# CITY OF NORTH PORT
# UTILITIES STANDARDS SPECIFICATIONS

## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section 1 - North Port Water and Wastewater Systems</strong></td>
<td></td>
</tr>
<tr>
<td>1.01 Introduction and Purpose</td>
<td>1-1</td>
</tr>
<tr>
<td>1.02 Duties of the Utility</td>
<td>1-1</td>
</tr>
<tr>
<td>1.03 Definitions</td>
<td>1-2</td>
</tr>
<tr>
<td>1.04 Criteria of Review</td>
<td>1-4</td>
</tr>
<tr>
<td>1.05 General Information</td>
<td>1-5</td>
</tr>
<tr>
<td>1.06 Plans and Specifications</td>
<td>1-5</td>
</tr>
<tr>
<td>1.07 Administrative Procedures</td>
<td>1-7</td>
</tr>
<tr>
<td>1.08 List of Materials and Approved Manufacturers</td>
<td>1-9</td>
</tr>
<tr>
<td>1.09 Persons to Contact</td>
<td>1-9</td>
</tr>
<tr>
<td>1.10 Procedure for Obtaining Capacity</td>
<td>1-9</td>
</tr>
<tr>
<td>1.11 Payment of Fees</td>
<td>1-10</td>
</tr>
<tr>
<td>1.12 Regulatory Permits</td>
<td>1-11</td>
</tr>
<tr>
<td>1.13 Allocation Factors and Limitations</td>
<td>1-11</td>
</tr>
<tr>
<td>1.14 Capacity Reservation or Allocation Recapture</td>
<td>1-11</td>
</tr>
<tr>
<td>1.15 Fees Subject to Change</td>
<td>1-12</td>
</tr>
<tr>
<td>1.16 Pending Wastewater and Water Capacity Lists</td>
<td>1-12</td>
</tr>
<tr>
<td>1.17 Septic Tank Policy</td>
<td>1-12</td>
</tr>
<tr>
<td>1.18 System Extension Policy</td>
<td>1-12</td>
</tr>
<tr>
<td>1.19 Reserve Capacity Fee</td>
<td>1-13</td>
</tr>
<tr>
<td>1.20 Prepayment Optional</td>
<td>1-13</td>
</tr>
<tr>
<td>1.21 Zoning</td>
<td>1-14</td>
</tr>
<tr>
<td><strong>Section 2 - Capacity Allocation</strong></td>
<td></td>
</tr>
<tr>
<td>2.01 General</td>
<td>2-1</td>
</tr>
<tr>
<td>2.02 Potable Water Capacity Allocation</td>
<td>2-1</td>
</tr>
<tr>
<td>2.03 Irrigation Water Capacity Allocation</td>
<td>2-9</td>
</tr>
<tr>
<td>2.04 Fire Protection Capacity Allocation</td>
<td>2-10</td>
</tr>
<tr>
<td>2.05 Wastewater Capacity Allocation</td>
<td>2-10</td>
</tr>
<tr>
<td>2.06 Connection Procedures and Application Forms</td>
<td>2-12</td>
</tr>
</tbody>
</table>
## Section 3 - General Construction Requirements

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.01 General</td>
<td>3-1</td>
</tr>
<tr>
<td>3.02 Grades, Survey Lines and Protection of Monuments</td>
<td>3-1</td>
</tr>
<tr>
<td>3.03 Utility Coordination</td>
<td>3-1</td>
</tr>
<tr>
<td>3.04 Maintenance or Traffic and Closing of Streets</td>
<td>3-2</td>
</tr>
<tr>
<td>3.05 Protection of Public and Property</td>
<td>3-3</td>
</tr>
<tr>
<td>3.06 Access to the Public Services</td>
<td>3-4</td>
</tr>
<tr>
<td>3.07 Public Nuisance</td>
<td>3-4</td>
</tr>
<tr>
<td>3.08 Construction Hours</td>
<td>3-5</td>
</tr>
<tr>
<td>3.09 Construction in Easements and Rights-of-Ways</td>
<td>3-5</td>
</tr>
<tr>
<td>3.10 Suspension of Work Due to Weather</td>
<td>3-5</td>
</tr>
<tr>
<td>3.11 Use of Chemicals</td>
<td>3-5</td>
</tr>
<tr>
<td>3.12 Cooperation with Other Builders and Forces</td>
<td>3-6</td>
</tr>
<tr>
<td>3.13 Subsurface Exploration</td>
<td>3-6</td>
</tr>
<tr>
<td>3.14 Cleaning</td>
<td>3-6</td>
</tr>
<tr>
<td>3.15 Salvage</td>
<td>3-6</td>
</tr>
<tr>
<td>3.16 Shop Drawings an Samples</td>
<td>3-6</td>
</tr>
<tr>
<td>3.17 Clearing and Grubbing</td>
<td>3-7</td>
</tr>
<tr>
<td>3.18 Excavation, Backfill, Compaction and Grading</td>
<td>3-7</td>
</tr>
</tbody>
</table>

## Section 4 - Materials

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.01 General</td>
<td>4-1</td>
</tr>
<tr>
<td>4.02 Pipe and Fittings</td>
<td>4-1</td>
</tr>
<tr>
<td>4.03 Valves</td>
<td>4-8</td>
</tr>
<tr>
<td>4.04 Installation</td>
<td>4-13</td>
</tr>
</tbody>
</table>

## Section 5 - Wastewater and Water Treatment Plants

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.01 General</td>
<td>5-1</td>
</tr>
<tr>
<td>5.02 Design Standards</td>
<td>5-1</td>
</tr>
<tr>
<td>5.03 Standard Requirements</td>
<td>5-1</td>
</tr>
<tr>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Section 6 - Water Distribution Systems</td>
<td></td>
</tr>
<tr>
<td>6.01 General</td>
<td>6-1</td>
</tr>
<tr>
<td>6.02 Design Standards</td>
<td>6-1</td>
</tr>
<tr>
<td>6.03 Standard Requirements</td>
<td>6-3</td>
</tr>
<tr>
<td>6.04 Installation</td>
<td>6-10</td>
</tr>
<tr>
<td>6.05 Testing</td>
<td>6-10</td>
</tr>
<tr>
<td>6.06 Disinfection</td>
<td>6-11</td>
</tr>
<tr>
<td>Section 7 - Sanitary Gravity Sewers</td>
<td></td>
</tr>
<tr>
<td>7.01 General</td>
<td>7-1</td>
</tr>
<tr>
<td>7.02 Design Standards</td>
<td>7-1</td>
</tr>
<tr>
<td>7.03 Standard Requirements</td>
<td>7-3</td>
</tr>
<tr>
<td>7.04 Installation</td>
<td>7-8</td>
</tr>
<tr>
<td>7.05 Testing</td>
<td>7-8</td>
</tr>
<tr>
<td>Section 8 - Wastewater Force Mains</td>
<td></td>
</tr>
<tr>
<td>8.01 General</td>
<td>8-1</td>
</tr>
<tr>
<td>8.02 Design Standards</td>
<td>8-1</td>
</tr>
<tr>
<td>8.03 General Requirements</td>
<td>8-2</td>
</tr>
<tr>
<td>8.04 Installation</td>
<td>8-6</td>
</tr>
<tr>
<td>8.05 Testing</td>
<td>8-6</td>
</tr>
<tr>
<td>Section 9 - Wastewater Pumping Stations</td>
<td></td>
</tr>
<tr>
<td>9.01 General</td>
<td>9-1</td>
</tr>
<tr>
<td>9.02 Design Standards</td>
<td>9-1</td>
</tr>
<tr>
<td>9.03 General Requirements</td>
<td>9-5</td>
</tr>
<tr>
<td>9.04 Type of Pumping Station Construction</td>
<td>9-14</td>
</tr>
<tr>
<td>9.05 Required Submittal</td>
<td>9-14</td>
</tr>
<tr>
<td>9.06 Tools and Spare Parts</td>
<td>9-15</td>
</tr>
<tr>
<td>9.07 Details</td>
<td>9-16</td>
</tr>
<tr>
<td>9.08 Installation and Testing</td>
<td>9-16</td>
</tr>
</tbody>
</table>
CITY OF NORTH PORT
UTILITIES STANDARDS SPECIFICATIONS

TABLE OF CONTENTS (Continued)

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section 10 - Reuse Distribution Systems</strong></td>
<td></td>
</tr>
<tr>
<td>10.01 General</td>
<td>10-1</td>
</tr>
<tr>
<td>10.02 Design Standards</td>
<td>10-1</td>
</tr>
<tr>
<td>10.03 Standard Requirements</td>
<td>10-3</td>
</tr>
<tr>
<td>10.04 Installation</td>
<td>10-7</td>
</tr>
<tr>
<td>10.05 Testing</td>
<td>10-7</td>
</tr>
<tr>
<td>10.06 Disinfection</td>
<td>10-9</td>
</tr>
</tbody>
</table>

<p>| <strong>Section 11 - Standard Drawings</strong>   |      |</p>
<table>
<thead>
<tr>
<th>Title of Drawing</th>
<th>Figure No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type B Bedding and Trenching Detail</td>
<td>100</td>
</tr>
<tr>
<td>Type A Bedding and Trenching Detail</td>
<td>101</td>
</tr>
<tr>
<td>Concrete Arch and Encasement Details</td>
<td>102</td>
</tr>
<tr>
<td>Thrust Block Detail</td>
<td>103</td>
</tr>
<tr>
<td>Restrained Pipe Detail</td>
<td>104</td>
</tr>
<tr>
<td>Water Main Thrust Collar Detail</td>
<td>105</td>
</tr>
<tr>
<td>Boring and Jacking Detail</td>
<td>106</td>
</tr>
<tr>
<td>Valve Collar Detail</td>
<td>107</td>
</tr>
<tr>
<td>Air or Combination Air/Vacuum Release Valve Detail</td>
<td>109</td>
</tr>
<tr>
<td>Offset Air or Combination Air/Vacuum Release Valve Detail</td>
<td>110</td>
</tr>
<tr>
<td>Precast Manhole Detail</td>
<td>200</td>
</tr>
<tr>
<td>Manhole Connection Details</td>
<td>201</td>
</tr>
<tr>
<td>Sanitary Manhole Cover</td>
<td>202</td>
</tr>
<tr>
<td>Plug Valve and Box Detail</td>
<td>203</td>
</tr>
<tr>
<td>Sanitary Service Detail</td>
<td>204</td>
</tr>
<tr>
<td>Wastewater pump Station Site Plan</td>
<td>300</td>
</tr>
<tr>
<td>Wastewater Pump Station Plans, Sections and Notes</td>
<td>301</td>
</tr>
<tr>
<td>Pump Station Control Panel Installation Detail</td>
<td>302</td>
</tr>
<tr>
<td>Duplex Control Panel Enclosure Dead Front Layout</td>
<td>303</td>
</tr>
<tr>
<td>Duplex Control Panel Enclosure Subpanel Layout</td>
<td>304</td>
</tr>
</tbody>
</table>
### CITY OF NORTH PORT
### UTILITIES STANDARDS SPECIFICATIONS

### TABLE OF CONTENTS (Continued)

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title of Drawing</strong></td>
<td></td>
</tr>
<tr>
<td>Duplex Control Schematic</td>
<td>305</td>
</tr>
<tr>
<td>Pump Station Control Panel Legend</td>
<td>306</td>
</tr>
<tr>
<td>Chain Link Fence Detail</td>
<td>307</td>
</tr>
<tr>
<td>Gate Valve and Box Detail</td>
<td>400</td>
</tr>
<tr>
<td>Butterfly Valve and Box Detail</td>
<td>401</td>
</tr>
<tr>
<td>Fire Hydrant Assembly Detail</td>
<td>402</td>
</tr>
<tr>
<td>Blow Off Valve Detail</td>
<td>403</td>
</tr>
<tr>
<td>Water Service Location Detail</td>
<td>404</td>
</tr>
<tr>
<td>Water Service Connection Details</td>
<td>405</td>
</tr>
<tr>
<td>Detector Check Valve Assembly</td>
<td>500</td>
</tr>
<tr>
<td>Reduced Pressure Backflow Preventer</td>
<td>501</td>
</tr>
<tr>
<td>Fire Line Master Meter Assembly</td>
<td>502</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix A - List of Materials and Approved Manufacturers</td>
<td>A-1</td>
</tr>
</tbody>
</table>
SECTION 1

NORTH PORT WATER AND WASTEWATER SYSTEMS

1.01 INTRODUCTION AND PURPOSE

The City of North Port Utilities’s (NPU) Manual of Standards and Specifications is a guide for the design and construction of potable water, irrigation water (including reused and reuse water) and wastewater systems. This manual shall be utilized for new Developments in the City involving any type of the Utilities mentioned above.

NPU owns, operates and maintains all the potable water, irrigation water and wastewater facilities. As the Owner of these utilities and as authorized by Federal, State and statues and ordinances, the City of North Port (the City) reviews, approves and inspects all new construction and installation that is added to the NPU system.

The followings specifications and standards shall be utilized for the preparation of drawings and specifications for all utilities construction projects for the City. These standards are provided for consistency in utilities construction within the City and represent minimum standards acceptable to NPU.

These standards and specifications shall be utilized within the Utility Service Area to accomplish the following goals:

A. To plan for and better accommodate water, reused water and wastewater users,
B. To delineate user procedures,
C. To provide a mechanism allowing service commitment for major capacity requests,
D. To establish a Guarantee Revenue for unused services,
E. To delineate user service policies,
F. To establish minimum technical specifications and standards for approval of water, reused water and wastewater facilities, transmission, collection and distribution systems to be constructed with the NPU service area.

1.02 DUTIES OF THE UTILITY

NPU is authorized and empowered:

A. To adopt rules and regulations as the City may deem necessary in transacting its business.
B. To construct, acquire, improve, maintain and operate water or wastewater systems within the Utility Service Area and the environs thereof, and to acquire by gift, purchase, grant-in-aid of planning, construction, reconstruction or financing, franchises, water or wastewater systems or portions thereof, land, rights or interests of any nature whatsoever in land or water rights connected therewith, and any of the property, real, personal and tangible or intangible, necessary for such water or wastewater systems.

C. To operate and maintain any water, reused water or wastewater systems for its own use and for the use and benefit of the inhabitants and of persons, firms, corporations, political subdivisions or other public agencies or parties located within the Utility Service Area or the environs thereto, who shall use the facilities and services of such system or systems and to enter into contracts for the supply and distribution or receiving of water with any such persons, firms, corporation, municipalities, special districts, political subdivisions or other public agencies or parties.

D. To employ and to enter into agreements or contracts with consultants, advisors, engineers, attorneys or fiscal, financial, or other experts for the planning, preparation, supervision, operation and financing of such water or wastewater systems or systems, or any part thereof, upon such terms and conditions as to compensation and otherwise as NPU shall deem desirable and proper.

E. To fix and collect fees, rentals or other charges (hereinafter sometimes referred to as revenues) determined on an equitable basis for the use of NPU water and/or wastewater facilities and services.

1.03 DEFINITIONS

Except where specific definitions are used within a specific section, the following terms, phrases, words, and their derivation shall have the meaning given herein when consistent with the context. Words used in the present tense include the future tense, words in the plural number include the singular number and words in the singular number include the plural number. The word shall is mandatory, and the work may is permissive.

A. AASHTO - American Association of State Highway and Transportation Officials. Any reference to AASHTO standards shall be taken to mean the most recently published revision unless otherwise specified.

B. ANSI - American National Standards Institute. Any reference to ANSI standards shall be taken to mean the most recently published revision unless otherwise specified.

C. APPLICANT/BUILDER - the person, firm or corporation engaged in developing or improving real estate for use or occupancy.

D. ASTM - American Society for Testing Materials. Any reference to ASTM standards shall be
E. AWWA - American Water Works Association. Any reference to AWWA Standards shall be taken to mean the most recently published revision unless otherwise specified.

F. BUILDER - used interchangeably with the word Developer, means the person, firm or corporation engaged in developing or improving real estate for use or occupancy.

G. BUILDER’S ENGINEER - an engineer or engineering firm registered with the State of Florida Department of Professional Regulation, retained by the builder to provide professional engineering services for a project.

H. CITY - the North Port City Council and/or its designated representative(s).

I. COMPREHENSIVE PLAN - the City’s Comprehensive Plan adopted on March 15, 1989 as amended and revised.

J. CONTRACTOR - the person, firm or corporation with whom the contract for work has been made by the Owner, the Builder or the City.


L. DRAWINGS - engineering drawings or plans prepared by an Engineer to show the proposed construction.

M. ENGINEER - an engineer or engineering firm registered with the State of Florida Department of Professional Regulation.

N. FDOT - the Department of Transportation, State of Florida.

O. GEOTECHNICAL/SOILS ENGINEER - a Registered Florida Engineer who provides services related to terrain evaluation and site selection, subsurface exploration and sampling, determination of soil and rock properties, foundation engineering, settlement and seepage analysis, design of earth and earth retaining structures, the design of subsurface drainage systems and the improvement of soil properties and foundation conditions, and testing and evaluation of construction materials.

P. MANUAL - the City of North Port Utilities Standards MANUAL.


R. NEMA - National Electrical Manufacturers Association. Any reference to NEMA Standards will be taken to mean the most recently published revision unless otherwise specified.
S. NORTH PORT UTILITIES (NPU)- the Utilities Department of North Port, Florida.

T. NSF - National Sanitation Foundation. Any reference to NSF Standards shall be taken to mean the most recently published revision unless otherwise specified.

U. OSHA - the Federal Occupational Safety and Health Administration.

V. OWNER - the person, firm, corporation or governmental unit holding right of possession of the real estate upon which construction is to take place.

W. PLANS - Drawings as defined herein above.

X. STANDARD DRAWINGS - the detailed drawings in this Specifications related to water and wastewater main materials and installation.


AA. UTILITIES DIRECTOR - the Director of the Utilities Department of North Port, Florida, acting directly or through an assistant or other representative authorized by the Director.


CC. UTILITY SERVICE AREA - the water, reused water and/or wastewater service area defined by the City.

DD. WATER MAINS - water transmission mains, distribution mains, pipes, fittings, valves, hydrants, services, meters and miscellaneous related appurtenances.

EE. REUSED (RECLAIMED) WATER MAINS – reused water transmission mains, distribution mains, hydrants, services, meters, pump stations, fittings, valves and miscellaneous related appurtenances.

FF. WASTEWATER MAINS - wastewater gravity sewers, force mains, pump stations, fittings, valves, service laterals and miscellaneous related appurtenances.

GG. WORK - means the labor, materials, equipment, supplies, services and other items necessary for the execution, completion and fulfillment of the contract.
1.04 CRITERIA OF REVIEW

No water, reused water or wastewater facility or associated transmission and distribution lines may be constructed in the Utility Service Area without obtaining prior NPU approval. NPU evaluates applications for approval to construct facilities or associated lines based upon the following criteria:

A. Compliance to the procedures and technical specifications of NPU, as contained within this Manual.

B. Compliance with City zoning regulations where applicable

C. Compliance with the Comprehensive Plan as amended.

D. No application for approval shall be granted which fails to comply with the above criteria.

E. Utilize for sizing of pipe lines and/or distribution or transmission a software approved by the Utilities Engineer or Utilities Director.

1.05 GENERAL INFORMATION

A. The information set forth in this document is intended to provide minimum standards for approving design and construction of water and wastewater facilities, transmission, and collection and distribution systems.

B. It shall be the responsibility of the Applicant to secure proper existing utility information, and prepare drawings (including plan and profile sheets) in accordance with these minimum standards. It remains the right of the Applicant to exceed these standards.

C. Construction drawings shall contain NPU approved plan and profile sheets showing all utilities and storm drains. No changes shall be made on approved drawings without approval of the NPU and construction shall not begin prior to plan approval by NPU.

D. Construction drawings submitted to NPU are to be the latest revision. Contractor must have a NPU approved set of Drawings and Specifications on the project site. This set will be the only official reference set for construction.

E. Contractor shall use accurately marked piping and covers (manholes, valves, etc) for any piping projects.

F. Applicant shall furnish three (3) copies of shop drawings plus any copies required by Applicant to NPU for approval prior to construction on all materials incorporated in a project.
1.06 PLANS AND SPECIFICATIONS

A. All submitted plans should be standard size sheet including 30-inches by 42-inches, 22-inches by 34-inches or/and 11-inches by 17 inches (true half size) with title block. Graphic scale(s) shall be provided on each sheet and all lettering shall be 1/8-inch or larger to permit photographic reproduction. Submittal of specifications will only be required when special facilities outside the scope of this Specifications are proposed. All plans sheets and the title page of submitted specifications must be signed, sealed and dated by the Builder’s Engineer.

B. Whenever possible, the entire water and wastewater systems shall be shown on a single Master Plan. The Master Plan shall indicate the general locations of all mains, manholes, valves, hydrants, services and service laterals with respect to the proposed development improvements and the existing water and wastewater systems. Main sizes shall be indicated on the Master Plan.

C. All gravity sewers, all wastewater force mains, and off-site water mains shall be drawn in plan and profile. On-site water mains may be shown in plan view only.

Whenever possible, on-site water and wastewater systems shall be shown on the same plans sheet. As a minimum, the plan and profile drawings shall include the following information:

1. General information such as north arrow, names of designer and engineer, revision block with dates, graphic scale(s) and sheet number.

2. Profile with elevations at 100-foot interval, or more frequently if required by good design practice.

3. Development layout with horizontal and vertical controls.

4. All conflicts with other utility and drainage systems.

5. All manhole locations and rim elevations for manholes outside of paved areas.

6. Pipe data including size, lengths, material and slopes.

7. Size, type and locations of fittings, valves, hydrants, air release/vacuum relief, and other related appurtenances.

8. Limits of pipe deflection.

9. Limits of special exterior coatings.
10. Limits of special bedding requirements.

11. Pipe restraint requirements.

12. Details of connection to existing systems.

13. Location(s) and general layout of wastewater pumping stations.

14. Construction notes regarding cover, horizontal and vertical control, special construction requirements and references to standard and special details.

D. The plans shall include all applicable Standard Drawings as shown in this Specifications. Special details shall be prepared by the Builder’s Engineer for aerial and underwater crossings of rivers, streams, canals and ditches. Other special details shall be prepared by the Builder’s Engineer as required.

E. The master plan shall be prepared at a scale not to exceed 1-inch to 200-feet. Plan and profile sheets shall not exceed a scale of 1-inch to 50-feet. Special details shall be of sufficiently large scale to show pertinent construction information.

1.07 ADMINISTRATIVE PROCEDURES

A. This section covers all water, reused water and wastewater improvements that are to be dedicated to the City. Such water and wastewater improvements shall be designed, reviewed, constructed and accepted in accordance with the criteria established herein.

B. Design of water and wastewater improvements shall be in compliance with the design standards and the specifications outlined in this Specifications. Plans will be reviewed and approved by NPU as part of the site plan review process. The review process consists of the following steps:

1. Site plan review application/plans/fee submittal.

2. Application/plans review by NPU.

3. Comments returned to Builder.

4. Final plan submittal and payment of NPU fees.

5. NPU executes DEP applications.

C. The Utilities Director or his/her designee shall periodically inspect all construction subject to these standards and specifications. These inspections shall include, at a minimum,
substantial and final completion inspections.

After all required improvements have been installed, the Builder’s Engineer shall submit certification to the City that the improvements have been constructed substantially according to approved plans and specifications. Non-compliance with approved plans or specifications or evidence of faulty materials or workmanship shall be called to the attention of the Builder or Builder’s Engineer and if not corrected in an expeditious manner, all work on the project will be suspended and/or certificate of occupancy withheld. Laboratory tests may be required when appropriate.

D. A bond shall be posted by the Builder and executed by a company authorized to do business in the State of Florida that is satisfactory to the city, payable to the City in the amount of ten percent of the estimated construction cost of all required water, reused water and wastewater improvements to be owned and maintained by the City. Such bond shall guarantee maintenance of all improvements intended to be owned and maintained by the City for a 1 year period, and the materials, workmanship and structural integrity of water and wastewater systems, and miscellaneous related facilities, excluding mechanical equipment for a 1 year period, commencing after a Certificate of Completion has been issued by the City. The manufacturer’s warranty will be acceptable for mechanical equipment. As an alternative to the provision of a surety bond, the Builder may provide for the deposit of cash in an escrow account or a letter of credit acceptable to the City.

E. After successful completion of all water, reused water and wastewater improvements, and after receipt of the required documents, the City will provide a Certificate of Completion verifying the satisfactory construction of all improvements intended to be owned and maintained by the City and execute all DEP required certifications. The required documents shall include Record Drawings, final release of lien, applicable operation and maintenance manuals and final construction cost information based on actual construction costs. After the 1 year Warranty Period and verification by the City satisfactory performance of all water, reused water and wastewater improvements, the City will issue the Approval for Maintenance, thereby releasing the Builder from further responsibilities.

F. The Builder’s Engineer shall submit a certified set of Record Drawings to the City prior to issuance of Certificate of Completion for the improvements. The Builder’s Engineer shall be responsible for recording information on the approved plans concurrently with construction progress. Record Drawings submitted to the City, as part of the project acceptance shall comply with the following requirements:

1. Drawings shall be legibly marked to record actual construction.

2. Drawings shall show actual location of all underground and above ground water, reused water and wastewater piping and related appurtenances. All changes to piping location including horizontal and vertical locations of utilities and appurtenances shall be clearly shown and referenced to permanent surface improvements. Drawings
shall also show actual installed pipe material, class, etc.

3. Drawings shall clearly show all field changes of dimension and detail including changes made by field order or by change order.

4. Drawings shall clearly show all details not on original contract drawings but constructed in the field. All equipment and piping relocation shall be clearly shown.

5. Location of all manholes, hydrants, valves and valve boxes shall be shown. All valves shall be referenced (swing tie) from three permanent points.

6. Dimensions between all manholes shall be field verified and shown. The inverts and grade elevations of all manholes shall be shown.

Each sheet of the plans shall be signed, sealed and dated by the Builder’s Engineer as being As-Builts or Record Drawings. Construction plans simply stamped As-Builts or Record Drawings and lacking in above requirements will not be accepted, and will be returned to the Builder's Engineer. The Certificate of Completion will not be issued until correct Record Drawings have been submitted.

1.08 LIST OF MATERIALS AND APPROVED MANUFACTURERS

A list of Materials and Approved Manufacturers for the various products specified in this Specifications is included in Appendix A. It is the intent of the City to review and update Appendix A as appropriate to ensure efficient operation of the services and facilities under the jurisdiction of this Specifications. For this purpose, the City shall evaluate technical submittals from interested manufacturers or suppliers at least once every 3 years.

1.09 PERSON TO CONTACT

Key persons to contact concerning this Specifications are as follows:

Utilities Director/Assistant Utility Director
City of North Port
6644 West Price Boulevard
North Port, FL 34287
(941) 426-9500

1.10 PROCEDURE FOR OBTAINING CAPACITY

Applications for wastewater or water capacity shall be submitted to NPU. Applications shall consist of appropriate forms and documentation as delineated in Section 2 and shall be available from NPU. Applications will be given a preliminary screening when submitted, and any incomplete or incorrect applications will be returned to the applicant for necessary revisions. Accepted applications shall be
entered on a categorical Pending Wastewater or Water Capacity List. Applications will be classified by the following categories:

A. Subdivision Single Family: Applicants desiring to build multiple single family residences.

B. Large Multi-Family: Applicants desiring to build multiple multi-family residential units.

C. Large Commercial/Industrial/Institutional: Applicants for commercial development who’s requested capacity allocation is in excess of 3,375 gpd.

D. Agricultural: Applicants requiring irrigation water for agricultural purposes.

Placement on a list will serve to confirm receipt of a valid application and insure an equitable First Come - First Served processing of applications. Applicants will be notified by certified mail that capacity is available for allocation for their specific project and advised as to any additional information or documentation required to facilitate review of their application.

Applicants will be required to provide such information or otherwise perfect a pending application within thirty (30) calendar days from notification by NPU. Failure to provide requested information within this time will result in removal of the application from the appropriate Pending Wastewater Capacity or Pending Water Capacity List.

Following review, processing and approval of the application and Standard Developer’s Agreement by the Utilities Department, the Wastewater, reused water and/or Water Fees will be calculated for the project. Payment of the Wastewater, reused water and/or Water Fees shall constitute a reservation of capacity and will remain as such, subject to complete compliance with other provisions of the policy.

To obtain wastewater, reused water and/or water capacity allocations, the property for which capacity application is made must be appropriately zoned and platted to support the proposed development.

In cases of applications for capacity allocations for non-residential developments, the applicant shall provide sufficient information to facilitate a reasonable estimate of capacity needs and determination of the Wastewater and/or Water Fees. Capacity will be reserved based on this estimate and payment of the prescribed Fees; however, upon completion of final building plans, the plans shall be submitted for re-evaluation of capacity needs and re-computation of the Fees.

1.11 PAYMENT OF FEES

Fees as adopted by the City shall be applied in conjunction with each application. Fees shall consist of all applicable connection and impact fees and contributions-in-aid-of-construction for the system connection. Payment of the Fees will be as follows:

A. At the time of application for capacity, and following Fee determination, the applicant will be
required to pay 100 percent of the Fees as a condition of capacity reservation.

Failure to make payment within the specified time frame will result in removal of the application from the appropriate Pending Capacity List.

1.12 REGULATORY PERMITS

All permits required from any federal, state and local government entity having jurisdiction over the facilities proposed to be installed shall be obtained by the applicant. Any application, which fails to meet the requirements of all federal, state and local governing bodies will be deemed incomplete by NPU.

1.13 ALLOCATION FACTORS AND LIMITATIONS

Evaluations of North Port’s Utility System have resulted in Equivalent Residential Connections (ERC) flows of 250 gpd for water and 225 gpd for wastewater. In reserving and allocating capacity for applications submitted to NPU the ERC factor method or one of the methods outlined in Section 2 shall be used. The method selected shall be approved by NPU.

1.14 CAPACITY RESERVATION OR ALLOCATION RECAPTURE

Having obtained a wastewater and/or water capacity reservation or allocation, the reservation or allocation shall be used and applied only with respect to the property for which the application for wastewater and/or water capacity has been made and approved. The reservation or allocation shall inure to the property, subject to the provisions of this policy. The applicant is not otherwise permitted to sell, lease, sublet, assign, lend or transfer a capacity reservation or allocation without the prior notification and approval of NPU. To insure maximum beneficial utilization of the available wastewater, reused water and/or water capacity, NPU reserves the right to recapture capacity reservations or allocations, or parts thereof, for failure of the applicant to meet the condition of authorization, or to responsibly and timely prosecute the development of the project for which capacity was obtained. The Developer agreement between the City and the Developer will include all the details not covered under this section concerning the Capacity fees.

NPU may institute the recapture of reserved or allocated wastewater or water capacity under the following circumstances:

A. Violation of the prohibition against transfer of a capacity reservation or allocation, or failure to provide requisite notification to the Utilities Department of any change in ownership of the property for which a reservation or allocation has been obtained.

B. Failure of those applicants who have previously obtained capacity allocations in the existing system to pay outstanding Wastewater or Water Fees and complete actions leading to utilization of such capacity allocation.
C. Failure to comply with the requirements of the NPU, as from time to time amended.
NPU shall give the applicant, or successor in interest according to NPU records, 30 calendar days written notice of its intent to recapture reserved or allocated wastewater or water capacity as provided above. The notice shall contain the basis for the intended recapture and state what corrective action is required to preserve the capacity reservation or allocation. During the 30 day period, the applicant may take corrective action to come into compliance with the requirements of the policy. Any recapture of capacity, as provided in this policy is subject to review by the City.

1.15 FEES SUBJECT TO CHANGE

Fees may be changed at any time, subject to approval by the City. Applicants will be required to develop a new Developers agreement with the City’s NPU Department. The Agreement will include the specifics on the Fees involved for a specific development. Applicants will be required to pay the current fees at the time the water meter(s) application has been filled out and returned to NPU along with the security deposit and capacity fees (whenever the Developer pays for them).

1.16 PENDING WASTEWATER AND WATER CAPACITY LISTS

As indicated previously in this policy, all applications for service will be placed on a Pending Wastewater or Water Capacity List, if capacity is not available.

1.17 SYSTEM EXTENSION POLICY

If a request is made beyond the limits of the present distribution system, the Developer will be required to install water and sewer systems from the City’s present system to the Development in accordance with applicable City Rules and Regulations. This extension policy shall not apply to property located outside the Utility Service Area’s limits. Where the length of the extension is longer than the maximum allowed under applicable Rules and Regulations, NPU shall make determination as to whether or not to provide service based on economic, public health and system integrity consideration. In the event the application is determined to be economically unfeasible, service may still be provided if the persons requesting such service will pay all costs in connection therewith. The Development Agreement between the City’s NPU and the Developer shall include the details concerning the extension of the system and the responsibilities of the Developer and the City.

