 2" HP,3",4",6", and 6"x8" | Commercial – ALF, Apartment Complex, Schools, Hospitals, Shopping Center, etc. |
| Neptune Turbine<br>(High Flow w/ Little Low Flow) | 1.5" to and including 20" | Commercial – Irrigation, Truck Washes, Water Plants, etc. |
| Neptune HP Protectus III<br>(High/Low Flow & Fire Protection) | 4", 6", 8", and 10"<br>(No strainer needed – included) | Commercial – When Fire and Potable Water are the same lines |

*1 All Neptune Radio Read Meters require an E-Coder R900i Pit Version MIU Register.*
*2 Neptune Strainers are required on all 3" and larger meter assembly installations.*
*3 All meter assemblies 3" and larger require above ground installation.*

3.12 PIPE HANDLING AND CUTTING, INSTALLATION OPTIONS AND PRESSURE TESTING PROCEDURES: The provisions set forth herein shall be applicable to all underground piping installations. It shall be the developer's responsibility to verify all existing conditions and to locate all structures and utilities along the proposed utility alignment in order to avoid conflicts. Where conflicts exist, work shall be coordinated with the facility owner and performed so as to cause minimum interference with the service rendered by the facility disturbed. Facilities or structures damaged during construction shall be repaired and/or replaced immediately at the developer's expense, in conformance with current standard industry practices, according to the direction of the owner of such facility, and approved by HCUD.

3.12.1 PIPE HANDLING, CUTTING AND LAYING: See Detail 16.

3.12.1.1 Care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coating. Any fitting showing a crack and any fitting or pipe which has received a severe blow that shall have caused an incipient fracture, even though such fracture cannot be seen, shall be marked, rejected and removed at once from the work area.

3.12.1.2 In any pipe showing a distinct crack and in which it is believed by the EOR that there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, shall be cut off and discarded before the remaining pipe section is used. The cut shall be made in the sound area of the pipe barrel, at a point of at least 12-inches from the visible limits of the crack and after the cutting process; all cut ends shall be examined for possible further cracks caused by cutting. All cutting shall be done with a machine adapted to the purpose.

3.12.1.3 Pipe shall be constructed of the materials specified and as shown on the drawings. Each section of the pipe shall rest upon the pipe bed for the full length barrel, with recesses excavated to accommodate bells and joints. Any pipe which has its grade or joint disturbed after laying shall be taken up and re-laid. No pipe shall be laid when the trench conditions or the weather is unsuitable for such work, except by permission of the EOR. Any section of pipe already laid which is found to be defective or damaged shall be replaced with new pipe without additional cost to HCUD. Excavation, trenching and backfilling shall be in accordance with the requirements of the applicable portions of these specifications.

3.12.2 PIPE INSTALLATION OPTIONS

3.12.2.1 Open Cutting

3.12.2.1.1 Trench Excavations that shall be “open cut”, shall have trench banks kept as near vertical as possible and wide enough to allow approximately 8-inches clearance on each side of the pipe. The trench floor shall provide a uniform bearing for each full length of pipe section. Excavate bell recesses after trench has been graded. Perform all excavations to the depths shown or indicated on plans. In the event unsuitable or unstable soil shall be encountered, it shall be removed and replaced with clean sand, gravel, crushed stone, crushed slag, or combination thereof, or other material as approved by the EOR. Trench excavations in excess of 8-feet deep shall have trench box safety structures used during construction. Any pipe which has its grade or joint disturbed after lying shall be taken up and re-installed. No pipe shall be laid when the trench conditions or weather is unsuitable for such work, unless approval is given by the EOR or HCUD. Any section of pipe already installed and found to be defective or damaged shall be replaced immediately with new pipe without additional cost to HCUD. The contractor shall use precautions during construction to protect the installed pipe from contamination from vermin or foreign materials.

3.12.2.1.1.1 Dewatering: The Contractor shall remove all water from excavations and maintain the excavations free of water while construction is in progress, by providing dewatering equipment as necessary to conform to this requirement. Dewatering procedure must meet all regulatory agencies rules, regulations and requirements.

3.12.2.1.1.2 Pipe trenching across roadways and driveways shall be backfilled and compacted as soon as pipe is installed. Open trenches near traffic shall have the proper protective barricades, signage and traffic control personnel provided by the contractor.

3.12.2.1.1.3 No more than 200-linear feet of pipe shall remain uncovered during the installation procedure.

3.12.2.1.1.4 Protection of Trees: Trenching shall not take place within the root zone of trees with a trunk diameter of 6-inches or larger. The root zone shall be defined as either; the drip-line of the tree canopy or a circular zone extending outward from the base of the tree for a distance equivalent to ½-foot for every inch of trunk diameter (as measured 4 ½-feet above natural grade). Questionable exotic nuisance plant species shall be identified by proper authorities and classified as exempt from this protection. Some examples are Brazilian Pepper and Melaleuca.

3.12.2.1.1.5 Backfill, Bedding and Compaction: Backfilling and compaction shall be conducted in a manner to preclude subsequent settlement and shall provide adequate support for the surface treatment, pavement, pipelines, or structures to be placed thereon. See Detail 16.

3.12.2.1.1.6 Backfill material shall be common fill material, free from organic matter, muck or marl, and rocks exceeding 2 ½-inches in diameter. Common fill shall not contain broken concrete, masonry, rubble or other similar materials.

3.12.2.1.1.7 Backfilling and Compacting Procedures: The backfilling procedures outlined below shall be for pipe mains and related structures. The backfilling shall be done in three stages as follows:

First Stage: The contractor shall provide adequate suitable material fill to be compacted beneath the haunches of the pipe, using mechanical tampers. This compaction also applies to the bedding material placed in layers above the pipe.

Second stage: The contractor shall obtain a well-compacted bed and fill and compact along the sides of the pipe and then to a point of at least 1-foot above the top of the pipe. The width of backfill and compaction to be done under this second stage shall be the width of the portion of the trench having vertical sides, or when no portion of the trench has vertical sides, it shall be to a width at least equal to three times the outside diameter of the pipe. Fill material shall be placed in 12-inch compacted thickness layers.

Third stage: The remainder of the trench up to grade shall be backfilled with suitable material fill in layers not to exceed 1-foot in thickness and compacted.

3.12.2.1.1.8 Method of Compaction: The contractor shall adopt compaction methods which will produce the degree of compaction specified herein without damage to the new or existing facilities. The degree of compaction specified below shall be considered the minimum allowable.

3.12.2.1.1.9 Compaction Density: For paved and unpaved roadways and traffic areas, from right-of-way line to right-of-way line, including all structures and railroad crossings, shall be 98% of the maximum density as determined by American Association of State Highway and Transportation Officials (AASHTO) T-180 (ASTM D1557 - Modified Proctor) with a minus 3% tolerance. For outside of the right-of-way, but within dedicated utility maintenance easements, shall be 95% of the maximum density as determined by AASHTO T-180 (ASTM D1557 - Modified Proctor) with a minus 3% tolerance.

3.12.2.1.1.10 Compaction Test Requirements: Compaction test results shall be submitted for all work in ROW(s) and dedicated easements. Results of compaction tests shall meet minimum requirements prior to proceeding with the next stage of the work. One complete set of all test reports shall be submitted with the "As Builts" (Record Drawings) package to HCUD upon project completion.

3.12.2.1.1.10.1 The contractor shall employ a certified independent testing laboratory and shall pay for all required density tests.

3.12.2.1.1.10.2 The laboratory shall submit one copy of the certified test reports, after testing in each phase, to the EOR for approval.

3.12.2.1.1.10.3 HCUD shall require density tests to be made every 24-inches vertically, staggered every 500-feet horizontally. There shall be a minimum of one test between structures.

3.12.2.2 Horizontal Directional Drilling (HDD) Pipe Installation Option: See Detail 19 and Section 7.

3.12.2.3 Jack and Bore (J&B): See Detail 18 and Section 8.

3.12.3 Hydrostatic and Leakage Testing for PVC Pressure Mains:

3.12.3.1 All sections of the buried pipe main shall be completely backfilled before testing. All pressure and leakage testing procedures shall be done in the presence of the HCUD Inspector and the EOR or his designated representative.

3.12.3.2 PVC water mains shall be tested as a whole or in sections between valves. The mains shall be tested in accordance with Section 4, Hydrostatic Testing, AWWA C600-87 under an average hydrostatic pressure of not less than 150 PSI, using a 200 PSI gauge, for a minimum of 2-hours. The following Table 3-4 shall be used when pressure testing PVC potable water mains. ANSI/AWWA C600-87 is a copyrighted document. Contact American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235, or www.awwa.org.

Table 3-5

HYDROSTATIC TEST FORMULA FOR PVC PRESSURIZED WATERMAINS

L = [S X D X SQ.RT. of P ÷ 133,200] X 2 Hrs.

"L" = the allowable leakage (in gallons);
"S" = the length of pipe tested (in feet);
"D" = the nominal diameter of the pipe (in inches);
"P" = the required test pressure
SQ. RT. of P = square root of the required test pressure:
Potable Water Mains: SQ. RT. of P = square root of 150 = 12.25;
Reclaimed Water Mains: SQ. RT. of P = square root of 150 = 12.25;
Sewer Force Mains: SQ. RT. of P = square root of 125 = 11.18;

3.12.3.3 All pumps, gauges and measuring devices shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation, shall be approved by the HCUD Inspector. All water for testing and flushing shall be potable water provided by the Contractor, at the developer's expense, from a source approved by HCUD. The quantity of water used for testing, which shall be compared to the allowable loss quantity, shall be measured by pumping from a calibrated container, approved by the HCUD Inspector. All restrained sections of the buried main shall be completely backfilled before such sections are tested. All pressure and leakage testing shall be done in the presence of the HCUD Inspector and the EOR or his designated representative.

3.12.3.4 When leakage occurs in excess of the specified amount, defective pipe, pipe joints or other appurtenances causing the loss shall be located and repaired at the expense of the contractor. If the defective portions cannot be located, the contractor, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a pipe main within the allowable leakage limits upon retesting.

3.13 DISINFECTING WATER SYSTEMS: After completion of the water main pressure test, the contractor shall disinfect all pipe sections and fittings installed in the system. The contractor shall pay for and schedule with HCHD or a National Environmental Laboratory Accreditation Program (NELAP) authority for the applicable collection and bacteriological testing of samples from the project. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA C 651-99, "Disinfecting Water Mains," and all appropriate approval agencies. Care should be taken to provide disinfection to the entire system, with at least one set of samples shall be collected from every 1,200 feet of the new water main, plus one set from the end of the line and at least one set from each branch after which the lines shall be thoroughly flushed until water samples show a chlorine residual value equal to or less then the existing line. The disinfection process shall be completed and acceptable bacteriological samples test results received prior to HCUD accepting and placing the system into service.

3.14 TEMPORARY WATER SERVICE FOR CONSTRUCTION: Temporary water service for construction and testing shall be supplied by HCUD after the contractor has applied for and paid applicable fees for the service. In order to obtain water for construction one of the following shall be done (See Detail 44):

3.14.1 For service lines 2-inches and less (in certain instances 3 inch or less): HCUD shall attach a hydrant meter assembly, including a proper BPA, to a convenient FHA on the existing HCUD water distribution system. The contractor shall be billed monthly for the water usage as recorded by the in-line meter in the assembly. Temporary Construction meters shall be installed for no longer than 180 days. The meter will be removed after the time limit has expired unless authorization has been obtained from the Director of Utilities or the Assistant Director of Water and Sewer Operations. When the project shall be completed or at the request from the contactor, the temporary service shall be terminated and HCUD shall retrieve the temporary meter assembly.

3.14.2 For service lines greater than 2-inches: The Contractor shall install a Water Meter / Reduced Pressure Zone - Backflow Prevention Assembly at the connection point to any existing HCUD water system. The Assembly shall be removed after the newly constructed water system has passed the required HCUD inspections, pressure tests and bacteriological sample tests. The Assembly shall be supplied and installed at the developer's expense and upon removal shall remain the property of the developer. (Temporary blow-off assemblies shall be installed at the remaining connection points in order to properly flush and test the lines). The contractor shall be responsible for all bacteriological testing.

3.15 PIPELINE LOCATORS

3.15.1 Magnetic Locator Tape (MLT): Water mains shall have suitable MLT installed 18-

inches above the waterline. The tape shall be continuous between and secured to each inline flow control valve. Where other waterlines join the mainline, the MLT used to locate these lines shall be secured to the mainline. The MLT shall be a minimum of 5 ½-mil thick, 2-inches wide material, sandwiched between two layers of polyethylene, blue in color (denoting water), with black 1-inch warning letters stating “Caution – Waterline Buried Below.”

3.15.2 Electronic Locating Wire (ELW): Water mains shall have ELW. The ELW shall be Direct Burial #10 AWG Solid (.1019” diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 600# average tensile break load, 30 mil. high molecular weight-high density Blue polyethylene jacket complying with ASTM-D-1248, 30 volt rating. The ELW shall be Copperhead Industries, LLC (part # 1030B-HS) or HCUD approved equal. The ELW shall be securely installed on top of the pipe at the 12 o’clock position. The ELW shall be held in place with nylon cable ties (or equal means of attachment as approved by HCUD), at each end and 48-inches on center of the pipe sections. The ELW shall be of sufficient length as to be extendable to the surface at each valve box, allowing a current to be induced through the wire to detect the location of the pipeline. The ELW shall be brought to the surface inside each valve pad, through a length of 3-inch PVC pipe, with a threaded cap to protect the wire and terminate with a tinned waterproof wire connector. See Detail 23. The ELW on service lines shall be connected to the main ELW and end 24-inches past the curb stop valve with a tinned waterproof wire connector. The cost of the ELW shall be included with the line items for pipe. ELW “stub-out” access points shall not exceed 1000-feet intervals and shall be noted on the final “As Builts” (Record Drawings) set of plans. See Detail 21. Instances where the ELW requires splicing, the two ends of the ELW shall be joined together with a silicon injected wire nut of the proper size. After installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

3.16 FINAL ACCEPTANCE OF PROJECT BY HCUD (See Subparagraph 1.23): Final acceptance of the project water distribution system(s) and release of the performance bond by HCUD shall occur when the following conditions shall be met:

3.16.1 Pressure tests, preliminary and final inspections shall have been made and the results are presented to and acceptable to HCUD.

3.16.2 Improvements are found to be in accordance with the applicable regulations of HCUD, Hernando County, State and Federal regulatory agencies.

3.16.3 Acceptable bacteriological clearance result forms have been obtained from HCHD or a National Environmental Laboratory Accreditation Program (NELAP) authority and the EOR has certified the work is in compliance with project specifications. Water samples shall be collected by a certified lab technician (samples collected by the contractor are not acceptable). Threadless hose bibs shall be used for sampling per FAC 62-555 and removed prior to HCUD acceptance.

3.16.4 Documents requesting to place water system(s) into service shall have been obtained and acceptance awarded from the appropriate regulatory agencies.

3.16.5 HCUD receives from the EOR, two sets of signed, sealed and dated “blue-line” “As Builts” (Record Drawings) and for specific HCUD projects, an additional two complete sets of electronic “As Builts” (Record Drawings), prepared in “.dwg” format and “.pdf” format.

3.16.6 The contractor shall ensure that all above ground valves, piping and mechanical joint fittings are protected from the elements by painting the exposed valves and fittings with an approved oil based enamel paint. The paint used to protect potable water

system valves, piping and fittings shall be blue in color.

3.16.7 All applicable utility easements have been acquired, recorded and documents received by HCUD.

3.16.8 The HCUD contributed Asset Donation Form has been submitted and accepted by HCUD.

# SECTION 4

# SPECIFICATIONS FOR WASTEWATER COLLECTION/ TRANSMISSION SYSTEMS DESIGN AND INSTALLATION

THIS SECTION IS DIVIDED INTO THE FOLLOWING FOUR SUB-SECTIONS:

4A GENERAL WASTEWATER SPECIFICATIONS
4B GRAVITY SYSTEMS
4C FORCE MAIN SYSTEMS
4D PUMP STATIONS

# SUB-SECTION 4A

# GENERAL SPECIFICATIONS FOR WASTEWATER COLLECTION / TRANSMISSION SYSTEMS DESIGN AND INSTALLATION

# SUB-SECTION 4A: GENERAL SPECIFICATIONS FOR WASTEWATER COLLECTION / TRANSMISSION SYSTEMS DESIGN AND INSTALLATION CONTENTS

# SUB-SECTION 4A

# GENERAL SPECIFICATIONS FOR WASTEWATER COLLECTION/TRANSMISSION SYSTEMS DESIGN AND INSTALLATION

4A.1 GENERAL

4A.1.1 SPECIFICATIONS: The following specifications cover the design, review of plans and specifications, installation, inspection, testing, and acceptance of wastewater collection systems, wastewater pumping stations, wastewater transmission force mains, wastewater line extensions, and all appurtenant items which shall be owned and maintained by HCUD.

4A.1.2 DEVELOPMENT REVIEW COMMITTEE: All improvements and/or modifications that shall be made to the HCUD wastewater system shall be done in accordance with plans approved by the CCR of the HCBD and the SRC of the HCPD. Plans, materials and workmanship shall conform to the specifications that appear in this manual.

4A.1.3 PIPE COLOR GUIDE: For standardized identification purposes, all pipelines and appurtenances installed within Hernando County shall meet the Color Marking Standards for Underground Utilities, as outlined in Detail 13.

4A.1.4 It shall be the contractor's responsibility to locate existing utilities for connection.

4A.2 PLANS PREPARATION

4A.2.1 DESIGN: All sanitary wastewater collection systems, wastewater pumping stations and wastewater transmission force mains shall be designed by the EOR in accordance with the applicable regulations of the Florida Department of Environmental Protection (FDEP) and the standards established herein. See section 12 for check list sheets.

4A.2.2 LOCATION OF UTILITIES: No wastewater collection system or wastewater transmission system or any part thereof, which shall become the property and sole responsibility of the HCUD shall be designed or constructed outside of any public right-of-way and/or dedicated easement which may be used for said purpose. The recommended location for utility placement is shown on Detail 17.

4A.3 PLANS REVIEW AND "AS BUILTS" (RECORD DRAWINGS): See Section 3.3.

4A.4 SYSTEM DESIGN, CONSTRUCTION STANDARDS AND FLOW CRITERIA

4A.4.1 GENERAL REQUIREMENTS: The standards of this section are required by HCUD for design and installation of wastewater collection/transmission systems and facilities.

4A.4.2 SERVICE CONNECTION AVAILABILITY: Connection to HCUD water and sewer systems shall be determined by Article VI, Section 28-210, sub-section (E) of the latest revision of the Hernando County Code. See Detail 12.

4A.4.3 FLOW CRITERIA

4A.4.3.1 Residential Flow Demand: Flow demands for design shall be calculated based on full or projected ultimate development. The Average Daily Flow (ADF) for single family and master-metered residential developments shall be based on 200 gallons per day (GPD) per unit as determined in the latest HCUD Water Master Plan Study. A Peak factor of 3 shall be

applied for design purposes.

4A.4.3.2 Commercial Flow Demand: Flow demands for design shall be based on 200 GPD per Equivalent Residential Unit (ERU). A Peaking factor a 3 shall be applied for design purposes.

4A.4.4 DEPTH OF COVER: Cover depth as measured from finished grade to top of the pipeline shall be a minimum of 48-inches.

4A.4.5 GRAVITY SEWER COLLECTION SYSTEM: See subsection 4B.

4A.4.6 FORCE MAIN SYSTEMS: See subsection 4C.

4A.4.7 WASTEWATER PUMP STATIONS: See subsection 4D and Detail 37.

4A.5 SEPARATION AND CROSSINGS OF POTABLE WATER, RECLAIMED WATER AND SEWER LINES: See section 3.5 and Detail 17.

4A.6 CROSS-CONNECTION CONTROL: See section 3.6.

4A.7 PIPE HANDLING AND CUTTING, INSTALLATION OPTIONS AND PRESSURE TESTING PROCEDURES: See subsection 3.12.

4A.8 INTERCEPTOR STRUCTURES: ("Grease Traps") Grease, oil and Sand Interceptor Structures (traps) shall be installed for the proper handling of non-liquid wastes, such as grease, sand or other detrimental ingredients that could enter existing HCUD wastewater collection systems. Interceptor shop drawings shall be approved by HCUD and shall be designed for easy accessibility for cleaning and inspection. The developer (owner) shall incur all costs to include the purchase, installation and regular maintenance procedures of the interceptor. Inspections shall be performed by HCUD personnel after installation and as future flow problems occur. See Hernando County ordinance for additional requirements.

4A.9 HCUD vs Developer responsibly for any new non-single family developments exceeding four units per development: all offsite infrastructure will be owned and maintained by HCUD. All onsite wastewater infrastructure including collection/transmission systems and pump stations will be owned and maintained privately.

4A.10 DUMPSTER DRAINS: Dumpster pad drains shall not be connected to the wastewater collection system. In rare instances where connection is required, the dumpster shall be housed in a structure as to ensure rain water does not enter the dumpster. The dumpster drain shall lead to an interceptor structure (grease trap) where the liquid will be separated from the non-liquid waste prior to entering the wastewater collection system.

4A.11 FINAL ACCEPTANCE BY HCUD: (See sub-paragraph 1.23). Final acceptance of the completed gravity sewer collection system, sewer force main transmission systems, and/or wastewater pump station facilities and release of the performance bond shall be recommended by HCUD when the following conditions are met:

4A.11.1 Pressure tests, preliminary and final inspections shall have been made and the results are acceptable to HCUD.

4A.11.2 Improvements are found to be in accordance with the applicable regulations of HCUD, Hernando County, State and Federal regulatory agencies.

4A.11.3 Documents to place sewer system(s) in service are issued to the EOR from the appropriate regulatory agencies.

4A.11.4 Dedicated Easements for ingress and egress to the lift station and for the lift station shall be

granted and recorded before the lift station shall be accepted by the HCUD for operation and maintenance.

4A.11.5 The contractor shall ensure that all above ground valves, piping and mechanical joint fittings are protected from the elements by painting the exposed valves and fittings with an approved oil based enamel paint. The paint used to protect sewer force main valves, piping and fittings shall be brown in color.

4A.11.6 HCUD receives from the EOR, two sets of signed, sealed and dated “blue-line” “As Builts” (Record Drawings) and for specific HCUD projects, an additional two complete sets of electronic “As Builts” (Record Drawings), prepared in the “.dwg” format and “.pdf” format.

# SUB-SECTION 4B

# GRAVITY SYSTEMS

# SUB-SECTION 4B: GRAVITY SYSTEMS

# 4B GRAVITY SEWER COLLECTION SYSTEMS

4B.1 GENERAL: Proposed gravity sewer mains shall be sized to accommodate peak flow when flowing ½ full (see sub-section 4A), but never less than 8-inches in diameter. Gravity sewer mains and laterals within county rights-of-way or dedicated easements shall have 48-inches of cover, unless otherwise approved by HCUD.

4B.2 PVC GRAVITY SEWER PIPE AND FITTINGS

4B.2.1 Pipe Materials: The following Table 4B-1 lists the allowable pipe materials for various sizes of wastewater gravity main lines:

TABLE 4B-1

GRAVITY MAIN PIPE OPTIONS

| Diameter | Material | General Specs. |
|---|---|---|
| 4” to 18” | PVC | ASTM D3034, DR 26 |
| 8” to 18” | DIP | ANSI/AWWA C151/A 21, CL 50 |

4B.2.2 Alternative piping materials shall be considered by HCUD if proper test documentation, performed by recognized pipe industry authorities is submitted prior to commencement of design. Tests on alternative piping materials should be at least as rigorous as testing conducted by ASTM, AWWA or ANSI. A letter of acceptance shall be issued by HCUD prior to commencement of design incorporating any alternative pipe material.

4B.2.3 PVC pipe and fittings used in the gravity system shall be green in color and meet requirements of ASTM D3034. Provisions shall be made for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral wall section with solid cross-section elastomeric gasket ring, factory assembled and securely locked in place to prevent displacement and meeting requirements of ASTM D3212. Standard minimum laying lengths for gravity sewer mains shall be 13-feet ±1-inch. Pipe shall conform to UNI-Bell Plastic Pipe Association Standard UNI-B-4. Jointing of PVC pipe using solvent cementing is not acceptable by HCUD.

4B.2.4 PVC gravity sewer pipe and fittings shall be installed with straight alignment between manholes, in accordance with the manufacturer’s requirements and ASTM D2321. Where PVC enters a manhole, a suitable manhole coupling or flexible manhole connector designed to produce a positive watertight connection shall be installed in the wall section of the manhole equal to A-Lok manufactured by A-Lok Products, Inc., or HCUD approved equal.

4B.2.5 Gravity sewer mains shall be designed with the minimum grades as shown in Table 4B-2:

TABLE 4B-2

MINIMUM GRADIENTS FOR GRAVITY MAINS

8" Gravity Sewer Mains..... 0.40%
10" Gravity Sewer Mains..... 0.28%
12" Gravity Sewer Mains..... 0.22%

4B.2.6 Gravity sewer mains with diameters greater than 12-inches shall be designed to have mean velocities of not less than 2-Feet per Second (FPS) when flowing half full. For velocity determinations use Manning's Formula where "N" value shall be 0.010 for PVC pipe.

4B.2.7 Each length of PVC pipe shall be marked with the following information: size, manufacturer, PVC gravity pipe, ASTM designation, manufacturer's code, cell classification and approval seal of the National Sanitation Foundation (NSF) that will remain legible during normal handling, storage, and installation.

4B.2.8 Conflict Structures: Where existing utility pipelines shall conflict proposed gravity sewer lines, a pipeline conflict structure installation shall be approved by HCUD on an individual basis. See Detail 20.

4B.3 GRAVITY SEWER LATERALS: See Detail 28.

4B.3.1 Proposed gravity sewer laterals shall be 6-inches in diameter from the gravity sewer main line up to the customer connection point at the right-of-way/property line. The terminal end of the sewer lateral at the customer property line shall be no less than 36-inches and no deeper than 48-inches from final grade. At the point where a proposed 6-inch sewer service line shall connect to an existing 4-inch sewer service lateral, HCUD shall require the owner to install a shallow pre-cast “Collector Manhole” in order to facilitate the additional flow volume from the customer. The purpose of the manhole is to furnish a reservoir, which shall allow the restricted sewer lateral additional time to drain to the sewer main line, preventing a back-flow up to the customer. The “Collector Manhole” base shall have a similar flow trough installed as shown in Detail 31.

4B.3.2 Installation of standard single or double 6-inch laterals shall be PVC. Each lateral shall be supplied with a WYE fitting and $^{1}/_{8}$-bend at the main and laid at a minimum slope of $^{1}/_{8}$-inch per foot to the property line where a “clean-out” shall be installed. The depth of the lateral invert at the property line shall be a minimum of 3-feet and a maximum of 4-feet below design grade. Open ends of laterals shall be securely sealed with appropriate plugs as recommended by the pipe manufacturer, and shall be marked with pressure treated wood 2”x 4”x 96” stake with top 6-inches painted green. See Detail 28.

4B.3.3 Sewer service connections shall be installed on existing gravity sewer lines upon approval of HCUD. See Detail 28 for connection fittings.

4B.3.4 Wherever possible (typically within 50-feet of a manhole), laterals are to be connected directly into the manhole.

4B.3.5 Gravity mains and manholes shall be placed in such a manor as to not allow sewer lateral services (installed within right-of-way or easements) to exceed 50 feet in length.

4B.4 MAGNETIC LOCATOR TAPE (MLT): Sewer mains shall have MLT installed 18-inches above the pipeline. The tape shall be continuous between and secured to each inline flow control valve. Where other pipelines join the mainline, the MLT used to locate these lines shall be secured to the mainline tape. The MLT shall be a minimum of 5 ½-mil thick, 2-inch wide material, sandwiched between 2-layers of polyethylene, green in color (denoting sewer), with black 1-inch high warning letters stating “Caution – Gravity Sewer Buried Below”.

4B.5 MANHOLES: See Detail 32.

4B.5.1 General

4B.5.1.1 Manholes shall be installed at the end of each gravity sewer line, at all changes in pipe, size or alignment and at all gravity main collection intersections. The standard distance between manholes shall not be greater than 350-feet, unless prior approval is obtained from HCUD.

4B.5.1.2 The minimum inside diameter of manholes shall be 48-inches, with a minimum access inside diameter of 23 ¾-inches. Materials of construction and installation shall be in accordance with the applicable provisions of these specifications.

4B.5.1.3 Manholes shall be minimum 48-inches inside diameter where incoming lines are 16-inches or less in diameter, or 60-inches minimum inside diameter where incoming lines are larger than 16-inches diameter.

4B.5.1.4 All manholes shall have inflow-protector accessories (without vents) installed between the ring and cover.

4B.5.1.5 Manhole depths are not to exceed 12-feet unless approved in advance by HCUD. Manholes greater than 30-feet in depth are not permitted.

4B.5.1.6 All manholes 12-feet and greater shall require either an IET coating installed by Paints and Coatings Inc. or be a monolithic fiberglass reinforced plastic (RFP) structure. FRP to be supplied by Mike Thompson Sales, Inc. Seffner, Florida, representing LFM Fiberglass Specialists, Giddings, Texas or approved equal.

4B.5.1.7 All manholes 20-feet and greater shall be a monolithic fiberglass reinforced plastic (RFP) structure. FRP to be supplied by Mike Thompson Sales, Inc. Seffner, Florida, representing LFM Fiberglass Specialists, Giddings, Texas or approved equal.

4B.5.1.8 In certain instances where the water table is exceptionally high, HCUD shall determine if the manhole shall be required to be a monolithic fiberglass reinforced plastic structure as defined in subparagraph 4B.5.2.

4B.5.2 Manhole Options: Structures approved by HCUD shall be either a monolithically fabricated Fiberglass Reinforced Plastic (FRP) single barrel structure or a pre-cast, reinforced concrete sectional structure with special protective interior polymer coating.

4B.5.2.1 The Fiberglass Reinforced Plastic (FRP) Manhole Structure Option

4B.5.2.1.1 Manhole shall consist of a single structure unit made of FRP, and shall be monolithically constructed with an integral top and bottom. The minimum shell thickness shall be ¾ -inch. ASTM D3753 rated for H-20 load. FRP to be supplied by Mike Thompson Sales, Inc. Seffner, Florida, representing LFM Fiberglass Specialists, Giddings, Texas or approved equal.

4B.5.2.1.2 All pipe connections, hatch openings, anti-floatation bottom and lifting rings shall be installed during the FRP construction process. All manhole wall penetrations shall be either Kor-N-Seal Boots, sleeves for mechanical link seals or PVC pipe stub-outs.

4B.5.2.1.3 The exterior wall surface shall be relatively smooth, eliminating fiber show, free of blisters larger than ½-inch in diameter and finished with a gray color gel coat coating.

4B.5.2.1.4 The interior wall surface shall be resin rich, smooth texture, free of fiber show, free of blisters larger than ½-inch in diameter, and wrinkles $^{1}/_{8}$-inch or larger in depth. Surface pits are acceptable if no larger than ¾-inch in diameter and less than $^{1}/_{8}$-inch in depth.

4B.5.2.1.4.1 The FRP manhole surfaces shall be free of exposed fibers, resin runs, dry resin void areas, laminate separations, large blisters, cracks caused by carelessness, unsafe sharp projections, pits, or air pockets.

4B.5.2.1.4.2 The FRP manhole shall be constructed with an integral reinforced fiberglass top, containing a round 24-inch opening, designed to accommodate the standard manhole cover assembly.

4B.5.2.1.4.3 The FRP manhole shall be constructed with an integral reinforced solid, minimum $^{3}/_{8}$-inch thick, fiberglass bottom containing sufficient reinforced stiffening ribs. The bottom shall have a 3-inch (minimum) wide anti-flotation ring or collar.

4B.5.2.1.4.4 The contractor shall furnish FRP manhole manufacturer Shop Drawings to the EOR and HCUD for approval.

4B.5.2.1.4.5 The contractor shall coordinate with the manufacturer to have a representative onsite during installation of the FRP manhole.

4B.5.2.2 The Pre-cast, Reinforced Concrete Manhole Structure Option

4B.5.2.2.1 Pre-cast Manhole structures shall consist of a base section, vertical barrel sections, concentric top section, concrete adjustment rings and a cast iron frame, inflow- protector and cover. The structure components shall be cylindrical, composed of pre-cast reinforced concrete sections that conform to the requirements of ASTM C478, minimum 4,000 PSI strength concrete, using Type II Portland Cement. Steps and ladders shall not be installed inside manholes. Minimum wall thickness shall be 5-inches. See Detail 32.

4B.5.2.2.2. The base section shall be pre-cast monolithically with the bottom barrel section and shall be installed on a leveling course of crushed stone. Subsequent sections shall be placed in accordance with manufacturer's requirements for water tightness and vertical alignment. Pre-cast holes or blank outs shall be provided in each section to conform with entry pipe or conduit sizes, location, and elevations as shown on the drawings.

4B.5.2.2.3 Section joints shall receive an application for recommended manufactures sealant, Asphalt Mastic, O-Ring, or Gasket with seal wrap on the exterior. A combination of sealants may be required for wet areas as specified by an HCUD inspector. Lift holes shall be plugged with waterproof non-shrink grout.

4B.5.2.2.4 The manhole interior and all exposed concrete shall be coated with a special coal tar epoxy finish which is resistant to the chemical corrosive environment, normally found in wastewater transmission systems. Coating shall be Koppers 3 M or equal. HCUD shall not accept fiberglass linings for pre-cast concrete manhole structures.

