Section#	Title
001570	Erosion and Sediment Control
001760	Surveying and Record Drawings
002240	Dewatering
002310	Pipe Removal, Disposal, Alteration, Modification or Pipe Abandonment
002320	Gravity Sewer System
002325	Force Mains
002330	Low Pressure Sewer Systems
002332	Vacuum Sewer Collection System
002335	Potable Water Mains
002340	Valves
002345	Fire Hydrants
002450	Reclaimed Water Mains
002445	Jack and Bore
002530	Submersible Sewage Pump Lift Station Individual Design
002540	Submersible Sewage Pump Lift Station Standard Design
002550	Submersible Sewage Pump Lift Station Master Design
002560	Submersible Sewage Pump Lift Station Private Design
002742	Sidewalks, Driveways, Streets, Pathways, Parking Lots, Concrete Gutter, Curb Elements, and Traffic Separator
002920	Landscaping
002930	Grassing
003300	Precast Concrete Products
003310	Cast In Place Concrete
003600	Grout
009900	Surface Preparation, Painting and Coating
009910	Sanitary Sewer System Rehabilitation
009920	Sanitary Sewer Structures Rehabilitation

PART 1 - GENERAL

The following specification is intended for use for the design and construction of erosion and sediment control. Erosion and sediment control, if applicable, shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit.

1.1 SCOPE

1.1.1 General

It is the intent of this specification to provide the requirements for erosion and sediment control for the project and to provide guidelines for completing the required regulatory permit form(s).

1.1.2 Work Included

The Contractor shall be solely responsible for all sediment and erosion control measures as required by the regulating agencies, directed in the field by the CCU, this specification, and as otherwise required to maintain compliance with:

- Storm Water Pollution Prevention Plan,
- National Pollutant Discharge Elimination System (NPDES) General Storm Water Permit for Construction Activity,
- Florida Department of Environmental Protection (FDEP),
- Southwest Florida Water Management District (SWFWMD
- U.S. Army Corps of Engineers,
- South Florida Water Management District
- Environmental Protection Agency (EPA),
- Charlotte County Community Development (CCCD)
- Charlotte County Public Works (CCPW)

and with all other agencies having jurisdiction.

The work under this section includes all necessary work, equipment, material, and labor to install and maintain erosion control devices as well as to acquire and report compliance with the Contractor's NPDES Permit. The Contractor shall provide all labor, equipment, tools, materials, all temporary dikes, culverts, check dams, sediment traps, hay and/or straw mulch

and all other associated appurtenances, services, and methods necessary to insure adequate erosion and sediment control measures. These measures shall conform to the plans and specifications and all state and local requirements. The work under this section shall include, but is not limited to the following:

The work in this section consists of the material, equipment, labor, and placement of erosion control related items including, but not limited to, synthetic bales or barriers, silt screens, screens, dewatering and settling basins in accordance with FDOT Standard Specifications, except as modified by the plans and herein. The work specified shall consist of furnishing all materials, equipment, labor, and operations necessary for complete temporary erosion control during the course of this project. The Contractor's Erosion Control Plan shall implement the Best Management Practices in the Construction Plans and shall include procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills. Contractor shall be responsible for management and implementation of all associated permit conditions and requirements. Do not begin any soil disturbing activities until CCU has received an approved Contractor's Erosion Control Plan, including all required signed certification statements. No separate payment shall be made to the Contractor for above work required by this section.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the erosion and sediment control measures with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and so as not to cause any unreasonable nuisance to affected residents. This includes the capture of water pumped from the site being dewatered. Under emergency conditions, this limitation may be waived by the written consent of the Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Payment for silt fence as detailed shall be on a linear foot basis for the length furnished and installed. Payment shall also include the removal of the silt fence from the project site after turf is established.

1.2.2 Temporary erosion control and NPDES compliance including but not limited to all items, devices, material, labor, operations, equipment and all work described herein shall be measured and paid for on a lump sum basis unless a specific bid item is provided in the bid proposal. The lump sum bid to be paid for under this section together, include all items and all work specified herein. Twenty-five (25%) percent of the lump sum bid shall be paid following the approved installation of the Temporary Erosion Control and NPDES Compliance. The remainder of the payment will be pro-rated per calendar day of Contract time, including any extensions. Any balances remaining will be paid as part of the final estimate. Bid item for the Temporary Erosion Control and NPDES compliance is included in the miscellaneous Items section of the Bid Form. The Contractor shall remove all temporary erosion control devices prior to receiving payment.

1.2.3 Acquisition of the NPDES permit, if required, and all related compliance efforts shall be considered incidental to the project.

1.2.4 All other erosion and sediment control measures required to complete the project shall be considered incidental to the project unless a specific bid item is provided in the bid proposal.

1.3 REFERENCED STANDARDS (LATEST REVISION)

See section 1.1.2 for a partial list of agencies having applicable standards such as:

- Section 306 of the Clean Air Act (42USC §1857(11))
- Section 508 of the Clean Water Act (33 USC §1368)
- Executive Order 11738
- 40 CFR Part 15 of EPA regulations

Other Standards/applicable documents:

- State of Florida Erosion and Sediment Control Designer and Reviewer Manual (E&SC Manual)
- FDOT Standard Specifications
- CCUD Standard Specifications and details
- Charlotte County Public Works (CCPW)
- Florida Stormwater Erosion and Sedimentation Control Inspectors Manual

1.4 PARTIAL LISTING OF RELATED SECTIONS

002240 - Dewatering
002310 - Pipe Removal, Disposal, Alteration, Modification or Pipe Abandonment
002320 - Gravity Sewer Systems
002325 - Force Mains
002330 - Low Pressure Sewer Systems
002335 - Potable Water and Reclaimed Water Mains
002345 - Fire Hydrants

002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design
002920 - Landscaping
002930 - Grassing

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

The Contractor shall obtain all required permits for construction from all governing regulatory agencies such as FDEP General Permit for Stormwater Discharge for Large and Small Construction Activities (CGP) which includes a Storm Water Pollution Prevention Plan (SWPPP). Copies of all permits such as the FDEP CGP approval letter, certification page, and the Notice of Intent to Use General Permit for Stormwater from Large and Small Construction Activities (NOI) must be submitted to the County prior to start of construction.

Additional information may be required for projects where the regulatory agency(s) deem that erosion, sedimentation or stormwater quality control problems are not be adequately handled by the submitted SWPPP. Such data may include, but not to be limited to, other engineering studies, computations, schedules, and supportive data such as product design information and specifications as deemed necessary by the regulatory agency(s).

Although these standards and regulations have been closely structured after those outlined by the FDEP, the Contractor should note that compliance with one program does not fill the need to comply with the others. Compliance with all other local, state and federal regulations is the responsibility of the Contractor as it relates to the development of the site.

PART 2 - PRODUCTS

Refer to the latest revisions of the following documents:

- State of Florida Erosion and Sediment Control Designer and Reviewer Manual (E&SC Manual).
- Florida Department of Transportation (FDOT) Standard Specifications
- CCPW Standard Specifications

PART 3 - EXECUTION

3.1 STORM WATER POLLUTION PREVENTION PLAN

3.1.1 General

The Contractor shall comply with all requirements outlined in the Storm Water Pollution Prevention Plan (SWPPP) as they apply to this project and implement Best Management Practices (BMPs) identified in this SWPPP and shown on the construction plans to minimize soil erosion, control sediment from construction activities, and protect receiving waters and storm water conveyance systems.

All storm water prevention activities shall ensure that the 29 NTU turbidity or current requirement is met.

The SWPPP does not waive the Contractor from their responsibilities to comply with all other standards, orders, or requirements by all regulatory agencies.

3.1.2 Erosion Prevention Practices

3.1.2.1 The Contractor must plan for and implement appropriate construction phasing, vegetative buffer strips, horizontal slope grading, and other construction practices that minimize erosion, so that the inspection and maintenance requirements outlined in the SWPPP are complied with. The location of areas not to be disturbed shall be delineated (e.g. with flags, stakes, signs, silt fence etc.) on the development site before work begins.

3.1.2.2 All exposed soil areas with a continuous positive slope within 200 lineal feet of a surface water, must have temporary erosion protection or permanent cover for the exposed soil areas year-round, according to the following table of slopes and time frames:

Type of Slope	Time*
Steeper than 3:1	7 days
Between 10:1 and 3:1	14 days
Flatter than 10:1	21 days

**The maximum time an area can remain open when the area is not actively being worked. The Contractor shall always comply with these requirements or the more stringent requirements of the regulatory agencies*

These areas include constructed storm water management pond side slopes, and any exposed soil areas with a positive slope to a storm water conveyance system, such as a curb and gutter system, storm sewer inlet, temporary or permanent drainage ditch or other natural or manmade systems that discharge to a surface water. Temporary stockpiles without significant silt, clay, or organic components (e.g., clean aggregate stockpiles, demolition concrete stockpiles, sand stockpiles) are exempt from this requirement but must comply with Section 3.1.3.5.

3.1.2.3 The normal wetted perimeter of any temporary or permanent drainage ditch that drains water from a construction site, or diverts water around a site, must be stabilized within 200 lineal feet from the property edge, or from the point of discharge to any surface water. Stabilization must be completed within 24 hours of connecting to surface water.

3.1.2.4 Pipe outlets must be provided with temporary or permanent energy dissipation within 24 hours of connection to surface water.

3.1.2.5 Staked Silt Fences, Synthetic Bales or Barriers

Staked silt fences, synthetic bales or barriers shall be placed in the swales at a minimum of 30' upstream from the top of the bank of the canal, or as directed by the County. Staked silt fences, synthetic bales or barriers shall remain in place and maintained until the project is completed and accepted by the County. The Contractor's work shall be in conformance with FDOT Standard Specification Section 104, and FDOT Index 102.

3.1.2.6 Staked and Floating Turbidity Barriers

Staked and Floating Turbidity Barriers shall be installed prior to any work and shall remain in place and maintained until all generated turbidity subsides to the approval of the County. Contractor shall install turbidity screens in conformance to FDOT Standard Specifications Section 104 and as required by the Construction Plans.

3.1.2.7 Turbidity Monitoring

The Contractor shall be required to monitor each site for turbidity twice a day during actual construction. The Contractor shall prepare a turbidity monitoring plan with locations upstream and downstream of the last erosion control devise. The turbidity monitoring plans shall be submitted at the Preconstruction Conference for County approval. Turbidity readings shall be in Nephelometric Turbidity Units (NTU) as outlined in "Turbidity, Method 180.1". Any time sampling results indicate that the background turbidity level is exceeded by 29 NTUs at the downstream sampling location, or as specified in the Environmental Resource Permit, the Contractor shall stop the work activity that created the turbidity. The Contractor must notify the appropriate state agency as well as the County and correct the violation of water quality standards prior to returning to the activity. Weekly sampling reports shall be submitted to the County.

3.1.3 Sediment Control Practices

3.1.3.1 Sediment control practices must minimize sediment from entering surface waters, including curb and gutter systems and storm sewer inlets.

a. Temporary or permanent drainage ditches and sediment basins that are designed as part of a treatment system (e.g., ditches with rock check dams) require sediment control practices only as appropriate for site conditions.

b. If the down gradient treatment system is overloaded, additional upgradient sediment control practices must be installed to eliminate the overloading, and the SWPPP must be amended to identify these additional practices.

c. In order to maintain sheet flow and minimize rills and/or gullies, there shall be no unbroken slope length of greater than 75 feet for slopes with a grade of 1:3 or steeper.

3.1.3.2 Sediment control practices must be established on all down gradient perimeters before any upgradient land disturbing activities begin. These practices shall remain in place until final stabilization has been established in accordance with Section 3.1.7 of the SWPPP (Final Stabilization).

3.1.3.3 The timing of the installation of sediment control practices may be adjusted to accommodate short-term activities such as clearing or grubbing, or passage of vehicles. Any short-term activity must be completed as quickly as possible and the sediment control practices must be installed immediately after the activity is completed. However, sediment control practices must be installed before the next precipitation event even if the activity is not complete.

3.1.3.4 All storm drain inlets must be protected by appropriate BMPs during construction until all sources with potential for discharging to the inlet have been stabilized.

3.1.3.5 Temporary soil stockpiles must have silt fence or other effective sediment controls, and cannot be placed in surface waters, including storm water conveyances such as curb and gutter systems, or conduits and ditches.

3.1.3.6 Vehicle tracking of sediment from the construction site must be minimized by BMPs such as stone pads, concrete or steel wash racks, or equivalent systems. Street sweeping must be used if such BMPs are not adequate to prevent sediment from being tracked onto the street (see Section 3.1.5.3.d).

3.1.3.7 The Contractor must install temporary (or permanently) sedimentation basins where ten (10) or more acres of disturbed soil drain to a common location prior to the runoff leaving the construction site or entering surface waters. The Contractor is encouraged, but not required, to install temporary sediment basins where appropriate in areas with steep slopes or highly erodible soils even if less than ten (10) acres drains to one area. The basins must be designed and constructed according to the following requirements:

a. The basins must provide storage below the outlet pipe for a calculated volume of runoff from a 2-year, 24-hour storm from each acre drained to the basin, except that in no case shall the basin provide less than 1800 cubic feet of storage below the outlet pipe from each acre drained to the basin.

b. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage below the outlet pipe per acre drained to the basin, shall be provided where attainable until final stabilization of the site.

c. Temporary basin outlets must be designed to prevent short-circuiting and the discharge of floating debris. The basin must be designed with the ability to allow complete basin drawdown (e.g., perforated riser pipe wrapped with filter fabric and covered with crushed gravel, pumps or other means, (see Section 3.1.4) for maintenance activities, and provide

a stabilized emergency overflow to prevent failure of pond integrity. Energy dissipation must be provided for the basin outlet (see Section 3.1.2.4).

d. The temporary (or permanent) basins must be constructed and made operational concurrent with the start of soil disturbance that is upgradient of the area and contributes runoff to the pond.

e. Where the temporary sediment basin is not attainable due to site limitations, equivalent sediment controls such as smaller sediment basins, and/or sediment traps, silt fences, vegetative buffer strips, or any appropriate combination of measures are required for all down slope boundaries of the construction area and for those side slope boundaries deemed appropriate as dictated by individual site conditions. In determining whether installing a sediment basin is attainable, the Contractor must consider public safety and may consider factors such as site soils, slope, and available area on site. This determination must be documented in the SWPPP.

3.1.4 Dewatering and Basin Draining

3.1.4.1 Dewatering or basin draining (e.g., pumped discharges, trench/ditch cuts for drainage) related to the construction activity that may have turbid or sediment laden discharge water must be discharged to a temporary or permanent sedimentation basin on the project site whenever possible. If the water cannot be discharged to a sedimentation basin prior to entering the surface water, it must be treated with the appropriate BMPs, such that the discharge does not adversely affect the receiving water or downstream landowners. The Contractor must ensure that discharge points are adequately protected from erosion and scour. The discharge must be dispersed over natural rock riprap, sandbags, plastic sheeting, or other accepted energy dissipation measures. Adequate sedimentation control measures are required for discharge water that contains suspended solids.

3.1.4.2 All water from dewatering or basin draining activities must be discharged in a manner that does not cause nuisance conditions, erosion in receiving channels or on downslope properties, or inundation in wetlands causing significant adverse impact to the wetland.

3.1.5 Inspections and Maintenance

3.1.5.1 The Contractor shall be responsible for routinely inspecting the construction site once every seven (7) days or at a frequency as required by CCU or regulatory agency during active construction and within 24 hours after a rainfall event greater than 0.5 inches in 24 hours as measured by the nearest or onsite weather station as approved by CCU. Any deficiencies found during the inspection shall be corrected within 24 hours of the inspection report unless otherwise noted.

3.1.5.2 All inspections and maintenance conducted during construction must be recorded in writing. The Contractor shall provide copies of these records to the CCU.

Records of each inspection and maintenance activity shall include:

a. Date and time of inspections;

b. Name of person(s) conducting inspections;

c. Findings of inspections, including recommendations or corrective actions;

d. Corrective actions taken (including dates, times, and party completing maintenance activities);

e. Date and amount of all rainfall events greater than 1/2 inch (0.5 inches) in 24 hours; and

f. Documentation of changes made to the SWPPP.

3.1.5.3 All erosion prevention and sediment control BMPs must be inspected to ensure integrity and effectiveness. All nonfunctional BMPs must be repaired, replaced, or supplemented with functional BMPs. The Contractor must investigate and comply with the following inspection and maintenance requirements:

a. All silt fences must be repaired, replaced, or supplemented when they become nonfunctional, or the sediment reaches 1/3 of the height of the fence. These repairs must be made within 24 hours of discovery, or as soon as field conditions allow access.

b. Temporary and permanent sedimentation basins must be drained, and the sediment removed when the depth of sediment collected in the basin reaches 1/2 the storage volume. Drainage and removal must be completed within 72 hours of discovery, or as soon as field conditions allow access (see Section 3.1.4).

c. Surface waters, including drainage ditches and conveyance systems, must be inspected for evidence of sediment being deposited by erosion. The Contractor must remove all deltas and sediment deposited in surface waters, including drainage ways, catch basins, and other drainage systems, and restabilize the areas where sediment removal results in exposed soil. The removal and stabilization must take place within seven (7) days of discovery unless precluded by legal, regulatory, or physical access constraints. The Contractor shall use all reasonable efforts to obtain access. Precluded, removal and stabilization must take place within seven (7) calendar days of obtaining access. The Contractor is responsible for contacting all local, regional, state and federal authorities and receiving any applicable permits, prior to conducting any work.

d. Construction site vehicle exit locations must be inspected for evidence of off-site sediment tracking onto paved surfaces. Tracked sediment must be removed from all offsite paved

surfaces, within 24 hours of discovery, or if applicable, within a shorter time to comply with Section 3.1.3.6.

e. The Contractor is responsible for the operation and maintenance of temporary and permanent water quality management BMPs, as well as all erosion prevention and sediment control BMPs, for the duration of the construction work at the site. The Contractor is responsible until CCU or another Contractor has assumed control over all areas of the site that have not been finally stabilized or the site has undergone final stabilization, and a National Pollutant Discharge Elimination System (NPDES) Stormwater Notice of Termination (NOT) has been submitted to the FDEP.

f. If sediment escapes the construction site, off-site accumulations of sediment must be removed in a manner and at a frequency sufficient to minimize off-site impacts (e.g., fugitive sediment in sheets could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).

3.1.5.4 All infiltration areas must be inspected to ensure that no sediment from ongoing construction activities is reaching the infiltration area and these areas are protected from compaction due to construction equipment driving across the infiltration area.

3.1.5.5 Repair all damages caused by soil erosion or construction equipment at or before the end of each workday.

3.1.5.6 Sediment shall be removed from sump areas. The sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the embankment or in or adjacent to a stream or flood plain.

3.1.5.7 After construction is completed and areas are seeded and/or sodded in accordance with CCU specification 002930 “Grassing”, maintenance is limited to visual inspections on a routine basis. Any damage to the berm shall be repaired at once and re-sodded and/or reseeded. If the level of water is being maintained over the expected draw down time, the outfall system shall be cleaned and repaired.

3.1.6 Pollution Prevention Management Measures

3.1.6.1 The Contractor shall implement the following pollution prevention management measures on the site:

a. Solid Waste: Collected sediment, asphalt and concrete millings, floating debris, paper, plastic, fabric, construction and demolition debris and other wastes must be disposed of properly and must comply with FDEP disposal requirements.

b. Hazardous Materials: Oil, gasoline, paint, and any hazardous substances must be properly stored, including secondary containment, to prevent spills, leaks or other

discharge. Restricted access to storage areas must be provided to prevent vandalism. Storage and disposal of hazardous waste must be in compliance with FDEP regulations.

c. External washing of trucks and other construction vehicles must be limited to a defined area of the site. Runoff must be contained, and waste properly disposed of. No engine degreasing is allowed on site.

3.1.7 Final Stabilization

The Contractor must ensure final stabilization of the site. The Contractor must submit a NOT within 30 days after final stabilization is complete or CCU or another Contractor has assumed control over all areas of the site that have not undergone final stabilization. Final stabilization can be achieved in one of the following ways:

3.1.7.1 All soil disturbing activities at the site have been completed and all soils must be stabilized by a uniform perennial vegetative cover with a density of 100 percent over the entire pervious surface area, or other equivalent means necessary to prevent soil failure under erosive conditions and:

a. All drainage ditches, constructed to drain water from the site after construction is complete, must be stabilized to preclude erosion;

b. All temporary synthetic, and structural erosion prevention and sediment control BMPs (such as silt fence) must be removed as part of the site filial stabilization; and

c. The Contractor must clean out all sediment from conveyances and from temporary sedimentation basins that are to be used as permanent water quality management basins. Sediment must be stabilized to prevent it from being washed back into the basin, conveyances or drainage ways discharging off-site or to surface waters. The cleanout of permanent basins must be sufficient to return the basin to design capacity.

3.2 SILT FENCE

3.2.1 General

The Contractor shall provide silt fence as shown on the plans and as directed in the field by the Engineer. The Contractor shall remove all silt fences from the project site after the Engineer has approved the turf establishment.

3.3 WETLAND PROTECTION

In areas of Construction adjacent to wetlands, the following shall be performed:

3.3.1 The actual wetland and required buffers, as shown on the plans, must be Roped off prior to the start of any construction activity adjacent to said areas.

3.3.2 Prior to the placement of any fill material adjacent to wetlands or buffer areas, a siltation barrier shall be constructed. An accepted alternate barrier would be a line of hay bales.

3.3.3 No rim ditching of the wetlands shall be performed. Water levels in the Wetlands should be maintained.

3.3.4 In areas of wetlands in which work is to be performed, such areas must be clearly staked and roped off. Along such limits, a siltation barrier must be constructed. The use of small equipment in these areas is recommended.

3.3.5 The Contractor shall be responsible for the maintenance of these barriers. Barriers shall remain in place until areas are stabilized.

3.3.6 If damage is done to the wetland area, the engineer shall be notified immediately. The Contractor is responsible for any damage to protected areas.

3.3.7 In areas where impacts will be performed in wetlands, such areas shall be stripped of existing material and stockpiled for use in the re-creation of these areas or in littoral zones.