1.18 GUARANTEE REVENUE

Each NPU water or wastewater permit shall remain current five years from the date of capacity availability and shall run with the land for which the permit is issued. A Guarantee Revenue shall be paid by the applicant annually for each ERC of capacity allocated to an applicant, which remains unused after capacity has been made available. A Guarantee Revenue will be established pursuant to law by NPU based on the cost to NPU of maintaining unused wastewater or water capacity for the amount of treatment set forth in said permit.
Should a permit become non-current, the right to connection established by such permit shall terminate. Any non-current permit may be reestablished as current only after application for current status is applied for and upon capacity for that type of permit becoming available to the applicant in the same manner as if the same were a new application. Such permit shall be recertified as current subject to all of the conditions of a new permit. All fees paid pursuant thereto shall, upon issuance of a water or wastewater permit therefore, be non-refundable. Prior to the NPU water or wastewater permit becoming non-current, NPU permittee may apply for an extension of an NPU permit beyond the period provided herein if the permittee can demonstrate to the satisfaction of NPU that the project for which the permit is issued is progressing. Determination of the term progressing shall be made by NPU and shall not exempt permittee from payment of the Guarantee Revenue as described herein.

All unpaid Reserve Capacity Fees shall accrue, and no connection shall be allowed to NPU utility facilities pursuant to any NPU permit until all such unpaid, accrued fees related to said permit have been paid in full by the permittee or his assigns.

Except as provided in the preceding paragraph, the obligation to continue paying the annual Guarantee Revenue for a particular ERC of service capacity shall terminate upon connection of that particular ERC of capacity to the NPU system. The reserved capacity fee shall be per the Developer Agreement between NPU and the Developer. Although this is a policy for reservation capacity fee, the Developer Agreement could supersede this policy, depending on NPU concurrence.

1.19 PREPAYMENT OPTION

Applicants desirous of reserving advance capacity in NPU water or wastewater facilities may purchase some at the prevailing Water or Wastewater Fee Charge, which will guarantee the availability of the purchased capacity and that it will not be subject to subsequent increases in the charge. In addition, purchases of capacity under this provision will not be subject to requirements of this policy for making application under the Pending Wastewater or Water Capacity Listing. They will also be afforded flexibility in utilization of their purchased capacity within prescribed land holding for which the capacity is obtained. Approval of the NPU for parcel-to-parcel transfers, or between different types of planned development will not be required. Applicants will be required to process applications through the NPU to facilitate payment of other relevant charges.

1.20 ZONING

Plans for construction of water and wastewater facilities, transmission, collection or distribution systems installations shall be subject to review by NPU. For this purpose the property must be appropriately zoned or plated to support the proposed facilities and shall comply with all appropriate aspects of the applicable zoning codes.
SECTION 2
CAPACITY ALLOCATION

2.01 GENERAL

Presented in this Section are design evaluations for the derivation of flow requirements and related capacity-demand units and connection policy application procedures. There are four major types of utility capacity allocations as appropriate to NPU. They are potable water, irrigation, fire flow and wastewater capacity allocations.

The capacity allocations outlined in this Section are necessary to provide a mechanism allowing for water and wastewater system capacity allocations for major capacity requests.

2.02 POTABLE WATER CAPACITY ALLOCATION

A. General: All potable water capacity allocations will be determined by the calculated instantaneous water demand flow in gallons per minute (gpm) and required meter size. Derivation of the instantaneous potable water demand flow will be based on one or more of the derivation methods shown in Paragraphs 2.02 B, C, D and E below, as applicable to specific requirements and as required by NPU. NPU reserves the right to decide on the applicable method(s) to be used.

B. Equivalent Residential Unit (ERC) Factor Chart Method:

1. First the ERC factor will be determined from the ERC Determination Schedule shown in Table 2-1.

2. Second, the potable water demand (in gallons per day) will be determined based on fixture counts. Fixtures include, but not limited to toilets, sinks, washer machines, etc.

3. For water the amount of ERC equals 250gpd and wastewater equals 225 gpd.
**TABLE 2-1**

**ERC DETERMINATION SCHEDULE**

<table>
<thead>
<tr>
<th>Establishment</th>
<th>Unit</th>
<th>ERC Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Family Home</td>
<td>Per Unit</td>
<td>1.000</td>
</tr>
<tr>
<td>Duplex (1 bedroom or efficiency)</td>
<td>Per Unit</td>
<td>0.833</td>
</tr>
<tr>
<td>Duplex (2 or more bedrooms)</td>
<td>Per Unit</td>
<td>1.000</td>
</tr>
<tr>
<td>Multi-Family (1 bedroom or efficiency)</td>
<td>Per Unit</td>
<td>0.833</td>
</tr>
<tr>
<td>Multi-Family (2 or more bedrooms)</td>
<td>Per Unit</td>
<td>1.000</td>
</tr>
<tr>
<td>Mobile Home (1 bedroom or efficiency)</td>
<td>Per Unit</td>
<td>0.667</td>
</tr>
<tr>
<td>Mobile Home (2 or more bedrooms)</td>
<td>Per Unit</td>
<td>0.833</td>
</tr>
</tbody>
</table>


4. Last, using the number of ERCS the average daily flow in gallons per day (gpd) for water capacity allocations is calculated by using the following formula:

\[
\text{Number of ERC’s} \times 250 \text{ gpd/ERC} = \text{Average Daily Flow (gpd)}
\]

C. Fixture Unit Calculation Method:

1. First, the number of fixture units will be calculated

2. Second, the total number of fixture units will be converted to equivalent residential connections (ERC) as follows:

\[
\text{Total Number of Fixture Units} \times \frac{30}{250} = \text{ERC Value}
\]

3. Third, the instantaneous potable water demand (in gallons per minute) will be determined from the Instantaneous Flow Per ERC Schedule shown in Table 2-3.

4. Example: A research laboratory with a total fixture unit number of 500:

   a. Convert Fixture Units to ERCs

   \[
   500 \text{ Fixture Units} \times \frac{30}{250} = 50 \text{ ERCs}
   \]

   b. Determine instantaneous potable water demand from Table 2-3.

   \[
   42 \text{ ERCs} = 176 \text{ Gallons Per Minute Instantaneous Demand}
   \]

5. Last, the ERC value will be converted to average daily flow in gallons per day (gpd) for water capacity allocations by using the following formula:

\[
\text{ERC Value} \times \frac{250 \text{ gpd/ERC}} = \text{Average Daily Flow(gpd)}
\]
### TABLE 2-2

**INSTANTANEOUS FLOW PER ERU SCHEDULE**

<table>
<thead>
<tr>
<th>No. of ERUs</th>
<th>Instantaneous Flow GPM</th>
<th>No. of ERUs</th>
<th>Instantaneous Flow GPM</th>
<th>No. of ERUs</th>
<th>Instantaneous Flow GPM</th>
<th>No. of ERUs</th>
<th>Instantaneous Flow GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>26</td>
<td>124</td>
<td>51</td>
<td>203</td>
<td>76</td>
<td>279</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>27</td>
<td>128</td>
<td>52</td>
<td>206</td>
<td>77</td>
<td>282</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
<td>28</td>
<td>132</td>
<td>53</td>
<td>209</td>
<td>78</td>
<td>285</td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>29</td>
<td>136</td>
<td>54</td>
<td>212</td>
<td>79</td>
<td>288</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>30</td>
<td>140</td>
<td>55</td>
<td>215</td>
<td>80</td>
<td>291</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>31</td>
<td>143</td>
<td>56</td>
<td>218</td>
<td>81</td>
<td>294</td>
</tr>
<tr>
<td>7</td>
<td>45</td>
<td>32</td>
<td>146</td>
<td>57</td>
<td>221</td>
<td>82</td>
<td>297</td>
</tr>
<tr>
<td>8</td>
<td>50</td>
<td>33</td>
<td>149</td>
<td>58</td>
<td>224</td>
<td>83</td>
<td>300</td>
</tr>
<tr>
<td>9</td>
<td>55</td>
<td>34</td>
<td>152</td>
<td>59</td>
<td>227</td>
<td>84</td>
<td>303</td>
</tr>
<tr>
<td>10</td>
<td>60</td>
<td>35</td>
<td>155</td>
<td>60</td>
<td>230</td>
<td>85</td>
<td>306</td>
</tr>
<tr>
<td>11</td>
<td>64</td>
<td>36</td>
<td>158</td>
<td>61</td>
<td>233</td>
<td>86</td>
<td>309</td>
</tr>
<tr>
<td>12</td>
<td>68</td>
<td>37</td>
<td>161</td>
<td>62</td>
<td>237</td>
<td>87</td>
<td>312</td>
</tr>
<tr>
<td>13</td>
<td>72</td>
<td>38</td>
<td>164</td>
<td>63</td>
<td>240</td>
<td>88</td>
<td>315</td>
</tr>
<tr>
<td>14</td>
<td>76</td>
<td>39</td>
<td>167</td>
<td>64</td>
<td>243</td>
<td>89</td>
<td>318</td>
</tr>
<tr>
<td>15</td>
<td>80</td>
<td>40</td>
<td>170</td>
<td>65</td>
<td>246</td>
<td>90</td>
<td>321</td>
</tr>
<tr>
<td>16</td>
<td>84</td>
<td>41</td>
<td>173</td>
<td>66</td>
<td>249</td>
<td>91</td>
<td>324</td>
</tr>
<tr>
<td>17</td>
<td>88</td>
<td>42</td>
<td>176</td>
<td>67</td>
<td>252</td>
<td>92</td>
<td>327</td>
</tr>
<tr>
<td>18</td>
<td>92</td>
<td>43</td>
<td>179</td>
<td>68</td>
<td>255</td>
<td>93</td>
<td>330</td>
</tr>
<tr>
<td>19</td>
<td>96</td>
<td>44</td>
<td>182</td>
<td>69</td>
<td>258</td>
<td>94</td>
<td>333</td>
</tr>
<tr>
<td>20</td>
<td>100</td>
<td>45</td>
<td>185</td>
<td>70</td>
<td>261</td>
<td>95</td>
<td>336</td>
</tr>
<tr>
<td>21</td>
<td>104</td>
<td>46</td>
<td>188</td>
<td>71</td>
<td>264</td>
<td>96</td>
<td>339</td>
</tr>
<tr>
<td>22</td>
<td>108</td>
<td>47</td>
<td>191</td>
<td>72</td>
<td>267</td>
<td>97</td>
<td>342</td>
</tr>
<tr>
<td>23</td>
<td>112</td>
<td>48</td>
<td>194</td>
<td>73</td>
<td>270</td>
<td>98</td>
<td>345</td>
</tr>
<tr>
<td>24</td>
<td>116</td>
<td>49</td>
<td>197</td>
<td>74</td>
<td>273</td>
<td>99</td>
<td>348</td>
</tr>
<tr>
<td>25</td>
<td>120</td>
<td>50</td>
<td>200</td>
<td>75</td>
<td>276</td>
<td>100</td>
<td>351</td>
</tr>
</tbody>
</table>
## TABLE 2-3

**FIXTURE UNIT CALCULATION TABLE**

**Instructions:**

1. Indicate number of fixtures proposed, by type.
2. Multiply by Fixture Unit Values.
3. Add values to obtain total number of fixture units.

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Number Proposed</th>
<th>Unit Value (Each)</th>
<th>Fixture Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bathroom Group (water closet, lavatory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bathtub or shower stall)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Installation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Installation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Bathtub (with or without overhead shower)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1½&quot; minimum trap size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot; minimum trap size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Bidet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Combination Sink and Tray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Combination Sink and Tray with Food disposal unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Dental unit or cuspidor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Dental lavatory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Drinking Fountain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Dishwashing machine domestic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Floor Drainage (*See Note #1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Kitchen sink domestic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Kitchen sink, with food waste grinder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Lavatory (small P.O.) 1 1/4&quot; Minimum Trap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Lavatory (large P.O.) 1 2&quot; Minimum Trap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Lavatory, barber’s, beauty parlor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Lavatory, Surgeon’s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Laundry tray (1 or 2 compartments)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Shower stall, domestic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Showers, (group) per head</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Surgeon's Sinks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Flushing rim sink (with valve)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Service (Trap standard) sink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Service sink (P. Trap)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Pot, Scullery, Mop, Sink etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Urinal, pedestal, siphon jet, blowout</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 2-3 (Continuation)

FIXTURE UNIT CALCULATION TABLE

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Number Proposed</th>
<th>Fixture Unit Value (Each)</th>
<th>Fixture Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. Urinal, wall lip</td>
<td>_______</td>
<td>X 4</td>
<td>= ___________</td>
</tr>
<tr>
<td>27. Urinal, stall, washout</td>
<td>_______</td>
<td>X 4</td>
<td>= ___________</td>
</tr>
<tr>
<td>28. Urinal Trough (each 2 feet section)</td>
<td>_______</td>
<td>X 2</td>
<td>= ___________</td>
</tr>
<tr>
<td>29. Washing Machine (residential)</td>
<td>_______</td>
<td>X 3</td>
<td>= ___________</td>
</tr>
<tr>
<td>30. Washing Machine (commercial)</td>
<td>_______</td>
<td>X __*</td>
<td>= ___________</td>
</tr>
<tr>
<td>*See Note #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Wash sink (circular or multiple each set of faucets)</td>
<td>_______</td>
<td>X 2</td>
<td>= ___________</td>
</tr>
<tr>
<td>32. Water Closet, Private Installation</td>
<td>_______</td>
<td>X 4</td>
<td>= ___________</td>
</tr>
<tr>
<td>33. Water Closet, Public Installation</td>
<td>_______</td>
<td>X 6</td>
<td>= ___________</td>
</tr>
</tbody>
</table>

Total Number of Fixture Units __________

*Notes:

1. Fixture Drain or Trap Size

<table>
<thead>
<tr>
<th>Fixture Unit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
</tr>
<tr>
<td>2 1/2&quot;</td>
</tr>
<tr>
<td>3&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
</tr>
</tbody>
</table>
E. **Existing Facility/Previous Records:** NPU may consider the past records of an existing operational facility for determining proposed flow requirements for a new development, provided the applicant submits sufficient information to allow NPU to determine anticipated flow. This information shall include but not be limited to twelve months previous water bills and a complete listing of the differences in the existing and proposed facility such as size, hours of operation, type of uses, number of employees, etc.

F. **Meter Sizing:** Potable water meters will be sized by the instantaneous demand flow as calculated in Paragraphs 2.02 B, C, D and E above, according to the following schedule:

<table>
<thead>
<tr>
<th>Instantaneous Demand</th>
<th>Meter Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15 GPM</td>
<td>5/8 Inch</td>
</tr>
<tr>
<td>16-25 GPM</td>
<td>3/4 Inch</td>
</tr>
<tr>
<td>26-37 GPM</td>
<td>1 Inch</td>
</tr>
<tr>
<td>38-75 GPM</td>
<td>1 ½ Inch</td>
</tr>
<tr>
<td>76-120 GPM</td>
<td>2 Inch</td>
</tr>
<tr>
<td>121-225 GPM</td>
<td>3 Inch</td>
</tr>
<tr>
<td>226-350 GPM</td>
<td>4 Inch</td>
</tr>
<tr>
<td>351-750 GPM</td>
<td>6 Inch</td>
</tr>
<tr>
<td>751-1200 GPM</td>
<td>8 Inch</td>
</tr>
<tr>
<td>1201-2000 GPM</td>
<td>10 Inch</td>
</tr>
</tbody>
</table>
2.03 IRRIGATION WATER CAPACITY ALLOCATION

A. **General:** It is a policy of NPU to have separate potable water and irrigation water meters to provide for future wastewater reuse capabilities. In line with this policy, a separate irrigation water meter may be required. All irrigation water capacity allocations will be determined by required meter size based on the calculated water demand flow in gallons per minute (gpm). Derivation of irrigation demand flow will be based on one of the methods outlined in Paragraphs 2.03 B or C below, as applicable and as required by NPU.

B. **Actual Irrigation System Requirements:** If available, the property owner will submit to NPU a complete plan of the proposed irrigation system with sufficient detail data so as to allow the NPU to calculate the required demand. Submittal data shall include, but not be limited to, main feed line size, sprinkler head flow requirements, number of heads per zone, number of zones, cycle times and total operation times for the system. Total system demand in gallons per minute will be computed using sound engineering practice and locally accepted methods.

C. **Square Foot Application Method:**

1. This method will be used if the requirements of Paragraph B, above, cannot be met.

2. For the purpose of computations, an application rate of one and one-half (1½) inches of water per Week per square foot will be used.

3. First, a determination of the total area to be irrigated must be determined by lot size less developed area.

4. Second, the total irrigated area must be converted to gallons per week by using the following formula:

   \[ \text{Irrigation Area (in sq. ft.)} \times 0.94 \text{ Gal. Per Week/Sq. Ft.} = \text{Total Gallons Per Week} \]

5. Third, the total gallons per week must be converted to average gallons per minute (gpm) based on the proposed system use as follows:

   \[ \text{Gal./Week} \times \frac{1 \text{ Week/___Days Operated} \times 1 \text{ Day/___Hours Operated} \times 1 \text{ hour/60 Min.}}{} = \text{Average gpm} \]

6. Example: 50,000 square feet irrigated 5 days per week for 6 hours per day.

   \[ 50,000 \text{ Sq. Ft.} \times 0.94 \text{ Gal. Per week/Sq. Ft.} \times 1 \text{ Week/5 Days} \times 1 \text{ Day/6 Hours} \times \frac{1 \text{ hour/60 Minutes}}{60} = 26 \text{ gpm} \]

7. Last, the gallons per minute must be converted to average daily flow for water capacity allocations by using the following formula:
Gallons Per Minute x 1440 minutes/Day = Average Daily Flow (gpd)

D. **Meter Sizing**: Irrigation water meters will be sized by the total system demand flow as calculated in Paragraphs 2.03 B and C above, according to the following schedule:

<table>
<thead>
<tr>
<th>Flow Required</th>
<th>Meter Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-400 GPM</td>
<td>4 Inch</td>
</tr>
<tr>
<td>130-900 GPM</td>
<td>6 Inch</td>
</tr>
<tr>
<td>300-1500 GPM</td>
<td>8 Inch</td>
</tr>
<tr>
<td>480-2400 GPM</td>
<td>10 Inch</td>
</tr>
<tr>
<td>700-3500 GPM</td>
<td>12 Inch</td>
</tr>
</tbody>
</table>

2.04 **FIRE PROTECTION CAPACITY ALLOCATIONS**

A. **General**: Specific fire protection requirements will be determined by and be in complete conformance with local and state fire protection regulations. Actual fire protection requirements will be based on information such as parcel size, building size and the type of establishment.

2.05 **WASTEWATER CAPACITY ALLOCATIONS**

A. **General**: Wastewater capacity allocations will be determined by the total equivalent residential unit (ERC) value calculated for each establishment. Derivation of the total ERC value will be based on one or more of the derivation methods shown in Paragraphs 2.05 B, C, D and E below, as applicable to specific requirements and as required by NPU.

B. **Fixture Unit Calculation Method**:

1. First, the number of fixture units will be calculated using the information contained in Table 2-2.

2. Second, the total number of fixture units will be converted to equivalent residential units as follows:

   Total Number of Fixture Units x 30/250 = ERC Value

3. Example: A research laboratory with a total fixture unit number of 170.

   170 Fixture Units x 30/250 = 24 ERCs

4. The ERC value must also be converted to gallons per day (gpd) for wastewater capacity allocations by using the following formula:
ERC Value x 225 gpd/ERC = Average Daily Flow (gpd)

C. **Special Considerations For Industrial Use:** Industrial use shall be defined as wastewater resulting from processing, manufacturing, cooling, make-up, cleaning and the like. The actual wastewater resulting from such use will be determined by the user and/or equipment manufacturer. The applicant must submit sufficient information so as to clearly define wastewater flow in gallons per day (gpd) for industrial uses. This information will be reviewed by NPU to determine the actual equivalent residential units produced using the relationship:

\[ 1 \text{ ERC} = 225 \text{ gpd} \]

All industrial flows must be pretreated to NPU acceptable levels by that industry onsite. All related costs for industrial pretreatment shall be borne by the industry and do not represent credits on any NPU fee.

E. **Existing Facility/Previous Records:** NPU may consider the past records of an existing operational facility for determining proposed flow requirements for a new development, provided the applicant submits sufficient information to allow the NPU to determine anticipated flow. This information shall include, but not be limited to, twelve months previous water bills and a complete listing of the differences in the existing and proposed facility such as size, hours of operation, type of uses, number of employees, etc.

2.06 **CONNECTION PROCEDURES AND APPLICATION FORMS**

A. **Stepwise Connection Procedure**

1. Applicant shall obtain a copy of this Specifications for his use.

2. Applicant completely reviews and becomes familiar with the information contained herein.

3. Applicant submits capacity application forms (see Paragraph B) with plans, specifications and all related submittal data.

4. Applications and capacity submittal reviewed by NPU.

5. The NPU will notify the applicant concerning the applicable connection fees and capacity allocation requirements.

6. All required estimated connection fees and the administrative fee due to NPU will be paid by the applicant upon execution of the utility agreement at the time of closing as adopted in the Water and Wastewater Utility Rate Ordinance 92-27.
7. Applicant completes final plans and specifications for improvements.

8. Applicant submits final plans and specifications to NPU for review and approval.

9. Final plans and specifications reviewed by NPU and, if required, adjustments made to required connection fees and capacity allocation.

10. All required adjustments to connection fees due to NPU will be paid prior to construction.

11. Applicant provides NPU with construction schedule.

12. After notification from NPU, contractor’s construction forces may begin work.

13. Utility user rates enter into effect at the time of notification to Applicant that construction may begin.

14. NPU construction forces will make required connections, tie-ins, set required meters and notify Applicant immediately upon completion of same prior to the substantial completion date.

B. Application Forms: The balance of this section contains blank application forms for general facility installation and potable water, irrigation water, fire protection and wastewater capacity from NPU.
SECTION 3

GENERAL CONSTRUCTION REQUIREMENTS

3.01 GENERAL

A. This Section sets forth the general requirements for construction and installation of water and wastewater utility facilities.

3.02 GRADES, SURVEY LINES AND PROTECTION OF MONUMENTS

A. Grades: All work shall be constructed in accordance with the lines and grades shown on the Plans. The full responsibility for keeping alignment and grade shall rest upon the Builder.

Benchmarks and base line controlling points shall be established prior to beginning work. Reference marks for lines and grades as the work progresses will be located to cause as little inconvenience to the prosecution of the work as possible. The Builder shall so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. Builder shall remove any obstructions placed contrary to this provision.

B. Surveys: The Builder shall furnish and maintain, at his own expense, stakes and other such materials, and give such assistance, including qualified helpers, for setting reference marks to the satisfaction of the City and the Engineer. The Builder shall check such reference marks by such means as he may deem necessary and, before using this, shall call the City’s attention to any inaccuracies. The Builder shall, at his own expense, establish all working or construction lines and grades as required from the reference marks, and shall be solely responsible for the accuracy thereof. The Builder shall, however, be subject to the check and review of the City.

C. Monument Preservation: Property corners and survey monuments shall be preserved using care not to disturb or destroy them. If a property corner or survey monument is disturbed or destroyed during construction, whether by accident, careless work, or required to be disturbed or destroyed by the construction work, said property corner or survey monument shall be restored by a land surveyor registered in the State of Florida. All costs for this work shall be paid for by the Builder.

3.03 UTILITY COORDINATION

A. Location of Utilities: Prior to proceeding with trench excavation, the Builder shall contact all utility companies in the area to aid in locating their underground services. It shall be the Builder’s responsibility to contact utility companies at least three (3) normal working days before starting construction. The Builder shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground utilities may be determined.
The Builder shall take all reasonable precautions against damage to existing utilities. However, in the event of a break in an existing water main, gas main, sewer or underground cable, the Builder shall immediately notify the responsible official of the organization operating the interrupted utility. The Builder shall lend all possible assistance in restoring services and shall assume all cost, charges, or claims connected with the interruption and repair of such services.

B. **Deviations Occasioned by Structures or Utilities:** Wherever obstructions are encountered during the progress of the Work and interfere to such an extent that an alteration in the Plans is required, the City shall have the authority to order a deviation from the line and grade or arrange with the owners of the structures for the removal, relocation or reconstruction of the obstructions. Where gas, water, telephone, electrical, hot water, steam or other existing utilities are an impediment to the vertical or horizontal alignment of the proposed pipe line, the City shall order a change in grade or alignment or shall direct the Builder to arrange with the owners of the utilities for their removal. If a change in line or grade of a gravity sewer is necessary, the City will require the addition of any manholes needed to maintain the integrity of the sewer system.

C. **Test Pits:** Test pits for the purpose of locating underground pipeline, utilities, or structures in advance of the construction shall be excavated and backfilled by the Builder. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the City. The costs for such test pits shall be borne by the Builder.

3.04 **MAINTENANCE OR TRAFFIC AND CLOSING OF STREETS**

A. The Builder shall carry on the Work in a manner, which will cause a minimum of interruption to traffic. Where traffic must cross open trenches, the Builder shall provide suitable bridges at street intersections and driveways. The Builder shall post suitable signs indicating that a street is closed and necessary detour signs for the proper maintenance of traffic. Prior to closing of any streets the Builder shall notify and obtain the approval of responsible authorities and the City.

Unless permission to close a street is received in writing from the proper authority (City, FDOT, etc.), all excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Builder’s operations cause traffic hazards, he shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the City.

Detours around construction will be subject to the approval of the authority having jurisdiction and the City. Where detours are permitted, the Builder shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is being detoured will be strictly controlled by the City.
It shall be the sole responsibility of the Builder to take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. The Builder shall be fully responsible for damage or injuries whether or not police protection has been provided.

3.05 PROTECTION OF PUBLIC AND PROPERTY

A. Barricades, Guards and Safety Provisions: The Builder, shall be solely responsible for adhering to the rules and regulations of OSHA and appropriate authorities regarding safety provisions. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, lights and guards as required shall be placed and maintained by the Builder at his expense during the progress of the Work and until it is safe for traffic to use the roads and streets. All material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. All signage and barricades shall be in accordance with the Manual on Uniform Traffic Control Devices and the Traffic Control and Safe Practices Manual.

B. Protection of Utility Structures: Temporary support, adequate protection and maintenance of all underground and surface utility structures including drains, sewers, manholes, hydrants, valves, valve covers, power poles and miscellaneous other utility structures encountered in the progress of the Work shall be furnished by the Builder at his expense. Any such structures which may have been disturbed shall be restored upon completion of the Work.

C. Open Excavation: All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The Builder shall, at his own expense, provide suitable and safe bridges with hand railings and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. The length of open trench will be controlled by the particular surrounding conditions, but shall be limited to 300 feet unless otherwise approved by the City. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the City may require special construction procedures such as limiting the length of open trench, fencing, prohibiting excavated material in the street and requiring that the trench shall not remain open overnight. The Builder shall take precautions to prevent injury to the public due to open trenches. All trenches excavated material, equipment or other obstacles which could be dangerous to the public shall be well lighted at night.

D. Protection of Trees and Shrubs: All trees and shrubs not shown to be removed on the Plans shall be protected by the Builder at his expense. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the Builder or he shall replace his employees with new stock of similar size and age at the sole expense of the Builder.
E. **Protection of Lawn Areas:** Lawn areas shall be left in as good or better condition as before starting of the Work. Where sod is to be removed it shall be carefully restored with new sod of the same type.

F. **Restoration of Fences:** Any fence, or part thereof, that is damaged or removed during the course of the Work shall be replaced or repaired by the Builder and shall be left in as good a condition as before the starting of the Work. The manner in which the fence is repaired or replaced and the materials used shall be subject to the approval of the City.

G. **Protection Against Siltation and Bank Erosion:** The Builder shall arrange his operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches. The Builder, at his own expense, shall remove any siltation deposits and restore to original grade.

### 3.06 ACCESS TO THE PUBLIC SERVICES

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

### 3.07 PUBLIC NUISANCE

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

### 3.08 CONSTRUCTION HOURS

A. No Work shall be done between the hours of 7:00 p.m. and 7:00 a.m., or on Saturdays and Sundays unless the proper and efficient prosecution of the Work requires operations during the night or weekend. Written notification for doing the work shall be provided to the City a minimum of 2 weeks before starting such items of the Work.
3.09 CONSTRUCTION IN EASEMENTS AND RIGHTS-OF-WAY

A. Construction Easements: In easements across private property, the Builder shall confine all operations within the easement area and shall be responsible and liable for all damage outside of the easement area. Trees, fences, shrubbery or other type of surface improvements located in easements will require protection during construction. Precautions shall be taken by adequate sheeting or other approved method to prevent any cave-in or subsidence beyond the easement limits or damage to improvements within the easement. In general, the easement area is intended to provide reasonable access and working area for efficient operation by the Builder. Where easement space for efficient operation is not provided, the Builder shall be responsible for organizing operations to perform within the restrictions shown on the Plans.

B. Construction in Florida Department of Transportation Rights-of-Way: The Builder shall strictly adhere to the requirements of the Florida Department of Transportation (FDOT) where construction work is in a right-of-way under the jurisdiction of the state of Florida, and shall take care to avoid any unreasonable traffic conflicts due to the Work in road right-of-way. The requirements anything necessary to obtain the FDOT permit. The developer shall coordinate and obtain the FDOT permitting on behalf of the City.

C. Construction in City of North Port Rights-of-Way: Work shall be governed by the city of North Port Regulations as amended.

3.10 SUSPENSION OF WORK DUE TO WEATHER

A. During inclement weather, all work which might be damaged or rendered inferior by such weather conditions shall be suspended. During suspension of the Work from any cause, the Work shall be suitably covered and protected so as to preserve it from injury by the weather or otherwise.

3.11 USE OF CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either United States Environmental Protection Agency (USEPA) or United States Department of Agriculture (USDA). Use of all such chemicals and disposal of residues shall be in strict conformance with label instructions.

3.12 COOPERATION WITH OTHER BUILDERS AND FORCES

A. During construction progress, it may be necessary for other contractors and persons employed by the City to work in or about the site. The City reserves the right to put such other contractors to work and to afford such access to the construction site and at such times as the City deems proper. The Builder shall not impede or interfere with the work of such
other contractors and shall cooperate with the other contractor(s) for proper prosecution of
the work.

3.13 SUBSURFACE EXPLORATION
A. The Builder shall make such subsurface explorations, as the Builder believes necessary to
perform the Work.

3.14 CLEANING
A. During Construction: During construction the Builder shall, at all times, keep the
construction site and adjacent premises as free from material, debris and rubbish as is
practicable and shall remove the same from any portion of the site if, in the opinion of the
City, such material, debris or rubbish constitutes a nuisance or is objectionable.
B. Final Cleaning: At the conclusion of the Work, all tools, temporary structures and materials
belonging to the Builder shall be promptly taken away. The Builder shall remove and
promptly dispose of all water, dirt, rubbish or any other foreign substances.

3.15 SALVAGE
A. Any existing City owned equipment or material including but not limited to valves, pipes,
 fittings, couplings, etc., which is removed or replaced as a result of construction may be
designated as salvage by the City, and if so, shall be carefully excavated if necessary and
delivered to the City at a location within the City.

3.16 SHOP DRAWINGS AND SAMPLES
A. If requested by the City, prior to construction the Builder shall submit three (3) copies of the
shop drawings, signed by the Builder’s Engineer, to the City. The data shown on the shop
drawings shall be complete with respect to dimensions, design criteria, materials of
construction and the like to enable review of the information as required. The Builder shall,
if requested by the City, furnish certificates, affidavits of compliance, test reports, or samples
for check analysis for any of the materials specified in these Specifications.

3.17 CLEARING AND GRUBBING
A. The Builder shall clear and grub all of the area within the limits of construction as shown and
Specified prior to the beginning of any Work. All site work shall conform to the applicable
site clearing ordinance, and landscaping and tree ordinances of the City.
B. Clearing: The surface of the ground for the area to be cleared and grubbed shall be
completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other
objectionable obstructions resting on or protruding through the surface of the ground.
However, trees and shrubs shall be preserved as specified in Section 3.05 D. Clearing operations shall be conducted so as to prevent damage to existing structures and installations and to those under construction, and so as to provide for the safety of employees and others.

C. **Grubbing:** Grubbing shall consist of the complete removal of all stumps, roots larger than 1 inch in diameter, matted roots, brush, timber, logs and any other organic or metallic debris not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

D. **Stripping:** In areas so designated, topsoil shall be stripped and stockpiled. Topsoil so stockpiled shall be protected until it is placed as specified. Any topsoil remaining after all Work is in place shall be disposed of by the Builder.