4B.5.2.2.5 Special “inside drop” manholes shall be provided for gravity sewer mains entering at a vertical drop distance of 24-inches or more above the outgoing channel invert. In cases where the vertical distance is less than 24-inches, a drop pipe shall not be required, but a channel shall be constructed to guide the flow into the outgoing channel. See Detail 32.

4B.5.2.2.6 Flexible manhole connector material shall be used to join new pipes and/or laterals to manholes and shall consist of a connector compounded from a blend material meeting the requirement of ASTM C923 “Resilient Connectors Between Concrete Manhole Structures and Pipes”. The connectors shall be integrally attached to cast into the manhole and shall be equivalent to “A-Lok” as manufactured by A-Lok Products, Inc., or as approved. Connector components shall meet the requirements of ASTM C923 and equivalent to “A-Lok XP” as manufactured by A-Lok Products, Inc., “Kor-N-Seal” as manufactured by NPC, or HCUD approved equal.

4B.5.2.2.7 Flow channel(s) in manhole base shall be formed of 4,000 PSI concrete, Type II Portland cement. Cut off pipe excess at inside face of the manhole and construct flow channel(s) to invert of the pipe entering the manholes. Changes in direction of the gravity main and entering branch(es) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipelines. See Detail 31.

4B.6 MANHOLE FRAMES AND COVERS: See Detail 33.

4B.6.1 Manhole frames and covers, for structures and for manholes, shall be heavy duty cast iron, designed to withstand traffic loads (AASHTO specifications HS20-44) and meet the requirements of ASTM A-48. Frames embedded in top slabs of structures or frames for structures with riser stacks shall be pressure-tight base flange type. Covers shall be Style Number 170, Type CE, made by U.S. Foundry or HCUD approved equal.

4B.6.2 Setting Manhole Frames: Manhole frames and covers shall be set to conform accurately to the finished pavement or grade surface. Frames on manhole cones shall be set concentric with the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flanges of the frame shall be completely filled and made watertight. A ring of mortar at least 1-inch thick and pitched to shed water away from the frame shall be placed around the outside of the bottom flange. Mortar shall extend up to the outer edge of the masonry and shall be finished smooth and flush with the top of the flange.

4B.6.3 The adjustment section for new construction shall be a minimum of 3-inches and shall not exceed 18-inches in height. Adjusting rings for lifting existing manhole covers to new grade shall be pre-cast concrete. Brick adjustments are not acceptable to HCUD. See Detail 32.

4B.6.4 The words “HERNANDO COUNTY”, “SEWER”, contents, and YEAR of casting shall be cast on the top of all covers. All sanitary sewer manholes not owned or maintained by HCUD must only have “Sanitary Sewer” cast on the lid. No reference to HCUD or Hernando County will be accepted.

## 4B.7 GRAVITY SEWER MAIN TESTING

4B.7.1 All pipelines shall be cleaned and tested (visually and by video inspection) upon completion of installation. HCUD shall designate the locations of tests, extent of the system to be tested, methods of testing for leakage, alignment and deflection and the requirements for recording test results. Sections of the gravity main which fail to pass the tests shall have defects located and repaired or replaced and be retested until test results are within specified allowances.

4B.7.2 Lamp Test: Lamp testing shall be performed by one of the following methods as specified by the HCUD inspector.

4B.7.2.1 Video Lamp Test: All gravity sewer lines shall be lamped by video camera and with a high intensity light source to verify accuracy of alignment, fullness of diameter and freedom from debris and obstruction. The height of the high intensity light source shall be varied during recording. The full diameter of the pipe should be visible when video recorded between consecutive manholes.

4B.7.2.2 Visual Lamp Test: All gravity sewer lines shall be visually inspected using a mirror and high intensity light source to verify accuracy of alignment, fullness of diameter and freedom from debris and obstruction. The full diameter of the pipe should be visible when viewed between consecutive manholes.

4B.7.3 Video Inspection:

4B.7.3.1 HCUD requires completed wastewater gravity mains to be video inspected prior to final acceptance. This inspection shall be performed by the contractor and monitored by the HCUD inspector. Copies of video reports and DVD’s or CD’s (No VHS tapes accepted) of each test shall be supplied to the HCUD by the contractor or developer.

4B.7.3.2 Procedures for Video Inspection for Sanitary Sewer Mains

4B.7.3.2.1 All sanitary sewer mains shall be televised utilizing a 360-degree pan and tilt color camera. The camera shall be of the self-propelled tractor type, with a pool depth measuring device mounted to the front, capable of being read as the tractor moves and capable of accurately measuring depth of standing water up to and including 1-inch. The camera shall produce a video with an audio track to narrate each taped test run. A linear footage reload shall be visual as the camera progresses through the test run. A pull type camera may be used only as a system backup.

4B.7.3.2.2 All sanitary sewer mains shall be televised in an upstream direction wherever possible.

4B.7.3.2.3 Inverts shall be constructed in manholes prior to televising.

4B.7.3.2.4 Preliminary video inspections for the contractor's own use may be done at any time; however, the HCUD inspector shall be present during all video inspections for project final acceptance and the procedures listed herein shall be followed.

4B.7.3.2.5 At least 24-hours prior to, and no more than 48-hours prior to televising, sufficient water shall be run through each section of main until water runs through each downstream manhole. No lines shall be televised which are dry or that enough water has not run through to reach the end of each section.

4B.7.3.2.6 Any pipeline dips in the mains found shall be reviewed and HCUD shall decide to accept the main as is, or to have the dip removed. Pipelines with depressions of 1-inch or greater in depth shall not be acceptable. Unacceptable pipelines shall be removed and replaced.

4B.7.3.2.7 The contractor shall be entitled to a second inspection on lines requiring repairs. Second inspections for dirty lines and additional inspections for repairs after the second free inspection shall be billed for time factor by HCUD for each section of main video inspected.

4B.7.3.2.8 The HCUD inspector shall initial each original DVD or CD as completed and that tape shall be submitted to the HCUD. Copies of the original DVD shall not be accepted. The original DVD and the televised reports shall be submitted to HCUD prior to the inspector signing off on the project.

4B.7.4 Air Test: Gravity sewer main testing for line and joint leakage shall be determined by conducting a Low Pressure Air Test, ASTM C828 Standard. Each end of a gravity sewer line shall be plugged and air introduced until a gauge pressure reading of 3.5 PSI is achieved. The elapsed time for a pressure drop of 1 PSI (from 3.5 to 2.5 PSI) shall be recorded and compared to the acceptable values in the "Low Pressure Air Test Table" (See Detail 27) Established elapsed time values shall be the determining factor for accepting the installed pipe. A pressure surge control device ("Snubber") shall connect a liquid filled, 20 PSI rated (in 1 PSI increments) pressure gauge to the system to be tested. The gauge shall read "zero" under no pressure situations and installed at an angle to facilitate easy recording.

# SUB-SECTION 4C

# FORCE MAIN SYSTEMS

# SUB-SECTION 4C: FORCE MAIN SYSTEMS

# 4C SEWAGE FORCE MAIN SYSTEMS

## 4C.1 GENERAL

4C.1.1 All wastewater Force Mains (FM) shall be designed to accommodate full development peak flow from all connected pumping stations within the designated stations service area. (See flow criteria set forth in subsection 4A). Each FM system should be capable of transporting the peak flow from each pump station operating simultaneously without producing excessive pressure, i.e., not to exceed 100-feet Total Dynamic Head (TDH) anywhere in the system unless approved by HCUD.

4C.1.2 The Developer shall install the largest size FM that shall maintain a minimum velocity of 2-FPS. The minimum size FM constructed within Hernando County road Rights-of-Way or dedicated easements shall not be less than 4-inches in diameter, unless specifically approved by the HCUD.

4C.1.3 Pipe Materials: The following Table 4C-1 lists the allowable pipe materials for various sizes of wastewater FM pipe:

TABLE 4C-1

FORCE MAIN PIPE OPTIONS

| Material | Diameter | General Specification |
|---|---|---|
| DIP | 4" to 24" | ANSI/AWWA C151/A 21, CL 50 |
| PVC | 4" to 12" | AWWA C900, Class 150, DR 18 |
| | 14” to 20” | AWWA C905, Rated 165, DR 25 |
| Horizontal Directional Drill (HDD) | | SEE SECTION 7 |

4C.1.4 Alternative piping materials and sizes will be considered if proper testing documentation, performed by recognized piping industry authorities is submitted. Tests on alternative piping materials should be at least as rigorous as testing conducted by ASTM, AWWA and ANSI. A Letter of Approval shall be issued by HCUD prior to commencement of design, of any alternative material.

4C.1.5 DEPTH OF COVER: Cover depth is measured from finished grade to the top of the pipeline; it shall be a minimum of 48-inches to a maximum of 60-inches for sewer force mains, unless authorized by HCUD. There will be exceptions made for conflicts that the pipeline has to cross; Horizontal Directional Drilling (HDD) does not apply.

## 4C.2 POLYVINYL CHLORIDE (PVC) SEWAGE FORCE MAIN (FM) PIPE

4C.2.1 Pipe color shall be green for force mains. At the discretion of HCUD white PVC C-900 spirally wrapped by green tape may be substituted.

4C.2.2 PVC pipe 4-inches to 12-inches in diameter shall conform to the requirements of AWWA C900. PVC resin compound shall conform to the requirements of ASTM D1784. The pipe shall conform to these standards: dimension ratio (DR) of 18, working pressure of 150 PSI, and laying length of 20-feet.

4C.2.3 PVC pipe 14-inches and up in diameter shall conform to the requirements of AWWA C905. PVC resin compound shall conform to the requirements of ASTM D1784. The pipe shall conform to these standards: DR 18, working pressure of 165 PSI, and laying length of 20-feet.

4C.2.4 Fittings for PVC pipe 4-inches through 20-inches shall be ductile iron fittings. Ductile iron fittings shall be mechanical joint with a minimum pressure rating of 250 PSI, shall have an interior coating of Protecto 401 or HCUD approved equal, and shall conform to the requirements of ANSI/AWWA Standard C110/A21.10 and A21.4.

4C.2.5 JOINTS: PVC pipe 4-inches through 20-inches shall have provisions for expansion and contraction provided in the joints. All joints shall be designed for push-on makeup connection. A push-on joint may be an elastomeric gasket bell end coupling manufactured as an integral part of the pipe barrel consisting of a thickened section with an expanded bell with a groove to retain a rubber sealing ring of uniform cross-section similar and equal to Johns-Manville Ring-Tite and Ethyl Bell Ring.

4C.2.6 Restrained joints for PVC pipe shall be Uni-Flange Series 1350 for PVC-PVC joints and Uni-Flange Series 1300 or EBBA PV2000 fittings for PVC-DIP joints, or HCUD approved equal. See Detail 15. The length of pipe to be restrained shall be noted on the drawings. Shop drawings from the manufacturer shall be submitted to and approved by the EOR and HCUD prior to construction. HCUD may require pre-cast 500 pound concrete Thrust Blocks in addition to restrained joints. (See Detail 14)

4C.3 DUCTILE IRON SEWAGE FORCE MAIN (FM) PIPE

4C.3.1 Ductile Iron Pipe (DIP) to be furnished in 20-foot lengths or as specified by HCUD, and shall be spirally wrapped by green tape with adhesive backing.

4C.3.2 DIP shall conform to the requirements of ANSI A21.51, minimum Class 50, unless otherwise specified by the EOR. The weight and class designation shall be painted in white paint on the exterior surface of each pipe section.

4C.3.3 Coatings: Pipe interior shall have protective ceramic epoxy lining of Protecto 401 by Vulcan Paintings. Pipe shall have an exterior bituminous coating in accordance with ANSI A21.51.

4C.3.4 Joints: Pipe joints for DIP shall be mechanical or push-on joints. Manufacturer code or serial number shall be provided on the bell of each pipe joint.

4C.3.4.1 MECHANICAL JOINTS: Mechanical joints consisting of pipe bell socket, gland, gasket, bolts and nuts shall conform to ANSI Standard A21.11. Bolts shall be high strength low alloy steel, such as "Corten," or "U.S. Alloy," T-head type having hexagonal nuts. Bolts and nuts shall be machined true and nuts shall be tapped at right angles to a smooth bearing surface.

4C.3.4.2 PUSH-ON JOINTS: Single seal gasket push-on type joints shall conform to the requirements of ANSI A21.11 and shall be U.S. Pipe "Tyton," American Cast Iron Pipe Company "Fastite," CLOW Corporation "Super Bell Tite," or HCUD approved equal.

4C.3.5 RESTRAINED JOINTS: Restrained joints shall be installed where force main pipe alignment changes direction or elevation. Restrained joints shall not be of the type that requires field welding or grooves cut into the pipe barrel for restraint. The number of pipe sections or linear pipe footage to be restrained shall be determined and noted on the drawings by the EOR and approved by HCUD. Shop drawings from the manufacture shall be submitted to and approved by the EOR and HCUD prior to construction. The restraining joints for mechanical joint fittings and valves shall be ROMAC Industries Grip Ring, EBAA Iron MEGALUG, All Grip or HCUD approved equal. See Detail 15.

4C.3.6 GASKETS: Pipe and fitting gaskets, conforming to ANSI A21.11, shall be made of viton (fluorocarbon elastomer), EPDM (Ethylene Propylene Diene Monomer) or SBR (Styrene-Butadiene Rubber).

4C.3.7 FITTINGS: All DIP fittings shall be mechanical joint, shall meet the requirements of ANSI/AWWA C110/A21.10, shall have a pressure rating of 250 PSI, and shall be full-radius fittings. All fittings shall be coated and lined as specified above for ductile iron pipe.

4C.4 PIPELINE LOCATORS

4C.4.1 Magnetic Locator Tape (MLT): Force mains shall have MLT installed 18-inches above the FM line. The tape shall be continuous between and secured to each inline flow control valve. Where FM lines join the mainline, the MLT used to locate these lines shall be secured to the mainline. The MLT shall be a minimum of 5 ½ mil thick, 2-inches wide material, sandwiched between two layers of polyethylene, green in color (denoting force main), with black 1-inch warning letters stating “Caution – Sewer Force Main Buried Below”

4C.4.2 Electronic Locating Wire (ELW): Force mains shall have ELW. The ELW shall be Direct Burial #10 AWG Solid (.1019” diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 600# average tensile break load, 30 mil. high molecular weight-high density Green polyethylene jacket complying with ASTM-D-1248, 30 volt rating. The ELW shall be Copperhead Industries, LLC (part # 1030G-HS) or HCUD approved equal. The ELW shall be securely installed on top of the pipe at the 12 o’clock position. The ELW shall be held in place with nylon cable ties (or equal means of attachment as approved by HCUD), at each end and 48-inches on center of the pipe sections. The ELW shall be of sufficient length as to be extendable to the surface at each valve box, allowing a current to be induced through the wire to detect the location of the pipeline. The ELW shall be brought to the surface inside each valve pad, through a length of 3-inch PVC pipe, with a threaded cap to protect the wire and terminate with a tinned waterproof wire connector. See Detail 23. The cost of the ELW shall be included with the line items for pipe. ELW “stub-out” access points shall not exceed 1000-feet intervals and shall be noted on the final “As Builts” (Record Drawings) set of plans. See Detail 21. Instances where the ELW requires splicing, the two ends of the ELW shall be joined together with a silicon injected wire nut of the proper size.

4C.5 VALVES AND APPURTANCES: All valves shall be the manufacturer's standard design for the service intended and shall bear the maker's name and pressure rating cast on the body, also the valve type, size, flow direction arrow, if applicable. Valves shall open to left (counter clockwise-CCW) with an arrow cast in the metal of operating hand wheel or nuts indicating the direction of opening.

4C.5.1 Gate Valves (GV): Underground gate valves, 4-inch to 20-inch, shall be of the resilient seat type meeting the requirements of AWWA C500 and C509. These GVs shall have non-rising stems, shall be furnished with 2-inch square AWWA operating nuts, and shall open when the nut is turned counterclockwise. GVs shall have mechanical joint ends and shall be furnished complete with joint accessories. Exposed or above-ground GVs shall be outside stem and yoke (OS&Y) flanged joint type. GVs shall be AVK, Kennedy KS-RW AWWA C515, American Flow Control Series 2500, or HCUD approved equal. See Detail 23.

4C.5.2 Tapping Valves (TV): TVs shall be mechanical joint outlet, non-rising stem, resilient seat gate valves meeting the applicable requirements of AWWA C509. TVs shall be specifically designed for pressure tapping with sufficient seat opening to allow full diameter taps to be made. TVs shall be manufactured with an integral tapping flange having a raised lip design.

4C.5.3 Tapping Sleeves: Tapping Sleeves for all force main connections shall be full Circle, Stainless Steel tapping sleeves and rated for 150 PSI working pressure in accordance with AWWA C110. TS shall have an outlet flange per ANSI B16.1, 125 lb. standard. The contractor shall confirm the outside diameter of the existing main before ordering the TS.

4C.5.4 Combination Air-Vacuum Release Valve Assembly (ARV): Combination Air Valves shall conform to the following: Automatic Air and Vacuum Valves shall be infinitely variable automatic air and vacuum valves designed to allow escape of air for an operating range starting from pressure range: 0,0 through 250 psi ( 0 – 17,2 bar ), close watertight when liquid enters the valve even when the fluid is rising without pressure ( no minimum operating pressure required), allow air to enter in the event of a vacuum, and soft working behavior as water hammer inhibition realized by roll-on diaphragm and spring mechanism. When the sealing device of the valve is closed an air cushion is trapped between the fluid and sealing area, a mud deflector made of PE allows no contact between fluid and sealing area. The spindle spring shall be stainless steel, grade 316Ti, the body shall be steel epoxy powder coated (min. thickness of coating: 10 mil) designed to facilitate disassembly for cleaning and maintenance. The float shall be Delrin (Polyoximethylene, POM); the valve seat and all working parts shall be of corrosion-resistant materials. Valves shall be equipped with the necessary attachments, including ball valve, to permit back flushing after installation without dismantling the valve. Valves shall be recommended by the manufacturer for wastewater service. The ARV shall be a H-TEC Model # 986 manufactured by Hawle or HCUD approved equal.

4C.5.4.1 Inline ARV Manhole Option (Detail 24A): ARV(s) shall be located at high elevation points on the pipeline and operate automatically. The ARV shall have a 2-inch inlet, 316 SS ball valve, SS bands, and epoxy coated saddle (Ford service saddle, FC 202 or HCUD approved equal) and 316 SS pipe and fittings. ARV(s), fittings, and piping shall be rated for a minimum working pressure of 250 PSI. The ARV shall be installed in a shallow manhole. The words “HERNANDO COUNTY”, “ARV” and YEAR of casting shall be cast on the top of all the manhole covers. Rings shall be Style Number 667 and covers shall be Type CE with non-penetrating pick holes, made by U.S. Foundry or HCUD approved equal. Manhole sections and top shall be pre-cast 4000 psi concrete, ASTM C-478 and C-76; base section shall be monolithically cast. Construction plans and “As Builts” (Record Drawings) shall include ARV stationing locations on the plan and profile view sheets.

4C.5.4.2 Offset ARV Manhole Option (Detail 24B): This option shall only be used in certain situations were the Inline ARV Manhole Option is not constructible due to elevations or limited ROW, etc. The ARV shall have a HCUD spec MJ tee (coated with Protecto 401) installed at high elevation points on the pipeline. The branch side of the tee shall be installed facing up with a MJ plug with a two (2) inch threaded hole, 2” brass corporation stop, 2” SS PET insert, and 2” DR9 PET (length will vary). A 2” CTS X FIP coupling shall be used to transition from the 2” poly tubing to the 2” stainless steel pipe before it enters the manhole. The ARV shall have a 2-inch inlet, 316 SS ball valve, 316 SS pipe and fittings. ARV(s), fittings, and piping shall be rated for a minimum working pressure of 250 PSI. The ARV shall be installed in a shallow manhole. The words “HERNANDO COUNTY”, “ARV” and YEAR of casting shall be cast on the top of all the manhole covers. Rings shall be Style Number 667 and covers shall be Type CE with non-penetrating pick holes, made by U.S. Foundry or HCUD approved equal. Manhole sections and top shall be pre-cast 4000 psi concrete, ASTM C-478 and C-76; base section shall be monolithically cast. Construction plans and “As Builts” (Record Drawings) shall include ARV stationing locations on the plan and profile view sheets.

4C.5.5 Valve Boxes: See Detail 23.

4C.5.5.1 Valve box for valve operating nut 36 inches or less to finished grade: Valve boxes for all valves installed below ground shall be made of cast iron. Valve boxes shall be adjustable to fit the depth of earth cover over the valve and shall be designed so as to prevent the transmission of surface loads directly to the valve or piping. Valve boxes shall have a minimum interior diameter of 5 ¼ - inches. Valve box extension shall be installed to reserve a minimum of 50% of the adjustment for a future extension. Valve boxes shall be supplied by Tyler MFG., two pieces, with cast iron lid, No. 461-S for short applications or 562-S for long applications. No ductile iron or PVC pipe allowed as part of the finished valve box assembly.

4C.5.5.2 Valve box for valve operating nut 36 inches or greater to finished grade: Pentek 5¼" ROADWAY VALVE BOX: Valve Box shall be injection molded and commercially manufactured utilizing a proprietary PENTEK® compound known as SUPERFLEXON per ASTM D-2853-70, Class 1212. Material shall be a rigid combination of polyolefin with fibrous inorganic component reinforcing and U.V. stabilizer additives to assure resistance to material degradation from ultraviolet light. The entire upper section of the box shall be made of a POLYIRON® magnetically locatable material. The use of magnets will not be permitted. Box shall have a cast iron ring and a cast iron 4-pronged traffic lid. Cast iron shall have a minimum weight of 18 lbs. and must conform to ASTM-A-48, Class 20 specifications. Box shall be a Buffalo type (screw) and have a shaft diameter of 5¼". The bottom part of the box shall have a bell measuring 7⅝" high by 10 1/16" wide and have a knock out as standard equipment.

4C.5.5.3 The cast iron cover of the valve box shall be marked “SEWER”, painted green, and shall be secured with a concrete pad to prevent tipping or moving.

4C.5.6 Concrete Valve Pad and Brass Tag: Valve boxes located outside of paved areas shall be cast in a 24-inch x 24-inch x 6-inch thick 3000 PSI concrete slab. See Detail 23 for Standard Pad installations. Brass tags shall read “SEWER” for force mains, diameter of pipe and the number of turns to open and close the valve.

## 4C.6 FORCE MAIN CONNECTONS TO EXISTING FORCE MAIN SYSTEMS

4C.6.1 General: The contractor shall be responsible for the scheduling and coordination of the work for each tap. The contractor shall furnish and install the approved tapping sleeve and valves for each scheduled main tap. The contractor shall excavate a dry and safe working area pit of sufficient size to perform the necessary work. Prior to performing the tap, the contractor shall pressure test the tapping sleeve and valve installation under supervision of HCUD. The contractor shall be responsible for properly backfilling and compacting the work area after work is completed. HCUD shall be given 48 hours notice prior to work.

4C.6.2 The contractor shall make the connection by using an approved tapping sleeve or tapping saddle as appropriate. The tapping of the main shall be done using standard tapping techniques as approved by HCUD.

4C.6.3 The contractor shall assemble all materials, tools, equipment, labor and supervision necessary to make the in an expeditious manner. A gate valve shall be installed on the branch side of the connection.

## 4C.7 FORCE MAIN CONNECTIONS TO HCUD GRAVITY SYSTEMS

4C.7.1 FM connections to existing gravity sewer manholes shall be considered by HCUD when absolutely necessary and the following proper precautions are taken to protect the existing infrastructure components and to control odors:

4C.7.1.1 All interior surfaces of the receiving pre-cast concrete manhole shall be completely sprayed with a special polyester resin coating (“IET Coating Systems,” applied by Paints and Coating Inc. (See Section 9) to protect the manhole interior from the corrosive effects of hydrogen sulfide gases.

4C.7.1.2 An Odor Control System shall be installed at the wastewater pump station receiving the FM (directly or through gravity) flow or shall be installed in the pump station where the FM flow began.

4C.7.2 Connecting To Existing Systems

4C.7.2.1 Where a new FM shall be connected into an existing manhole, construction plans shall include the connection on the plan and profile views.

4C.7.2.2 The manhole shall be properly prepared to receive the new FM by carefully core boring the wall of the existing manhole through the use of mechanical drilling equipment. The perimeter of the penetration shall not be closer than 12-inches to a barrel section joint. A flexible resilient water-tight connector shall be installed prior to pipe insertion into the manhole. The flexible connector shall be equivalent to Z-LOK XP manufactured by A-LOK Products, Inc., Kor-N-Seal by NPC Inc., or HCUD approved equal. Any penetration to a manhole liner shall be properly sealed to restore the integrity of the liner. Manhole inverts shall be reshaped as required by the new connection to provide a smooth flowing channel of the exact shape of the gravity main to which it connects. See Detail 31.

4C.7.2.3 Manhole Frames and covers shall be machined or ground at touching surfaces so as to seat firmly and prevent rocking. Any set where mating faces do not match shall be removed and replaced. "Wastewater", “Hernando County” and year shall be embossed in the cover. See Detail 33.

4C.7.3 “Collector Manholes” shall be installed within 50-feet of all pump station wet well points of entry. The pre-cast concrete sectional “Collector Manhole” shall be lined with a special polyester resin coating which is resistant to the chemical corrosive environment, normally found in wastewater transmission systems. Coating shall be “IET coating system” installed by Paints and Coatings, Inc. FM and gravity sewer line direct connections to pumping station wet wells shall not be allowed. HCUD requires the installation of a special IET coated “Collector Manhole” (CMH) to deliver sewerage to pump station wet wells.

## 4C.8 FORCE MAIN ISOLATION VALVES AND LOCATIONS

4C.8.1 ISOLATION VALVES: All isolation valves shall be resilient seat gate valves.

4C.8.2 Valves shall be placed so that the maximum allowable length of force main required to be shut down for repair work shall be no more than 1000-feet on off-site transmission mains, distribution systems in residential subdivisions, and commercial, industrial, or multi-family residential districts.

4C.8.3 The designer shall consider and incorporate maintenance considerations when placing isolation valve location. HCUD reserves the right to require additional isolation valves for efficient operation and maintenance.

4C.8.4 Valve boxes shall be provided for all control valve installations.

# SUB-SECTION 4D

# WASTEWATER PUMP STATIONS

# SUB-SECTION 4D: WASTEWATER PUMP STATIONS CONTENTS

# SUB-SECTION 4D: WASTEWATER PUMP STATIONS CONTENTS

# SUB-SECTION 4D: WASTEWATER PUMP STATIONS

## 4D.1 GENERAL

4D.1.1 Pump Stations shall be installed when conditions exclude the utilization of gravity sewer lines.

4D.1.2 Where materials and/or equipment are specified by brand name or manufacturer, the intent shall be to establish a minimum standard of quality acceptable to HCUD.

4D.1.3 The codes, specifications, standards, etc., referenced herein, shall be of the issue in effect on the date of the invitation to bid.

4D.1.4 Pump Stations shall be complete with duplex or triplex submersible pumps located within a wet well, piping, valves, pre-cast special coated “Collector Manhole” structure, companion valve vault with access frame and locking covers, pump rail guides and supports, pump mounting plates or bases with hydraulic sealing flanges, heavy-duty 316 SS lifting chains, electric cable and conduit, sealed mercury switches for level and alarm control, pump controls and starters with enclosure, and other accessories as shown on the drawings and specified herein. See Detail 37.

4D.1.5 Each master pump station shall be equipped with an Emergency Power Generator System (EPGS), permanently installed on the pump station site. The EPGS shall be capable of providing sufficient electrical power to simultaneously operate all the sewerage pumps during periods of power outages. EPGS’s shall be required on all pump stations that are expected to pump more than 20,000 GPD (expected flow based on average daily flow per unit as found in the latest HCUD Sewer Master Plan Study) and in areas where during a power outage a spill could occur and reach a body of water (lakes, ponds, rivers, etc.) within 30 minutes. The EPGS’s approved by HCUD are noted in Section 6.

4D.1.6 Tracts dedicated for pump stations shall be dimensioned no less than 50-feet by 50-feet for Duplex Pumping Station and 75-feet by 75-feet for Triplex Pumping Stations. See Detail 39.

4D.1.7 See SECTION 11 for Pump Station Electrical Specifications.

## 4D.2 DESIGN

4D.2.1 Wastewater pump stations shall be designed to accommodate the full development flow from all contributing areas at peak flow computed in accordance with the "Flow Criteria" set forth in sub-section 4A General Wastewater Specifications.

4D.2.2 Pump Stations shall have a minimum of two submersible pumps, and each shall have a capability of pumping 250-percent of the average design flow.

4D.2.3 Each pump shall have the capability of pumping the design peak flow at the maximum computed TDH with pipe friction loss calculated by the "Hazen-Williams" formula with normal friction factors for the pipeline material and such factors shall not exceed "C=150" for PVC Pipe, "C=140" for DIP. Static head pressures shall be calculated by utilizing the low wet well water elevation for the lead pump.

4D.2.4 Each pump station shall have a minimum of two pumps for peak flows of 750 Gallons per Minute (GPM) or less. When the flow exceeds 750-GPM then three or more pumps will be required. Standby pumping capability shall be provided such that if any one pump is out of service the remaining pumps shall be capable of pumping out estimated peak flows.

4D.2.5 System head versus pump capacity curves shall be prepared by the pump manufacturer's representative and analyzed to determine the system operating capability at the following conditions:

4D.2.5.1 Non-manifolded Pumping Station

4D.2.5.1.1 One pump running, if duplex pumping station.

4D.2.5.1.2 One pump and two pumps running if triplex pumping stations, etc.

4D.2.5.1.3 If FM profile results in siphon, curves shall show operation at start-up (to high point only) as well as full flow conditions.

4D.2.5.2 Manifolded Pumping Stations: All conditions outlined in subsection 4C Force Main Systems and in addition, operation while all remaining stations are on.

4D.2.5.3 Variable Speed Pump Stations: All applicable conditions in subsection 4C Force Main Systems, and in addition, operating point, specifying Revolutions per Minute (RPM) at peak, average and minimum flows.

4D.3 THE ODOR CONTROL SYSTEM (OCS): The OCS shall be designed and installed to remove the hydrogen sulfide odors and other mercaptans (sulfur containing compounds), commonly present in "on line" pump station facilities, using a hydration process. Acceptable OCS Manufacturer options are: "Bio-Sponge" Odor Control Systems, by Jacobs Air Water Systems for wastewater treatment plants or "Zabocs" Biological Odor Control Systems, by US Filter for pump stations.

4D.3.1 Odor Control Systems shall be required for any lift station located adjacent to a golf course, store, residence, pool, etc. or a lift station receiving flows from other lift stations which shall cause high levels of hydrogen sulfide gas.

4D.3.2 The OCS shall be designed for continuous outdoor operation (temperatures up to 120-degrees Fahrenheit), with components being constructed from materials resistant to the hostile compounds being absorbed. All hardware shall be 316 SS. The equipment shall comply with the latest editions of the following code and standards: NEC (National Electrical Code), NEMA (National Electrical Manufacturers Association) and ASTM (American Society for Testing and Materials).

4D.3.3 The contractor shall install the OCS in accordance with the manufacturer's instructions.

4D.3.4 All piping to and from the OCS, including electrical conduit, shall be installed through the OCS support slab and routed underground so they will not cause a trip hazard for personnel working around the lift station. The OCS drain and suction piping shall be installed in the side of the lift station wet well, not through the top; they both shall enough fall to drain into the wet well. The OCS piping shall be the same size through out the installation, no reducers.

4D.3.4.1 CONCRETE WET WELL: The penetration into the wet well shall be a core bore, not hammered out with a chisel or jack hammer. Both the drain and suction piping can be installed into the same core bore; or two smaller core bores can be utilized for each pipe. After installation of the OCS piping, the bore hole shall be grouted closed with non-shrink grout; the grout shall be the full wall thickness of the wet well. The exterior and interior coating of the wet well shall be replaced, either coal tar epoxy or IET, where the OCS piping penetrated the wet well.

4D.3.4.2 FIBERGLASS REINFORCED PLASTIC (FRP) WET WELL: The wet well wall penetrations shall be with either Kor-N-Seal Boots, sleeves for mechanical link seals or PVC pipe stub-outs.

4D.3.5 The external wet well vent shall be capped off with a removable type cap or plug to prevent outside air from entering the wet well during OCS operation.

4D.3.6 The piping for the water service that is above the OCS support slab shall be either galvanized or SCH. 80 PVC.

4D.3.7 A manufacturer's representative shall be present and perform a test run of the OCS following installation. Upon satisfactory results from the performance test, HCUD shall accept the OCS as installed.

4D.4 PUMP STATION SITE LOCATION AND PAVING

4D.4.1 The distance requirements from the master pump station (concrete pad) are 20- feet to the edge of the lot. In no case shall the front of the pump station be closer than 28-feet from the edge of pavement or back of curb.

4D.4.2 The pump station detail sheets of the construction plan submission shall include a to-scale site plan of the pump station slab with all lot grading details and elevations. The slab elevation shall be set based on adjacent lot pad elevations. In the absence of adjacent lot pads, the slab elevation shall be set based on a minimum rise of 2 percent from the edge of pavement or minimum 1-foot above the crown of the road, whichever is greater. All driveway and site drainage shall be directed away from the station slab, allowing for no standing or ponding of water on the pump station site.

4D.4.3 Upon completion of construction, site plan "As Builts" (Record Drawings) of the pump station shall be submitted by the EOR. Information on the site plan shall locate the constructed pumping facility in relation to the lot corners and property lines, and note the finished pad elevation and spot elevations of finished grades around the pumping station. The site to be owned by HCUD shall be finish graded and sodded prior to final inspection.