3.4 EARTH MOVING ACTIVITIES

3.4.1 The Contractor shall exercise care to preserve the natural landscape and Shall conduct his/her construction operations so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the work area. Except where clearing is required for permanent work, for Approved construction roads or for excavation operations, all trees, native Shrubbery, and vegetation shall be preserved and shall be protected from Damage which may be caused by the Contractor's construction operations and equipment.

3.4.2 The first stage of the earth moving activity shall be confined to the excavation of the storm water facility.

3.4.3 Topsoil should be taken from the construction areas and should be stockpiled for reuse in finished grading. Stockpiles should be placed so as not to add any additional sediment to the construction. The stockpiles should be mulched and/or seeded when exposed beyond thirty (30) days.

3.4.4 Graded areas are to be seeded and/or sodded within twenty-one (21) days following Earth moving procedures. If the time of year is not conducive for permanent seeding, temporary mulch and/or seeding shall be used.

3.4.5 Temporary diversion berms and/or barriers shall be removed only after the Construction of those areas directed to the berms and/or barriers have been completed.

3.4.6 The silt collection ponds should be removed and/or regraded for Permanent use, as the final grading and seeding overlap the area used by same.

3.5 FILLS

3.5.1 Land to be cut or filled should be cleared of trees, stumps, roots, brush, Boulders, sod, and debris.

3.5.2 Fill areas should be scarified, keyed and drained.

3.5.3 Fill material should be free of sod, roots, or other decomposable material.

3.5.4 The placing and spreading of fill material should be started at the lowest Point.

3.5.5 Generally, a 6:1 slope should be used unless specific engineering data shows a steeper slope is stable. Slopes of 4:1 or flatter are desirable for erosion control and maintenance.

3.5.6 Fills should be seeded and/or mulched immediately upon completion of Earth placement.

3.5.7 Water management systems should be provided to prevent water concentration and eroding the face of the slope. Keep surface water off the face of the slope.

3.6 CUTS

3.6.1 Diversions should be constructed at top of the slopes prior to cutting operations to convey water from face of slope.

3.6.2 Steepness of cuts will depend on soil type and design; however, cut slopes of 4:1 or flatter are desirable for erosion control and stability.

3.6.3 Cut slopes should be benched to provide access for seeding and mulching Equipment.

3.6.4 Cut slopes should be seeded and/or mulched immediately after removal of earth.

3.7 TEMPORARY SEDIMENT BASINS AND PERMANENT STORM WATER BASINS

3.7.1 <u>Site preparation</u>

Areas under the embankment and any structural works shall be cleared, grubbed and stripped of topsoil to remove trees, vegetation, roots and other objectionable materials in order to facilitate

clean-out and restoration, the pool area (measured at the top of the spillway) will be cleared of all brush and trees.

3.7.2 Cut-off trench

A cut-off trench, when pond depths are in excess of three feet, shall be excavated along the centerline of earth fill embankments. The minimum depth shall be two feet.

The cut-off trench shall extend up both abutments to the riser crest elevation. The minimum bottom depth shall be four feet, but wide enough to permit operation of excavation and compaction equipment. The side slopes shall be no steeper than 3:1. Compaction requirements shall be the same as those for the embankment. The trench shall be dewatered during the backfilling-compacting operations.

3.7.3 Embankment

The fill material shall be taken from approved borrow areas. It shall be clean soil free of roots, woody vegetation, over-sized stones, rocks or other objectionable material. Areas on which fill is to be placed shall be scarified prior to placement of fill. Fill material shall be placed in six to eight inches thick continuous layers over the entire length of the fill. Compaction shall be obtained by routing hauling equipment over the fill so that the entire surface of each layer of the fill is traversed by at least one wheel of tread truck of the equipment or by the use of a compactor. The embankment shall be constructed to an elevation of 10% higher than the design height to allow for settlement if compaction is obtained with hauling equipment. If compactors are used for compaction, the overbuild may be reduced to not less than 5%.

3.7.4 Pipe Spillways

The riser shall be securely attached to the barrel of the outfall pipe. The barrel and riser shall be placed on a firm, smooth soil foundation. The connection between the riser and riser base shall be watertight. The fill material around the pipe spillway shall be placed in six-inch layers and compacted under the shoulders and around the pipe to at least the same density as the adjacent embankment. Hand compacted backfill shall be placed over the pipe spillway before crossing it with Construction equipment.

3.7.5 Erosion Pollution Control

Construction operations shall be carried out in such a manner that erosion and Water pollution will be minimized. State and local laws concerning pollution abatement shall be complied with.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

1.1.1 General:

The following specifications defines the requirements for the utility survey preparation, selection of materials, surveying for the utility construction, surveying of CCU approved installed utility locations and the preparation and submittal of the project Record Drawings.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, provide all materials, equipment, tools, and labor necessary to mark the construction area for surveying, surveying as-built utility installations, and preparation and submittal of Record Drawings in accordance with the current Charlotte County Utilities (CCU) Minimum Drawing and Submittal Requirements for Potable Water, Wastewater, and Reclaimed Water Projects and CCU CADD Standards. All surveying and Record preparation must be done by a Professional Surveyor and Mapper (PSM) licensed in the State of Florida.

1.1.3 Location of the Work

The location of this work is as shown in the Contract Documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the surveying activities with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

All surveying and Record preparation must be done by a Professional Surveyor and Mapper (PSM) licensed in the State of Florida.

The work shall be measured and the compensation determined in the following manner:

1.2.1 Surveying

Surveying shall be paid for on a lump sum basis including providing all materials, equipment, tools, and labor necessary to provide the utility survey preparation, mark the construction area for surveying, surveying as-built CCU approved installed utility locations, in accordance with the current version of the CCU Minimum Drawing and Submittal Requirements for Potable Water, Wastewater, and Reclaimed Water Projects and CCU CADD Standards and Details.

1.2.2 Record Drawings

The preparation and submittal of the record drawings shall be paid for on a lump sum basis including preparing and submitting the PSM signed and sealed set of Record Drawings in accordance with the current version of the CCU Minimum Drawing and Submittal Requirements for Potable Water, Wastewater, and Reclaimed Water Projects and CCU CADD Standards and Details.

1.3 REFERENCED STANDARDS (Not used)

1.4 PARTIAL LIST OF RELATED SECTIONS

002320 – Gravity Sewer System
002325 – Force Mains
002330 – Low Pressure Sewer Systems
002335 – Potable Water and Reclaimed Water Mains
002340 – Valves
002345 – Fire Hydrants

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 The contractor shall submit the Record Drawings in accordance with the current CCU Minimum Drawing and Submittal Requirements for Potable Water, Wastewater, and Reclaimed Water Projects and CCU CADD Standards and Details.

1.5.2 The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or design details.

PART 2 - PRODUCTS

2.1 MATERIALS

The contractor shall furnish all materials of adequate quality for the purpose intended, including all stakes, pipes, paint, and all other materials necessary to properly perform the required work.

Stakes and pipes shall be suitable for general field construction staking and shall be durable enough to last from installation of the utility to the surveying for the preparation of the Record Drawings. Any stakes and pipes damaged during the duration of the contract shall be replaced and re-set at their proper location with no additional compensation being made therefore.

PART 3 - EXECUTION

3.1 GENERAL

3.1.1 The Engineer of Record will provide the CADD Drawings to the project's contractor for use by the PSM for the construction stake out and for the production of the Record Drawings.

3.2 SURVEYING REQUIREMENTS

All surveying for the project shall be done by or under the supervision of a Florida licensed PSM experienced and competent in utility construction surveying. The PSM shall review the work, resolve problems, and make decisions in a timely manner.

3.3 SURVEYING PREPARATION

3.3.1 The contractor's surveyor shall set all property corners and stake out the limits of all permanent and temporary easements in those areas where utilities are being installed. The survey points shall be left in place and/or replaced and remain visible for County use until contract close out.

3.3.2 The Contractor shall survey and lay out the construction site before the start of construction and provide construction staking for all utility installations. The work shall consist of physically marking and placing stakes/piping necessary for the contractor to properly install all utilities in accordance with the approved engineering drawings.

3.3.3 The re-use of stakes that have been previously marked shall not be allowed.

3.4 SURVEYING FOR RECORD DRAWINGS

3.4.1 All newly installed potable and reclaimed water mains, gravity sanitary sewers, vacuum sewers, wastewater low pressure force mains, wastewater force mains, valves, blow-off assemblies, clean-outs, service connections, meters, fire hydrants, lift stations, fittings, manholes, reclaimed water meter assemblies, in-ground electrical conduit, and related items shall be located, surveyed, and shown on the Record Drawings in accordance with the current CCU Minimum Drawing and Submittal Requirements for Potable Water, Wastewater, and Reclaimed Water Projects and CCU CADD Standards and Details.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

1.1.1 General:

It is the intent of these specifications is to provide the requirements for dewatering on the project.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the dewatering work required under the contract to include, but not limited to, dewatering the area around the pipe and structures, providing erosion control methods for the discharging water, obtaining necessary permits, and complying with all permit conditions. The Contractor shall handle all drainage or ground water by installing well points, pipe headers and pumping equipment. Well points shall be used as a primary means of dewatering. Kelly wells may be used as a secondary means of dewatering as approved by CCU, if installation can be done as per the specifications and in an efficient and timely manner. The Contractor shall also remove any surfaces as required; excavate the trenches and pits to the required dimensions; construct and maintain all required for traffic control; sheet, brace, and support the adjoining ground or structures where necessary;; provide barricades, guards, and warning lights; backfill; maintain all surfaces over the dewatering area until surface restoration; restore the surfaces unless otherwise stipulated by Charlotte County Utilities (CCU); remove surplus excavated material; and clean the site of the work.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of the Work

The contractor shall be responsible for the satisfactory coordination of the dewatering with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and so as not to cause any unreasonable nuisance to affected residents. This includes the capture of water pumped from the site being dewatered. Under emergency conditions, this limitation may be waived with the consent of CCU.

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Dewatering shall be considered incidental to the project and no direct payment will be made .

1.3 REFERENCED STANDARDS (Latest Revision)

Not used

1.4 RELATED SECTIONS

001570 Erosion and Sediment Control
002320 Gravity Sewer Systems
002325 Force Mains
002330 Low Pressure Sewer Systems
002335 Potable Water Mains
002450 Reclaimed Water Mains
002345 Fire Hydrants
002530 Submersible Sewage Pump Lift Station-Package Design
002540 Submersible Sewage Pump Lift Station- Standard Design

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

Prior to starting any construction, the Contractor shall submit a complete dewatering program for the entire project to CCU, and to any other agencies with jurisdiction over dewatering, such as the Southwest Florida Water Management District (SWFWMD) and/or the South Florida Water Management District (SFWMD) for review and written approval. The program shall include all equipment, materials, and procedures for the well point dewatering system to be an effective process. No dewatering shall take place until the EOR and all agencies with jurisdiction over dewatering have approved the dewatering plan and all permits, if required, have been obtained by the Contractor from each appropriate agency. Special precautions shall be taken adjacent to structures so the dewatering does not create any structural damage. The review of dewatering program by the EOR and the other regulatory agencies does not relieve the Contractor from the requirement that a dry trench must be provided at the time the utilities are installed. Any claims for damages as a result of the dewatering operation shall be the responsibility of the Contractor.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 General Requirements

A high ground water table may exist in portions of the project or throughout the entire project area. This indicates that utility construction will have to be in a dewatered trench in those areas where a high ground water table exists.

The SWFWMD and/or SFWMD approval of the dewatering plan must be obtained prior to start of dewatering.

3.2 Permits

The Contractor shall be responsible for acquiring all dewatering permits from SWFWMD and/or SFWMD prior to start of dewatering activities. The Contractor shall expect and allow ample time for approval through SWFWMD and/or SFWMD.

The Contractor shall be responsible for the preparation and the cost for obtaining all necessary permits to conduct the dewatering operations and for complying with all permit conditions for the duration of the project.

3.3 Discharges

Discharges from the dewatering systems shall be the responsibility of the Contractor and shall be in accordance with Section 104 of the current FDOT Standard Specifications for Road and Bridge Construction. If the discharge from the dewatering or pumping process is turbid or contains sediment-laden water, it shall be treated through the use of sediment traps, vegetative filter strips, flocculants, or other sediment reducing measures as permitted by the regulating agency. Rates of discharge shall be controlled so no erosion takes place. Erosion control measures at the discharge points shall be provided by the Contactor and are subject to the review and written approval of CCU.

3.4 Water Quality

Water discharged through the dewatering process may have to be analyzed by an independent certified laboratory retained by the Contractor at no charge to CCU and shall meet the water quality requirements of regulating agencies. If the water quality requirements of the regulating agencies are not met, the Contractor shall provide the water treatment necessary to meet the water quality requirements at no charge to CCU.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the removal, disposal, alteration, modification or abandonment of existing pipe.

1.1 SCOPE

1.1.1 General

a. This specification provides the requirements for the removal, disposal, alteration, modification or abandonment of existing pipe where required by the contract documents.

b. Asbestos-Cement Pipe special requirements: Removal, disposal, alteration, modification or abandonment of existing asbestos-cement pipe shall meet the requirements of the most current revisions of the Florida Department of Environmental Protection (FDEP), the current publication entitled "AWWA Work Practices for Asbestos-Cement Pipe" or subsequent revisions and in accordance with the requirements provided in the current standard entitled "OSHA Asbestos Construction Standards" or subsequent revisions for the removal, disposal, or abandonment of all asbestos-cement pipes as shown on the plans and/or encountered in the field during construction and any other applicable federal, state or local regulation. In addition, the removal of AC pipe must be done under the supervision of a person or firm in accordance with all FDEP regulations.

1.2 WORK INCLUDED

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the work required under the contract, including removal, disposal, alteration, modification or abandonment of pipe, spill/emergency clean-up, transportation, temporary storage, containment and housekeeping activities on the site where construction activities are performed.

1.3 LOCATION OF THE WORK

The location of this work is as shown on the Contract Document plans and/or encountered in the field during construction.

1.4 COORDINATION OF THE WORK

The Contractor shall be responsible for the satisfactory coordination of the pipe removal, disposal, alteration, modification, or abandonment of pipe with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.5 WORKING HOURS

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by a written consent of Charlotte County Utilities (CCU).

1.6 METHOD OF MEASUREMENT AND PAYMENT

The work shall be measured and the payment determined in the following manner:

1.6.1 Pipe Removal and Disposal

1.6.1.1 Asbestos-Cement Pipe Removal and Disposal

Asbestos-Cement Pipe removal and disposal shall be paid for at the contract bid price per linear foot for each size, irrespective of the depth of the main, which shall include the cost of removal and disposal of all pipe, (including disposal of the content within the pipe and cleaning), pipe bend sections, jointing material, restraints, stainless steel stiffeners and all other appurtenances, and of handling, hauling, dewatering, trenching, sheeting, excavating and backfilling, restoring the surface equal to or better than the original condition to the satisfaction of the County (unless separate bid item is provided), necessary permits, and all material or work necessary to remove and dispose of the pipe as specified in the Contract Documents and/or as directed by CCU, all of which shall be in accordance with all applicable federal, state and local regulations and requirements. All force mains, reclaimed water mains, and sewer mains must be flushed before removal and all liquid be contained and removed accordingly and all cost for this work shall be considered incidental to this payment item. Payment will only be provided for the linear feet of AC pipe verified by disposal tickets that identify proper disposal at a licensed and approved disposal site. The contractor must contact FDEP seven (7) days before the removal of asbestos pipe.

1.6.1.2 <u>All Other Type of Pipe</u> Removal and Disposal

All other type of pipe removal and disposal shall be paid for at the contract bid price per linear foot for each size, irrespective of the depth of the main, which shall include the cost of removal and disposal of the content within the pipe, and cleaning, pipe bend sections, jointing material, restraints, stainless steel stiffeners and all other appurtenances, and of flushing, handling, hauling, dewatering, trenching, sheeting, excavating and backfilling, restoring the surface equal to or better than the original condition to the satisfaction of the County (unless separate bid item

is provided), necessary permits, and all material or work necessary to remove and dispose of the pipe as specified in the Contract Documents and/or as directed by CCU, all of which shall be in accordance with all applicable federal, state and local regulations and requirements. All force mains, reclaimed water mains, and sewer mains must be flushed before removal and all liquid be contained and removed accordingly and all cost for this work shall be considered incidental to this payment item.

1.6.2 Pipe Abandonment with Grout

All type of pipe abandonment with grout, including asbestos-cement pipe, shall be paid for at the contract bid price per linear foot for each size, irrespective of the depth of the main, which shall include the cost of removal of the content within the pipe, cleaning, grouting, plugging, capping, and abandoning all pipe, pipe bend sections, and all other appurtenances, and of dewatering, trenching, sheeting, excavating and backfilling, restoring the surface equal to or better than the original condition to the satisfaction of the County (unless separate bid item is provided), necessary permits, and all material or work necessary to properly abandon the pipe as specified in the Contract Documents and/or as directed by CCU, all of which shall be in accordance with all applicable federal, state and local regulations and requirements.

1.6.3 Pipe Abandonment without Grout (Special circumstances only)

All type of pipe abandonment without grout, including asbestos-cement pipe, shall be paid for at the contract bid price per linear foot, irrespective of size or depth of the main, which shall include the cost of removal of the content within the pipe, cleaning, plugging, capping, and abandoning all pipe, pipe bend sections, and all other appurtenances, and of dewatering, trenching, sheeting, excavating and backfilling, restoring the surface equal to or better than the original condition to the satisfaction of the County (unless separate bid item is provided), necessary permits, and all material or work necessary to properly abandon the pipe as specified in the Contract Documents and/or as directed by CCU, all of which shall be in accordance with all applicable federal, state and local regulations and requirements. No pipe shall be abandoned without grout unless written CCU approval is obtained. Contractor shall submit plan for written CCU approval.

1.6.4 Pipe Alteration, Modification

All type of pipe alteration and/or pipe modification, including asbestos-cement pipe, irrespective of the depth of the main, shall be considered incidental to the project and no direct payment will be made. The work shall include all labor, materials, equipment, dewatering, trenching, sheeting, excavating and backfilling, restoring the surface equal to or better than the original condition to the satisfaction of the County (unless separate bid item is provided), necessary permits and all other appurtenances to construct the pipe alteration and or pipe modification as specified in the Contract Documents or as directed by CCU.

1.6.5 Existing Fire Hydrant Assembly Removal and Disposal

The removal and disposal of the existing fire hydrant assemblies shall be paid for at the Contract Bid price per each which shall include the cost of removal and proper disposal of the hydrant

assembly, satisfactory coordination of utility constructions, labor, material, equipment, and all other associated appurtenances required to complete the project in accordance with the Contract Documents.

1.6.5 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct payment will be made.

1.7 REFERENCED STANDARDS (Latest Revisions)

AWWA Work Practices for Asbestos-Cement Pipe
OSHA 1926.1101 and 1910.1001
Federal, State, and Local regulations
Florida Department of Transportation (FDOT)
Florida Department of Environmental Protection (FDEP)

1.8 PARTIAL LISTING OF RELATED SECTIONS

001570 – Erosion and Sediment Control
001760 – Survey Record Drawings
001770 – Record Drawings
002240 – Dewatering
002320 – Gravity Sewer System
002325 – Force Mains
002330 – Low Pressure Sewer System
002335 – Potable Water Mains
002340 – Valves
002345 – Fire Hydrants
002450 - Reclaimed Water Mains
002445 – Jack and Bore

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

PART 2 - PRODUCTS

2.1 SUBMITTALS

2.1.1 Grout Mix

Grout for filling abandoned mains shall consist of at least 15 percent Portland Cement by volume and shall be mixed to a consistency suitable for pumping. Sand used in the mixture shall be composed only of hard, strong, durable, uncoated grains of quartz and shall be free from extraneous substances.

PART 3 - EXECUTION

3.1 GENERAL

a. All work involving asbestos cement pipe shall be completed in accordance with all the latest applicable federal, state and local requirements and regulations as well as the applicable AWWA standards.

b. Existing pipe shall be removed when so designated on the plans or directed by CCU. When existing pipe is encountered which is not shown on the plans, it shall not be removed until CCU has been notified of its presence and has directed its removal in writing.

c. Where traffic is to be maintained, the removal of pipe shall be done in sections so that half the width of the roadway will be available to traffic per the approved MOT requirements.

d. Existing pipe shall be removed in such a manner that any nearby facilities will not be damaged.

e. The area disturbed by the removal of an existing pipe shall be backfilled in accordance with the sections of these specifications applicable to the adjacent construction.

f. Removed pipe shall become the property of the Contractor unless otherwise indicated by the special provisions.

g. Disposal of Debris: All material not salvaged by the Contractor shall be considered debris and disposed of by hauling to an approved disposal site. The Contractor shall be responsible for legally disposing of all debris and associated costs.

h. CCU shall be notified of the permitted disposal site and shall be provided verification that the material that has been accepted at the permitted disposal site.

3.2 ABANDONMENT

3.2.1 Abandonment by Capping-Plugging (Special Circumstances only)

When called for on the Contract Drawings, abandoned mains shall be plugged with a plugged fitting at points specified. All plugs shall be appropriately sized and shall conform as applicable to other sections of these specifications**.**

3.2.2 Abandonment by Grout Filling

When called for on the Contract Drawings, the abandoned main shall be grout filled by pumping a grout mixture into the main with an approved mix. The main shall be completely filled, leaving no voids or air spaces. Grout mix shall be as specified in this specification. In the event that a specific abandonment method is not called out on the plans, abandonment shall be by grout filling. The contractor shall submit their process for grout filling for written approval by CCU.

END OF SECTION

PART I – GENERAL

The following specification is intended for use for the design, selection of materials, and construction of gravity sanitary sewer projects. The gravity sanitary sewer shall meet the requirements of the Florida Department of Environmental Protection permit.

1.1 SCOPE

1.1.1 General

This specification provides the requirements for gravity sanitary sewer system design, selection of materials and construction for the project.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools and all other associated appurtenances, necessary to do the work required under the contract for a complete and operational gravity sanitary sewer system.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of Work

The Contractor shall be responsible for the satisfactory coordination of the construction of the gravity sanitary sewer system with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the written consent of the Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Gravity Sanitary Sewer Pipe:

Gravity Sanitary Sewer Pipe shall be paid for at the contract bid price per lineal foot for each size and type of material specified which shall include the cost of furnishing all pipe, pipe bend sections, jointing material, bedding material and all other associated appurtenances, and of delivering, handling, laying, dewatering, trenching, sheeting and backfilling, testing, restoring of the surface (unless separate bid item is provided), necessary permits and all other associated appurtenances or work necessary to install the pipe complete in place at the depth specified.