### 3.18 EXCAVATION, BACKFILL, COMPACTION AND GRADING

A. All such Work shall be performed by the Builder concurrently with the Work specified in Divisions 6, 7, 8, 9 and 10 of these Specifications. The Builder shall furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill, compaction, grading and slope protection required to complete the Work shown on the Plans and specified herein. The Work shall include, but not necessarily be limited to pump stations, manholes, vaults, conduit, pipe, roadways and paving; all backfilling, fill and required borrow; grading; disposal of surplus and unsuitable materials; and all related Work such as sheeting, bracing and water handling.

B. The Builder shall examine the site and undertake subsurface investigations including soil borings before commencing the Work. The City will not be responsible for presumed or existing soil conditions in the Work area.

C. The Builder shall locate existing utilities in the areas of Work. If utilities are to remain in place, the Builder shall provide adequate means of protection during earthwork operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, the Builder shall consult the owner of such piping or utility immediately for directions. Payment for damage and repair to such piping or utilities is the Builder’s responsibility. Refer to Section 3.03 for utility coordination requirements. The City shall not be responsible for uncharted or incorrectly charted water and wastewater mains or other utilities. It is the Builder’s responsibility to ensure that such facilities exist at the presumed point prior to commencing construction.

D. Materials for use as bedding and backfill, whether insitu or borrow, shall be as described under this Section. The Builder shall upon request by the City, make an appropriate sample of this material available for testing by the City or its designated representative.
1. Materials for structural fill shall be bedding rock or select common fill as specified herein or other suitable material as approved by the City.

2. Common fill shall consist of mineral soil, substantially free of clay, organic material, loam, wood, trash and other objectionable material which may be compressible or which cannot be compacted properly. Common fill shall not contain stones larger than 6 inch in any dimension, asphalt, broken concrete, masonry, rubble, or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Additionally common fill shall be no more than 12 percent by weight finer than the No. 200 mesh sieve unless finer material is approved for use in a specific location by the City.

Material falling within the above Specifications, encountered during the excavation may be stored in segregated stockpiles for reuse. All material which, in the opinion of the city, is not suitable for reuse, shall be spoiled as specified herein for disposal of unsuitable materials.

3. Select common fill shall be as specified above from common fill, except that the material shall contain no stones larger than 1 inches in largest dimension, and shall be no more than 5 percent by weight finer than the No. 200 mesh sieve.

4. Bedding rock shall be 3/16 inch to 3/4 inch washed and graded stone (FDOT #67). This stone shall be graded so that 90 to 100 percent will pass a 3/4 inch screen and 95 to 100 percent will be retained on a No. 8 screen. No stones larger than 1 inch in any dimension shall be accepted.

E. **Sheeting and Bracing in Excavations**: If required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction and to protect adjacent structures, existing piping and/or foundation material from disturbance, undermining or other damage, the Builder shall construct, brace and maintain cofferdams consisting of sheeting and bracing. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
For trench sheeting for pipes, no sheeting is to be withdrawn if driven below mid-diameter of any pipe and no wood sheeting shall be cut off at a level lower than one foot above the top of any pipe unless otherwise directed by the City. If during the progress of the Work, the City decides that additional wood sheeting should be left in place, it may direct the Builder to do so. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given by the City for an alternate method of removal. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities, existing piping or property. Unless otherwise approved or indicated on the Drawings or in the Specifications, all sheeting and bracing shall be removed after completion of the substructure. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specially adapted to that purpose, by watering or otherwise as may be directed.

The right of the city to order sheeting and bracing left in place shall not be construed as creating any obligation on its part to issue such orders and its failure to exercise its right to do so shall not relieve the Builder from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Builder to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

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

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

The Builder shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

It is expected that well points will be required for predrainage of the soils prior to final excavation for some of the deeper in-ground structures, or piping and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged. Well points shall be surrounded by suitable filter sand and negligible fines shall be removed by pumping.

The Builder shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems for handling groundwater and surface water encountered during construction of structures, pipelines and compacted fills.

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

G. **Excavation:** Excavation consists of removal, storage and disposal of material encountered when establishing required grade elevations and in accordance with the notes shown in the Plans. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of the city. Unauthorized excavation, as well as remedial work directed by the City shall be at the Builder’s expense. Such remedial work shall be performed as directed by the City.
If requested by the City, when excavation has reached required subgrade elevations, a Geotechnical/Soils Engineer shall make an inspection of conditions. If the subgrade is unsuitable, the Builder shall carry excavation deeper and replace excavated material with select common fill or bedding rock, as directed by the City.

If the Builder excavates below, grade through error or for his own convenience or through failure to properly dewater the excavation or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the City to excavate below grade and refill the excavation using select common fill or bedding rock.

Slope sides of excavations shall comply with local codes and ordinances, and with OSHA requirements. Builder shall shore and brace where sloping is not possible due to space restrictions or stability of the material excavated. Sides and slopes shall be maintained in a safe condition until completion of backfilling.

Builder shall stockpile satisfactory excavated materials at a location approved by the City until required for backfill or fill. When needed in the Work, material shall be located and graded at the direction of a Geotechnical/Soils Engineer.

Stockpiles shall be placed and graded for proper drainage. All soil materials shall be located away from the edge of excavations. All surplus and/or unsuitable excavated material shall be legally disposed of by the Builder. Any permits required for the hauling and disposing of this material shall be obtained by the Builder prior to commencing hauling operations.

1. **Excavation for Structures**: All such excavations shall conform to the elevations and dimensions shown on drawing within a tolerance of plus or minus 0.10 feet and extending a sufficient distance from footings and foundations to permit placing and removing form work, installation of services and other construction, inspection or as shown on the Drawings. In excavating for footings and foundations, care shall be exercised not to disturb the bottom of the excavation. Bottoms shall be trimmed to required lines and grades to leave a solid base to receive concrete.

2. **Trench Excavation**: Excavation for all trenches required for the installation of utility pipes shall be made to the depths indicated on the Drawings and in such manner and to such widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting and for pumping and drainage facilities.

The bottom of the excavations shall be firm and dry and in all respects acceptable to the City. Excavation shall not exceed normal trench width as specified in the Standard Drawings. Any excavation, which exceeds the normal trench width, shall require special backfill requirements as determined by the City.
Where pipes are to be laid in bedding rock, select common fill or encased in concrete, the trench may be excavated by machinery to or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.

Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade by machinery. The lat of the material being excavated shall be done manually in such a manner that will give a shaped bottom, true to grade, so that pipe can be evenly supported on undisturbed material, as specified in the Standard Drawings. Bell holes shall be made as required.

H. **Bedding and Backfill**: Material placed in fill areas under and around structures and pipelines shall be deposited within the lines and to the grades shown on the Plans or as directed by the City, making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces, which have been inspected and approved by the City. If sufficient select common or common fill material is not available from excavation on site, the Builder shall provide fill as may be required.

Fill shall be brought up in substantially level lifts starting in the deepest portion of the fill. The entire surface of the Work shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section.

Fill shall be placed and spread in layers by a backhoe or other approved method, unless otherwise specified. Prior to the process of placing and spreading, all materials not meeting those specified under Section 3.18 D shall be removed from the fill areas. The Builder shall assign a sufficient number of men to this Work to insure satisfactory compliance with these requirements.

If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.

All fill materials shall be placed and compacted in-the-dry. The Builder shall dewater excavated areas as required to perform the work and in such manner as to preserve the undisturbed state of the natural inorganic soils.

Prior to filling, the ground surface shall be prepared by removing vegetation, debris, unsatisfactory soil materials, obstructions and deleterious materials. Builder shall plow strip or break up sloped surfaces steeper than one (1) vertical to four (4) horizontal so that fill material will bond with the existing surface. When existing ground surface has a density less than that specified under Section 3.18 I, for the particular area classification, Builder shall break up the ground surface, pulverize, moisture-condition to the optimum moisture content and compact to required depth and percentage of maximum density.
Before compaction, material shall be moistened or aerated as necessary to provide the optimum moisture content. Material, which is too wet, shall be spread on the fill area and permitted to dry, assisted by harrowing if necessary, until the moisture content is reduced to allowable limits. If added moisture is required, water shall be applied by sprinkler tanks or other sprinkler systems, which will insure uniform distribution of the water over the area to be treated and give complete and accurate control of the amount of water to be used. If too much water is added, the area shall be permitted to dry before compaction is continued. The Builder shall supply all hose, piping, valves, sprinklers, pumps, sprinkler tanks, hauling equipment and all other materials and equipment necessary to place water in the fill in the manner specified. Builder shall compact each layer to required percentage of maximum dry density or relative dry density in accordance with Section 3.1.

Backfill or fill material shall not be placed on surfaces that are muddy, frozen or contain frost or ice.

1. Bedding and Backfill for Structures: Bedding rock shall be used for bedding under all structures as indicated on the Standard Drawings. The Builder shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed. Structural fill shall be used as backfill against the exterior walls of the structures. Fill shall be compacted sufficiently in accordance with Section 3.18 I of these Specifications if compaction is by rolling or ramming, material shall be wet down as required.

Backfilling shall be carried up evenly on all walls of an individual structure. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength.

In locations where pipes pass through building walls, the Builder shall take precautions to consolidate the fill up to an elevation of at least 1 foot above the bottom of the pipes. Structural fill in such areas shall be placed for a distance of not less than three (3) feet either side of the centerline of the pipe in level layers not exceeding eight (8) inches in depth.

The surface of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the Plans. No soft spots or uncompacted areas will be allowed in the Work.

Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.
2. **Bedding and Backfill for Pipes**: Bedding for pipe shall be as shown on the Plans and detailed on the Standard Drawings. The Builder shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed.

Backfilling over and around pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected. All backfilling shall be prosecuted expeditiously and as detailed on the Standard Drawings.

Any space remaining between the pipe and sides of the trench shall be carefully backfilled and spread by hand or approved mechanical device and thoroughly compacted with a tamper as fast as placed, up to a level of 1 foot above the top of the pipe. The filling shall be carried up evenly on both sides. Compaction shall be in accordance with the Standard Drawings and Section 3.18 I.

The remainder of the trench above the compacted backfill, as just described above, shall be filled and thoroughly compacted in uniform layers. Compaction shall be in accordance with the Standard Drawings and Section 3.18 I.

I. **Compaction**: The Builder shall control soil compaction during construction to provide the percentage of maximum density specified. The Builder shall provide the City copies of all soils testing reports, prepared by a Geotechnical/Soils Engineer, demonstrating compliance with these Specifications.

When existing trench bottom has a density less than that specified under Section 3.18 I. 1, the Builder shall break up the trench bottom surface, pulverize, moisture-condition to the optimum moisture content and compact to required depth and percentage of maximum density.

1. **Percentage of Maximum Density Requirements**

   A. Fill or undisturbed soil from the bottom of the pipe trench to 1 foot above the pipe shall be densified to a minimum density of 95 percent of the maximum dry density as determined by AASHTO T-180.

   B. Backfill from 1 foot above utility pipes to grade shall be densified to a minimum density of 95 percent of the maximum dry density as determined by AASHTO T-180.

   C. Fill under and around structures, and to the extent of the excavation shall be densified to a minimum density of 95 percent of the maximum dry density as determined by AASHTO T-180.

   D. A minimum density of 98 percent of the maximum dry density is required for
road, driveways and structures - top 3’ of trench.

2. **Compaction Tests**: One (1) compaction test location shall be required for each 300 linear feet of pipe for every 100 square feet of backfill around structures as a minimum and one test location between two manholes or structures more than 40’ apart. The City may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of compaction tests within the trench shall be in conformance with the following schedule.

   A. One (1) test at the spring line of the pipe.

   B. At least one (1) test for each 12-inch layer of backfill within the pipe bedding zone for pipes 24 inches and larger.

   C. One (1) test at an elevation of 1 foot above the top of the pipe.

   D. One (1) test for each 1 feet of backfill placed from 1 foot above the top of the pipe to finished grade elevation.

   If based on Geotechnical/Soils Engineer testing reports and inspection, fill which has been placed is below specified density, Builder shall provide additional compaction and testing prior to commencing further construction.

J. **Grading**: All areas within the limits of construction, including transition areas, shall be uniformly graded to produce a smooth uniform surface. Areas adjacent to structures or paved surfaces shall be graded to drain away from structures and pavement. Ponding shall be prevented. After grading, the area shall be compacted to the specified depth and percentage of maximum density. No grading shall be done in areas where there are existing pipelines that may be uncovered or damaged until such lines have been relocated.

K. **Maintenance**: Builder shall protect newly graded areas from traffic and erosion and keep them free of trash and debris. Builder shall repair and reestablish grades in settled, eroded and rutted areas. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, Builder shall scarify surface, and reshape and compact to required density prior to further construction.

L. **Inspection and Quality Assurance**: Builder shall examine the areas and conditions under which excavating, filling and grading are to be performed, and not proceed with the Work until unsatisfactory conditions have been corrected. Builder shall examine existing grade prior to commencement of Work and report to the City if elevations of existing grade vary from elevations shown on Plans.

All work shall be performed in compliance with applicable requirements of governing authorities having jurisdiction. The Builder, at his expense, shall engage soil testing and inspection services for quality control testing during earthwork operations. The testing and
inspection service shall be subject to the approval of the City.

Quality control testing shall be performed during construction to ensure compliance with these Specifications. Builder shall allow the testing service to inspect and approve fill materials and fill layers before further construction is performed. The Builder shall give copies of all test results in a report form to the Utilities Director to demonstrate compliance with compaction requirements stipulated in these Specifications.
SECTION 4

MATERIALS

4.01 GENERAL

This Section includes the material and installation standards for pipe, fittings, valves and appurtenances, as applicable to wastewater, water and effluent reuse installations. The data included herein are to be used as the standards for approved materials indicated under specific facility installations as set forth in other Sections.

Materials referred to by brand name in this Section and Appendix A of these Specifications represent specific requirements of NPU. If desired, requests for substitutions of specified materials shall be made in writing to NPU prior to construction. Determination of the equality of substitute materials will be at the sole discretion of NPU. All equipment to be installed shall be new and unused.

When a standard is specified by reference, (i.e. AWWA, ANSI, ASTM, etc.), it refers to the latest edition thereof.

Required specialty items not included under this Section shall be high quality and consistent with approved standards of the industry for the approved materials indicated under specified facility installations, as set forth in other Sections.

4.02 PIPE AND FITTINGS

A. General: All pipe and fittings for water and wastewater service shall be clearly marked with the name or trademark of the manufacturer, the batch number, the location of the plant and the strength designation, as applicable.

B. Ductile Iron (DI):

1. Ductile Iron: Pipe shall be in accordance with ANSI Standards A 21.50 and A 21.51, minimum thickness Class 50, unless heavier class is required for design conditions.

2. Fittings: Ductile iron pipe fittings shall conform to ANSI Standards A 21.20 or A 21.53 and a 250 psi minimum pressure rating. C-150 for 2" - 24"/C-110 for 27" and larger.

3. Joints:

   a. “Push-On” and mechanical type joints shall be in accordance with ANSI Standard A 21.11.
b. Restrained joint assemblies (with mechanical joint pipe) shall be ductile iron mechanical joint retainer glands. Bolts and nuts for restrained joints shall be Corten, low alloy, and high strength steel.

c. Flexible type joints shall be of the boltless type, with a joint deflection of up to 15 degrees and shall be specifically designed for flexible joint use.

d. Flanged connections shall be in accordance with ANSI Standard B 16.1, 125 lb. standard and shall have full-faced type rubber Toruseal Gaskets or equivalent 1/8 inch thick. Bolts and nuts shall be Stainless Steel Grade B conforming to the ASTM Designation A 307, for Steel Machine Bolts and Nuts and Tap Bolts unless otherwise specified by NPU.

4. Coating and Linings:

   a. Ductile iron pipe and fittings for underground wastewater service shall receive an exterior bituminous coating of coal tar varnish or asphalt base paint, 1.0-mil film thickness in accordance with ANSI/AWWA A 21.51/C-151.

   b. Exposed ductile iron pipe and fittings for wastewater service shall receive a factory applied exterior coating of a universal rut-inhibitive primer, 2.0-mils dry film thickness. This coating shall be followed by field painting of an intermediate and final field coats of Alkyd applied, in accordance with the paint manufacturer’s recommendations. Final color shall be blue for potable water, brown for treated wastewater, green for raw water, gray for raw wastewater and purple for reused reuse water, unless otherwise approved by NPU.

   c. Ductile iron pipe and fittings for wastewater service shall receive a factory applied interior corrosion resistant epoxy coating specified by NPU with a minimum dry thickness of 30-mils in accordance with ANSI A 21.4 AWWA C-104.

   d. Ductile iron pipe and fittings for water and reuse service shall receive an exterior coating as specified above under paragraphs 4.02 B.4.A or 402 B.4.b. and shall be cement mortar lined and bituminous sealed in accordance with ANSI A 2.14.

   e. Machined surfaces shall be cleaned and coated with a suitable rust preventive coating at the shop immediately after being machined.
f. Special Protective Interior Linings:

(1) General - The pipe lining material shall be either a corrosive resistant epoxy lining as specified by NPU or virgin polyethylene. Pipe coating shall be factory applied at the rate and in the manner specified by the coating manufacturer. The lining shall extend from the plain end of the pipe to the gasket set of the bell socket. Not less than 5 percent of the pipe shall be checked for dry mil thickness, with compliance certification submitted to NPU.

(2) Coal tar epoxy shall be applied with total thickness of the dry coating, a minimum of 20 mils.

(3) Polyethylene Lining material shall comply with ASTM Designation D 1248. The polyethylene shall be fused to the interior of the pipe by heat forming a tightly bonded lining, with minimum 30 mils dry thickness.

(4) Specified corrosive resistant epoxy coating.

C. Polyvinyl Chloride (PVC):

1. Potable water and effluent reuse pipe shall be manufactured from clean virgin Type I, Grade I rigid unplasticized polyvinyl chloride resin conforming to ASTM Designation D 1784. Potable water and reuse pipe shall have the National Sanitation Foundation (NSF) seal, shall conform to AWWA C-900, and shall have a dimension ratio (DR) of not more than 18. PVC pipe for wastewater force mains shall have a DR of not more than 25, or less if design considerations require. The PVC pipe shall have integral bell push on type joints conforming to ASTM D 3139. Pipe used for reuse mains shall be purple (Pantone 522C), water main shall be blue and for wastewater shall be green in color.

2. Connections for pipe 2 inches in diameter and larger shall be rubber compression ring type. Pipe shall be extruded with integral thickened bell walls without increase in DR. Rubber ring gaskets shall consist of synthetic compounds meeting the requirements of ASTM Designation D 1869 and suitable for the designated service. Other connections shall be solvent-cemented joints.

3. Gravity wastewater PVC pipe and fittings shall be manufactured from PVC resin conforming to ASTM Designation D 1784. Pipe and fittings of this material shall conform to ASTM Designation D 3034 (4" to 15") and F 679 (18" and up), Standard Specifications for Type PSM Polyvinyl Chloride Sewer Pipe and Fittings. All pipe and fittings shall have a Standard Dimension Ratio (DR) of not more than 26.
4. PVC pipe for gravity sewers shall be furnished in a maximum of 20 feet lengths, with integrally formed bell joints.

5. All PVC pipe and accessories less than 2 inches in diameter shall be Schedule 80 and be of rigid normal impact polyvinyl chloride. The pipe and accessories shall conform to ASTM Specification D 1785 and Product Standard PS 21-70. All materials to be furnished complete to perform the work, including solvent cement, etc.

6. **Connections**: Connection of PVC gravity sewer lines to manholes shall be made by using an approved resilient connector with stainless steel band and clamp. The connection shall provide flexibility and a watertight connection at the structure.

D. **High density polyethylene pipe (HDPE)**

1. HDPE pipe and fittings shall be a PE3408 high density, extra-high molecular weight polyethylene manufactured from first-quality high density polyethylene resin containing no additives, fillers, or extenders. The HDPE pipe shall have an ASTM D3350 cell classification of PE 345434C, and shall meet or exceed the properties listed in Table 02618-1 of this specification. The HDPE pipe shall meet the requirements of AWWA C906 and shall match ductile iron OD pipe sizing. The HDPE pipe and fittings shall be SDR-11 Phillips Driscopipe Series 1000, Chevron Plexco, or approved equal, and shall bear the approval seal of the National Sanitation Foundation (NSF).

2. **Joints**: A continuous pipe shall be formed by butt fusing sections of pipe using manufacturer-approved equipment. The fused joints shall have equal or greater tensile and hydrostatic strength than the pipe.

3. Fittings shall be MJ DIP meeting the requirements of Section 02610. The pipe shall have fusion welded restrainer ring, follower gland, and a stainless steel insert for the MJ connection.

4. The pipe shall include the following characteristics:

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
<th>Unit</th>
<th>Nominal Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Designation</td>
<td>PPI/ASTM</td>
<td></td>
<td>PE 3408</td>
</tr>
<tr>
<td>Material Classification</td>
<td>ASTM D-1248</td>
<td></td>
<td>III C 5 P34</td>
</tr>
<tr>
<td>Cell Classification</td>
<td>ASTM D-3350</td>
<td></td>
<td>345434C</td>
</tr>
<tr>
<td>Density</td>
<td>ASTM D-1505</td>
<td>gm/cm³</td>
<td>0.955</td>
</tr>
<tr>
<td>Melt Index</td>
<td>ASTM D-1238</td>
<td>gm/10 min.</td>
<td>0.11</td>
</tr>
<tr>
<td>Property</td>
<td>Standard</td>
<td>Unit</td>
<td>Value</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------</td>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>Flex Modulus</td>
<td>ASTM D-790</td>
<td>Psi</td>
<td>135,000</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D-638</td>
<td>Psi</td>
<td>3,200</td>
</tr>
<tr>
<td>HDB @ 73NF</td>
<td>ASTM D-2837</td>
<td>Psi</td>
<td>1,600</td>
</tr>
<tr>
<td>U-V Stabilizer</td>
<td>ASTM D-1603</td>
<td>% C</td>
<td>2.5</td>
</tr>
<tr>
<td>Hardness</td>
<td>ASTM D-2240</td>
<td>Shore “D”</td>
<td>65</td>
</tr>
<tr>
<td>Compressive Strength (yield)</td>
<td>ASTM D-695</td>
<td>Psi</td>
<td>1,600</td>
</tr>
<tr>
<td>Tensile Strength @ Yield (Type VI Spec.)</td>
<td>ASTM D-638 (2”/min.)</td>
<td>Psi</td>
<td>3,200</td>
</tr>
<tr>
<td>Elongation @ Yield</td>
<td>ASTM D-638</td>
<td>%, minimum</td>
<td>8</td>
</tr>
<tr>
<td>Tensile Strength @ Break (Type VI Spec.)</td>
<td>ASTM D-638</td>
<td>Psi</td>
<td>5,000</td>
</tr>
<tr>
<td>Elongation @ Break</td>
<td>ASTM D-638</td>
<td>%, minimum</td>
<td>750</td>
</tr>
<tr>
<td>Modulus of Elasticity</td>
<td>ASTM D-638</td>
<td>Psi</td>
<td>130,000</td>
</tr>
<tr>
<td>Linear Thermal Expansion Coefficient</td>
<td>ASTM D-696</td>
<td>In./in./NF</td>
<td>$1.2 \times 10^4$</td>
</tr>
<tr>
<td>Brittleleness Temperature</td>
<td>ASTM D-746</td>
<td>NF</td>
<td>&lt;=-180</td>
</tr>
<tr>
<td>Vicat Softening Temperature</td>
<td>ASTM D-1525</td>
<td>NF</td>
<td>257</td>
</tr>
</tbody>
</table>

5.

E. **Service Pipe:**

1. **Water Service Pipe:** All potable water service lines shall be 1 inch, 1½ inches or 2 inches polyethylene tubing conforming to AWWA C-800 and C-901.

2. **Wastewater Service Lateral:** All wastewater service laterals shall be PVC and have a minimum diameter of 6 inches and shall conform to ASTM D 3034, SDR 35.

F. **Jack and Bore:**

1. **Pipe Material:**

   a. Steel castings shall conform to the requirements of ASTM Designation A 139 (straight seam pipe only) Grade B with a minimum yield strength of
35,000 psi. The casing pipes shall have the minimum nominal diameter and wall thickness as shown on the following table:

<table>
<thead>
<tr>
<th>Carrier Pipe Nominal Diameter</th>
<th>Casing Outside Diameter</th>
<th>Casing Wall Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>16&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>18&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>8&quot;</td>
<td>20&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>24&quot;</td>
<td>0.250&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carrier Pipe Nominal Diameter</th>
<th>Casing Outside Diameter</th>
<th>Casing Wall Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>30&quot;</td>
<td>0.312&quot;</td>
</tr>
<tr>
<td>16&quot;</td>
<td>30&quot;</td>
<td>0.312&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>30&quot;</td>
<td>0.312&quot;</td>
</tr>
<tr>
<td>20&quot;</td>
<td>36&quot;</td>
<td>0.375&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>42&quot;</td>
<td>0.500&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>48&quot;</td>
<td>0.500&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>54&quot;</td>
<td>0.500&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>60&quot;</td>
<td>0.500&quot;</td>
</tr>
</tbody>
</table>

b. Field and shop welds of the casing pipes shall conform with the American Welding Society (AWS) standard specifications. Field welds shall be complete penetration, single-bevel groove type joints. Welds shall be airtight and continuous over the entire circumference of the pipe and shall not increase the outside pipe diameter by more than 3/4 inch.

c. The carrier pipe shall be minimum Class 50 ductile iron or minimum DR-14 pipe with restrained joints as approved by NPU. Ductile iron pipes shall comply with the specification outlined in Division 6, 8 and 10.

d. The carrier pipes shall be supported within the casing pipes so that the pipe bells do not rest directly on the casing. The load of the carrier pipes shall be distributed along the casing by casing spacers. Casing spacers shall be bolt on style split shells made of T-304 stainless steel. All nuts and bolts shall be high strength 316 Stainless Steel. Runners shall be made of a high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction.
G. Pressure Pipe Restraints:

1. The restraint system for fittings shall be "MEGA LUG 2000 PV Series" Joint Restraint System as manufactured by EBAA Iron, Inc. or approved equal. The Engineer shall determine length and location of restraining. All fittings sixteen inches (16") in diameter and larger shall be restrained and shown on the plans. The restrain shall be used to prevent movement of lines under pressure at bends, tees, caps, valves, hydrants etc., shall be by mechanical restraints and as approved by NPU. Use of thrust blocks for pressure pipe and fittings shall not be allowed unless approved by NPU.

2. If NPU approves thrust block for any reason they shall have a minimum compressive strength of 2500 psi. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks where trench conditions require. Thrust blocks shall be properly set and adequately cured prior to pressurizing the system.

3. Restrained Joints: Sections of piping requiring restrained joints shall be constructed using pipe and fittings with restrained Locked-Type joints manufactured by the pipe and fitting manufacturer and the joints shall be capable of holding against withdrawal for line pressures 50 percent above the normal working pressure. Mechanical joint ductile iron pope retainer glands shall not be permitted unless approved by NPU. Any restrained joints that allow for elongation upon pressurization will not be allowed in those locations where the pipe comes out of the ground. Restrained pipe joints that achieve restraint by incorporating cut out sections in the wall of the pipe shall have a minimum wall thickness at the point of cut out that corresponds with the minimum specified wall thickness for the rest of the pipe.

The minimum number of restrained joints required for resisting forces at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. The required lengths of restrained joint ductile iron pipe shall be determined by the Engineer and shown in a tabular form as depicted on the Restrained Pipe Table in the Standard Drawings. All calculation shall be based on the method outlined in the publication entitled Thrust Restraint Design for Ductile Iron Pipe, latest edition, published by Ductile Iron Pipe Research Association, Birmingham, AL 35244.

Wherever two (2) 45 degree bends are used in place of a 90 degree bend and the minimum restrained joints required from one (1) 45 degree bend extend beyond the other 45 degree bend, the two (2) 45 degree bends will be considered as though a 90 degree bend were located midway between the two (2) 45 degree bends.
4. **Mechanical Restraining Devices:** Mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A 536. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BAN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI A 21.11 and ANSI/AWWA C-153/A 21.53. Twist-off nuts shall be used to insure proper actuating of the restraining devices. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1.

**H. Special Items:**

1. **Expansion Joints:** Pipe expansion joints shall be suitable for the applicable service with a minimum 150 psi working pressure.

2. **Flanged Coupling Adapters:** Units shall be compatible with ANSI Standard B 16.1, 125 lb. flanges.

3. **Cast Iron Sleeves and Wall Pipes:** Units shall have integral annular ring water-stops, and also conform to other requirements for cast iron fittings specified in this Section. Sleeves and wall pipes to have laying length and ends required for proper installation.

4. **Tapping Saddles:** Units shall be fabricated of Fusion Bonded Epoxy coated ductile iron and suitable for either wet or dry installation. The sealing gasket shall be the O-Ring type suitable for the applicable service. Outlet flange shall be ANSI B 16.1, 125 lb. standard. Tie straps and bolts shall be a corrosion resistant stainless steel.

5. **Tapping Sleeves:** Units shall be of fabricated stainless steel for pressure connections 4” and larger. Outlet flange shall meet AWWA C-207, Class D, ANSI 150 lb. drilling and be properly recessed for the tapping saddle valve. Bolts and nuts shall be of type 304 (min) stainless steel.

   - Body - 18-8 Type 304 Stainless Steel
   - Flange - equivalent to 18-8 Type 304 Stainless Steel
   - Gasket - full circumferential gasket compounded for use with water, salt solutions mild acids, bases and sewage.

6. **Service Saddles:** Saddles shall be double stainless steel strap, anchored by a minimum four (4) bolt pattern on a epoxy coated ductile iron saddle body. Service saddles for PVC pipe shall have a double stainless steel strap sized exactly to the
pope outside diameter. Sealing gaskets shall be suitable for the applicable service and straps shall be corrosion resistant alloy steel. The City will require a stainless steel strap and fusion epoxy coated ductile iron body with stainless steel hardware.

7. Polyethylene Encasement: Encasement shall have a minimum thickness of 8-mils and comply with the applicable provisions of ANSI/AWWA C-105/A 21.5, Polyethylene Encasement for Gray and Ductile Iron Piping for Water and Other Liquids.

4.03 VALVES

A. General: The valve type, size, rating, flow direction arrow, if applicable, and manufacturer shall be clearly marked on each unit. Valves shall open left (counterclockwise), with an arrow cast-in the metal of operating hand wheels and nuts indicating the direction of opening.

B. Gate Valves (GV):

1. General: All gate valves shall be resilient seat gate valves and shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C-509. The valve body, bonnet and bonnet cover shall be cast iron and comply ASTM A 126, Class B. The valves shall be non-rising stem with the stem made of cast, forged, or rolled bronze as specified in AWWA C-509 (for 2½” to 12” diameter valves). For diameters of 14” and larger the valve shall be per AWWA C515. Two (2) stem seals shall be provided and shall be O-Ring type for 2½” to 12” diameter valves and Three (3) ) stem seals shall be provided and shall be O-Ring type for 14” and larger sizes. The stem must be independent of the gate. The resilient sealing mechanism shall provide zero leakage at the system working pressure when installed with the line flow in either direction. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating. All nuts, bolts, washers and springs shall be 316 stainless steel. The valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.

2. Underground Service: Valves shall be iron body, bronze mounted, conforming to AWWA C-509, resilient seat, non-rising stem type, bolted bonnet, mechanical joint and shall be equipped with 2 inch square cast iron wrench nuts.

3. Aboveground Service: Valves shall be iron body, bronze mounted gate valves, bolted bonnet, flanged, conforming to C-509, resilient seat, with the exception that valves shall be outside screw and yoke (OS&Y), rising stem type. Valves shall have cast iron hand wheels or chain operators with galvanized steel chains, as required.
4. **Tapping Valves**: Valves shall conform to the Specifications set forth under paragraphs 4.03 B.1 and 2., for the applicable service conditions. Additionally, units shall be compatible with the connecting sleeve or saddle and specially designed for wet tapping installation operations.

5. **Valves 2-inches and Smaller**: Valves shall be bronze, wedge disc, 150 psi minimum working pressure, equipped with wrought steel or cast iron operating handwheels.

6. **Actuators**: Valves 16-inches and larger shall be equipped with approved gearing actuators, with sealed enclosures for buried or submerged service and shall be furnished by the valve manufacturer. Position indicators shall be furnished as required.

7. **Horizontal Installation**: Valves 16-inches in diameter or larger, to be installed horizontally, shall be additionally equipped as specified under the applicable Section of AWWA C-500 and as follows:
   
   a. Installed in vertical pipe with horizontal stem shall be fitted with approved slides, tracks and shoes to assist the travel of the gate assembly.
   
   b. Installed in horizontal pipe with horizontal stem shall be equipped with approved rollers, tracks and scrapers to assist the travel of the gate assembly and to clear the track of obstructions.