4D.4.4 Pump station site paving shall be 6-inches minimum of 4,000 PSI concrete after 28-days. All areas will be reinforced with 6 X 6 – W2.9 X W2.9 W.W.F. and conduits shall be located in the slab as indicated on plan sheets.

4D.4.5 The pump station shall have a concrete or asphalt paved access driveway to the site from the street, constructed per HCUD requirements. The driveway shall be at least 14-feet wide, 28-feet long and 2-inches thick type S-1 asphalt over 10-inch lime-rock base and compacted sub-grade. Driveways in excess of 30-feet may be approved for construction. HCUD shall consider proposed alternative driveway and site configurations.

4D.4.6 Base and sub-base density tests shall be taken prior to asphalt paving and concrete slab. Densities shall be compacted to no less than 98 percent of a modified proctor.

4D.5 FENCING: Pump station sites shall be secured with 6-feet high galvanized interwoven fence enclosure, with a 3-strand barbed wire top security zone and 2-lockable gates. See Section 11 for fence grounding and Detail 40. Materials and installation shall be in accordance with HCUD pump station fencing requirements, as follows:

4D.5.1 Fence fabric shall be interlocking 6-feet high with galvanized coating to resist corrosion.

4D.5.2 Fence corner posts shall be 3-inch diameter posts with 2-feet in the ground. Fence posts shall be installed on 6-foot centers, maximum. Gate posts shall be 4-feet in the ground.

4D.5.3 Double gates construction, 7-feet wide for a 14-foot opening, shall be provided. Gates shall have three 1 ½-inch steel tubing horizontal runners and two 1 ½-inch steel tubing vertical runners (all steel tubing shall be 18-gauge hot dipped galvanized). Steel tubing is to be welded at all corners and mid-points (six total welds). All welds and drilled holes in steel tubing are to be coated with "Cold Galvanizing" to resist oxidation.

4D.5.4 Each gate shall be provided with two hook style hinges, with the top hook turned down and the bottom hook turned up. Gate hardware shall be as listed or heavier. All fence hardware is to be zinc electroplated steel.

4D.5.5 Each gate shall be provided with a ½-inch diameter x 34-inch long rod with a 90 degree bend 4-inches long on the end for the gate drop rod. Rods are to be mounted with three 316L SS eye bolts, nuts and washers to allow rod to drop 12-inches below bottom of gated to hold in the open position. Rods shall drop into a 1 ¼-inch diameter pipe that extends 18-inches below grade. Rods are to be installed on vertical 1 ½-inch steel tubing of the gate. Stainless steel (316L) carriage bolts, nuts and washers shall be installed on each gate to hold drop rods in the up position. A 1-inch diameter hole, 9-inches deep shall be bored into concrete to hold the right hand gate in the closed position.

4D.5.6 Special fencing (i.e. PVC) may be acceptable by HCUD. If approved, a three-foot wide walk through gate and a letter stating the Homeowners Association will be responsible for fence maintenance shall be required.

4D.6 PRIVATELY OWNED PUMP STATIONS

4D.6.1 The Developer shall submit pump and system response curves for all privately owned pump stations at the time of construction plan submittal to HCUD.

4D.6.2 The control panel for private lift stations shall have an emergency telephone number of a representative of the owner. This person must be available for emergency calls at all times, days, nights, weekends and holidays. The telephone number is to be prominently displayed on the panel cover in order to assist HCUD Wastewater Division Personnel during emergency events.

4D.7 PUMP STATION VALVE VAULTS: (See Detail 38).

4D.7.1 The Pump Station Valve Vault shall be a rectangular pre-cast reinforced concrete structure with a top. The valve vault concrete top slab shall be integrally cast with lockable aluminum access doors, frame and lifting rings. Manufacturer to supply Shop Drawings for HCUD approval.

4D.7.2 Hatch Assembly:

4D.7.2.1 Access hatch assemblies shall be manufactured by Halliday Products or HCUD approved equal.

4D.7.2.2 The doors and frames are to be made of aluminum, have a 150 PSF load rating, be easily removable for replacement of existing valves and/or plumbing fixtures, and be capable of being secured in the open position.

4D.7.2.3 Doors are to have retractable lifting handles

4D.7.2.4 The lifting rings cast into the lid are to be removed (flush with the top surface of the lid) after installation of the lid onto the top of the valve vault structure.

4D.7.2.5 All access hatch hardware shall be 316 SS.

4D.7.2.6 Duplex Stations: The valve vault hatch assembly shall have a minimum opening of 48-inches by 48-inches with two lockable double doors for a duplex

4D.7.2.7 Triplex Stations: The valve vault hatch assembly shall have a total minimum opening of 60-inches by 120-inches with four lockable doors.

4D.7.3 Pre-cast holes or blank outs shall be provided to conform with entry pipe sizes, location and elevation as shown on the drawings. The drain pipe opening shall be sealed with water proof non-shrink grout on both sides. Other pipe openings shall receive a flexible, adjustable seal by LINK-SEAL, or HCUD approved equal, installed on the interior side.

4D.7.4 Interior and exterior surfaces shall have a protective coal tar epoxy coating with a minimum dry film thickness of 18-mils. Coal tar epoxy shall be Koppers 300-M, or an HCUD approved equal.

## 4D.8 PUMP STATION WET WELLS

### 4D.8.1 General

4D.8.1.1 Wet well shall have sufficient capacity for a holding period of 5-minutes at the maximum rate of the largest pump.

4D.8.1.2 The high water alarm level shall not exceed the wet well invert elevation of the lower inflow pipe.

4D.8.1.3 Control float elevations shall be set to ensure the Low Water Level (pump off) setting will be at least 3-inches above the top of the pumps, allowing the pumps to remain submersed at all times. The top of the pump is defined as the highest point such as the housing or the electrical cable connector.

4D.8.1.4 The wet well shall be designed to prevent fluid vortexing and/or air binding.

4D.8.1.5 The wet well floor shall have a minimum slope of 1 to 1 toward a "hopper" bottom with the horizontal area of the bottom being no greater than necessary for proper installation and function of the pump suction.

4D.8.1.6 Wet wells greater than 30-feet in depth are not permitted.

4D.8.1.7 Wet wells greater than 20-feet in depth are required to be a monolithic fiberglass reinforced plastic structure.

4D.8.1.8 All wet wells shall require either an IET coating installed by Paints and Coatings inc. or be a monolithic fiberglass reinforced plastic structure. (See Section 9)

4D.8.1.9 In certain instances where the water table is exceptionally high, HCUD shall determine if the wet well shall be required to be a monolithic fiberglass reinforced plastic structure.

4D.8.1.10 Prior to application of interior wall protective coating, the contractor shall provide a grout fillet around the inside of the bottom of the wet well. Grout shall be 4000 PSI concrete, with the maximum aggregate size to be $^{3}/_{8}$-inch.

4D.8.2 Pump Station Wet Well Options: Structures approved by HCUD shall be either a monolithically fabricated Fiberglass Reinforced Plastic (FRP) single barrel structure or a pre-cast, reinforced concrete sectional structure with special protective interior polymer coating.

4D.8.2.1 Safety Netting: All pump station wet wells shall have safety netting permanently installed at the access opening. The netting shall be made of a high strength polyester material that has been tested and certified to meet OSHA standard 1926.502. (c) (4) (i) drop test. All hardware, hooks and anchors shall be 316 stainless steel. Acceptable safety netting options are “Hatch Safety Net” as manufactured by U.S.F. Fabrication, Inc. or HCUD approved equal.

4D.8.2.2 The Fiberglass Reinforced Plastic (FRP) Wet Well Structure Option: See Detail 39

4D.8.2.2.1 Shall consist of a single structure unit made of FRP, and shall be monolithically constructed with an integral top and bottom. Minimum shell thickness to be ¾ -inch. ASTM D3753 rated for H-20 load. FRP to be supplied by Mike Thompson Sales, Inc. Seffner, Florida, representing LFM Fiberglass Specialists, Giddings, Texas or equal. A separate fiberglass top to be installed with SS bolts, washers and nuts.

4D.8.2.2.2 All pipe connections, vents, OCS piping, hatch openings, anti-floatation bottom and lifting rings shall be installed during the FRP construction process. All wet well wall penetrations shall be with either Kor-N-Seal Boots, sleeves for mechanical link seals or PVC pipe stub-outs.

4D.8.2.2.3 The exterior wall surface shall be relatively smooth, eliminating fiber show, free of blisters larger than ½-inch in diameter and finished with a gray color gel coat coating.

4D.8.2.2.4 The interior wall surface shall be resin rich, smooth texture, free of fiber show, free of blisters larger than ½-inch in diameter, and wrinkles $^{1}/_{8}$-inch or larger in depth. Surface pits are acceptable if no larger than ¾-inch in diameter and less than $^{1}/_{8}$-inch in depth.

4D.8.2.2.5 The FRP wet well surfaces shall be free of exposed fibers, resin runs, dry resin void areas, laminate separations, large blisters, cracks caused by carelessness, unsafe sharp projections, pits, or air pockets.

4D.8.2.2.6 The FRP wet well top shall be constructed as a reinforced fiberglass unit, with predrilled installation holes containing a square or rectangular opening that has been fashioned to accommodate the lockable hatch cover assembly. Larger systems shall have a vent pipe shaft hole shall be placed in the top section for ventilation.

4D.8.2.2.7 The FRP wet well shall be constructed with an integral reinforced solid, minimum $^{3}/_{8}$-inch thick, fiberglass bottom containing sufficient reinforced stiffening ribs. The bottom shall have a 3-inch (minimum) wide anti-flotation ring or collar. The manufacturer shall “glass in” pump mounting bolts or brackets as required.

4D.8.2.2.8 The manufacturer shall furnish FRP wet well Shop Drawings to the EOR and HCUD for approval.

4D.8.2.2.9 The contractor shall install the FRP wet well in accordance with the manufacturer’s instructions. A manufacturer’s representative shall be onsite during installation and accessible if installation issues occur.

4D.8.2.3 The Pre-cast Reinforced Concrete Sectional Wet Well Structure Option: See Detail 38.

4D.8.2.3.1 Shall be cylindrical, composed of pre-cast reinforced concrete sections that conform to the requirements of ASTM C478, minimum 4,000 PSI strength concrete, using Type II Portland Cement.

4D.8.2.3.2 The base section shall be pre-cast monolithically with the bottom barrel section. Subsequent sections shall be placed in accordance with manufacturer's requirements for water tightness and vertical alignment. Pre-cast holes or blank outs shall be provided in each section to conform with entry pipe or conduit sizes, location, and elevations as shown on the drawings. Section joints shall receive an application for recommended manufacture sealant, around the full circumference for water tightness. Lift holes shall be plugged with waterproof non-shrink grout. Wet well concrete base section shall be set upon 6-inch to 12-inches of gravel leveling course approved by the EOR.

4D.8.2.3.3 The wet well shall be coated with a special polyester resin finish which is resistant to the chemical corrosive environment, normally found in wastewater transmission systems. Coating shall be IET coating system installed by Paints and Coatings, Inc. HCUD shall not accept fiberglass lined pre-cast concrete wet well structures. (See Section 9)

4D.8.2.3.4 Prior to application of interior wall protective coating, the contractor shall provide a grout fillet around the inside of the bottom of the wet well. Grout shall be 4000 PSI concrete, with the maximum aggregate size to be $^{3}/_{8}$-inch.

4D.8.2.3.5 The wet well top concrete slab shall be integrally cast with a lockable aluminum access cover frame Shop Drawings to be submitted for approval by HCUD.

4D.8.2.3.6 The wet well top concrete slab shall be integrally cast with a lockable aluminum access cover frame (shop drawings to be approved by HCUD).

4D.8.2.4 Wet well access hatch assemblies shall have a minimum opening of 36-inches by 48-inches with double doors for a duplex and 36-inches by 107-inches with triple doors for the triplex. The doors and frames to be made of aluminum, have 150 pounds per square foot (PSF) load rating, suitable for easy removal and replacement of the pumps, with the hinges located on discharge piping side, and capable of being secured in the open position. All doors are to have retractable lifting handles and padlocking security hasps.

## 4D.9 PUMP STATION PUMPS

### 4D.9.1 General

4D.9.1.1 Each pump shall be of a heavy-duty submersible type, capable of handling raw, unscreened sewage, and capable of passing a minimum of 3-inch diameter spherical solids. The pump shall be constructed with a minimum 4-inch discharge, cast iron pump case, SS shaft, heavy-duty upper and lower permanently lubricated ball bearings, and tandem double mechanical seals in an air filled chamber with moisture sensors. Impellers shall be of cast iron and of a non-clog design and dynamically balanced.

4D.9.1.2 Each pump shall be constructed with a discharge disconnect coupling and installed on 316 SS guide rails, diameter to be recommended by the pump manufacturer. The system shall include the necessary discharge base with 316 SS mounting hardware, heavy-duty 316 SS connectors and SS 316 retrieval chain with SS lift rings at 10-foot intervals and other components for a complete pump retrieval and reinstallation system without entering the wet well. Pump discharge shall be provided with standard 125 pound ANSI flanges. Each pump shall have a minimum 1-year warranty by the manufacturer.

4D.9.1.3 Each pump shall be capable of pumping raw sewage at design flows and total dynamic head pressures as shown on drawings. Pumps with efficiencies less than 40 percent at design point shall be unacceptable.

4D.9.1.4 The HCUD shall be furnished with three copies of complete, descriptive data of the motors and pumps proposed for installation with the completed data sheets and standard Performance Curves for each set of pumps marked with impeller size, horsepower, performance points, and efficiencies. The manufacturer shall also include Electrical Detail Sheet(s), which shall include an Electrical Load Summary and a Short Circuit Analysis completed, signed and sealed by an Electrical Engineer registered in the State of Florida.

4D.9.1.5 The HCUD shall be furnished three copies of detailed instructions for proper pump installation, wiring diagrams, schematics, operation and maintenance manuals, including parts list and availability.

4D.9.2 Pumps and Accessories

4D.9.2.1 Pumps and accessories shall be carefully handled and protected during transferring and installation. The contractor shall be responsible for the reporting and replacement of any damaged equipment upon delivery to job site.

4D.9.2.2 Pumps and accessories shall be installed in conformance with manufacturer's drawings, diagrams and instructions.

4D.9.2.3 Each pump model number shall be confirmed by the EOR prior to installation and the serial number recorded. Each pump shall have a stainless steel name plate indicating the Horsepower (HP), TDH, capacity in GPM, impeller number or size, rpm, voltage, full load amperage, date of manufacture, and model and serial number. The same data shall be recorded on the inside the control panel.

4D.9.2.4 All guide rail carrier assemblies shall be provided by manufacturer for size of pump to be installed. Clearance of 8-inches in height between the carrier assembly and the top of the pump motor conduit box shall be provided. The carrier assembly shall be attached securely to the pump in such a way that the weight of the pump is evenly distributed and will not cause the carrier assembly to misalign or bind on the guide rails. The pump guide rails, guide rail brackets, cable holder, and all support bolts and hardware shall be 316 SS. Intermediate pump guide rail brackets shall be located at mid-length of guide rail as a minimum, with a maximum spacing of 10-feet. All welded SS components in the wet well shall be fabricated of 316 SS materials.

4D.9.2.5 All control cable suspension hooks and pump lift chains shall be made of 316 SS. The inside hook diameter of the suspension hooks shall be a minimum of 2-inch diameter. Lift chains shall be SS with link diameter sized according to the weight (size) of the pump, with 4-inch diameter 316 SS rings located every 10-feet.

4D.9.2.6 HCUD pump stations require pump manufacturer to be Ebara International Corporation, Homa, or Barnes.

## 4D.10 PUMP MOTORS

4D.10.1 Pump motors shall be housed in a watertight casing, designed and manufactured for 60-cycle service with the required voltage and phase (as shown on the approved drawings), and for continuous submersible service under either 30-feet of sewage or dry conditions. Pump motors shall be overload protected and manufactured in compliance with NEMA standards. Pump motors shall have Class F insulation and be capable of sustaining a minimum 10 starts per hour. Upper and lower ball bearings shall be permanently lubricated.

4D.10.2 The cable entry seal design shall be such as to ensure a watertight and submersible installation.

4D.10.3 The electric motor cable shall be sized in conformance with NEC specifications and suitable for submersible service and be continuous (un-spliced) from pump to junction box.

4D.10.4 Pump motors shall have a seal probe in the housing to detect the presence of water, coupled to the warning light in the control panel.

4D.10.5 Pump motors shall have a self-resetting temperature monitor in each phase coupled to the control circuit for pump shutdown at high temperature.

4D.10.6 Pump motors shall not run above the Full Load Amps (FLA) rating. The service factor amp rating shall not be an acceptable performance condition.

4D.10.7 Pump motors, 3-horsepower or larger, shall be 3-phase. Phase converters or "add a phases" are not acceptable.

4D.10.8 All pump motors less then 25-hp shall be 230-VOLT. All pump motors 25-hp or more shall be 460-VOLT where available by the local power company.

## 4D.11 LIQUID LEVEL SENSORS

4D.11.1 Hermetically sealed mercury switches, externally weighted, shall be furnished and installed with appropriate length cable to reach the control panel. SENSORS shall be NEMA 6 rated with #18-2 STD cable, normally open, polypropylene casing, for suspended operation. Sensors shall be installed at the elevations shown on the drawings, appropriately spaced to avoid interference, and firmly attached to maintain elevation.

4D.11.2 A 316 SS hanger system with 316 SS attachment anchor bolts, washers and nuts shall be installed with individual hooks for each sensor cable and each pump with a 12-foot long SS lifting chain.

4D.11.3 Each float shall have extra cable (minimum 36-inches), coiled and taped for future adjustment of control elevations.

4D.11.4 Pump "off" elevation shall not be lower than top of pump elevation in the wet well. Pumps shall remain submerged at all times.

## 4D.12 CONDUIT SYSTEMS: All conduits shall be arranged to present a neat mechanical appearance.

4D.12.1 Conduit: Unless otherwise noted in the drawings or in this document, all conduit and fitting installations above grade shall be corrosion resistant PVC Sch. 40 pipe. Waterproof fittings and hubs shall be installed at all equipment interfaces.

4D.12.2 Conduit installations extending from above grade to below grade shall be PVC Sch. 40 conduit.

4D.12.3 All conduits shall be arranged to present a neat mechanical appearance. Sealing compound shall be provided and poured in all conduit sealing fittings installed or indicated in the drawings. The wires for each pump shall be in a separate conduit from junction box “JB1” to the control panel. A sealing fitting shall be installed for each conduit.

4D.13 PIPING

4D.13.1 Piping shall be PVC C900, minimum 4-inch.

4D.13.2 One flanged adaptor to PVC force main shall be installed outside of valve vault.

4D.13.3 A minimum of one length of PVC C900 pipe shall be laid into the wet well on the gravity influent line, projecting 4-inches into wet well.

4D.13.4 Vent shall be a minimum of 4-inch PVC pipe, installed in the wet well concrete top. Placement shall allow the aluminum hatch to be folded back for pump removal. Vent pipe shall extend straight up then turned down with two PVC 90 fittings and opening fitted with a screen to prevent vermin entry. Vents shall not be higher than 24-inches above concrete top.

4D.13.5 Potable water service pipe shall be 1-inch polyethylene tubing with brass fittings where installed under ground. The continuing above ground installation shall be ¾-inch galvanized pipe, flow controlled by a “female by female” ball valve with lockable padwings, pressure transducer (see section 11 subsection 8) freeze protection valve (see subsection 4D.16). Backflow prevention shall be accomplished by installing a Reduced Pressure Zone (RPZ) Backflow Prevention Assembly (BPA) and a ¾-inch standard brass hose bib. The hose bib shall be affixed to control panel support post with a galvanized pipe strap and installed a minimum of 18-inches above the 4-inch thick concrete slab.

4D.13.6 All pump discharge piping and fittings shall be PVC C900. The discharge pipe shall be supported from the wet well wall at mid-length with a 316 SS bracket, with spacing shall not exceed 10-feet. All valves shall be located above ground, a minimum of 18-inches above pad and supported on each side of valve assemblies with supports. All ductile iron piping and fittings, above ground and within the wet well, shall have the exterior coated with Tnemec 1074 or HCUD approved equal. All ductile iron pipe and fittings utilized in the construction of wastewater discharge shall have an interior coating of “Protecto 401”. An “isolation” valve shall be installed in the discharge force main outside of the pump station valve vault.

4D.14 VALVES AND FITTINGS (See Detail 38).

4D.14.1 Piping, valves and fittings for above ground installation shall be flanged and shall follow the general requirements as shown in the drawings.

4D.14.2 “Swing” check valves shall be AVK only. Where FM exceed 70-feet TDH, “Soft Shut” style AVK check valves shall be required. See Detail 12.

4D.14.3 Resilient Seated Wedge Gate Valves (RSWGV) shall be flanged and constructed of ASTM, A126-61 Class B, close-grained nickel chromium alloy iron.

4D.14.4 Metal ball valves shall be non-lubricated, free floating ball type. Port areas shall be full-bore (free area through valve shall not be less than the inside area of a pipe of the nominal valve size). Valves shall be manufactured by Stockham, ACT Industries, Jamesbury Corporation, William Powell Company, or HCUD approved equal.

4D.14.5 Stainless steel adjustable stands shall be installed for support. Valves shall not be cast in concrete or mortar.

4D.14.6 Emergency “pump-out” connection shall be installed as in valve vault Detail 38.

4D.14.7 A pressure gauge with SS isolation ball valve and SS nipple shall be installed in force main piping near wye.

4D.15 PRESSURE TAPS AND GAUGE

4D.15.1 Pressure taps shall be installed on each pump discharge line near the inlet of the check valve and on the line from the discharge header. Each tap shall include a 2-inch long, ½-inch SS nipple and a ½-inch SS ball valve.

4D.15.2 Provide one SS, glycerin filled, compound pressure gauge. The gauge shall be an Ashcroft model 63-1008AL-02L or equal, with a pressure range of 0 to 60 PSI and a vacuum range of 0 to 30-inches of mercury.

4D.15.3 The gauge shall be mounted on a silicone filled diaphragm seal with SS bottom. The seal shall be an Ashcroft model 50-310SS-02T-CK or equal. The gauge and diaphragm seal shall be assembled by a factory authorized representative only. A ½-inch, 2-inch long, Schedule 40, SS nipple shall be provided to connect the diaphragm seal to the ball valve.

4D.16 POTABLE WATER FAUCETS: Faucets (hose bibs) for potable water use shall be similar to Grinnell Company, Catalog No. 918-17, or HCUD approved equal. The potable water service line shall have a BPA-RPZ (see subsection 4D.18.3 and Section 10) with a freeze protection valve (see subsection 4D.18.5 and Section 10) located and sized as indicated on the Design Drawings.

4D.17 ACCESSORIES

4D.17.1 Pump guide rails shall be 316L SS, Schedule 40, rail size to be determined by manufacturer, supported at the top by stainless steel holders and anchors and rubber bushings. Intermediate SS 316 guide rail brackets shall be installed as per manufacturer's recommendations.

4D.17.2 Lifting chains, SS 316L, shall be capable of lifting 2,500-pounds.

4D.17.3 Lifting rings, SS 316, shall be installed at the top end of the chain and at 10-foot intervals down the length of the chain.

4D.17.4 Fasteners and hardware inside the wet well and valve vault shall be 316 SS.

4D.18 APPROVED PARTS LIST FOR STANDARD PUMPING STATION DESIGN

4D.18.1 Diaphragm Seal
Ashcroft type 310, threaded female ½-inch NPT, capsule, 316L SS, ¼-inch NPT instrument connection.

4D.18.2 SS Ball Valve
Stockham S-2120 SSMO-R.T. (1/2")

4D.18.3 BPA-RPZ
Conbraco 40204T2
Wilkens/Zurn 975 XL
Ames 4000 SS

4D.18.4 Faucet (Hose Bib)
Grinnell – 918-17

4D.18.5 Freeze Protection Valve
Dole Specialty Products – FP35

4D.19 EXCAVATION AND BACKFILL

4D.19.1 Site shall be cleared of trees, brush, and similar material, and the material disposed of in accordance with applicable laws and regulations.

4D.19.2 Top soil shall be salvaged and stored temporarily for replacement around structures after completion of construction.

4D.19.3 Excavation shall comply with currently accepted trench and site safety rules, laws and regulations.

4D.19.4 Excavations shall be kept dry at all times. No attempts shall be made to set wet well bases in wet conditions.

4D.19.5 Pump station site shall be accessible by an asphalt paved road for maintenance purposes.

4D.19.6 A leveling course of crushed stone shall be provided for the wet well hole base as directed by the EOR.

4D.19.7 Ballast concrete to prevent wet well flotation shall be installed when required by EOR.

4D.19.8 Backfilling shall be accomplished in 18-inch lifts with soil, free of rocks, roots, limbs, or similar material, and mechanically compacted. Backfilling shall proceed to pipe or conduit elevations where additional compaction shall precede pipe or conduit installation.

4D.19.8 Subsequent compacted backfill lifts and spreading of any stored topsoil shall bring the surrounding soils to grade. The finished grade shall provide for surface water drainage away from the structures.

4D.19.9 When construction shall be finished, the new Pump Station site shall be completely sodded, excluding areas of asphalt driveways and concrete surfaces.

4D.19.10 Settling in the area surrounding the pump station, occurring during the warranty period shall be corrected by the Contractor at no charge to HCUD.

4D.19.11 The finish slab elevation of the top of the wet well and valve vault, shall be at or above the 100-year flood elevation.

4D.20 PUMP DATA SHEET: Data sheets shall be prepared for each set of pumps and submitted to HCUD and the EOR in three copies. Attach catalog illustrations, cuts, pump curves, etc. and specify the following information:

4D.20.1 Project Name, Project Number and Proposed Location.

4D.20.2 Data sheets shall be prepared for each set of pumps and submitted to HCUD and the EOR in three copies and shall include the following information:

4D.20.2.1 Submersible Pump Manufacturer:
Model
Speed, RPM
Maximum Solid Size Passage (Minimum 3-inches diameter)
Pump Casing Material
Impeller Material, Type and size
Shaft Material
Type Seal
Type Lubrication
Suction Size
Minimum Spacing between pumps

4D.20.2.2 Pump Motor Manufacturer:
Speed, RPM
Efficiency at Design Point
Guaranteed Field Efficiency at Design Point
Type
Brake Horsepower
Full Load Efficiency
Service Factor
Full Load Amps
Voltage/Cycle/Phase
Insulation Rating
Enclosure
Capacitor Sizes and Type if Applicable

4D.21 MISCELLANEOUS: In addition to submittals previously described for the pumps, the Contractor shall further furnish:

4D.21.1 Three sets of shop drawings on other equipment.

4D.21.2 Three sets of “As Builts” (Record Drawings) wiring diagrams of the control panel.

4D.21.3 Three sets of manufacturer's warranty.

4D.21.4 Four sets of operation, maintenance, and repair manuals, to include complete parts listing, reference drawings and lubrication identification for the major equipment.

4D.21.5 Spare parts or lubricants recommended by the manufacturer for routine maintenance during the warranty period shall be furnished with the lift station.

4D. 22 LOW-FLOW WASTEWATER (“GRINDER”) PUMP STATIONS (see section 11 for electrical specifications)

4D.22.1 General: Peak flows that are less than 80-GPM may require either a submersible type low-flow “Grinder” pump or a non-clog pump as defined in sub-paragraphs 4D.2 and 4D.9. Both instances shall be required to meet the following conditions:

4D.22.1.1 Force mains leaving the pump station which are installed in the County right-of-way shall be a minimum of 4-inches in diameter.

4D.22.1.2 Velocities within the force main shall maintain a minimum of 2-fps.

4D.22.1.3 Grinder pump stations shall be constructed in the same manner as defined for non-clog pump stations. See Detail 38.

4D.22.2 “GRINDER” PUMP STATION SHOP DRAWINGS, ELECTRIC SHEETS AND “AS BUILTS” (RECORD DRAWINGS)

4D.22.2.1 Shop drawings shall be submitted and must be approved by HCUD prior to construction. Shop drawings shall include pumps, wet well and mechanical and electrical components.

4D.22.2.2 The electrical detail sheets include an electrical load summary and a short circuit analysis which shall be completed, signed and sealed by an Electrical Engineer registered in the State of Florida.

4D.22.2.3 A set of “As Builts” (Record Drawings) shall be maintained during construction, showing any deviations from the original design drawings. All changes and dimensions for structural, mechanical and electrical installations shall, at the completion of the project, be transferred to a set of mylar sepia reproducible media for a permanent set of “As Builts” (Record Drawings). One set of mylar reproducible and four sets of prints of the “As Builts” (Record Drawings) shall be submitted to HCUD. Each print of the “As Builts” (Record Drawings) set shall be signed, sealed and dated by a professional engineer, registered in the State of Florida.

4D.22.3 “GRINDER” PUMP STATION WET WELL OPTIONS: See sub-paragraph 4D.8. The minimum inside diameter of the wet well shall be 4-feet. The wet well diameter shall be a minimum of 6-feet for wet wells in excess of 12-feet deep. Wet Well access hatch assemblies shall have a minimum opening of 24-inches by 36-inches and shall meet the requirements stated in subparagraph 4D.7.2.

4D.22.4 “GRINDER” PUMP STATION PUMPS

4D.22.4.1 Pumps shall be the submersible grinder type and located within a FRP or pre-cast concrete wet well. Pumps and motors shall meet the applicable discharge, head, horsepower and RPM requirements. The pumps shall be capable of handling raw, unscreened sewage. They shall have a cast iron, brass or stainless steel impeller. The pumps shall be Ebara, or HCUD approved equal grinder pumps with double mechanical seals.

4D.22.4.2 The motors shall be NEMA Design B, 230-VOLT, 3-phase, 60-Hertz with a 1.2 service factor, NEMA Class F-155□C insulation. All low-flow wastewater pumping stations shall be sized to the available electric service, single or 3-phase.

4D.22.4.3 Each pump shall have a stainless steel nameplate indicating the HP, AMPS, VOLTS, phase, RPM, service factor, insulation Class, serial number, model number, GPM, TDH, and impeller number or size. A self-adhesive aluminum tag or laminated label shall be mounted inside the outer door of the control panel for each pump installed and shall contain the same nameplate information.

4D.22.4.4 The following spare parts and tools shall be furnished for each pump: one set of mechanical seals, special impeller pullers, and special wrenches needed for breakdown of pump.

4D.22.4.5 The following items shall be furnished with each station: one stainless steel glycerin-filled pressure gauge and diaphragm seal unit, one spare check valve flapper, flapper bolt, and hinge pin. Provide four spare lamps and fuses for each size and type used in the control panel.

4D.22.4.6 When an over-temperature condition occurs, the affected motor shall be shut off and the associated over-temperature alarm light shall be activated. The over-temperature alarm light shall be a "latching" type alarm and shall remain latched until a control panel alarm reset is initiated. However, the affected motor shall be automatically restored to operation when the bi-metallic thermal switch automatically resets after the motor temperature falls below the switch reset temperature. Over-temperature conditions of the motor stator windings shall be sensed by two bi-metallic thermal switches contained in the motor. The leads for these switches shall be brought out through a waterproof connection such that the switches may be connected into the motor control circuit shown in the drawings.

4D.22.4.7 A seal sensor module and a seal failure alarm light shall be furnished in the control panel. When a seal failure occurs, the seal failure alarm light shall be activated but the affected pump shall not be shut off. A seal failure in the pump shall be sensed by a moisture sensor contained in the oil chamber of the pump. The leads for this sensor shall be brought out through a waterproof connection such that the sensor may be connected to the sensor module located in the control panel.

4D.22.4.8 Pump motor shall be capable of continuous operation without damage, submerged or dry. Pump motors shall be class "F" insulation or better and certified as such by the vendor. The service factor of the motor shall not be used to achieve the operating performance of the pump. Additionally, the rated horsepower of the motor listed in the motor nameplate data shall not include horsepower available from the service factor rating of the motor. Motor shall be non-overloading for the full range of its operating curve.

4D.23 TESTING: "PUMP STATION START UP"

4D.23.1 Upon pump station completion, the EOR shall arrange with HCUD at least 48-hours in advance for final inspection of the facility and testing of the pumps. A trained representative of the pump manufacturer shall supervise start-up and observe tests.

4D.23.2 The Contractor shall provide ladders, measuring rules, water and such equipment as required to conduct the tests.

4D.23.3 Pump “drawdown” shall be measured against time and pumping rate calculated for each pump.

4D.23.4 Pump motor amperage and voltage shall be measured and recorded for each pump during “drawdown” test.

4D.23.5 Controls shall be tested for satisfactory performance. All pumps shall be tested to and through complete “drawdown” to check for vortexing and dry operation.

4D.23.6 Pumps shall be raised from the base to top of wet well and re-seated to check rail system and general alignment and operation. Contractor shall provide means for raising pumps.

4D.23.7 The Contractor shall repair and/or correct any deficiencies or make adjustments or replacements as directed by the EOR to bring the pump station into contract compliance and proper operation.

4D.23.8 Copies of the completed pump station final inspection and testing forms shall be forwarded to the HCUD and the Contractor, with a list of deficiencies noted.

4D.23.9 The Surveyor shall verify final invert and manhole elevations.

4D.24 WARRANTY: Workmanship, materials, and equipment shall be guaranteed against defects for a period of 1-year from the date of issuance of certificate of substantial completion and defects shall be promptly repaired by the Contractor at the Contractor's expense, exclusive of the pumps which shall be warranted for 1-year by manufacturer.