The length of pipe for which payment is made shall be the actual overall length measured along the axis of the pipe without regard to intervening manholes, tee sections or bend sections. Lengths of branches will be measured from the centers of connecting manholes to the center of manhole. All lengths will be measured in a horizontal plane unless the grade of the pipe is more than fifteen percent (15%). The depth of cut for payment shall be defined as the distance between the invert of the pipe at a particular point and the intersection of a vertical or plumb line extended from the said point to the point of intersection of the line with the ground surface as it exists at time of construction.

1.2.2 Gravity Sanitary Sewer Services Including Riser Sections

The method of measurement and payment shall be the same as in section 1.2.1 Gravity Sanitary Sewer Pipe with the length of branches being measured from the center of the gravity sanitary sewer pipe to which connection was made to the end of the gravity sanitary sewer service either being the right-of-way or the property line at which a clean out shall be installed. In addition, any fittings other than gravity sanitary sewer main line wyes or tees, shall be considered incidental to this pay item and no direct payment will be made (unless separate bid item is provided).

1.2.3 Gravity Sanitary Sewer Service Clean Outs

Gravity Sanitary Sewer Service Clean Outs shall be paid at the contract bid price per each size specified which shall include all labor, material, equipment, and associated appurtenances to complete the installation as specified.

1.2.4 Gravity Sanitary Sewer Service Wyes and Tees

Wyes and tees shall be paid for at the contract bid price for each unit furnished and installed of the size and classification specified.

1.2.5 Standard and Drop Manholes

Standard and Drop Manholes (inside or outside as designated) shall be paid for at the contract bid price per each for each type, depth and size specified which shall include the cost of furnishing all pipe, tees, precast sections, boots w/stainless steel straps, concrete slabs,

adjusting rings and covers, mortar, castings, interior/exterior coatings, jointing, and all other associated appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface (unless a separate bid item is provided), and all other associated appurtenances necessary to install the units complete in place at the depth specified. Standard and Drop Manholes shall be measured from the invert of the gravity sanitary sewer to the top of the manhole cover.

a. The inside drop piping shall be included in the contract bid price of the inside drop manhole including all piping, fittings, support brackets and all associated appurtenances as specified.

b. The outside drop piping shall be included in the contract bid price of the outside drop manhole including all piping, fittings, concrete horseshoes/reinforcement, and all associated appurtenances as specified.

1.2.6 Coring of Existing Sanitary Sewer Manhole

The Contractor shall core specified existing manhole(s) to the correct size hole and install a boot at the core w/stainless steel strap, grout, reconstruct the manhole bench for optimum flow, and line the inside of the manhole in accordance with specification 009920 “Sanitary Sewer Structures Rehabilitation”. Payment shall be at the contract bid price per each core size for providing all labor, materials, equipment, dewatering, reconstructing, grouting, coring, lining and all associated appurtenances for the installation of the boot as specified.

1.2.7 Connect to Existing Sanitary Sewer Manhole with Stub Out to be removed

In cases where a short sanitary pipe stub out of a manhole exists, the Contractor shall remove the existing pipe stub and connect the new pipe to the connection provided as shown on the engineering drawings and/or as directed by the Engineer. The Contractor shall line the inside of the manhole in accordance with specification 009920 “Sanitary Sewer Structures Rehabilitation”. Payment shall be made at the contract bid price per each stub out connection.

1.2.8 Connect to Existing Sanitary Sewer with Stub Out to remain

The Contractor shall remove the existing plug, verify the invert elevation and alignment of the existing pipe, make corrections as required and connect the new pipe as shown on the engineering drawings and/or as directed by CCU. Removal of plugs, verification of invert elevation and alignment and making corrections as required shall be considered to be incidental to the connection. Payment shall be made at the contract bid price per each connection to the existing sanitary sewer stub out.

1.2.9 Gravity Sanitary Sewer Service Connection to Existing Gravity Sanitary Sewer Main

a. Cut-in Connection (12” size existing mains or smaller)

The gravity sanitary sewer service connection to existing gravity sanitary sewer main (12" size or less) shall be paid for at the contract bid price per each connection installed as per the CCU standard details Including the wye/tee, piping, repair couplings with stainless steel shear rings, hardware, bedding material, dewatering, pre-installation and post-installation television inspection of existing main, restoration (unless a separated bid contract item is provided), all equipment, materials, labor and all other associated appurtenances required to install the sewer service complete in place at the depth and location shown on the plans and/or as directed by CCU.

The sewer service piping shall be paid as described in section 1.2.2 Gravity Sanitary Sewer Services Including Riser Sections.

b. Sanitary Sewer Service connection (15" size existing mains or larger)

The gravity sanitary sewer service connection to existing gravity sanitary sewer main shall be paid for at the contract bid price per each connection installed including the core-boring into the main (sizes 15" and larger only), the collar wye/tee saddle, piping, repair couplings, hardware, bedding material, dewatering, pre-installation and post-installation television inspection of existing main, restoration (unless a separated bid contract item is provided), all equipment, materials, labor and all other associated appurtenances required to install the sewer service complete in place at the depth and location shown on the plans and/or as directed by CCU.

The sewer service piping shall be paid as described in section 1.2.2 Gravity Sanitary Sewer Services Including Riser Sections.

1.2.10 Testing

All required testing shall be considered incidental to the project and no direct payment will be made.

1.2.11 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct payment will be made.

1.3 REFERENCED STANDARDS (latest revisions)

AWWA:

C-105, Polyethylene Encasement for Ductile-Iron Pipe Systems
C-110, Ductile-Iron and Gray-Iron Fittings
C-111, Rubber – Gasket Joints for Ductile-Iron Pressure Pipe Fittings C-150, Thickness Design of Ductile-Iron Pipe
C-151, Ductile-Iron Pipe, Centrifugally Cast
C-153, Ductile-Iron Compact Fittings

C-900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
C 906, Polyethylene (PE) Pressure Pipe Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
C-909, Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger

ASTM:
A-48 (Standard Specification for Gray Iron Castings)
A-139 (Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over),
C-109 (Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens)
C-293 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading
C-478 Circular Precast Reinforced Concrete Manhole Sections,
C-496 Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
C-536 Standard Test Method for Continuity of Coatings in Glassed Steel Equipment by Electrical Testing
D-638 Standard Test Method for Tensile Properties of Plastics,
D-790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials,
D-1120 Standard Test Method for Boiling Point of Engine Coolants,
D-1248 Polyethylene Plastics Extrusion Materials for Wire and Cable
D-1785 Poly(Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120,
D-1869 Rubber Rings for Fiber-Reinforced Cement Pipe,
D-2241 Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series,
D-3350 Polyethylene Plastics Pipe and Fittings Materials,
D-4748 Standard Test Method for Determining the Thickness of Bound Pavement Layers Using Short-Pulse Radar

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
001760 - Surveying and Record Drawing
002240 - Dewatering
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design
002930 - Grassing
003300 - Precast Concrete Products
009900 - Surface Preparation, Painting and Coating

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

The Contractor shall submit complete detailed documentation of all materials for approval by CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

Final written approval is at the discretion of CCU.

PART II – PRODUCTS

2.1 MATERIALS

All approved products are listed in the current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions.

2.1.1 General

The materials used in this work shall be all new, and conform to the requirements for class, kind, size and material as specified below.

All pipe furnished for gravity sanitary sewer and service installations including wyes/tees shall be of the type, kind, size, and class indicated for each particular line segment as shown on the engineering drawings and/or designated in the Contract Documents.

2.1.2 Ductile Iron Pipe (DIP)

The ductile iron pipe covered by this specification shall be the push-on joint type, centrifugally cast to conform to all requirements of AWWA Specification C-151, latest revision. All pipes shall have an epoxy bonded lining in accordance with AWWA Specifications, latest revision. The maximum allowable deflection of the pipe shall not exceed two percent (2%) of the pipe diameter. Ductile iron pipe shall be fully encased in an 8 mil polyethylene sleeve in accordance with AWWA Specification C-150, Method A. The pipe and the polyethylene sleeve shall be color coded green by a means acceptable to CCU.

a. All piping and fittings shall be either:

- fusion bonded epoxy coated as per AWWA Specification latest revision or
- ceramic epoxy coated as per ASTM Specifications G-95, B-117, D-1308 and E-96

b. Polyethylene material shall conform to ASTM standard Specification D-1248-68. All ductile iron pipe shall be marked "DUCTILE IRON" in large letters. The nominal wall thickness shall be legibly plainly marked on each piece of pipe.

Minimum thickness of ductile iron pipe shall be as follows:

3” Ductile Iron Pipe	0.25”	Class 51
4” Ductile Iron Pipe	0.26”	Class 51
6” Ductile Iron Pipe	0.25”	Class 50
8” Ductile Iron Pipe	0.27”	Class 50
10” Ductile Iron Pipe	0.29”	Class 50
12” Ductile Iron Pipe	0.31”	Class 50
14” Ductile Iron Pipe	0.33”	Class 50
16” Ductile Iron Pipe	0.34”	Class 50
18” Ductile Iron Pipe	0.35”	Class 50
20” Ductile Iron Pipe	0.36”	Class 50
24” Ductile Iron Pipe	0.38”	Class 50
30” Ductile Iron Pipe	0.39”	Class 50
42” Ductile Iron Pipe	0.47”	Class 50
48” Ductile Iron Pipe	0.51”	Class 50
54” Ductile Iron Pipe	0.57”	Class 50

c. Ductile iron pipe joints shall be of the push-on type with rubber gasket which complies with the latest revision of AWWA Specification C-111.

d. All fittings shall be in accordance with AWWA Specification C-153 latest revision and have the same pressure rating of the connecting pipe. All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel. All buried fasteners such as bolts, nuts, and washers shall be “Cor-Ten” steel or Cor-blue coated steel. Threaded rod for buried applications shall be Type 316 stainless steel. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

All stainless-steel fasteners threads shall be coated with an anti-seize compound as approved in writing, by CCU.

2.1.3 Polyvinyl Chloride Sewer Pipe (PVC)

a. PVC pipe shall conform to the applicable requirements of AWWA C-900 (3" through 48"), and AWWA C-909 (6” through 60”) and shall be Class 150 SDR 18 for depths of 0 to 4 feet of cover and SDR 26 for depths greater than 4 feet of cover. PVC pipe shall be Class 200 SDR 14 between the first upstream manhole and lift station wet well regardless of pipe depth. Three (3) inch diameter and smaller schedule 80 PVC pipe shall conform to the requirements

of ASTM D-1785, latest revision. The manufacturer shall insure all quality control test and AWWA requirements are complied with during the production of PVC pipe.

C-900, , and C-909 pipes shall have an integral bell formed with a race designed to accept the gasket in accordance with AWWA requirements. The spigot end shall have a bevel and a stop mark on the outside diameter to indicate proper insertion depth. Provisions shall be made for expansion and contraction at each joint. All surfaces of the joint where the gasket may bear shall be smooth, free of cracks, fractures, or imperfections that could adversely affect the performance of the joint.

Schedule 80 PVC piping can be joined by solvent cements, adhesive, or threaded type connections as approved by CCU prior to their use.

b. Pipe Color: All C-900, and C-909 polyvinylchloride sewer main pipes shall be green in color with a PVC ASTM D-1120 and ASTM D-2241 reference, the class pressure rating, and the SDR number permanently and plainly marked on the pipe. Schedule 80 PVC piping shall be white and/or grey and the type of pipe permanently and plainly marked on the pipe.

c. Rubber Gasket Joints: C-900, , and C-909 polyvinylchloride pipe joints shall be the bell and spigot type using rubber gasket push-on type joints. Rubber gaskets shall be molded to a circular form to the proper cross section and shall consist of a vulcanized high grade elastomeric compound conforming to ASTM D-1869 and AWWA C-900, , and C-909 elastomeric seals for joining PVC pipe.

2.1.4 Manholes

a. Manholes shall be constructed of precast sections. Manholes shall conform to ASTM C-478. No brick and mortar shall be used to complete the cone between the top precast section and the ring and cover. The manhole cover ring shall be mounted in the top precast cone section.

b. A minimum of one (1) and a maximum of three (3) four (4) inch precast adjusting rings shall be provided between the cast iron frame and the top concrete manhole section as outlined in section 3.5.3. External coating outlined in section 2.1.5.

c. The manhole shall be delivered to the job site with pre-installed elastomeric gasket(s) for all piping. The gasket(s) shall have a stainless-steel adjustable strap to seal the gasket to the pipe. An elastomeric gasket(s) with a stainless-steel adjustable strap to seal the gasket to the pipe shall be installed in all on site core bored holes.

d. The manhole invert shall have a 1% slope with the bench and channels constructed of 3000 psi concrete having a smooth trowel finish. The concrete shall be machine mixed and contain no pieces of foreign material.

e. The individual manhole sections shall fit together with interlocking tongue and groove joints. All manholes shall be sealed with a R-4 rubber gasket. The outside of the groove joints for all

manholes shall be covered with a continuous overlapping butyl rubber wrap a minimum of six (6) inches wide.

f. Drop manholes are required when an invert exceeds 24" from the manhole bench. The drop pipe shall be external unless otherwise approved in writing by CCU. The drop pipe shall meet the requirements of the CCU standard details. An external drop is required unless otherwise approved in writing by CCU, on an existing manhole that has been core bored for a new gravity sanitary sewer and/or force main. Force mains at a manhole shall have a plug valve at the manhole.

2.1.5 External Manhole Coating:

The outside surface of the manhole and adjustable risers shall be coated with 3 coats (black/red/black or color changes to allow CCU personnel to verify multiple coats) of epoxy coating with a minimum dry film thickness of 10 mils per coat for a total of 30 mils dry film thickness. Subsequent coats shall be applied within 48 hours of the previous coat.

2.1.6 Internal Manhole Coatings:

The internal manhole coatings shall be a polymorphic resin, a pure-fused calcium aluminate mortar, an epoxy coating, polyetheramine coating, or polyurethane coating. Coatings shall be installed in accordance with the manufacturer's specifications.

2.1.6.1 Polymorphic resin coating system

The sprayed applied polymorphic resin shall be a 100% solids, two components, highly modified isothalic polyester resin material. The coating shall form a mechanical and chemical bond to the manhole liner surface with less than 0.08% shrinkage (ASTM C596) in 28 days. The material shall have a minimum twenty-eight (28)-day compressive strength of 9,000-psi.

The three-coat system is:

I. Prime Coat: 5-10 mils thick

II. Intermediate Coat: 20 mils thick

III. Final Coat: 5 mils thick

The finish resin shall be resistant to sulfuric acid attack associated with domestic sewage.

The existing manhole and junction chambers shall be prepared for the application of the polymorphic resin system by cleaning and stoppage of infiltration as specified above. Prior to applying the resin liner, the entire manhole surface and benches shall be patched and grouted to the extent needed to provide a smooth and even surface to which the liner will adhere.

The cured resin system shall conform to the minimum physical standards, as listed below:

CURED RESIN	STANDARD	LONG-TERM DATA
TENSILE STRENGTH	ASTM D-638	5,000 psi
FLEXURAL STRESS	ASTM D-790	8,630 psi
FLEXURAL MODULUS	ASTM D-790	15,120 psi

The Contractor shall provide certified independent, third-party test results verifying the minimum physical properties listed above. The tests shall be in conformance with the ASTM specifications listed.

The finished liner shall be cured in strict accordance with the manufacturer's instructions.

2.1.6.2 Pure-fused Calcium aluminate mortar liner:

Material shall form a mechanical and chemical bond to the manhole liner surface with less than 0.08% shrinkage (ASTM C596) in 28 days. The liner shall have a minimum twenty-eight (28) day compressive strength of 9,000 psi. The liner is a one coat application. The liner shall be spray applied directly to the damp manhole surface, trowel smooth, and "brushed" finished. The material shall completely cover the interior surface of the manhole with a minimum thickness of ½ inch.

2.1.6.3 Polyurethane Coating System

The existing manhole and junction chambers shall be prepared for the application of the polyurethane system by cleaning and stoppage of infiltration as specified in section 221412 – Gravity Sanitary Sewer Manhole Rehabilitation. Prior to applying the polyurethane liner, the entire manhole surface and benches shall be patched and grouted to the extent needed to provide a smooth and even surface to which the liner will adhere.

The cured polyurethane system shall conform to the minimum physical standards, as listed below:

CURED POLYURETHANE	STANDARD	LONG-TERM DATA
TENSILE STRENGTH	ASTM D-638	5,000 psi
FLEXURAL STRESS	ASTM D-790	10,000 psi
FLEXURAL MODULUS	ASTM D-790	550,000 psi

The Contractor shall provide certified independent, third-party test results verifying the minimum physical properties listed above. The tests shall be in conformance with the ASTM specifications listed.

The finished liner shall be cured in strict accordance with the manufacturer's instructions.

A. The sprayed applied polyurethane resin system shall be as specified. The finished polyurethane shall be resistant to sulfuric acid attack associated with domestic sewage. The polyurethane shall be manually sprayed onto the structures or manholes to provide a uniform smooth surface. A minimum thickness of 250 mils (1/4") shall be applied for structural integrity. If design requires, 1" can be applied in a single application". The coating system shall be capable of being applied over wet surfaces without degrading the final product.

B. Epoxy coating systems will be considered equal to the specified Polyurethane Resin System provided that the material is a solvent-free, 100% solids epoxy and meets or exceeds the minimum physical properties listed above. Composite systems containing layers of different materials or cured-in-place resin systems that are inflated in the manholes will not be considered as equal. The epoxy liner shall be Raven 405 or approved equivalent. The liner shall be applied by brush, roller, plural component airless or air-assisted spray to a moist and damp condition. The Raven 405 shall be sprayed applied at a minimum thickness of 125 mils, unless otherwise specified by CCU, in a single application and shall completely cover the interior surface of the manhole. Raven 405 is a 100% solids epoxy with zero shrinkage. Therefore, actual wet film thickness and final dry film thickness are the same (i.e. 10 mils WFT=10 mils DFT). Maximum physical properties are achieved in approximately eight hours at 70°F, however maximum chemical resistance may take three to seven days.

2.1.7 Manhole – Ring and Covers:

All covers shall be H-20 rated and conform to the requirements and dimensions shown on the engineering drawings and the CCU standard details. All covers shall fit closely in the rings in any and all positions and must fit the ring solidly in the ring and in all positions so that there shall be no rocking from pressure on any point of the cover. All manhole covers shall be ASTM A536, Grade 60-40-18 ductile iron; and meet the requirements of ASTM A-48, Class 35B, AASHTO M-306 or higher. The cover shall be marked as designated in the "hinged" or "non-hinged" cover requirements.

2.1.7.1 Hinged Cover

The hinged cover shall be manufactured from ductile iron IAW ISO 1083 or reinforced galvanized steel and incorporate a 90-degree blocking system to prevent accidental closure. Covers shall be one man operable using standard tools and shall be capable of withstanding a test loads of 120K lbs. or H-20 rated whichever is greater. The cover shall be simply removed by one person. Cover hinges shall be flush with the top of the cover.

a. Circular hinged covers shall be a 24” or 36” clear opening diameter, and the frame shall incorporate a 360 degree mechanically attached elastomeric seating gasket for infiltration control and traffic shock. The hinge box shall include a self-cleaning, dual wiper infiltration plug. The frame depth shall not exceed 4 inches, and the flange shall in corporate bedding slots, bolt holes, and lifting eyes. All components shall be black coated. The hinged cover shall have either a stainless-steel tag permanently attached to the cover with Charlotte County and the date of installation embossed or painted on the tag or Charlotte County and the date of installation cast into the cover. The cover shall have at least one non-penetrating pick hole opposite the hinge. Installation location of the hinged cover shall meet the CCU standard details.

b. Rectangular covers shall be sized and installed as designated on the engineering drawings and meet the requirements of a circular cover as applicable. If required, the cover shall have a manual opening assist mechanism.

2.1.7.2 Non-hinged Cover:

Circular non-hinged covers shall be a 24” or 36” clear opening diameter, and the frame shall incorporate a 360 degree mechanically attached elastomeric seating gasket for infiltration control and traffic shock. The cover shall have two (2) non-penetrating pick holes 180 degrees apart and Charlotte County and the date of installation cast into the cover. The cover shall have no alignment tabs protruding from the bottom of the lid which would fit into the top of the manhole riser. A removable rain shield shall be installed with each manhole. Installation location of the non-hinged cover shall meet the CCU standard details.

PART III – EXECUTION

3.1 MATERIAL HANDLING, ALIGNMENT AND GRADE

3.1.1 Material Handling

Manholes, piping, and other accessories shall be unloaded at the point of delivery and hauled to and distributed at the site of the project by the Contractor and be handled with care to avoid damage. In distributing the material at the site, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. If any manholes, piping, and other accessories are damaged, the replacement or approved repair shall be made by the Contractor at the Contractor's expense as approved in writing by CCU.

3.1.2 Pipe Alignment and Grade

All pipes shall be laid and maintained to the required lines and grades with manholes at the required locations. No deviation shall be made from the required line or grade except with the approval in writing by CCU. All construction staking requirements of the project shall be performed by a Professional Surveyor and Mapper (PSM) licensed in the state of Florida, paid for by the contractor, to ensure compliance with the construction plans.

3.2 LAYING PIPE

3.2.1 Trench preparation:

Prior to the laying of the pipe, the trench shall be excavated and prepared in accordance with the CCU standard details class of bedding, fill materials, and compaction requirements.

3.2.2 Cleaning pipe:

All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench, and the pipe shall be kept clean by approved means during and after laying. The outside of the tongue or spigot end of the pipe shall be wire brushed and wiped clean, dry, and free from oil and grease before the pipe is laid.