8. The valves shall be manufactured by Muller.

C. **Check Valves (CV)**:

1. **General Service**: Valves shall be iron body, bronze mounted, stainless steel hinge pin, outside lever and weight operated, single disc swing non-slam type, and equipped with removable inspection covers and shall meet the requirements of AWWA C-508. Ends shall be 125 pound ANSI B 16.1 flanges. Units shall be rated for 175 psi minimum working pressure and shall permit full flow area equal to that of the connecting pipe. Valves shall be constructed to allow disc and body seat to be easily removed and replaced without removing valve from the line. Valves shall be fitted with an extended hinge arm with outside lever and weight. If pump shutoff exceeds 77-feet, then an air cushioned assembly shall be installed. All exposed nuts, bolts, washers and springs on buried and on above ground outdoor service valves shall be 316 stainless steel.

2. Check valves larger than two (2) inches shall be iron body and bronze mounted per AWWA C508. The valves shall have a 316 stainless steel hinge pin, outside lever and weight or spring/level weight operated, non-slam type equipped with removable inspection covers. Flanges of valves shall be per ANSI B16.1.
3. Valves shall be rated for 150 p.s.i.g minimum working pressure.

4. The interior coating of the valves shall be two (2) part thermosetting epoxy per AWWA C550.

5. Valves 2 inches and Smaller: Valves shall be bronze body and disc, swing check type, with removal inspection covers, and rated 150 psi minimum working pressure.

D. Plug Valves (PV):

1. Eccentric plug valves 4 inches and large shall be of the non-lubricated type and comply with AWWA C-504 and C-507. Minimum pressure rating of valves 4 inches through 12 inches shall be 175 psi, valves 14 inches through 72 inches shall be 150 psi. Valve bodies shall be cast iron ASTM A 126, Class B, in compliance with AWWA C-504 and C-507. Unless otherwise noted, port areas for all valves shall be 100 percent of full pipe area. Resilient plug facings shall be of Hycar, Nitrile Butadiene rubber or Neoprene. Valve ends shall be flanged (or grooved end couplings) or mechanical joint for above ground and underground installation, respectively. Valve body seats shall have a welded-in overlay of not less than 90 percent nickel for all parts, which comes in contact with the plug face. Packing shall be safely adjustable and replaceable without removing the valve from service, with the body pressurized to its full rated pressure. Bearings shall be permanently lubricated 316 stainless steel in both upper and lower journals in accordance with AWWA Standard C-507. The valve supplied shall have drip tight shut off with flow in either direction at the full pressure rating of the valves. All exposed nuts, bolts, springs and washers on buried and on above ground outdoor service valves shall be 316 stainless steel.

2. All body, bonnet and flange thickness shall be designed and rated in accordance with the specified valve pressure rating and ANSI B 16.1, per AWWA Standards C-504 and C-507. Mechanical joint ends shall be to the AWWA Standard C-111, Class B. Screwed ends shall be to the NPT standard.

3. Valves shall be furnished with permanently lubricated stainless steel or oil-impregnated bronze upper and lower plug stem bushings. These bearings shall comply with AWWA C-504 and C-507. Valve shaft seals shall be adjustable and comply with AWWA Standard C-507.

4. Operation of all valves 8 inches-10 inches or larger, and smaller sizes in exposed locations which require handwheels or chain wheels, shall be by approved gear actuators, equipped with position indicator and stop, and shall be furnished by the valve manufacturer. Gear actuators for buried or submerged installations shall be furnished with sealed enclosures. Valves shall be equipped with actuating nuts, cast
iron handwheels or chain operators, with galvanized steel chains, as appropriate for the installation and type of operator coordinated with NPU.

5. Plug Valves shall be manufactured by Milliken. The valves shall have a circular port. From sizes up to 12” diameter.

E. **Butterfly Valves:**

1. Valves shall be cast or ductile iron body that conforms to ASTM A26, Class B. All retaining segments and adjusting devices shall be of corrosion resistant material. The valves shall have bonded or mechanically restrained seats as outlined in AWWA C-504. Valve seats shall be a natural rubber or synthetic rubber compound. The valve shaft shall be turned, ground and polished constructed 18-8 stainless steel, and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. The shaft shall be a one (1) piece unit extending full size through the valve disc. The valves shall be of either a short or long body type, with the valve class, shaft size and other special requirements selected in accordance with the specific design, and shall comply with the provisions of AWWA C-504, Rubber Seated Butterfly Valves. Valve operation shall be by approved gear actuators, with sealed enclosures for buried or submerged service. Position indicators shall be furnished, as required. Units shall be equipped with actuating nuts, cast iron handwheels or chain operators, with galvanized steel chains, as appropriate for the installation.

2. All exposed nuts, bolts, springs and washers on buried and on above ground outdoor service valves shall be 316 stainless steel. Appurtenances shall be furnished by the valve manufacturer.

3. Valves shall be manufactured by DeZurik or equal.

F. **PVC Ball Valves:** PVC ball valves shall be provided, as required, for chemical service installations and shall be full port area.

G. **Corporation Stops and Curb Stops:** Units shall be 1 inch, 1½ inch, or 2 inches brass, equipped with connections compatible with the connecting service pipe type, threaded in accordance with AWWA Standard C-800 and C-901. Curb stop shall be sized to match the meter size and conform to AWWA C-800 and C-901. Fittings shall be brass, cast and machined in accordance with AWWA C-800 and C-901, with compatible polyethylene tubing connections.

H. **Backflow Preventers:** The assembly shall be of the type approved by NPU based on the type of service and shall comply with the applicable provisions of AWWA Standards and City regulations.
I. Air and Vacuum Release Valves:

1. **Wastewater Service Air/Vacuum Release Valve**: Valves shall be specially adapted for raw wastewater service. Valves shall be of the long body design unless approved by NPU and be constructed of cast iron ASTM A 126-B, Class 35 with stainless steel Type 304 stem, float and guide made of 316 stainless steel and float and Buna-N seat. Valves shall have an upper and lower float separated by a hexagonal float guide to prevent fouling and shall have a pressure rating of 150 psi. Valves shall have standard 2 inch NPT inlets and outlets, and be equipped with accessories for backwashing.

2. The Air release valves shall be manufactured by Val-Matic, per Model No. VM-801ABW. The assembly shall include the 2” bronze isolation valve. The materials of construction of the valve shall be per series No. 801A by Val-Matic.

3. **Water Service**: The valve shall be a heavy-duty combination air release and vacuum type for 150 psi working pressure, tested to 300 psi. Body, cover and baffle shall be cast iron. All internal parts shall be stainless steel and inside of valve shall be coated with a rust inhibitor. The valves shall be provided with a vacuum check to prevent air from re-entering the line. All valves shall comply with AWWA C-512.

J. Special Items:

1. **Water Meters**: 5/8 inch through 1½ inch meters shall be AWWA approved Sealed Register Displacement Type Meters. The water meters that are 2 inches and larger shall be AWWA Approved Turbo-Meters. Meters that are 6 inches and larger to be equipped with strainer.

2. **Floor Stands**: Units shall be cast iron, equipped with convenient grease fittings for all lubrication points and suitable for the applicable operation. Stem guides shall be cast iron, adjustable with bronze bushings.

3. **Valves Boxes**: Units shall be adjustable, cast iron, minimum interior diameter of 5 inches with covers cast with the applicable inscription in legible lettering on the top: SEWER, EFF WATER or WATER. Boxes shall be suitable for the applicable surface loading and valve size. Sewer covers shall be painted green, effluent water shall be painted purple and water shall be painted blue.

4. **Meter Boxes**: Meter boxes shall be prestressed concrete or plastic units of a size comparable with the meter.

5. **Service Boxes**: Service boxes for reuse connections shall be plastic with a jam lock cover. Boxes shall be purple (Pantone 522C) in color.
4.04 INSTALLATION

A. Potable Water, Wastewater Force Main and Effluent Reuse Pipe:

1. Piping, fittings, valves and appurtenances shall be installed in accordance with these Standards, including the attached Standard Details all applicable AWWA standards, and with the manufacturer’s recommendations for the applicable service.

2. All types of pipe shall be handled in such a manner as will prevent damage to the pipe or coating. Accidental damage to the pipe or coating shall be repaired to the satisfaction of the city or be removed from the job site. When not being handled, the pipe shall be supported on timber cradles or on properly prepared ground, graded to eliminate all rock points and to provide uniform support along the full length. When being transported, the pipe shall be supported at all times in a manner which will not permit distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of the city, is damaged beyond repair by the Contractor shall be removed from the site of the work and replaced with another unit. Joint gaskets shall be stored in a clean, dark, dry location until immediately before use.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. At all times when the pipe laying is in progress, the open ends of the pipe shall be closed by a water-tight plug or by other means approved by the City to ensure absolute cleanliness inside the pipe.

3. Water mains that are laid in the vicinity of pipelines designated to carry raw wastewater, reused reuse or wastewater effluent shall meet the requirements outlined in Section 6.03 G.

4. Piping shall be installed along straight line and grade between fittings, manholes, or other defined points, unless definite lines of alignment deflection or, grade change have been established. Modification to approved alignment or grade during construction shall receive prior approval from NPU, and all resulting design considerations shall be resolved by the Builder.

5. Materials shall be cleaned and maintained clean, with all coatings protected from damage. The interior of the pipe shall be free of dirt and debris, and when work is not in progress, all open ends shall be plugged. Also, materials for potable water systems including tops, repairs, etc., shall be disinfected in compliance with AWWA C-651.

6. Pipe, valves, fittings or other items shall be inspected prior to installation, and any items showing a fracture or other defect shall be rejected. Additionally, any pipe or
fitting which has received a severe blow that may have caused an incipient fracture, even though not visible, shall also be rejected. However, ductile iron pipe showing an end crack, with no fracture indicated beyond that visible, may be salvaged by cutting off the damaged section 12 inches past, providing the remaining pipe is sound.

7. The Contractor shall prevent water from entering the trench during excavation and pipe laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water and Specifications outlined in Section 3.18 shall apply.

8. Pipe shall be laid to the lines and grades shown on the Plans. The Contractor shall provide line and grade stakes at 100 foot maximum spacing and at all line and/or grade change locations. The Contractor shall provide temporary benchmarks at maximum 1,000-foot intervals. The minimum pipe depth shall be 3 feet below finished grade surface of 3 feet below the edge of pavement of road surface whichever is greater.

9. Long radius curves, either horizontal or vertical, may be laid with standard pipe deflections at the joints. The maximum deflections at pipe joints and laying radius for the various pipe lengths shall be as recommended by the pipe manufacturer.

10. Underground piping shall not be driven to grade by striking it with an unyielding object. When the pipe has been properly bedded, enough compacted backfill shall be placed to hold the utility in correct alignment. If necessary, precaution shall be taken to prevent flotation.

11. The installation of casing pipe underneath existing roadways shall be by the method of jack & boring and shall meet the requirements outlined in Section 4.04 D.

12. Jointing shall be by an approved method and shall not require undue force to accomplish full satisfactory seating and assembly. Connections at structures shall be cut accurately and worked into place without forcing and shall align with the connecting point. Flanged joints shall be made up tight, but with care taken to prevent undue strain upon equipment or other items. Suitable flange filler rings shall be installed where required to provide suitable joints. The installation shall be permanently watertight, with no visible leakage at joints or connections with structures. Any joint that does not remain completely sealed and/or watertight shall be rejected.

13. Underground pressure piping systems shall be thoroughly braced with restraints as specified for fittings, valves and plugs unless other restraining designs are applicable as specified in Section 4.02F. Fittings shall be protected by polyethylene film (8-mil). Pipe joints shall be restrained each side of the fitting for a continuous discharge.
in accordance with DIPRA Thrust Restraint Design for Ductile Iron Pipe.

14. Requirements for bedding and backfill for the pipes are outlined in Section 3.18.

15. Exposed systems shall be supported as necessary to hold the piping and appurtenances in a firm, substantial manner to the required lines and grades indicated, with no undue piping stresses transmitted to equipment or other items. Piping within buildings shall be adequately supported from floors, walls, ceilings or beams. Supports from the floor shall be by suitable saddle stands or piers. Piping along walls shall be supported by satisfactory wall brackets, or saddles, or by wall brackets with adjustable hanger rods. For piping supported from the ceiling, approved rod hangers of a type capable of screw adjustment after erection of the piping shall be used. Pipe above ground outside of buildings shall be supported on concrete supports.

16. Proper provision for pipe expansion or contraction shall be provided by installation of expansion joints or other suitable methods. Additionally, flexible connections shall be provided to expedite equipment or piping system removal.

17. Subaqueous pipe laying may be permitted where conditions make it impractical to lay pipe in the dry, provided the Builder submits his plans for laying pipe underwater to NPU and obtains advance approval thereof.

18. **Ductile Iron Pipe:** Installation shall be performed in accordance with the applicable provisions of AWWA Standard C-600. The opening cut in the pipe wall for installation of tapping saddles and sleeves shall be made by a special tapping machine designed for this specific service; however, for dry installations on ductile iron (only), the opening may be made with a cutting torch, with edges ground smooth. All pipe cutting shall be accomplished by power operated abrasive wheel or saw cutters, or other methods approved by the pipe manufacturer. Where required, polyethylene Encasement shall be installed as set forth previously in this section.

19. **Polyvinyl Chloride Pipe:** All PVC pipe shall be installed in accordance with the Standards set forth in the UNI-BELL Specifications of PVC Pipe Design and Construction, unless such standards conflict with these Specifications in which case these Specifications shall apply. Lubrication and/or solvent used for pipe and fitting joints shall be non-toxic (NSF Approved for potable water). Following making, solvent type joints shall not be disturbed for 5 minutes and shall not have internal pressure applied for 24 hours, or as recommended by the pipe manufacturer.

20. **HDPE piping** shall be utilized primarily for directional drilling situations. Use DR 11 for most applications unless NPU indicates differently. The ID of the HDPE pipe shall match the ID of the PVC or DI pipe.
21. Testing of piping systems shall be performed by the Builder in accordance with the Specifications set forth under the Standard for the applicable service, said prior testing procedures shall be in accordance with AWWA standards. Prior to testing procedures, all piping shall be thoroughly cleaned and flushed with clean water to clear the lines of all foreign matter. This work shall be done with care to avoid damage to any inside coating.

22. Disinfecting of all potable water and reuse pipes shall be accomplished by the Builder, following approved pressure testing. Unless alternate procedures are set forth under the applicable service Standard, said disinfecting procedures shall be in accordance with AWWA Standard C-651 and as required by the appropriate local approval agency. All water mains shall be pigged such that all debris is removed from the new main(s) installed. Contractor shall protect structures during the pigging process to avoid erosion during piping cleaning. Contractor shall pig the mains utilizing progressive pigging method to avoid the pig from getting stuck. Utilize low density pigs during the pigging process. The Contractor shall be responsible for the removal of any pig material and debris within the mains after the pigging has been completed. The pigging of the lines will be at the discretion of Utilities Department.

23. All connections to existing pressure pipes shall be made by the Contractor only after the connection, procedure and work schedule has been reviewed and approved by the City a minimum of 5 working days prior to scheduling the connection(s). The Contractor shall outline the following:

   a. Points of connection, fittings to be used, and method of flushing and disinfection, if applicable.

   b. Estimated construction time for the connection(s).

The City shall review the submittal within 5 working days after receiving it and inform the Contractor regarding approval or denial of the request. If the request is rejected by the City, the Contractor shall resubmit the request by modifying it in a manner acceptable to the City.

All connections shall only be made on the agreed upon date and time. If the Contractor does not initiate and complete the connection work in the agreed upon manner, the Contractor shall be required to reschedule the said connection by following the procedure outlined above. The Contractor shall not operate any valves in the system.

During the construction sufficient length of main shall be exposed to allow for the installation of the tapping sleeve and valve and the operation of the tapping machinery. The main shall be supported on concrete pedestals or bedding rock at sufficient intervals to properly carry its own weight, plus the weight of the tapping
sleeve and machinery. Any damage to the pipe due to improper or insufficient supports shall be repaired at the Contractor’s expense.

The inside of the tapping sleeve and valve, the outside of the main, and the tapping machine shall be cleaned and swabbed, or sprayed with 10 percent liquid chlorine prior to beginning installation for water system pressure connections.

After the tapping sleeve has been mounted on the pipe, the tapping valve shall be bolted to the outlet flange, making a pressure tight connection. Prior to beginning the tapping operation, the sleeve and valve shall be pressure tested at 150 psi for ½ hour to ensure that no leakage will occur.

For pressure connections 12 inches in diameter or less the minimum diameter cut shall be ½ inch less than the nominal diameter of the pipe to be attached. For pipes 14 inches through 20 inches in diameter, the minimum diameter shall be 1 ½ inch less; for larger taps the allowable minimum diameter shall be 2 to 3 inches less than the nominal diameter of the pipe being attached. After the tapping procedure is complete the Contractor shall submit the coupon to the City.

For pressure connections to wastewater force mains, the tapping valve shall be placed horizontally. After the tapping procedure is complete a plug valve shall be attached to the tapping valve. The tapping valve shall be left in the open position prior to backfilling unless otherwise approved by NPU.

Adequate poured concrete thrust blocks or restrained joint fittings shall be provided to prevent movement of the installation when test pressure is applied. The pipe restraints shall meet the requirements of Section 4.02 F.

B. **Gravity Sewers**

1. The Contractor shall set temporary benchmarks at a maximum of 500-foot intervals. The Contractor shall constantly check line and grade of the pipe by laser beam method. In the event line and grade do not meet specified limits described hereinafter, the Work shall be immediately stopped, the City notified, and the cause remedied before proceeding with the Work.

2. All pipes shall be inspected and handled as specified under Sections 4.04 A.2. and 4.04 A.5.

3. Laying of gravity sewer pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the trench has been prepared in accordance with Sections 3.18. Mud, silt, gravel and other foreign material shall be kept out of the pipe and off the jointing surface. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to
adequately hold the pipe in place. All pipes shall be laid to conform to the line and grade shown on the Plans.

Variance from the established line and grade, at any point along the length of the pipe, shall not be greater than 1/32 of an inch per inch of pipe diameter and not to exceed ½ inch, provided that any such variation does not result in a level or reverse sloping invert.

The gravity sewer pipe, unless otherwise approved by the City, shall be laid up grade from point of connection on the existing gravity sewer or from a designated starting point. The gravity sewer pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress the open end of the pipe shall be kept tightly closed with an approved temporary plug.

4. All PVC pipe shall be installed in accordance with the Standards set forth in the Uni-Bell Specifications of PVC Pipe Design and Construction.

5. Laying of ductile iron pipe shall conform to the Specifications outlined in Section 4.04 A.18.

6. All applicable provisions of Section 3.18 shall apply with regards to trench excavation, dewatering, bedding material, backfill, compaction, fill and grading.

7. The Contractor shall hand-grade bedding to proper grade ahead of pipe laying operation. Bedding shall provide a firm, unyielding support along the entire pipe length. If without direction from the City, the trench has been excavated below the required depth for pipe bedding material placement, the Contractor shall fill the excess depth with pipe bedding material to the proper grade. The Contractor shall excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

8. The Contractor shall provide bedding material in accordance with the Standard Drawings.

9. Gravity sewers that are laid in the vicinity of pipe lines designated to carry potable water shall meet the requirements set forth in Sections 404 A.3 and 6.03 G.

10. Plugs for pipe branches, stubs or other open ends which are not to be immediately connected shall be made of an approved material and shall be secured in place with a joint comparable to the main line joint.

11. The type of joint shall conform to the requirements outlined in Section 4.02 B.3.a and 4.02 C.3 of these Specifications.
C. **Manholes and Precast Structures**

1. Base sections shall be placed on bedding rock conforming to the requirements outlined in Section 3.18 H.1. The bedding rock shall be firmly tamped and made smooth and level to assure uniform contact and support of the pre-cast element in accordance with Section 3.18 1.

2. The cast-in-place bases shall be utilized only when specifically approved by the City. Unless otherwise specified, cast-in-place bases shall be at least 8 inches in thickness and shall extend at least 6 inches radially outside of the outside dimension of the structure. Reinforcement and connection to the riser sections shall be designed by the Builders Engineer and submitted to the City for approval.

3. A pre-cast base section shall be carefully placed on the prepared bedding so as to be fully ad uniformly supported in true alignment and making sure that all entering pipes can be inserted on proper grade. Pre-cast manhole and lift station sections shall be handled by lift rings or non-penetrating lift holes. Such holes shall be filled with non-shrink grout after installation of the structure. The first pre-cast section shall be placed and carefully adjusted to true grade and alignment. All inlet pipes shall be properly installed so as to form an integral watertight unit. The sections shall be uniformly supported by the base structure, and shall not bear directly on any of the pipes.

   Pre-cast sections shall be placed and aligned to provide vertical alignment with a 1/4-inch maximum tolerance per 5 feet of depth. The completed manhole shall be rigid, true to dimensions and watertight.

4. The excavation and backfilling shall conform to the requirements outlined in Section 3.18.

5. Castings for manholes shall be fully bedded in mortar with adjustment brick courses placed between the frame and manhole. Bricks shall be a minimum two (2) and four (4) courses. Mortar shall conform to ASTM C-270, type M and the bricks shall be clay and conform to ASTM C-216, grade SW and have the following dimensions of 3 inches wide by 8 inches long and 2 1/4 inches high.

   The top of the manhole castings that are located in pavement, shouldered areas, and sidewalks shall be flush with the finished grade. The top of manhole castings that are located outside of these areas shall be placed 2 inches above the finished grade.

6. Manhole flow channels shall be as shown on the Standard Drawings, with smooth and carefully shaped bottoms, built up sides and benching constructed using cement. Channels shall conform to the dimension of the adjacent pipe and provide charges in size, grade and alignment evenly. Cement shall be Portland Cement Type II only.
7. Special care shall be taken to see that the openings through which pipes enter the structure are provided with watertight connections. For ductile iron and PVC pipe, connections shall conform with ASTM C-923. Drop manhole connections shall conform all respects to details shown on the Standard Drawings.

8. All newly constructed manhole and lift stations shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

D. Jack and Bore:

1. **General:** The overall work scope shall include, but not be limited to, boring and jacking pits and equipment, sheeting, steel casing pipe, skid steel straps, coatings, location signs as required, miscellaneous appurtenances to complete the entire Work as shown on the Standard Drawings, and restoration. Applicable provisions of Sections 6, 8, and 10 shall apply concurrently with these Specifications. Boring and jacking operations shall be performed within the right-of-way and/or easements shown on the Plans.

   a. **All casing pipe to be installed may be inspected at the site of manufacture for compliance with these Specifications by an independent laboratory selected and paid for by the City. The manufacturer’s cooperation shall be required in these inspections. All casing pipe shall be subjected to a careful inspection prior to being installed. If the pipe fails to meet the Specifications it shall be removed and replaced with a satisfactory replacement at no additional expense to the City.**

   b. **Pipe Handling:** Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Pipe shall not be dropped. All pipe shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe or coatings shall be repaired to the satisfaction of the City.

   c. **Work Coordination:** It shall be the Builder’s responsibility to perform the boring and jacking work in strict conformance with the requirements of the agency in whose right of way or easement the work is being performed. Any special requirements of the agency such as insurance, flagmen, etc., shall be strictly adhered to during the performance of Work. The special requirements shall be performed by the Builder at no additional cost to the City.

   d. **Dewatering through the casing during construction shall not be permitted. All dewatering methods shall be approved by the City before construction work begins.**
e. Excavation adjacent to the roads shall be performed in a manner to adequately support the roads. Bracing, shoring, sheeting or other supports shall be installed as needed. Builder shall install suitable reaction blocks for the jacks as required. Jacking operations shall be continuous and precautions shall be taken to avoid interruptions which might cause the casing to freeze in place. Upon completion of jacking operations, the reaction blocks, braces and all other associated construction materials shall be completely removed from the site.

f. Correct line and grade shall be carefully maintained. Earth within the casing shall not be removed too close to the cutting edge in order to prevent the formation of voids outside the casing. If voids are formed, they shall be satisfactorily filled with grout by pumping.

g. The sections of steel casing shall be field welded in accordance with the applicable portions of AWWA C-206 and ASTM D 7.0 for field welded pipe joints. Builder shall wire brush the welded joints and paint with Inertol Quick-Drying Primer 626 by Koppers Company or approved equal. After completion of jacking, Builder shall clean the interior of the casing of all excess material.

E. Valves:

1. **General:** Valves shall be carefully inspected, opened wide and then tightly closed and all the various nuts and bolts thereon shall be tested for tightness. Special care shall be taken to prevent joint materials, stones or other substances from becoming lodged in the valve seat. Valves, unless otherwise required, shall be set with their stems vertically above the center line of the pipe. Any valve that does not operate correctly shall be adjusted to operate properly or removed and replaced.

2. Buried valves shall be installed vertically where depth of cover permits. Where depth of cover does not permit, the valves shall be mounted horizontally. Extension stems shall be provided on all buried valves when the operating nut is deeper than 4 feet below the final grade, with sufficient stem extension to place the nut not more than 1 foot below grade. Where extension stems are required within valve boxes, approved insert stem guides shall be provided.

3. Valve boxes shall be carefully centered over the operating nuts of underground valves to permit a valve wrench to be easily fitted to the nut. The types of valve boxes shall be set to the required grade. The valve box shall not transmit surface loads directly to either the pipe or valve. Care shall be taken to prevent earth and other material from entering the valve boxes. A concrete support collar shall be provided for the valve box. PVC valve box risers may be used to adjust the valve box to grade.
4. Where floor stands and/or extension stems are required, for exposed valves, adjustable wall brackets and extension stems shall be furnished. Generally, brackets shall not be more than 6 feet apart, with floor stands and guides set so that the stems shall run smoothly and in true alignment. Stands and guides shall be firmly anchored to the concrete.

5. After installation, all valves shall be subjected to the field test for piping as outlined in Sections 6, 8 and 10 of these Specifications. Should any defects in materials or workmanship appear during these tests, the Contractor should correct such defects to the satisfaction of the City.

6. All flanged and mechanical joints shall be made with #316 stainless steel nuts, bolts and washers.

7. All valve boxes shall include a bronze Tag including the size of the valve with the amount of turns for valve shut off or opening. The bronze Tag shall be of approximately 2¼” diameter. The lettering height of the Tag shall be not larger than 3/8” and smaller than ¼”. The Tag shall be incorporated to the grout of the valve box.
SECTION 5

WASTEWATER AND WATER TREATMENT PLANTS

5.01 GENERAL

A. This section sets forth the general requirements for design and installation of wastewater and water treatment plants to be constructed within the Utility Service Area.

5.02 DESIGN STANDARDS

A. **Required Reference:** Facilities shall comply with the design and installation requirements as established by the Florida Department of Environmental Protection (FDEP) and additional specific requirements stated in these Specifications. The criteria set forth in the "Recommended Standards for Water Works (Ten States Standards)" should be used as a design guide for water treatment facilities. The criteria set forth in the "Recommended Standards for Wastewater Facilities (Ten States Standards)" shall be used as a design guide for wastewater treatment facilities.

5.03 STANDARD REQUIREMENTS

A. **Building and Structure Sites:**

1. **Clearing:** Clear and remove obstructions within building sites only as required to provide adequate workspace and/or accomplish the specified construction. The removal of trees or permanent structures within the specified construction areas shall be done only as approved or directed by NPU. Should the removal of valuable trees or shrubs be required, this work shall be done in cooperation with the local communities, in which the work takes place, in order that they may be replanted, if so desired. At sites of new structures, remove only such trees and shrubs as are necessary to facilitate the work and protect trees that will remain against damage during construction period.

2. **Grubbing:** Grubbing shall be performed where required, including, but not limited to, areas where fill will be placed, structures erected, or where other installation is required. It shall include the complete removal of all obstructions resting on or protruding through the surface of the existing ground to a depth of one foot below finished grade. Where excavation is done, all stumps, roots and deleterious material thereby exposed shall be removed to a depth of one-foot minimum below the excavated surface.
3. **Disposal of Cleared and Grubbed Material:** All refuse from clearing and grubbing operations shall be disposed of either by burning or removal to a dump area approved by NPU. Burning shall be done at locations and at times as directed, in a manner that will avoid all hazards. Permit(s) shall be obtained from all applicable authorities for burning, and burning shall be kept under constant attendance until the fires have burned out or have been extinguished. Burning operations shall be done in compliance with all applicable regulations.

4. **Unsuitable Material:** All muck or other unsuitable material within the limits of building sites, or other designated areas, shall be excavated and removed. Depth of removal shall be that required to reach an approved suitable material. Removal and subsequent backfilling shall be maintained within the limits of the designated construction area unless specifically approved otherwise by NPU. Sheeting shall be installed and left in place along the site boundary where required, in order to preclude infringement on adjacent property and prevent damage by future demucking. Muck or other unsuitable material shall be disposed of by the Builder.

5. **Fill:** Suitable fill material shall be placed and compacted where muck or other unsuitable material has been removed and as required to elevate the site to finish grade. Fill shall be placed in successive layers of not more than 12 inches, loose measure, and suitably compacted to 95 percent minimum of maximum density, as determined by ASSHO Specification T99, unless higher percentage is necessary in specific locations. Side slopes shall not exceed 2.5 (horizontal) to 1 (vertical), unless specifically approved otherwise, and shall be protected from erosion by staggered solid grass sodding, or other approved method. Density tests for determination of the specified compaction shall be made by an approved testing laboratory, as directed by NPU.

6. **Grading:** All building sites shall be properly graded, including all cutting and filling necessary for the construction. Finish building site elevations shall be as required to preclude flooding and shall receive prior approval from NPU. Filling shall be accomplished, if necessary, to provide acceptable site elevations. Finish surface grades shall eliminate potholes, abrupt changes in grade and bring the ground to an even surface, and shall provide adequate drainage for the complete site, with special consideration for the following. The grade shall be sloped evenly to provide drainage away from the building walls in all directions at 1/4 inch per foot minimum for at least 10 feet from the building walls. Drainage swales shall have a minimum flow-line grade of not less than 1/8 inch per foot. Roundings shall be provided at top and bottom of banks and at other breaks in grade.
7. **Asphaltic Concrete Pavement:** Driveways, parking locations and other vehicular traffic areas at building sites shall be paved with an asphaltic concrete surface course. The dimensions for said surfacing shall be in accordance with good engineering practice and suitable for the designated service. Roadbed stabilization shall be 6-inch minimum below the base course and shall have a minimum Florida Bearing Value of 50 pounds per square inch (psi). Base course shall be limerock or soil-cement, placed to 6-inch minimum thickness. Prime coat shall be rapid curing cutback asphalt RC70, applied at the rate of 0.10 gallons per square yard. Asphaltic concrete surface course shall be 1-inch minimum thickness, Type II.

8. **Concrete Walks:** In order to provide an all-weather surface for foot traffic ways, concrete walks shall be provided between points of frequent travel. Walks shall be minimum 4 feet wide by 4 inches thick, with concrete construction in accordance with the standards specified under Section B.2. The base material shall be thoroughly compacted to 100 percent of maximum density. Walks shall be provided with expansion joints at structures and/or intervals not exceeding 18 feet, with dummy groove joints at 6 feet intervals. A broom finish shall be provided.

9. **Fencing**

   a. **General:** All building sites shall be totally enclosed by protective fencing, unless specifically excluded from this requirement by NPU. Said fence shall consist of 6 foot high black PVC coated chain link fabric, surmounted with 3 strands of barbed wire, for a total height of 7 feet. Fence shall be fabricated and installed in accordance with good standard practice and shall be complete, including top rail; stretcher bars and clips; all end, corner, pull and gate posts; post braces; ornamental post tops; barbed wire and support arms; and other necessary items. The fence shall include a minimum of one gate opening 12 feet in width, consisting of two 6 feet wide locking, 180 degree, swing gates, with total height equal to fence (7 feet).

   b. **Materials:** Fencing shall be fabricated in compliance with the following minimum material standards:

      (1) **Chain Link Fabric:** 2-inch mesh woven from 9 gage steel wire.

      (2) **End, Corner and Pull Posts:** 2 ½ inch Schedule 40 steel pipe.

      (3) **Gate Posts:** 6 feet maximum width, 2 ½ inch Schedule 40 steel pipe; and 6 feet to 12 feet width: 3 ½ inch Schedule 40 steel pipe.
(4) **Gate Frames and Intermediate Posts**: 1.875 inch outside diameter (O.D.), 2.71 pounds per foot (lb./Pt.) steel tube.

(5) **Post Braces and Top Rails**: 1.625 inch O.D., 2.27 lb/ft. steel tube.