## 4D.25 PUMP STATION FINAL INSPECTION AND TESTING

4D.25.1 The pump station shall be thoroughly tested to demonstrate that the entire system is in proper working order and is installed in accordance with the approved plans and specifications. Each pump with its control circuit shall be run as nearly as possible under operating conditions for a sufficient length of time to demonstrate correct alignment, wiring capacity, speed and satisfactory operation. All isolation and check valves shall be tested for proper operation. During the final inspection and test, the Contractor shall furnish the test instruments. Readings shall be made of line voltage and current at the main disconnect during starting and operating conditions, as well as pump discharge pressure and flows. Such results must meet pump manufacturer's specifications.

4D.25.2 Only the EOR or his representative shall be allowed to schedule a pump station inspection. The EOR shall be responsible for verifying that the following conditions have been met prior to scheduling the inspection:

4D.25.2.1 Power shall be supplied through the electrical meter serving the pump station. Generator power is not an acceptable power source for the final inspection, however, the contractor may use generator power for conducting preliminary tests during construction.

4D.25.2.2 BPA inspection shall have been performed by HCUD and the certifications available at the final inspection.

4D.25.3 The following parties or representatives shall be present at the final inspection: EOR, Contractor, subcontractor, pump manufacturer, HCUD Inspector and HCUD Systems Operation Division personnel.

4D.25.4 The contractor shall supply sufficient water to the wet well for pump pressure and flow testing.

4D.25.5 Each pump shall be hoisted and removed from wet well, inspected and replaced, then operated to test for leaks at the discharge seal. The contractor shall provide the equipment to remove and reinstall the pumps in the wet well.

4D.25.6 The Contractor shall perform additional tests requested by HCUD Operations Division during the inspection. The cost of the tests shall be borne by the Contractor, including expenses incident to retest caused by defects and/or failure of the equipment to meet the specifications.

4D.25.7 Three copies of all applicable operating and maintenance manuals for mechanical and electrical equipment are to be supplied to the HCUD inspector at the final pump station inspection.

# SECTION 5

# SPECIFICATIONS FOR RECLAIMED WATER DISTRIBUTIONS SYSTEMS DESIGN AND INSTALLATION

# SECTION 5: SPECIFICATIONS FOR RECLAIMED WATER (RW)

# DISTRIBUTION SYSTEMS DESIGN AND INSTALLATION CONTENTS

# SECTION 5

# SPECIFICATIONS FOR RECLAIMED WATER (RW)

# DISTRIBUTION SYSTEMS DESIGN AND INSTALLATION

## 5.1 GENERAL

5.1.1 SPECIFICATIONS: The following specifications shall cover the design, review of plans and specifications for the installation, inspection, testing, and acceptance of Reclaimed Water (RW) distribution systems, transmission main extensions, and all appurtenant items which shall be constructed by private enterprise and shall be owned and maintained by HCUD when the projects are completed.

5.1.2 DEVELOPMENT REVIEW COMMITTEE: All improvements and modifications made to the HCUD RW system shall be done in accordance with plans approved by the HCUD section of the Code Compliance Review (CCR) in the Hernando County Planning Department. Material and workmanship shall conform to the specifications that appear in this document. All pipeline and appurtenance materials in contact with RW shall be National Sanitation Foundation (NSF) - 61certified.

5.1.3 PIPE COLOR GUIDE: For standardized identification purposes, all pipelines and appurtenances installed within Hernando County shall meet the Color Marking Standards for Underground Utilities, as outlined in Detail 13.

## 5.2 PLANS PREPARATION

5.2.1 DESIGN: All RW distribution (on-site) systems, transmission main (off-site) extensions, and all appurtenant items shall be designed in accordance with the applicable regulations, standards and specifications of Hernando County, the Hernando County Health Department (HCHD), the Florida Department of Environmental Protection (FDEP) and the standards established herein.

5.2.2 LOCATION OF UTILITIES: The RW distribution system or RW main extension or any portion thereof, which is to become the property and sole responsibility of HCUD, shall be designed to be constructed within any public rights-of-way (ROW) and/or dedicated easements. When a RW distribution main shall serve existing or future developments beyond the borders of the proposed site, the HCUD may request over-sizing. The recommended location for utility placement is shown on Detail 17.

## 5.3 PLANS REVIEW AND “AS BUILTS” (RECORD DRAWINGS): See Section 3.3.

## 5.4 SYSTEM DESIGN AND CONSTRUCTION STANDARDS

5.4.1 GENERAL REQUIREMENTS: The provisions of this Section set forth the general requirements for design of RW distribution systems and provide criteria for determining flow demands. The EOR shall comply with all the requirements of the HCHD in addition to the criteria contained herein.

5.4.2 SERVICE CONNECTION FEASIBILITY: Connection to HCUD RW systems shall be determined by HCUD following individual project case presentation by developers.

5.4.3 PIPE SIZING

5.4.3.1 The EOR shall be responsible for sizing the RW distribution system piping. Design flows and method of computation shall be submitted to the HCUD for review.

5.4.3.2 The pipe sizing design criteria for RW distribution systems shall be sized to maintain a minimum RW distribution main pressure of 20 PSI during peak conditions. The minimum pipe size for RW distribution mains shall be 4-inches in diameter.

5.4.4 LINE ROUTING: The primary main for the RW distribution system of a residential or commercial subdivision shall be routed within County road ROW or dedicated utility easement, unless otherwise approved by HCUD.

5.4.5 DEPTH OF COVER: Cover depth is measured from finished grade to the top of the pipeline; it shall be a minimum of 48-inches to a maximum of 60-inches for reclaimed water mains, unless authorized by HCUD. There will be exceptions made for conflicts that the pipeline has to cross; Horizontal Directional Drilling (HDD) does not apply.

5.5 SEPARATION AND CROSSINGS OF POTABLE WATER, RECLAIMED WATER AND SEWER LINES: See Section 3.5 and Detail 17.

5.6 CROSS-CONNECTION CONTROL: See section 3.6.

5.7 ISOLATION VALVES AND LOCATIONS

5.7.1 The designer shall consider and incorporate maintenance considerations when placing isolation valve location. HCUD reserves the right to require additional isolation valves for efficient operation and maintenance.

5.7.2 All isolation valves shall be resilient seat gate valves and shall be placed so that the maximum allowable length of RW main required to be shut down for repair work shall be no more than 1,000-feet nor less than 500-feet on off-site transmission mains or commercial or industrial districts

5.7.3 RW main extensions or mains extending at a project phase line shall include a valve and one additional standard length of pipe with a cap and a temporary Blow-Off Assembly (BOA). (detail 10)

5.8 PIPES, FITTINGS, VALVES, AND APPURTENANCES: RW distribution mains shall be PVC, DIP or HDPE. Pipe larger than 24-inches in diameter shall be approved by HCUD on a case-by-case basis.

5.8.1 PIPE MATERIALS: The following Table 5-1 lists the allowable pipe materials for various sizes of RW main pipe:

Table 5-1

RW MAIN PIPE OPTIONS

| Material | Diameter | General Specification |
|---|---|---|
| DIP | 4" to 24" | ANSI/AWWA C151/A 21, CL 50 |
| PVC | 4" to 12" | AWWA C900, Class 150, DR 18 |
| PVC | 14” to 24” | AWWA C905, DR 25, 165 psi |
| Horizontal Directional Drill (HDD) | | SEE SECTION 7 |

5.8.2 DUCTILE IRON PIPE (DIP) AND FITTINGS

5.8.2.1 DIP shall conform to the requirements of ANSI A21.51, minimum Class 50, unless other-wise specified by the EOR. Pipe joints for DIP shall be mechanical or push-on joints. Pipe shall have an exterior bituminous coating in accordance with ANSI A21.51. Pipe interior shall have a cement mortar lining with an asphaltic seal coat conforming to ANSI/AWWA C104/A21.4. The weight and class designation shall be painted in white paint on the exterior surface of each pipe section. Manufacturer code or serial number shall be provided on the bell of each pipe joint. DIP shall be spirally wrapped by purple tape with adhesive backing. DIP will be furnished in 20-foot lengths or as specified by HCUD.

5.8.2.2 Fittings: All DIP fittings shall be mechanical joint, shall meet the requirements of ANSI/AWWA C110/A21.10, shall have a pressure rating of 250 PSI and shall be full-radius fittings. All fittings shall be coated and lined as specified above for ductile iron pipe.

5.8.2.3 Mechanical Joints: Mechanical joints consisting of bell, socket, gland, gasket, bolt and nuts shall conform to ANSI Standard A21.11. Bolts shall be high strength low alloy steel, such as "Corten," or "U.S. Alloy," T-head type having hexagonal nuts. Bolts and nuts shall be machined true and nuts shall be tapped at right angles to a smooth bearing surface.

5.8.2.4 Push-on Joints: Single seal gasket push-on type joints shall conform to the requirements of ANSI A21.11 and shall be U.S. Pipe "Tyton," American Cast Iron Pipe Company "Fastite," CLOW Corporation "Super Bell Tite," or HCUD approved equal.

5.8.2.5 Restrained Joints: Restrained joints shall be installed where RW pipe alignment changes direction. Restrained joints shall not be of the type that requires field welding or grooves cut into the pipe barrel for restraint. The length of pipe sections to be restrained shall be determined by the EOR and noted on the drawings. Shop drawings from the manufacture shall be submitted to and approved by the EOR and HCUD prior to actual construction. The restraining joints for mechanical joint fittings and valves shall be ROMAC Industries Grip Ring, EBAA Iron MEGALUG, or HCUD approved equal. See Detail 15.

5.8.2.6 Gaskets: Pipe and fitting gaskets, conforming to ANSI A21.11, shall be made of viton (fluorocarbon elastomer), EPDM (Ethylene Propylene Diene Monomer) or SBR (Styrene-Butadiene Rubber).

5.8.2.7 Encasement: All DIP and fittings shall be encased in polyethylene in accordance with ANSI/AWWA C105/A21.5 when installed in hostile soil conditions.

5.8.2.8 HCUD may require pre-cast 500 pound concrete Thrust Blocks in addition to restrained joints. (See Detail 14)

5.8.3 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS

5.8.3.1 Pipe color shall be purple for RW mains.

5.8.3.2 PVC pressure pipe 4-inches through and including 12-inches in diameter, shall meet the requirements of AWWA C900, laying length of 20-feet shall have the same outside diameter (OD) as DIP and be compatible for use with ductile iron fittings. PVC pipe less than 4-inches in diameter shall not be accepted by HCUD.

5.8.3.3 Fittings: Fittings for PVC Pressure Pipe (4-inches through 12-inches) shall be ductile iron with mechanical joints, with a minimum pressure rating of 250 PSI and shall conform to the requirements of ANSI A21.10 and A21.4.

5.8.3.4 Joints: Joints for PVC pressure pipe shall be of the compression rubber gasket type and the pipe line installation shall be as recommended by the pipe manufacturer.

5.8.4 PIPELINE LOCATORS

5.8.4.1 Magnetic Locator Tape (MLT): RW mains shall have MLT installed 18-inches above the RW line. The tape shall be continuous between and secured to each inline flow control valve. Where other RW lines join the mainline, the MLT used to locate these lines shall be secured to the mainline. The MLT shall be a minimum of 5 ½ mil thick, 2-inches wide material, sandwiched between two layers of polyethylene, purple in color (denoting reclaimed water), with black 1-inch warning letters stating “Caution – Reclaimed Water Buried Below.”

5.8.4.2 Electronic Locating Wire (ELW): RW mains shall have ELW. The ELW shall be Direct Burial #10 AWG Solid (.1019" diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 600# average tensile break load, 30 mil. high molecular weight-high density Purple polyethylene jacket complying with ASTM-D-1248, 30 volt rating. The ELW shall be Copperhead Industries, LLC (part # 1030P-HS) or HCUD approved equal. The ELW shall be securely installed on top of the pipe at the 12 o'clock position. The ELW shall be held in place with nylon cable ties (or equal means of attachment as approved by HCUD), at each end and 48-inches on center of the pipe sections. The ELW shall be of sufficient length as to be extendable to the surface at each valve box, allowing a current to be induced through the wire to detect the location of the pipeline. The ELW shall be brought to the surface inside each valve pad, through a length of 3-inch PVC pipe, with a threaded cap to protect the wire and terminate with a tinned waterproof wire connector. See Detail 23. The ELW on service lines shall be connected to the main ELW and end 24-inches past the curb stop valve with a tinned waterproof wire connector. The cost of the ELW shall be included with the line items for pipe. ELW "stub-out" access points shall not exceed 1000-feet intervals and shall be noted on the final "As Builts" (Record Drawings) set of plans. See Detail 21. Instances where the ELW requires splicing, the two ends of the ELW shall be joined together with a silicon injected wire nut of the proper size.

5.8.5 VALVES AND APPURTENANCES: All valves shall be the manufacturer's standard design for the service intended and shall bear the maker's name, pressure rating, type, size and flow direction arrow cast on the body. Valves shall open left (counter clockwise) with an arrow cast in the metal of operating hand wheels or nuts indicating the direction of opening. All underground valves 3-inches and larger, shall have mechanical joints.

5.8.5.1 Gate Valves (GV)

5.8.5.1.1 A GV 2-inches in size shall have a full port opening, non-rising stem with hand wheel, thread to thread, and resilient wedge. Example is AVK, No. 03-063-43 with hand wheel. See Detail 23.

5.8.5.1.2 A GV 4-inch, up to and including 12-inch for in-ground applications, shall be of the resilient seat type (meeting the requirements of AWWA C500/C509). These valves shall have non-rising stems, with a 2-inch square AWWA style operating nut, and shall open when the nut is turned counterclockwise when viewed from above the activator nut. Valves shall have mechanical joint ends and shall be furnished complete with joint accessories. Exposed or above-ground GV's shall be outside stem and yoke (OS&Y) flanged joint type. GV's shall be "Ken-Seal" as manufactured by Kennedy; "Metroseal" by U.S. Pipe, AVK, or HCUD approved equal.

5.8.5.1.3 The GV activator nut shall be protected by an adjustable cast iron valve case (similar or equal to Tyler, 2 piece, No. 461-S for short applications or 562-S for long applications) with a cast iron lid marked "RECLAIMED WATER" on top. Valve cases shall be secured by a concrete pad, 24-inches by 24-inches by 6-inches thick, with #4 rebar inside the pad perimeter and shall conform to final grade and slope. If the GV activator nut shall be installed lower than 36-inches below grade, the contractor shall install a valve operation nut extension device, such as Pentek 5¼" Roadway Valve Box or HCUD approved equal. The contractor shall modify the valve case to ensure soil does not enter the operating nut area, causing GV operational difficulties.

5.8.5.2 Combination Air-Vacuum Release Valve (ARV) Assembly: The ARV shall be of the type that shall release air from the line when pressurized and keep air from entering the line when not pressurized. The ARV shall be located at high elevation points on the pipeline and operate automatically. The ARV shall have a 2-inch inlet, corporation stop, saddle, - brass or SS pipe and fittings, and locking curb stop. The ARV, fittings, and piping shall be rated for a minimum working pressure of 150 PSI. The ARV shall be installed in traffic bearing shallow pre-cast concrete manholes. Construction plans and "As Builts" (Record drawing) shall include ARV stationing on both the plan and profile views. See Detail 33 for manhole rings and covers.

5.8.5.3 Valve Boxes

5.8.5.3.1 Valve boxes for all valves installed below ground shall be cast iron. Valve boxes shall be adjustable to fit the depth of earth cover over the valve and shall be designed so as to prevent the transmission of surface loads directly to the valve or piping. Valve boxes shall have a minimum interior diameter of 5 ¼ -inches. Valve box extension shall be installed to reserve a minimum of 50% of the adjustment for a future extension. Valve boxes shall be supplied by Tyler MFG., two piece, with cast iron lid, No. 461-S for short applications or 562-S for long applications.

5.8.5.3.2 The operating nut should not exceed 36-inches below finished grade. If conditions require that the operating nut exceeds 36-inches, a mechanical extension shall be attached to the valve. The contractor shall install a valve operation nut extension device, such as Pentek 5¼ "Roadway Valve Box" or HCUD approved equal.

5.8.5.3.3 The cast iron cover of the valve box shall be marked "RECLAIMED WATER" painted purple, and shall be secured with a concrete pad to prevent tipping or moving. See Detail 23.

5.8.5.4 Concrete Valve Pad and Brass Tag: Valve boxes located outside of paved areas shall be cast in a 24-inch x 24-inch x 6-inch thick 3000 PSI concrete slab. See Detail 23 for Standard Pad installations.

## 5.9 METERING

### 5.9.1 METERING REQUIREMENTS

5.9.1.1 The EOR shall incorporate all the requirements of this Manual, with attention to Sub-Section 5.12 titled "SYSTEM IDENTIFICATION AND SIGNAGE" of this section. See Detail 11.

5.9.1.2 A master meter shall be installed on a RW distribution line at each location where a distribution line is connected to a RW transmission main in order to measure the flow entering a development. The size and actual placement location of each meter shall be reviewed and approved by the HCUD. The entire meter assembly, including valves and pipes, shall be colored purple, as required by Florida Department of Environmental Protection (FDEP) rules. See Detail 6.

5.9.1.3 All commercial customers with a common area irrigation system shall be metered. All meters shall be appropriately sized and approved. Meters sized 2-inches or smaller shall be installed by HCUD; meters larger than 2-inches shall be approved by HCUD and installed by the customer. All RW meters larger than 2" for commercial customers, including multi-family common area connections, shall be installed above ground. The pipe supports used in the meter assemblies installations shall be adjustable

5.9.1.4 Although meter bypass loops are typically not required because RW delivery is not essential to the public health and safety, HCUD reserves the right to request a bypass design on a case-by-case basis.

5.9.2 METER SPECIFICATIONS (Without Telemetry) (See Table 5-2)

5.9.2.1 Meter size shall be dependent upon flow characteristics. The EOR will size the meter or meters and are subject to approval by HCUD.

5.9.2.2 Meters sized 1-inch and smaller shall be a displacement type, magnetically driven Neptune T-10 with an E-coder R900i Pit Version MIU Register.

5.9.2.3 Meters sized 1.5" thru and including 20" shall be a Neptune HP Turbine with an E-coder R900i Pit Version MIU Register.

5.9.2.4 All RW meters shall be ordered with the "RECLAIMED" trim option.

5.9.2.5 Meters (with telemetry) for golf courses and other major users are specified in Sub-Section 5.10.

5.9.2.6 Meters shall be provided with calibration certification tags prior to installation.

Table 5-2

Reclaimed Water Meter Applications
Without Telemetry

| Meter Type *1* | Meter Size *2, 3* | Meter Application<br>Not Limited To |
|---|---|---|
| | | |
| Displacement Type<br>Neptune T-10 | ⅝" to and including 1" | Irrigation and Some Commercial Irrigation |
| Neptune Turbine<br>(High Flow w/ Little Low Flow) | 1.5" to and including 20" | Commercial Irrigation |

*1 All Neptune Radio Read Meters require an E-Coder R900i Pit Version MIU Register.*
*2 Neptune Strainers are required on all 3" and larger meter assembly installations.*
*3 All meter assemblies larger than 2" require above ground installation.*

5.9.3 PLACING METER IN SERVICE: Once the RW distribution line has been flushed and the meter installation is complete, filling the main line and meter with RW shall be accomplished by slowly opening the inlet valve and allowing trapped air to be released slowly at the highest point available. Avoid the rapid expulsion of large amounts of entrapped air because this could cause damage to the internal measuring mechanism of the meter.

5.10 GOLF COURSES AND OTHER MAJOR USERS: Golf courses and other major water users (over 100,000 GPD annual average) shall be required to install a meter with telemetry to monitor and control the flow entering the property. Prior to connection to the RW system, the golf course owner shall enter into a service agreement with HCUD.

5.10.1 METER: The meter shall be a Sparling Model 657 TIGERMAG, or HCUD approved equal, and meet the general requirements of Section 5.

5.10.2 RECEIVING POND LEVEL SENSOR: The golf course owner shall be responsible for installing and maintaining, in good operating condition, one or more pond level sensors. The type of sensor shall be approved by HCUD before installation.

5.10.3 CONTROL VALVE, OPERATOR, AND ELECTRONIC CONTROLLER: A control valve shall be installed at the metering station and shall be configured to sustain upstream pressure and shall shut off when commanded from a remote location. In conjunction with an electronic controller, the valve shall maintain a flow rate set point.

5.10.4 PRESSURE GAUGES AND PRESSURE TRANSMITTER: Pressure gauges shall be installed on the supply side and distribution side of the metered connection.

5.10.5 REAL-TIME MONITORING AND CONTROL PANEL: The real-time monitoring and control field panel shall be installed at the metering station shall contain all components necessary for both local and remote monitoring and control of the metering stations. A programmable logic controller (PLC), radio, operator interface unit (OIU), electronic interface controller, open/close/remote hand-switch, power supplies to control circuitry and surge suppression shall be included. The contractor shall provide all programming necessary for operating system.

## 5.11 SYSTEM IDENTIFICATION AND SIGNAGE

### 5.11.1 PIPING AND APPURTENANCES

5.11.1.1 All RW piping and appurtenances shall be clearly identified as RW facilities, with purple colorings and signage.

5.11.1.2 The standard color is Pantone Purple 522C for all RW system piping and above-ground appurtenances including valves, meter assemblies, and BPA(s).

5.11.1.2.1 PVC distribution mains shall be color purple which shall be an integral part of the pipe materials.

5.11.1.2.2 DIP distribution mains shall be color coded with a purple spiral-wrapped tape with adhesive backing. Adhesive tape shall be at least 5-mils in thickness, at least 2-inches in width, and made of an aluminum material sandwiched between two layers of polyethylene. Above-ground piping shall be painted Pantone Purple 522C.

5.11.1.2.3 PET service pipe or tubing. Service pipe shall be the standard purple or identified with a purple stripe with the words “RECLAIMED WATER” at 8-inch intervals.

5.11.1.3 Valves installed below ground shall be identified with a SS tag to differentiate RW valves from potable water valves.

5.11.1.4 Covers for all valve boxes, meter and service boxes, and other below-ground devices on the RW system shall be painted purple and shall be permanently embossed “RECLAIMED WATER” and bear the words in English and Spanish “DO NOT DRINK, NO BEBER,” together with the equivalent standard international symbol.

### 5.11.2 SIGNAGE: See Detail 11.

5.11.2.1 The public shall be notified of the use of RW by posting advisory signs designating the nature of the reuse project area.

5.11.2.2 Signage shall be placed, as appropriate, at entrances to residential neighborhoods where RW is used for landscape irrigation and at prominent locations at all commercial sites, including multi-family developments, office parks, schools, churches, condominiums, residential common areas, recreational developments, and golf courses. A notification method for golf courses, for example, shall be to post of advisory signs at the entrance to a golf course and at the first and tenth tees as well as notes on scorecards.

5.11.2.3 Advisory signs shall be color-coded Pantone Purple 522C and include the following text in English and Spanish "RECLAIMED WATER” and “DO NOT DRINK, NO BEBER,” together with the equivalent standard international symbol. A typical advisory sign is shown in Detail 11.

5.11.2.4 Advisory signs shall be posted adjacent to lakes or ponds used to store RW and shall include the following text in English and Spanish “DO NOT DRINK, NO BEBER” and “DO NOT SWIM, NO NADIR,” together with the equivalent standard international symbols, in addition to “RECLAIMED WATER”.

5.12 PIPE HANDLING AND CUTTING, INSTALLATION OPTIONS AND PRESSURE TESTING PROCEDURES: See section 3.12.

5.13 FINAL ACCEPTANCE OF PROJECT BY HCUD: (See sub-paragraph 1.23). Final acceptance of the RW distribution system(s) and release of the performance bond by HCUD shall occur when the following conditions shall be met:

5.13.1 Pressure tests, preliminary and final inspections shall have been made and the results are acceptable to HCUD.

5.13.2 Improvements are found to be in accordance with the applicable regulations of HCUD, Hernando County, State and Federal regulatory agencies.

5.13.3 Documents requesting to place water system(s) into service shall have been obtained and acceptance awarded from the appropriate regulatory agencies.

5.13.4 HCUD receives from the EOR, two sets of signed, sealed and dated “As Builts” (Record Drawings) and one complete set of electronic “As Builts” (Record Drawings), prepared in the “.dwg” format and “.pdf” format.

5.13.5 The contractor shall ensure that all above ground valves, piping and mechanical joint fittings are protected from the elements by painting the exposed valves and fittings with an approved oil based enamel paint. The paint used to protect reclaimed water system valves, piping and fittings shall be purple in color.

5.13.6 All applicable utility easements have been acquired, recorded and documents received by HCUD.

# SECTION 6

# SPECIFICATIONS FOR EMERGENCY POWER GENERATOR SYSTEMS (EPGS)

SECTION 6: EMERGENCY POWER GENERATOR SYSTEM (EPGS)

CONTENTS

SECTION 6

# EMERGENCY POWER GENERATOR SYSTEM (EPGS) SPECIFICATIONS

## 6.1 GENERAL DESCRIPTION

6.1.1 SCOPE: The system shall provide Emergency Power Generator system (EPGS) in event of failure of normal power supply failure. The system shall consist of a liquid cooled diesel engine, an AC alternator and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified hereinafter.

6.1.2 GENERAL REQUIREMENTS

6.1.2.1 The EPGS shall consist of an internal combustion diesel engine, alternating current (AC) power generator, governor, coupling and all controls, factory tested as a complete unit, representative of the model of the system to be installed.

6.1.2.2 The EPGS shall conform to applicable National Electrical Code (NEC) and applicable inspection authorities and must be available with the Underwriters Laboratories (UL) 2200 listing as a stationary engine-generator assembly.

6.1.3 MANUFACTURER QUALIFICATIONS

6.1.3.1 The EPGS shall be supplied by Tradewinds, Onan, or MTU Onsite Energy.

6.1.3.2 To be classified as a manufacturer, the builder of the EPGS shall be identified as a “one source of supply and warranty” responsibility.

6.1.3.3 The manufacturer shall supply printed literature and brochures describing the standard series specified.

## 6.2 EMERGENCY POWER GENERATOR SYSTEM (EPGS) COMPONENT SPECIFICATIONS

6.2.1 ENGINE SPECIFICATIONS

6.2.1.1 The engine shall be a liquid cooled, diesel fueled, turbocharged after-cooled engine of 4-stroke cycle design.

6.2.1.2 The engine shall be cooled with a unit mounted radiator, fan, water pump, and closed coolant recovery system providing visual diagnostic means to determine if the system is operating with a normal engine coolant level. The radiator shall be designed for operation in 77-degrees Fahrenheit, 25-degrees Celsius ambient temperature.

6.2.1.3 The intake air filter(s) with replaceable paper element(s) shall be mounted on the unit. Full pressure lubrication shall be supplied by a positive displacement lubrication oil pump. The engine shall have a replaceable oil filter(s) with an internal bypass. Engine coolant and oil drain extensions, equipped with pipe plugs, shall be provided to outside of the engine mounting base for cleaner and more convenient engine servicing. A fan guard shall be installed for personnel safety.

6.2.1.4 The engine shall have a battery charging direct current (**DC**) alternator with a transistorized voltage regulator. Remote 2-wire starting shall be by a solenoid shift, electric starter motor.

6.2.1.5 Engine speed shall be controlled by an isochronous governor to maintain alternator frequency within 0.5% from no load to full load alternator output. Steady state regulation shall be 0.25%.

6.2.1.6 The engine fuel system shall be designed for operation on No. 2 diesel fuel. A primary fuel filter, water separator, manual fuel priming pump, fuel shutoff solenoid and all fuel lines shall be installed at the factory.

6.2.1.7 The primary diesel fuel filter element shall be replaceable and capable of removing contaminants of 10-microns.

6.2.1.8 The engine shall have a thermostatically controlled water jacket heater unit(s) to aid in quick starting with wattage as recommended by the manufacturer. The contractor shall provide proper branch circuit from normal utility power source. See Details 35 A and B. Line voltage of the jacket heater shall be the same as the main service voltage. Adding transformers is not acceptable.

6.2.1.9 Sensing elements shall be located on the engine for low oil pressure shutdown, high coolant temperature shutdown, low coolant level shutdown, over-speed shutdown and over-crank shutdown. These sensors shall be connected to the control panel using a wiring harness with the following features: wire number labeling on each end of the wire run for easy identification, a molded rubber boot to cover the electrical connection on each sensor to prevent corrosion and all wiring to be run in flexible conduit for protection from the environment and any moving objects.

6.2.1.10 The following items shall be installed at the factory on each EPGS:

6.2.1.10.1 The engine shall have a SS, flexible connector to couple the engine exhaust manifold to the exhaust system.

6.2.1.10.2 The Fuel System:

6.2.1.10.2.1 Shall have a factory installed, double walled, base mounted fuel tank with sufficient capacity to operate the engine for a minimum period of 48-continuous hours operation rated load. The design engineer shall consider the engine size and fuel efficiency when recommending the fuel tank capacity. The capacity of the fuel tanks shall NOT exceed 500 gallons unless approved by HCUD.

6.2.1.10.2.2 Shall have a convenient stub up area for electrical conduit entry.

6.2.1.10.2.3 Shall have the structural integrity to support the engine-generator set and carry the UL 142 mark.

6.2.1.10.2.4 Shall have the minimum features of but not limited to, all welded construction, lockable fuel filler cap, fuel gauge, low fuel level alarm, fuel line check valve, vent and fittings for fuel supply, fuel return and filler tube.

6.2.1.10.3 The base fuel tank shall be supplied with emergency venting capacity as per NFPA 37.

6.2.2 ALTERNATOR SPECIFICATIONS

6.2.2.1 The alternator shall be a 4-pole revolving field type. The stator shall be direct connected to the engine to insure permanent alignment. The generator shall meet temperature rise standards for Class "H" insulation, operate within Class "F" standards for extended life. All leads shall be extended into an AC connection panel. The alternator shall be protected by internal thermal overload protection and an automatic reset field circuit breaker.

6.2.2.2 One step load acceptance shall be 10-percent of EPGS nameplate rating and meet the requirements of NFPA 110 paragraph 5-13.2.6. The generator set and regulator must sustain at least 90-percent of rated voltage for 10-seconds with 250-percent of rated load at near zero power factor connected to its terminals when equipped with direct or brushless excitation. 300-percent short circuit current shall be selectable on units equipped with permanent magnet exciters shall have a selectable 300-percent short circuit current.

6.2.2.3 A solid state voltage regulator designed and built by the alternator manufacturer shall be used to control output voltage by varying the exciter magnetic field to provide + or – 1-percent regulation during stable load conditions. Should an extremely heavy load drop the output frequency, the regulator shall have a voltage droop of 4-Volts/Hertz to maximize motor starting capability. The frequency at which this droop operation begins shall be adjustable, allowing the EPGS to be properly matched to the load characteristics insuring optimum system performance. Additional rheostats for matching generator voltage, droop, and stability characteristics to the specific load conditions shall be available.

6.2.2.4 A NEMA 1 panel that is an integral part of the EPGS shall be provided to allow for a convenient location in which to make electrical output connections. A fully rated, isolated neutral shall be included by the EPGS manufacturer to insure proper sizing.

6.2.2.5 The electric plant shall be mounted with vibration isolators on a welded steel base that shall permit suitable mounting to any level surface.

6.2.2.6 The following items shall be provided and installed at the factory: A main line circuit breaker carrying the UL mark shall be factory installed. The breaker shall be rated per the manufacturer's recommendations and mounted in the genset connection box. The line side connections shall be made at the factory. Output lugs shall be provided for load side connections.

6.2.3 SYSTEM CONTROLS SPECIFICATIONS

6.2.3.1 All engine, alternator controls and instrumentation shall be designed, built, wired, tested and shock mounted in a NEMA 1 enclosure to the engine-generator set by the manufacturer. It shall contain panel lighting, a fused DC circuit to protect the controls and a +/-5% voltage adjusting control. This panel shall be able to be rotated 90-degrees in either direction for correct installation.

6.2.3.2 The EPGS shall contain a complete 2-wire automatic engine start-stop control which starts the engine on closing contacts and stops the engine on opening contacts. A programmable cyclic cranking limiter shall be provided to open the starting circuit after eight attempts if the engine has not started within that time.

6.2.3.3 The panel shall include; meters to monitor AC voltage, AC current and AC frequency with a phase selector switch, an emergency stop switch, an audible alarm, battery charger fuse, and a programmable engine control and monitoring module.

6.2.3.4 The control panel shall include: a manual, off, auto switch; four Light Emitting Diode Lamps (LED) to indicate 1) Not In Auto, 2) Alarm Active, 3) Generator Running, 4) Generator Ready; a data entry keypad and a digital display panel.

6.2.3.5 The module shall display all pertinent unit parameters including:

6.2.3.5.1 Generator Status - Current unit status shall be in real time.

6.2.3.5.2 Instrumentation - Real time readouts of the engine and alternator analog values for oil pressure, coolant temperature, fuel level, DC battery voltage, and run time hour meter.

6.2.3.5.3 Generator Commands - Current demand shall start/stop engine operation.

6.2.3.5.4 Alarm Status Conditions: High or low AC voltage, high or low battery voltage, high or low frequency, low or pre-low oil pressure, low water level, low water temperature, high and pre-high engine temperature, high, low and critical low fuel levels (where applicable), over-crank, over-speed, unit not in "Automatic Mode", eight user programmable digital channels and four user programmable analog channels.

6.2.3.5.5 Alarm Log - There shall be an electronic memory of last fifty alarm events.

6.2.3.5.6 Operating parameters - There shall be access to and manipulation of the current operating parameters and alarm limits.

6.2.3.5.7 Software Information - There shall be version information and module display test function.

6.2.3.6 A list of equipment to be installed at the engine-generator set manufacturer's facility shall be provided by the manufacturer.

6.2.3.7 A list of equipment to be provided by the EPGS manufacturer and shipped loose with the unit shall be provided to HCUD by the manufacturer.