3.2.3 Laying Pipe:

The pipe shall be laid proceeding upgrade with the tongue or spigot ends pointed in the direction of flow. Pipe shall not be laid in water or when the trench conditions are unsuitable for such work except by written permission of CCU. The excavation of trenches shall be fully completed a sufficient distance in advance of the pipe laying and the exposed ends of all pipe shall be fully protected with a board or approved stopper to prevent earth or other substances from entering the pipe. The interior of the sewer piping shall be continually cleaned of all dirt, cement, or superfluous material as the work progresses. If necessary and/or required by CCU at the completion of the installation, the pipe shall be thoroughly flushed by the CCU approved method at the expense of the Contractor prior to testing.

3.2.4 Rock conditions:

No piping shall be laid directly on a bed of rock. All rock shall be removed or cut away to a minimum dimension of twelve inches (12”) beyond the pipe wall in all directions. If cut away, proper specified bedding shall be placed between the rock surface and the outside of the pipe to prevent damage to the pipe.

3.2.5 Pipe Orientation:

Pipe shall be laid with the lettering designating manufacturers name, class, and size of pipe visible from the top of the open trench.

3.2.6 Pipe Continuity:

A continuous run of gravity sanitary sewer piping between manholes and/or between a manhole and a wet well shall be from the same manufacturer. A continuous run of gravity sanitary sewer piping shall be either PVC or DI and no mixing of type of piping is allowed.

3.2.7 Laser Beam Grade Control:

The Contractor shall maintain the line and grade of the pipe in the trench by means of a laser machine. The laser apparatus shall be in good working order when being used. When directed by CCU, the Contractor shall set the laser machine above ground and verify the working order of the laser machine to CCU's satisfaction. The Contractor shall check periodically the line and grade of the pipe being laid by other means. The Contractor shall check the grade of each structure placed by means of an automatic level or other means approved in writing by CCU. All pipes and manholes shall be installed within tolerance levels of the laser apparatus as approved in writing by CCU.

3.3 MARKER BALLS AND METALLIC MARKER TAPE

a. Marker balls and metallic marker tape: The tape shall be marked green for sewer. The metallic tape shall be laid 12 to 18 inches above the pipe and the ball markers placed directly on top of the pipe or fitting. Marker balls shall be placed on all wyes and tees.

b. Installation: On vertical and horizontal deflections of the sanitary sewer service lateral, the marker ball shall be placed on all fittings.

c. Programming: The contractor shall program all balls and provide a copy of the programmed data in each marker ball in either Microsoft EXCEL or Access electronic format to CCU. The contractor as-built drawings shall show the location of all marker balls.

3.4 PIPE JOINTING

3.4.1 Joints for gravity sanitary sewer PVC and DI pipe shall be made by the use of push on rubber gaskets only. All jointing procedure shall be in accordance with the recommendations of the pipe manufacturer as approved in writing by CCU.

3.4.2 All sliding surface of joints shall be cleaned and lubricated immediately before the pipe is brought home.

3.4.3 Only in specific locations approved in writing by CCU, the contractor may use a fitting based on the eight-tenths rule for service connections only.

3.4 SERVICE CONNECTIONS, WYES, TEES

3.4.1 General

The appropriate size service connections, wyes, tees shall be installed for service connections in accordance with the engineering drawings, the CCU standard details and/or at locations as determined by CCU. The joints and bedding shall be made as previously specified. The tops of all risers and openings to wyes and/or tee branches shall be capped by a slip joint plug to prevent

any water from entering the service until the connection is place in service. A clean out as specified in the CCU standard details shall be installed at the end of all service connections which is either at the right-of-way or property line.

3.4.2 Pre-Installation and Post-Installation Television Inspection of Existing Sewer Main

When the new sewer services are being connected to the existing sewer main, the contractor shall video (TV) inspect the existing sewer main immediately before and after the new sewer services installation to verify the existing pipe conditions. The audio, video, and written records shall be provided to CCU for review.

3.4.3 Records and Location of service connections

The contractor shall keep written records of service connection, wye, tee locations, depth to top of riser, type of connection for completion of as-built drawings. A locate ball shall be placed on the service connection at the clean out location which is either at the right-of-way or property line. The wye or tee location shall be made to the nearest manhole center downgrade from the service.

3.5 SETTING MANHOLES

3.5.1 Manholes shall be set and jointed to the line in the manner specified for laying and jointing pipe and at location(s) as shown on the engineering drawings, the CCU standard details and/or as directed by CCU.

3.5.2 Frames and covers shall be set to the designated elevation on a precast concrete riser section. The bottom of all manholes shall be constructed of half section of equivalent size pipe shaped to conform to the inlet and outlet pipe so as to allow a free, uninterrupted flow.

3.5.3 A minimum of one (1) and a maximum of three (3) four (4) inch precast adjusting rings shall be provided between the cast iron frame and the top concrete manhole section on a full bed of non-shrinking mortar with non-shrinking mortar between rings. The interior and exterior of rings shall be grouted.

3.5.4 The manholes shall be assembled/erected such that they are waterproof. The interlocking joints between manhole sections shall be sealed using a joint seal previously specified. A continuous and overlapping at its end outside wrap as previously specified shall be installed for all manhole joints between sections.

3.5.5 Not less than three (3) and not more than four (4) lifting holes shall be allowed in any pre-cast manhole section. All lifting holes shall be plugged with non-shrinking mortar and internally and externally coated to ensure a waterproof installation.

3.5.6 Precast concrete bases shall be of size and depth in accordance with the CCU standard details. Concrete used shall have a 28-day compressive strength of at least 3,000 pounds per square

inch. Bases must be placed in a waterless excavation on a minimum of eight inches of Number 57 stone thoroughly compacted and leveled off across the entire width of the base.

3.5.7 Manhole drop sections shall be constructed in accordance with the CCU standard details.

3.6 BEDDING, BACKFILL, AND COMPACTION

3.6.1 All bedding, backfill and compaction shall meet the requirements of CCU Standard Design Details.

3.7 QUALITY ASSURANCE

3.7.1 General:

The contractor shall verify the operability of the gravity sanitary sewer including service connections installed and manholes prior to CCU acceptance of the system. Verification of the operability of the gravity sanitary sewer including service connections and manholes includes cleaning of the gravity sanitary sewer and manholes prior to TVing, flow testing of gravity sanitary sewer, mandrel deflection testing, vacuum testing of manholes, and air pressure testing of gravity sanitary sewer including service connections in accordance with the specifications and the CCU standard details. The gravity sanitary sewer flow testing and mandrel deflection testing (if required) shall be conducted after the air pressure testing of the gravity sanitary sewer and after the backfilling is complete above the gravity sanitary sewer. Oil filled gauges shall only be used for all pressure tests. All failed testing shall be redone at no cost to CCU. The specifics of all these tests are outlined in the CCU standard details except for deflection testing as outlined herein:

3.7.2 Gravity Sanitary Sewer Main Air Test:

a. Gravity sanitary sewer system testing (inclusive of sewer mains, sewer services, and manholes) shall only be conducted after the placement and compaction of backfill and base materials are completed, and the compaction has been tested and approved.

b. All services shall be installed prior to testing the gravity sanitary sewer main.

c. All gravity sanitary sewer pipe shall be air tested as follows:

1. The sewer main shall be flushed and cleaned prior to the air test.

2. The section of gravity main to be tested shall be isolated with air filled stoppers or plugs suitable for air testing.

3. The services shall be capped and weighted to preclude blowing off during the test.

4. Air shall be added slowly to the test section so that the test pressure equals 4.0 psig.

5. Test air pressure shall be maintained within 0.5 psig of the test pressure by regulating the air supply for a period of two (2) minutes to stabilize the temperature.

6. After two (2) minutes the air supply shall be disconnected and the pressure in the pipe adjusted to 3.5 psig.

7. Measure the time required for a one (1) psig drop in pressure using a stop watch.

8. Compare the recorded time with the allowable time in the following table:

Length of Test Section (Ft)	Test Time (Min:Sec)	
	10" Dia. Pipe	8" Dia. Pipe
150 & Less	7:34	9:26
175	7:34	9:26
200	7:34	9:26
225	7.34	9:53
250	7.34	9:53
275	7:35	11:52
300	7:35	11:52
325 & Greater	8:50	13.50

9. If the recorded time is less than allowable loss. Replace the defective fittings and pipe and re-test until a satisfactory test is achieved.

3.7.3 Gravity Sanitary Sewer Main Flow Test:

All installed gravity sanitary sewer main piping shall be flushed with a high-pressure water hose and televised with an in-line video camera having pan and tilt capabilities. A calibrated depth gauge shall be mounted to allow the camera to show the residual water in the main. Deviation from line or grade shall not be more than ½ inch for linear and ½ inch for grade. All sewer laterals shall be inspected.

3.7.3.1 Test results:

The contractor shall provide CCU audio, video, and written records of the flow testing for review and approval.

3.7.4 Gravity Sanitary Sewer Deflection Test:

Deflection tests shall be performed on all plastic gravity sanitary sewer pipes at the discretion of CCU based upon field observations indicating non-conformance(s). The test shall be conducted after the sewer trench has been backfilled to the desired finished grade and has been in place for 30 days. The deflection test shall be performed by pulling a rigid ball or nine-point mandrels

through the pipe without the aid of mechanical pulling drives. The ball or mandrel shall have a minimum diameter equal to 95% of the actual inside diameter of the pipe. The maximum allowable deflection shall not exceed five percent of the pipe's internal diameter. The line will be considered acceptable if the mandrel can progress through the line without binding. The time of the test, the method of testing, and the equipment to be used for the test shall be subject to the approval in writing of CCU.

All testing shall be performed by the Contractor at his expense without any direct payment being made therefore, and he shall furnish all necessary equipment and materials required.
Test Failure and Remedy: In the event of test failure on any test section, the section shall be replaced, with all repair work subject to approval in writing by CCU. The replaced section shall be retested for leakage and deflection in conformance with the specifications contained herein. All repairs, replacement, and retesting shall be at the Contractor's expense.

3.7.5 Manhole Testing:

a. All Manholes shall be vacuum tested. Vacuum testing shall be done in accordance with the following table:

Manhole Depth (Ft)	Min. Test Time (Sec) (4' Dia. Manhole)
4	10
6	15
8	20
10	25
12	30
14	35

b. Procedure: Induce a back pressure of 5.0 psi, equivalent to 10" Hg (Mercury). Allowable loss is less than 1" Hg for the length of the time specified.

3.7.6 Internal Coating Thickness Testing:

3.7.6.1 Polyurethane resin system, epoxy and polymorphic resin and pure-fused calcium aluminate mortar coatings shall be high voltage spark tested in accordance with ASTM D-4787 using a Model AP/W Tinker Razor Holiday Detector or CCU approved equal device to verify the dry film thickness of the coating is as required by the manufacturer or engineering drawings. A test voltage of 100 volts/mil of coating thickness shall be applied to the coating. All pinholes and any other areas damaged by the test shall be marked and repaired by the contractor in accordance with the coating manufacturer's specification.

3.7.6.2 Wet coatings shall be tested using a thickness gauge in a minimum of three locations: one towards the top and one towards the bottom and one in the center of the structure as approved in writing by CCU.

3.7.6.3 All thickness testing shall be witnessed by CCU personnel.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and construction of force main projects. The force mains, if applicable, shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit.

1.1 SCOPE

1.1.1 General

This specification provides the requirements for the design, selection of materials and construction of force main for the projects.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools and all other associated appurtenances, necessary to do the work required under the contract to include but not be limited to unloading, hauling, and distributing all pipe, fittings, valves and appurtenances. The Contractor shall also remove any surfacing as required; excavate the trenches and pits to the required dimensions; construct and maintain all required traffic control devices and appurtenances; sheet, brace, and support the adjoining ground of all adjacent structures where necessary; furnish all pipe, pipe bend sections, jointing material, restraints, stainless steel stiffeners, bedding material and all other appurtenances; laying, furnishing and installing flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures; handle all drainage or ground water; provide barricades, guards, and warning lights; lay and test the pipe, valves, fittings and appurtenances; place all marking and locating devices, backfill and consolidate the trenches and pits; maintain all surfaces over the trench until surface restoration is completed; restore the surfaces; remove surplus excavated material; and clean the site of the work.

The Contractor shall also furnish all labor, materials, equipment, tools and all other associated appurtenances required to rearrange sewers, conduits, ducts, pipes, or other structures encountered in the installation of the work.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the construction of the force mains with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the written consent of the Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Force Mains

Direct bury and directional bore force main pipe shall be paid for at the contract bid price per lineal foot for each size and type of specified which shall include the cost of furnishing all pipe, pipe bend sections, jointing material, restraints, stainless steel stiffeners, bedding material and all other appurtenances and of delivering, handling, laying, dewatering, trenching, sheeting and backfilling, furnishing and installing flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures (unless separate bid item is provided), testing, restoring the surface (unless separate bid item is provided), necessary permits, and all material or work necessary to install the pipe complete in place at the depth specified on the plans and/or as directed by CCU.

The length of pipe for direct bury installation for which payment is made shall be the actual overall length measured along the axis of the pipe without regard to tee sections or bend sections. All lengths shall be measured in a horizontal plane unless the grade of the pipe is more than fifteen percent (15%). No payment consideration will be given to depth zones for the installation of the force mains.

The length of pipe for directional bore force main pipe shall be measured by the length pipe before installation and subtracting the lengths of the pipe cut from the ends of pipe when the bore pipe is connected to the pipe on either end. The difference is the length of the pipe in the ground.

1.2.2 Ductile Iron Fittings

Ductile iron fittings shall be paid for by the contract bid price by weight (latest revision of AWWA C153) and shall include all labor, equipment, materials, and all associated appurtenances to install the ductile iron fittings. Restraints shall be considered incidental to the ductile iron fittings contract bid price and no direct payment will be made. Any other items necessary for the installation of the ductile iron fittings that are not included in the manufacturer's specified weight,

including but not limited to bolts, gaskets, jointing materials, labor, and testing shall be considered incidental to the project.

1.2.3 Tie Back Assembly (for Existing Facilities Only)

The tie back assembly, if required, for connection to existing facilities which are not properly restrained, shall be paid for at the contract bid price per each which shall include the cost of furnishing tie back assembly device, stainless steel threaded rods, fittings, concrete blocking, restraints and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans.

1.2.4 Thrust Block

Thrust blocks, if required, for connection to existing facilities which are not properly restrained, shall be paid for at the contract bid price pe each thrust block for the size of pipe involved which shall include the cost of furnishing thrust block and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans.

1.2.4 Locate Balls and Marker Tape

a. Locate balls shall be paid for at the contract bid price per each which shall include all labor, equipment, materials, and associated appurtenances to install and program the marker balls and submit the marker ball data to CCU.

b. Marker tape shall be considered incidental to the force main.

1.2.5 Testing

All required testing shall be considered incidental to the project and no direct payment will be made.

1.2.6 Line Stops

The installation of line stops shall be paid for at the contract bid price per each based on size specified in the bid form and shall include the cost of labor, material, equipment and all other associated appurtenances required to complete the installation of line stops in accordance with the Contract Documents. The installation of line stops on existing reclaimed water mains shall be approved by CCU EOR before Contractor proceeds and coordinated with CCU Operations.

1.2.6 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct payment will be made.

1.3 PARTIAL LISTING OF REFERENCED STANDARDS (LATEST REVISION)

AWWA:

C-105 Polyethylene Encasement for Ductile-Iron Pipe Systems
C-111 Rubber – Gasket Joints for Ductile-Iron Pressure Pipe Fittings
C-116 Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
C-151 Ductile-Iron Pipe, Centrifugally Cast
C-153 Ductile-Iron Compact FittingsC-600 Installation of Ductile-Iron Mains and their Appurtenances
C-651 Disinfecting Water Mains
C-652 Disinfection of Water-Storage Facilities C-900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
C-906 Polyethylene (PE) Pressure Pipe Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
C-909 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger

ASTM:

A-139 Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over),
B-117 Standard Practice for Operating Salt Spray (Fog) Apparatus
D-1120 Standard Test Method for Boiling Point of Engine Coolants,
D-1248 Polyethylene Plastics Extrusion Materials for Wire and Cable,
D-1308 Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems
D-1598 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
D-1599 Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings,
D-1785 Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 1201,
D-1869 Rubber Rings for Fiber-Reinforced Cement Pipe,
D-2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series),
D-3350 Polyethylene Plastics Pipe and Fittings Materials,
E-96 Standard Test Methods for Water Vapor Transmission of Materials
G-95 Standard Test Method for Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method)

FDEP: Wastewater Collection/Transmission System Requirements

AASHTO Code

Florida Administrative Code

Ten States Recommended Standards for Wastewater

Note: This is only a partial listing of related references. The Contractor shall be responsible to review the entire contract documents.

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
001760 - Surveying and Record Drawing
002240 - Dewatering
002330 - Low Pressure Force Mains
002340 - Valves
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design
002930 - Grassing
009900 - Surface Preparation, Painting and Coating

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

The Contractor shall submit complete detailed documentation of all materials for approval by CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

The Contractor shall provide proof of supplier certification/training for thermal butt-fusion of pipe for any employee fusing pipe.

Final written approval is at the discretion of the CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions

2.1.1 General

The materials used in this work shall be all new and conform to the requirements for class, kind, size, and material as specified below.

All pipes furnished for force main installations shall be of the type, kind, size, and class indicated for each particular line segment as shown on the engineering drawings and/or designated in the Contract Items.

2.1.2 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

a. PVC Pipe: PVC pipe for force mains shall conform to the requirements of AWWA C-900 (4" through 60"), and AWWA C-909 (4" through 24") and shall be Class 150 DR 18 for all open cut and direct bury installations with a minimum of forty-eight (48) inches of cover. For shallower depth, the type of pipe and installation shall require prior written approval by CCU. The manufacturer shall insure all quality control test and AWWA requirements are complied with during the production of PVC pipe.

b. C-900, and C-909 pipes shall have an integral bell formed with a race designed to accept the gasket in accordance with their respective AWWA requirements. The spigot end shall have a bevel and a stop mark on the outside diameter to indicate proper insertion depth. Provisions shall be made for expansion and contraction at each joint. All surfaces of the joint where the gasket may bear shall be smooth, free of cracks, fractures, or imperfections that could adversely affect the performance of the joint.

c. Pipe Color: All C-900 and C-909 force main pipes shall be green in color with a PVC ASTM D-1120 and ASTM D-2241 reference, the class pressure rating, and the DR number permanently and plainly marked on the pipe.

d. Rubber Gasket Joints: C-900, and C-909 polyvinylchloride pipe joints shall be the bell and spigot type using rubber gasket push-on type joints. Rubber gaskets shall be molded to a circular form to the proper cross section and shall consist of a vulcanized high grade elastomeric compound conforming to ASTM D-1869 and AWWA C-900 elastomeric seals for joining plastic pipe.

e. Fittings: All ductile iron fittings shall be in accordance with AWWA Specification C-153 and as a minimum have the same pressure rating of the connecting pipe. All ductile iron fittings shall be either:

   - fusion bonded epoxy coated as per AWWA Specification C-116 or
   - ceramic epoxy coated as per ASTM Specifications, G-95, B-117, D-1308 and E-96

   All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel and all buried fasteners such as bolts, nuts, fasteners, and washers shall be "Cor-Ten" steel or Cor-blue coated. Threaded rod for buried applications shall be Type 316 stainless steel. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

f. Fastener Threads: All stainless-steel fastener threads shall be coated with an anti-seize compound as approved in writing, by CCU.

2.1.3 High Density Polyethylene (HDPE) Pipe and Fittings

a. High Density Polyethylene (HDPE) pipe shall meet the requirements of AWWA C-906 for polyethylene pressure pipe and fittings and for PE-3408 SDR 11. HDPE pipe shall meet ASTM D-3350 cell classification of PE 345434C. Permanent identification of the pipe shall be provided by co-extruding green longitudinal stripes into the pipes outside surface for force mains. All polyethylene piping shall have ductile iron pipe nominal outside diameters.

   Individual sections of HDPE piping shall be joined together by thermal butt-fusion to make a continuous section of pipe as recommended by the pipe manufacturer. Bends in HDPE pipe shall not be within ten (10) pipe diameters from any fitting or valve. The minimum radius of curvature shall be per the pipe manufacturers recommendation and bending shall not cause kinking. HDPE piping shall not be joined by solvent cements, adhesive or threaded type connections.

   The color marking stripes shall be aligned during the fusing process and the pipe shall be pulled through the bore to allow identification of the type of system utilizing the HDPE pipe.

b. All mechanical joint fittings and sleeves used with high density polyethylene (HDPE) pipe shall be fusion bonded epoxy coated ductile iron with mechanical joints rated to 350 psi and conforming to AWWA C-153 and C-111. All MJ fitting connections to polyethylene pipe shall be restrained with Mega-Lug restrainers. The HDPE pipe shall be reinforced on the ends using stainless steel wedge internal stiffeners.

   The mechanical connection to MJ fittings and sleeves shall use mechanical restraints that meet specification requirements. Size-on-size mechanical connection to PVC or DI pipe shall be by compact ductile iron solid sleeve FBE Coupling with Mega-Lug restrainers.

   No electro fusion fittings shall be used with HDPE unless written approval is provided by CCU.

   HDPE molded butt fittings and couplings for non-standard fittings and couplings shall require written approval from CCU for installation.

2.1.4 Ductile Iron Pipe and Fittings

a. The ductile iron pipe covered by this specification shall be the push-on joint type or mechanical joint type, centrifugally cast to conform to all requirements of AWWA Specifications C-151 and C-153, latest revisions.

   The maximum allowable deflection of the pipe shall be per the pipe manufacturers recommendation. Ductile iron pipe will be fully encased in an 8-mil polyethylene sleeve, in accordance with AWWA C-105, Method A. The pipe and the polyethylene sleeve shall be color coded green by a means acceptable to the CCU.

b. All piping and fittings shall be either:

- fusion bonded epoxy coated as per AWWA Specification latest revision or
- ceramic epoxy coated as per ASTM Specifications G-95, B-117, D-1308 and E-96

c. Polyethylene material shall conform to ASTM Standard Specification D1248-, latest revision. All ductile iron piping shall be marked "DUCTILE IRON" in large letters. The nominal wall thickness shall be legibly marked on each piece of pipe and the pipe installed so that the markings can be read from the top of the trench.