(6) **Barbed Wire**: Two (2) twisted strands of 12 gage steel wire, with 14 gage, 4 point, barbs spaced on 5 inch centers.

(7) **Accessories**: Steel

(8) **Coatings**: Hot dip galvanized with 1.2 ounces of zinc per square foot, applied after weaving for fabric and following fabrication for all other ferrous metal items.

(9) **Concrete**: 2,500 psi compressive strength.

c. **Installation**: The fencing shall be installed to proper grade, alignment and plumb, with corner posts and bracing provided at all angles in alignment. Posts shall be set 3 feet deep in concrete footings: 1 feet 4 inch diameter for line posts; and 2 feet diameter for gate and corner posts.

10. **Landscaping and Grassing**:

   a. **General**: Building sites shall be suitably landscaped in order to be harmonious with the existing or projected adjacent development, provide screening plants and in general present a pleasing appearance. Plants shall equal or exceed Standards for Florida No. 1, as given in Grades and Standards for Nursery Plants, Part I (1963) and Part 11, State of Florida Department of Agriculture. The landscaper shall install the approved planting (grass, trees and shrubbery) in accordance with good standard practice and maintain said items until hardy growth has been established.

   b. **Landscaping**: The Builder shall provide NPU with landscaping plans for approval prior to installation. Said plan shall be prepared by an experienced landscaping company and shall include only such plants which are established for the area of construction and which require minimal maintenance.
c. **Grassing:** The Building shall place solid sod, where not covered by structures or surfacing, over the total area of small facility sites (pumping stations, etc.) and over the prime area of large sites (Treatment Facilities), with additional placement, as required, for erosion control. Where not solid-sodded, balance of the site area shall be totally grassed by sprigging. Unless approved otherwise by NPU, the grass shall be Argentine Bahia. Sod and sprigs shall be fresh and uninjured to time of installation, and sod shall be clean, have a well-matted root system and have a minimum thickness of 2 inches.

**B. Building and Structures:**

1. **Excavations and Fill:**
   a. Excavation shall not proceed until building lines have been surveyed and staked. The Builder shall remove and dispose of all unwanted material, supply all fill material, and install all dewatering facilities, shoring and/or bracing needed.
   b. Bearing capacity of surfaces in excavations or on compacted fill shall be adequate to support the building or structure to be placed thereon. In the event such bearing capacity is uncertain, or suspected of being inadequate, NPU may require testing by an independent testing laboratory to verify adequacy of the foundation design or to require special foundation features, such as larger footings, piles, increased compactions, etc.
   c. Fill and backfill shall be compacted to 95 percent of maximum density at optimum moisture, as determined by ASTM D1557, Method D, or AASHO Method T-147 and T-180.
   d. Building sit shall be kept clear of rubble and any material which may be hazardous to persons or impede construction progress.

2. **Soil Treatment** (Termite Control):
   a. When structures are to be constructed of, or are to contain any wood or wood products, soil treatment shall be required for termite control.
b. Chemicals shall be one of the following water-based emulsions, uniform in composition, containing a dye which will be readily seen to the naked eye after application to the soil, and containing in concentration by weight:

(1) Chlordane, 1.0 percent
(2) Dieldrin, 0.5 percent
(3) Aldrin, 0.5 percent
(4) Heptachlor, 0.5 percent

c. Application of chemical selected shall be made to all areas along foundation walls, around piers and under all concrete slabs at the following rates:

(1) Foundation walls and piers, all sides: 4 gallons per 10 linear feet, mixed with backfill, to a depth of 1 foot below finished grade for concrete; for masonry, increase application rate proportionately by depth of foundation or piers.

(2) Within voids of masonry foundation walls or piers, apply to void at or near bottom of foundation at rate of 2 gallons for each 10 linear feet.

(3) Under all concrete slabs less than 6 feet below finish grade: 1 gallon per 10 square feet.

3. Concrete Work:

a. Design, material, workmanship and practices shall conform to American Concrete Institute Manual of Standard Practice (ACI 315) and the Code of Standard Practice of the Concrete Reinforcing Steel Institute (CRSI).

b. Field and laboratory tests shall be conducted by independent testing laboratory on structural concrete pours for buildings to ascertain that concrete design slumps and strengths are attained.

c. Applicable standards shall include latest editions of the following:

(1) Southern Standard Building Code.

(2) Building Code Requirements for Reinforced Concrete: ACI 318.
(3) Concrete proportions and placing: ACI 211.1 and ACI 301.
(5) Formwork: ACI 347.
(6) Reinforcing bars: ASTM A615, Grade 60.
(7) Stirrups and ties: ASTM A615, Grade 40.
(9) Cement for concrete not exposed to sewage: ASTM C150, Type I.
(10) Cement for concrete exposed to sewage: ASTM C150, Type II, or ASTM C150, Type I, with sulfate resistant properties equal to Type II if Type II is not available and the design engineer affirms the acceptability of Type I.
(11) Watertight and chemical resistant concrete: ACI 614
(12) Aggregate: ASTM C33, salt free.
(13) Water: potable (free from oil, alkali, acid, salt, organic matter, etc.)
(14) Ready-mix: ASTM C94.
(15) Slump test: ASTM C143.
(16) Test cylinders: ASTM C31, minimum of 3 per 50 c.y. of pour or fraction thereof.
(17) Compression test: ASTM C39, at cylinder ages of 7 days, 28 days and finally, if indicated and directed by design engineer, at extended time period, not to exceed 45 days.

(d) Water stops and vapor barriers shall be provided as follows:

(1) Water stops shall be installed at all construction joints in concrete structures retaining liquid and at all construction joints at or below ground level in concrete structures required to remain dry.
(2) Damp check or waterproof membranes shall be installed under and around all concrete slabs to be placed against soil, with joints lapped a minimum of 6 inches.

4. **Masonry Work:**

(a) Concrete masonry units shall be modular and conform to ASTM C90, Grade U-1.

(b) Brick masonry units shall be clay and conform to ASTM C216, Grade SW for below groundwork and grade MW for the above ground work.

(c) Reinforcement of all masonry unit walls shall be provided at alternate courses with Due-0-Wall, Wal-Lock, Block-Lot or approved equal.

(d) Anchors and ties shall be of ferrous metal, with zinc coating conforming to ASTM A153, Class B-1, B-2 or B-3, as appropriate, and as follows:

   (1) **Rigid Steel:** 1 inch x 1/4 inch x 24 inch, with ends turned down 3 inches.

   (2) **Wire Mesh:** 16 gage, ½ inch mesh, 3 inch x 16 inch.

   (3) **Veneer Ties:** No. 6 W & M gage wire bent 90 degrees to form 2 inch hook for mortar embedment, or 22 U.S. gage corrugated sheet metal.

   (4) Spacing of ties shall be such that each tie shall not support more than 3 square feet of wall area with vertical spacing not more than 24 inch, and with additional ties at wall openings.

(e) Mortar shall conform to ASTM C270 (except that slog cements shall not be used), Type M or S. Type N may be used for non-bearing interior walls and partitions above grade.

5. **Waterproofing:**

(a) Waterproofing shall be provided in two (2) coats on all exterior surfaces of subgrade concrete or masonry walls, with outside lap of vapor barriers, damp checks or waterproof membranes thoroughly sealed into the sidewall waterproofing material.
(b) Waterproofing material shall be an asphalt base coating applied in accordance with manufacturers recommendations.

(c) Minimum film thickness (dry) after application shall be 8.0 mils for first coat, 6.0 mils for second coat.

6. Architecture and Wall Finishes:

(a) Complete architectural plans and Specifications for building shall be submitted for approval by NPU prior to construction. In no case shall a structure be planned without regard to aesthetic appearance and maintenance costs.

(b) Exterior wall finishes for permanent above-grade buildings or structures shall comply with one or more of the following selection of materials:

(1) Stucco/stucco brick.
(2) Rubbed concrete.
(3) Brick, over masonry or sturdy wood frame.
(4) Stone aggregate on masonry.
(5) Stone.
(6) Asbestos-cement on masonry substrate.

7. Metal Fabrications:

(a) Steel or other ferrous materials shall conform to the following:

(1) Structural shapes and plates: ASTM A36.
(2) Pipe: ASTM A53.
(4) Bolts, high tensile: ASTM A325.
(5) Galvanizing: ASTM A123 or A 153, as applicable.

(7) Abrasive cast iron (nosings): American Abrasive Metals Co. Feralun or equal.

(8) Cast Steel: ASTM A27, Grade N2.

(9) Stainless Steel: Type 304, unless otherwise required or specified.

(10) Fabrication and Erection: AISC Manual of Steel Construction.

(b) Aluminum materials shall conform to the following:

(1) Rolled shapes, smooth or checkered plates and extruded pipe ALCOA-6061-T6.

(2) Other extruded shapes: ALCOA 6063-T5.

(3) Sheets: ALCOA 3003.

(4) Pipe hand railing: ASTM B429.

8. Windows:

(a) Natural light is preferred for all buildings, and use of common sizes, spaced for adequate natural lighting of interiors is encouraged.

(b) Windows and frames shall conform to quality standards ANSI A34 and AAMS 30 for high performance series.

(c) Frames shall be basic aluminum 6063-T5 with fasteners of aluminum or stainless steel.

(d) Plate glass shall be a minimum thickness of 7/32 inch and set in vinyl glazing material.

(e) All windows shall be sealed all around, both sides, with a non-shrink silicone-based caulk.
9. **Metal Doors and Frames:**

(a) Door frames shall be combination buck and frame type, with adjustable anchors for masonry applications. Frames shall be filled with sand cement grout when installed.

(b) Doors shall be constructed of honeycomb material with metal laminated facing. Minimum door thickness shall be 1 3/4 inch, height 6 feet-8 inch.

(c) All doors and frames shall be mortised and reinforced to receive hardware. Non-ferrous metal should be used at all areas exposed to corrosive atmosphere.

10. **Finish Hardware:**

(a) Hardware shall be heavy-duty type with non-magnetic accessories and compatible with door and frame materials.

(b) Panic exit devices shall be provided in all areas of corrosive or hazardous atmosphere, which may be encountered by occupants.

(c) Finish hardware shall include:

   (1) Locksets: cylinder type with dead latch, suitable for master keying.

   (2) Butt hinges: 1 2 airs per door, ball bearing type preferred.

   (3) Door Closers, holders and silencers.

   (4) Thresholds: aluminum.

   (5) Flush Bolts.

   (6) Panic exit devices, as indicated.

11. **Carpentry:**

(a) All carpentry components shall be of high quality, with galvanized fasteners and treated wood where in contact with all masonry, metal or exposed to weather.
(b) Rough carpentry of construction grade lumber shall conform to standards as follows:


(2) American Institute of Timber Construction.

(3) Truss Plate Institute Specifications.

(c) Finish carpentry or millwork shall be of B or better yard grade seasoned lumber, conforming to applicable requirements of the Architectural Woodwork Institute. Shelving, cabinet doors, tops and ends shall be a minimum of 3/4 inch plywood with all exposed edges trimmed with hardwood. Joints shall be tight and formed to conceal shrinkage.

12. **Roofing:**

(a) Moisture control methods and materials for roofing shall be similar and equal to Johns-Manville or Bird Specifications for built-up and shingle roofs.

(b) Flat roofs shall have a minimum slope of 1/16 inch per foot, with 5-ply built-up roofing meeting the requirements for a 20 year bond. All built-up roofs on concrete slabs or metal decking shall be applied to III rigid insulation board.

(c) Pitches shingle roofs shall have a minimum pitch of 3 vertical to 12 horizontal, with seal-down type asphalt or fiberglass shingles at 300 lbs. per square, on two (2) layers of 15 lb. underlayment, meeting requirements for a minimum of 5 year warranty.

(d) Facia, gravel stops and soffits shall be of low maintenance materials, architectural metal or masonry preferred.

(e) Flashing and trim shall be either galvanized steel, 24 gage minimum thickness, conforming to Fed. Spec. QQ-S775, Type 1, Class C; or aluminum 0.019-inch minimum thickness.
(f) Gutters and downspouts shall be provided on all permanent buildings. Screen protection from debris and concrete splash blocks are required for all downspouts. Materials shall be as follows:

1. **Gutters**: 24 gage galvanized steel or 0.032 inch anodized aluminum.
2. **Downspouts**: 26 gage galvanized steel or 0.025 inch anodized aluminum.
3. **Hanger Straps**: Some material as gutters, as 3 feet-0-inch on centers, with blocking behind downspouts.

13. **Specialties and Accessories**:

(a) Stairs shall be of reinforced concrete or all-welded structural aluminum. Nosing and treads shall be non-skid. Tread widths and riser heights shall conform to applicable codes wherever possible. The use of ship-ladders or vertical ladders is discouraged.

(b) Handrails shall be of all-welded 1 inch O.D. aluminum pipe, 42 inch high with intermediate rail. Rail post spacing shall not exceed 8 feet-0-inch.

(c) Grating and checkered plate shall be of aluminum (preferred) or galvanized steel, and designed to carry a uniform live load of 200 pounds per square foot (psi) with a safety factor of 5, based on ultimate strength. Reinforcing shall be utilized to preclude deflections greater than 1/160 of span. All grating and plates shall have non-skid surface.

(d) Plumbing fixtures shall include, but not necessarily be limited to, water closet and lavatory, and larger facilities provided with shower, water heater and drinking fountain as may be required by NPU. Appropriate toilet partitions and stainless steel accessories shall be provided as indicated.

(e) Fire extinguishers shall be 10-pound extinguishers, Type ABC rechargeable units, provided and spaced as applicable in all buildings and structures.

(f) Other safety equipment shall be provided wherever hazardous materials or equipment are utilized, such as eyewash fountain, gas mask, emergency lighting, etc.
B PAINTING

1. **General**: This section includes the general requirements for painting materials and workmanship, as applicable to all wastewater and water facilities.

   (a) Painting materials shall be delivered to the work site in the original and unbroken containers, marked with the manufacturer name, type of material and analysis of the product, and stored at one location. Special care shall be exercised in the handling and maintenance of painting materials, and all applicable safety regulations shall be followed.

   (b) A Painting System Schedule shall be included in the project Specifications for specific facility items and surfaces. Said schedule shall include, but not be limited to, the specific surface to be coated and specified painting system, with minimum dry mil thickness per coat required.

2. **Materials**:

   (a) All paints and painting materials shall be high-grade products of manufacturer’s of established reputation and shall be Approved for the intended use.

   (b) To ensure a satisfactory end product, it is essential that paint coats be mutually compatible; both shop and field applications. To this end, insofar as possible, all paints applied to a given surface shall be the product of a single manufacturer.

   (c) The paint material set forth in the Paint Schedule shall be the minimum acceptable type for the application indicated.

3. **Application**:

   (a) The Builder shall do a complete painting job throughout the project in accordance with generally approved modern practice for work of high quality. Additionally, surface preparation and application shall be in strict compliance with the manufacturer’s recommendations, and paint shall not be extended or modified.

   (b) Factory finish coatings shall be inspected following installation and any mars or blemishes shall be touched up in the field with the original color and type of paint.
4. **Painting Requirements:**

Table 5-1, Paint Schedule, attached hereto, specifies in general the surfaces to be painted; service conditions for the indicated surfaces; finish paint coating for the specific surface and service condition; and other special requirements. The total painting system (surface treatment, primer, finish coat and other necessary applications) and minimum dry mil thickness per coat required to achieve the specified finish for the specific surface and service condition shall be in strict compliance with the paint manufacturer’s recommendations.

For convenience of description and as a standard for quality comparative reference, the Paint Schedule indicated the finish coating by name, number, or both, for products manufactured by Koppers Co., Inc., Pittsburgh, PA. This does not imply preference for the subject manufacturer, and approved equal products are acceptable.
TABLE 1
PAINT SCHEDULE

<table>
<thead>
<tr>
<th>SURFACE TO BE PAINTED</th>
<th>SERVICE CONDITIONS</th>
<th>FINISH PAINT COATING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Application:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masonry &amp; Concrete (Walls &amp; Ceilings)</td>
<td>Interior Above Grade - Normal Conditions</td>
<td>Glamor glaze</td>
</tr>
<tr>
<td>Masonry &amp; Concrete (Building &amp; Tanks)</td>
<td>Exterior Above Grade - Normal Conditions</td>
<td>Ramuc Exterior Masonry Paint</td>
</tr>
<tr>
<td>Wood Interior - Normal Conditions</td>
<td>Ponkote 300 Enamel</td>
<td>Rustarmor 500</td>
</tr>
<tr>
<td>Metal (Machinery, Piping Systems, etc.)</td>
<td>Interior - Normal Conditions - Nonsubmerged</td>
<td>Ponkote 300 Enamel</td>
</tr>
<tr>
<td>Metal (Machinery, Piping Systems, etc.)</td>
<td>Exterior - Normal Conditions - Nonsubmerged</td>
<td>Glamortex - 501 Enamel</td>
</tr>
<tr>
<td>Metal - Large Areas (Tank Surfaces, Structural Steel, etc.)</td>
<td>Severe Moisture &amp; Condensations Conditions - Nonsubmerged</td>
<td>Torex 800 Enamel</td>
</tr>
<tr>
<td>Wastewater Facilities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete (Wet Wells, Tanks, channels, etc.)</td>
<td>Submerged or severe conditions</td>
<td>Black - Bitumastic No. 300M</td>
</tr>
<tr>
<td>Metal (Equipment, Piping Systems, Tank, etc)</td>
<td>Submerged, or intermittently submerged or extreme conditions</td>
<td>Black - Mitumastic No. 330M</td>
</tr>
<tr>
<td>Metal (Moving Parts - Chains, Gates, etc.)</td>
<td>Submerged, or intermittently submerged</td>
<td>Inertol Grease Coating</td>
</tr>
</tbody>
</table>
# TABLE 1

## PAINT SCHEDULE

<table>
<thead>
<tr>
<th>SURFACE TO BE PAINTED</th>
<th>SERVICE CONDITIONS</th>
<th>FINISH PAINT COATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Facilities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete (Tanks, Troughs, Basins, etc.)</td>
<td>Submerged or intermittently submerged</td>
<td>Black - Petropoxy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color - Torez 800 Enamel</td>
</tr>
<tr>
<td>Metal (Tanks, Piping Systems, Equipment)</td>
<td>Submerged or intermittently submerged</td>
<td>Black - Petropoxy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color - Torez 800 Enamel</td>
</tr>
</tbody>
</table>

**Special Note:**

1. All galvanized or other nonferrous surface requiring painting shall be pre-treated with an approved conditioner or passivator, as recommended by the paint manufacturer, prior to application of the painting system.

2. Bituminous coated pipe shall be coated with Interol Tar Stop, as recommended, prior to application of the painting system.

3. Metal in contact with concrete or masonry shall be protected by coating the contract surface with Koppers Bitumastic No. 50, as recommended. This provision shall not apply to concrete reinforcement, piping and fittings, or conduits and accessories.
In addition to the data contained herein, painting for water storage tanks shall comply with AWWA Standard D102 (latest edition), Painting and Repainting Steel Tanks, Standpipes, Reservoirs and Elevated Tanks for Water Storage.

Unless specifically indicated under Pipe Color Code, the color for surfaces to be painted shall be as selected by NPU. The finish paint color for exposed sewerage and water facilities piping shall be as follows for the specified service:

(a) Pipe Color Code:

(1) Sewage: Green (Solid).
(2) Sludge: Brown (Solid).
(3) Potable Water: Blue (Solid).
(4) Raw Water (water facilities: Blue (with 2 inch bright orange bands spaced 24 inches apart).
(5) Non-Potable Water (Plant): Bright Orange (Solid).
(6) Gas or Fuel Oil: Red (Solid)
(7) Compressed Air: Green (Solid).
(8) Chlorine Gas: Yellow (Solid).
(9) Chlorine or other chemical solutions: Yellow (with 24 inch red bands, spaced 24 inches apart).
(10) Reuse Water: Pink
(10) Other Services: As directed by NPU.

Note: Banding shall be accomplished by painting or approved durable plastic adhesive tape.

(b) Surfaces which shall not require painting (unless service color coding, or other specific coatings are required), are as follows: exterior piping, below ground, factory finished equipment, galvanized fencing; stainless steel, aluminum and brass, plastic or rubber, concrete floors and stair treads, interior of concrete below grade dry pits, and exterior concrete surfaces (as specifically approved).
D.  ELECTRIC

1.  General:  The provisions of this Section, including other specific design considerations, shall be the minimum standards as applicable to all wastewater and water facilities.

   a.  It shall be the responsibility of the Builder to advise the appropriate electrical power company regarding the proposed facility prior to installation and to make the necessary provisions for service thereto.

   b.  In accordance with the provisions of the General Conditions, complete shop drawings and technical data shall be submitted to NPU; including, but not limited to, motor control centers and control systems, with wiring diagrams and components; manufacturer’s data for switches, transformers, relays, lighting fixtures and other accessories; panelboards; and all other applicable information.

2.  Materials, Equipment and Installation:

   a.  General Requirements: Materials, equipment and workmanship shall conform to the applicable portions of the codes, Specifications, standards and statutes listed below:


      (2)  Local Codes: All applicable local codes, regulations and ordinances in effect at the place of the work.

      (3)  National Electrical Manufacturers Association (NEMA): The following equipment should be NEMA approved:

          (a)  Circuit Breakers: Molded Case.

          (b)  Conduit Fittings, Cable Fittings and Accessories.

          (c)  Industrial Control.

          (d)  Connectors: Electric power.

          (e)  Enclosed Switches.
(f) Panelboards.

(g) Transformers.

(h) Connectors for Copper Conductors.

(i) Industrial Enclosures.

(j) Thermoplastic: Insulated Wire & Cable.

(4) American National Standards Institute:

(a) C80.1 Rigid Steel Conduit.

(b) C6.1 Terminal Markings for Electrical Apparatus.

(5) Underwriters Laboratories, Inc.:

(a) Standards for Cabinets and Boxes.

(b) Standards for Service Equipment.

(c) Standard for Industrial Control Equipment.

(d) Standard for Thermoplastic-Insulated Wire.

(6) Illuminating Engineering Society:

(a) IES Lighting Specifications.

(7) United States Federal Government:

(a) Williams: Steiger Occupational Safety and Health Act of 1970 (OSHA).

(8) Special Requirements:

(a) Phase rotation of electrical service shall be: L1, L2, L3 (A,B,C) left to right when facing equipment.
(b) Generator receptacles for portable emergency power connection shall be provided for all electrically operated facilities and shall be as follows for the specified service:

Three phase, 100 amps, 120/240V, 4 wire, tapped delta:

Pyle National, JRE-4100, SW, 4P-100 amp, 600 vac receptacle.

Three phase, 200 amps, 120/240V, 4 wire tapped delta:
Crouse Hinds, AR-2042, 3W, 4P-100 amp, 600 vac receptacle.

Three phase, 277,480V, 4 wire, Y: Russell & Stoll, FCB-3144, 3W, 4P-200 amp, 480 vac receptacle.

(c) Electric Motors Environment: Motors shall have enclosure types which provide safe protection from exposure to unusual environments such as chemical fumes, damp places, outdoors, poorly ventilated rooms, or places of restricted air circulation. In general, enclosures shall be NEMA standardized motor types.

(d) Insulation: Motor insulation materials shall be Class F Systems.

(e) Size: Motors for non-submersible service shall be sized such that the name plated horsepower rating shall not be less than 1.2 times the required shaft brake horsepower output. Appropriate NEMA design shall be used to provide torque and/or other load requirements.

(f) Electrical Characteristics: Motor electrical rating shall be compatible with station electrical service.

(g) Mounting: Motor Mounting shall be of standard NEMA design and shall be compatible with the drive apparatus.

(h) Controls: Motors shall be controlled NEMA standard controllers for all across-the-line or reduced voltage starting. Where variable speed pumping is required, the Specifications or variable speed control equipment shall be coordinated with NPU. In general, motors shall be equipped with all necessary controls and devices for complete and operable systems.
SECTION 6
WATER DISTRIBUTION SYSTEMS

6.01 GENERAL

A. This Section sets forth the general requirements for design and installation of water distribution systems for potable water and irrigation service. Pipe used in water distribution or irrigation systems shall be either polyvinyl chloride (PVC), HDPE or DI (DI) pipe as specified in Section 4 of these Specifications.

The Contractor shall be responsible for all materials furnished and storage of same, until the date of substantial completion. The Contractor shall replace at the Contractor's expense all material found to be damaged or defective in handling or storage. The Contractor shall, if requested by the City, furnish certificates, affidavits of compliance, test reports, or samples for check analysis for any of the materials specified in these Specifications as it relates to water and irrigation systems. All pipe delivered to the project site for installation is subject to random testing for compliance with the designated Specifications.

6.02 DESIGN STANDARDS

A. **Required Reference:** The Builder shall comply with the design and installation requirements as established by the Florida Department of Environmental Protection (FDEP) and additional specific requirements stated in these Specifications. The criteria set forth in the most recent edition of Recommended Standards for Water Works (Ten States Standards) and Insurance Services Office should be used as a design guide, if not in conflict with State, County or other regulatory agency requirements.

B. Water mains shall be located in dedicated rights-of-way or utility easements. When installed in rights-of-way, water mains at the north or west side of the road shall, in general, maintain a consistent alignment with respect to the centerline of the road. All water mains located outside of dedicated rights-of-way shall require a 20 foot easement. If a gravity sewer is located adjacent to a road rights-of-way, a minimum 10 foot easement shall be provided. Additional easement widths shall be provided when the pipe size or depth of cover so dictate, in both cases. If a water main is located adjacent to a road rights-of-way, a minimum 10 foot easement shall be provided. No water mains shall be placed under retention ponds or drainage ditches, tennis courts, or other structures. In general, water mains shall not be located along side or rear lot lines. Placement of a water main along side or rear lot line may be allowed on a case by case basis if such a water main configuration results in efficient placement and utilization of the water distribution system.
C. **System Design:**

1. **Normal Flow Demands:** Flow demands for design shall be calculated on the basis of the ultimate development as known, or projected. The average daily flow for domestic use shall be calculated at the minimum rate of 250 gpd per ERC. Table 2-1 (ERC Determination Schedule) shall be used to calculate the number of ERCs for residential and commercial projects. Flow demands for commercial, industrial or other special developments shall be established using the fixture unit method of existing flow records for a period of at least one year from a similar establishment. Decision on the appropriate method shall be at the sole discretion of NPU.

2. **Peak Flow Demands:** Maximum daily flow shall be determined by applying a peak factor of 2.5 to the average daily flow calculated above. Peak hourly flow shall be determined by applying a peak factor of 4.0 to the average daily flow calculated above.

3. **Fire Flow:** Minimum system requirements for fire flow rates, duration (time) for total flow, as related to the total ultimate maximum-day demand, shall be designed in conformance with the Insurance Services Office Fire Suppression Rating Schedule, Latest Edition. All fire flow rates and fire protection systems shall also be in complete conformance with applicable local and state fire code regulations. Minimum fire flow rates required for maximum-day demands shall be based on population, density, and/or other hazardous features of the proposed construction, as specifically required. Where fire flow requirements exceed the anticipated available fire flow from the central water system, an on-site fire protection system or other fire department approved mitigation measures shall be utilized.

4. **Fire Hydrant Location:** Spacing for hydrants located within low density areas shall in no case exceed 400 feet (measured along the roadway) and shall be connected to 6 inch diameter water mains minimum, which are of satisfactory loop design. Connection to dead-end stubs are acceptable, providing said stub water main is not less than 8 inches in diameter, unless approved by NPU. Hydrants located in commercial, industrial or other high density areas, shall be spaced no further than 400 feet apart (measured along the roadway) and shall connect to looped water mains 8 inches in diameter, or larger, if required by the design flow demand. Exact locations of fire hydrants will be in complete conformance with local and state fire code regulations.

5. **System Size Computation:** The minimum design for water distribution systems shall provide for at least 100 percent of the combined maximum day demand rate and the required fire flow for said rate, or peak hourly flows, whichever is greater. The allowable minimum service pressure under said design condition shall not be less
than 65 pounds per square inch (psi). However, minimum service pressure under maximum daily flow alone shall not be less than 55 psi, unless approved by NPU. The Builder’s Engineer shall submit signed, sealed and dated design calculations with the Drawings for all water distribution projects. The calculations shall show that the water distribution mains will have sufficient hydraulic capacity to transport peak hourly flows and the combination of maximum daily flows and fire flows while meeting a minimum pressure of not less than 30 psi. Head losses through meters and backflow devices shall also be included in the calculations. Design computations shall be by provided to the City utilizing water gems software version 2007 or as approved by the City.

6. **Valve Locations**: Valves shall be provided for all branch connections, main ends, fire hydrant stubs or other locations, as required to provide an operable, easily maintained and repaired water distribution system. Valves are to be placed so that the maximum allowable length of water main required to be shut down for repair work shall be 500 feet in commercial, industrial or high density residential districts, or 1000 feet in other areas. Valve shall be in a three pack at all intersections.

### 6.03 STANDARD REQUIREMENTS

**A. Approved Pipe, Fittings and Valves**: All polyvinyl chloride (PVC) pipe of nominal diameter of 4 inches through 16 inches shall be manufactured in accordance with AWWA Standard C-900 and shall meet the requirements of Section 4.02C of these Specifications. The PVC pipe shall have a minimum working pressure rating of 150 psi and shall have a dimension ratio of 18. The pipe shall be the same outside diameter as DI pipe. The DI pipe of nominal diameter of 4 inches through 36 inches shall conform to ANSI/AWWA A21.51/C-151. A minimum of Class 50 shall be supplied for all sizes of pipe unless specifically required by NPU. The types tabulated below, within the size range indicated and for the applicable service, are approved for water distribution system construction:

<table>
<thead>
<tr>
<th>Pipe and Fittings</th>
<th>Size Range (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI Pipe &amp; Fittings – Epoxy coated</td>
<td>No Limit</td>
</tr>
<tr>
<td>Polyvinyl Chloride</td>
<td>16 inches or Less</td>
</tr>
<tr>
<td>Copper Pipe or Tubing and Brass Fittings</td>
<td>Service Connections Only</td>
</tr>
<tr>
<td>Polyethylene Plastic Pipe and Brass Fittings</td>
<td>Service Connections Only</td>
</tr>
<tr>
<td>Polybutylene Plastic Pipe and Brass Fittings</td>
<td>Service Connections Only</td>
</tr>
<tr>
<td>Gate Valves (GV)</td>
<td>No Limit</td>
</tr>
<tr>
<td>Butterfly Valves (BFV)</td>
<td>No Limit</td>
</tr>
<tr>
<td>Corporation Stops and Curb Stops</td>
<td>Service Connections Only</td>
</tr>
</tbody>
</table>

1. The minimum sized water mains shall be 8 inches unless otherwise approved by NPU. As a minimum, 8 inch looped systems shall be required in low density residential projects. Where looping of water mains is not practical, minimum 8 inch
water mains shall be required, unless detailed calculations are submitted and approved to substantiate the sufficiency of a 6 inch water main. In commercial, industrial, and high density residential areas, minimum 8 inch looped water mains shall be required. Larger size water mains shall be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure of 20 psi.

2. **Joints:** PVC pipe shall have integral bell push on type joints conforming to ASTM D3139. Joints for DI pipe and fitting joints shall be push-on or mechanical joints conforming to ANSI/AWWA A21.11/C-111. Where called for by NPU restrained or flanged joints will be required. Restrained joints shall meet the requirements of Section 4.02F of these Specifications. Flanged joints shall conform to ANSI Standard B16.1, 125 lb.

3. **Fittings:** All fittings shall be mechanical joint DI or gray iron conforming to ANSI/AWWA A21.10/C-110, 250 psi minimum pressure rating.

4. **Coatings and Linings:** Interior and exterior coatings for DI pipe shall conform to the requirements outlined in Section 4.02B.4 of these Specifications.

**B. Fire Hydrants:**

1. **Hydrants shall comply with AWWA Standard Ce-502, Dry Barrel Fire Hydrants; and shall be equipped with a minimum of one (1) pumper outlet nozzle 4 inches in diameter and two (2) hose nozzles 2½ inches in diameter, all having National Standard hose threads. Units shall be traffic type with breakable safety clips, or flange, and stem, with safety coupling located below barrel break line to preclude valve opening. Fire hydrant shall be of ample length for 3½ foot depth of bury. Outlet nozzles shall be on the same plane, with minimum distance of 18 inches from center of nozzles to ground line. Valve shall be compression type with 5 1/4 inches minimum valve opening and shoe inlet connection to be 6 inches minimum. Fire hydrants shall be equipped with O-Ring packing.**

All iron parts of the hydrant both inside and outside shall be painted, in accordance with AWWA C-502. All inside surfaces and the outside surfaces below the ground line shall be coated with asphalt varnish. They shall be covered with two (2) coats. The outside of the hydrant above the furnished ground shall be painted with two (2) coats of Federal Safety Yellow paint.