## 6.3 ADDITIONAL UNIT SPECIFICATONS

### 6.3.1 UNIT ACCESSORIES

6.3.1.1 The following equipment is to be installed at the EPGS manufacturer’s facility:

6.3.1.1.1 The enclosure shall be aluminum, wind rated to 150 mph, weather protective, and sound attenuating: The EPGS shall be factory enclosed with corner posts, uprights and headers. The roof shall aid in the runoff of water and include a drip edge. The enclosure shall be coated with electrostatically applied power paint, baked and finished to manufacturer’s specifications. The enclosure shall be completely lined with sound deadening material of self extinguishing design. The enclosure shall have large, hinged removable doors to allow access to the engine, alternator and control panel. Hinges and all exposed fasteners shall be SS. Each door shall have lockable hardware with identical locks all keyed to CH751. Padlocks do not meet this specification. When generator is installed on the site, the combined sound level for the exhaust, engine, fan and all components of the generator must not exceed 75 DBA peak measured at 7 meters for all generators 1000 KW or smaller. HCUD will have the option to measure and record sound levels once the generator is installed. At the minimum, enclosure shall have a level II (2) sound attenuation or approved equal. Enclosure shall be completely line with 1 inch thick, UL 94, HF 1 listed acoustic insulation. Exhaust discharge should be directed to minimize exhaust noise toward nearest residential or commercial property. HCUD shall have the option of requiring vertical exhaust discharge. For generators larger than 1000 KW shop drawings must be submitted for HCUD approval. The shop drawings must detail enclosure materials of construction, overall dimensions, layout, sound attenuation capabilities, and highest sound level measured at 7 meters from generator.

6.3.1.1.2 The exhaust silencer(s) shall be provided of the size as recommended by the manufacturer to achieve required exhaust sound level maximum of 75 DBA measured at 7 meters for all generators 1000 KW or smaller. For larger generators, proposed exhaust silencer(s) shall be submitted to HCUD for approval prior to start of construction. The silencer(s) shall be mounted within the weather protective enclosure for reduced exhaust noise and shall be connected to the engine with a flexible, seamless, stainless steel exhaust connection. A rain cap shall be attached to and terminate the exhaust pipe. All components shall be properly sized to assure operation without excessive back-pressure during operation.

6.3.1.1.3 A heavy duty, lead acid battery set rated at 135AMP/HOURS including connecting battery cables shall be installed by the EPGS manufacturer.

6.3.1.1.4 Provide an automatic dual rate battery charger manufactured by the EPGS supplier. The automatic equalizer system shall monitor and limit the charge current to 10-amps. The charger shall be protected against a reverse polarity connection. The battery charger shall be factory installed in the automatic transfer switch whenever possible. A battery charger mounted inside the weatherproof enclosure of the EPGS may be acceptable with HCUD approval. The battery charger line voltage shall be the same as the main service voltage. Adding transformers is not acceptable.

6.3.1.1.5 The following equipment shall also be provided by the EPGS set manufacturer and shipped loose with the unit: spring type vibration isolators of the type, size and number recommended to support the EPGS set to reduce transmitted vibration.

## 6.4 AUTOMATIC TRANSFER SWITCH (ATS) SPECIFICATIONS

6.4.1 GENERAL: The ATS shall be furnished by Thompson Technology, Onan or the manufacturer of the EPGS set so as to maintain system compatibility and local service responsibility for the complete emergency power system. The ATS shall be listed by UL, Standard 1008, with circuit breaker protection. Representative production samples of the ATS supplied shall have demonstrated through testing the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle shall be the electrically operated transfer from normal to emergency and back to normal. Wiring shall comply with NEC Table 373-6(b). The manufacturer shall furnish schematic and wiring diagrams for the particular ATS and a typical wiring diagram for the entire system.

6.4.2 RATINGS AND PERFORMANCE SPECIFICATIONS: The ATS shall be a 3-pole design rated for 200-amps continuous operation in ambient temperatures of –20 degrees Fahrenheit (-30 degrees Celsius) to +140 degrees Fahrenheit (+60 degrees Celsius). Main power switch contacts shall be rated for 600 VOLT-AC minimum. The ATS supplied shall have a minimum withstand and closing rating when fuse protected of 200,000 amperes. Where the line side over-current protection is provided by circuit breakers, the short circuits withstand and closing ratings shall be 25,000 amperes Root Mean Square (RMS). These RMS symmetrical fault current ratings shall be the rating listed in the UL listing or component recognition procedures for the ATS. All withstand tests shall be performed with the over-current protective devices located external to the ATS.

### 6.4.3 ATS CONSTRUCTION SPECIFICATIONS

6.4.3.1 The ATS shall be double throw construction, positively electrically and mechanically interlocked to prevent simultaneous closing and mechanically held in both normal and emergency positions. Independent break before make action shall be used to positively prevent dangerous source to source connections. When switching the neutral, this action prevents the objectionable ground currents and nuisance ground fault tripping that can result from overlapping designs. The ATS shall be approved for manual operation. The electrical operating means shall be by electric solenoid. Every portion of the contactor shall be positively mechanically connected. No clutch or friction drive mechanism shall be allowed. This ATS shall not contain integral over-current devices in the main power circuit, including molded case circuit breakers or fuses.

6.4.3.2 The ATS electrical actuator shall have an independent disconnect means to disable the electrical operation during manual switching. Main switch contacts shall be high pressure silver alloy with arc chutes to resist burning and pitting for long life operation.

### 6.4.4 ATS CONTROLS SPECIFICATONS

6.4.4.1 All control equipment shall be mounted on the inside of the cabinet door in a metal lockable enclosure with transparent safety shield to protect all solid state circuit boards. This shall allow for ease of service access when main cabinet lockable door is open, but shall prevent access by unauthorized personnel. Control boards shall have installed cover plates to avoid shock hazard while making control adjustments. The solid state voltage sensors and time delay modules shall be plug-in circuit boards with silver or gold contacts for ease of service.

6.4.4.2 A solid state under voltage sensor shall monitor all phases of the normal source and provide adjustable ranges for field adjustments for specific application needs. Pick-up and drop-out settings shall be adjustable from a minimum of 70-percent to a maximum of 95-percent of nominal voltage. A utility sensing interface shall be used, stepping down system voltage of 277/480 VOLT 3-phase to 24-VOLT, helping to protect the printed circuit board from voltage spikes and increasing personnel safety when troubleshooting.

6.4.4.3 An automatic “Alert to Start” signal switch to start the EPGS in the event of a power interruption shall be installed. A set of contacts shall close to start the engine and open for engine shutdown. A solid state time delay start, adjustable 0.1 to 10-seconds, shall delay this signal to avoid nuisance startups on momentary voltage dips or power outages.

6.4.4.4 Transfer the load to the EPGS after it reached proper voltage (adjustable from 70 to 90-percent of system voltage) and frequency (adjustable from 80 to 90-percent of system frequency). A solid state time delay adjustable from 5-seconds to 3-minutes shall delay this transfer to allow the engine-generator to warm up before application of load. There shall be a switch to bypass this warm-up timer when immediate transfer shall be required.

6.4.4.5 Re-transfer the load to the line after normal power restoration. A return to utility timer (adjustable from 1 to 30-minutes) shall delay this transfer to avoid short term normal power restoration.

6.4.4.6 The operating power for transfer and re-transfer shall be obtained from the source to which the load is being transferred. Controls shall provide an automatic re-transfer of the load from emergency to normal if the emergency source fails with the normal source available.

6.4.4.7 Signal the EPGS to stop after the load re-transfers to normal. A solid state engine cool-down timer (adjustable from 1 to 30-minutes) shall permit the engine to run unloaded to cool down before shutdown. Should the utility power fail during this time, the switch shall immediately transfer back to the generator.

6.4.4.8 Provide an engine minimum run timer (adjustable from 5 to 30-minutes) to ensure an adequate engine run period.

6.4.4.9 Provide a solid state plant exercise clock to allow selection of any combination of days of the week and the time of day for the EPGS exercise period. The clock shall have a one-week cycle and be powered by the load side of the transfer switch. A battery shall be supplied to maintain the circuit board clock operation when the load side of the transfer switch is de-energized. Include a switch to select if the load shall transfer to the engine-generator set during the exercise period.

6.4.4.10 The transfer switch shall have a time delay neutral feature to provide a time delay (adjustable from 0.1 to 10-seconds) during the transfer in either direction, during which time the load is isolated from both power sources. This allows residual voltage components of motors or other inductive loads (such as transformers) to decay before completing the switching cycle. A switch shall be provided to bypass all transition features when immediate transfer is required.

6.4.4.11 The transfer switch shall have an in-phase monitor which allows the switch to transfer between live sources if their voltage waveforms become synchronous within 20-electrical degrees within 10-seconds of transfer initiation signal. A switch shall be provided to bypass this feature if not required.

6.4.4.12 If the in-phase monitor shall not allow such a transfer, the control shall default to time delay neutral operation. Switches with in-phase monitors which do not default to time delay neutral operation shall not be acceptable.

6.4.4.13 Front mounted controls shall include a selector switch to provide for a NORMAL TEST mode with full use of time delays. FAST TEST mode, which bypasses all time delays to allow for testing the entire system in less than 1-minute, or AUTOMATIC mode to set the system for normal operation.

6.4.4.14 Provide bright lamps to indicate the transfer switch position in either UTILITY (white) or EMERGENCY (red). A third lamp is needed to indicate STANDBY OPERATING (amber). These lights shall be energized from utility or the engine-generator set.

6.4.4.15 Provide manual operating handle to allow for manual transfer. This handle shall be mounted inside the lockable enclosure so as to be accessible only by authorized personnel.

6.4.4.16 Provide a safety disconnect switch to prevent load transfer and automatic engine start while performing maintenance. This switch shall also be used for manual transfer switch operation.

6.4.4.17 Provide LED status lights to give a visual readout of the operating sequence. This shall include utility on, engine warm-up, standby ready, transfer to standby, in-phase monitor, time delay neutral, return to utility, engine cool-down and engine minimum run. A “signal before transfer” lamp shall be supplied to operate from optional circuitry.

6.4.4.18 The transfer switch mechanism and controls shall be mounted in a NEMA 4X enclosure.

## 6.5 ADDITIONAL PROJECT SPECIFICATIONS

6.5.1 FACTORY TESTING: Before shipment of the EPGS, the engine-generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include: verifying that all safety shutdowns are functioning properly, verify single step load pick-up per NFPA 110-1996, Paragraph 5-13.2.6., verify transient and voltage dip responses and steady state voltage and speed (frequency) checks.

6.5.2 OWNER/OPERATOR MANUALS: Three sets of owner/operator manuals specific to the product supplied shall accompany delivery of the EPGS. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model shall be included.

6.5.3 EPGS INSTALLATION SPECIFICATIONS: The contractor shall install the complete EPGS including all fuel connections in accordance with the manufacturer's recommendations as reviewed by the EOR.

6.5.4 SERVICE SPECIFICATIONS: Supplier of the EPGS and associated items shall have permanent service facilities with factory trained service personnel on 24-hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service. Service contracts shall also be available from the manufacturer.

6.5.5 WARRANTY SPECIFICATIONS:

6.5.5.1 The standby EPGS system components, engine generator and instrumentation panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of 5-years. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge for parts, labor and travel for the first 2-years. Parts shall be replaced free for the remaining 3-years of the warranty period.

6.5.5.2 The warranty period shall commence when the EPGS shall be placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) shall not be acceptable. Satisfactory warranty documents shall be provided.

6.5.6 PRE-OPERATION, OPERATION AND LOAD TEST SPECIFICATIONS:

6.5.6.1 The supplier of the EPGS and associated items covered herein shall provide factory trained technicians to check out the completed installation and to perform an initial startup tests to include: ensuring the engine starts (both hot and cold) within the specified time, verification of engine parameters within specification, verify no load frequency and voltage, adjusting if required and test all automatic shutdowns of the engine-generator.

6.5.6.2 4-Hour Load Bank Test: The contractor shall perform a 4-hour electric load bank test, at 100-percent load, upon the completion of the installation of an EPGS. The contractor shall schedule such tests to coincide with key HCUD Technical Personnel being on site during the test.

6.5.6.3 The emergency power system shall be designed to the specified manufacturer's electrical and physical characteristics. The equipment sizing, spacing, amounts, electrical wiring, ventilation equipment, fuel and exhaust components shall be sized and designed for the specified system. No substitutions shall be made without written permission from HCUD. Upon approval of the specific EPGS, the contractor shall bear responsibility for the installation, coordination and test-operation of the system as well as any engineering and re-design costs which shall result from such substitutions. A separate list of all printed circuit boards with part numbers and current pricing shall also be included.

6.5.6.4 Software needed to program the generator and the transfer switch shall be provided to HCUD upon installation.

# SECTION 7

# SPECIFICATIONS FOR TRENCHLESS PIPE INSTALLATION

## (HORIZONTAL DIRECTIONAL DRILL)

THIS SECTION IS DIVIDED INTO THE FOLLOWING FIVE SUB-SECTIONS:

# SECTION 7

# SPECIFICATIONS FOR HORIZONTAL DIRECTIONAL DRILLING (HDD)

# SECTION 7: HORIZONTAL DIRECTIONAL DRILLING (HDD) CONTENTS

# SECTION 7

# HORIZONTAL DIRECTIONAL DRILLING (HDD)

## 7.1 GENERAL DESCRIPTION

7.1.1 SCOPE OF WORK: The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

7.1.2 QUALITY ASSURANCE: These requirements specify a wide range of procedural precautions to insure the essential aspects of a directional bore installation are adequately controlled. Adherence to the specifications contained herein shall in no way relieve the contractor of the ultimate responsibility for the satisfactory completion of the work.

7.1.3 PROJECT SCHEDULE AND COOPERATION: The project schedule shall be established on the basis of working a normal work schedule including five days per week, single shift, and eight hours per day or four days per week, single shift, ten hours per day. General items of work, such as bacteriological testing, leakage and pressure testing, density testing and final inspections, shall be scheduled during the normal work schedule.

7.1.4 WARRANTY: The contractor shall supply to HCUD an 18-month unconditional warranty. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications.

7.1.5 REFERENCED STANDARDS: The work shall conform to applicable provisions of applicable AWWA standards and of the HCUD Water and Sewer Specifications Manual.

7.1.6 PERMITS: Permits for all work shall be obtained by the owner. The contractor shall verify the existence of all permits before commencing any work on the project.

7.1.7 NOTIFICATION: HCUD shall be notified 48-hours (minimum) in advance of starting the drilling work. The Directional Bore procedure shall not begin until the proper preparations (see work plan) for the operation have been completed.

7.1.8 SUBMITTALS

7.1.8.1 WORK PLAN: Prior to beginning work, the contractor shall submit to the HCUD a work plan detailing the procedure and schedule to be used to properly execute the project.

7.1.8.2 SHOP DRAWING SUBMITTALS: Actual catalog data, brochures and descriptive literature shall not be required for items of standard usage which meet the requirements of the HCUD Water and Sewer Standards Manual. Any specialty item not shown in this manual shall require a complete shop drawing submittal for any material which may, in the opinion of the EOR, not be in compliance with the HCUD Water and Sewer Standards.

7.1.8.3 Record Drawing: The contractor shall submit as-built records in duplicate to the EOR within five days after completing the pull back, The as-built records shall include a plan, profile, and all information recorded during the progress of the work, including all subsurface anomalies identified by Ground Penetrating Radar (GPR) or vacuum excavation.

7.1.8.4 ELECTRONIC LOCATOR WIRE (ELW) AND INSTALLATION: The contractor shall furnish and install two (2) ELWs with the horizontal directional drilled mains. The ELW shall be Direct Burial #10 AWG Solid (.1019" diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 600# average tensile break load, 30 mil. high molecular weight-high density polyethylene jacket complying with ASTM-D-1248, 30 volt rating. The ELW shall be Copperhead Industries, LLC. The exterior color shall be blue for water mains and green for sewer mains. The Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations: and all "exit point locations". There shall be a maximum length or intervals of 500-feet between locate wire stations. No splices or connections shall be allowed underground. After installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

## 7.2 SITE PREPARATION

7.2.1 Prior to any alterations to worksite, the contractor shall video tape entire work area, one copy of which shall be given to HCUD and one copy to remain with the contractor.

7.2.2 The contractor shall coordinate utilities locates with Sunshine State One-Call of Florida, Inc., (#800-CAREFUL). Once the locate service has field marked all utilities, the contractor shall verify each utility (including any service laterals, i.e. water, sewer, cable, gas, electric, phone, etc.) and those within each paved area. Verification may be performed utilizing GPR, hand dig, or vacuum excavation. Prior to initiating drilling, the contractor shall record on the drawings both the horizontal and vertical location of the utilities off of a predetermined baseline. The contractor shall utilize the GPR over the projected bore path whether utilities are located in the horizontal drill pathway or not, in order to reduce the opportunity of conflicting with any unforeseen obstructions.

7.2.3 Work site shall be graded and filled to provide a level working area. No alterations beyond what is required for operations are to be made. The contractor shall confine all alteration activities to designated work areas

7.2.4 Following drilling operations, the contractor shall demobilize equipment and restore the work-site to original condition. All excavations shall be backfilled and compacted to a minimum of 95% of original density.

7.2.5 ENVIRONMENTAL PROTECTION: The contractor shall provide and install silt fencing between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by state, federal and local regulations. The contractor shall place hay bales, or approved protection, to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. The contractor shall adhere to all applicable environmental regulations including environmental condition stated in local, state and federal permits.

7.2.6 SAFETY: The contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

7.2.7 PERSONNEL QUALIFICATIONS CERTIFICATION: DIRECTIONAL BORING: All personnel shall be fully trained in the respective duties as part of the directional drilling crew and in safety. A supervisor thoroughly familiar with the equipment and type of work to be performed shall be in direct charge and control of the operation at all times. The supervisor shall be present at the job site during the actual directional bore operation. The contractor shall have a sufficient number of competent workers on the job at all times to insure the directional bore procedure shall be made in a timely and satisfactory manner.

## 7.3 DELIVERY, STORAGE AND HANDLING OF MATERIALS

7.3.1 The contractor shall inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.

7.3.2 The contractor shall unload and store materials as near the place where the work shall be performed, allowing for minimum handling. Material shall be stored under cover or out of direct sun light. Do not store materials directly on the ground. Keep all materials free of dirt, debris and vermin.

7.3.3 The contractor is responsible for obtaining, transporting and sorting any fluids, including water, to the work site.

7.3.4 Disposal of fluids shall be the responsibility of the contractor. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. The contractor shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants and sod damaged, discolored or stained by drilling fluids.

## 7.4 EQUIPMENT REQUIREMENTS

7.4.1 GENERAL: The directional drilling equipment shall consist of a safe directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used, a guidance system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system.

7.4.2 DRILLING SYSTEM

7.4.2.1 DRILLING RIG: The directional drilling machine shall consist of a safe power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head.

7.4.2.2 DRILL HEAD: The drill head shall be controllable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

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

7.4.2.4 DRILL PIPE: Shall be constructed of high quality 4130 seamless tubing, grade D or better.

7.4.3 GUIDANCE SYSTEM: A Magnetic Guidance System (MGS) or proven gyroscopic system shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to eighty feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction) The guidance system shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 1.5 meters horizontally.

7.4.4 DRILLING FLUID (MUD) SYSTEM

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

7.4.4.2 DRILLING FLUIDS: Clean and safe drilling fluid shall be composed of clean water, appropriate additives and clay. No potentially hazardous material shall be used in drilling fluid. Drilling Fluids shall be bentonite slurry only.

7.4.4.3 DELIVERY SYSTEM: The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. A berm, minimum of 12-inches high, shall be maintained around drill rigs, entry and exit pits to prevent spills into the surrounding environment.

7.4.4.5 DRILLING FLUID RECYCLING SYSTEM: The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid shall be stockpiled for later use or disposal.

## 7.5 DRILLING PROCEDURES

7.5.1 DRILL PATH: Prior to drilling, the contractor shall mark up drawings to determine the drill pathway. The drawings shall be on site at all times during the drill operation.

7.5.2 GUIDANCE SYSTEM: The contractor shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string torsional and axial, measure drilling fluid discharge rate and pressure. The EOR shall have access to instrumentation and readings at all times during operation.

7.5.3 PILOT HOLE: The pilot hole shall be drilled along the path shown on the plans and profile drawings or as directed by the EOR in the field. Unless approved otherwise by the EOR, the pilot-hole tolerances shall be as follows:

7.5.3.1 ELEVATION: As shown on the plans.

7.5.3.2 ALIGNMENT: +5-Feet and within 3-feet of right-of-way or easement boundary.

7.5.3.3 CURVE RADIUS: The pilot hole radius shall be no less than 75% of the maximum bending radius of the pipe being installed.

7.5.3.4 ENTRY POINT LOCATION: The exact pilot hole entry point shall be within +5-feet of the location shown on the drawing or as directed by the EOR in the field.

7.5.3.5 EXIT POINT LOCATION: The exit point location shall be within + 5-feet of the location shown on the drawing or as directed by the EOR in the field.

7.5.3.6 LIMITATIONS ON DEPTH: If not noted on the plans, 6" pipe and smaller shall be installed with a depth of 3 to 5-feet. 8” pipe thru 12” pipe shall be installed with a depth of 3 to 6-feet unless required to install the pipe deeper due to utility conflicts. Pipe larger than 12” shall be specifically required by the EOR and approved by HCUD. Where utilities cross under FDOT roads, the depth of cover shall comply with applicable FDOT permit.

7.5.3.7 WATER MAIN AND NON-WATER MAIN SEPARATION REQUIREMENTS: The minimum separation requirements between a water main and a non-water main shall be as per FDEP regulations.

7.5.4 PULL BACK: After successfully reaming bore hole, the contractor will pull the pipe through the bore hole. In front of the pipe shall be a swivel and reamer to compact bore hole walls. Once pull-back operations have commenced, operations shall continue without interruption until pipe is completely pulled into bore hole. In the event that pipe becomes stuck, the contractor shall cease pulling operations to allow any potential hydro-lock to subside. If pipe remains stuck, the contractor will notify EOR to discuss options and before work shall proceed.

# SECTION 7A

# SPECIFICATIONS FOR FUSIBLE POLYVINYLCHLORIDE PIPE

## SECTION 7A: FUSIBLE POLYVINYLCHLORIDE PIPE

SUB-SECTION PAGE

# SECTION 7A
# FUSIBLE POLYVINYLCHLORIDE PIPE

## 7A.1 GENERAL

7A.1.1 This section specifies fusible polyvinylchloride pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling and storage.

7A.1.2 MANUFACTURER REQUIREMENTS: Fusible polyvinylchloride pipe shall be tested at the extrusion facility for properties required to meet all applicable parameters as outlined in either AWWA C900, AWWA C905, applicable sections of ASTM D2241, ASTM D3034, or ASTM F679. Testing priority shall be in conformance with AWWA C900 and AWWA C905, except for pipe made to the ASTM D3034 or ASTM F679 standards, which shall be tested to those standards. All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784.

7A.1.3 FUSION TECHNICIAN REQUIREMENTS: Fusion Technician shall be fully qualified by the pipe supplier to install fusible polyvinylchloride pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

7A.1.4 SPECIFIED PIPE SUPPLIERS: Fusible polyvinylchloride pipe shall be used as manufactured under the trade names FusibleC-900®, Fusible C-905®, and FPVC™ for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusion process shall be as patented by Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051. Owner and Engineer are aware of no other supplier or fusible polyvinylchloride pipe that is an equal to this specified pipe supplier and product.

7A.1.5 ELECTRONIC LOCATOR WIRE (ELW) AND INSTALLATION: The contractor shall furnish and install two (2) ELWs with the horizontal directional drilled mains. The ELW shall be Direct Burial #10 AWG Solid (.1019" diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 600# average tensile break load, 30 mil. high molecular weight-high density polyethylene jacket complying with ASTM-D-1248, 30 volt rating. The ELW shall be Copperhead Industries, LLC. The exterior color shall be blue for water mains and green for sewer mains. The Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations: and all "exit point locations". There shall be a maximum length or intervals of 500-feet between locate wire stations. No splices or connections shall be allowed underground. After installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

## 7A.2 PRODUCTS

### 7A.2.1 FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR POTABLE WATER

7A.2.1.1 Fusible polyvinylchloride pipe shall conform to AWWA C900 or AWWA C905, and/or ASTM D2241 or ASTM D1785 for IPS standard dimensions if applicable. Testing shall be in accordance with AWWA standards for all pipe types.

7A2.1.2 Rework material shall be allowed per AWWA C900 and AWWA C905 standards.

7A.2.1.3 Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

7A.2.1.4 Fusible polyvinylchloride pipe shall be manufactured in standard 20', 30' or 40' nominal length.

7A.2.1.5 Fusible polyvinylchloride pipe shall be blue in color for potable water use.

7A.2.1.6 Pipe generally shall be marked per AWWA C900 or AWWA C905, and shall include as a minimum:

7A.2.1.6.1. Normal pipe size

7A 2.1.6.2 PVC

7A.2.1.6.3. Dimension Ratio, Standard Dimension Ratio or Schedule

7A.2.1.6.4. AWWA pressure class or standard pressure rating for non-AWWA pipe

7A.2.1.6.5. AWWA Standard designation number or pipe type for non-AWWA pipe

7A.2.1.6.6. NSF-61 mark verifying suitability for potable water service

7A.2.1.6.7. Extrusion production-record code

7A.2.1.6.8. Trademark or trade name

7A.2.1.6.9. Cell Classification 12454 and/or PVC material code 1120 may also be included

7A.2.1.7 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7A.2.2 FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR NON-POTABLE WATER

7A.2.2.1 Fusible polyvinylchloride pipe shall conform to AWWA C900 or AWWA C905, and/or ASTM D2241 or ASTM D1785 for IPS standard dimensionality, if applicable. Testing shall be in accordance with AWWA standards for all pipe types.

7A.2.2.2 Rework material shall be allowed per AWWA C900 and AWWA C905 standards.

7A.2.2.3 Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

7A.2.2.4 Fusible polyvinylchloride pipe shall be manufactured in a standard 20', 30' or 40' nominal length.

7A.2.2.5 Fusible polyvinylchloride pipe shall be purple in color for reclaim, reuse, or other non-potable distribution or conveyance. Fusible polyvinylchloride pipe shall be white in color for raw water collection and transmission, or other non-potable resource or irrigation water uses.

7A.2.2.6 Pipe generally shall be marked per AWWA C900 or AWWA C905, and shall include as a minimum:

7A.2.2.6.1 Nominal pipe size

7A.2.2.6.2 PVC

7A.2.2.6.3 Dimension Ratio, Standard Dimension Ratio or Schedule

7A.2.2.6.4 AWWA pressure class or standard pressure rating for non-AWWA pipe

7A.2.2.6.5 AWWA Standard designation number or pipe type for non-AWWA pipe

7A.2.2.6.6 Extrusion production-record code

7A.2.2.6.7 Trademark or trade name

7A.2.2.6.8 Cell Clarification 12454 and/or PVC material code 1120 may also be included

7A.2.2.6.9 For reclaim water service, the wording: “Reclaimed Water, NOT for Potable Use”

7A.2.2.7 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7A.2.3 FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR WASTEWATER

7A.2.3.1 Fusible polyvinylchloride pipe shall conform to AWWA C900 or AWWA C905, and/or ASTM D2241 or ASTM D1785 for IPS standard dimensionality, if applicable. Testing shall be in accordance with AWWA standards for all pipe types.

7A.2.3.2 Rework material shall be allowed per AWWA C900 and AWWA C905 standards.

7A.2.3.3 Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

7A.2.3.4 Fusible polyvinylchloride pipe shall be manufactured in a standard 20’, 30’ or 40’ nominal length.

7A.2.3.5 Fusible polyvinylchloride pipe shall be green in color for wastewater use.

7A.2.3.6 Pipe generally shall be marked per AWWA C900 or AWWA C905, and shall include as a minimum:

7A.2.3.6.1 Nominal pipe size

7A.2.3.6.2 PVC

7A.2.3.6.3 Dimension Ratio, Standard Dimension Ratio or Schedule

7A.2.3.6.4 AWWA pressure class or standard pressure rating for non-AWWA pipe

7A.2.3.6.5 AWWA Standard designation number or pipe for non-AWWA pipe

7A.2.3.6.6 Extrusion production-record code

7A.2.3.6.7 Trademark or trade name

7A.2.3.6.8 Cell Classification 12454 and/or PVC material code 1120 may also be included.

7A.2.3.7 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7A2.4 FUSIBLE POLYVINYLCHLORIDE NON-PRESSURE PIPE FOR WASTEWATER OR SURFACE WATER

7A.2.4.1 Fusible polyvinylchloride pipe shall conform to ASTM D3034 or ASTM F679.

7A.2.4.2 Fusible polyvinylchloride pipe may instead conform to AWWA C900 or AWWA C905, and/or ASTM D2241 or ASTM D1785 for IPS standard dimensionality, if applicable. Testing shall be in accordance with AWWA standards for any of these pipe types.

7A.2.4.3 Rework material shall be allowed per ASTM D3034, ASTM F679, AWWA C900 or AWWA C905 standards.

7A.2.4.4 Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

7A.2.4.5 Fusible polyvinylchloride pipe shall be manufactured in a standard 20', 30' or 40' normal length.

7A.2.4.6 Fusible polyvinylchloride pipe shall be green in color for wastewater use. Fusible polyvinylchloride pipe shall be white in color for surface or storm water use.

7A.2.4.7 Pipe generally shall be marked per AWWA C900 or AWWA C905, and shall include as a minimum:

7A.2.4.7.1 Nominal pipe size

7A.2.4.7.2 PVC

7A.2.4.7.3 Dimension Ratio, Standard Dimension Ratio or Schedule (omit for ASTM D 3034 or ASTM F679 pipe)

7A.2.4.7.4 Pipe legend or stiffness designation, or AWWA pressure class or standard pressure rating for non-AWWA pipe

7A.2.4.7.5 AWWA Standard designation number or pipe type for non-AWWA pipe (omit for ASTM D3034 or ASTM F679 pipe)

7A.2.4.7.6 Extrusion production-record code

7A.2.4.7.7 Trademark or trade name

7A.2.4.7.8 Cell Classification 12454 and/or PVC material code 1120 may also be included.

7A.2.4.8 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7A.2.5 FUSION JOINTS: Unless otherwise specified, fusible polyvinylchloride pipe lengths shall be assembled in the field with butt-fused joints. The contractor shall follow the pipe supplier's written instructions for this procedure. All fusion joints shall be completed as described in this specification.

7A.2.6 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS

7A.2.6.1 Connections shall be defined in conjunction with the coupling of project piping, as well as the tie-ins to other piping systems.

7A.2.6.2 DUCTILE IRON MECHANICAL AND FLANGED FITTINGS:
Acceptable fitting for use with fusible polyvinylchloride pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10 and AWWA/ANSI C111/A21.11.

7A.2.6.2.1. Connections to fusible polyvinylchloride pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.

7A.2.6.2.2. Bends, tees and other ductile iron fittings shall be restrained with the use of trust blocking or other means as indicated in the construction documents.

7A.2.6.2.3. Ductile iron fittings and glands must be installed per the manufacturer's recommendations and instructions.

7A.2.6.3 PVC GASKETED, PUSH-ON FITTINGS

Acceptable fittings for use with fusible polyvinylchloride pipe shall include standard PVC pressure fittings conforming to AWWA C900 or AWWA C905.

7A.2.6.3.1. Acceptable fittings for use joining fusible polyvinylchloride pipe other sections o fusible polyvinylchloride pipe or other sections of PVC Pipe shall include gasketed PVC, push-on type couplings and fitting, including bends, tees and couplings as shown in the drawings.

7A.2.6.3.2. Bends, tees and other PVC fittings shall be restrained with the use of thrust blocking or other restraint products as indicated in the construction documents.

7A.2.6.3.3. PVC gasketed, push-on fittings and mechanical restraints, if used, must be installed per the manufacturer's recommendations.

7A.2.6.4 SLEEVE-TYPE COUPLINGS

7A.2.6.4.1. Sleeve-type mechanical couplings shall be manufactured for use with PVC pressure pipe, and may be restrained or unrestrained as indicated in the construction documents.

7A.2.6.4.2. Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

7A.2.6.5 EXPANSION AND FLEXIBLE COUPLINGS

7A.2.6.5.1. Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.

7A.2.6.5.2. Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

7A.2.6.6 CONNECTION HARDWARE:

7A.2.6.6.1 Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

## 7A.2.7 CONNECTIONS FOR GRAVITY SANITARY SEWER AND NON-PRESSURE APPLICATIONS

7A.2.7.1 The following connections are to be used in conjunction with tie-ins to other non-pressure, gravity sewer piping and/or structures, and shall be as indicated in the construction documents.

7A.2.7.2 PVC GASKETED, PUSH-ON COUPLINGS

7A.2.7.2.1 Acceptable couplings for joining fusible polyvinylchloride pipe to other sections of fusible polyvinylchloride pipe or other sections of PVC pipe shall include gasketed PVC, push-on type couplings as shown in the drawings.

7A.2.7.2.2 PVC gasketed, push-on fittings and/or restraint hardware must be installed per the manufacturer's recommendations.

7A.2.7.3 SLEEVE-TYPE COUPLINGS

7A.2.7.3.1 Sleeve-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.

7A.2.7.4 EXPANSION AND FLEXIBLE COUPLINGS

7A.2.7.4.1 Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.

7A.2.7.5 CONNECTION HARDWARE

7A.2.7.5.1 Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

7A.2.7.6 CONNECTION TO SANITARY SEWER MANHOLES AND STRUCTURES

7A.2.7.6.1 Fusible polyvinylchloride pipe shall be connected to manholes and other structures to provide a leak-free, properly graded flow into or out the manhole structure.