Minimum thickness of ductile iron pipe shall be as follows:

3” Ductile Iron Pipe	0.25”	Class 51
4” Ductile Iron Pipe	0.26”	Class 51
6” Ductile Iron Pipe	0.25”	Class 50
8” Ductile Iron Pipe	0.27”	Class 50
10” Ductile Iron Pipe	0.29”	Class 50
12” Ductile Iron Pipe	0.31”	Class 50
14” Ductile Iron Pipe	0.33”	Class 50
16” Ductile Iron Pipe	0.34”	Class 50
18” Ductile Iron Pipe	0.35”	Class 50
20” Ductile Iron Pipe	0.36”	Class 50
24” Ductile Iron Pipe	0.38”	Class 50
30” Ductile Iron Pipe	0.39”	Class 50
36” Ductile Iron Pipe	0.43”	Class 50
42” Ductile Iron Pipe	0.47”	Class 50
48” Ductile Iron Pipe	0.51”	Class 50
54” Ductile Iron Pipe	0.57”	Class 50

d. Rubber gasket joints shall be in accordance with AWWA Specification C-111 latest revision.

e. All fittings shall be in accordance with AWWA Specification C-153 latest revision and have the same pressure rating of the connecting pipe. All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel. All buried fasteners such as bolts, nuts, and washers shall be “Cor-Ten” steel or Cor-blue coated steel. Threaded rod shall be Type 316 stainless steel for buried applications. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

f. All stainless-steel fasteners threads shall be coated with an anti-seize compound as approved in writing, by CCU.

g. All tapping sleeves shall be 316 stainless steel.

2.1.5 Pipe and Fittings Unloading at Site

The contractor shall inspect each shipment of pipe and fittings and make provisions for a timely replacement of any damaged material. The contractor shall unload by hand or use canvas slings to avoid scratching the pipe. The contractor shall not sling or drag pipe over an abrasive surface. Pipe or fittings damaged during handling shall be removed from the site and replaced with new pipe and/or fittings. The contractor shall follow the manufacturer's storage specification and store pipe and fittings in such a manner that prevents damage due to crushing, piercing, excessive heat, harmful chemicals, and exposure to sunlight. Pipe and fittings shall be stored in a dry and secure area.

2.1.6 Marker Balls and Marker Tape

a. Force main marker balls shall be 3M 4 inch marker ball green in color.

Force main marker tape stripes shall be green in color.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

Direct Bury, Directional Bore, and Jack and Bore: All direct bury, directional bore, and jack and bore force main pipe shall be installed at a minimum depth of forty-eight (48) inches to the top of the force main or as approved in writing by CCU. If additional fittings are required where not shown on the engineering drawings to maintain alignment around curves, the Contractor shall provide the required number fittings and be compensated at the unit price as proposed on the bid form.

NOTE: If the new construction is tying into existing utilities, the Contractor shall verify the existing utilities, such as fittings and valves, are restrained prior to the start of installation of the valve or piping. If not properly restrained, the contractor shall notify CCU in writing and shall restrain the existing utility as approved in writing by CCU.

3.1.1 Direct Bury of Material

a. Open cut PVC force main piping shall be Class 150 DR 18 for all areas with a minimum of forty-eight (48) inches of cover. For shallower depth, the type of pipe and installation shall require prior written approval by CCU. Any pipe left in the trench overnight shall be plugged or capped and watertight. Bags, plastic and tape will not be allowed. Force mains shall be installed at a consistent depth.

b. Proper implements, tools, and facilities satisfactory to the CCU shall be provided and used by the Contractor for the safe and convenient execution of the work and the testing. All pipe, fittings, and valves shall be carefully lowered into the trench in such a manner as to prevent damage to force main materials and protective coatings and linings. The force main materials shall not be

dropped or dumped into the trench. The pipe shall be laid with the manufacturers lettering designating the type and size of pipe visible from the top of the open trench. Wherever it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane to avoid obstructions or where long-radius curves are permitted, the amount of pipe or joint deflection shall not exceed fifty (50) percent of the manufacturer's recommended limit. Pipelines intended to be straight shall not deviate from the straight line.

c. Open cutting of roads for trenching and direct bury of force mains shall not exceed 8’ in width unless specified otherwise in contract documents. All effort shall be made to minimize the width of the trench and the amount of restoration.

d. As directed by CCU, all existing materials removed to facilitate the tunneling or deflecting of direct bury piping under or adjacent to existing storm piping and/or structures shall be replaced by flowable fill. Prior to placing flowable fill, the area between the direct bury piping and existing piping or structure shall be hollowed out to a defined cavity along the length of the direct bury piping. The Contractor is responsible for filling the entire cavity with flowable fill and replacing the flowable fill as necessary throughout the contract and warranty period should erosion occur.

e. PVC pipe may be laid in the trench in single sections or preassembled multiple sections including no more than 1 full stick of pipe, 1 partial stick of pipe, and intervening required fittings and/or valves. Preassembled sections of pipe shall be carefully fed by hand or with the use of approved equipment on the pipe bed. The contractor shall provide pockets in the pipe bed material to eliminate any concentration of loads on the bell ends or joints. The ends of mechanical joint pipe and fittings and rubber gasket joint pipe and fittings shall be clean of all dirt, grease, and foreign matter prior to installing fittings or joining of pipe sections. A joint lubricant shall be applied to all gaskets prior to joining two pipe sections together. To preclude the possibility of cross usage between force main and potable water piping, the joint lubricant shall have been tested and approved for potable water service. No lubricant shall be used that harbor bacteria or damage the gaskets.

f. Cutting pipe for inserting valves, fittings, or closure pieces shall be in a neat and workmanlike manner without damaging the pipe or lining and so as to leave a smooth end at right angles to the axes of the cut pipe. The cut end of mechanical joint pipe shall be dressed to remove sharp edges or projections which may damage the rubber gasket. For push-on joints, the contractor shall dress the pipe cut ends by beveling as recommended by the manufacturer.

3.1.2 Directional Bore of Material

a. Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and convenient execution of the work. The Contractor shall meet the jointing and cutting pipe direct bury force main piping requirements as they apply to the directional bore. A log of the bore depths shall be based on one foot intervals staking from the entry and exit locations and intermediate centerline. The vertical and horizontal location readings shall be plotted on a one inch (1") equals twenty feet (20') natural scale drawing which shall be provided to CCU within 48 hours of completion of the bore.

No electro fusion fittings shall be used with HDPE unless written approval is provided by CCU.

b. For force mains eight (8") inches in size or smaller, the HDPE pipe shall have the same outside diameter as the connecting mains. For larger sizes, the HDPE pipe shall have the same size or larger inside diameter as the connecting mains unless otherwise noted on the plans; provided for in the Special Provisions; or approved in writing by CCU.

c. The depth of all directional bores for FDOT roads shall be in accordance with the FDOT permit requirements.

d. The slurry may be recycled for reuse in additional hole opening operations if approved in writing by CCU or it shall be removed and disposed of at an approved dump site. No fluids shall be allowed to enter any unapproved areas or any waterways.

e. For directional bores under any surface water (subaqueous) the drilling contractor must submit a 'frac-out' response plan to CCU and, as required, to permitting agencies for review and approval prior to starting the directional bore. During execution of all subaqueous directional bores, the drilling contractor must have at the site the necessary material, equipment, and manpower to properly respond to a 'frac-out' in accordance with the 'frac-out' response plan.

f. All bores two (2") inches or larger in diameter (except for service lines) shall have two tracer wires attached to the bore. All tracer wire shall be a 10 AWG, steel reinforced, insulated copper tracer wire, with a minimum of 2,000-pound break load. The Contractor shall submit the selected tracer wire to the CCU for written approval. It shall run continuously with and shall be securely fastened to the utility main. All tracer wire shall be in compliance with the following:

   I. All tracer wire termination points must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose and with the CCU approved load rating.

   II. All grade level/in-ground access boxes shall be appropriately identified with "sewer" cast into the cap and be color coded.

   III. A minimum of 20 ft. of excess/slack wire is required in all tracer wire access boxes after meeting final elevation.

   IV. All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the tracer wire connection and the terminal for the grounding anode wire connection.

   V. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

   VI. The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the project with CCU staff present.

g. <u>Boring Failure</u>

The Contractor shall maintain a copy of a Frac-out contingency plan on the construction site and provide a copy to CCU. The Contractor's Frac-out plan shall meet FDEP permit regulations and other regulatory agency requirements in accordance with the project regulatory permits where applicable. (Frac-out is a condition where drilling mud is released through fractured rock or soil and travels toward the surface.)

If conditions warrant removal of any materials installed in a failed bore path, as determined by CCU, it will be at no cost to CCU. Promptly fill all voids with excavatable flowable fill.

If an obstruction is encountered during boring which prevents completion of the installation in accordance with the design location and specification, the pipe may be taken out of service and left in place at the discretion of CCU. Immediately fill the product left in place with excavatable flowable fill or capped at the discretion of CCU. Submit a new installation procedure and revised plans to CCU for written approval before resuming work at another location.

h. Quality Control

The Contractor shall submit a description of the quality control methods they propose to use in the directional drilling operations to CCU for written approval at least 10 days prior to the start of directional drilling. The submittal shall include procedures for controlling and checking line and grade and field forms for establishing and checking line and grade to comply with the required limitations.

i. Control of Line and Grade

The Contractor shall establish and be fully responsible for the accuracy of their own control for the construction of the entire project, including structures, bore hole line and grade.

The Contractor shall:

a. Establish control points a sufficient distance away from the bore hole operation not to be affected by construction operations.
b. Check control for the bore alignment against an above ground undisturbed reference at least once each hour and once for each 50 feet of bore hole constructed, or more often as needed or directed by CCU.
c. Drill pilot holes to ensure the required vertical clearances from ditch, river, or wetland bottoms, and horizontal clearances from buffers or easement lines are maintained. The contractor shall monitor and record horizontal and vertical boring hole locations at twenty-five-foot (25') intervals or any change in line and grade. If the pilot hole exists in buffers or outside of easements as shown on the plans the Contractor shall be responsible for grouting the hole to the satisfaction of CCU. If the pilot hole deviates outside of its permitted limits, the drill string shall be withdrawn, and the borehole grouted to the satisfaction of CCU.

j. As-Built plans for on-grade bores shall indicate the depth of both pipe inverts and verify the grade. As-Built plans shall conform to the Charlotte County Utility's "Minimum Drawing Requirements".

3.1.3 Marker Balls and Metallic Marker Tape

a. Contractor shall provide and install metallic marker tape and provide, program, and install marker balls for all installed trenched pipe. For trenchless pipe installations the Contractor shall provide, program, and install marker balls. Metallic marker tape is not required on trenchless pipe installations. The metallic marker tape shall be marked green for wastewater. The metallic tape shall be laid 12 to 18 inches above the pipe and the ball markers placed directly on top of the pipe or fitting. For trenchless pipe installations the marker balls shall be placed with a minimum of 18 inches of cover and no deeper than 3 feet of cover with the exception that no marker balls are required for that portion of pipe that lies beneath the water surface at a subaqueous crossing.

b. Installation: The balls shall be installed at all changes of direction and fittings absent of any valve. For cul-de-sacs having continuous fused or roll piping with no in-line fittings, the balls shall be placed starting at the point of curvature of the cul-de-sac and every 50 linear foot to the end of the line. On straight runs of pipe, the balls shall be installed at every power pole. If power poles do not exist, the balls shall be placed every 150 feet from the nearest change of direction or fitting. At road and driveway crossings the marker balls shall be placed on each side of the road or driveway, two feet from the pavement or driveway edge, or as otherwise approved in writing by CCU. On vertical deflections the marker ball shall be placed on the top fitting only.

c. Programming: The contractor shall program all balls and provide a copy of the programmed data in each marker ball in either Microsoft EXCEL or Access electronic format to CCU. The contractor as-built drawings shall show the location of all marker balls.

3.1.4 Fittings

When tightening bolts, the contractor shall bring the gland up toward the flange evenly while maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. Tighten all nuts progressively a little at a time. DO NOT over stress bolts to compensate for poor alignment. If effective sealing is not attained at the maximum allowable torque, disassemble the joint and reassemble again after cleaning. Fittings shall be installed in accordance with the manufacturer's published instructions.

3.1.5 Restraints

Piping shall be restrained in accordance with the CCU standard details restraint table. The table is based on a safety factor of 2.0 and takes into account variables such as type of soil, type and depth of the trench, and depth and type of pipe. In addition, the restraints may be supplemented with thrust blocks or tie-back assemblies. CCU may require the engineer to provide the dimensions and calculations of the thrust block for written approval by CCU prior to construction.

3.1.6 Storm Sewer Conflicts

Force mains that must be installed with less than 12 inches of clearance under storm sewer pipes or structures due to existing physical limitations that prohibit deflection or directional drilling, require construction of a bridging structure that is acceptable to CCU to support the storm sewer prior to installation of the force main. The force main pipe section under the storm sewer pipe or structure shall be replaced with a single 20 LF stick of ductile iron pipe centered under

the storm sewer pipe or structure. The ductile iron pipe shall be fully encased in an 8-mil polyethylene sleeve in accordance with AWWA C-105, Method A. Polyethylene material shall conform to ASTM Standard Specification D 1248-68. The contractor shall submit details of the proposed bridging structure and force main pipe installation to CCU for review and written approval prior to the start of construction at the conflict location.

Force mains that must be installed over storm sewer with less than adequate depth shall be armored in accordance with Standard Details and as approved in writing by the CCU.

3.1.7 Potable Water Main Crossing

All force mains shall cross potable water mains and reclaimed mains at ninety (90) degrees or as approved in writing by CCU.

3.2 TESTING MAINS AND TAPPING SLEEVES

All pressure tests shall be in accordance with AWWA C-600, latest revision. A pressure test shall be required for all installations of force mains and all appurtenances.

3.2.1 Pressure Test

a. Pipe:

The contractor shall hydrostatically pressure test all PVC, HDPE, and DI force mains in accordance with the latest revision of AWWA C-600 series as applicable. Oil filled gauges only shall be used for all pressure tests. The tests shall be at 150 psi for a period of two (2) hours. The allowable loss for one (1) hour shall be determined by the following formula:

$$\text{Allowable Leakage} = \frac{(D)\,(L)\,(PY)}{133{,}200}$$

Where: D = nominal diameter of the pipe in inches
L = length of pipe in feet
PY= square root of test pressure during the leakage test in pounds per square inch

Calibrated test equipment shall be on site to verify the loss of water during the testing period. Pressure testing shall not exceed 1500 linear feet unless otherwise approved in writing by CCU.

b. Tapping Sleeves:

All force main tapping sleeves shall be hydrostatically pressure tested in accordance with the latest revision of AWWA C-600. The test shall be conducted at 150 psi for a period of two (2) hours. No loss of pressure is allowed.

c. Procedures:

Each section of pipe between valves, between the tapping sleeve and the pipe, and/or the valve and the tapping sleeve shall be slowly filled with water from a safe source, and the specified test pressure shall be applied by means of a water pump in a manner satisfactory to CCU. In the case of testing a pipe where valves do not exist, the contractor shall plug the end of the line as approved in writing, by CCU. The pump, pipe, and/or tapping sleeve connections, gauge, and all necessary apparatus shall be furnished by the contractor and shall be approved in writing by CCU prior to conducting any test. All necessary pipe taps for testing shall be made by the contractor as approved in writing, by CCU. CCU may request testing of isolated portions between valves within the test section if a portion of that main has critical components such as multiple fittings at an extreme deflection. The contractor shall be responsible to remove any pipe taps installed for this purpose upon completion of the test as approved in writing, by CCU.

Pressure testing shall be measured from sample points and/or blow-off assemblies for force main pressure tests. CCU shall witness all tapping sleeves and force main pressure tests.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials and construction of low-pressure sewer system projects. The low-pressure sewer systems, if applicable, shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit.

1.1 SCOPE

1.1.1 General

This specification provides the requirements for the design, selection of materials and construction of low-pressure sewer systems for the project.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances, necessary to do the work required under the contract to include but not be limited to unloading, hauling, and distributing all pipe, casting, fittings, valves, and appurtenances. The Contractor shall also remove any surfacing as required; excavate the trenches and pits to the required dimensions; construct and maintain all required traffic control devices and appurtenances; sheet, brace, and support the adjoining ground of all adjacent structures where necessary; furnish all pipe, pipe bend sections, jointing material, restraints, stainless steel stiffeners, bedding material and all other appurtenances; laying, furnishing and installing flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures; handle all drainage or ground water; provide barricades, guards, and warning lights; lay and test the pipe, valves, fittings, and appurtenances; place all marking and locating devices, backfill and consolidate the trenches and pits; maintain all surfaces over the trench until surface restoration is completed; restore the surfaces ; remove surplus excavated material; and clean the site of the work.

The Contractor shall also furnish all labor, materials, equipment, tools, and all other associated appurtenances required to rearrange sewers, conduits, ducts, pipes, or other structures encountered in the installation of the work.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the construction of the low-pressure sewer systems with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the written consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Low-pressure Sewer System Main

Direct bury and directional drill low-pressure sewer system main shall be paid for at the contract bid price per lineal foot for each size and type of material specified which shall include the cost of furnishing all pipe, pipe bend sections, jointing material, restraints, stainless steel stiffeners, bedding material and all other appurtenances, and of delivering, handling, laying, dewatering, trenching, sheeting and backfilling, furnishing and installing flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures (unless separate bid item is provided), testing, restoring the surface (unless separate bid item is provided), necessary permits, and all material or work necessary to install the pipe complete in place at the depth specified on the plans and/or as directed by CCU.

The lengths of pipe for direct bury installation for which payment is made shall be the actual overall length measured along the axis of the pipe without regard to tee sections or bend sections. All lengths shall be measured in a horizontal plane unless the grade of the pipe is more than fifteen percent (15%). No payment consideration will be given to depth zones for the installation of the low-pressure main.

The length of pipe for directional bore installation shall be measured by the length of pipe before installation and subtracting the lengths of the pipe cut from the ends of pipe when the bore pipe is connected to the pipe on either end. The difference is the length of the pipe in the ground.

1.2.2 Ductile Iron Fittings

Ductile iron fittings shall be paid for by the contract bid price by weight (latest revision of AWWA C153) and shall include all labor, equipment, materials, and all associated appurtenances to

install the ductile iron fittings. Restraints shall be considered incidental to the ductile iron fittings contract bid price and no direct payment will be made. Any other items necessary for the installation of the ductile iron fittings that are not included in the manufacturer's specified weight, including but not limited to bolts, gaskets, jointing materials, labor, and testing shall be considered incidental to the project.

1.2.3 Low-pressure Cleanout Assembly

The low-pressure cleanout assembly shall be paid for at the contract bid price per each which shall include the cost of furnishing low-pressure cleanout assembly device, piping, tees, fittings, 2" plug valve and box, 2" PVC ball valve, meter box, restraints and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans. Testing shall be included in the piping test.

1.2.4 Locate Balls and Marker Tape

a. Locate balls shall be paid for at the contract bid price per each which shall include all labor, equipment, materials, and associated appurtenances to install and program the marker balls and submit the marker ball data to CCU.

b. Marker tape shall be considered incidental to the low-pressure sewer system mains.

1.2.5 Service Connections

a. Service connections shall be paid for as outlined below and shall include all labor, equipment, materials, and all associated appurtenances to completely install service connections.
b. Service connection piping shall be paid for as per the contract bid price per lineal foot installed for each size.

c. Brass Nipple shall be paid for as per contract bid price per each installed for each size.

d. Service saddle shall be paid for as per contract bid price per each installed for each service size.

e. Brass Gate Valve shall be paid for as per contract bid price per each installed for each size. The male adaptor shall be considered incidental to the contract bid price for each brass gate valve and no direct compensation will be made therefore

f. Swing Check Valve shall be paid for as per contract bid price per each installed for each size.

g. Ball Valve shall be paid for as per contract bid price per each installed for each size.

h. Low-pressure Tanks shall be paid for as per contract bid price per each installed for each size. The hatches, covers, pump chamber, outlet piping, inlet piping, floats, concrete patio stones and

all other associated appurtenances shall be considered incidental to the contract bid price for each low-pressure tank and no direct payment will be made.

i. Low-pressure Pumps shall be paid for as per contract bid price per each installed for each size. The electrical panels, electrical conduit, electrical wiring and all other associated appurtenances shall be considered incidental to the contract bid price for each low-pressure pump and no direct payment will be made.

1.2.6 Cleanout Boxes for Low-pressure Cleanout Assembly

a. Cleanout boxes and covers for the low-pressure cleanout assembly shall be rated as follow:

For low vehicle traffic areas such as sidewalk, property line/easement shall be at a minimum ANSI/SCTE Tier 8 rated potable water and reclaimed water cleanout boxes and covers.

For medium vehicle traffic areas such as residential driveways, roadways, and parking lots shall be at a minimum ANSI/SCTE Tier 15 rated cleanout boxes and covers.

For high vehicle traffic areas such as county arterial roadways, state roads, commercial driveways, industrial parks shall be at a minimum ANSI/SCTE Tier 22 rated cleanout boxes and covers.

b. Cleanout boxes and covers shall be green in color

c. All cleanout boxes shall be delivered with the service access holes installed.

d. Cleanout boxes, shall be installed as a double configuration.

1.2.6 Testing

All required testing shall be considered incidental to the project and no direct payment will be made.