2. **Hydrants shall be installed plumb and in true alignment with the connection pipes to the water main. They shall be secured with restraining assemblies. The gravel or crushed stone for the drain pump, followed by backfilling, shall be carefully placed**
and compacted. Installation shall be as shown on Fire Hydrant Assembly Detail. Final field location of all hydrants shall be approved by NPU. All hydrants shall be located no less than 5 and no more than 10 feet from the edge of pavement of the adjacent roadway and no less than 7½ feet from any physical feature which may obstruct access or view of any hydrant unless otherwise approved by NPU. Bollards may be required to protect fire hydrant in high rise area. (Coordinate with NPU)

C. Dead Ends: In order to provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins whenever practical, as determined by the City. Where dead end mains occur, they shall be provided with a fire hydrant or automatic blow-off for flushing purposes. Flushing devices shall be sized to provide flows which will provide a velocity of at least 2.5 feet per second in the water main being flushed. No flushing device shall be connected to any sewer.

D. Valves: Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located at not more than 500 foot intervals in commercial, industrial and high density residential areas and at not more than 1,000 foot intervals in all other areas. Appropriate valving shall also be provided at all areas where water mains intersect to ensure effective isolation of water lines for repair, maintenance or future extension. The acceptable valves, installation methods and other specialty items are identified in Section 4 of these Specifications.

E. Joint Restraining: Pressure piping fittings and other items requiring restraint, shall be braced with restraining assemblies, as specified under Section 4. Said restraining devices shall be designed for the maximum pressure condition (testing) and the safe bearing loads for horizontal thrust, if thrust blocking is used.

F. Pipe Depth and Protection: The standard minimum cover for water distribution systems shall be 3 feet from the top of the pipe to finish grade and maximum of 4 feet. Should this design not be feasible, alternatives shall be reviewed for acceptance by NPU.

G. Separation of Water Mains and Sewers: Water mains that are installed in the vicinity of pipe lines designated to carry raw wastewater, reused reuse or wastewater effluent shall meet the horizontal and vertical separations specified herein.

1. Horizontal Separation: Under normal conditions water mains shall be located at least 10 feet horizontally from pipes carrying raw wastewater, and 5 feet horizontally from pipes carrying reused reuse or wastewater effluent, whenever possible; the distance shall be measured from the inside edge of pipe to inside edge of pipe. When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a pipe carrying raw wastewater provided that the bottom of the water main is at least 18 inches above the top of the sewer pipe and the water main is laid in a separate trench or on an undisturbed earth shelf.
2. **Vertical Separation:** Under normal conditions water mains shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. When construction conditions prevent a vertical separation of 18 inches as described herein above, the sewer pipe shall be constructed of DI pipe with mechanical joints.

3. **Crossing of Water Mains and Sewers:** Water mains shall be installed above sewers whenever they cross. A vertical separation of at least 18 inches shall be maintained between the top of the sewer and the bottom of the water main as noted above. Adequate structural support for both the water main and sewers shall be provided to prevent excessive deflection of joints and settling. Sewers shall be constructed of DI pipe with mechanical joints and the length shall be a minimum of 18 feet. The sewer shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water main.

**H. Surface Water Crossings**

1. **Aerial Crossings:** Structural supports shall be provided for all joints in pipes utilized for aerial crossings and shall be designed to prevent overturning and settlement. Expansion joints shall be provided between the aerial and buried sections of pipe. The impact of flood waters and debris shall be considered and the bottom of the pipe shall be placed no lower than 1 foot above the 100 year flood elevation.

   Flanged DI pipe, minimum Class 53 shall be used for all aerial crossings. The above ground pipe shall be painted as specified in Section 4.02B.4.b. for above ground water mains. Underground pipe shall be provided at both ends of the crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding. An air release/vacuum relief valve shall be installed at the high point of the crossing. Appropriate guards shall be installed at both ends of the crossing to prevent pipe access to the public.

   It shall be the responsibility of the Developer to obtain all applicable regulatory permits. When the aerial crossing is accomplished by attachment to a bridge or drainage structure, the Developer shall meet all requirements of the Agencies who own or have jurisdiction over such structures.

2. **Underwater Crossings:** A minimum of 3 feet 6 inches concrete slab shall be provided over the pipe. The pipe material shall meet appropriate AWWA Standards for use in submerged conditions. Valves shall be provided at both end of the water crossings so that the section can be easily isolated for testing or repair. The valves shall be easily accessible, and not subject to flooding. Both valves shall be provided in a manhole or valve vault. It shall be the responsibility of the Developer to obtain all applicable regulatory permits, including dredge and fill permits.
I. **Pipe Bedding:** Special care shall be exercised in design and installation to provide adequate bedding for the type of pipe used, taking into consideration trench width and depth, superimposed loadings above grade and the material below trench grade. Pipe loading capabilities shall be computed in accordance with established design criteria and special supporting bedding or facilities shall be provided as required.

J. **Connections at Structures:** Where pipes are to extend into or through structures, flexible joints shall be provided at the wall face.

K. **Special Exterior Protection for Corrosion:** Extra protection shall be provided for underground DI pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement, as specified in AWWA C-105, through the area of concern. The soil-test evaluation to determine the necessity for extra protection in suspect areas shall be as set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, DI pipe crossing said utility shall be protected for a distance of 20 feet to each side, and when installed parallel to and within 10 feet of, protection shall also be provided.

L. **Air Venting and Blow-Offs:** Where the water main profile is such that air pockets or entrapment could occur, resulting in flow blockage, methods for air release shall be provided. Air venting capabilities shall be provided for distribution mains by appropriately placing fire hydrants, blow-offs or other manual devices. At critical points on major mains, automatic air release assemblies shall be installed. All dead-end water mains, temporary or permanent, shall be equipped with a manually operated blow-off at the terminus.

M. **Service Connections:**

1. All service lines shall be 1 inch, 1 ½ inch or 2 inch polyethylene tubing conforming to the Specifications in AWWA C-800 and C-901.

2. Connections to water mains (other than DI), of 4 inches and larger, shall be made by the drilling of the appropriate size hole and the installation of service saddles. Where water services greater than 12 inches are required dual services shall be provided. Services to smaller size mains shall be accomplished by in-line fittings. A corporation stop shall be placed at the saddle or fitting, with the service line extended perpendicular to said line. Installation shall be as shown on Water Service Connection Detail.

3. No water service lateral shall parallel adjoining lots, run between neighboring property lines or come through the rear of the property’s lot line in order to provide utility service, unless otherwise approved by NPU.
4. Corporation stops shall be 1 inch, 1 1/2 inch or 2 inch brass, equipped with connections compatible with the polyethylene tubing and threaded in accordance with Specifications in AWWA C-901. Curb stops shall be sized to match the meter size and conform to AWWA C-800 and AWWA C-901.

5. Fittings shall be brass, cast and machined in accordance with Specifications in AWWA C-800 and AWWA C-901, with compatible polyethylene tubing connections.

6. Service saddles shall be for service line taps and conform with the requirements outlined in Section 4.02F.6 of this Specifications.

7. On curbed streets, the exact location for such water service shall be marked by stamping, etching or cutting a “W” in the cement curb.

N. Water Metering: All water service connections shall be metered. In general, the method of metering will follow the guidelines listed below. However, the Builder’s Engineer must obtain approval before finalizing the design of the metering system.

1. Single Family, Duplex, and Multi-Family Subdivisions with Public Rights-of-Way: Each unit shall be individually metered. Single and double services shall be installed at the property lines as indicated by the Standard Drawings.

2. Single Family and Duplex Subdivisions with Private Streets: Individual meters may be permitted in accordance with Section N.(1) if the private streets are designed to City standards and easements are dedicated over the entire private street common areas. In addition, sufficient area must be available to locate water mains, services and meters. If the above criteria cannot be met, the subdivision shall be metered pursuant to Section N.(4).

3. Commercial, Industrial, Institutional Projects without Private Fire Lines: In general, each building shall be individually metered. Meter(s) shall be located in the public rights-of-way at the property line.

4. Commercial, Industrial, Institutional, Multi-Family with Private Streets, Apartments and Condominium Projects with Private Fire Lines: In general, all such projects shall require installation of a fire line master meter. Where on-site fire systems contain less than 75 feet of water main, a dual system (separate domestic and fire lines) may be considered. Dual systems shall require installation of a detector check or double detector check as determined by the City. Individual meters to each unit may be considered on a case-by-case basis subject to the Builder executing a Meter Installation and Easement Agreement.
5. **Shopping Centers**: In general, shopping centers shall require installation of a fire line master meter. Individual meters to each unit may be considered on a case-by-case basis subject to the Builder executing a Meter Installation and Easement Agreement.

6. **Meter Installation**: All meters will be installed by the City after payment of applicable fees and charges. All meters less than 1 1/2 inches in size will be installed underground in an approved meter box. For single family lots, when facing the lot, meters shall be installed on the right side for odd numbered lots and on the left side for even numbered lots. Meters 1 1/2 inches and larger shall be installed above ground. In general, meters larger than 2 inches shall be located in a meter easement located adjacent to the public rights-of-way.

7. **Meter Sizing**: The size of all meters shall be determined by NPU. The Builder’s Engineer shall provide sufficient information on estimated peak flows and low flows so that a meter size can be determined.

O. **Backflow Prevention**: In order to protect the public water supply system from contamination due to cross-connections, the Builder shall install where there is the potential of a non-potable substance coming into contact with the public water system. Some of the common systems requiring back flow prevention are commercial and industrial projects, all projects with fire sprinkler and standpipe systems, projects with extensive on-site water systems and irrigation systems.

All commercial and industrial projects shall, as a minimum, require installation of approved double check valves assembly. Projects with a higher degree of hazard may be required to install an approved reduced pressure device. All projects with fire sprinkler and standpipe systems, and projects with extensive on-site water systems shall be required, as a minimum, to install an approved double check valve assembly. Pressure-type vacuum breakers or double check valves assembly shall be utilized on all irrigation systems.

The RP should be installed so that the vent of the differential relief valve is between 12 and 24 inches above the ground or high water mark, with a minimum of 24 inches on all sides. It should be situated so the discharge of water from the relief port does not create an aesthetic problem. Moreover, discharges of water from the assembly should not create flooding of the port. Just as with the atmospheric and pressure vacuum breaker, it is essential that the air inlet port not be blocked or flooded. Because the air inlet port must not be flooded, the RP should not be installed in pits.

All backflow prevention devices are to be located directly following the water meter on Builder’s property, installed above ground to facilitate maintenance and testing. It shall be the Builder’s responsibility to pay for, install and maintain all backflow prevention devices. Additional requirements, if any, are contained in the city’s backflow prevention ordinance.
P. **Identification Tape**: Locating tape shall be installed 1 foot below final grade over the centerline of the pipe. The tape shall be the detectable type.

O. **Locating Wire**: Locating wire shall be installed directly on top of the pipe (no more than 6 inches directly above the top of the pipe), continuously without gaps over the entire length at pipe with access through valve boxes. The tape shall be laid continuously without gaps between ends over all installed piping. The tape shall have the words “Caution, Water Line Buried Below” printed continuously along its length.

6.04 INSTALLATION

A. All water mains, valves and appurtenances shall be installed in accordance with Sections 3 and 4 of these Specifications.

6.05 TESTING

A. The Builder shall perform hydrostatic testing of all water distribution systems, as set forth in the following, and shall conduct said tests in the presence of representatives from NPU or other authorized agencies, with 2 days advance notice provided. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints and valves including all service lines to the curb stops. Air testing of pressure pipe will not be permitted under any circumstance. The Contractor shall furnish all necessary equipment and material, make all taps and furnish all closure pieces in the pipe as required.

1. Piping and appurtenances to be tested shall be within sections between valves, unless alternate methods have received prior approval. Testing shall not proceed until concrete thrust blocks are in place and cured, or other restraining devices installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required. Flushing shall be at full flow conditions and at least 2.5 feet per second flow rate.

2. Hydrostatic testing shall be performed at 150 psi pressure or 1.5 times the working pressure, whichever is greater, for a period of not less than 2 hours. If during the test the integrity of the tested line is in question, the City may require a 6 hour pressure test. Testing shall be in accordance with the applicable provisions as set forth in Section 4 of AWWA Standard C-600. The Contractor may conduct hydrostatic tests after the trench has been partially backfilled with the joints left exposed for inspection for the Contractors informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified.
The procedure for conducting the test will be that each section of pipe to be tested will be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this taps shall be made, and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves, or hydrants are discovered in consequence of this pressure test, all such items shall be removed and replaced by the Contractor with sound material and the test repeated until satisfactory results are obtained. The allowable rate of leakage for DI piping shall be less than the number of gallons per hour determined by the following formula:

$$
\frac{SD(P)^{1/2}}{L} = 133,200
$$

$L$ = allowable leakage in gallons per hour

$S$ = length of pipe tested, in feet

$D$ = nominal diameter of the pipe in inches

$P$ = average test pressure maintained during the leakage test in pounds per square inch gauge, (minimum 150 psi)

The allowable leakage for PVC and HDPE piping shall be 90 percent of the value calculated above.

3. The testing procedure shall include the continued application of the specified pressure to the test system, for the 2-hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container. Should the test fail, the Builder shall accomplish necessary repairs and the test repeated until with the established limits. The Builder shall furnish the necessary labor, water, pumps, gauges and all other items required to conduct the required water distribution system testing and perform necessary repairs.

6.06   DISINFECTION

A. Following pressure testing, the Builder shall disinfect all sections of the water distribution system and receive approval thereof from the appropriate agencies, prior to placing in service. In addition, any part of the City’s water system, which has direct contact with finished water and has been out of service for repair, alteration, or replacement shall be disinfected. Two (2) days advance notice shall be provided to NPU before disinfecting procedures start. The disinfection shall be accomplished in accordance with the applicable
provisions of AWWA Standard C-651, “Disinfecting Water Mains”, and all appropriate approval agencies.

B. Sections of pipe to be disinfected shall first be flushed and pigged (full diameter) to remove any solids or chlorination or flushed purpose, or for the temporary or permanent release of air shall be provided for by the Contractor as a part of the construction of water mains, all such taps shall be sealed to the satisfaction of the City.

Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinated so that the initial chlorine residual is not less than 50 mg/l and that a chlorine residual of not less than 25 mg/l remains in the water after 24 hours in the pipe. Chlorine may be applied as liquid chlorine (gas-water mixture), or a mixture of water and high-test calcium hypochlorite. The Contractor shall assume the responsibility for safe handling of chlorine and shall meet the requirements of OSHA and other regulatory agencies for safe handling of chlorine.

The preferred point of application of the chlorinating agent shall be at the beginning of the pipeline extension or any valued section of it and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipeline extension. Alternate points of applications may be used when approved by the City.

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its lengths shows upon test, a free chlorine residual not in excess of that normally carried in the system. After flushing, water samples shall be collected on two (2) successive days from the treated piping systems, as directed by the City, shall show acceptable bacteriological results. All bacteriological testing shall be performed by the Developer or Contractor, and must be performed by a laboratory certified by the State of Florida. In addition, proper chain of custody procedures must be followed and samples shall only be collected by certified personnel in the presence of City Personnel. Copies of testing results and all related correspondence with the State of Florida Department of Health and Rehabilitative Services (Sarasota County Public Health Unit) and FDEP shall be submitted to the City.

C. Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained.
SECTION 7
SANITARY GRAVITY SEWERS

7.01 GENERAL

This Section includes general technical criteria for the design and installation of sanitary gravity wastewater systems.

7.02 DESIGN STANDARDS

A. Required Reference: The Builder shall comply with the applicable requirements as established by the FDEP. Additionally, the criteria set forth in the most recent edition of “Recommended Standards for Wastewater Facilities (Ten States Standards)”, may generally be used as a design guide, if not in conflict with State, County or other regulatory agency requirements.

B. Gravity sewers shall be located in dedicated rights-of-way or utility easements. Whenever possible, sewers shall be located under pavement in dedicated rights-of-way. All sewers located outside of dedicated rights-of-way shall require a 20-foot easement. If a gravity sewer is located adjacent to road rights-of-way, a minimum 10-foot easement shall be provided. Additional easement widths shall be provided when the pipe size or depth of cover so dictate, in both cases. No gravity sewers shall be placed under retention ponds or drainage ditches, tennis courts, or other structures. In general, gravity sewers shall not be located along side or near lot lines. Placement of a gravity sewer along side or rear lot line may be allowed on a case by case basis if such a sewer configuration results in efficient placement and utilization of the sewer system, and must be approved by NPU. In addition, no manholes shall be placed along side or rear lot lines.

C. System Design:

b. Average Design Flows: The sewer system design shall be based on full ultimate development as known, or projected. The average daily flow (ADF) from domestic units shall be calculated at the minimum rate of 100 gallons per capita per day. One ERC shall be equal to the rate of 225 gallons per day. Table 2-1 (ERC Determination Schedule) shall be used to calculate the number of ERC’s for residential and commercial projects. Flow requirements from commercial, industrial, institutional or other special development areas shall be established using the fixture unit method of existing flow records for a period of at least one year from a similar establishment. Decision on the appropriate method shall be at the sole discretion of NPU. The progressive summation of the previously described contributions shall constitute the ADF for specific sections of the sewer system.
c. **Peak Design Flows:** Gravity sewers shall be designed on the basis of ultimate development maximum rates of flow, which will be the product of selected peak factors times the cumulative ADF for the subject portion. In general, the following peak factors shall be applicable for the range of average daily flow rates indicated (million gallons per day – MGD), unless larger values are required for specific conditions or prior approval is received for modification thereof.

<table>
<thead>
<tr>
<th>Flow Range</th>
<th>Peak Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000 to 0.100 MGD-ADF</td>
<td>4.0</td>
</tr>
<tr>
<td>0.100 to 0.250 MGD-ADF</td>
<td>3.5</td>
</tr>
<tr>
<td>0.250 to 1.000 MGD-ADF</td>
<td>3.0</td>
</tr>
<tr>
<td>1.000 to 4.000 MGD-ADF</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Note: Special analysis shall be made for flows beyond 4.000 MGD-ADF or peak factors less than 2.5.

d. **Sewer Size Computation:** Sanitary sewers shall be sized to provide ample capacity for the required ultimate population/development peak flow rates. The minimum allowable size for any sewer, other than service connections, shall be 8-inches in diameter. All sewers shall be designed at slopes providing minimum velocities of not less than 2 feet per second when flowing full or half-full. Said computation shall be based on Manning’s Equation, using a roughness coefficient (“n”) of 0.12 for polyvinyl chloride (PVC) pipe and 0.013 for other pipe material, unless justifiably approved otherwise. In general, the following minimum slopes shall be provided:

<table>
<thead>
<tr>
<th>Sewer Diameter</th>
<th>Minimum Slope (Feet per 100 Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-inches</td>
<td>0.40</td>
</tr>
<tr>
<td>10-inches</td>
<td>0.28</td>
</tr>
<tr>
<td>12-inches</td>
<td>0.22</td>
</tr>
<tr>
<td>16-inches</td>
<td>0.14</td>
</tr>
<tr>
<td>18-inches</td>
<td>0.12</td>
</tr>
<tr>
<td>20-inches</td>
<td>0.11</td>
</tr>
<tr>
<td>24-inches and larger</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Minimum slopes slightly less than those indicated may be considered; providing the depth of flow will not be less than 0.3 of the pipe diameter or the velocity less than 2.0 feet per second at design average daily flow, and justifiable reasons for the modification are presented.
e. **Design Considerations:**

i. Sewers shall be installed with straight alignment and grade between manholes, with manhole spacing not to exceed 400 feet for sewers, 15-inches or less, and 500 feet for sizes larger; however, special provisions may be considered for sizes 30 inches and larger.

ii. All sanitary sewers shall initiate and terminate at manholes.

iii. Sewers of diverse sizes shall always join at manholes, with no size conversions between manholes. Where different sizes join, the pipes shall be placed at elevations where the 0.8 depth points are equal. If the entrance pipe elevation exceeds 2.0 feet above the effluent sewer, drop manhole connections shall be provided.

iv. Flow direction changes in excess of 90 degrees shall not be included in sewer alignments without special consideration. When directional changes exceeding 45 degrees occur, an extra flow line elevation drop (0.1 feet) across manholes shall be provided.

v. Where design velocities greater than 10 feet per second are attained, due to topography or other reasons, special provisions shall be provided for sewer protection.

vi. The minimum cover over gravity sewers shall be no less than 3 feet calculated from the finished grade.

vii. All sewer extensions for future connections shall terminate at a manhole.

viii. Main drain and backwash systems for pools and spas, and storm drain systems shall not connect to the gravity system.

ix. The Engineer shall submit signed, sealed and dated design calculations with the Drawings for all sewer projects. Calculations shall show that sewers will have sufficient hydraulic capacity to transport all design flows.

x. Sanitary sewer lines and fittings with an invert depth of 10 feet or deeper from finish grade shall be SDR-26.
7.03 STANDARD REQUIREMENT:

A. Approved Pipe and Fittings: For PVC pipe ranging in diameter from 4 to 15 inches, it shall meet the requirements for ASTM D-3034, SDR-35. For PVC pipe with a diameter greater than 18 inches shall meet ASTM F-679, SDR-35. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D-3212 and ASTM F-477. Ductile iron (DI) pipe shall be epoxy coating with approved coating and conform to ANSI/AWWA A21.51/c-151, class thickness designed per ANSI/AWWA A21.50/c-150, with mechanical or push on joints. All PVC and DI gravity sewer pipe shall meet the requirements of Section 4 of these Specifications. Unless otherwise specified, wye branches shall be provided in the gravity sewer main for service lateral connections. Wyes shall be 6-inches inside diameter, unless otherwise approved by NPU. All fittings shall be the same material as the pipe. Plugs for stub outs shall be of the same material as the pipe, and gasketed with the same gasket material as the pipe joint. The types tabulated below, within the size range indicated, are approved for sanitary gravity sewer construction:

<table>
<thead>
<tr>
<th>Pipe and Fittings</th>
<th>Size Range (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ductile Iron Pipe &amp; Fittings</td>
<td></td>
</tr>
<tr>
<td>(*) Special Protective Interior Linings</td>
<td>4 inches or larger</td>
</tr>
<tr>
<td>Polyvinyl Chloride</td>
<td>21 inches or less</td>
</tr>
</tbody>
</table>

(*) Interior coating or lining requirements shall receive special consideration in regard to operational conditions.

B. Sanitary Sewer Manholes:

1. Manholes shall be pre-cast concrete, as detailed herein. Alternate manhole materials and designs shall receive prior approval. The minimum inside diameter of manholes shall be 48 inches for sewer sizes to 24 inches in diameter or less. For sewers between 24 inches and 36 inches the minimum inside diameter shall be 60 inches. A minimum access cover diameter of 24 inches shall be provided. Installation of manholes shall be as shown on “Gravity Sewer Detail.”

2. Pre-cast reinforced manholes shall be in accordance with ASTM Designation C-478, with performed flexible plastic joint sealer conforming to Federal Specification SS-S0021 (GSA-FSS).

3. The minimum wall thickness shall be 5 inches. Pre-cast manholes shall be constructed with a pre-cast monolithic base structure as shown on the
4. Manhole frames and covers shall be gray cast iron conforming to ASTM Designation A48, Class 30. Castings shall be true to pattern in form and dimensions and free from pouring faults and other defects which would impair their strength, or otherwise make them unfit for service intended. The seating surfaces between frames and covers shall be machined to fit true. No plugging or filling will be allowed. Lifting or pick holes shall be provided.

Casting patterns shall conform to those shown or indicated on the Standard Drawings. Covers shall have no perforations and shall be marked with the word “SANITARY”. Frames and covers shall be fully bedded in mortar to the correct finish grade elevation, with adjustment brick courses placed below, for pre-cast manholes. Frames shall be suitable for the future addition of cast iron rings for upward adjustment of top elevation. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings.

5. Manhole flow channels shall be smooth with carefully shaped bottoms, built up sides and benching constructed from concrete. Channels shall conform to the dimension of the adjacent pipe and provide changes in size, grade and alignment evenly. Flow directional changes of greater than 90 degrees shall not be included in sewer alignments without special consideration. When directional changes exceeding 45 degrees occur, an additional flow line elevation drop of 0.1 foot across manholes shall be provided. Benching shall be provided which shall have a minimum slope of 2 inches per foot.

6. Unless specified elsewhere, manhole interior coating shall be Bitumastic Super Service Black or approved equal 2 coats, total 16 mils minimum dry thickness. Exterior surfaces shall receive two (2) coats epoxy coal tar coating with a minimum 9 mils dry thickness. Surface preparation and paint application shall comply with the manufacturer’s recommendations.

All manholes receiving the discharge of a force main, the first manhole downstream of a lift station and any manhole which has been rehabilitated or replaced due to corrosive attack shall be lined or coated, unless otherwise approved, on all interior concrete surfaces as selected by the Engineer or Record with the Department’s approval. Note that the Department reserves the right to require coating or lining of any manhole, as it deems necessary. For example, at times the terminal manhole of a basin, i.e. the first manhole upstream of a pump station wet well, may be required to have a coating or lining. The decision of the Department in this regard shall be final.

The Department reserves the right to approve or reject any lining or coating system proposed for use. Presently the Department has a number of lining
and coating systems considered suitable for use and may, as future experience and testing by the New Technology Committee or others dictates, add to or subtract from this group.

Lining or coating system shall fully protect openings, such as for pipes, to insure that corrosive attack cannot take place at these locations. Concrete protective system design for these areas will be checked as shop drawings.

Lining or coating system shall carry a minimum 5 year unlimited warranty on material and workmanship.

7. **Surface Preparation**

   A. Loose and disintegrated mortar, stone, vitrified sewer material, brick or similar materials shall be removed from the inner surface of the structure. All cracks, channels and holes shall be completely chipped to a firm surface. Chippings should continue until there are no offsets, which would cause an abrupt change in the thickness of the repair. All protruding taps and lateral sewers shall be cut off flush with the inside face of the sewer barrel or finished sprayed surface.

   B. Manhole walls shall be sandblasted down to white concrete finish to ensure all acids and containments are removed prior to the application of the lining or epoxy coating.

   C. Once preparation is complete, all seepage through existing masonry shall be stopped by way of caulking, pressure grouting, or other suitable means. No lining or coating shall be applied to any surface where free or running water exists.

8. Where additional pipe connections or modification of existing factory made openings are required on new or existing pre-cast concrete manholes, all cutting relative thereto shall be performed only by a power driven abrasive wheel or saw. It is specifically noted that such connections to existing manholes shall be caulked watertight with non-shrinking grout.

9. An outside drop pipe shall be provided for a sewer entering a manhole where its invert elevation is 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the manhole invert shall be filleted to prevent solids deposition.

10. Concrete for manholes shall be Type II, 4,000 psi at 28 days. Barrel, top and
base sections shall have tongue and groove joints. All jointing material shall be cold adhesive performed gaskets, conforming to FDOT Article 942-2.

11. Manhole sections shall be cured by an approved method for at least 28 days prior to painting and shall not be shipped until at least 2 days after having been painted.

12. Pre-cast concrete top slabs shall be used where cover over the top is less than 4 feet. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the manhole sections.

C. **Pipe Depth and Protection**: The minimum allowable cover for gravity sewers shall be 3 feet from the top of the pipe to finish grade. Where waterways are crossed, ductile iron pipe and protective concrete slabs shall be installed across and to 10 feet each side of the bottom. Additionally, approved utility crossing signs shall be placed on the pipe alignment at each side of any waterway crossed.

D. **Pipe Bedding**: The minimum allowable cover for gravity sewers shall be 3 feet from the top of the pipe to finish grade. Where waterways are crossed, ductile iron pipe and protective concrete slabs shall be installed across and to 10 feet each side of the bottom. Additionally, approved utility crossing signs shall be placed on the pipe alignment at each side of any waterway crossed.

E. **Special Exterior Protection for Corrosion**: Extra protection shall be provided for underground ductile iron pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement, as specified in AWWA C-105 through the area of concern. The soil test evaluation to determine the necessity for extra projection in suspect areas shall be set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, ductile iron pipe crossing said utility shall be protected for a distance of 20 feet to each side; and, when installed parallel to and within 10 feet of same, protection shall also be provided.

F. **Connections at Structures**: Where sanitary sewers connect to structures, pipe joints shall be provided at the wall face; and further, where said connection is to wet wells or other installations where backfill exists below trench grade, one joint (18 to 20 feet) of ductile iron pipe epoxy lined or C-900 DR18 (minimum) shall extend outward from the structure. When it is necessary to extend sewers through structures, such as conflict manholes, the pipe within shall be ductile iron with no inside joints.

G. **Transition Connections**: Where pipes of alternate materials (PVC to DI, etc.) are to be connected between manholes, suitable approved transition couplings shall be installed. Couplings shall be “C-T Adapters”. Special designed units may be submitted for approval; however, concrete collars are not acceptable.
H. **Service Connections:** Installation shall be as shown on “Service Lateral Details”; including the wye branches installed in the sewer main at the point of connection, and the service pipe and required fittings extended to the property line, perpendicular to said line, terminating with stopper ends or fittings, as indicated. The minimum service pipe size shall be 6 inches in diameter and not more than 75 feet in length for single or double connections. In general, service laterals shall not be allowed to discharge into sanitary manholes, except at terminal manholes. A case-by-case exception to this requirement may be allowed if the lateral discharges at the same elevation as the manhole invert. On curbed streets, the exact location for each installed service shall be marked by etching or cutting an “S” in the concrete curb. Service laterals shall have a minimum slope of 1/8 inch per foot and shall be installed no more than 4 inches below finish grade unless approved by NPU. Where no curb exits or is planned, locations shall be adequately marked by a method approved by NPU.

No wastewater service lateral shall parallel adjoining lots, run between neighboring property lines or come through the rear of the property’s lot line in order to provide utility service, unless otherwise approved by NPU.

I. **Protection of Water Systems:** The horizontal separation between sanitary sewers and existing or proposed water mains shall not be less than 10 feet. However, should the stipulated horizontal separation not be possible, the sewer pipe shall be completely encased (6 inches minimum) in concrete, or constructed of ductile iron with pressure-tight joint, or protected by other methods as approved. Unless sewer pipes cross below water mains with a vertical separation of 18 inches between the bottom of the water pipe and the top of the sewer, special protection shall be provided. Said protection shall consist of completely encasing (6 inches minimum) the sewer pipe in concrete for a minimum distance of 10 feet each side of the water main, or installation of pressure-tight joint of ductile iron pipe for the same dimension.

J. **Grease Traps:** All Foot Preparation/Service Establishments shall have outside grease traps sized as discussed herein. All wastewater flow from the kitchen areas of these establishments must flow through approved grease traps prior to entering the wastewater collection.

1. **Fast Food Restaurants:** Single grease trap capacity shall be sized at the rate of 10 gallons per seat. If two grease traps are used in series, total capacity of the grease traps shall be based on 5 gallons per seat.

2. **Single grease trap capacity shall be sized at the rate of 20 gallons per seat. If two grease traps are used in series, total capacity of the grease traps shall be based on 10 gallons per seat.**

3. **24 Hour Restaurants:** Single grease trap capacity shall be sized at the rate of 30 gallons per seat. If two grease traps are used in series, total capacity of the grease
traps shall be based on 15 gallons per seat.

4. **Convention Center/Manufacturing Cafeterias**: Single grease trap capacity shall be sized at the rate of 3 gallons per meal. If two grease traps are used in series, total capacity of the grease traps shall be based on 1.5 gallons per meal.

5. **Miscellaneous Foot Preparation/Service Establishments**: Developer’s Engineer shall consult with the City Public Utilities Division personnel before finalizing the design.

### 7.04 INSTALLATION

#### A.
All gravity sewer pipe, manholes and appurtenances shall be installed in accordance with Section 4 of these Specifications.

#### B.
The installed sewers shall be “lamped” between manholes, or other structures in order to ascertain that they are clear and to connect alignment. The concentricity of the lamp image received shall be such that the diameter of said image shall have no vertical reduction from that of the pipe inside diameter and not more than 20 percent horizontal reduction.

#### C.
Sanitary sewers to be tested shall be within sections as previously approved. Testing shall not proceed until all facilities are complete in place and concrete cured. All piping shall be thoroughly cleaned prior to testing to clear the lines of all foreign matter.

#### D.
Leakage testing shall be conducted in accordance with the procedure for “Recommended Practice For Low Pressure Air Testing of Installed Sewer Pipe” as established by the Uni-Bell PVC Pipe Association. Passing this test shall be presumed to establish leakage test limits of 50 gallons per day per inch diameter per mile of sewer.