7A.2.7.6.2 Connections to existing manholes and structures shall be as specified and shown on the drawings.

7A.2.7.6.2.1 For a cored or drilled opening provide a flexible, watertight connection that meets and/or exceeds ASTM C923.

7A.2.7.6.2.2 For a knock out opening, provide a watertight connection (waterstop or other method) meeting the material requirements of ASTM C923 that is securely attached to the pipe with stainless steel bands or other means.

7A.2.7.6.2.3 Grout opening in manhole wall with non-shrink grout. Pour concrete collar around pipe and outside manhole opening. Provide flexible pipe joint or flexible connector within 2' of collar.

7A.2.7.6.3 Connections to a new manhole or structure shall be as indicated in the construction documents.

7A.2.7.6.3.1 A flexible, watertight gasket per ASTM C923 shall be cast integrally with riser section(s) for all precast manhole and structures.

7A.2.7.6.3.2 Drop connections shall be required where shown on drawings.

7A.2.7.6.3.3 Grout internal joint space with non-shrink grout.

## 7A.3 EXECUTION

### 7A.3.1 DELIVERY AND OFF-LOADING

7A.3.1.1 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Owner or Engineer.

7A.3.1.2 Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify Owner or Engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color and type.

7A.3.1.3 Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all pipe supplier's instructions and recommendations shall be followed.

7A.3.1.4 Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut or gouge the pipe are strictly prohibited.

7A.3.1.5 During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.

7A.3.1.6 If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damage. Pipe should be carefully lowered, not dropped, from trucks.

### 7A.3.2 HANDLING AND STORAGE

7A.3.2.1 Any length of pipe showing a crack or which has received a blow that may have cause an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the Owner or Engineer.

7A.3.2.2 Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the Owner or Engineer.

7A.3.2.3 Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

7A.3.2.4 Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.

7A.3.2.5 If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required preventing excess heat accumulation.

7A.3.2.6 Pipe shall be stored and stacked per the pipe supplier's instructions and recommendations.

7A.3.3 FUSION PROCESS

7A.3.3.1 GENERAL

7A.3.3.1.1 Fusible polyvinylchloride pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's recommendations.

7A.3.3.1.2 Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.

7A.3.3.1.3 Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine.

7A.3.3.1.4 Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following properties, including the following elements;

7A.3.3.1.4.1 HEAT PLATE – Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's recommendations.

7A.3.3.1.4.2 CARRIAGE – Carriage shall travel smoothly with no binding at less than 50psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

7A.3.3.1.4.3 GENERAL MACHINE – Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

7A.3.3.1.4.4 DATA LOGGING DEVICE – The current version of the pipe supplier's recommended and compatible software shall be used. Protective case shall be utilized for the hand held wireless portion of the unit. Datalogger operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

7A.3.3.1.5 Other equipment specifically required for the fusion process shall include the following:

7A.3.3.1.5.1 Pipe rollers shall be used for support of pipe to either side of the machine.

7A.3.3.1.5.2 A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement and/or windy weather.

7A.3.3.1.5.3 Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

7A.3.3.1.5.4 Facing blades specifically designed for cutting fusible polyvinylchloride pipe.

7A.3.3.2 JOINT RECORDING

7A.3.3.2.1 Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of thermoplastic pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data logger shall be logged manually and be included in the fusion Technician's joint report.

7A.3.4 GENERAL INSTALLATION

7A.3.4.1 Installation instructions from the pipe supplier shall be followed for all installations.

7A.3.4.2 The fusible polyvinylchloride pipe will be installed in a manner so as not to exceed the recommended bending radius.

7A.3.4.3 Where fusible polyvinylchloride pipe is installed by pulling in tension, the recommended Safe Pulling Force, according to the pipe supplier, will not be exceeded.

7A.3.5 PREPARATION PRIOR TO MAKING CONNECTIONS INTO EXISTING PIPING SYSTEMS

7A.3.5.1 Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the Contractor shall:

7A.3.5.1.1 Field verify location, size, piping material and piping system of the existing pipe.

7A.3.5.1.2 Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.

7A.3.5.1.3 Have installed all temporary pumps and/or pipes in accordance with established connection plans.

7A.3.5.1.4 Have on hand necessary pipe stoppers, pancake flanges or other items which may be necessary should an existing valve or appurtenance fail to seal properly.

7A.3.5.2 Unless otherwise approved by the Engineer, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

7A.3.6 PIPE SYSTEM CONNECTIONS

7A.3.6.1 Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's recommendations and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's recommendations.

7A.3.7 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

7A.3.7.1 Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping per Uni-Pub-8.

7A.3.7.2 All other connections requiring a larger diameter shall be made with a pipe connection as specified and indicated on the drawings.

7A.3.7.3 Equipment used for tapping shall be made specifically for tapping PVC pipe:

7A.3.7.3.1 Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe. "Hole saws" made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.

7A.3.7.3.2 Manually operated or power operated drilling machines may be used.

7A.3.7.4 Taps may be performed while the pipeline is filled with water and under pressure ("wet" tap), or when the pipeline is not filled with water and not under pressure ("dry" tap).

7A.3.8 TESTING

7A.3.8.1 Testing shall comply with all local building codes, statutes, standards, local jurisdiction, and laws.

7A.3.8.2 HYDROSTATIC TESTING AND LEAKAGE TESTING FOR PRESSURE PIPING

7A.3.8.2.1 Hydrostatic and leakage testing shall comply with AWWA C605.

7A.3.8.2.2 For a simultaneous hydrostatic and leakage test, following installation, a pressure equal to 150% of working pressure at point of test, but not less than 125% of normal working pressure at highest elevation is applied. The duration of the pressure test is for two (2) hours.

7A.3.8.2.3 If hydrostatic testing and leakage testing are performed at separate times, following procedures as outlined in AWWA C605.

7A.3.8.2.4 In preparation for pressure testing the following parameters must be followed:

7A.3.8.2.4.1 All air must be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation stop valves, or corporation stop valves, vent piping in the testing hardware or end caps, or any other method which adequately allows air to escape the pipeline at all high points. Venting may also be accomplished by “flushing” the pipeline in accordance with the parameters and procedures as described in AWWA C605.

7A.3.8.2.4.2 The pipeline must be fully restrained prior to pressurization. This includes complete installation of all mechanical restraints per the manufacturer’s instructions and recommendations, whether permanent or temporary to the final installation. This also includes the installation and curing of any and all required thrust blocking. All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to the beginning of the test.

7A.3.8.2.4.3 Temporary pipeline alignments that are being tested, such as those that are partially installed in their permanent location shall be configured to minimize the amount of potentially trapped air in the pipeline.

7A.3.8.3 LEAKAGE TESTING FOR NON-PRESSURE PIPING

7A.3.8.3.1 Gravity sanitary sewers shall be tested for excessive leakage. This may include appropriate water or low pressure air testing. The leakage outward or inward (exfiltration or infiltration) shall not exceed 25 gallons per inch of pipe diameter per mile per day for any section of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of two feet. The air test, if used, shall be conducted in accordance with ASTM F1417 or UNI-B-6.

7A.3.8.3.2 The testing method selected shall properly consider the existing groundwater elevations during the test. If the test section fails the test for excessive leakage, the Contractor shall repair or replace all defective materials and/or workmanship.

7A.3.8.4 DEFLECTION TESTING FOR NON-PRESSURE PIPING

7A.3.8.4.1 After completion of the backfill, the Engineer or Owner may require that a deflection test be performed. If the test section fails the test for excessive deflection, the Contractor shall repair or replace all defective materials and/or workmanship at no additional cost to the Owner.

7A.3.8.4.2 Deflection tests should be conducted using a go/no-go mandrel. The mandrel's outside dimension shall be sized to permit no more than 7.5 percent deflection. The percent deflection shall be established from the base inside diameter of the pipe. If the internal beading of the joints for the pipe are not required to be removed, the mandrel shall account for this clearance as well. The mandrel shall be approved by the Owner or Engineer prior to use. Lines that permit safe entry may allow other deflection test options, such as directed measurements with extension rulers.

7A.3.8.5 DISINFECTION OF THE PIPELINE FOR POTABLE WATER PIPING

7A.3.8.5.1 After installation, the pipeline, having passed all required testing, shall be disinfected prior to being put into service. Unless otherwise directed by the Owner or Engineer, the Pipeline will be disinfected per AWWA C651.

7A.3.8.6 PARTIAL TESTING

7A.3.8.6.1 Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by HCUD.

7A.3.8.7 LOCATE WIRE TEST

7A.3.8.7.1 After pipe installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

# SECTION 7B

# SPECIFICATIONS FOR RESTRAINED JOINT POLYVINYLCHLORIDE PIPE

## SECTION 7B: RESTRAINED JOINT POLYVINYLCHLORIDE PIPE

SUB-SECTION PAGE

# SECTION 7B

# RESTRAINED JOINT POLYVINYLCHLORIDE PIPE

## 7B.1 GENERAL

7B.1.1 This section specifies restrained joint polyvinylchloride pipe from 4" to 12", including standards for dimensionality, testing, quality, safe handling and storage.

7B.1.2 MANUFACTURER REQUIREMENTS: Restrained joint polyvinylchloride pipe shall be tested at the extrusion facility for properties required to meet all applicable parameters as outlined in AWWA C900, applicable sections of ASTM D2122, ASTM D3139, or ASTM F477. Testing priority shall be in conformance with AWWA C900 standards. All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784. Acceptable restrained joint pipe is Diamond Lok – 21 manufactured by Diamond Plastics Corporation, or HCUD approved equal.

## 7B.2 PRODUCTS

7B.2.1 RESTRAINED JOINT POLYVINYLCHLORIDE PRESSURE PIPE FOR POTABLE WATER

7B.2.1.1 Restrained joint polyvinylchloride pipe shall conform to AWWA C900 and/or ASTM D2122 or ASTM D3139 for IPS standard dimensions if applicable. Testing shall be in accordance with AWWA standards for all pipe types.

7B.2.1.2 Restrained joint polyvinylchloride pipe shall be manufactured in standard 20' nominal length.

7B.2.1.3 Restrained joint polyvinylchloride pipe shall be blue in color for potable water use.

7B.2.1.4 Pipe generally shall be marked per AWWA C900 and shall include as a minimum:

7B.2.1.4.1 Normal pipe size

7B.2.1.4.2 PVC

7B.2.1.4.3 Dimension Ratio, Standard Dimension Ratio or Schedule

7B.2.1.4.4 AWWA pressure class or standard pressure rating for non-AWWA pipe

7B.2.1.4.5 AWWA Standard designation number or pipe type for non-AWWA pipe

7B.2.1.4.6 NSF-61 mark verifying suitability for potable water service

7B.2.1.4.7 Extrusion production-record code

7B.2.1.4.8 Trademark or trade name

7B.2.1.4.9 Cell Classification 12454 and/or PVC material code 1120 may also be included

7B.2.1.5 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7B.2.2 RESTRAINED JOINT POLYVINYLCHLORIDE PRESSURE PIPE FOR NON-POTABLE WATER

7B.2.2.1 Restrained joint polyvinylchloride pipe shall conform to AWWA C900 and/or ASTM D2122 or ASTM D3139 for IPS standard dimensionality, if applicable. Testing shall be in accordance with AWWA standards for all pipe types.

7B.2.2.2 Restrained joint polyvinylchloride pipe shall be manufactured in a standard 20' nominal length.

7B.2.2.3 Restrained joint polyvinylchloride pipe shall be purple in color for reclaim or reuse.

7B.2.2.4 Pipe generally shall be marked per AWWA C900 and shall include as a minimum:

7B.2.2.4.1 Nominal pipe size

7B.2.2.4.2 PVC

7B.2.2.4.3 Dimension Ratio, Standard Dimension Ratio or Schedule

7B.2.2.4.4 AWWA pressure class or standard pressure rating for non-AWWA pipe

7B.2.2.4.5 AWWA Standard designation number or pipe type for non-AWWA pipe

7B.2.2.4.6 Extrusion production-record code

7B.2.2.4.7 Trademark or trade name

7B.2.2.4.8 Cell Clarification 12454 and/or PVC material code 1120 may also be included

7B.2.2.4.9 For reclaim water service, the wording: "Reclaimed Water, NOT for Potable Use"

7B.2.2.5 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7B.2.3 RESTRAINED JOINT POLYVINYLCHLORIDE PRESSURE PIPE FOR WASTEWATER

7B.2.3.1 Restrained joint polyvinylchloride pipe shall conform to AWWA C900 and/or ASTM D2122 or ASTM D3139 for IPS standard dimensionality, if applicable. Testing shall be in accordance with AWWA standards for all pipe types.

7B.2.3.2 Restrained joint polyvinylchloride pipe shall be manufactured in a standard 20' nominal length.

7B.2.3.3 Restrained joint polyvinylchloride pipe shall be green in color for wastewater use.

7B.2.3.4 Pipe generally shall be marked per AWWA C900 and shall include as a minimum:

7B.2.3.4.1 Nominal pipe size

7B.2.3.4.2 PVC

7B.2.3.4.3 Dimension Ratio, Standard Dimension Ratio or Schedule

7B.2.3.4.4 AWWA pressure class or standard pressure rating for non-AWWA pipe

7B.2.3.4.5 AWWA Standard designation number or pipe for non-AWWA pipe

7B.2.3.4.6 Extrusion production-record code

7B.2.3.4.7 Trademark or trade name

7B.2.3.4.8 Cell Classification 12454 and/or PVC material code 1120 may also be included.

7B.2.3.5 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7B.2.4 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS

7B.2.4.1 Connections shall be defined in conjunction with the coupling of project piping, as well as the tie-ins to other piping systems.

7B.2.4.2 DUCTILE IRON MECHANICAL AND FLANGED FITTINGS

Acceptable fitting for use with restrained joint polyvinylchloride pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10 and AWWA/ANSI C111/A21.11.

7B.2.4.2.1 Connections to restrained joint polyvinylchloride pipe may be made using a restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.

7B.2.4.2.2. Bends, tees and other ductile iron fittings shall be restrained with the use of restrained retainer gland (mega-lug) or other means as indicated in the construction documents.

7B.2.4.2.3 Ductile iron fittings and glands must be installed per the manufacturer's recommendations and instructions.

7B.3 EXECUTION

7B.3.1 DELIVERY AND OFF-LOADING

7B.3.1.1 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Owner or Engineer.

7B.3.1.2 Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify Owner or Engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color and type.

7B.3.1.3 Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all pipe supplier's instructions and recommendations shall be followed.

7B.3.1.4 Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut or gouge the pipe are strictly prohibited.

7B.3.1.5 During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.

7B.3.1.6 If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damage. Pipe should be carefully lowered, not dropped, from trucks.

## 7B.3.2 HANDLING AND STORAGE

7B.3.2.1 Any length of pipe showing a crack or which has received a blow that may have cause an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the Owner or Engineer.

7B.3.2.2 Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the Owner or Engineer.

7B.3.2.3 Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

7B.3.2.4 Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.

7B.3.2.5 If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required preventing excess heat accumulation.

7B.3.2.6 Pipe shall be stored and stacked per the pipe supplier’s instructions and recommendations.

## 7B.3.3 GENERAL INSTALLATION

7B.3.3.1 Installation instructions from the pipe supplier shall be followed for all installations.

7B.3.3.2 The restrained joint polyvinylchloride pipe will be installed in a manner so as not to exceed the recommended bending radius.

7B.3.3.3 Where restrained joint polyvinylchloride pipe is installed by pulling in tension, the recommended Safe Pulling Force, according to the pipe supplier, will not be exceeded.

7B.3.3.4 ELECTRONIC LOCATOR WIRE (ELW) AND INSTALLATION: The contractor shall furnish and install two (2) ELWs with the horizontal directional drilled mains. The ELW shall be Direct Burial #10 AWG Solid (.1019" diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 600# average tensile break load, 30 mil. high molecular weight-high density polyethylene jacket complying with ASTM-D-1248, 30 volt rating. The ELW shall be Copperhead Industries, LLC. The exterior color shall be blue for water mains and green for sewer mains. The Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations: and all "exit point locations". There shall be a maximum length or intervals of 500-feet between locate wire stations. No splices or connections shall be allowed underground. After installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

7B.3.4 PREPARATION PRIOR TO MAKING CONNECTIONS INTO EXISTING PIPING SYSTEMS

7B.3.4.1 Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the Contractor shall:

7B.3.4.1.1 Field verify location, size, piping material and piping system of the existing pipe.

7B.3.4.1.2 Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.

7B.3.4.1.3 Have installed all temporary pumps and/or pipes in accordance with established connection plans.

7B.3.4.1.4 Have on hand necessary pipe stoppers, pancake flanges or other items which may be necessary should an existing valve or appurtenance fail to seal properly.

7B.3.4.1.5 Unless otherwise approved by the Engineer, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

7B.3.5 PIPE SYSTEM CONNECTIONS

7B.3.5.1 Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's recommendations and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's recommendations.

7B.3.6 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

7B.3.6.1 Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping per Uni-Pub-8.

7B.3.6.2 All other connections requiring a larger diameter shall be made with a pipe connection as specified and indicated on the drawings.

7B.3.6.3 Equipment used for tapping shall be made specifically for tapping PVC pipe:

7B.3.6.3.1 Tapping bits shall be slotted “shell” style cutters, specifically made for PVC pipe. “Hole saws” made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.

7B.3.6.3.2 Manually operated or power operated drilling machines may be used.

7B.3.6.4 Taps may be performed while the pipeline is filled with water and under pressure (“wet” tap), or when the pipeline is not filled with water and not under pressure (“dry” tap).

## 7B.4 TESTING

### 7B.4.1 HYDROSTATIC TESTING AND LEAKAGE TESTING FOR PRESSURE PIPING

7B.4.1.1 All pressure and leakage testing procedures shall be done in the presence of the HCUD Inspector and the EOR or his designated representative.

7B.4.1.2 PVC water mains shall be tested as a whole or in sections between valves. The mains shall be tested in accordance with Section 4, Hydrostatic Testing, AWWA C600-87 under an average hydrostatic pressure of not less than 150 PSI, using a 200 PSI gauge, for a minimum of 2-hours. The following Table 7B-1 shall be used when pressure testing PVC potable water mains. ANSI/AWWA C600-87 is a copyrighted document. Contact American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235, or www.awwa.org.

Table 7B-1

HYDROSTATIC TEST FORMULA FOR PVC PRESSURIZED WATERMAINS

$$L = [S \times D \times SQ.RT.\ of\ P \div 133{,}200] \times 2\ Hrs.$$

“L” = the allowable leakage (in gallons);
“S” = the length of pipe tested (in feet);
“D” = the nominal diameter of the pipe (in inches);
“P” = the required test pressure
SQ. RT. of P = square root of the required test pressure:
Potable Water Mains: SQ. RT. of P = square root of 150 = 12.25;
Reclaimed Water Mains: SQ. RT. of P = square root of 150 = 12.25;
Sewer Force Mains: SQ. RT. of P = square root of 125 = 11.18;

7B.4.1.3 All pumps, gauges and measuring devices shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation, shall be approved by the HCUD Inspector. All water for testing and flushing shall be potable water provided by the Contractor, at the developer’s expense, from a source approved by HCUD. The quantity of water used for testing, which shall be compared to the allowable loss quantity, shall be measured by pumping from a calibrated container, approved by the HCUD Inspector. All pressure and leakage testing shall be done in the presence of the HCUD Inspector and the EOR or his designated representative.

7B.4.1.4 When leakage occurs in excess of the specified amount, defective pipe, pipe joints or other appurtenances causing the loss shall be located and repaired at the expense of the contractor. If the defective portions cannot be located, the contractor, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a pipe main within the allowable leakage limits upon retesting.

7B.4.2 DISINFECTION OF THE PIPELINE FOR POTABLE WATER PIPING

7B.4.2.1 After completion of the water main pressure test, the contractor shall disinfect all pipe sections and fittings installed in the system. The contractor shall pay for and schedule with a state certified lab or HCHD for the applicable collection and bacteriological testing of samples from the project. Note: Contractors CAN NOT collect the water samples for the lab. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA C 651-92, “Disinfecting Water Mains,” and all appropriate approval agencies. Care should be taken to provide disinfection to the entire system, with sample collection points every 1200-feet, after which the lines shall be thoroughly flushed until water samples show a chlorine residual value equal to or less then the existing line. The disinfection process shall be completed and acceptable bacteriological samples test results received prior to HCUD accepting and placing the system into service.

7B.4.3 Locate Wire Test: After pipe installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

# SECTION 7C

# SPECIFICATIONS
# FOR
# CERTAINTEED CERTA-LOK

## SECTION 7C: CERTAINTEED CERTA-LOK

# SECTION 7C

# CERTAINTEED CERTA-LOK

## 7C.1 GENERAL

7C.1.1 This specification covers thrust-restrained Polyvinyl Chloride (PVC) Pipe, 4" – 12 ", with ductile iron pipe (DIP) outside diameters.

7C.1.2 CERTA-LOK may be used for potable water mains only.

7C.1.3 Pipe shall be colored blue.

7C.1.4 Products delivered under this specification shall be manufactured only from water distribution pipe and couplings conforming to AWWA C900. The restrained joint pipe system shall also meet all short and long term pressure test requirements of AWWA C900. Pipe, couplings, and locking splines shall be completely non-metallic to eliminate corrosion problems.

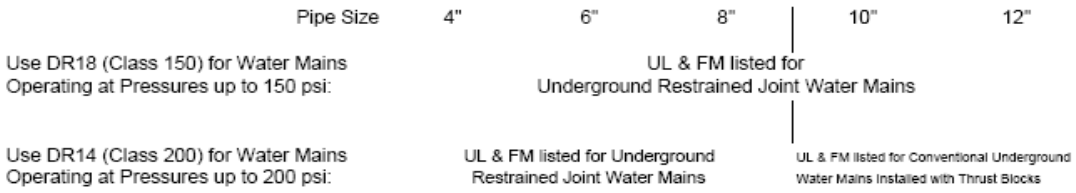
7C.1.5 ELECTRONIC LOCATOR WIRE (ELW) AND INSTALLATION: The contractor shall furnish and install two (2) ELWs with the horizontal directional drilled mains. The ELW shall be Direct Burial #10 AWG Solid (.1019" diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 600# average tensile break load, 30 mil. high molecular weight-high density polyethylene jacket complying with ASTM-D-1248, 30 volt rating. The ELW shall be Copperhead Industries, LLC. The exterior color shall be blue for water mains. The Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations: and all "exit point locations". There shall be a maximum length or intervals of 500-feet between locate wire stations. No splices or connections shall be allowed underground. After installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

## 7C.2 MATERIALS

7C.2.1 Pipe and couplings shall be made from unplasticized PVC compounds having a minimum call classification of 12454-B, as defined in ASTM D1784. The compound shall qualify for Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4°F, in accordance with the requirements of ASTM D2837.

## 7C.3 APPROVALS

7C.3.1 Restrained joint PVC pipe products shall have been tested and approved by Underwriters Laboratories and Factory mutual Research for Continuous use at rated pressures as follows:

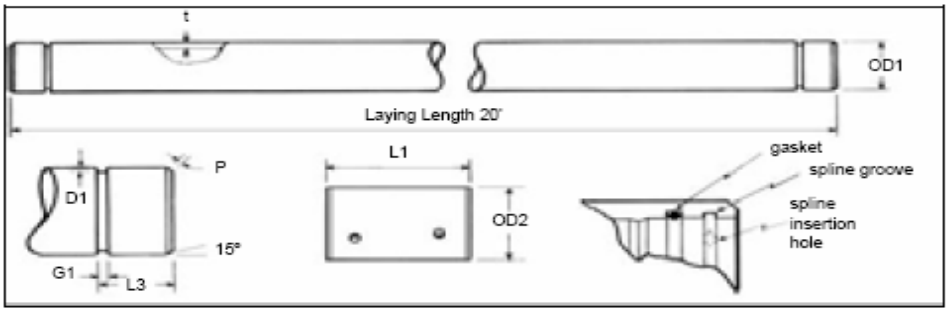



***Note:*** ***All UL/FM approvals shown are for a locking-joint system suitable for directional drilling and other underground applications.***

7C.3.2 Copies of agency approval reports or product listings shall be provided to the Engineer. Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with NSF 61 by an acceptable certifying organization.

## 7C.4 DIMENSIONS

7C.4.1 Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of AWWA C900, Thrust-restrained pipe shall be furnished in 4”, 6”, 8”, 10” and 12” sizes, in Class 150 (DR18) and Class 200 (DR14). Pipe shall be furnished in standard lengths of 20 feet. Dimensions of the pipe are shown below:




| Sizes | OD1 | t min. Class 150 | t min. Class 200 | P min. | P max. | L3 | G1 | L1 | OD2 | D1 min. | D1 max. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4" | 4.800" | .267" | .343" | 1/4" | 5/16" | 3.000" | .375" | 8.250" | 5.964" | .125" | .130" |
| 6" | 6.900" | .383" | .493" | 1/4" | 5/16" | 3.000" | .375" | 5.250" | 8.366" | .125" | .130" |
| 8" | 9.050" | .503" | .646" | 5/8" | 11/16" | 3.163" | .500" | 10.500" | 10.947" | .130" | .135" |
| 10" | 11.100" | .617" | .793" | 5/8" | 11/16" | 3.500" | .500" | 11.125" | 13.361" | .200" | .210" |
| 12" | 13.200" | .733" | .943" | 5/8" | 11/16" | 3.500" | .500" | 12.000" | 15.836" | .200" | .210" |

## 7C.5 JOINTS

7C.5.1 Pipe shall be joined using non-metallic couplings for form an integral system for maximum reliability and interchangeability. High-strength, flexible thermoplastic splines shall be inserted into mating, precision-machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading.

7C.5.2 Couplings shall be designed for use at or above the rated pressures of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139.

## 7C.6 WORKMANSHIP

7C.6.1 Pipe and couplings shall be homogeneous throughout and free from voids, cracks, inclusions and other defects, and shall be as uniform as commercially practicable in color, density and other physical characteristics.

## 7C.7 QUALITY CONTROL

7C.7.1 Every pipe and machined coupling shall pass the AWWA C900 hydrostatic proof test requirements of 4 times the pressure class for 5 seconds.

7C.8 IDENTIFICATION: Pipe and couplings shall be legibly and permanently marked in ink with the following minimum information:

**PIPE**

7C.8.1 Normal size (for example, 4 In.)

7C.8.2 PVC

7C.8.3 Dimension ratio (for example, DR18)

7C.8.4 AWWA pressure class (for example, Class 150)

7C.8.5 AWWA designation number for this standard which is ANSI/AWWA C900-97 (or latest edition)

7C.8.6 Manufacture's name or trademark and production record code

7C.8.7 Seal (mark) of the testing agency verifying the suitability of the pipe material for potable water service

7C.8.8 Seal (mark) of the certifying agencies which have tested and approved the pipe for use in fire protection systems

**COUPLINGS**

7C.8.9 Nominal size (for example, 4 In.)

7C.8.10 PVC

7C.8.11 AWWA pressure class (for example, Class 200)

7C.8.12 AWWA designation number for this standard which is ANSI/AWWA C900-97 (or latest edition)

7C.8.13 Manufacture's name or trademark

7C.8.14 Seal (mark) of the testing agency verifying the suitability of the pipe material for potable water service

7C.8.15 Seal (mark) of the certifying agencies which have tested and approved the pipe for use in fire protection systems

7C.9 APPROVED MANUFACTURERS

7C.9.1 C900/RJ™ PVC restrained-joint pipe from CertainTeed Corporation, or approved equal.

7C.10 TESTING

7C.10.1 HYDROSTATIC TESTING AND LEAKAGE TESTING FOR PRESSURE PIPING

7C.10.1.1 All pressure and leakage testing procedures shall be done in the presence of the HCUD Inspector and the EOR or his designated representative.

7C.10.1.2 PVC water mains shall be tested as a whole or in sections between valves. The mains shall be tested in accordance with Section 4, Hydrostatic Testing, AWWA C600-87 under an average hydrostatic pressure of not less than 150 PSI, using a 200 PSI gauge, for a minimum of 2-hours. The following Table 7C-1 shall be used when pressure testing PVC potable water mains. ANSI/AWWA C600-87 is a copyrighted document. Contact American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235, or www.awwa.org.

Table 7C-1

HYDROSTATIC TEST FORMULA FOR PVC PRESSURIZED WATERMAINS

$$L = [S \times D \times \text{SQ.RT. of } P \div 133{,}200] \times 2 \text{ Hrs.}$$

"L" = the allowable leakage (in gallons);
"S" = the length of pipe tested (in feet);
"D" = the nominal diameter of the pipe (in inches);
"P" = the required test pressure
SQ. RT. of P = square root of the required test pressure:
Potable Water Mains: SQ. RT. of P = square root of 150 = 12.25;
Reclaimed Water Mains: SQ. RT. of P = square root of 150 = 12.25;
Sewer Force Mains: SQ. RT. of P = square root of 125 = 11.18;

7C.10.1.3 All pumps, gauges and measuring devices shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation, shall be approved by the HCUD Inspector. All water for testing and flushing shall be potable water provided by the Contractor, at the developer's expense, from a source approved by HCUD. The quantity of water used for testing, which shall be compared to the allowable loss quantity, shall be measured by pumping from a calibrated container, approved by the HCUD Inspector. All pressure and leakage testing shall be done in the presence of the HCUD Inspector and the EOR or his designated representative.

7C.10.1.4 When leakage occurs in excess of the specified amount, defective pipe, pipe joints or other appurtenances causing the loss shall be located and repaired at the expense of the contractor. If the defective portions cannot be located, the contractor, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a pipe main within the allowable leakage limits upon retesting.

7C.10.2 DISINFECTION OF THE PIPELINE FOR POTABLE WATER PIPING

7C.10.2.1 After completion of the water main pressure test, the contractor shall disinfect all pipe sections and fittings installed in the system. The contractor shall pay for and schedule with a state certified lab or HCHD for the applicable collection and bacteriological testing of samples from the project. Note: Contractors CAN NOT collect the water samples for the lab. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA C 651-92, “Disinfecting Water Mains,” and all appropriate approval agencies. Care should be taken to provide disinfection to the entire system, with sample collection points every 1200-feet, after which the lines shall be thoroughly flushed until water samples show a chlorine residual value equal to or less then the existing line. The disinfection process shall be completed and acceptable bacteriological samples test results received prior to HCUD accepting and placing the system into service.

7C.10.3 Locate Wire Test: After pipe installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

# SECTION 7D

# SPECIFICATIONS FOR HIGH DENSITY POLYETHYLENE PIPE (HDPE)

# SECTION 7D: HIGH DENSITY POLYETHYLENE PIPE CONTENTS

## 7D.1 GENERAL DESCRIPTION

### 7D.1.1 HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

7D.1.1.1 MATERIALS: Materials used for the manufacturer of polyethylene pipe and fittings shall be PE3408 high density polyethylene meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting Manufacturer in PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 PSIG at 73°F per ASTM D2837. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

7D.1.1.2 POLYETHYLENE PIPE (4-inch and larger): HDPE Pipe shall conform to AWWA C906, SDR11, Ductile Iron Pipe (DIP) size and NSF 61 Standard. For pipe sizes 24-inch and larger, the HDPE may be IPS size, DR 11. Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, percent carbon, dimensions and either quick burst or ring tensile strength (equipment permitting).

7D.1.1.3 Nominal pipe sizes only are to be indicated on the drawings and bid form. Outside diameter of pipe is generally 1 to 2-inches greater than the nominal pipe diameter.

7D.1.1.4 SERVICE IDENTIFICATION: Permanent identification of pipe shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. The striping material shall be the same material as the pipe material except for color. The following colors shall be used to identify pressurized piping services:

7D.1.1.4.1 Blue - potable water

7D.1.1.4.2 Green - wastewater or force main

7D.1.1.4.3 Purple - reclaimed water

7D.1.1.4.4 Black - raw water

7D.1.1.5 POLYETHYLENE FITTINGS AND CUSTOM FABRICATION: Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer or trained personnel. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Fabricated fittings shall have the same working pressure as the mating pipe.

7D.1.1.6 MOLDED FITTINGS: Molded fittings shall be manufactured in accordance with ASTM D3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the test required under ASTM D3261.

7D.1.1.7 FABRICATED FITTINGS: Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe. Directional fittings 16-inch and larger such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets.

7D.1.1.8 ELECTROFUSION BRANCH SADDLES: Shall meet AWWA C-906, outlet shall comply with ASTM-D3261, and shall be specifically manufactured for HDPE pipe. This saddle may be utilized for wet-tap applications. These electrofusion fittings shall be designed and manufactured in accordance with ASTM Specifications F-1055 for use with HDPE or DIP.

7D.1.1.9 POLYETHYLENE FLANGE ADAPTERS: Flange adapter shall be made with sufficient throughbore length to be clamped in a butt fusion joining machine without the use of a stubend holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooved to provide gasketless sealing, or to restrain the gasket against blow-out. Below ground flange adapter may be utilized for 30-inches and larger, DIP and valves. Adapters for 24-inch and smaller shall utilize an MJ adapter.

7D.1.1.10 BACK-UP RINGS AND FLANGE BOLTS: Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. Convoluted style backup rings shall be used instead of the flat stock rings. The lap joint flange bore shall be chamfered to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

7D.1.1.11 POLYETHYLENE (PE) MECHANICAL JOINT (MJ) ADAPTERS: Mechanical connections of HDPE pipe (4-inches through 24-inches diameter) to Ductile Iron or PVC piping, mechanical joint fittings, or valves shall be through a self-restraining, fusible mechanical joint adapter with or without an integral, internal stainless steel insert. Mechanical joint adapter shall be of the same SDR rating as the pipe. In rare instances, a separate, loose SS type insert shall be allowed for pipe sizes 4-inch through 8-inches when approved by HCUD.