1.2. ~~8~~ 7 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (LATEST REVISION)

ANSI: A21.10, A21.53, A 21.11,
AWWA:
C-105 Polyethylene Encasement for Ductile-Iron Pipe Systems
C-110 Ductile-Iron and Gray-Iron Fittings
C-111 Rubber – Gasket Joints for Ductile-Iron Pressure Pipe Fittings

C-116 Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
C-150 Thickness Design of Ductile-Iron Pipe
C-151 Ductile-Iron Pipe, Centrifugally Cast
C-153 Ductile-Iron Compact Fittings
C-600 Installation of Ductile-Iron Mains and their Appurtenances
C-651 Disinfecting Water Mains
C-652 Disinfection of Water-Storage Facilities
C-900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
C906 Polyethylene (PE) Pressure Pipe Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
C-909 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger

ASTM:
A-139 Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
B-117 Standard Practice for Operating Salt Spray (Fog) Apparatus
C-857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
D-790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials,
D-1120 Standard Test Method for Boiling Point of Engine Coolants
D-1248 Polyethylene Plastics Extrusion Materials for Wire and Cable
D-1308 Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems
D-1598 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
D-1599 Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
D-1693 Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
D-1785 (Poly Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 1201
D-1869 Rubber Rings for Fiber-Reinforced Cement Pipe,
D-2241 (Poly Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series),
D3299 Standard Specification for Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks
D-3350 Polyethylene Plastics Pipe and Fittings Materials
E-96 Standard Test Methods for Water Vapor Transmission of Materials
G-95 Standard Test Method for Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method)

AASHTO Code

FDEP: Wastewater Collection/Transmission System Requirements

Florida Building Code: Plumbing, Chapter 10

Florida Administrative Code: 64E-6.013 Florida Health Department Guidelines
International Association of Plumbing and Mechanical Officials (IAPMO) PS 1

Plumbing and Drainage Institute G101

Ten States Recommended Standards for Wastewater

International Association of Plumbing and Mechanical Officials (IAPMO) IGC3-74

Design and Specification Guidelines for Low-pressure Sewer Systems: Prepared by a Technical Advisory Committee for the State of Florida Department of Environmental Regulation in June of 1981

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
001760 - Surveying and Record Drawings
002240 - Dewatering
002310 - Pipe Removal, Disposal, Alteration, Modification or Pipe Abandonment 002325
002325 - Force Mains
002340 - Valves
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design
002930 - Grassing
003300 - Precast Concrete Products
009900 - Surface Preparation Painting and Coating

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents

1.5 SUBMITTALS

The Contractor shall submit complete detailed documentation of all materials for approval by the CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

The Contractor shall provide proof of supplier certification/training for thermal butt-fusion of pipe for any employee fusing pipe.

Final written approval is at the discretion of the CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions.

2.1.1 General

Low-pressure Sewer Systems Mains shall be a minimum of three (3) inches in diameter.

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below.

All pipes furnished for low-pressure sewer systems main installations shall be of the type, kind, size, and class indicated for each particular line segment as shown on the engineering drawings and/or designated in the Contract Items.

2.1.2 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

a. PVC pipe for low-pressure system mains shall conform to the requirements of AWWA C-900 (4" through 60"), and AWWA C-909 (4" through 24") and shall be Class 150 DR 18 for all open cut and direct bury installations with a minimum of forty-eight (48) inches of cover. For shallower depth, the type of pipe and installation shall require prior CCU written approval. Three (3) inch diameter pipe shall be schedule 80 PVC conforming to the requirements of ASTM D-1785. The manufacturer shall insure all quality control test and AWWA requirements are complied with during the production of PVC pipe.

b. C-900, , and C-909 pipes shall have an integral bell formed with a race designed to accept the gasket in accordance with their respective AWWA requirements. The spigot end shall have a bevel and a stop mark on the outside diameter to indicate proper insertion depth. Provisions shall be made for expansion and contraction at each joint. All surfaces of the joint where the gasket may bear shall be smooth, free of cracks, fractures, or imperfections that could adversely affect the performance of the joint.

c. Schedule 80 PVC piping shall be joined by solvent cements, adhesive, or threaded type connections. These materials shall be approved in writing by CCU prior to their use.

d. Pipe Color: All C-900, and C-909 low-pressure sewer system main piping shall be green in color with a PVC ASTM D-2241 reference, the class pressure rating, and the DR number permanently and plainly marked on the pipe. For schedule 80 PVC piping marker tape stripes shall be installed and shall be green in color.

e. Rubber Gasket Joints: C-900, and C0-909 polyvinylchloride pipe joints shall be the bell and spigot type using rubber gasket push-on type joints. Gaskets shall be molded to a circular form

to the proper cross section and shall consist of a vulcanized high grade elastomeric compound conforming to ASTM D-1869 and AWWA C-900 elastomeric seals for joining plastic pipe.

f. DIP Fittings: All ductile iron fittings shall be in accordance with AWWA Specification C-153 and as a minimum have the same pressure rating of the connecting pipe. All ductile iron fittings shall be either:

- fusion bonded epoxy coated as per AWWA Specification C-116 or
- ceramic epoxy coated as per ASTM Specifications F-4176-95A, G-95, B-117, D-1308 and E-96

All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel and all buried fasteners such as bolts, nuts, fasteners, and washers shall be "Cor-Ten" steel or Cor-blue coated. Threaded rod for buried applications shall be Type 316 stainless steel. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

g. PVC Fittings: PVC fittings shall be only be used on schedule 80 PVC piping in accordance with ASTM D-1785 and have the same pressure rating of the connecting pipe. All PVC fittings shall be solvent welded.

h. Fastener Threads: All stainless-steel fastener threads shall be coated with an anti-seize compound as approved in writing by CCU.

2.1.3 <u>High Density Polyethylene (HDPE) Pipe and Fittings</u>

a. High Density Polyethylene (HDPE) pipe shall meet the requirements of AWWA C906 for polyethylene pressure pipe and fittings and for PE-3408 (SDR 11). HDPE pipe shall meet ASTM D-3350 cell classification of PE 345434C. Permanent identification of the pipe shall be provided by co-extruding green longitudinal stripes into the pipes outside surface for low-pressure sewer system mains. All polyethylene piping shall have ductile iron pipe nominal outside diameters.

Individual sections of HDPE piping shall be joined together by thermal butt-fusion to make a continuous section of pipe as recommended by the pipe manufacturer. Bends in HDPE pipe shall not be within ten (10) pipe diameters from any fitting or valve. The minimum radius of curvature shall be per the pipe manufacturer recommendation and bending shall not cause kinking. HDPE piping shall not be joined by solvent cements, adhesive, or threaded type connections.

The color marking stripes shall be aligned during the fusing process, and the pipe shall be pulled through the bore to allow identification of the type of system utilizing the HDPE pipe.

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b. All mechanical joint fittings and sleeves used with high density polyethylene (HDPE) pipe shall be fusion bonded epoxy coated ductile iron with mechanical joints rated to 350 psi and conforming to AWWA C-153 and C-111. All MJ fitting connections to polyethylene pipe shall be

restrained with Mega-Lug restrainers. The HDPE pipe shall be reinforced on the fitting ends using stainless steel wedge internal stiffeners

The mechanical connection to MJ fittings and sleeves shall use mechanical restraints that meet specification requirements. Size-on-size mechanical connection to PVC or DI pipe shall be by long ductile iron solid sleeves with Mega-Lug restrainers.

No electro fusion fittings shall be used with HDPE unless written approval is provided by CCU.

HDPE molded butt fittings and couplings shall require approval from CCU for installation.

2.1.4 Ductile Iron Pipe and Fittings

a. The ductile iron pipe covered by this specification shall be the push-on joint type or mechanical joint type, centrifugally cast to conform to all requirements of AWWA Specifications C-151 and C-153, latest revisions.

The maximum allowable deflection of the pipe shall be per the pipe manufacturers recommendation. Ductile iron pipe will be fully encased in an 8-mil polyethylene sleeve, in accordance with AWWA C-150, Method A. The pipe and the polyethylene sleeve shall be color coded green by a means acceptable to CCU.

b. All piping and fittings shall be either:

- fusion bonded epoxy coated as per AWWA Specification latest revision or
- ceramic epoxy coated as per ASTM Specifications F-4176-95A, G-95, B-117, D-1308 and E-96

c. Polyethylene material shall conform to ASTM Standard Specification D1248-68, latest revision. All ductile iron piping shall be marked "DUCTILE IRON" in large letters. The nominal wall thickness shall be legibly marked on each piece of pipe and the pipe installed so that the markings can be read from the top of the trench.

Minimum thickness of ductile iron pipe shall be as follows:

3" Ductile Iron Pipe	0.25"	Class 51
4" Ductile Iron Pipe	0.26"	Class 51
6" Ductile Iron Pipe	0.25"	Class 50
8" Ductile Iron Pipe	0.27"	Class 50
10" Ductile Iron Pipe	0.29"	Class 50
12" Ductile Iron Pipe	0.31"	Class 50
14" Ductile Iron Pipe	0.33"	Class 50
16" Ductile Iron Pipe	0.34"	Class 50
18" Ductile Iron Pipe	0.35"	Class 50

20" Ductile Iron Pipe	0.36"	Class 50
24" Ductile Iron Pipe	0.38"	Class 50
30" Ductile Iron Pipe	0.39"	Class 50
36" Ductile Iron Pipe	0.43"	Class 50
42" Ductile Iron Pipe	0.47"	Class 50
48" Ductile Iron Pipe	0.51"	Class 50
54" Ductile Iron Pipe	0.57"	Class 50

d. Rubber gasket joints shall be in accordance with AWWA Specification C-111 latest revision.

e. All fittings shall be in accordance with AWWA Specification C-153 or C-110 latest revision and have the same pressure rating of the connecting pipe. All ductile iron fittings shall be fusion bonded epoxy coated. All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel. All buried fasteners such as bolts, nuts, and washers shall be "Cor-Ten" steel or Cor-blue coated steel. Threaded rod shall be Type 316 stainless steel for buried applications. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

f. All stainless-steel fastener threads shall be coated with an anti-seize compound as approved in writing by the CCU.

2.1.6 All tapping sleeves shall be 316 stainless steel.

2.1.5 Service Connections

The existing CCU approved products are listed on the Approved Products list, posted on the CCU website. Other products shall not be used until a thorough evaluation is completed by the CCU to determine if the same standards are met. Final written approval by the CCU is required in writing to confirm acceptability.

a. Low-pressure sewer system service connections pipe shall be Schedule 80 pipe conforming to the requirements of ASTM D-1785 and be permanently marked with the type/size/use of the pipe. For schedule 80 PVC piping marker tape stripes shall be installed and shall be green in color.

b. Fittings for Low-pressure Service Connections shall be Schedule 80 PVC conforming to the requirements of ASTM D-1785. For schedule 80 PVC piping marker tape stripes shall be installed and shall be green in color.

c. Service Saddles:

All service saddles shall conform to AWWA standards and shall meet the CCU standard details as determined by the CCU. Service Saddles for HDPE pipe include fusion bonded HDPE saddles as per AWWA standards.

d. Brass Nipple.

All brass nipples shall conform to AWWA standards and shall comply with CCU standard details as determined by CCU.

e. Brass Gate Valve

All Brass Gate Valve shall conform to AWWA standards and shall comply with CCU standard details as determined by CCU.

f. Male adaptor

All male adaptors shall conform to AWWA standards and shall comply with CCU standard details as determined by CCU.

g. PVC Fittings

All PVC Fittings shall conform to AWWA standards and shall comply with CCU standard details as determined by CCU.

h. Swing Check Valve.

All PVC Fittings shall conform to AWWA standards and shall comply with CCU standard details as determined by CCU.

i. Ball Valve

All PVC ball valve shall conform to AWWA standards and shall comply with CCU standard details as determined by CCU.

2.1.6 Low-pressure Tanks

2.1.6.1 Non-Traffic Load Bearing

All low-pressure tanks for non-traffic load bearing applications shall comply with the CCU standard details as determined by the CCU.

a. Low-pressure Tanks shall be made of Fiberglass, Concrete, or HDPE
b. Fiberglass low-pressure tanks shall be constructed according to ASTM D3299 or International Association of Plumbing and Mechanical Official (IAPMO) IGC3-74 as applicable. Wall and

bottom thicknesses will be determined by the specific application to meet the worst structural loading condition. Because of their light weight, plastic septic tank installations should consider anti flotation measures. Deterioration of fiberglass has been known to occur by wicking along the glass fibers should fiberglass become exposed to moisture. Wicking may be reduced by application of resin rich coating or a gel coat applied to all surfaces.

c. Low-pressure tank risers and wet well covers shall be secured to preclude desired removal but be provided sufficient clearance to vent hydrostatic pressure should a check valve fail and backflow enter the tank, unless other forms of pressure relief are provided. Unauthorized removal of the low-pressure tank riser or wet well covers should be discouraged through use of a tamper-resistant construction or locking device.
d. The non-access hatch shall be buried within 4” – 6” of grade
e. All fiberglass reinforced plastic tanks furnished with accessories and appurtenances shall be new and shall be products of a single manufacturer.
f. The tanks furnished shall be designed and constructed in accordance with best manufacturing quality practice methods, constructed to H 20 load rating standards, and shall operate in accordance with design criteria when installed. The manufacturer shall furnish Fiberglass Reinforced Plastic (FRP) tanks along with screened pump chamber, PVC sanitary tee four-inch (4") inlets, full tank partition or baffle, lift rings, lids, and clean-out extensions.
g. FRP interceptor tanks shall be cylindrical in design with reinforced vertical strengthening ribs. The end sections shall be spherical with two (2) 26-inch diameter man-way towers. The top and bottom sections of the tank shall be mated together at the centerline with a tongue and groove joint. Centerline joint shall be filled with a high-density bonding material forming a watertight seal.
h. The interceptor tanks shall be designed by the manufacturer for structural integrity, water tightness, and protection against flotation. Design of the tanks shall be based on the following conditions:
    - Soil Cover: 1 -12 inches
    - Soil Weight: 120 pounds per cubic foot
    - Liquid Level in Tank: Empty
    - Hydrostatic Loading: Water table at ground surface
    - Soil Friction Angle: 30 degrees
    - Soil Compaction: 85% standard proctor density
i. Structural design and protection against flotation shall be based on the worst-case combination of conditions listed above. Complete structural design and flotation calculations shall be prepared by a professional engineer registered in the State of Florida and submitted to CCU.
j. All fiberglass interceptor tanks shall be constructed in accordance with the requirements and rules of the State of Florida Department of Health and Rehabilitative Services Health Programs, Chapter 64E-6.013. The wall thickness shall average at least 0.25 inches, but no less than a minimum of 3/16-inch thickness in isolated areas. At any time, if the required minimum of 3/16-inch thickness is not found, repair shall be the responsibility of the manufacturer. If repair is judged not feasible, the tank shall be rejected. Tanks shall show no leakage from section seams, pinholes, or other areas. Any leakage is cause for rejection.
k. The interceptor tanks shall be fitted with a full tank partition/baffle installed at a position in the tank that will provide two thirds (2/3) of the liquid volume in the inlet section and one third (1 /3) of the liquid volume in the outlet section. The interior baffle shall be secured to the tank walls with a permanent fastener.

l. The fiberglass pump chamber insert shall be fitted in the following manner: Four (4) four-inch diameter openings, with 90-degree spacings, will be drilled six inches (6") to the center of opening from the bottom of the pump chamber on the vertical plane. The inlet openings will be covered with polyethylene screen with 1 /4-inch sized spacing. The polyethylene screen shall be affixed to the wall of the pump chamber with stainless steel screws and washers. The inlet end of tank is to have an eight-inch high extension installed on the man-way. The extension is to be fiber glassed to tank for permanent installation. Description of extension is as follows:

m. Each tank shall be clearly and permanently marked with the manufacturer's registered trademark and the year manufactured.

n. The FRP interceptor tank, pump chamber and external pump chamber shall be manufactured from polyester resin that is impervious to hydrogen sulfide corrosion.

o. The equipment required shall be of the manufacturer's latest production model and shall be equipped with all standard equipment.

p. External pump chamber shall be 36 inches in diameter and 44 inches in height with (6") six-inch wide anti-flotation ring.

q. The fiberglass interceptor tanks with accessories and appurtenances shall be warranted, in writing, by the supplier or manufacturer, for a period of two (2) years from date of acceptance by the County, and be free from defective workmanship, design, and materials. If any part of the equipment should fail during the warranty period, it shall be replaced by the bidder at no expense to Charlotte County.

r. All low-pressure tanks shall meet or exceed the following specifications and shall be designed, constructed and structurally tested in accordance with the latest revision of:

- Florida building code-plumbing, chapter 10
- ASTM C-857 minimum structural design
- Plumbing and drainage institute G101
- International Association of Plumbing and Mechanical Officials (IAPMO) PS 1
- ASTM D 1248 polyethylene plastics extrusion materials
- ASTM D 1693 test method for stress-cracking
- ASTM D 790 flexural properties of unreinforced and reinforced plastics

s. In addition, concrete tanks must comply with the following requirements:

- Inside and outside surfaces of concrete tanks shall be lined in accordance with Section # 003300 Precast Concrete Products. The Contractor shall notify CCU of the intended lining location to allow coordination of the inspection of the lining application.

2.1.6.2 Traffic Load Bearing

a. All low-pressure tanks for traffic load bearing applications shall be constructed of concrete materials only and shall require shop drawing submittals for CCU review and written approval.

b. Inside and outside surfaces of concrete tanks shall be lined in accordance with Section# 003300 Precast Concrete Products. The Contractor shall notify CCU of the intended lining location to allow coordination of the inspection of the lining application.

2.1.7 Low-pressure Sewer Pump Chamber

All low-pressure sewer pump chambers shall comply with CCU standard details will specifically denote which type of pump chamber to use for each type of tank material being installed. The depth of the pump chamber shall allow for pumping from the gray water liquid layer in the tank and not the scum or sludge layer and provide for a 100% submerged pump motor installation under all operating conditions. A minimum of 150 gallons of freeboard shall be provided in the tank at the high-level alarm float on position. For a typical tank, the sludge layer is approximately 3 feet - 3 .5 feet and the scum layer is 3.5 inches - 4 inches. The operating volume shall allow for a pump cycle of two times per day at 75 gallons each cycle.

The septic tank effluent pump (STEP) system should have reserve holding capacities. Individual resident GP installations generally provide a reserve storage capacity of about 0.19m3 (50 gallons). The pressuration unit (PU) reserve capacity is the volume available for storage between the elevations of the high-water alarm float switch and the invert of the overflow pipe. CCU standard drawing details indicate the freeboard within the septic tank generally available for reserve storage for a typical STEP system with the PU located either within or adjoining the septic tank.

The pump chamber shall be equipped with floats, one for operation and the other as a high alarm float. Specification for preferred operation switch and high float switch.

2.1.8 Low-pressure Pumps

All low-pressure pumps shall comply with the CCU standard details as determined by the CCU.

Pumps, motors and materials shall be warranted, in writing for a period not less than two (2) years from the date of installation. The warranty shall provide for the replacement of all pumps (complete) that fail during the warranty period while in normal operation.

All pumps shall be new in its entirety and be products of a single manufacture. The pumps shall be designed and constructed in accordance with best manufacturing practices and shall operate in accordance with design criteria when installed. The pumps and associated materials shall be the manufacturer's latest production model and shall be equipped with all standard equipment in accordance with the manufacturer's latest literature.

A. Pumps - Each pump shall be capable of delivering the flows within the specified operating parameters. The pump(s) shall be manufactured by a company regularly engaged in the manufacture and assembly of similar units for a minimum of five (5) years. Each pump shall be capable of handling septic tank effluent with solids to ¾" inch diameter. The pump(s) shall be capable of handling liquids with temperatures to 104° F continuous, 140° F intermittent, and

shall be capable of running dry for extended periods. The volute, seal plates and motor housing shall be constructed of a high-quality ASTM A-48 class 30 cast iron or approved equal. The pump(s) shall be painted with a water-based air dry enamel of 2.0 mil minimum thickness or alternative coating as approved by the County. All exposed hardware shall be 300 series stainless steel. The pump construction shall contain no points of critical clearance nor require periodic adjustment or replacement to maintain operating efficiency. Discharge connection shall be a minimum two – inch NPT in the vertical position.

All gaskets shall be of the compression square ring type eliminating critical slip fits and the possibility of damage during service associated with sliding O-ring sealing arrangements. The pump impeller shall be cast iron. The unit shall utilize a single mechanical shaft seal, which will operate in an oil atmosphere. The materials of construction shall be carbon for the rotating face and ceramic for the stationary face, lapped and polished to a tolerance of one light band, 300 series stainless steel hardware, and all elastomer parts to be of Buna-N.

The pump shall be designed to be non-overloading throughout the entire pump curve. The rotor and stator assembly shall be of the standard frame design and secured to the pump seal plate by threaded fasteners allowing for easy serviceability. Motor designs incorporating shrink or press fit assembly between the stator and motor housing shall not be acceptable. The motor shall be constructed with the windings operating in a sealed environment containing clean dielectric oil, making it capable of operating in a totally, partially or non-submerged condition for extended periods of time without damage due to the heat being generated. Air-filled motors shall not be acceptable. The motor windings shall be of Class B insulation. The motor shall meet the standard NEMA Design L for single phase. The motor should utilize an electrolytic type capacitor. The motor shaft shall be of 400 Series stainless steel or hardened steel. Preference shall be given to 400 series stainless steel. The lower bearing shall be of the single ball type to accept radial and thrust loads, and the upper bearing of the single ball type for radial loads. Preference shall be given to single ball type upper bearing. Bearings shall operate in an oil bath atmosphere for superior life. Permanently lubricated bearings are not acceptable.

The pump shall be equipped with 50 feet of type 14/3 – SJOW or SJTOW-A power cable. Preference shall be given to cables connected to the motor via quick disconnect pin terminals. Threaded cord grip type cord entries are acceptable if quick disconnect is not available. Pin receptacles shall be crimped and molded to the power cord in a PVC plug. The plug shall be secured with a stainless-steel compression plate to prevent water from entering the housing and to provide strain relief at the point of cable entry. A stainless-steel clamp shall compress the PVC molding against the cable jacket to prevent water from entering the jacket. A polybutylene terephthalate terminal block with brass pin inserts shall connect the power cord leads with the motor leads. The ground pin shall be longer than the other pins such that the ground connection is the first connection made and the last connection broken when the plug is inserted and removed, respectively. A Buna-N O-ring shall provide isolation sealing between the terminal block and the motor housing when the cord plug is removed. The pump manufacturer shall perform the following inspections and tests in accordance with Hydraulic Institute type B specifications before shipment from the factory:

- A check of the motor voltage and frequency shall be made as shown on the nameplate.

- A motor and cable insulation test for moisture content or insulation defects shall be made per UL criteria.
- The pump shall be completely submerged and run to determine that the unit meets three pre-determined hydraulic performance points.
- A written report shall be available showing the aforementioned tests have been performed in accordance with the specifications. The Contractor shall submit the following with approval by CCU:
- Pump catalog data.
- Pump performance curve.
- Typical installation drawing.
- Installation & Operation Manuals with Parts List.