#### E.
Should the test fail, necessary repairs shall be accomplished by the Builder and the test repeated until the results are within the established limits. The Builder shall furnish the necessary labor, water and all other items required to conduct the required testing and shall perform the necessary system repairs required to comply with the specified test.

#### F.
Maximum ring deflection of PVC pipe under load shall be limited to five percent of the vertical internal pipe diameter.

#### G.
The installed sewers shall undergo television inspection at two times. The first shall be prior to final acceptance by NPU and the other shall be within 1 year of NPU acceptance. The television inspections shall be performed in accordance with The National Association of Sewer Service Companies “Recommended Specifications For Sewer Collection System Rehabilitation”. Videotapes and inspection logs shall be provided to NPU for each inspection. If either inspection reveals cracked, broken or defective pipe or pipe misalignment resulting in vertical sags in excess of ¾ inches, the Builder shall be required to
repair or replace the pipeline. Prior to repair or replacement of failed sewer pipe, the method of repair or replacement shall be submitted to NPU for approval. Pressure grouting shall not be considered as an acceptable method of repair.

H. The results of all testing shall be provided to the City in legible form by the Builder.
SECTION 8
WASTEWATER FORCE MAINS

8.01 GENERAL

This Section includes the general requirements for design and installation of force main systems servicing wastewater-pumping stations.

8.02 DESIGN STANDARDS

A. **Required Reference**: The Builder shall comply with the applicable design and installation requirements as established by the FDEP and the most recent edition of “Recommended Standards for Wastewater Facilities (Ten States Standards)”.

B. **System Design**: Force main systems shall be of adequate size to efficiently transmit the total ultimate peak operational flows, applied by the connected sewage pumping station(s), to the effluent point. Consideration should be given to possible future connecting pumping stations and the NPU representatives shall review this probability. Capacity computations shall be coordinated with the proposed pumping system(s) along with any future flow requirements, if applicable. Force main flow velocity shall not be less than 2 feet per second.

1. **Average Design Flows**: The force main system design shall be based on full ultimate development as known, or projected. The average daily flow (ADF) from domestic units shall be calculated at the minimum rate of 100 gallons per capita per day. One ERC shall be equal to the rate of 225 gallons per day. Table 2-1 (ERC Determination Schedule) shall be used to calculate the number of ERC’s for residential and commercial projects. Flow requirements from commercial, industrial, institutional, or other special development areas shall be established using the fixture unit method of existing flow records for a period of at least one year from a similar establishment. Decision on the appropriate methods shall be at the sole discretion of NPU. The progressive summation of the previously described contributions shall constitute the ADF for specific sections of the sewer system.

2. **Peak Design Flow**: The peak design flow rate shall conform to the requirements outlined in Section 9.02B.

3. At design pumping rates, a cleaning velocity of at least 2 feet per second should be maintained at all times. The maximum velocity at design pumping rates should not exceed 8 feet per second for ductile iron (DI) pipe and 5 feet per second for polyvinyl chloride (PVC) pipe. The minimum for main diameter shall be 4 inches.
4. Friction losses through force mains shall be based on the Hazen Williams formula. In the use of the Hazen Williams formula, the values for “C” shall be 120 for DI pipe and 130 for PVC pipe. Values for “C” greater than 130 shall not be allowed.

When initially installed, the force mains may have a significantly higher “C” factor. The higher “C” factor should be considered only in calculating maximum power requirements and duty cycle time of the pump station.

5. The force main and fittings, including all restrained joint fittings and thrust blocking, shall be designed to withstand pump operating pressures and pressure surges, but not less than 100 pounds per square inch (psi).

6. Force mains shall not terminate directly into a gravity sewer line. Force mains should enter the manhole at a point not more than 1 foot above the flow line of the receiving manhole.

7. **Design Calculations:** The Builder’s Engineer shall submit signed, sealed and dated design calculations for all wastewater force main projects. The calculations shall show that the force main will have sufficient hydraulic capacity to transport all design flows.

C. **Operational Cost Considerations:** In addition to initial capital expenditure, long term pumping station operational costs shall also receive consideration when sizing force mains. Should a pipe size option be available with the design limits, the cost of sewage pumps and motors, force main system, and pump operating power (computed for design average daily flow rate for 10 year existing electricity cost), shall be compared to like amounts for the alternate designs. The final force main size selection shall be directed towards the system with the least long range capital and operational cost. Said cost analysis shall be subject to review.

D. **Location:** Force mains shall be located in dedicated rights-of-way or utility easements. When installed in rights-of-way, force mains shall maintain a consistent alignment with respect to the centerline of the road. All force mains located outside of dedicated rights-of-ways shall require a minimum 20-foot easement.

**8.03 STANDARD REQUIREMENTS**

A. **Approved Pipe, Fittings and Valves:** Pipe used for force main systems shall be either PVC, HDPE or DI pipe. Pre-stressed concrete cylinder pipe is not allowed. All PVC pipe shall be manufactured in accordance with AWWA Standard C-900. The PVC pipe shall have a minimum working pressure of 100 psi and a dimension ratio (DR) of 25. All DI pipe shall conform to ANSI/AWWA A21.51/C-151. The DI pipe shall be a minimum
class 50 pipe, unless a higher-class pipe is specifically required by NPU. The types tabulated below, within the size range indicated and for the applicable service, are approved for wastewater force main construction. Force main shall be a minimum of 4 inches in diameter.

<table>
<thead>
<tr>
<th>Pipe and Fittings</th>
<th>Size Range (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyvinyl Chloride Pipe</td>
<td>18 inches or less</td>
</tr>
<tr>
<td>Ductile Iron Pipe &amp; Fittings</td>
<td>4 inches or larger</td>
</tr>
<tr>
<td>(*) Special Protective Interior Linings</td>
<td>4 inches or larger</td>
</tr>
</tbody>
</table>

(*) Interior coating or lining requirements shall receive special consideration in regard to operation conditions.

<table>
<thead>
<tr>
<th>Valves</th>
<th>Size Range (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug Valves (PV)</td>
<td>No Limit</td>
</tr>
</tbody>
</table>

B. **Joints:** All PVC pipe shall have integral bell push on type joints conforming to ASTM D3139. Joints for DI pipe and fittings shall be push on or mechanical type joints conforming to ANSI/AWWA A21.11/C-11, unless otherwise required by NPU. Flanged joints, if required, shall conform to ANSI B16.1-125 lb.

C. **Joint Restraining:** Pressure piping fittings and other items requiring restraint, shall be as specified. Said restraining devices shall conform to Section 4.02F of these Specifications, and shall be designed for the maximum pressure condition (testing) and the safe bearing loads for horizontal thrust, if thrust blocking is used.

D. **Pipe Depth and Protection:** The standard minimum cover for wastewater force main systems shall be 3 feet from the top of the pipe to finished grade. Where waterways, canals, ditches, or other cuts are crossed, protective concrete slabs shall also be installed across and to 10 feet of each side of the bottom. Additionally, approved utility crossing signs shall be placed on the pipe alignment at each side of the canal, etc.

E. **Separation of Water Mains and Sewers:** Wastewater force mains that are installed in the vicinity of pipelines designated to carry potable water shall meet the horizontal and vertical separations specified herein.

1. **Horizontal Separation:** Under normal conditions wastewater force mains shall be located at least 10 feet horizontally from pipes carrying potable water. Whenever possible, the distance shall be measured from the inside edge of pipe to inside edge of pipe. When local conditions prevent a horizontal separation of 10 feet, a wastewater force main may be laid closer to a pipe carrying potable water.
provided that the bottom of the water main is at least 18 inches above the top of the wastewater force main, and the water main is laid in a separate trench or on an undisturbed earth shelf.

2. **Vertical Separation:** Under normal conditions wastewater force mains shall be laid to provide a separation of at least 18 inches between the top of the wastewater main and the bottom of the water main. When construction conditions prevent a vertical separation of 18 inches as described, herein above, the wastewater force main pipe shall be constructed of DI pipe or DR-14 PVC with mechanical joints.

3. **Crossing of Water Mains and Sewers:** Wastewater force mains shall be installed below water mains whenever they cross. A vertical separation of at least 18 inches shall be maintained between the top of the force main and the bottom of the water main as noted above. Adequate structural support for both the water main and wastewater force main shall be provided to prevent excessive deflection of joints and settling. Wastewater force mains shall be constructed of DI pipe with flanged and mechanical joints and the length shall be a minimum of 18 feet. The sewer shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the water main.

F. **Connections at Structures:** Where pipes are to extend into or through structures, flexible joints shall be provided at the wall face.

G. **Special Exterior Protection for Corrosion:** Extra protection shall be provided for underground DI pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement, as specified in AWWA C-105 through the area of concern. The soil-test evaluation to determine the necessity for extra protection in suspect areas shall be as set forth in ANSI Standard A21.5. Additionally, where other existing utilities are for a distance of 20 feet to each side; and, when the installed parallel to and within 10 feet of same, protection shall also be provided.

H. **Air and Vacuum Venting:** Where the force main profile is such that air pockets or entrapment could occur, resulting in flow blockage, provisions for air release shall be provided. The air and vacuum release valves shall conform to the requirements outlined in Section 4.03I of these Specifications. Manually operated vent valves shall be provided along minor force mains where continual problems are not anticipated. Automatic air release assemblies shall be installed, where venting is required, on all major force mains and at critical points on lesser mains. At profile break points on major force mains, such as tops of hills, etc, where free flow will occur during operation or after pumping stops, combined air release and vacuum valve assemblies shall be provided. Air and vacuum valves shall be suitably housed in a properly vented underground chamber. Installation shall be as shown on “air or combination air/vacuum release valve detail”, or “offset air or combination air/vacuum release valve”.

116
I. **Valves:** Only eccentric type plug valves as specified in Section 4.03D shall be used on all wastewater force mains unless otherwise approved by NPU. All plug valves shall be installed so that the direction of flow through the valve is in accordance with the manufacturer’s recommendations.

J. **Valve Locations:** Valves shall be installed on all subsidiary force mains at the point of connection to the major main, in order to isolate said pipeline for maintenance. Where force mains are to be extended, valves shall be placed at the future connection point, to preclude line shutdown at the time of extension. At future connection branches or ends, the valves shall be restrained by methods other than thrust blocking in order to facilitate said connection without system shutdown. On straight runs of force mains, valve spacing shall not exceed 2,000 feet. Generally, valves shall not be installed within the run of individual force mains, nor for pipe sizes in excess of 14 inches, without special consideration.

K. **Branch Connections:** Where the receiving force main liquid transmission sectional area is less than four times (4x) that of the subsidiary main, connections shall be through wye fittings. Where within the allowable range (receiving main sectional area more than for times that of the branch), tee fitting connections may be acceptable, if approved by NPU, with tapping saddles recommended for receiving mains 24 inches and larger.

L. **Alignment Direction Change:** When changes in the direction of alignment are required, fitting angles shall not exceed 45 degrees, unless specific design consideration dictates otherwise. For example, at a 90-degree turn, two 45 degree bends will be used in place of one 90-degree bend.

M. **Clean-Out Connections:** Should force mains appear to be susceptible to sedimentation clogging, as created by depressed crossings or extended low flow (velocity) periods, suitable clean-out connections shall be provided. Said clean-outs, such as plugged wye or tee fittings, shall be located to facilitate the subject maintenance operation.

N. **Terminal Discharge:** Force mains shall enter the terminal facility (gravity sewer manhole, pumping station wet well or other) at a point equal to or above the operation water level of said receiving unit. In the case of manholes, the termination point shall not be more than 1 foot above the flow line of the receiving manhole.

O. **Identification Tape:** Locating tape shall be installed 1 foot below final grade over the centerline of the pipe. The tape 1 foot below final grade shall be the detectable type and shall be laid continuously without gaps between ends over all installed pipe. The tape shall have the words “Caution: Sewer Line Buried Below” painted continuously along its length.

P. **Locating Wire:** Locating wire shall be installed directly on top of the pipe (n more than 6” above top of pipe) continuously without gaps between ends over the entire length at
the pipe and fittings with access to the wire through the valve boxes.

8.04 INSTALLATION

A. All water mains, valves and appurtenances shall be installed in accordance with Sections 3 and 4 of these Specifications.

8.05 TESTING

A. The Builder shall perform hydrostatic testing of all wastewater force mains, as set forth in the following, and shall conduct said tests in the presence of representatives from NPU and/or other authorized agencies, with two (2) days advance notice provided.

B. Piping and appurtenances to be tested shall be within sections between valves or adequate plugs, with prior approval. Testing shall not proceed until concrete thrust blocks are in place and cured, or other restraining devices installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.

C. Hydrostatic testing shall be performed at 150 percent of the maximum operating pressure of the tested system, or connected sewage pump shut-off pressure, or 100 psi for 18 inch diameter pipe and less, or 50 psi for 20 inch diameter pipe and larger, whichever value is greater. The testing procedure shall continue for an uninterrupted period of not less than two (2) hours. Testing shall be in accordance with the applicable provisions as set forth in Section 4 of AWWA Standard C-600. The allowable rate of leakage for DI piping shall be less than the number of gallons per hour determined by the following formula:

\[
L = \frac{SD(P)^{\frac{1}{2}}}{133,200}
\]

where:
- \( L \) = allowable leakage in gallons per hour
- \( S \) = length of pipe tested, in feet
- \( D \) = nominal diameter of the pipe in inches
- \( P \) = average test pressure maintained during the leakage test in pounds per square inch, gauge

The allowable leakage for PVC and HDPE piping shall be 90 percent of the value calculated above.

D. The testing procedure shall include continuous application of the specified pressure
to the test system, for the tow hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container.

E. Should the test fail, the Builder shall accomplish necessary repairs and the test repeated until within the established limits. The Builder shall furnish the necessary labor, water, pumps, gauges and all other items required to conduct the required sanitary sewage force main testing and shall perform the necessary system repairs required to comply with the specified hydrostatic test.

F. Surface Water Crossings

1. **Aerial Crossings:** Structural supports shall be provided for all joints in pipes utilized for aerial crossings and shall be designed to prevent overturning and settlement. Expansion joints shall be provided between the aerial and buried sections of pipe. The impact of floodwaters and debris shall be considered and the bottom of the pipe shall be placed no lower than 1 foot above the 100-year flood elevation.

   Flanged DI pipe, minimum Class 53, shall be used for all aerial crossings. The above ground pipe shall be painted as specified in Section 4.02B.4.b for above ground water mains. Underground pipe shall be provided at both ends of the crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding. An air release/vacuum relief valve shall be installed at the high point of the crossing. Appropriate guards shall be installed at both ends of the crossing to prevent pipe access to the public.

   It shall be the responsibility of the Developer to obtain all applicable regulatory permits. When the aerial crossing is accomplished by attachment to a bridge or drainage structure, the Developer shall meet all requirements of the Agencies who own or have jurisdiction over such structures.

2. **Underwater Crossings:** A minimum of 3 feet 6 inches concrete slab shall be provided over the pipe. The pipe material shall meet appropriate AWWA Standards for use in submerged conditions. Valves shall be provided at both ends of the water crossings so that the section can be easily isolated for testing or repair. The valves shall be easily accessible, and not subject to flooding. Both valves shall be provided in a manhole or valve vault. It shall be the responsibility of the Developer to obtain all applicable regulatory permits, including dredge and fill permits.
SECTION 9

WASTEWATER PUMPING STATIONS

9.01 GENERAL

This Section includes the general requirements for the design criteria and installation of wastewater pumping stations discharging less than 3,000 gallons per minute (gpm). All such pump stations shall be submersible type pump stations. All design calculations and plans for wastewater pumping stations shall be signed, sealed, and dated by a professional engineer registered in the State of Florida. Only approved pumps and equipment listed in Appendix A shall be allowed.

9.02 DESIGN STANDARDS

A. Required Reference: The Builder shall comply with the applicable requirements established by the Florida Department of Environmental Protection (FDEP). Additionally, the criteria provided in the most recent edition of “Recommended Standards for Wastewater Facilities (Ten States Standards)”, may generally be utilized as design guidelines, if not in conflict with State, County or other regulatory agency requirements.

B. Design Flows: Wastewater Pumping Stations shall be designed for the total ultimate development flow from all contributory areas. Said contributions shall include the immediate gravity system, subsidiary sources and known or projected future development within the designated station service area. The design average daily flow shall be computed at the unit rates set forth herein. The maximum required pumping capability shall be the product of selected peak factors times the cumulative average daily flow (ADF) from the total service area. In general, the following factors shall be applicable for the range of flow contributions indicated (million gallon per day – average daily flow: MGD-ADF), unless larger values are required.

<table>
<thead>
<tr>
<th>Flow Range</th>
<th>Peak Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 to 0.05 MGD-ADF</td>
<td>4.0</td>
</tr>
<tr>
<td>0.10 to 0.25 MGD-ADF</td>
<td>3.5</td>
</tr>
<tr>
<td>0.25 to 1.00 MGD-ADF</td>
<td>3.0</td>
</tr>
<tr>
<td>1.00 MGD-ADF and greater</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Note: Special analysis shall be made for flows beyond 2.00 MGD-ADF and peak factors less than 2.5 may be considered if substantiated by extensive data. Under no circumstances shall peaking factors less than 2.0 be allowed.
C. **Pumping Selection:**

1. For pumping stations with a maximum flow demand of 1,500 gpm or less, a minimum of two (2) pumping units shall be provided. Where the peak design flow exceeds 1,500 gpm, three (3) or more units shall be included in the facility. In all cases, stand-by pumping capacity shall be provided, such that if any on (1) pump is out of service, an alternate unit is available at equal or greater capacity. Pumps shall be capable of meeting all system hydraulic conditions without overloading the motors.

2. The selected sewage pump system shall have the minimum capability of pumping the design peak flow (at the maximum computed system total dynamic head (TDM)) requirements with the largest pumping unit out of service.

3. Head-Capacity curves shall be prepared for the proposed pumping system in order to determine the various operational conditions. Hydraulic computations shall be in accordance with good engineering practice, with pipe friction loss calculated by the “Hazen-Williams Formula”, using standard friction factors based on the material utilized; however, not greater than “C=120”, unless the justification for higher values are approved. Pump curves for the proposed pump shall be included with head-capacity curves for NPU review. The system head-capacity analysis shall provide the following and be subject to review.

   a. System operation under peak flow conditions, with one (1) pump or multiple parallel pumping, as designed. Should the receiving force main system be interconnected to additional pumping stations, hydraulic design conditions shall also include said pumping systems operating at rated capacity.

   b. Pumping capability with one (1) pump running, all units operating in parallel and other combinations, if applicable.

   c. For multiple pumping station force main systems, the one pump maximum capacity under minimum flow contribution conditions from the other connected facilities shall be calculated.

D. **Design Calculations:** The Builder’s Engineer shall submit signed, sealed and dated design calculations for all wastewater pump stations. Calculations shall include head-capacity curves with copies of manufacturers pump curves, hydraulic analysis of the force main system, operating cycle calculations with wet well sizing and buoyancy calculations.
E. Complete shop drawings of both concrete structure and castings and showing all dimensions, reinforcement data, concrete strengths, etc. If a non-standard design or if required by the Engineer of Record submit design calculations and data. All computations shall bear the seal of a Professional Engineer registered in the State of Florida.

F. Wet Well Design: The wet well structure shall provide a capacity, between operational water levels, sufficient to allow a minimum of 10 minutes between successive starts of the pumps, under the following condition: Influent rate of on-half the maximum one (1) pump capacity and, one (1) pump running at said maximum. Additionally, wet wells shall provide sufficient space for installed equipment, required suction pipe submergence and spacing, and shall not be less than 10 feet in minimum horizontal dimension or provide less than 36 inches between shut-off (low water) and lead pump start levels. The wet well bottom shall be a minimum of 5 feet below the lowest invert. Low water levels shall provide adequate submergence to preclude pump inlet vortexing, air binding or other design considerations. Operational maximum water levels shall not exceed the invert elevation of the influent pipe.

In general, the normal operational water level shall provide a positive suction head for the sewage pumps. Operational maximum or high water levels shall not exceed the invert elevation of the lower influent pipe, with high water alarm no higher than the 0.8 point of said pipe. A minimum size hopper bottom shall be provided, with the wet well floor sloping to said bottom at a slope of not less than one to one to one (1:1). No interior ladders shall be permitted in the wet well. Only one (1) inlet connection shall be permitted to a wet well, unless approved by NPU.

Buoyancy calculations verifying that adequate provisions have been made to prevent wet well floatation shall be submitted to NPU. These calculations shall assume that the wet well is empty.

G. Ventilation: Wet wells for submersible installations or others shall be ventilated with not less than one (1) 4-inch diameter open vent pipe.

H. Water System: The wastewater pump stations shall be provided with a water system with adequate capacity and pressure for station wash down and other requirements. The station water system shall be completely separated from the potable water supply by means of a reduced pressure backflow preventer or other NPU approved system.

I. Emergency Operation: All pump stations shall be provided with emergency power receptacles as specified herein, or with stationary generators where needed.

J. Site: Pumping stations shall be installed on off-the-right-of-way, readily accessible sites, and shall have adequate area provided for operation and maintenance of the facility. The site shall be readily accessible by maintenance vehicles during all weather conditions. The wastewater pumping station structures and electrical and mechanical equipment shall
be protected from physical damage by the 100-year flood. The wastewater pumping stations should remain fully operational and accessible during 100-year flood events. Regulations of the City, State and Federal agencies regarding flood plane obstructions shall be considered.

The pump station sites shall be sized and dedicated easements shall also be required around the site as delineated on the “Pump Station Site Plan” in the Standard Drawings.

The Builder shall dedicate the pump station site by warranty deed or plat to the City. All pump station sites shall be PVC fenced. However, exception to this requirement may be made for pump stations serving residential areas only, on a case-by-case basis and subject to sufficient landscape screening and approval by NPU.

K. General: A site plan must be provided indicating the following:

1. The station must be referenced to the nearest street.

2. Adequate access with not less than 12-ft wide minimum driveway.

3. Auxiliary power plug or the generator location and automatic power transfer switch.

4. The power pole location.

5. The water meter with backflow prevention and hose bib location.

6. The pumping station site plan must indicate what landscaping the developer will provide.

7. Pump and pump station Specifications and performance data must be provided. This should include:


   b. Lightning protection,

   c. SCADA by Dataflow system,

   d. Attached to the control panel a layout block diagram showing location of different components.

   e. The performance curves for the pump submitted must show that it will operated generally in the center part of the curve and not approach either upper or lower extreme.
f. An electrical schematic and wiring diagram including a parts schedule containing information on type, model and rating of components.

g. Motor controls should include backspin motor protection.

8. Emergency alarm system circuitry must be installed.

9. All wiring must be copper.

10. All outside enclosures must be Nema 4X.

11. A lock out pump down switch is to be provided at the wet well. This function has to be interrelated with the main auto/off/manual MCC switch.

12. The electric meter should face the fence so that it can be easily read from the outside of the fence.

9.03 GENERAL REQUIREMENTS

A. Piping Systems:

1. Approved Pipe, Fittings and Valves: The following material or item shall be suitable for the indicated operation service:

   a. **Gravity Sewer and Force Main Influent Pipe and Fittings:** All influent piping to the wet well shall meet the requirements of Sections 4, 7, and 8 of these Specifications, except that the influent pipe to the wet well shall be a minimum of 18 feet of ductile iron (DI) pipe or DR 14 PVC. In addition, the DI pipe shall have interior epoxy coatings. Other wastewater collection system materials are as specified in Sections 4, 5, 7 and 8 of these Specifications.

   b. **Wastewater Pressure Pipe and Fittings:** All pipe within 18 feet of the discharge side of the valve shall be DI pipe or DR 14 PVC and meet the requirements of Section 7 and 8 and shall have an interior epoxy coating.

   c. **Wastewater Service Valves:** Plug valves with operators for underground or exposed service and check valves shall meet the requirements outlined in Sections 4.03C and 4.03D of these Specifications.

   d. **Potable or Non-Potable Water:** Polyvinyl chloride (PVC) pipe fittings, with appropriate gate valves.
2. **Connections at Structures:** Where DI pipes are to extend into or through structures from the exterior, flexible connections (mechanical or push-on type joints) shall be provided at the exterior wall face.

3. **Wall Pipes or Sleeves:** For pipes passing through structural walls, wall pipes shall be installed where the location is below the surface of the ground or at any point where levels will exceed the installed pipe elevation. Sleeves with watertight caulking shall be suitable at other locations.

4. **Piping Flexibility:** In order to provide for expansion and contraction or expedite installation and maintenance, flexible connections (flanged coupling adapters, expansion joints, couplings, etc.) shall be provided.

B. **Valves:**

1. **Check Valves:** Check valves for DI pipelines shall be swing type and shall meet the requirements of AWWA C-500 and Section 4.03C of these Specifications.

2. **Plug Valves:** Plug valves for DI pipelines shall be swing type and shall meet the requirements of AWWA C-504 and C-507 and Section 4.03D of these Specifications.

C. **Emergency Pump Connections:** For wastewater pumping stations not equipped with stationary stand-by power generators, connections shall be provided for emergency auxiliary pumping. Said connection shall be located immediately outside of the pump chamber in the valve box within range of the auxiliary pump discharge connection and shall be coupled to the discharge main through a fitting, with valving as required for making a dead hook-up. The connection pipe shall be DI of suitable size, but in no case less than 4 inches in diameter (Schedule 40 or Schedule 80 PVC will not be accepted).

D. **Surge Control:** Surge control valves or other approved systems shall be provided for all wastewater-pumping stations where hydraulic conditions indicate the necessity.

E. **Wastewater Pumps and Motors:**

1. **General:** The wastewater pumping units shall be capable of handling raw, unscreened wastewater and shall be capable of passing a sphere of at least 3 inches in diameter. Pumps shall be electric motor driven and of a proven design that has been in sewage service under similar conditions for at least five years. Pumps shall provide the required peak design performance requirements and be suitable for operation with the total hydraulic range of operation.

2. **Submersible Pumps:** The pump design shall provide easy removal and replacement for inspection or maintenance purposes, without bolts or other fastenings to be
removed. The units shall be non-clog, mechanical seal, and submersible sewage pumps.

3. **Shaft:** The pump shaft shall be of Series 300 or 400 stainless steel or carbon steel. When a carbon steel shaft is provided, the manufacturer shall demonstrate that any part of the shaft, which will normally come in contact with the wastewater, has proven to be corrosion resistant in this application. The shaft and bearings shall be adequately designed to meet the maximum torque required for start-up or operating condition and to minimize vibration and shaft deflection. As a minimum, the pump shaft shall rotate on two (2) permanently lubricated bearings. The upper bearing shall be a single row ball bearing. The lower ball bearing shall be a two (2) row angular contact ball bearing, if required to minimize vibration and provide maximum bearing life.

4. **Impeller:** The impeller shall be constructed of gray cast iron, ASTM A48, Class 30. Each pump shall be provided with a replaceable metallic wear ring system to maintain pump efficiency. As a minimum, one (1) stationary wear ring provided in the pump volute or one (1) rotating wear ring provided on the pump impeller shall be required. In addition, a two (2) part system is acceptable.

5. **Mechanical Seal:** Each pump shall be provided with a tandem double mechanical seal running in an oil reservoir, composed of two (2) separate lapped face seals, each consisting of one (1) stationary and one (1) tungsten carbide ring with each pair held in contact by a separate spring, so that the outside pressure assists spring compression in preventing the seal faces from opening. The compression spring shall be protected against exposure to the wastewater. Silicone carbide may be used in place of tungsten carbide for the lower seal. The pumped liquid shall be sealed from the oil reservoir by one (1) face seal and the oil reservoir from the air-filled motor chamber by the other. The seals shall require neither maintenance nor adjustment, and shall be easily replaced. Conventional double mechanical seals with a single spring between the rotating faces, requiring constant differential pressure to effect sealing and subject to openings and penetrations by pumping forces shall not be considered equal to tandem seal specified and required.

6. **Guides:** A sliding bracket shall be an integral part of the pump casing and shall have a machined connecting flange to connect with the cast iron discharge connection, which shall be bolted to the floor of the wet well with stainless steel anchor bolts and so designed as to receive the pump discharge flange without the need of any bolts or nuts. Sealing of the pumps to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided by no less than two (2) Type 316 seamless tubular stainless steel guides, which will press it tightly against the discharge connection. No portion of the pump shall bear directly on the floor of the wet well and no rotary motion of the pump shall be required for sealing. Sealing at the discharge connection by means of a diaphragm
or similar method of sealing shall not be accepted as an equal to a metal to metal contact of the pump discharge and mating discharge connection specified and required. Approved pump manufacturers, if necessary to meet the above specification shall provide a sliding guide bracket adapter. The design shall be easily lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts, or fastenings to be removed for this purpose, and no need for personnel to enter the wet well. Each pump shall be fitted with a Type 304 stainless steel, ¾ inch lifting chain of adequate strength. A ¼ inch stainless steel cable, aircraft rating, shall be provided between the cable holder and the lifting chain.

7. **Pump Motors**: All motors shall be built in accordance with the latest NEMA, IEEE, ANSI and AFBMA Standards where applicable. Pump motors shall be housed in an air-filled, watertight casing and shall have Class F insulated windings, which shall be moisture resistant. Motors shall be NEMA Design B, rated 155 degrees Celsius maximum. Pump motors shall have cooling characteristics suitable to permit continuous operation, in a totally, partially or non-submerged conditions. The pump shall be capable of running continuously in a non-submerged condition under full load without damage, for extended periods. The motor shall be capable for a minimum of 10 starts per hour. If required by NPU, before final acceptance, a field running test demonstrating this ability, with 24 hours of continuous operation under the above conditions, shall be performed for all pumps being supplied. Motors 25 horsepower and below shall be 230/460 volt, 3 phase, and motors greater than 25 horsepower shall be 460 volt, 3 phase. All pump motors shall be designed with a 1.15 service factor and shall not be less than 5 horsepower (hp) unless approved. Pumps shall be capable of meeting all pump curve conditions without exceeding the motor’s rated horsepower.

Two (2) or more normally closed heat sensing miniature switches connected in series and embedded within the motor windings shall be provided. In addition, the motor shall incorporate one (1) motor sensing device. These protective devices shall be wired into the pump controls in such a way that if excessive temperature or moisture is detected the pump will shut down. These devices shall be self-resetting.

Cables shall be designed specifically for submersible pump applications and shall be properly sealed. A type CGB watertight connector with a neoprene gland shall be furnished with each pump to seal the cable entry at the control panel. The pump cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. The assembly shall bear against a shoulder in the pump top. The cable entry junction chamber and motor shall be separated by a stator lead sealing
gland or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. Secondary sealing systems utilizing epoxy, potting compounds may be used. When this type of sealing system is used, the manufacturers shall supply a cable cap as part of the spare parts for each pump. All cables shall be continuous, without splices from the motor to the control panel. The junction chamber, containing the terminal board, shall be perfectly leak proof.

F. Pump Control Panel:

1. The control panel shall respond to liquid level float switches to automatically start and stop pumps, as well as sound an alarm upon high or low wet well levels. The control panel shall operate two (2) electrical submersible pumps at the power characteristics stipulated. The control function shall provide for the operation of the lead pump under normal conditions. If the incoming flow exceeds the pumping capacity of the lead pump, the lag pump shall automatically start to handle this increased flow. As the flow decreases, the pumps shall be cutoff at the specified elevation. The pumps shall alternate positions as lead pump at the end of each cycle. A failure of the alternator shall not disable the pumping system. The alternator shall include a safe, convenient method of manual alternation and also have provisions to prevent automatic alternation without disturbing any wiring. Should the “pump off” regulator fail, the system shall keep the station in operation and provide a visual indication of the regulator failure.

The control panel shall consist of main circuit breakers and generator breaker with mechanical interlock, an emergency power receptacle, a circuit breaker and magnetic starter for each pump motor, and 15 ampere, 120-volt circuit breakers as required. All pump control operations shall be accomplished by a float type liquid level control system with all control components mounted in one (1) common enclosure. Control switches shall provide means to operate each pump manually or automatically. When operated in the automatic mode, the control assembly shall provide means to manually select or automatically alternate the position of the “lead” and “lag” pumps after each pumping cycle. A float type liquid level control system shall continuously monitor wet well liquid level and control operation of the low-level cutoff for the pumps and shall operate off a 24-volt circuit.

2. Panel Construction: The panel shall be housed in a NEMA 4X, Type 304, 14 gauge stainless steel enclosure with 30 percent extra mounting space for additional equipment. The enclosure shall have provisions for padlocking the door and a dead front inner door unit for mounting controls. All exterior hardware and hinges shall be stainless steel. In addition, there shall be permanently affixed to the interior side of the exterior door both a nameplate and a 10-inch by 12-inch pocket for log sheet storage. The nameplate shall contain the following information: voltage, phase, rated horsepower, speed, date manufactured and pump and control panel manufacturer’s name, address and telephone number, pump date, including impeller
data, operating point and head, KW input, and amps at the operating point and at least two (2) other points on the pump curve. Provide space inside the panel box to accommodate installation of an 8” x 8” x 10” telemetry unit (coordinate with NPU).