7D.1.1.12 ELECTROFUSION COUPLINGS: Polyethylene pipe and fittings may be joined using approved electrofusion couplings. Fittings shall be PE3408 HDPE, Cell Class 345464C as determined by ASTM D3350-99. Electrofusion fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe. All electrofusion fittings shall be suitable for use as pressure conduit per AWWA C906, and have nominal burst.value of 3.5 times the working pressure of the fitting.

7D.1.2 WATER SERVICE LINES: Polyethylene service line tubing shall be 1-inch polyethylene tubing, blue for water, Endot Manufacturer.

7D.1.3 SERVICE CONNECTIONS: Services 2-inches and smaller shall include an integral shut-off valve and be Philmac Fuse-A-Corp fusible valve; or Central Plastics electrofusion saddle tapping tee (use shell cutter to cut the HDPE or HCUD approved equal). The contractor shall supply all adapters, electrofused couplings, and special connections necessary to transition from the service connection to the HCUD Standard polyethylene service tubing at both ends. Payment for this item shall be included in the unit price bid amount for the water service.

## 7D.2 PIPE ASSEMBLY AND INSPECTION

7D.2.1 GENERAL: Pipe shall be welded/fused together in one length, if space permits. Pipe shall be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. For pipes 16-inch and larger, a re-rounding clamp tool shall be utilized during the electro-fusion process to ensure pipe roundness. For pipe sizes larger than 12-inch mechanical scrapers shall be used.

7D.2.2 ELECTRONIC LOCATOR WIRE (ELW) AND INSTALLATION: The contractor shall furnish and install two (2) ELWs with the horizontal directional drilled mains. The ELW shall be Direct Burial #10 AWG Solid (.1019" diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 600# average tensile break load, 30 mil. high molecular weight-high density polyethylene jacket complying with ASTM-D-1248, 30 volt rating. The ELW shall be Copperhead Industries, LLC. The exterior color shall be blue for water mains and green for sewer mains. The Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations: and all "exit point locations". There shall be a maximum length or intervals of 500-feet between locate wire stations. No splices or connections shall be allowed underground. After installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

7D.2.3 HDPE PIPE JOINTING METHOD

7D.2.3.1 HDPE pipe shall be jointed by the butt-fusion process in accordance with pipe manufacturer's directions. Contractor shall provide butt-fusion technicians who are trained and certified by the P.E. pipe manufacturer to complete the project. The date of technician certification shall not exceed 12 months before commencing construction.

7D.2.3.2 All HDPE pipe joined by butt-fusion shall be made from the same class and type of raw material made by the same raw material supplier.

7D.2.3.3 Butt-fusion means the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure.

7D.2.3.4 The internal and external beads resulting from the butt-fusion process shall be visible and examined for penetration 360 degrees around the pipe diameter.

7D.2.3.5 Short pieces of pipe between valves and fittings shall be DIP with all joints retrained for sizes 3-inches and larger. For 2-inch, the short pieces shall be brass or Sch. 80 with IP threads and DI, HDPE or brass fittings and all joints restrained.

7D.2.4 PIPE INSPECTION: Cuts, gouges or holes that penetrate the pipe wall thickness by more than 10 percent shall not be acceptable and shall be cut out and discarded. Before pipe installation, the contractor shall be responsible for carefully inspecting the assembled pipeline to insure tat no vandalism or improper acts have occurred to render the new pipeline defective. Any pipeline that has been installed and has failed the required pressure test procedure and upon investigation was found to be defective because of cuts or holes drilled through the pipe walls, shall be removed and/or repaired at expense to the contractor.

7D.2.5 MECHANICAL JOINING: Polyethylene pipe and fittings may be joined together or to the materials by means of flanged connections (flange adapters, electro fused couplings, and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

7D.2.6 MECHANICAL JOINT AND FLANGE INSTALLATION: Mechanical joints and flange connections shall be installed in accordance with the Manufacturer recommended procedure. Flange faces shall be centered and aligned to each other before assembling and tightening bolts. In no case shall the flange bolts be used to draw the flanges into alignment. Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least 1-hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. (See also Detail 19)

## 7D.3 TESTING

### 7D.3.1 DISINFECTION TESTS

7D.3.1.1 All water pipe and fittings shall be thoroughly disinfected prior to being placed in service. Disinfection shall follow the applicable provisions of the procedure established for the disinfection of water mains as set forth in AWWA - Standard C651 entitled "AWWA Standard for Disinfecting Water Mains". Bacteriological testing on the water main shall be scheduled with a state certified lab, including the HCHD, by the contractor. The state certified lab or HCHD shall collect the water samples and shall complete the water samples and be responsible for completing the water analysis (lab testing). Note: Contractors can not collect the water samples for the lab.

7D.3.1.2 Temporary blow-offs shall be installed for the purpose of cleaning the main pipe line. Blow-offs installed on mains up to and including 12-inches shall be the same diameter as the water main. Blow-offs installed on 16-inch mains and larger shall be the next smaller size, in diameter, than the main being tested. Temporary blow-offs shall be removed and plugged after the main is cleared. The HCUD shall be present prior to and during the operation of blow-offs. The main shall be pigged and flushed prior to disinfection.

7D.3.1.3 A new water main shall be connected to the existing water main at one point only for flushing purposes. The new main shall have a blow off assembly on the end. After the new main is pigged and thoroughly flushed, the open end shall be sealed and restrained and the main shall be pressure tested. Anytime the new line is reopened (to repair defective joints or pipe, defective fitting or valve) the complete testing process shall be repeated. After successful testing and once bacteriological clearance has been received from the regulatory authority, the new main shall be placed into service.

## 7D.3.2 PRESSURE AND LEAKAGE TESTS

7D.3.2.1 The contractor shall test installed pipelines in accordance with these specifications prior to acceptance of the pipeline by the HCUD. All field tests shall be made in the presence of the EOR and HCUD Representative. Except as otherwise directed, all pipelines shall be tested. All piping to operate under liquid pressure shall be tested in sections of approved length. The pressure testing of an HDPE line section shall be tested separately from the PVC and DIP line sections. Where impractical, the HDPE test section shall include only a minimum amount of PVC and ductile iron pipe within the test section. If at all possible, the PVC and DIP, test sections shall be left exposed during the pressure test for visual leakage observation. For these tests, the contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment, and all labor required: If the contractor chooses to pressure test against an existing HCUD water main valve, the new water main must be disinfected prior to connection to the HCUD line. HCUD will not be responsible for failure of the pressure test due to the existing valve leaking. The contractor shall furnish suitable pressure gauges, calibrated by an approved testing laboratory, which increments no greater than 2 PSIG, gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves.

7D.3.2.2 The section of pipe to be tested shall be filled with potable water and air shall be expelled from the pipe. If blow offs or other outlets are not available at high points for releasing air, the contractor shall provide 1-inch (minimum taps and blow-off valves (at the 12:00 position), as necessary. The cost of constructing blow-off valves and plugging them, after a successful pressure test, shall be included in the unit price bid amount for the HDPE pipe.

7D.3.2.3 Hydrostatic testing shall consist of a 150 PSIG test pressures, based on the elevation of the highest point of the line or section under tests. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the EOR. The pump, pipe connection and all necessary apparatus shall be furnished by the contractor and shall be subject to the approval of the EOR.

7D.3.2.4 Maximum duration for pressure test, including initial and final phase of the test, shall not exceed 8-hours. If the test is not completed (due to leakage, equipment failure, etc.), depressurize the test section, and then allow it to 'relax" for at least 8-hours before bringing the test section back up to test pressure again.

7D.3.2.5 Initial Phase of Pressure Testing: All air shall be removed from the test section. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection. The pressure within the test section should be raised to approximately 160 PSIG and then allowed to be idle for approximately 3-hours. During this 3-hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water/pressure shall be applied to the test section during this 3-hour stabilization period unless the line pressure drops below 140 PSIG. Make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 PSIG (during the 3-hour stabilization period).

7D.3.2.6 Final Phase of Pressure Testing: The final phase of the pressure test shall involve applying make-up water/pressure to achieve an "initial test pressure" of 150 PSIG (minimum) / l55 PSIG (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2-hours. After this 2-hour period, make-up water/pressure is applied and measured to re-establish the "initial test pressure". The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the Table 7D-1 below. If the make-up water quantity is equal to or less than the allowable amount, the pressure test passes. If the make-up water quantities are greater than the allowable amount, the pressure test fails.

TABLE 7D-1

ALLOWABLE MAKE-UP AMOUNT

| Nominal Pipe Size (inches) | Make-up Water Allowance (U.S. Gallons/l00 ft. of Pipe) 2-hour test |
|---|---|
| 6 | 0.30 |
| 8 | 0.50 |
| 10 | 0.65 |
| 12 | 1.15 |
| 14 | 1.40 |
| 16 | 1.65 |
| 18 | 2.15 |
| 20 | 2.75 |
| 22 | 3.50 |
| 24 | 4.40 |

7D.3.2.7 In the event a section fails to pass the tests, the contractor shall do everything necessary to locate, uncover (even to the extent of uncovering the entire section), and replace the defective pipe, valve, fitting or joint. Visible leaks shall be corrected regardless of total leakage. Lines which fail to meet these tests shall be retested as necessary until test requirements are complied with. All testing shall be performed at the contractor's expense.

7D.3.2.8 If, in the judgment of the EOR, it is impracticable to follow the foregoing procedures exactly modifications in the procedure shall be made. Re-disinfection shall be required if the line is de-pressurized for repairs.

7D.3.3 LOCATE WIRE TEST

7D.3.3.1 After installation, the contractor shall perform a wire continuity test in the presence of a HCUD inspector.

# SECTION 8

# SPECIFICATIONS
# FOR
# JACK AND BORE (J&B)
# UNDER ROAD CROSSINGS

SECTION 8: JACK AND BORE (J&B) UNDER ROAD CROSSINGS CONTENTS

# SECTION 8

# "JACK AND BORE" (J&B) UNDER ROAD CROSSINGS

8.1 J&B INSTALLATION AND MATERIALS: The plan, profile and cross section views of the J&B crossing shall show the steel casing pipe as extending 10-feet beyond the edge of pavement on both sides of the roadway. The steel casing pipe exterior wall surface shall be bituminous coated, to a minimum 16-mil thickness. Steel casing pipe shall be new prime steel pipe conforming to ASTM A-139, Grade B or AWWA C200, latest edition. Steel casing pipe shall be seamless or have no more than one longitudinal weld.

8.2 STEEL CASING PIPE SPECIFICATIONS: Minimum steel casing pipe size and wall thickness shall be as indicated in the following Table 8-1.

TABLE 8-1

Carrier Pipe, Steel Casing Pipe Diameter & Wall Thicknesses

| Diameter (in.) Carrier Pipe | Outside Diameter (in.) Casing Pipe | Wall Thickness (in.) Casing Pipe |
|---|---|---|
| 4 | 8 | .188 |
| 6 | 12 | .188 |
| 8 | 16 | .250 |
| 10 | 20 | .250 |
| 12 | 24 | .250 |
| 14 | 28 | .312 |
| 16 | 32 | .312 |
| 20 | 34 | .375 |
| 24 | 36 | .375 |

8.3 STEEL CASING PIPE WELDING: All section joints of steel casing pipe shall be full penetration welded with a continuous circumferential weld. Joints shall be electric-fusion (Arc) welded by operators qualified in accordance with American Welding Society (AWS) Standard Procedure. After welding, the Contractor shall wire brush the welded joints and apply Kop-Coat Interol Quick drying Primer 626 or HCUD approved equal.

8.4 CARRIER PIPE INSTALLATION AND SUPPORT: The J&B carrier pipe shall be installed inside the casing pipe using the polyethylene support block assembly system with spacing as per manufacturer's recommendations. The carrier pipe shall have "mechanical joint restraints" at each bell joint completely through the casing pipe. The carrier pipe ends shall extend beyond steel casing pipe by 6-inches and the voids between the inside of the casing pipe and outside of the carrier pipe shall be sealed with brick and non-shrink grout mortar. Depending upon road bore location, the contractor shall notify FDOT or HCDPW 48-hours in advance before commencing work.

8.5 CASING SPACERS

8.5.1 GENERAL DESCRIPTION: The Casing spacers shall be used to install the carrier pipe inside the encasement pipe. To provide support around the periphery of the pipe should the pipe twist as it is pushed through the casing, the spacers shall be a projection type that has a minimum number of projections around the circumference totaling the number of diameter inches. For example, 8" pipe shall have a minimum of 8 projections and 18" pipe shall have a minimum of 18 projections.

8.5.2 ATTACHMENT: Casing spacers shall use double backed tape, provided with the spacers, to fasten tightly onto the carrier pipe so that the spacers do not move during installation.

8.5.3 SPACING: Casing spacers shall have a maximum spacing span of 10 feet. On sewer pipe the maximum span should be 6-1/2 feet to prevent sagging of the carrier pipe. The span between spacers should result in long term safety factor of 2 to 1 to support the carrier pipe full of liquid.

8.5.4 HEIGHT: Spacers shall have a minimum height that clears the pipe bell or as otherwise indicated on plans.

8.5.5 REQUIREMENTS

8.5.5.1 Casing spacers shall be projection type totally non-metallic spacers constructed of preformed sections of high density polyethylene.

8.5.5.2 Spacers shall be ISO 9002 certified for strength and quality.

8.5.5.3 Projection type spacers shall be RACI spacers as marketed by Public Works Marketing, Inc., P.O. Box 38174, Dallas, Texas 75238-0174; Phone (214) 340-4226 or 1-800-517-0395.

8.5.6 ENDS: The ends of the casing shall be sealed using PWM model 1 WA Wrap around end seal made of 1/8” thickness rubber and stainless steel bands.

# SECTION 9

# SPECIFICATIONS FOR WASTEWATER STRUCTURE COATINGS

# SECTIONS 9: COATING CONTENTS

SUB-SECTION PAGE

# SECTION 9
# COATINGS

9.1 This specification shall cover contractor guidelines and all structures that require protective coatings. All preparation, patching, repairs, and application specifications listed below are to be used as minimum guidelines.

9.2 The contractor providing service shall have a minimum of five years' experience in the application of wastewater protective coatings in the state of Florida. Contractors will be required to provide five references of previous work performed, one of which must be at least five years old. The contractor shall provide all coating data sheets, methods of preparation, application methods, and a one contract source for service, repair, and warranty. Contractor must be registered in Hernando County and have all current insurance requirements per Hernando County purchasing guidelines. The contractor shall be certified by the coating manufacturer for installation of the product.

9.3 PREPARATION

9.3.1 All leaks in structures will be patched or repaired per 9.3.10 below.

9.3.2 All pipes shall be plugged or bypassed before any work is done on the structure. No debris shall be flushed down the pipe line.

9.3.3 All structures installed or refurbished shall be sandblasted to bare concrete in order to remove all loose patching, old coating, and contamination, and shall include the invert and floor areas.

9.3.4 After sandblasting, the structure shall be cleaned of abrasives and debris and pressure washed. The concrete interior shall be forced air dried.

9.3.5 Any exposed steel reinforcement shall be sandblasted to bare metal and removed of all corrosion, paint, and contaminants.

9.3.6 Surface preparation shall meet all requirements of the coatings system data sheet on concrete preparation (Data sheet shall be provided to the county). All interior surfaces of the structure shall be sound, porous, dry, and free of dust, dirt, oil, grease, and other contaminants prior to application of coating.

9.3.7 Lift Stations must have inverts (fillets) poured prior to coating.

9.3.8 All Ram Neck needs to be recessed so that the seams and areas around the pipes can be filled creating a smooth continuous surface.

9.3.9 Lift Stations may only have invert and force main pipes installed prior to coating.

9.3.10 Bench and Trough construction should be competed in the required structures prior to coating.

9.3.11 Concrete Patching / Repair Materials

The following products manufactured by the Sika Corporation have been determined to be suitable for the necessary repairs. Products of other manufacturers may be acceptable, providing they meet or exceed the mechanical properties, service records, and warranties of the following products…

1. Sikatop 123 Plus – a two-component, non-sag cementitious mortar intended for vertical and overhead surfaces. This product also contains FerroGard 901 penetrating corrosion inhibitor.
2. Sikarepair 224 – a one component, cementitious mortar intended for repair of vertical and overhead surfaces. Formulated for application by trowel or low-pressure spray.
3. Sika Armatec 110 EpoCem – a three component, solvent-free, moisture tolerant, epoxy-modified, cementitious product specifically formulated as a bonding agent and an anti-corrosion coating. This product shall be applied on existing steel reinforcement.

All surface preparation, storage and application of these products shall strictly conform to the manufacturer's instructions and recommendations. These products shall be manufactured to ISO 9001 and 9002 standards.

## 9.4 Coating Systems

### 9.4.1 Epoxy Coating System

- The product shall be 100% solids, solvent-free ultra-high-build epoxy.
- The finished epoxy shall be resistant to sulfuric acid attack associated with domestic sewage.
- The epoxy shall be manually sprayed onto the structure to provide a uniform smooth and even surface.
- The minimum finished thickness shall be as specified on the plans.
- The coating system shall be capable of being applied over wet surfaces without degrading the final product.
- The cured epoxy system shall conform to the minimum physical standards, as listed below…

| CURED EPOXY | STANDARD | LONG-TERM DATA |
|---|---|---|
| TENSILE STRENGTH | ASTM D-638 | 7,500 psi |
| FLEXURAL MODULUS | ASTM D-790 | 600,000 psi |
| FLEXURAL STRESS | ASTM D-790 | 13,000 psi |
| COMPRESSIVE STRENGTH | ASTM D-695 | 18,000 psi |

- The contractor shall provide certified independent, third party test results verifying the minimum physical properties listed above. The test shall be in conformance with the ASTM specifications listed.
- The finished liner shall be cured in strict accordance with the manufacturer's instructions.
- Composite systems containing layers of different materials or cured-in-place resin systems will not be considered as equal.

### 9.4.2 Polymorphic Resin Systems

- The polymorphic resin shall be 100% solids, two component, highly modified isophthalic polyester resin material.
- The finished resin shall be resistant to sulfuric acid attack associated with domestic sewage.
- The minimum finished thickness shall be as specified on the plans.
- The cured resin system shall conform to the minimum physical standards, as listed below…

| CURED RESIN | STANDARD | LONG-TERM DATA |
|---|---|---|
| TENSILE STRENGTH | ASTM D-638 | 4,900 psi |

| | | |
|---|---|---|
| FLEXURAL STRESS | ASTM D-790 | 8,630 psi |
| FLEXURAL MODULUS | ASTM D-790 | 15,120 psi |

- The contractor shall provide certified independent, third party test results verifying the minimum physical properties list above. The test shall be in conformance with the ASTM specifications listed.
- The finished liner shall be cured in strict accordance with the manufacturer's instructions. Composite systems containing layers of different materials or cured-in-place resin systems will not be considered as equal.

9.4.3 Fiber-Reinforced Modified Polyamine Epoxy System

- The finished polyamine epoxy shall be resistant to sulfuric acid attack associated with domestic sewage.
- The epoxy shall be manually sprayed onto the structures to provide a uniform smooth surface.
- The minimum finished thickness shall be as specified on the plans.
- The coating system shall be capable of being applied over wet surfaces without degrading the final product.
- Concrete surfaces shall be prepared for the application of the fiber reinforced modified polyamine system by cleaning and stoppage of infiltration as specified above. Prior to applying the modified polyamine liner, concrete surfaces shall be repaired to the extent needed to provide a smooth and ever surface to which the liner will adhere.
- The cured fiber-reinforced modified polyamine system shall conform to the minimum physical standards, as listed below…

| **CURED RESIN** | **STANDARD** | **LONG-TERM DATA** |
|---|---|---|
| TENSILE STRENGTH | ASTM D-638 | 2,507 psi |
| FLEXURAL STRESS | ASTM D-790 | 8,148 psi |
| FLEXURAL MODULUS | ASTM D-790 | 540,000 psi |

- The contractor shall provide certified independent, third party test results verifying the minimum physical properties listed above. The test shall be in conformance with the ASTM specifications listed.
- The finished liner shall be cured in strict accordance with the manufacturer's instructions.

9.5 Thickness Verification, Inspections and Testing

9.5.1 The contractor shall provide a method of verifying the actual coating thickness installed to ensure it meets or exceeds the minimum values in the manufactures specifications. The proposed liner thickness verification method shall be submitted to the engineer for approval. Dry film thickness readings can be taken on concrete by the use of ultrasonic thickness gauges in strict accordance with SSPC PA 9.

Contractor may utilize a wet film thickness gage meeting ASTM D4414 to ensure monolithic coating and uniform thickness during application. A minimum of three readings per 200 square foot area shall be recorded. Documentation on thickness readings shall be conveyed to the inspector on a daily basis when the coating application occurs.

All phases of the structure rehabilitation such as surface preparation, liner application, curing, testing, etc., will be inspected by the County's field engineering personnel from conformance to the specifications, construction drawings, and manufacturer's

instructions. The contractor shall coordinate all rehabilitation work with the County and with due regard for site and weather conditions prevailing at the time.

9.5.2 Spark Testing

- All new construction coating systems will be required to be spark tested prior to acceptance. Existing structures may be required and shall be separate line items on the bid. Documentation for coatings that do not require spark testing must be provided at the time of bid and be reviews by the county's engineering department to be deemed exempt form testing.
- The holiday testing shall be in strict accordance with NACE SP0188
- After the coating system had set hard to touch the coating shall be inspected with high-voltage holiday detection equipment.
- The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of minimum specified (not average) film thickness applied but may be increased if it is insufficient to detect the induced holiday.
- All detected holidays shall be marked and repaired per the manufacturer's recommendations.
- All cost associated with the testing shall be borne by the contractor.
- Testing equipment shall be in good working condition and evidence of certified calibration within the last year shall be provided before the detection test equipment shall be used.

9.6 Bypass Pumping

9.6.1 If bypass pumping is required, a detailed by pass pumping submittal will be required and approved by the county's engineering department before work can begin.

9.6.2 Bypass pumping is the sole responsibility of the contractor to insure it is functioning at all times including but not limited to set up, monitoring, and fueling.

9.6.3 Call out alarms will be required while unmanned. Response to the jobsite for all callouts / alarms is the responsibility of the contractor and must have a response time of no more than 30 minutes.

Any work that may need to be performed by the county due to lack of response by the contractor will be billed to the contractor. All invoice adjustments, credits, or payments for this work must be made before final payment will be approved.

9.7 Warranty

The contractor shall furnish Hernando County with an unconditional 10-year warranty for materials and workmanship. This warranty shall be a guarantee against failure for the warranty period. Failure shall be defined to occur if the rehabilitation system fails to:

1. Prevent the internal damage or corrosion of the structure.
2. Adhere to existing structure surface.

If any failures occur within the specified warranty period after final acceptance, the contracture shall repair or restore the structure to it previously accepted state including all materials, labor, and at no additional cost to the County.

Repairs shall be completed within 30 days of written notification of the failure.

# SECTION 10

# BACKFLOW PREVENTION ASSEMBLIES (BPA)

# *SECTION* 10: BACKFLOW PREVENTION ASSEMBLIES (BPA)

# *SECTION* 10

# BACKFLOW PREVENTION ASSEMBLIES (BPA)

## 10.1 GENERAL COMMERCIAL

10.1.1 Backflow prevention is required in accordance with PL 93-623, the Federal Safe Drinking Water Act, the Florida Safe Drinking Water Act, the Florida Building Code, Florida Administrative Code 62-555, and by county ordinance for the protection of public health. The BPA shall be a reduced pressure zone assembly (RPZ) for all commercial purposes. In the case of 3" or larger unmetered connections, a reduced pressure detector assembly (RPDA) shall be utilized and will be manufactured by: Ames (4000 series), Apollo RP40, Conbraco 40204T2, Watts 009, Wilkins/Zurn 975 XL, or a HCUD approved equal.

10.1.2 BPA(s) shall be installed in all lines where the possibility exists for water from any other source to enter the public water supply system. This includes all properties with auxiliary water sources such as wells, re-use (reclaimed) water systems, ponds, streams, lakes, canals, etc.

10.1.3 A physical separation (known as an "Air Gap") is the safest method of cross connection prevention. If an Air Gap application is impractical, then a proper BPA(s) shall be installed in order to prevent possible back siphonage or back flow conditions from occurring into a public potable water supply system.

10.1.4 Dedicated, unmetered fire lines shall be RPDA's. Hydrant leads in excess of 50' shall have proper backflow protection.

10.1.5 Spacing:

10.1.5.1 BPA(s) shall be attached to the water line in a horizontal position and installed to facilitate "in line maintenance" and/or minor repair.

10.1.5.2 Horizontal separation is to be 12 inches or vertical height may be staggered to allow proper room for testing.

10.1.5.3 The concrete support pad shall be 4-inches thick and extend 12-inches in all directions of the assembly.

10.1.5.4 The BPA's dump zone shall be a minimum of 12-inches above finished grade and a maximum of 48-inches above a rectangular concrete support pad. Maximum distance between the BPA's dump zone and the concrete support pad shall not exceed 24 inches for lines 6 (six) inches or greater. The BPA's dump zone shall be at or above the 100-year flood elevation with the support pad distance spaced appropriately. The distance of the centerline of the wheel valves and the concrete pad shall not be greater than six feet. BPA's shall not be placed in a gully or swale. The use of in-ground vaults is prohibited.

10.1.6 Materials shall be either galvanized, copper, black iron, or a HCUD approved equivalent. PVC pipe is not allowed.

10.1.7 All BPA(s) shall be installed as per manufacturer's recommendations and inspected by HCUD after installation is completed. BPA(s) must be installed prior to delivery of water on all commercial sites.

10.1.8 All BPA(s) shall clearly display the model number and the serial number.

10.1.9 Freeze Protection: All BPA's shall be installed with freeze protection. Acceptable freeze protection valves are Dole FP-35 & FP-45 and Conbraco series 40-000. Additional freeze protection shall be of a type sanctioned by the AWWA or FW&PCOA or approved equivalent (foam pipe insulation, custom built boxes, mock rock). The use of fiberglass insulation, rags, old towels, etc. is strictly prohibited. At no time will valves, test ports, relief ports, or serial numbers be covered.

## 10.2 REDUCED PRESSURE ZONE ASSEMBLY (RPZ)

10.2.1 The RPZ shall be installed on the discharge side of the water meter service line (within 18 inches of the water meter) to provide back-siphonage or back pressure protection from high hazard facilities as designated by HCUD.

10.2.2 The RPZ shall contain two independently acting check valves, a pressure differential relief valve located in a zone between the two check valves, a shut off valve installed at each end of the assembly and be fitted with the properly located test cock valves. Only complete assemblies will be accepted from the manufacturer (consisting of device and valves fully assembled).

10.2.3 The RPZ shall meet the requirements of ASSE Standard 1013 and AWWA Standard C-506 for Reduced Pressure Principal Backflow Preventers and shall be USC tested and approved.

10.2.4 All Test ports shall contain a threaded cap or plug to prevent tampering and vandalism.

10.2.5 At no time shall there be an unmetered connection anywhere on the assembly, nor shall there be any hose bib or other appurtenance before the #1 shut-off valve on the assembly. All auxiliary connections shall be after the #2 shut-off valve, excluding fire lines, which shall have none except those approved by the fire department.

10.3 COMMERCIAL ACCOUNTS

10.3.1 Commercial Building Permit issuance shall be delayed until the owner or developer (or representative) completes a Utility Fees Calculation Data Form, pays the Connection, Hook-Up and Deposit Fees (if applicable), and applies for a standard water service contract (if applicable) through the Customer Service Section of HCUD. The Certificate of Occupancy (C.O.) issuance shall be delayed until the applicable BPA(s) is/are inspected and approved by HCUD and all other project specific items are submitted and approved by HCUD.

10.3.2 At no time shall a connection exist between the commercial meter and the interior plumbing until the proper BPA has been installed and inspected. If such a condition is found to exist, the water service shall be locked off until the proper backflow protection is installed and inspected by an HCUD inspector. A separate inspection may be required by the Building Dept.

10.4 INSPECTIONS: The RPZ-BPA shall be inspected as follows:

10.4.1 Delivery of water: Water meters will be unlocked after an RPZ-BPA is installed.

10.4.2 Issuance of Certificate of Occupancy (C.O.): A final inspection shall be performed on installation, pad, height, etc. prior to issuance of C.O.'s.

10.4.3 Annual inspection is required by FAC 62-555.360 (2) and county ordinance. The testing procedure shall be performed in accordance with one of the following standards: ASSE 5013, ASSE 5015, ASSE 5020, ASSE 5047, ASSE 5048, ASSE 5052, ASSE 5056, or CAN/CSA B64.

10.4.4 Arrangements for inspection shall be made at least 48-hours in advance.

10.4.5 The RPZ shall be tested (and passed) by a state certified tester prior to issuance of C.O.

10.5 RESIDENTIAL IRRIGATION SYSTEMS

10.5.1 Irrigation systems are considered high hazard and backflow prevention assemblies shall be either reduced pressure zone (RPZ) or pressure vacuum breaker (PVB) type.

10.5.2 All residential irrigation systems connected to potable water and/or having an alternate water source shall have backflow prevention, testable in-line, with dump zones open to the atmosphere.

10.5.3 Residential irrigation BPA's (RPZ's & PVB's) operating within HCUD potable water authority jurisdictions shall comply with all sections and rules as listed above for general commercial practices for the purposes of public safety and protection of the public water supply.

## 10.6 LIFT STATION SPECIFICATIONS

10.6.1 Potable water connections at lift stations are considered high hazard and backflow prevention at all lift stations shall be Reduced Pressure Zone (RPZ) type only.

10.6.2 Current specifications shall be followed regarding the construction, retro-fitting, and rehabilitation of all existing lift stations.

# SECTION 11

# ELECTRICAL SPECIFICATIONS

# SECTION 11: ELECTRICAL SPECIFICATIONS

SUB-SECTION PAGE

# SECTION 11

# ELECTRICAL SPECIFICATIONS:

11.1 GENERAL: The following specifications shall cover the design and installation of the necessary electrical components of Water, Reclaimed Water and Wastewater Systems.

11.2 TELEMETRY CONTROL SYSTEM: Telemetry shall be required on all pump stations, water treatment plants and wastewater treatment plants which are to be owned and maintained by HCUD.

11.2.1 CONTROLS (TELEMETRY): Programmable Logic Controllers (PLC) shall be used for water plant and wastewater plant monitoring and control. PLC may be used for lift stations with HCUD approval PLC shall be supplied by Data Flow Systems Inc. Melbourne, FL (321) 259 – 5009. (See Details 35 and 36). The telemetry control unit (TCU) shall be a microprocessor-based multi-pump controller module designed for use with the telemetry systems. As a minimum, the pump control unit shall have the following features:

11.2.1.1 Local automatic control from float, bubbler, transducer, or ultrasonic inputs. All the electronics for each type of input shall be included in the TCU.

11.2.1.2 Local manual control provided by HOA (Hand-off automatic) switches. The HOA switches shall be fail safe and operate in the OFF and HAND position without power. HOA Switch Alarms shall be reported back to central site computer. Alarms shall indicate that an HOA switch has been left in the HAND or OFF position.

11.2.1.3 Remote control from the central site computer shall provide individual pump overrides and disables, station and alarm disables.

11.2.1.4 Triplex/Duplex/Simplex configurable. The module shall have the capability of being configured for one, two or three pumps.

11.2.1.5 Pump alternation function shall be provided. Alternation around non-operational pumps shall be provided.

11.2.1.6 An on-board 240-VOLT three-phase monitor shall be provided. The phase monitor shall be transformer-isolated and detect loss of phase, phase reversal, low phase and high phase faults. All phase monitor adjustments shall be adjustable from the keyboard. Phase voltages from phase A to B and from phase A to C shall be transmitted to the central site computer.

11.2.1.7 The TCU shall be easily replaced by removing two industry standard terminal connectors.

11.2.1.8 Alarm light and bell outputs capable of driving 122-VOLT loads to 1-AMP.

11.2.1.9 Local input for alarm silence switch.

11.2.1.10 Remote alarm bell and light disable from central site computer.

11.2.1.11 Float alarm reporting back to central site computer when floats are operating out of sequence. In the float mode each float position shall be transmitted to the central computer.

11.2.1.12 The TCU shall utilize a 16-character display to provide the operators with the elapsed runtime of each pump, the average runtime of each pump, the flow of each pump, the flow of the station and the time of day.

11.2.1.13 Pumps/Starter/Breaker Fault alarms shall be reported back to central site computer. The alarms shall be activated when a pump is called to run, but fails to run, or if the pump is turned off by the TCU, but continues to run.

11.2.1.14 Pump run status shall be reported back to central site computer. Pump run times recorded with 2-second accuracy.

11.2.1.15 Configuration parameters shall be adjustable through the front mounted keypad or a RS-232 service port.

11.2.1.16 Redundancy of level sensing devices shall be supported.

11.2.1.17 All inputs and outputs shall be optically or magnetically isolated and surge suppressed. The TCU shall be manufactured by Data Flow Systems, Inc., of Melbourne, Florida (321) 259-5009.