2.1.9 The Electrical Panels

All the electrical panels shall comply with CCU standard details as determined by CCU.

A. All panels shall be designed by the manufacturer for structural integrity, water tightness, and uniformity of components.

B. All electrical panels shall include a visual alarm consisting of a red fluted lens mounted to the top of the enclosure in such a manner as to maintain rain-proof integrity.

C. Panel enclosure shall be gray, NEMA type 4X fiberglass, requiring no painting and shall be one (1) piece molded construction with no gasketed joints except for cover.

D. The enclosure shall have corrosion resistant stainless steel piano hinge.

E. Simplex Electrical Panel Layout, Schematic and List of Components are attached.

The panels with all accessories and appurtenances shall be warranted, in writing, by the supplier or manufacturer, for a period of two (2) years from date of acceptance by the CCU, and be free from defective workmanship, design, and/or materials. If any part of the equipment should fail during the warranty period, it shall be replaced at no expense to CCU. The Contractor shall provide shop drawings for the simplex electrical panel. The shop drawings shall include schematics, manufacturer brochures, all simplex electrical panel components, and appurtenances applicable to the panel. Approval of the shop drawings by the Electrical Inspector shall be required before fabrication of any unit is instituted.

2.1.10 The Electrical cables

All the electrical cables shall conform to NEC and ICDA standards with P-MSHA written approval and shall comply with CCU standard details as determined by CCU.

2.1.11 Pipe and Fittings Unloading at Site

The Contractor shall inspect each shipment of pipe and fittings and make provisions for a timely replacement of any damaged material. The Contractor shall unload by hand or use canvas slings to avoid scratching the pipe. The Contractor shall not sling or drag pipe over an abrasive surface. Pipe or fittings damaged during handling shall be removed from the site and replaced

with new pipe and/or fittings. The Contractor shall follow the manufacturer's storage specification and store pipe and fittings in such a manner that prevents damage due to crushing, piercing, excessive heat, harmful chemicals, and exposure to sunlight. Pipe and fittings shall be stored in a dry and secure area.

2.1.12 Marker Balls and Marker Tape

a. Low-pressure system main marker balls shall be 3M 4-inch marker ball and green in color.

b. Low-pressure system mains and service connections shall be green in color or provided with green marker tape stripes.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

Direct Bury, Directional Bore, and Jack and Bore: All direct bury, directional bore, and jack and bore low-pressure sewer system main pipes shall be installed to a minimum depth of forty-eight (48) inches or as approved in writing by CCU. The Contractor shall satisfactorily maintain the specified cover by a means approved in writing by CCU. If additional fittings are required where not shown on the engineering drawings to maintain alignment around curves, the Contractor shall provide the required number and be compensated at the unit price as provided on the bid form.

NOTE: If the new construction is tying into existing utilities, the Contractor shall verify the existing utilities, such as fittings and valves, are restrained prior to the start of installation of the valve or piping. If not restrained, the Contractor shall notify the CCU in writing and shall restrain the existing utility as approved in writing by the CCU.

3.1.1 Direct Bury of Material

a. Open cut PVC LPFM piping shall be Class 150 DR-18 for all areas with a minimum of forty-eight (48) inches of cover. For shallower depth, the type of pipe and installation shall require prior written approval by CCU. Any pipe left in the trench overnight shall be plugged or capped and watertight. Bags, plastic and tape will not be allowed. Low-pressure sewer mains shall be installed at a consistent depth.

b. Proper implements, tools, and facilities satisfactory to CCU shall be provided and used by the Contractor for the safe and convenient execution of the work and the testing. All pipe, fittings, and valves shall be carefully lowered into the trench in such a manner as to prevent damage to low-pressure sewer system main materials and protective coatings and linings. The low-pressure sewer system main materials shall not be dropped or dumped into the trench. The pipe shall be laid with the manufacturers lettering designating the type and size of pipe visible from the top of the open trench. Wherever it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane to avoid obstructions or where long-radius curves are

permitted, the amount of pipe or joint deflection shall not exceed fifty (50) percent of the manufacturer's recommended limit. Pipelines intended to be straight shall not deviate from the straight line.

c. Open cutting of roads for trenching and direct bury of low-pressure sewer system mains shall not exceed 8’ in width unless specified otherwise in the contract documents. All effort shall be made to minimize the width of the trench and the amount of restoration.

d. As directed by CCU, all existing materials removed to facilitate the tunneling or deflecting of direct bury piping under or adjacent to existing storm piping and/or structures shall be replaced by flowable fill. Prior to placing flowable fill, the area between the direct bury piping and existing piping or structure shall be hollowed out to a defined cavity along the length of the direct bury piping. The Contractor is responsible for filling the entire cavity with flowable fill and replacing the flowable fill as necessary throughout the contract and warranty period should erosion occur.

e. PVC pipe may be laid in the trench in single sections or preassembled multiple sections including no more than 1 full stick of pipe, 1 partial stick of pipe, and intervening required fittings and/or valves. Preassembled sections of pipe shall be carefully fed by hand or with the use of approved equipment on the pipe bed. The Contractor shall provide pockets in the pipe bed material to eliminate any concentration of loads on the bell ends or joints. The ends of mechanical joint pipe and fittings and rubber gasket joint pipe and fittings shall be clean of all dirt, grease, and foreign matter prior to installing fittings or joining of pipe sections. A joint lubricant shall be applied to all gaskets prior to joining two pipe sections together. To preclude the possibility of cross usage between wastewater and potable water piping, the joint lubricant shall have been tested and approved for potable water service. No lubricant shall be used that harbor bacteria or damage the gaskets.

f. Cutting pipe for inserting valves, fittings, or closure pieces shall be in a neat and workmanlike manner without damaging the pipe or lining and so as to leave a smooth end at right angles to the axes of the cut pipe. The cut end of mechanical joint pipe shall be dressed to remove sharp edges or projections which may damage the rubber gasket. For push-on joints, the Contractor shall dress the pipe cut ends by beveling as recommended by the manufacturer.

3.1.2 Directional Bore of Material

a. Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and convenient execution of the work. The Contractor shall meet the jointing and cutting pipe direct bury low-pressure sewer system main piping requirements as they apply to the directional bore. A log of the bore depths shall be based on one-foot intervals staking from the entry and exit locations and intermediate centerline. The vertical and horizontal location readings shall be plotted on a one inch (1") equals twenty feet (20') natural scale drawing which shall be provided to CCU within 48 hours of completion of the bore.

No electro fusion fittings shall be used with HDPE unless written approval is provided by CCU.

b. For low-pressure sewer system mains eight (8”) inches in size or smaller, the HDPE pipe shall have the same outside diameter as the connecting mains. For larger sizes, the HDPE pipe shall have the same size or larger inside diameter as the connecting mains unless otherwise noted on the plans; provided for in the Special Provisions; or approved in writing by CCU.

c. The depth of all directional bores for FDOT roads shall be in accordance with the FDOT permit requirements.

d. The slurry may be recycled for reuse in additional hole opening operations if approved in writing by CCU or it shall be removed and disposed of at an approved dump site. No fluids shall be allowed to enter any unapproved areas or any waterways.

e. For directional bores under any surface water (subaqueous) the drilling Contractor must submit a ‘frac-out’ response plan for review and approval prior to starting the directional bore. During execution of all subaqueous directional bores, the drilling Contractor must have at the site the necessary material, equipment, and manpower to properly respond to a ‘frac-out’ in accordance with the ‘frac-out’ response plan.

a. All bores two (2”) inches or larger in diameter (except for service lines) shall have two tracer wires attached to the bore. All tracer wire shall be a # 10 AWG, steel reinforced, insulated copper tracer wire, with a minimum of 2,000-pound break load. The Contractor shall submit the selected tracer wire to the CCU for written approval. It shall run continuously with and shall be securely fastened to the utility main. All tracer wire shall be in compliance with the following:

I. All tracer wire termination points must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose and with the CCU approved load rating.

II. All grade level/in-ground access boxes shall be appropriately identified with “sewer” cast into the cap and be color coded.

III. A minimum of 20 ft. of excess/slack wire is required in all tracer wire access boxes after meeting final elevation.

IV. All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the tracer wire connection and the terminal for the grounding anode wire connection.

V. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

VI. The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the project with the CCU staff present.

b. Boring Failure

The Contractor shall maintain a copy of a Frac-out contingency plan on the construction site and provide a copy to the CCU. The Contractor’s Frac-out plan shall meet FDEP permit regulations

and other regulatory agency requirements in accordance with the project regulatory permits where applicable. (Frac-out is a condition where drilling mud is released through fractured rock or soil and travels toward the surface.)

If conditions warrant removal of any materials installed in a failed bore path, as determined by the CCU, it will be at no cost to the CCU. Promptly fill all voids with excavatable flowable fill.

If an obstruction is encountered during boring which prevents completion of the installation in accordance with the design location and specification, the pipe may be taken out of service and left in place at the discretion of the CCU. Immediately fill the product left in place with excavatable flowable fill or capped at the discretion of the CCU. Submit a new installation procedure and revised plans to the CCU for approval before resuming work at another location.

c. Quality Control

The Contractor shall submit a description of the quality control methods they propose to use in the directional drilling operations to the CCU for approval at least 10 days prior to the start of directional drilling. The submittal shall include procedures for controlling and checking line and grade and field forms for establishing and checking line and grade to comply with the required limitations.

d. Control of Line and Grade

The Contractor shall establish and be fully responsible for the accuracy of their own control for the construction of the entire project, including structures, bore hole line and grade.

e. The Contractor shall:
   a. Establish control points a sufficient distance away from the bore hole operation not to be affected by construction operations.
   b. Check control for the bore alignment against an above ground undisturbed reference at least once each hour and once for each 50 feet of bore hole constructed, or more often as needed or directed by the CCU.
   c. Drill pilot holes to ensure the required vertical clearances from ditch, river, or wetland bottoms, and horizontal clearances from buffers or easement lines are maintained. The contractor shall monitor and record horizontal and vertical boring hole locations at twenty-five-foot (25') intervals or any change in line and grade. If the pilot hole exists in buffers or outside of easements as shown on the plans the Contractor shall be responsible for grouting the hole to the satisfaction of the CCU. If the pilot hole deviates outside of its permitted limits, the drill string shall be withdrawn, and the borehole grouted to the satisfaction of the CCU.

f. As-Built plans for on-grade bores shall indicate the depth of both pipe inverts and verify the grade. As-Built plans shall conform to the Charlotte County Utilities 's "Minimum Drawing Requirements".

3.1.4 Marker Balls and Metallic Marker Tape

a. Marker balls and metallic marker tape: Contractor shall provide and install metallic marker tape and provide, program, and install marker balls for all installed trenched pipe. For trenchless pipe installations the Contractor shall provide, program, and install marker balls. Metallic marker tape

is not required on trenchless pipe installations. The tape shall be marked blue for potable water and purple for reclaimed water. The metallic tape shall be laid 12 to 18 inches above the pipe and the ball markers placed directly on top of the pipe or fitting. For trenchless pipe installations the marker balls shall be placed with a minimum of 18 inches of cover and no deeper than 3 feet of cover with the exception that no marker balls are required for that portion of pipe that lies beneath the water surface at a subaqueous crossing.

b. Installation: The balls shall be installed at all changes of direction and fittings absent of any valve. For cul-de-sacs having continuous fused or roll piping with no in-line fittings, the balls shall be placed starting at the point of curvature of the cul-de-sac and every 50 linear foot to the end of the line. On straight runs of pipe, the balls shall be installed at every power pole. If power poles do not exist, the balls shall be placed every 150 feet from the nearest change of direction or fitting. At road and driveway crossings the marker balls shall be placed on each side of the road or driveway, two feet from the pavement or driveway edge, or as otherwise approved in writing by CCU. On vertical deflections the marker ball shall be placed on the top fitting only.

c. Programming: The Contractor shall program all balls and provide a copy of the programmed data in each marker ball in either Microsoft EXCEL or Access electronic format to CCU. The Contractor as-built drawings shall show the location of all marker balls.

3.1.5 Fittings

When tightening bolts, the Contractor shall bring the gland up toward the flange evenly, while maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. Tighten all nuts progressively a little at a time. DO NOT over stress bolts to compensate for poor alignment. If effective sealing is not attained at the maximum allowable torque, disassemble the joint and reassemble again after cleaning. Fittings shall be installed in accordance with the manufacturer's published instructions.

3.1.6 Restraints

Piping shall be restrained in accordance with the CCU standard details restraint table. The table is based on a safety factor of 2.0 and takes into account variables such as type of soil, type and depth of the trench, and depth and type of pipe. In addition, the restraints may be supplemented with thrust blocks or tie-back assemblies. CCU may require the engineer to provide the dimensions and calculations of the thrust block for written approval prior to construction.

3.1.7 Storm Sewer Conflicts

Low-pressure sewer system mains that must be installed with less than 12 inches of clearance under storm sewer pipes or structures due to existing physical limitations that prohibit deflection or directional drilling, require construction of a bridging structure that is acceptable to CCU to support the storm sewer prior to installation of the low-pressure sewer system main. The low-pressure sewer system main pipe section under the storm sewer pipe or structure shall be replaced with a single 20 LF stick of ductile iron pipe centered under the storm sewer pipe or structure. The ductile iron pipe shall be fully encased in an 8-mil polyethylene sleeve in

accordance with AWWA C-105, Method A. Polyethylene material shall conform to ASTM Standard Specification D 1248. The contractor shall submit details of the proposed bridging structure and low-pressure sewer system main pipe installation to the CCU for review and written approval prior to the start of construction at the conflict location. Low-pressure sewer mains that must be installed over storm sewer with less than adequate depth shall be armored in accordance with Standard Details and as approved by CCU. ~~th~~

3.1.8 Water Main Crossing

All low-pressure sewer system mains and potable water mains shall cross at ninety (90) degrees or as approved by the CCU..

3.1.9 Low-pressure Tank Installation

All low-pressure tanks shall be installed according to the CCU standard details specific to tank material type, load bearing and non-load bearing applications.

Only manufacturer certified contractors shall install HDPE low-pressure tanks. Low-pressure sewer tanks shall be installed in accordance with the sound engineering practice. The excavation backfill adjacent to the installed septic tank should be placed in 150 mm (6 inch) lifts watered to optimum and compacted to 90% of relative density. Stones or debris having a diameter of 102 mm (four inches) or larger should not be included in the backfill material. Backfill in the vicinity of the septic tank inlet and outlet piping should be manually placed and consist of crushed rock to a depth of 150 mm (6 inches) over the inlet or outlet pipes with the remaining backfill placed in the same manner as adjacent to the septic tank. Septic tanks installed in soft or yielding soils should be bedded on crushed rock having a thickness of not less than 150 mm (6 inches). When low-pressure sewer tanks are installed in areas where groundwater will be above the septic tank floor the septic tank shall be secured against floatation.

3.2 TESTING MAINS, TAPPING SLEEVES, AND LOW-PRESSURE TANKS

All pressure tests shall be in accordance with AWWA C-600, latest revision. A pressure test shall be required for all installations of low-pressure sewer systems mains and all appurtenances.

3.2.1 Pressure Test:

a. Pipe:

The Contractor shall hydrostatically pressure test all PVC, HDPE, and DI low-pressure sewer system mains in accordance with the latest revision of AWWA C-600 series as applicable. Only oil filled gauges shall be used for all pressure tests. The tests shall be at 100 psi for a period of two (2) hours. The allowable loss for one (1) hour shall be determined by the following formula:

$$\text{Allowable Leakage} = \frac{(D)(L)(PY)}{133{,}200}$$

Where: D = nominal diameter of the pipe in inches
L = length of pipe in feet
PY = square root of test pressure during the leakage test in pounds per square inch

Calibrated test equipment shall be on site to verify the loss of water during the testing period. Pressure testing shall not exceed 1500 linear feet unless otherwise approved in writing by the CCU.

b. Tapping Sleeves:

All low-pressure sewer systems main tapping sleeves shall be hydrostatically pressure tested in accordance with the latest revision of AWWA C-600. The test shall be conducted at 100 psi for a period of two (2) hours. No loss of pressure is allowed.

c. Procedures:

Each section of pipe between valves, between the tapping sleeve and the pipe, and/or the valve and the tapping sleeve shall be slowly filled with water from a safe source, and the specified test pressure shall be applied by means of a water pump in a manner satisfactory to the CCU. In the case of testing a pipe where valves do not exist, the Contractor shall plug the end of the line as approved in writing by CCU. The pump, pipe, and/or tapping sleeve connections, gauge, and all necessary apparatus shall be furnished by the Contractor and shall be approved in writing by CCU prior to conducting any tests. All necessary pipe taps for testing shall be made by the Contractor as approved in writing by CCU. CCU may request testing of isolated portions between valves within the test section if a portion of that main has critical components such as multiple fittings at an extreme deflection. The Contractor shall be responsible to remove any pipe taps installed for this purpose upon completion of the test as approved in writing by CCU.

Pressure shall be measured from sample points and/or blow-off assemblies for low-pressure sewer system main pressure tests. CCU shall witness all tapping sleeve and low-pressure sewer systems force main pressure tests.

3.2.2 Testing Low-pressure Tanks

Low-pressure Tanks shall be exfiltration tested. The test shall consist of plugging all inlets and outlets and filling the low-pressure tank to just above the pumps. A measurement shall be taken from the rim of the tank to the water surface. The water shall remain in the tank for 24 hours. After 24 hours the distance to the water surface shall be measured again. No drop in water level is permitted for the test to be considered passed. Any tanks that fail the test shall be removed and replaced as directed by CCU.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and construction of vacuum sewer collection systems. The vacuum sewer collection system design shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit.

1.1 SCOPE

1.1.1 General

This specification provides the requirements for vacuum sewer collection system mains, gravity sewer laterals, air terminal lines, valve pits, vacuum valves, buffer tanks, division valves, fittings, accessories, and specialty items associated with the vacuum sewer system as specified herein and directed by the Engineer and Charlotte County Utilities (CCU) to be constructed, tested, and flushed, all as required to produce a fully operational vacuum sewer collection system. The extent of the work is shown on the construction plans.

It does not cover the design and equipment requirements for the vacuum pump station or the requirements for a vacuum collection system monitoring system.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances, necessary to do the work required under the contract to include but not limited to unloading, hauling, and distributing all vacuum mains and gravity sewer lateral pipe, air terminal lines, fittings, valves, valve pits, vacuum valves, and appurtenances. The contract may specify that the valve pits and vacuum valves are being purchased separately by CCU in which case the contract will only require the Contractor to store the valve pits and vacuum valves furnished by CCU and install the valve pits and vacuum valves as part of the vacuum sewer collection system construction. If the vacuum valves are to be stored and installed by CCU personnel, such storage and work will be clearly defined in the contract documents.

The Contractor shall also obtain the required right-of-way permit from Charlotte County Public Works (CCPW); construct and maintain all required traffic control devices and appurtenances and provide the necessary flag persons and signs to meet Charlotte County Maintenance of Traffic requirements (MOT); remove any surfacing as required; excavate the trenches and pits to the required dimensions following OSHA requirements; sheet, brace, and support the adjoining ground of structures where necessary; furnish all pipe, pipe bend sections, jointing material, restraints, bedding material and all other appurtenances; furnish and install flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures; handle

all drainage or ground water; provide barricades, guards, and warning lights; lay, test and flush the pipe, valves, fittings and appurtenances; place all marking and locating devices, backfill and consolidate the trenches and pits to meet CCPW compaction requirements; maintain all surfaces over the trench until surface restoration is completed; restore the surfaces to CCPW requirements; remove and properly dispose surplus excavated material; clean the site of the work; and provide the necessary soil erosion and dust control.

The Contractor shall also furnish all labor, materials, equipment, tools and all other associated appurtenances required to rearrange sewers, conduits, ducts, pipes, or other structures encountered in the installation of the work.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the construction of the vacuum sewer collection system with other construction and activities in the area including coordination with work by CCU Operations and CCPW. Coordination of the work with other utilities that may be in the area as identified during the 811 mark-outs is required to avoid damage to underground utilities and avoid interruption of service. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the written consent of the Charlotte County Utilities (CCU).

1.1.6 Certificates and Forms:

a. Pipe and pipe gasket: Contractor to provide a certificate from the pipe manufacturer(s) stating the pipe gasket has been tested at 22 in. hg vacuum with no leakage in accordance with ASTM D-3139 and guaranteed for such use.

b. Fitting and fitting gasket: Contractor to provide a certificate for the fitting manufacturer(s) that the fittings and fitting gasket has been tested at 22 in. hg vacuum with no leakage in accordance with ASTM D-3139 and is guaranteed for such use.

c. Division (Gate) valve: Contractor to provide gate valve manufacturer's certificate that the valve will not leak when subject to a vacuum of 22 inches of mercury for one (1) hour in both open and closed position.

d. Valve Pit Installation Forms: Contractor to provide CCU with a complete set of Valve Pit Installation Forms. One form is required for each valve pit installed. Each form must be signed by the Contractor certifying that all required pressure tests have been successfully completed and that all sump cut-outs (coupons) have been removed from the sump.

e. Final Inspection Form: Contract to provide CCU with a signed copy of the Final Inspection Form.

f. Vacuum Valve Installation Forms *(only required when Contractor is responsible to install the vacuum valve under the contract)*: Provide CCU with a complete set of Vacuum Valve Installation Forms certifying the proper installation and testing of each vacuum valve placed into service.

1.1.7 Warranty

a. If the Contractor is responsible for purchase and installation of the valve pits, vacuum valves, and associated manufactured items, a two (2) year manufacturer's product warranty shall be provided. Manufacturer's warranty shall commence on the date of substantial completion of the project.

b. Contractor to provide a one (1) year installation warranty for all work done on the project. The Warranty shall commence on the date of substantial completion of the project.

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured, and the payment determined in the following manner:

1.2.1 Vacuum Mains, Gravity Sewer Service Laterals and Air Terminal Lines

Shall be paid for at the contract bid price per lineal foot for each size and type of material specified which shall include the cost of furnishing all pipe, fittings, pipe bend sections, jointing material, reducers, restraints, bedding material and all other appurtenances, and of delivering, handling, restraining and holding utility line poles (unless a separate bid item is provided), laying, dewatering, trenching, sheeting and backfilling, testing, restoring the surface (unless separate bid item is provided), necessary permits, and all material or work necessary to install the pipes complete in place at the depth specified on the plans and/or as directed by CCU.