3. Power Supply and Main Disconnect: The power supply to the control panel shall be 240 volt, 3 phase, 4 wire or 480 volt, 3-phase, 4 wire. Minimum service shall be 100-amp. Single-phase power shall not be accepted. Non fusible safety service main disconnects shall be installed at all stations. In all 240 volt systems, disconnects should be installed between the meter and the panel, and on all 480 volt systems disconnect should be installed ahead of the meter. LED power available indicators shall be supplied on all legs.

4. Circuit Breakers:
   a. **Main Breakers:** The panel shall have an inter-lock system between the normal power main breaker and the emergency breaker to ensure only one (1) breaker is in the “on” position at a time. Both breakers shall be equal in size.

   b. **Circuit Breakers:** All circuit breakers shall be heavy-duty molded case breakers. The handle on the circuit breakers shall be operational through the inner door.

5. Motor Circuit Protectors: Each pump shall be protected by a 3-pole motor circuit protector. The motor circuit protector shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free from the handle so that the contacts cannot be held closed against a short circuit and abnormal currents which cause the motor circuit breaker to trip. Tripping shall be clearly indicated by the handle automatically assuming a position midway between the normal “on” and “off” positions. All latch surfaces shall be ground and polished. All poles shall be so constructed so that they open, close and trip simultaneously. Motor circuit protector must be completely enclosed in a high-strength glass polyester molded case. Ampere ratings shall be clearly visible. Contacts shall be of non-welding silver alloy. Arc extinction must be accomplished by means of arc chutes. A manual push-to-trip button shall be provided for manual exercising of the trip mechanism. Each pole of these motor circuit protectors shall provide instantaneous short circuit protection by means of an adjustable magnetic-only element.

6. Motor Starter and Selector Switches: The panel shall contain two (2) motor starters. The motor starter shall be an across the line magnetic starter with individual overload protection on each lower leg with reset installed through the inner door unit. Selector switches shall be installed on the face of the inner door unit. Selector switch shall be a heavy-duty oil tight “Hand-Off-Automatic” three (3)-position switch to control the
operation mode of each pump motor starter.

7. **Pump Alternator:** An eight pin plug-in solid-state alternator shall be provided to change the pump starting sequence on each pumping cycle. A three (3)-position alternator test switch shall be provided to control the alternation operation. Switch positions, to include the “Auto” to provide normal automatic sequence, “Off” position to disable alternator, and “Test” position with a spring return to allow the alternating of the pump sequence to check alternator operation.

8. **Lights and Alarms:**

   a. **Indicator Lights:** There shall be installed on the face of the inner door unit, heavy-duty oil tight indicator lights as shown on the Standard Drawings.

   b. **High Level Alarm:** A vapor proof red light and horn shall be mounted on the top of the panel for high level alarm. In addition, there shall be an alarm silence push-button on the inner door and a silence relay, which will silence the horn and automatically reset when these signals are restored to normal. The push-button shall be heavy-duty oil tight. The red globe shall be the screw-on type.

9. **Emergency Power Receptacle:** The control panel shall have an external mounted generator receptacle of the required size and type as indicated in Appendix A.

10. **Additional Requirements:**

   a. All power wires shall be THW or THWN 75 degree Celsius insulated stranded copper conductors and shall be appropriately sized for the given load application. All control circuit wire shall be type THW, Size 14, stranded wire type. All wiring within the enclosure shall be neatly routed by the use of slotted wiring duct with snap on type covers. Wiring on the rear of the inner door shall be neatly bundled with nylon ties and include sufficient loop across the hinges to prevent wire damage, with each end of the conductor marked as indicated below:

   (1) 24 volt:  RED

   (2) Neutral:  WHITE

   (3) 120 volt:  BLACK

   b. Terminal points of all terminal strips shall be permanently identified. All terminal numbers and identifying nomenclature shall correspond to and be shown on the electrical diagrams. All wiring shall be
permanently shown on the electrical drawings.

c. All circuit breakers, control switches, indicator pilot lights and other control devices shall be identified with permanently affixed legend plates and lamicoid-type engraved nameplates.

d. A surge protector shall be included and wired to protect motors and control equipment from lightning induced line surges. All surge protectors shall be United Laboratories (UL) approved and installed per the respective power company requirements and manufacturer’s specifications. Surge protectors shall be attached to the main disconnects.

e. Elapsed time meters shall be 115 volt not-reset type and shall totalize pump-running time in hours and tenths of hours to 99999.9 hours.

f. On the face of the inner door unit, there shall be installed a 15 amp, 120 volt, duplex convenience receptacle. It shall be provided with it’s own single pole, 15 amp circuit breaker for protection. Ground fault interrupt type shall be required.

g. Control terminal blocks shall be of the clamp screw type, rated for 600 volts. Amperage rating shall accommodate the control circuit amperage. An additional 30 space terminal strip shall be installed in the cabinet for future use, with RTU equipment.

h. There shall be a control power transformer with a minimum size of 500VA to provide 120VA power for: coils for starters, 15A duplex receptacle, indicator pilot lights, alarm horn, pump alternator, elapsed time meters, etc. The secondary side shall have one (1) leg fused and the other grounded. The float switches require this control power transformer and relays shall be 24VAC. A 24 VAC control power transformer properly sized with a fused secondary shall provide this.

i. All lift stations and pump stations shall include a SCADA system by Data Flow System (DFS) and per NPU’s approval.

G. Fencing:

1. The Builder shall furnish and erect the chain link fence (black Vinyl type) and gate around the pump station site as shown on the pump station site plan. The fabric, posts, fastenings, fittings, and other accessories for chain link fence shall meet the requirements of AASHTO M 181 with the following revisions:
1. The weight of coating of wire fabric shall be 1.2 ounces of zinc per square foot (Class B).
2. The galvanizing of steel materials shall be hot-dipped galvanized.
3. The weight of the coating on posts and braces shall be 1.8 ounces of zinc per square foot, both inside and outside to meet the requirements of AASHTO M 111.

2. The base metal of the fabric shall be a good commercial quality 9 Gauge Steel wire. The fabric shall be of uniform quality and shall be 6 feet high with a 2 inch mesh size.

3. All posts and rails shall be in accordance with the following schedule:
   a. **End, Corner and Pull Posts:** 2 3/8 inches outside diameter (OD), Schedule 40.
   b. **Line Posts and Gate Frames:** 2 inches OD, Schedule 40.
   c. **Gate Posts:** 3 inches OD, Schedule 40.
   d. **Post Races and Top Rail:** 1 5/8 inches OD, Schedule 20.

4. Tension wire shall be 0.177 inch coiled spring wire tensioned along the bottom of the fabric and shall be coated similarly to the wire fabric.

H. **Interior Protective Lining for Concrete Structures:**

1. **Scope of Work:**

   The Contractor shall furnish all labor, tools, materials, equipment and incidentals required to provide corrosion resistant protective linings or coatings for the interior surfaces of the influent chamber, effluent chamber and pump wet well as specified herein. Exterior linings are specified in other Sections of these Specifications.

2. **Submittal:**
   a. The Contractor shall submit shop drawings in accordance with Section 00800. The shop drawings shall include detailed information regarding the chemical composition, corrosion resistance properties, and application procedures for each coating. A detailed plan must be submitted outlining the remediation plan and completion schedule.
b. Provide documentation that the proposed rehabilitation liner or coating has a minimum of 5-year history for the reconstruction of sanitary sewer structures.

3. **Coatings/Linings:**

   a. Exterior surfaces of precast structures, below finished grade shall be coated with Kop-Coat Bitumastic 300M, or coal tar epoxy approved equal, 2 coats, and total 16 mils minimum dry thickness.

   b. All wet well interior concrete surfaces shall be lined with Integrated Environmental Technologies (IET) from Santa Barbara California. The product shall include 5 year warranty on workmanship and the coating itself.

   (1) NPU reserves the right to approve or reject any additional lining or coating for use.

   (2) Lining or coating systems shall fully protect openings, such as for pipes, to ensure that corrosive attack cannot take place at these locations. Concrete protective system design for these areas will be checked as shop drawings. Note that NPU does not accept boot systems.

4. **Surface Preparation:**

   a. Loose and disintegrated mortar, stone, vitrified sewer material, brick or similar materials shall be removed from the inner surface of the structure. All cracks, channels and holes shall be completely chipped to a firm surface. Chipping or sandblasting should continue until there are no offsets, which would cause an abrupt change in the thickness of the repair.

   b. Wet well walls shall be sandblasted down to white concrete finish to ensure all acids and contaminants are removed prior to the application of the lining or epoxy coating.

   c. Once preparation is complete, all seepage through existing masonry shall be stopped by way of caulking, pressure grouting or other suitable means. No lining or coating shall be applied to any surface where free or running water exists.

5. **Application:**

133
a. All interior concrete surfaces of wet wells shall be lined or coated with the specified corrosion resistant coating. Surfaces to be lined include, but are not limited to, floor, fillets, walls, top slabs and hatch openings.

b. All lining shall be applied by workers approved by the manufacturer for the application of the lining systems. The Contractor shall submit a written affidavit from the manufacturer of the lining stating that the individuals applying the coatings are sufficiently skilled in the application of their product. Additionally, the lining application personnel shall have five (5) years of experience in the application of products similar to those specified.

c. All linings shall be applied in strict accordance with the manufacturer stating that a factory representative has inspected the finished lining and that the lining system has been installed in accordance with the manufacturer’s recommendations.

d. The Contractor shall furnish a written affidavit from the lining manufacturer stating that a factory representative has inspected the finished lining and that the lining system has been installed in accordance with the manufacturer’s recommendations.

e. All linings shall carry a minimum five (5) year unlimited warranty on material and workmanship.

f. Miscellaneous fittings and hardware shall be zinc coated commercial quality or better steel or zinc coated cast or malleable iron as appropriate.

g. Post caps, designed to provide a drive fit over the top of the tubular post to exclude moisture, shall be provided.

### 9.04 TYPE OF PUMPING STATION CONSTRUCTION

Wastewater pumping stations of the submersible type are suitable where the peak design flow rate does not exceed 3,000 gallons per minute or the pump motor size is 50 horsepower or less. Said installation shall include the removable pump units. Aluminum access frame and cover, stainless steel pipe guide bars, pump discharge connection and other necessary appurtenances. Individual discharge pipes shall extend from each pump to an accessible drained pit, in which the plug and check valves shall be installed.

### 9.05 REQUIRED SUBMITTAL
A. The Builder shall provide to NPU in triplicate the following information regarding the wastewater pumping equipment:

1. Shop and erection drawings showing all important details of construction, dimensions and anchor bolt locations, type and dimensions of aluminum frames and doors, wet well and valve vault dimensions and special protective interior and exterior coatings.

2. Descriptive literature, bulletins and/or catalogs of the equipment.

3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity, efficiency, NPSHR, submergence and horsepower. Curves shall be plotted from no flow at shut off head to maximum manufacturer recommended pump capacity. Catalog sheet showing a family of curves will not be acceptable.

4. Complete layouts, wiring diagrams, elementary or control schematics, including coordination with other electrical control devices operating in conjunction with the pump control system. Suitable outline drawings shall be furnished for approval before proceeding with the manufacture of any equipment. Standard preprinted sheets or drawings simply marked to indicate applicability will not be accepted.

5. A drawing showing the layout of the pump control panel shall be furnished. The layout shall indicate all devices mounted on the door and in the panel shall be completely identified. Drawing shall indicate the location of an 8” x 8” x 10” area to accommodate a future telemetry unit.

6. The weight of each pump.

7. Complete motor data shall be submitted including:
   b. No-load current.
   c. Full load current.
   d. Full load efficiency.
   e. Locked rotor current.
   f. High potential test data.
9.06 TOOLS AND SPARE PARTS

A. One (1) set of all special tools required for normal operation and maintenance shall be provided. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

B. Spare parts shall be properly packaged and labeled for each identification without opening the packaging and suitably protected for long term storage under humid conditions. The manufacturer shall furnish the following spare parts for each pump supplied:

1. One (1) upper bearing.
2. One (1) lower bearing.
3. One (1) set of upper and lower shaft seals.
4. One (1) set of “O-Rings” or gaskets required for replacement of bearings and seals.
5. One (1) impeller wear ring.
6. One (1) shaft sleeve, if applicable.
7. One (1) cable cap, if applicable.

9.07 DETAILS

Pump station details shall be as set forth in these Specifications.

9.08 INSTALLATION AND TESTING

A. The pump station, pumps, controls, electrical, piping, valves and associated appurtenances shall be installed in accordance with Sections 3 and 4 and Standard Details of these Specifications.

B. A factory representative knowledgeable in pump operation and maintenance shall inspect and supervise a test run at the pumping station. A minimum of 1 working day shall be provided for the inspections. Additional time made necessary by faulty or incomplete work or equipment malfunctions shall be provided as necessary to meet the requirements in these Specifications at no additional cost to the City. Upon satisfactory completion of
the test run, the factory representative shall issue the required manufacturer’s certificate.

The test run shall demonstrate that all items of these Specifications have been met by the equipment as installed and shall include, but not limited to, the following tests:

1. That all units have been properly installed.

2. That the units operate without overheating or overloading any parts and without objectionable vibration.

3. That there are no mechanical defects in any of the parts.

4. That the pumps can deliver the specified pressure and quantity.

5. That the pumps are capable of pumping the specified material.

6. That the pump controls perform satisfactorily.

C. Warranty and Service:

1. **Warranty:** The products shall be guaranteed to be free from defects in material and workmanship under normal use and service for a period of 1 year after start-up. The lift station and its components shall include a 1 year warranty through the Developer including workmanship and parts. The warranty shall begin once the City has accepted the lift station once the Utility permit has been approved.

2. **Service:** Service shall be available for instant repair of the products. Manufacturer’s repair personnel shall be based in Florida to ensure a reasonable response time of not more than 2 working days.
SECTION 10
REUSE DISTRIBUTION SYSTEMS

10.01 GENERAL
A. This Section sets forth the general requirements for design and installation of reuse distribution systems for irrigation and fire protection service. NPU shall determine, prior to plan preparation, if the system is to be sized for fire protection in addition to irrigation. Pipe used in reused water irrigation systems shall be either PVC (min DR-18), HDPE (DR 11) for ductile iron (DI) pipe as specified in Section 4 of these Specifications.

B. The Contractor shall be responsible for all materials furnished and storage of same, until the date of substantial completion. The Contractor shall replace, at the Contractor’s expense, all material found to be damaged or defective in handling or storage. The Contractor shall, if requested by the City, furnish certificated, affidavits of compliance, test reports, or samples for check analysis for any of the materials specified in these Specifications as it relates to reused water irrigation systems. All pipe delivered to the project site for installation is subject to random testing for compliance with the designated specifications.

10.02 DESIGN STANDARDS
A. Required Reference: The Builder shall comply with the design and installation requirements as established by the Florida Department of Environmental Protection (FDEP) and additional specific requirements stated in these Specifications.

B. System Design:

1. Normal Flow Demands: The reuse distribution system shall supply water to irrigation and, in some cases, fire flow. Where applicable, fire flow demands are described below. Irrigation demands shall be determined using the method described previously in these Specifications.

2. Fire Flow, if applicable: Minimum system requirements for fire flow rates, duration (time) for total flow, as related to the total ultimate maximum-day demand, shall be designed in conformance with the Insurance Services Office Fire Suppression Rating Schedule, Latest Edition. All fire flow rates and fire protection systems shall also be in complete conformance with applicable local and state fire code regulations. Minimum fire flow rates required for maximum-day demands shall be based on population, density, and/or other hazardous features of the proposed construction, as specifically required. Where fire flow requirements exceed the anticipated available fire flow from the central water system, an on-site fire protection system or other fire department approved mitigation measures shall be utilized.
3. **Fire Hydrant Location:** Spacing for hydrants located within low density areas shall in no case exceed 500 feet (measured along the roadway) and shall be connected to 6-inch diameter water mains minimum, which are of satisfactory loop design. Connection to dead-end stubs are acceptable, providing said stub water main is not less than 8 inches in diameter, unless approved by NPU. Hydrants located in commercial, industrial or other high density areas, shall be spaced no further than 500 feet apart (measured along the roadway) and shall connect to looped water mains 8 inches in diameter, or larger, if required by the design flow demand. Exact locations of fire hydrants will be in complete conformance with local and state fire code regulations.

4. **System Size Computation:** The minimum design for reuse distribution systems shall provide for at least 100 percent of the normal flow demand or fire flow previously calculated, whichever is greater. The allowable minimum service pressure under said design condition shall not be less than 30 pounds per square inch (psi). Design computation shall be by the “Hardy Cross” procedure, or other applicable methods, as dictated by the system configuration. Design flows and method of computation shall be subject to review and approval. These calculations shall be signed, sealed and dated by a professional engineer registered in the State of Florida.

5. **Valve Locations:** Valves shall be provided for all branch connections, main ends, fire hydrant stubs or other locations, as required to provide an operable, easily maintained and repaired distribution system. Valves are to be placed so that the maximum allowable length of reuse main required to be shutdown for repair work shall be 500 feet in commercial, industrial or high-density residential districts, or 1,000 feet in other areas.

C. **Location:** Reused water reuse mains shall be located in dedicated rights-of-way or utility easements. When installed in rights-of-way, reuse mains shall maintain a consistent alignment with respect to the centerline of the road. All reuse mains located outside of dedicated rights-of-way shall require a minimum 20-foot wide easement. Water mains shall be located in dedicated rights-of-way or utility easements. When installed in rights-of-way, water mains shall, in general, maintain a consistent alignment with respect to the centerline of the road. If a potable water main is located adjacent to a road’s right-of-way, a minimum 10-foot easement shall be provided. Additional easement widths shall be provided when the pipe size or depth of cover so dictate, in both cases. No reused water reuse mains shall be placed under retention ponds or drainage ditches, tennis courts, or other structures. In general, water mains shall not be located along side or rear lot lines. Placement of a reused water reuse main along side or rear lot line may be allowed on a case-by-case basis if such a reused reuse water main configuration results in efficient placement and utilization of the water distribution system.

D. The Builder’s Engineer shall submit signed, sealed and dated design calculations with the
Drawings for all reclaimed water reuse irrigation projects. The calculations shall show that the reclaimed water reuse distribution mains will have sufficient hydraulic capacity to transport peak hourly flows and the combination of maximum daily flows while meeting a minimum pressure of not less than 30 psi. Head losses through meters and backflow devices shall also be included in the calculations. Design Computations shall be by the “Hardy Cross” procedure, or other applicable methods, as dictated by the system configuration.

10.03 STANDARD REQUIREMENTS

A. **Approved Pipe, Fittings and Valves:** All PVC pipe of nominal diameter of 4 inches through 16 inches shall be manufactured in accordance with AWWA Standard C-900 and shall meet the requirements of Section 4.02C of these Specifications. The PVC pipe shall have a minimum working pressure rating of 150 psi and shall have a dimension ration of 18. The pipe shall be the same outside diameter as DI pipe. The DI pipe of nominal diameter of 4 inches through 36 inches shall conform to ANSI/AWWA A21.51/C-151. A minimum of Class 50 shall be supplied for all sizes of pipe unless specifically required by NPU. The types tabulated below, within the size range indicated and for the applicable service, are approved for reused water reuse distribution system construction:

<table>
<thead>
<tr>
<th>Pipe and Fittings</th>
<th>Size Range (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ductile Iron Pipe &amp; Fittings – Cement Mortar Lines</td>
<td>No Limit</td>
</tr>
<tr>
<td>Polyvinyl Chloride Pipe &amp; Ductile Iron Fittings</td>
<td>16 inch or Less</td>
</tr>
<tr>
<td>Copper Pipe or Tubing and Brass Fittings</td>
<td>Service Connection Only</td>
</tr>
<tr>
<td>Polyethylene Plastic Pipe and Brass Fittings</td>
<td>Service Connection Only</td>
</tr>
<tr>
<td>Polybutylene Plastic Pipe and Brass Fittings</td>
<td>Service Connection Only</td>
</tr>
<tr>
<td>PVC Pipe (Schedule 40) and Brass Fittings</td>
<td>Service Connection Only</td>
</tr>
<tr>
<td>Gate Valves</td>
<td>No Limit</td>
</tr>
<tr>
<td>Corporation Stops and Curb Stops</td>
<td>Service Connection Only</td>
</tr>
</tbody>
</table>

1. **Joints:** PVC pipe shall have integral bell push on type joints conforming to ASTM D3139. Joints for DI pipe and fitting joints shall be push-on or mechanical joints conforming to ANSI/AWWA A21.11/C-111. Where called for by NPU restrained or flanged joints will be required. Restrained joints shall meet the requirements of Section 4.02F of these Specifications. Flanged Joints shall conform to ANSI Standard B16.1, 125 lb.

2. **Fittings:** All fittings shall be mechanical joint DI or gray iron conforming to
3. **Coatings and Linings:** Interior and exterior coatings for DI pipe shall conform to the requirements outlined in Section 4.02B.4 of these Specifications.

**B. Fire Hydrants:**

1. Hydrants shall comply with AWWA Standard C-502, “Dry Barrel Fire Hydrants”, and shall be equipped with a minimum of one (1) pumper outlet nozzle 4½ inches in diameter and two (2) hose nozzles 2½ inches in diameter, all having National Standard hose threads. Units shall be traffic type with breakable safety clips, or flange, and stem, with safety coupling located below barrel break line to preclude valve opening. Fire hydrant shall be of ample length for 3½-foot depth of bury. Outlet nozzles shall be on the same plane, with minimum distance of 18 inches from center of nozzles to ground line. Valve shall be compression type with 5½ inches minimum valve opening and shoe inlet connection to be 6 inches minimum. Fire hydrants shall be equipped with “O-Ring” packing.

All iron parts of the hydrant, both inside and outside, shall be painted in accordance with AWWA C-502. All inside surfaces and the outside surfaces below the ground line shall be coated with asphalt varnish. They shall be covered with two (2) coats. The outside of the hydrant above the furnished ground shall be painted with two (2) coats of red paint.

2. Hydrants shall be installed plumb and in true alignment with the connection pipes to the water main. They shall be secured with restraining assemblies. The gravel or crushed stone for the drain pump, followed by backfilling, shall be carefully placed and compacted. Installation shall be as shown on “Fire Hydrant Assembly Detail”. Final field location of all hydrants shall be approved by NPU. All hydrants shall be located no less than 5 and no more than 10 feet from the edge of pavement of the adjacent roadway and no less than 5 feet from any physical feature, which may obstruct access or view of any hydrant unless otherwise approved by NPU.

**C. Joint Restraining:** Pressure piping fittings and other items requiring restraint, shall be braced with restraining assemblies, as specified under Section 4. Said restraining devices shall be designed for the maximum pressure condition (testing) and the safe bearing loads for horizontal thrust, if thrust blocking is used.

**D. Pipe Depth and Protection:** The standard minimum cover for reused water reuse distribution systems shall be 3 feet from the top of the pipe to finish grade. Should this design not be feasible, alternatives shall be reviewed for acceptance.

**E. Pipe Bedding:** Special care shall be exercised in design and installation to provide adequate bedding for the type of pipe used, taking into consideration trench width and
depth, superimposed loadings above grade and the material below trench grade. Pipe loading capabilities shall be computed in accordance with established design criteria and special supporting bedding or facilities shall be provided as required.

F. **Connections at Structures:** Where pipes are to extend into or through structures, flexible joints shall be provided at the wall face.

G. **Special Exterior Protection for Corrosion:** Extra protection shall be provided for underground DI pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement, as specified in AWWA C-105, through the area of concern. The soil test evaluation to determine the necessity for extra protection in suspect areas shall be as set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, DI pipe crossing said utility shall be protected for a distance of 20 feet to each side, and when installed parallel to and within 10 feet of, protection shall also be provided.

H. **Air Venting and Blow-Offs:** Where the reuse main profile is such that air pockets or entrapment could occur, resulting in flow blockage, methods for air release shall be provided. Air venting capabilities shall be provided for distribution mains by appropriately placing fire hydrants, blow-offs or other manual devices. At critical points on major mains, automatic air release assemblies shall be installed. All dead end reuse mains, temporary or permanent, shall be equipped with a manually operated blow-off at the terminus.

I. **Service Connections:** All service lines shall be 1 inch, 1½ inch or 2 inch polyethylene tubing conforming to the Specifications in AWWA C-800 and C-901. Connections to reused water reuse mains (other than DI), of 4 inches and larger, shall be made by the drilling of the appropriate size hole and the installation of service saddles. Services to smaller size mains shall be accomplished by in-line fittings. A corporation stop shall be placed at the saddle or fitting, with the service line extended perpendicular to said line. Services shall consist of hose bibs. Hose bibs shall be located in below grade jam-lock service boxes, which shall be clearly labeled as not of potable water quality. No water service lateral shall parallel adjoining lots, run between neighboring property lines or come through the rear of the property’s lot line in order to provide utility service, unless otherwise approved by NPU.

J. **Identification Tape:** Locating tape shall be installed 1 foot below final grade over the centerline of the pipe. The tape installed 1 foot below final grade shall be the detectable type. The tape shall be laid continuously without gaps between ends over all installed piping. The tape shall have the words “Caution, Reused Water Line Buried Below” printed continuously along its length.

K. **Locating Wire:** Locating wire shall be installed directly on top of the pipe (no more than 6 inches above the top of the pipe) continuously without gaps between ends over the
entire length of the pipe and fittings with access to wire through the valve boxes.

L. Separation of Reused Water Mains from Water Mains and Sewers: Reused reuse water mains that are installed in the vicinity of pipe lines designated to carry potable water and raw wastewater shall meet the horizontal and vertical separations specified herein.

1. Horizontal Separation: Under normal conditions reused reuse water mains shall be located at least 5 feet horizontally from pipes carrying potable water and raw wastewater; the distance shall be measured from the inside edge of pipe to inside edge of pipe. When local conditions prevent a horizontal separation of 5 feet, a water main may be laid closer to a pipe carrying reused water provided that the bottom of the water main is at least 18 inches above the top of the reused water reuse pipe and the water main is laid in a separate trench or on an undisturbed earth shelf.

2. Vertical Separation: Under normal conditions reused water reuse mains shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the reused water reuse main. When construction conditions prevent a vertical separation of 18 inches as described herein above, the reused water pipe shall be constructed of DI pipe with mechanical joints.

3. Crossing of Water Mains and Sewers: Reused water reuse mains shall be installed above sewers whenever they cross. A vertical separation of at least 18 inches shall be maintained between the top of the sewer and the bottom of the reused water reuse main. Adequate structural support for both the reused water reuse main and sewers shall be provided to prevent excessive deflection of joints and settling. Sewers shall be constructed of DI pipe with mechanical joints and the length shall be a minimum of 18 feet. The sewer shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the reused water reuse main.

M. Surface Water Crossings:

1. Aerial Crossings: Structural supports shall be provided for all joints in pipes utilized for aerial crossings and shall be designed to prevent overturning and settlement. Expansion joints shall be provided between the aerial and buried sections of pipe. The impact of floodwaters and debris shall be considered and the bottom of the pipe shall be placed no lower than 1 foot above the 100-year flood elevation.

Flanged DI pipe, minimum Class 53, shall be used for all aerial crossings. The above ground pipe shall be painted as specified in Section 4.02B for above ground water mains. Underground pipe shall be provided at both ends of the crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding. An air release/vacuum relief valve shall be installed at the high point of the crossing. Appropriate guards shall be installed at both ends of the crossing to prevent pipe access to the public.
It shall be the responsibility of the Developer to obtain all applicable regulatory permits. When the aerial crossing is accomplished by attachment to a bridge or drainage structure, the Developer shall meet all requirements of the Agencies who own or have jurisdiction over such structures.

2. **Underground Crossings:** A minimum of a 3 feet 6 inch concrete slab shall be provided over the pipe. The pipe material shall meet appropriate AWWA Standards for use in submerged conditions. Valves shall be provided at both ends of the water crossings so that the section can be easily isolated for testing or repair. The valves shall be easily accessible, and not subject to flooding. Both valves shall be provided in a manhole or valve vault. It shall be the responsibility of the Developer to obtain all applicable regulatory permits, including dredge and fill permits.

**10.04 INSTALLATION**

A. All reused water reuse mains, valves and appurtenances shall be installed in accordance with Sections 3 and 4 of these Specifications.

**10.05 TESTING**

A. The Builder shall perform hydrostatic testing of all reused water reuse distribution systems, as set forth in the following, and shall conduct said tests in the presence of representatives from NPU or other authorized agencies, with 2 day advance notice provided. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints and valves including all service lines to the curb stops. Air testing of pressure pipe will not be permitted under any circumstance. The Contractor shall furnish all necessary equipment and material, make all taps, and furnish all closure pieces in the pipe as required.

1. Piping and appurtenance to be tested shall be within sections between valves, unless alternate methods have received prior approval. Testing shall not proceed until concrete thrust blocks are in place and cured or other restraining devices installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required. Flushing shall be at full flow conditions and at least 2.5 feet per second flow rate.

2. Hydrostatic testing shall be performed at 150-psi pressure or 1.5 times the working pressure; whichever is greater, for a period of not less than 2 hours. If during the test, the integrity of the tested line is in question, the City may require a 6-hour pressure test. Testing shall be in accordance with the applicable provisions as set forth in Section 4 of AWWA Standard C-600. The Contractor may conduct hydrostatic tests
after the trench has been partially backfilled with the joints left exposed for inspection for the Contractors informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified.

The procedure for conducting the test will be that each section of pipe to be tested will be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves or hydrants are discovered in consequence of this pressure test, all such items shall be removed and replaced by the Contractor with sound material and the test repeated until satisfactory results are obtained. The allowable rate of leakage for DI piping shall be less than the number of gallons per hour determined by the flowing formula:

\[
\frac{SD(P)^{1/2}}{L} = 133,200
\]

L = allowable leakage in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe in inches
P = average test pressure maintained during the leakage test in pounds per square inch gauge, (minimum 150 psi)

The allowable leakage for PVC and HDPE piping shall be 90 percent of the value calculated above.

3. The testing procedure shall include the continued application of the specified pressure to the test system, for the 2-hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container. Should the test fail, the Builder shall accomplish necessary repairs and the test repeated until within the established limits. The Builder shall furnish the necessary labor, water, pumps, gauges and all other items required to conduct the required water distribution system testing and perform necessary repairs.

10.06 DISINFECTION

A. Following pressure testing, the Builder shall disinfect all sections of the reused water reuse distribution system, and receive approval thereof from the appropriate agencies,
prior to placing in service. In addition, any part of the City’s reused water reuse system, which has direct contact with reused water reuse and has been out of service for repair, alteration, or replacement shall be disinfected. Two (2) days advance notice shall be provided to NPU before disinfecting procedures start. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA Standard C-651, “Disinfecting Water Mains”, and all appropriate approval agencies, unless otherwise approved by NPU.

B. Sections of pipe to be disinfected shall first be flushed (full diameter) to remove any solids or contaminated material that may have become lodged in the pipe. All taps required for chlorination or flushing purpose, or for the temporary or permanent release of air shall be provided for by the Contractor as a part of the construction of water mains, all such taps shall be sealed to the satisfaction of the City.

Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinate so that the initial chlorine residual is not less than 50 mg/l and that a chlorine residual of not less than 25 mg/l remains in the water after 24 hours in the pipe. Chlorine may be applied as a liquid-chlorine (gas-water mixture), or a mixture of water and high-test calcium hypochlorite. The Contractor shall assume the responsibility for safe handling of chlorine and shall meet the requirements of OSHA and other regulatory agencies for safe handling of chlorine.

The preferred point of application of the chlorinating agent shall be at the beginning of the pipeline extension of any valved section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipeline extension. Alternate points of applications may be used when approved by the City.

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its lengths shows upon test, a free chlorine residual not in excess of that normally carried in the system. After flushing, water samples shall be collected on two (2) consecutive days from the treated piping systems, as directed by the City, shall show acceptable bacteriological results. All bacteriological testing shall be performed by the Developer or Contractor, and must be performed by a laboratory certified by the State of Florida. In addition, proper chain of custody procedures must be followed and samples shall only be collected by certified personnel in the presence of City personnel. Copies of testing results and all related correspondence with the State of Florida Department of Health and Rehabilitative Services (Sarasota County Public Health Unit) and FDEP shall be submitted to the City.

C. Should the initial treatment result in an unsatisfactory bacterial test, the Contractor shall repeat the original chlorination procedure until satisfactory results are obtained.

END OF SPECIFICATIONS