11.2.2 TELEMETRY CONTROL UNIT - As a minimum, the TCU/radio shall have the following features:

11.2.2.1 Environmentally sealed/corrosion resistant enclosure.

11.2.2.2 Conformally coated PC Board.

11.2.2.3 Surge protected radio power.

11.2.2.4 On board communications and functional firmware.

11.2.2.5 Watchdog Timer.

11.2.2.6 On board voltage regulation and radio power supply control.

11.2.2.7 RS-232 service port.

11.2.2.8 LED’s on test mode, power, transmit data, receive data, and CPU failure.

11.2.2.9 Test mode switch for radio service.

11.2.2.10 Radio current, receiver sensitivity and operating temperature are monitored for system diagnostics.

11.2.2.11 Unit removable without disturbing field wiring or configuration jumpers.

11.2.2.12 The TCU shall be manufactured by DFS, of Melbourne, Florida (321) 259-5009.

11.2.3 ANTENNA SUBSYSTEM (See Detail 37).

11.2.3.1 A high gain directional antenna shall be used to transmit and receive data at the Remote Terminal Unit (RTU). The antenna shall be supported on a mast/pole and have DC grounding for lightning protection.

11.2.3.2 The antenna mast/pole shall be hot dipped galvanized for corrosion protection. All mounting hardware shall be made of SS. The mast shall meet or exceed the quality and reliability of the AG20 style, manufactured by Rohn.

11.2.3.3 The coax cable shall be the type that utilizes an inert semi-liquid compound to flood the copper braid. The coax cable shall be of the RG-8 construction type and have the RF loss characteristic of foam flex. The coax cable shall meet or exceed the quality, reliability and performance of series RTC 400 as supplied by Data Flow Systems, Inc., of Melbourne, Florida. Type N connectors shall be utilized at both ends of the coax. The Type N connectors shall be sealed with 3-inch sections of Alpha FIT321-1-0 sealant shrink tubing. The coax cable shall be secured to the mast/pole with 316 SS cable ties. The cable ties shall meet or exceed the quality, reliability and performance of AE112 cable ties manufactured by Band-It.

11.2.3.4 The antenna shall be an all welded aluminum elements. The antenna shall have a single radiator element connected to a type N female connector. Element connections utilizing nuts and bolts are not acceptable. The antennas shall meet or exceed the quality, reliability and performance of the RTA series as provided by Data Flow Systems, Inc., of Melbourne, Florida. The antenna/tower shall be designed to meet wind loading without damage as specified in Detail D-37. Sealed engineering drawings shall be submitted to verify the design.

11.2.4 ENCLOSURES – No external enclosures allowed. The TCU shall be installed within the new control panel by the panel manufacturer; in the event of an existing control panel, a new control panel shall be required to replace the exiting control panel.

11.2.5 PRESSURE TRANSDUCER: A Pressure Transducer shall be installed to transmit water pressure data from the RTU to the existing Central Site via SCADA. The pressure transducer shall be 0-100 psig, 4-20 ma output, +/- 1.0% Accuracy, NEMA 4X with NPT threaded process connection. The pressure transducer shall be installed in a tee that is located before the BPA and after the lockable curb stop on the inlet piping of the BPA for the water service to the lift station. The cable for the pressure transducer shall be installed in a conduit from the transducer to the bottom of the control panel. This conduit shall be installed down through the concrete slab then back up to the control panel. The Pressure Transducer shall be wired to the TCU's Analog Input 2, and water pressure shall be displayed on the RTU's graphic screen at the Central Site. The Pressure Transducer shall be Model TIS-9001-2 manufactured by Data Flow Systems or HCUD approved equal. (Detail 37)

11.2.6 SURGE PROTECTION - Surge protection must be provided for all power supply and power monitoring circuits. The protection shall be equipped with both energy limiting and clamping circuits with slow blow fuses designed for overload conditions. This design shall provide a very high level of non-destructive transient immunity. With the exception of a direct lightning strike, the device shall protect the RTU power supply and power monitoring circuits from damage due to voltage transients. The unit shall provide circuit protection to withstand multiple transients in excess of 6500-VOLTS, 3250-AMPS, without damage. Damage shall be limited to a blown fuse when exposed to larger transients. The device shall be transient-tested to ANSI standard C62.41. The unit shall meet or exceed the quality, reliability and performance of the Transient Filter Shield TFS001 as manufactured by DFS.

11.2.7 WARRANTY - The system supplier shall warrant all hardware provided under this contract against all defects in material and workmanship for a period of one year. When installed with a DFS Transient Filter Shield (TFS001-2), the TCU shall carry an additional 2-year, return-to-factory warranty. The addition of a properly installed TFS shall also extend the TCU Pack warranty to include damage caused by lightning and electrical surge.

11.2.8 SERVICE - The supplier shall offer full factory support of the installed products through the use of factory employees. Service representatives who are not direct employees of the system supplier, or who are not specifically trained in the service of radio telemetry systems shall be unacceptable. The customer shall have 24-hour per day access to service personnel through the use of a pager.

11.3 CONTROLS (STANDARD): The contractor shall install a complete control system as required for system operation. The control panel shall operate the equipment at the power characteristics shown on the plans. A level control system shall be provided to start and stop equipment in response to liquid level or pressure. On and off levels shall be sensed by float mercoid switches or transducer. Control Panels shall be manufactured and UL approved.

11.3.1 The control panel shall be NEMA 4X, 14-gauge, Type 304 SS, with padlock type locking hasp and removable back panel. The enclosure door shall have a full length piano type hinge with a stainless steel hinge pin. A rain drop shield shall be positioned on the top front of the panel. A three point latch, operated from 1 exterior stainless steel handle shall secure door and allow for pad locking. The enclosure shall contain an interior aluminum "DEADFRONT" panel door with a ¾-inch break on all four sides for rigidity, mounted on a full length aircraft type hinge and a hand operated latch assembly which latches to a full length door stop. The dead front panel shall have “cut-outs” for the operating handles of all circuit breakers. The outer SS door shall be equipped with a safety "hold-open" arm device.

11.3.2 The control panel shall be floor or wall mounted or on two 6-inch x 6-inch x 10-feet pre-cast concrete posts. A 4-inch thick concrete base slab on grade shall be installed. Panel horizontal centerline shall be 5-feet above ground elevation, with the bottom of said panel to be at or above the "100 year flood elevation", where applicable. The panel shall be located 3-feet away from wet well hatch cover to avoid interference when access doors are in open position. Control panels within plants shall be installed per plans with a minimum of 3-feet working clearance. See Detail 34.

11.3.3 Float level test switches and level indication lights shall be provided in the control panel to test and monitor the float level activation. A test switch and an indicator light shall be provided for each float switch.

11.3.4 CONTROL POWER TRANSFORMER: A power transformer to supply 120-VOLT control power shall be provided when 120-VOLT is unavailable from the electrical service. The power transformer shall provide 120-VOLT to power the control circuits, panel lights, meters, outlets, generator block heater and other 120-VOLT devices.

11.3.5 CONTROL PANEL: The control panel shall be fully shop tested by manufacturer prior to shipment and all components UL listed. The control panel shall contain the following components (see Detail 35 and 37):

11.3.5.1 Main and emergency circuit breakers with interlock shall be Square D, Type H or J Frame, 600 VOLTS only.

11.3.5.2 Automatic “on and off” at designated points through level sensors, 24-VOLT AC.

11.3.5.3 Red globed alarm light, top mounted, activated by high water level sensor. Light shall be equipped with a flasher to pulse the light during high level condition.

11.3.5.4 Audible horn, side mounted, activated by high water level sensor, and equipped with external weatherproof "push-to-silence" button. The silence button shall be mounted on the right side of the panel.

11.3.5.5 Liquid level indicator lights with “push-to-test” circuit and light.

11.3.5.6 Pump run and seal fail lights with “push-to-test” circuit and light.

11.3.5.7 Automatic thermal overload protection on each leg of starter with manual reset.

11.3.5.8 Where 3-phase is used, phase monitor by “Diversified”, SLJ series, or equal, reading phase and voltage with adjustable delay on make time delay. Phase monitor to “Lock out” or protect motor starters only.

11.3.5.9 Ammeter monitoring one leg of each pump motor complete with selector switch and momentary read button.

11.3.5.10 Lightning arrestor externally mounted on main disconnect box and shall be connected to the load side of the main circuit breaker with leads as short and straight as possible.

11.3.5.11 The transient voltage surge protection shall be mounted inside the control panel.

11.3.5.12 Pump elapsed time indicators, STA-CON D851 or equal, mounted on dead front for each pump.

11.3.5.13 120 VOLT duplex outlet with ground fault interrupter (GFI).

11.3.5.14 Generator receptacle, female type, shall be Crouse Hines AR 1041-M-72, 100-AMP rated, side mounted and angled down.

11.3.5.15 600-VOLT terminal strips.

11.3.5.16 Alternator - lead, lag, auto select. For Triplex Stations, “Diversified ARA 120 AHE”. For duplex stations, “Diversified ARB 120 AEA P”.

11.3.5.17 Heavy-duty motor starters, relays and other related control components and hardware, shall be Square D, Class 8536 only. Relays shall be octal base design with 8 or 11 pin configuration.

11.3.5.18 All wiring shall be color-coded, numbered and matched to wiring diagram.

11.3.5.19 Control panel breakers, Square D, H or J frame only, shall be molded case, thermo-magnetic 600-VOLT 18,000 RMS minimum.

11.3.5.20 Starters shall have heavy-duty HOA ("Hand-off-Automatic") selector switches.

11.3.5.21 For single phase pumps, separate "start" and "run" capacitors shall be furnished in the control panel. Capacitors in motors shall not be acceptable.

11.3.5.22 Resetable Cycle counter for each pump shall be installed.

11.3.5.23 Any penetration into the control panel box by the Contractor shall be made from the bottom of the control panel.

11.3.5.24 Control Panel Design – Approved Parts List

11.3.5.24.1 Float switches
Anchor Scientific Type S (N.O.)
S.J. Electro System – Model SWI (N.O.)

11.3.5.24.2 Main, Emergency Circuit Breaker, and Pump Circuit Breaker, Square D, H or J Frame, 600-VOLT rated – 25,000-AMP interrupting rating

11.3.5.24.3 Flasher solid state, approximately 75 F.P.M.
SSAC – FS127
Diversified Electronics – TSL series

11.3.5.24.4 Phase Monitor Relay – Independent N.O. and N.C. Contacts with time delays
Diversified Electronics – Model No. SLJ-230-ALE (240-VOLT),
SLJ-440-ALE (480-VOLT) or
SLA Series with Separate Time Delay is also acceptable.

11.3.5.24.5 Transient Voltage Surge Suppressor
Square D SDSA650
GE – 9L18BB301
EDCO

11.3.5.24.6 Duplex Receptacle 15A, 125 VOLT (GFI, Standard)
Leviton – 6598-I, 5662-I
Hubbell – GF-5262-I, 5262-I
Eagle – 666-2 VOLT-BOX

11.3.5.24.7 Motor Starter – Full Voltage with Coil Surge Suppressor
Square D – 8536 (with hand reset overload relays only)

11.3.5.24.8 Overload Relays (Provided with Motor Contractor)
Square D – Class 9065 only

11.3.5.24.9 Emergency Generator Receptacle – Receptacle with angle adapter
Crouse-Hinds #1041 @ 100-AMPS or #2041 @ 200-AMPS

11.3.5.24.10 Elapsed Time Meter – 120 VOLT, Not Resetable, Round Face
Cramer – Series 635E
Redington/Engler – 710-0002
Sta-Con D 851

11.3.5.24.11 Alternator
Diversified Electronics ARB-120-AEA-P (Electronic – switchable duplex/triplex)
Diversified Electronics ARA-120-AHE (Electronic – triplex)

11.3.5.24.12 Hand-Off Automatic Switch (3-position, maintained)
Square D – KS43BH13 only

11.3.5.24.13 Alarm Light – 120 VOLT, Shatterproof Red Lexan Lens
Ohio Electric – RL3K
Edwards – Adaptabeacon (built-in flash)

11.3.5.24.14 Pump Running (Gree, 120 VOLT)
Square D – 9001KP38G9 only

11.3.5.24.15 Alarm Horn – 120 VOLT
Federal – 350 WB
Edwards – 876-N5

11.3.5.24.16 Terminal Blocks
Square D – 9080-GA6, GK6, GC6, GD6
Buchanan #725

11.3.5.24.17 Transformer – Control 480/120 VOLT, Low Voltage 120/24 VOLT
Square D – 907Ot2000d15 (480/120 VOLT), 9070T100D13 (120/24 VOLT) only

11.3.5.24.18 Alarm Silence and Alarm Reset Buttons
Square D – Class 9001-KR1BH13 only

11.3.5.24.19 Fuse – 120 VOLT (Control), 24 VOLT (Low Voltage)
Littelfuse – KLDR
Bussman – FNQR

11.3.5.24.20 Control Relays
Square D – Class 8501 – KU-13 (120 VOLT and 24 VOLT coils)

11.3.5.24.21 Ammeter Selector Switch
Entrelec – VY10/D – S7022565 – (3-position, duplex),
VY10/D/A22/ST/C511 (4-position, triplex)
Electro-switch – Series 20K – 20KC-08 with 53C-3A12A
Nameplate (duplex), 20Kc-10 with 53C-4A13 nameplate (triplex)

11.3.5.24.22 Ammeter Yokogawa – 250-340LSXX
Simpson – Type 1327 Series (with appropriate scale)

11.3.5.24.23 Current Transformer – 600 VOLT 5A
Yokogawa – TR11-RT-XXX
Anderson Electrical Connectors (Square D) – Class 4210 Simpson Donut CT's – Type 012XX

11.3.5.24.24 Fuseholder – 600 VOLT/300 VOLT, 2 Pole/1 Pole
Bussman – 2079/2078
Littelfuse – Class CC, Type L60030C-2SQ

11.3.5.24.25 Main Disconnect – Heavy Duty, Rain-tight Hubs, E.G. Kit, NEMA 4 x SS Enclosure
Square D – HU Series only

11.3.5.24.26 Motor Junction Box JBI (NEMA 4X, 316 Stainless Steel)
Hoffman – Bulletin A-41
Carlon
Vynckier

11.3.5.24.27 Control Panel (NEMA 3R, Stainless Steel with Swing-out Deadfront Panel and 3-Point Latch)
Hoffman
May be custom fabricated by StaCon

11.3.5.24.28 Test Switch (Single Pole, Single Throw, Two-Position Toggle Switch) Carlingswitch – 6FA54-73 (Spring Return)

11.3.5.24.29 Seal Failure Module
Syrelec – PNRU110

11.3.5.24.30 Seal Failure Lights (Red)
Square D – 9001KP38R9

11.3.5.24.31 Floats Junction Box JB2 (NEMA 4X, 316 Stainless Steel)
Hoffman Bulletin A-41

11.3.5.24.32 Receptacle, Control and Flowmeter Circuit Breaker
Square D – FA Type, 600-VOLT Rated

11.3.5.24.33 Test Lights (White, Amber, Green, Red)
Dial light – 95-5710-319X-301 (Type 757, T – 3-1/4, 28 VOLT bulb)

11.3.5.24.34 Flow Meter
Thermopolysonics, Model: DCT#1088

11.3.5.24.35 Wire Markers
Panduit Corp. – Thomas & Betts Insta-Code clip on markers.

11.3.6 Pump Station Junction Boxes

11.3.6.1 There shall be two junction boxes, (JB1 and JB2), NEMA 4X, constructed of 304 SS and installed under the control panel. The JB1 shall house the pump motor connections with two 2-inch PVC conduits exiting from the bottom of the box, going to the wet well. The JB2 shall house the floats connections and have one 2-inch PVC exiting from the bottom to the box, going to the wet well. There shall be a minimum of four spare wires pulled into the JB2 from the control panel.

11.3.6.2 Junction box shall be sized to permit at least 3-inches of spacing between terminal strips, 4-inches between conduits entering box and terminal strips, and 3-inches between the terminal strips and sides of the box. Enclosure shall be at least 6 ¾-inches deep and shall have watertight bushings and hubs at all outlets.

11.3.6.3 The junction boxes JB1 and JB2 shall be mounted directly under the control panel. The top of the control panel shall not be higher than 6-feet from the top of the finished concrete slab. The bottom of junction box (JB1) shall be at least 30-inches above the top of the finished slab. A minimum of 18-inches of horizontal clear mounting space shall be provided adjacent to the control panel for future telemetry cabinet installation. A sealing fitting shall be installed in each conduit connecting JB1 to the control panel.

11.3.6.4 Three 2-inch schedule 40 PVC conduits shall run from the junction boxes over to and through the manhole wall, with a minimum of 12-inches cover. One conduit shall contain wiring for level sensors. The remaining conduits shall contain pump wiring with one pump set per conduit. The PVC conduits shall be sized for the largest future pump wire requirements.

11.4 CIRCUIT BREAKERS: Thermal magnetic molded case circuit breakers shall be furnished for each motor and accessory load. Each motor breaker shall be adequately sized to meet the pump motor operating conditions and shall have a minimum symmetrical RMS interrupting rating of 18,000-amperes. All breakers shall be heavy duty Square D, 600V, H or J Frame, molded case breakers. "Q" frame breakers shall not be acceptable. The controls and the 15-AMP ground fault receptacle shall be individually controlled by circuit breakers.

11.4.1 The main and motor circuit breakers shall be of the thermal-magnetic, molded case type with 25,000-amperes interrupting rating (minimum) at 600-VOLTS rated. The main and emergency generator circuit breakers shall be provided with a mechanical interlock to permit connection to either the utility service or the emergency generator receptacle, but not to both at the same time.

11.4.2 Circuit breakers shall be quick-make and quick-break on manual, as well as, automatic operation and have inverse time characteristics, secured through the use of bimetallic tripping elements supplemented by a magnetic trip.

11.4.3 Multi-pole breakers shall be designed so an overload on 1 pole automatically causes all poles to open and it shall be common trip. Field installed handle ties shall not be accepted.

11.5 MOTOR STARTERS: An open frame, across the line, NEMA rated, magnetic motor starter Class 8536 Square "D" shall be furnished for each pump motor. Pump motor starter contacts and overload relays shall be easily replaceable without removing the motor starter from its mounted position. Overload relays, with individual protection for each leg shall be block type, utilizing melting alloy spindles and shall have visual trip indication with trip-free construction. Adjustable type overload relays, definite purpose contactors, horsepower rated conductors, relays, and fractional NEMA sizes shall not be acceptable. Starter coil voltage shall be 120-VOLTS.

11.6 CONCRETE BASE PAD: A concrete (3,000 PSI) pad shall be installed around panel base to extend 12-inches from each concrete mounting post or a minimum size of 30-inches by 60-inches 4-inches thick.

11.7 MISCELLANEOUS ELECTRICAL: (Aluminum wire is not acceptable)

11.7.1 If underground service is available, the "meter can" and main disconnect shall be installed by a licensed electrical contractor on the outside face of the two 6-inches x 6-inches x 10-feet pre-cast concrete post, with the control panel mounted on the inside face adjacent to the manhole. Mounting hardware shall be aluminum or stainless steel. Copper only installed in conduit. Direct burial wire shall not be accepted.

11.7.2 Overhead service shall have a separate concrete pole installation for the "meter can" and main disconnect, with PVC conduit connecting the control panel. Main disconnect shall be provided in a separate rain-tight steel box with provision for locking in the "on" or "off" position.

11.7.3 Service shall be "sized" as required but a minimum of 100-AMPS capacity.

11.7.4 An adequate service loop shall be provided from the dead-front swing-out panel to the control panel to protect the wire bundle from crimping or binding during door movement. The service loop shall be secured at both ends.

11.7.5 Main disconnects shall be fuse type and rated at 600VOLT. Note: A fused disconnect may be required before the meter on 277/480 volt services per local power company. See Detail 43

11.7.6 The lightning arrestor shall be mounted on the outside of the main disconnect enclosure and shall be connected to the load side of the main disconnect with leads as short and straight as possible. The secondary transient voltage surge suppressor shall be mounted inside the control panel.

11.7.7 Phase, neutral and equipment grounding conductors shall be color coded per the requirements of NFPA-70. The 120 VOLT control wiring shall be color coded differently than 24 VOLT control wiring. Colored tape may be used for conductors, sizes AWG #8 and larger. All control wiring shall have color coded insulation.

11.7.8 All conductors throughout the installation shall be copper. Aluminum wire is unacceptable.

11.7.9 Conductors to wet well shall be installed in minimum 2-inch schedule 40 PVC conduit with separate conduits for sensor leads and motor leads. All conduits shall be plugged with duct putty compound.

11.7.10 Pump Station Security Fence Enclosure Grounding:

11.7.10.1 The security fence enclosures around all HCUD Pump Stations shall be grounded by installing a ground rod at each of two opposite corners of the enclosure. The fence fabric shall be securely connected with (a minimum of a) #6 AWG bare copper wire bonded back to the electric service ground rods. The barbed wire shall be bonded to the ground rods as well. See Detail 41.

11.7.10.2 The enclosure gates shall be grounded by installing a ground rod beside each gatepost with a heavy-duty copper grounding strap connecting the gates to the ground rods.

11.7.10.3 All ground rods shall be $^{5}/_{8}$-inch in diameter, copper to resist corrosion, and be of sufficient length to register a maximum of 5-ohms resistance when tested after installation. The grounding conductor shall not be smaller than a # 4 AWG bare copper and installed inside PVC conduit.

11.7.11 Electrical installations shall conform with NEC and any local codes having jurisdiction.

11.7.12 All conductors shall be stranded copper with type THHN/THWN, moisture and heat-resistant thermoplastic insulation. All control wiring shall be THHN/THWN insulated stranded copper and numbered for identification at each end. Control wire size shall be at least AWG # 16. All wiring shall be installed on the surface of the back-panel and laid in plastic raceways. Numbering of wires shall be from the meter can through the field side of the terminal strip in the junction boxes.

11.7.13 The pump motor power and control cable shall be the pump manufacturer's standard cable or Type W moisture and oil resistant, multi-conductor flexible power cable with identified grounding conductor suitable for extra hard duty usage in wet locations. Cable installations shall be suitable for disconnect and removal when the pump is removed and reinstalled.

11.7.14 A weatherproof schematic wiring diagram shall be permanently affixed to the interior of the enclosure door. For each external connection required, a separate terminal shall be provided. No double wires shall be permitted on outgoing terminals. Terminal blocks shall be located far enough away from the enclosure side(s) to permit convenient and safe connection of incoming wires. Supplementary or miscellaneous items, equipment, appurtenances, or devices necessary for or incidental to complete and functional installation, whether or not shown on the plans or addressed in the specifications, shall be provided and installed in complete accordance with the contract documents.

## 11.8 FLOW METERS

11.8.1 Reclaimed water mains shall require a Water Specialties propeller type meter with 4-20 MA output or HCUD approved equal. A bypass line to circumvent the flow meter shall be installed.

11.8.2 Wells shall require a Water Specialties propeller type meter with 4-20 MA output or HCUD approved equal.

11.8.3 Water mains leaving water plants shall require a McCrometer Ultra Mag UMO6-R or HCUD approved equal flow meter. A bypass line to circumvent the flow meter shall be installed.

11.8.4 Lift stations with 16 inch effluent force mains shall require a Unimag DT flow meter or HCUD approved equal. A bypass line to circumvent the flow meter shall be installed. The flow meter transmitter is preferred to be installed above ground whenever possible; if not, then in a dry vault with access lid. See Detail 6.

11.8.5 Non-potable water mains within a wastewater treatment plant shall require a Water Specialties propeller type meter with 4-20 MA output or HCUD approved equal.

11.8.6 Return activated sludge, waste activated sludge and the influent flow to the waste water treatment plants shall require a Rosemont 8705 series flow meter. The flow meter transmitter shall be a Rosemount 8723E series and it shall be mounted on a 6-inch by 6-inch concrete pole. The flow meter is preferred to be installed above ground whenever possible; if not, then in a dry vault with access lid. See Detail 6.

11.8.7 Wastewater treatment plant effluent mains at the chlorine contact chamber shall require a Teledyne ISCO 4200 Series ultrasonic type flow meter.

11.9 VARIABLE SPEED DRIVES: Variable speed drives shall have across the line by-pass capability. Acceptable variable speed drives are as follows: Magnatech (Yaskawa), Sq D, or HCUD approved equal.

11.10 ELECTRIC MOTORS: Electric motors shall be US, Baldor, GE, or HCUD approved equal. Electric motors shall be TEFC with cast iron or aluminum casing (rolled steal will not be acceptable).

# SECTION 12

# UTILITIES DEVELOPMENT REVIEW CHECK LIST

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# UTILITIES DEVELOPMENT REVIEW CHECK LIST:

The following are the standard specifications required for utility plans review by HCUD. In some instances these items are not applicable and the designer should refer to each section in the manual for allowable deviations.

12.1 Subdivision, Commercial and Offsite Utilities to be Owned and Maintained by HCUD

12.1.1 General

- ☐ Water and Sewer services are provided to all lots and/or out parcels.
- ☐ 1 inch water service is provided to the lift station.
- ☐ Water and Sewer services are located at the property line or in utility easements.
- ☐ Valves, bends, tees, etc are located in green areas not roadways.
- ☐ Valves, fittings, hydrants, etc are symbolized and labeled.
- ☐ No 90 degree bends are used (use two 45 degree bends).
- ☐ HDPE pipe, Fusible PVC pipe and/or steel casing extends 10 feet past the edge of pavement on both sides of the road in areas where drilling or boring is performed.
- ☐ Sidewalks shall be located no closer than 2.5 feet from the right of way line to allow room for water meter box installation. Water and sewer utility mains shall be placed a minimum of 3 feet away from the curb and shall not be placed within 1.5 feet of or under the sidewalk.

12.1.2 Water Mains

- ☐ Water mains constructed along local streets shall have a minimum of 36-inches of cover. Water mains constructed along arterial streets or roadways shall have a minimum of 48-inches of cover. Cover is measured from finished grade to top of pipe line.
- ☐ Valves are located to isolate no greater than 30 lots.
- ☐ Fire Hydrants are installed on no less than an 8 inch line.
- ☐ Minimum distribution line pipe size is 4 inch.
- ☐ Water mains are constructed of PVC C900.
- ☐ Cul-de-sacs are looped.
- ☐ Dead ends and cul-de-sacs have blow-off assemblies.
- ☐ Fire Hydrants are less than 600 linear feet apart in residential areas and less than 500 linear feet apart in commercial.

12.1.3 Sewer Force Mains

- ☐ Minimum pipe size is 4 inch.
- ☐ Constructed of PVC C900.
- ☐ Have a minimum of 48 inches of cover.

12.1.4 Sewer Gravity Systems

- ☐ Manhole spacing does not exceed 350 feet apart.
- ☐ Manholes and wet wells greater than 20 feet in depth are constructed of Monolithic Fiberglass.
- ☐ Double laterals are not located within drainage easements.
- ☐ Manholes 12 feet deep and greater are labeled as IET coated or monolithic fiberglass.
- ☐ Collector Manholes are IET coated or monolithic fiberglass.
- ☐ Manholes are no less than 48 inches and no greater than 30 feet in depth.
- ☐ Wet wells are no less than 48 inches and no greater than 35 feet in depth.
- ☐ Nearby laterals (usually within 50 feet) are connected directly into the manhole.
- ☐ Existing or proposed manholes receiving force main flows are to be IET coated or monolithic fiberglass.
- ☐ Proposed sewer service laterals are no more than 48-inches deep at the property line.

12.1.5 Notes and Details

- ☐ The following note is indicated on at least one utility sheet: “All installations shall meet or exceed Hernando County Utilities Department specifications as defined in the Water and Wastewater Construction Specifications Manual, (insert date of current edition) Edition/or latest edition.”
- ☐ Notes pertaining to locator wire and tape are shown.
- ☐ Notes pertaining to water and sewer mains and fittings are shown on the plans (cover depth, material, testing, etc.)
- ☐ FDEP utilities separation requirements are shown on the plans.
- ☐ Notes regarding temporary water service are shown on the plans.
- ☐ Details from the current HCUD specifications manual are shown.

12.1.6 Lift Stations

- ☐ Are equipped with DFS telemetry.
- ☐ The pump has a minimum of a 4 inch discharge.
- ☐ Minimum internal piping is 4 inch, C900.
- ☐ Are equipped with an Odor Control Unit when applicable.
- ☐ Are equipped with a generator when applicable.
- ☐ The wet well is IET coated or monolithic fiberglass.

## 12.2 Onsite Commercial Projects Not Owned and Maintained by HCUD

### 12.2.1 General

- ☐ Locations and sizes of all proposed/existing water and sewer lines are shown.
- ☐ Proposed points of connection and sizes for potable and irrigation service water meters are shown.
- ☐ Proposed points of connection for sanitary sewer service & “Clean-Out” fittings are shown.
- ☐ Proposed locations and sizes of Reduced Pressure Zone-Backflow Prevention Assemblies (RPZ-BPA’s) for potable, irrigation, &/or fire services are shown. Note: RPZ-BPA sizes must be equal to or greater than the proposed waterline. HCUD does not accept Double Detector Check Valve Assemblies. (DDCVA’s).
- ☐ All water lines entering the property have a Reduced Pressure Zone-Backflow Prevention Assemblies (RPZ-BPA’s) installed directly downstream of the water meter. Fire line RPZ’s are installed directly inside the property line.
- ☐ If a well is used to supply potable &/or irrigation service, or a septic tank is proposed, note accordingly.
- ☐ Potable water meters larger than 2-inch are shown as a Neptune Tru/Flo Radio Read compound water meter. These meters are purchased & installed by the contractor. (If applicable)
- ☐ Location, type, and size of the proposed grease interceptor system (grease trap) are shown. (If applicable)
- ☐ Proposed & existing utilities/access easements are shown. (If applicable)
- ☐ A project location map is shown on all utility sheets.
- ☐ Utility details shown are the current HCUD Specification Manual version.

### 12.2.2 Notes

The following notes must be shown on at least one utility sheet:

- ☐ “All installations shall meet or exceed Hernando County Utilities Department specifications as defined in the Water and Wastewater Construction Specifications Manual, (insert date of current edition) Edition/or latest edition.”
- ☐ Construction water shall be provided by a temporary construction water meter installed by HCUD on the closest fire hydrant to the site. Contractor is to contact HCUD’s Commercial Customer Service Division to sign up for service, if construction water is required.
- ☐ Contractor shall notify HCUD Inspector 48 hours prior to utility construction in the County Right-of-Way. HCUD Inspector MUST be present for all water and sewer connections.
- ☐ HCUD shall not own, operate, or maintain on-site water &/or sewer utilities.

☐ Engineer/Developer/Contractor/Owner is to complete and dedicate all offsite water and/or sewer infrastructure constructed by the contractor to HCUD. Contact HCUD to obtain the contributed asset form. (If applicable)

☐ Contractor shall schedule a preconstruction meeting five (5) business days prior to the start of off-site utility construction. Contractor must provide the HCUD inspector with all utility submittals for approval at the preconstruction meeting. A HCUD inspector MUST attend the preconstruction meeting. (If applicable)

☐ Contractor to install emergency contact signage on all private liftstation control panels indicating the following: FOR EMERGENCIES CALL: (***) ***-****. Signage shall be permanent type and visible from at least 25 feet away.

12.3 Commercial Building Permit approval check list

☐ Construction plans have all required data & are approved by HCUD.

☐ Owner/Developer has completed a HCUD Utilities Fees Calculation Data Form, submitted to HCUD's Commercial Customer Service Division, paid the applicable fees, and signed a Sewer and/or Water Service Application.

☐ Permit is approved by HCUD for construction at the Building Department.

☐ A preconstruction meeting is scheduled with HCUD inspector present (Notify HCUD inspector 5 business days prior to meeting). (If applicable)

☐ Notify HCUD inspector 48 hours prior to utility construction in the right-of-way including all water and sewer connections.

☐ Water meters 2-inch and smaller as set by HCUD upon request from owner/contractor.

☐ Project is constructed by contractor with all water/sewer connections made with a HCUD Utility Inspector present.

12.4 Commercial Building Permit Certificate of Occupancy (C.O.) approval process:

12.4.1 The Reduced Pressure Zone Backflow Prevention Assembly (RPZ-BPA) for potable, irrigation, &/or fire services have been installed and meet the following criteria:

☐ USC (University of Southern California) Certified and Underwriter Laboratories (UL) approved.

☐ Installed per HCUD specifications and tested by a licensed plumber/BPA tester.

☐ Site inspected & approved by HCUD's BPA Inspector; contact BPA inspector at (352)754-4037. Note: This inspection is separate from the plumbing inspection scheduled with the Development Department.

☐ BPA test results have been sent to HCUD's BPA Inspector.

12.4.2 Grease Interceptor (Grease Trap) Installation & inspection criteria:

☐ Contact HCUD's Waste Water Operations Inspector at (352) 754-4490 to schedule an inspection of new grease trap installations.

12.4.3 Utility/Access Easements (if applicable)

☐ Signed easement documents have been approved by HCUD and recorded at the Clerk of Courts office. Recorded easement document copies have been provided to HCUD's Permitting and Development Review Coordinator, Scott Rimby.

12.4.4 Contributed Assets (if applicable)

☐ A completed contributed asset form with itemized material cost list has been submitted to and approved by HCUD. Contact HCUD Utility Inspector to obtain the contributed asset form.

12.4.5 As-built Construction Drawings (if applicable)

☐ Two (2) sets of 24"x36" signed and sealed As-built drawings have been submitted for review.

☐ Two (2) sets of AutoCAD as-built CD's with Adobe PDF's of all utility sheets have submitted for review. As-built data shown on the original site/utility plan (submitted for building permit approval).

12.4.6 Utility Infrastructure Testing

☐ Submitted all required pressure tests for water lines, sewer force mains, and gravity sewer lines per FDEP and HCUD requirements. (if applicable)

☐ Submit two (2) consecutive bacteriological samples for all contractor installed potable water lines per FDEP and HCUD requirements. (if applicable)

☐ Submit a copy of the sanitary sewer system visual inspection CD or DVD and report. (if applicable)