The length of pipe for which payment is made shall be the actual overall length measured along the axis of the pipe without regard to bend sections. All lengths shall be measured in a horizontal plane unless the grade of pipe is more than fifteen percent (15%). Measurement of the pipe shall be rounded to the nearest foot including the lengths of valves and fittings. No payment consideration will be given to depth zones for the installation of the pipes.

1.2.2 Solvent Weld Fittings or "Reiber" Gasketed Joints

Solvent weld fittings, fittings with "Reiber" gasketed joints, and any other fittings approved for use on the project shall be considered incidental to the contract bid prices for the vacuum sewer mains, gravity sewer service laterals, and air terminal lines and no direct payment will be made.

1.2.3 Vacuum Line Gate Valves (Division Valves)

Vacuum line gate valves shall be paid for at the contract unit price per each size furnished and installed including the valve, restraints, valve boxes, bedding material, dewatering, testing, all equipment, materials, labor and all other associated appurtenances to install and test the valves complete in place at the depth and location shown on the plans and/or as directed by CCU and include restoration unless a separate bid item is provided in the contract.

1.2.4 Vacuum Valve Pit

Vacuum valve pit assembly and installation shall be paid for at the contract unit price per each furnished, assembled, and installed valve pit for each depth class, complete and in service. The price bid for this item includes the installation of equipment, including fittings, 3" flexible connector, 3" pipe coupling, vacuum valve sensor/controller, in-sump breather, suction and sensor pipes, grommets, pit cover, excavation, dewatering, bedding, backfill, compaction, clean-up, testing, completion of the valve pit form, and all labor, storage, equipment, and materials necessary for the installation as shown and described in the drawings and specifications.

1.2.5 Vacuum Valves

If the supply and installation of vacuum valves are part of the contract, each vacuum valve furnished and installed with all required accessories, and appurtenances shall be paid for at the unit price bid.

1.2.6 Dedicated Air Terminal Installation

Measurement and payment for dedicated air terminals will be for each unit furnished and installed in accordance with the detail provided on the plans at the unit price bid.

1.2.7 Valve Pit Concrete Collar

Valve pit concrete collar shall include construction of a concrete collar 12"x12" w/ #5 rebar, Top & Bottom for valve pits constructed in traffic areas and for valve pits as determined by the Engineer to be in areas where there is potential for vehicular damage to occur. Payment will be made at the unit price for each valve pit concrete collar constructed.

1.2.8 Locate Balls and Marker Tape

a. Locate balls shall be paid for at the contract bid price per each which shall include all labor, equipment, materials, and associated appurtenances to install and program the marker balls and submit the marker ball data to CCU.

b. The cost of marker tape shall be included in the bid price for locate balls.

1.2.9 Buffer Tank

If included in the project where shown on the construction plans buffer tanks shall arrive at the job site completely assembled. Payment will be made at the contract unit price per each furnished and installed buffer tank at each depth class, complete and in service. This item also includes the assembly of equipment, fittings, excavation, dewatering, pipe, bedding, backfill, compaction, flex hose connector, clean-up, testing, completion of a buffer tank form, and all labor, storage, equipment, and materials necessary for the installation as shown and described in the drawings and specifications.

1.2.10 Electronic Air Admission Control (EAAC)

If included in the project for installation in a valve pit as an accessory to a typical vacuum valve, payment shall be made for each EAAC furnished and installed at the unit price bid.

1.2.11 Testing

All required testing shall be considered incidental to the project and no direct payment will be made.

1.2.12 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct payment will be made.

1.3 PARTIAL LISTING OF REFERENCED STANDARDS (LATEST REVISION)

ASTM:

A-48 Standard Specifications for Gray Iron Castings
D-656, Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings
D-1784, Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
D-1785, PolyVinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 1201
D-2241, PolyVinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
D-2466, Poly (Vinyl Chloride) (PVC) Schedule 40 Pipe Fittings
D-2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
D-3139, Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
D-3350, Polyethylene Plastics Pipe and Fittings Materials
AWWA C509087, C550-81t
FDEP: Wastewater Collection/Transmission System Requirements
AASHTO Code
Florida Administrative Code
Ten States Recommended Standards for Wastewater

Note: This is only a partial listing of related references. The Contractor shall be responsible to review the entire contract documents.

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 – Erosion and Sediment Control

001760 – Surveying and Record Drawing

002240 – Dewatering

002325 – Force Mains

002340 - Valves

002930 – Grassing

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

The Contractor shall submit complete detailed documentation of all materials or products to be incorporated into the work for approval by the Engineer and CCU. Delivery, storage, and incorporation of the material or product into the work is prohibited until the submittal has been approved. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details. For projects subject to American Iron and Steel (AIS) requirements, the submittals shall include a letter from the manufacturer stating that the material or product supplied complies with AIS. The AIS letter shall include the name of the project and the location where the material or product was manufactured. If compliance with the Build America, Buy America (BABA) Act is required under the contract, the Contractor shall submit the necessary documentation with the submittal as outlined in the contract documents.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products for vacuum sewer collection systems are listed in either the current CCU Approved Products List, the contract Special Provisions and/or the contract Technical Specifications.

2.1.1 General

The materials used in this work shall be all new and conform to the requirements for class, kind, size, and material as specified below.

All pipe, fittings, valve pits, vacuum valves and appurtenances furnished for installation shall be of the type, kind, size, and class indicated for each particular line segment as shown on the engineering drawings and/or designated in the Contract Documents.

2.1.2 Vacuum Sewer Mains and Fittings

a. PVC Pipe: All buried vacuum main lines and branch lines shall be gasketed PVC SDR 21, 200 psi pressure rated pipe per ASTM D-2241 and ASTM D-3139. Pipes shall have an integral bell formed with a race designed to accept the gasket in accordance with ASTM D-3139. The spigot end shall have a bevel and a stop mark on the outside diameter to indicate proper insertion depth. All surfaces of the joint where the gasket may bear shall be smooth, free of cracks, fractures, or imperfections that could adversely affect the performance of the joint.

b. Pipe Color: All vacuum sewer main pipe shall be white in color with a ASTM D-2241 reference, the class pressure rating, and the SDR number permanently and plainly marked on the pipe.

c. Pipe Gasket Joints: Elastomeric joints are to be “Reiber Style” or approved equal. Manufacturer is required to submit a certification that the pipe seal will operate at 22 inches of mercury vacuum

and pass a vacuum test at 22 inches of mercury vacuum with no leakage after 1 hour with joints deflected as per ASTM D-3139.

d. Fittings – Bends:

1. 45 Ells shall be used throughout. Tee fittings, 90-degree ells and vent type ells are not permitted with the exception that a 90-degree ell may be used inside the valve pit to join the 3" suction pipe to the 3" vacuum valve.

2. Molded Solvent Weld Fittings: Shall be PVC Sch 40 per ASTM D-2466 from a PVC compound having a cell classification of 12454 conforming to ASTM D-1784. Manufacturer shall submit a certification that the fittings will operate at and withstand a vacuum test at 22 inches of mercury vacuum for 1 hour with no leakage with joints deflected as per ASTM D-3139.

3. Assembled Gasket Joint Fittings: Shall be assembled from molded Sch 40 fittings per ASTM D-2466 and Spigot x Gasket Adapters fabricated from SDR 21, 200 psi pressure rated pipe per ASTM 2241. Gasketed joints shall be "Reiber Style" (or approved equal), 200 psi rated complying with ASTM D-3139. Gasket material shall be EPDM or SBR unless otherwise specified. Fittings shall be marked "vacuum rated" with a weatherproof label affixed to each fitting clearly observable for inspection. Manufacturer shall submit a certification that the fittings will operate at and withstand a vacuum test at 22 inches of mercury vacuum for 1 hour with no leakage with joints deflected as per ASTM D-3139.

4. Fabricated, miter cut, butt fused joints are not permitted.

e. Fittings – Wyes

1. Fabricated Solvent Weld: Wye fittings may be fabricated per the requirements of 2.1.2d.2. Fabricated wyes shall be marked "vacuum rated" with a weatherproof label clearly observable for inspection. Manufacturer shall submit a certification that the fittings will operate at and withstand a vacuum test at 22 inches of mercury vacuum for 1 hour with no leakage with joints deflected as per ASTM D-3139.

2. Fabricated or Assembled Gasket Joint Fittings: Shall be IPS diameter fabricated from SDR-21, 200 psi pressure rated PVC pipe per ASTM D-2241 or assembled from Sch 40 fittings per ASTM D-2466, with either fitting form using Spigot x Gasket Adapters fabricated from SDR-21, 200 psi pressure rated pipe per ASTM D-2241. Gasketed joints shall be "Reiber Style" (or approved equal) 200 psi rated complying with ASTM D-3139. Gasket material shall be EPDM or SBR unless otherwise specified. Fittings shall be marked "vacuum rated" with a weatherproof label affixed to each fitting clearly observable for inspection. Manufacturer shall submit a certification that the fittings will operate at and withstand a vacuum test at 22 inches of mercury vacuum for 1 hour with no leakage with joints deflected as per ASTM D-3139.

3. Fabricated, miter cut, butt fused joints are not permitted.

f. Primer: Primers used for solvent cement joints shall be per ASTM D-656

g. Solvent Cement: Solvent cement shall be per ASTM D-2564. Solvent cement shall not be the same color as the primer.

2.1.3 Gravity Sewer Pipe (Stub-out pipes and Sewer Service Laterals)

a. All valve pit stub-out pipes, gravity laterals, and fittings installed in the public right-of-way shall be pressure rated pipe. Non-pressure rated pipe and fittings and foam core pipe are not acceptable.

b. Pipe: SDR 21 conforming to ASTM D-2241; Sch 40 confirming to ASTM D-1784

c. Fittings: Sch 40 conforming to ASTM D-1784 and ASTM D-2466

d. Pipe Color: Pipe color shall be green.

e. Stub outs: Stub-outs shall be of the pipe material specified in 2.1.3b and shall be 4" or 6" in diameter and a minimum of 6 feet long or the length necessary to extend service to the property line.

f. House Laterals: Any gravity house lateral pipe that is connected to the valve pit stub-out shall be of the pipe material specified in 2.1.3b.

2.1.4 Vacuum Line Gate Valves (Division Valves) (Compliments CCU Standard Specification 002340 relative to valve specification. Where a conflict is found the below specifications shall govern).

a. Valves shall conform to AWWA C509087 latest revision, Standard for Resilient Seated Gate Valves.

b. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas.

c. Wedge rubber shall be molded in place and bonded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.

d. Wedge shall seat against seating surfaces arranged symmetrically about the centerline of the operating stem, so that seating is equally effective regardless of direction of pressure unbalance across the wedge.

e. All seating surfaces in body shall be inclined to the vertical at a minimum angle of 32 degrees (when stem is in a vertical position) to eliminate abrasive wear of rubber sealing surfaces.

f. Stem shall be sealed by at least two (2) O-Rings; all stem seals shall be replaceable with valve wide open and while subjected to full rated pressure.

g. Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing.

h. Valve body and bonnet shall be coated, inside and out, with fusion-bonded epoxy. Coating shall conform to AWWA C550-81, Standard for Protective Interior Coating for Valves and Hydrants.

i. Mechanical joint connections with transition to PVC gaskets shall be provided.

j. Two (2) tee keys shall be provided for each valve size required.

k. Buried valves shall be provided with valve boxes and covers conforming to CCU Standard Specification 02340, and the operating nut shall be extended to within 9", plus or minus 6", of finished grade. The valve box cover shall have the words "SEWER" and "OPEN" with a directional arrow cast on it. The valve cover shall be painted green.

l. Manufacturer shall provide a full ten (10) year money back warranty.

2.1.5 Vacuum Valve Pits – General

a. Valve pit types: Two (2) Piece Hybrid Valve Pits: Material – fiberglass & polyethylene. Valve pits shall be provided in the following types and depths at locations shown on the Construction Plans:

Model No.	Overall Depth	Depth to invert of gravity inlet 4" or 6" stub-out	Sump capacity
Varies By Manufacturer	6 ft.	4.74 ft.	85 gal
Varies By Manufacturer	8 ft.	6.74 ft.	158 gal

b. Separating barrier: All valve pits shall incorporate a physical barrier, part of the collection sump, that separates the valve chamber from the collection sump.

c. Traffic rated: All valve pits shall be H20 traffic rated on their own merits without a concrete collar included in the rating process. An independent laboratory certification shall be provided that the entire valve pit assembly is rated for H20 traffic wheel loads. Calculated data is not acceptable.

d. In-sump breather: All valve pits shall include an internal "in-sump" breather. No external breather piping of tubing will be acceptable. The sump breather is to be as described in paragraph 2.1.12.

e. Grommet and twist lock hole lubricant: Type of lubricant used shall be as follows:

Type of Lubricant	Permitted	Where used
Pipe lubricant per ANSI/NSF Standard #61	Either water soluble or non-water soluble is permitted	Grommets for gravity stub-outs and vacuum service laterals.
Liquid dishwashing detergent diluted 10-20% in water	Pipe lubricant not permitted	Grommets for suction & sensor pipes and in-sump breather (2-piece pits only)

2.1.6 Vacuum Valve Pits (2-Piece Type – fiberglass & polyethylene)

Described below is the 6 foot valve pit. The 8 foot valve pit differs only by dimensions relating to depth.

a. Type: Valve pit shall have two (2) major components: 1) the valve pit cone; and 2) the collection sump as well as associated pipes, connectors, seals, and grommets. Overall depth of the unit shall be 72" nominal.

b. Valve pit cone: The valve pit cone shall be manufactured by filament winding fiberglass process with a 36" inside diameter at bottom and conically shaped to allow fitting a 26-3/4" frame with a 23-1/2" diameter clear opening cast iron cover. The valve pit cone shall have a depth of 42" and a wall thickness of 3/16".

c. Collection sump: The collection sump and integral pit bottom shall be manufactured by the rotational molding process using polyethylene (PE). It shall be tapered, with the upper rim designed to accept the valve pit cone as described in paragraph b above. The collection sump shall have an overall height of 30" nominal with a capacity of 85 gallons. The collection sump shall have (4) stabilizing embosses to accept up to four (4) gravity service connections with 4" or 6" PVC pipe. Holes shall be field cut by the installation contractor.

d. Suction and Sensor Pipes: Suction and sensor pipes shall be Sch 40 PVC. Lubricant shall be as specified in 2.1.5e.

e. Anti-buoyancy collar: Anti-buoyancy collars shall be manufactured from reinforced fiberglass and designed to prevent flotation of the valve pit when ground water is present at grade. Anti-buoyancy collar shall be a minimum of 53" square with rounded corners and a minimum of ½" thick.

f. Grommets: Holes for the house gravity line connections into the collection sump shall be field located and cut. EPDM Rubber grommets as manufactured by the vacuum vendor shall be used to make a watertight seal.

2.1.7 Flexible Connection

Flexible connector: Flexible connector shall be 3" in diameter with an overall length of 7' 10-1/4" (+/- ¾") and shall incorporate a 4' 2" long piece of flexible pipe. The flexible pipe shall have the proper outside diameter for solvent welding into PVC fittings. One end of the flexible pipe shall be joined to a piece of 3" Sch. 40 PVC pipe with a 3" Sch. 40 PVC coupling. The opposite end of the flexible pipe shall be fitted with a 3" Sch. 40 PVC coupling.

2.1.8 Valve Pit Covers

a. Valve pit covers: Valve pit covers are designed for H-20 loading. Castings shall meet ASTM A-48, Class 35B gray cast iron.

b. Identification markings: The words "SANITARY" shall appear on top of cover in 1" tall lettering.

c. Pick holes: Covers for the two-piece valve pit have an open pick hole and no elastomer seal.

d. Concrete collars: Concrete collars are required for all valve pits located in traffic areas or as directed by the Engineer. See Construction Plans for details.

2.1.9 Vacuum Valve and Valve Pit Interdependence

Interdependence: The vacuum valve and valve pit shall be designed to function together as a complete system. Valve, valve pits and accessories shall be by the same manufacturer.

2.1.10 Vacuum Valve

a. Design conformance. Vacuum valves shall be designed to minimize head loss through the valve and shall have a “Cv” factor of 256 or higher. An Independent Laboratory certificate shall be supplied upon request.

b. Valve construction: Full-port 3 inch diameter valve capable of passing a 3” diameter solid while matching the outside diameter of 3” SDR-21 PVC pipe. Valve to be vacuum operated on opening and spring assisted on closing; valve configuration arranged so that the system vacuum ensures positive valve seating. Valve plunger and shaft arranged to be completely out of the flow path when valve is in open position. Valve plunger and seat shall have no exposed metal parts that could allow ice buildup.

c. Vacuum Operator: Self-lubricating, rolling diaphragm type: diameter sufficient to open valve fully using line vacuum to overcome sealing force; equipped with elastomer seal where shaft enters housing; vacuum drain connected to housing to return seal leakage to sewer when valve cycles.

d. Valve Position Switch: The valve position switch shall be IP67 rated (Ingress Protection Rating of 6 for solids and 7 for liquids) and shall be internally installed in the lower housing. The valve position switch shall not require any alignment in order to activate. Valve position switches that require the use of magnetic sensor are prohibited.

e. Lower housing electrical connections: An IP68 rated thermoplastic electrical connection shall be installed into the side of the lower housing. Connection contacts shall be gold plated and supplied with a rubber cover plug. Connectors shall have molded-in elastomer seal faces. Loose O-rings are prohibited. All electrical connections shall be epoxy encapsulated or plastic over-molded. The electrical connection is for use in a wired or wireless monitoring system which is not required for system operation.

f. Operation: Valve and sensor/controller require no outside power service.

g. The valve shall be manufactured such that small objects may be removed from the valve seat area by means other than complete valve removal and disassembly.

h. The valve and sensor/controller shall be capable of operation when submerged in water to a depth of 2 feet above the upper most component.

i. Furnished: Vacuum valves shall be furnished by the Contractor unless otherwise provided in the contract.

j. Installed: Vacuum valves shall be installed by the Contractor unless otherwise provided in the contract.

k. Materials: Valves shall be chemically resistant to sewage and sewage gases. The valves shall be constructed from materials described in the following table:

COMPONENT	MATERIAL
Valve Body	Glass Filled Polypropylene
Valve Shaft	316 Stainless Steel
Valve Shaft Seal	Buna N Rubber
Valve O-Rings	Buna N Rubber
Valve Spring	304 Stainless Steel
Valve Plunger	Buna N Rubber

Valve Seat	Buna N Rubber
Valve Piston Cup	Polypropylene
Valve Bearing	Acetal
All Fasteners	316 Stainless Steel

2.1.11 Vacuum Valve Sensor/Controller

a. The valve as described in paragraph 2.1.10 shall be equipped with a sensor-controller which shall rely on atmospheric air and vacuum pressure from the downstream side of the valve for its operation, thereby requiring no other power source. Rising liquid within the holding sump shall initiate the opening of the valve when sufficient head pressure is reached in the holding sump. The activation point shall equate to approximately 10 gallons of liquid. The controller shall apply line vacuum from the downstream side of the vacuum valve and apply it to the actuator chamber and fully open the valve.

b. The controller shall be capable of maintaining the valve fully open for a fixed period of time. This shall be field adjustable over a range of 3 to 10 seconds. After this time period has elapsed, the controller shall apply atmospheric air to the actuator chamber permitting spring assisted closure of the valve.

c. The controller shall have no internal tubing, nor use tubing for connection of timing components.

d. The controller shall not use a needle valve for timing but use a timing wheel composed of plastic components and rubber seals that are not prone to change of adjustment, moisture freezing, and do not allow out of range max or min settings that can cause the unit to hold open.

e. The controller shall have passages and chamber sizes to allow water to pass through if present, and not hold open for unacceptable lengths of time while passing water.

f. The controller shall have vacuum passages that are designed to drain moisture from chambers, which prevents the possibility of held moisture from freezing.

g. The controller air passages shall be designed to reduce the likelihood of water being pulled into the controller.

h. The controller shall be serviceable by factory-trained personnel and shall be removable from the valve by means of a sliding key device. There shall be no tools required to remove and replace the controller from the vacuum valve with the exception of tubing clamp nut drivers.

i. The controller shall be easily fully functional tested to determine any leaking internal seals and to guarantee consistent quality. This shall be done by manufacturer production and during operator re-build.

j. The controller body and end pieces shall be constructed to allow visual inspection for moisture and to determine operation position without disassembly.

k. Each vacuum valve controller shall be equipped with a port for connecting a portable, self-contained valve cycle counter.

l. The controller shall be chemically resistant to sewage and sewage gases, including bleach (used as disinfectant) and sulfuric acid (from septic sewage). Controllers shall be constructed from materials described in the following table.

COMPONENT	MATERIAL
Controller Body, Clear End Parts	Clear Nylon 12
Controller Body, Blue Parts	Polypropylene
Controller Shaft, Small parts	Polypropylene
Controller Springs	316 Stainless Steel
Controller O-Rings	Silicon Rubber, Buna N Rubber
All metal Fasteners	316 Stainless Steel

m. The controller shall provide for manual activation by using an activation tool. The activation design shall not expose any rubber components that can be damaged or deteriorate and prevent controller operation.

2.1.12 In-Sump Breather:

a. With the exception of the individual house 4" gravity line air intake (or the 6" Air Terminal, if used), there shall be no other external sources of air necessary or permitted as a part of this assembly.

b. A factory provided internal sump breather unit arrangement shall connect the controller to its air source and provide a means of assuring no liquid can enter the controller during system shutdowns and re-starts.

c. The sump breather shall be installed into a breather pipe fitting that mounts through a grommet in the sump pit bottom. The sump breather shall be activated by pressure building in the breather pipe only when high sewage level occurs. The pressure then causes the sump breather to switch to the closed position and protects water from getting to the controller or valve.

d. The internal sump breather shall be arranged to prevent sump pressure from forcing the valve to open during low vacuum conditions and provide positive sump venting regardless of traps in the home gravity service line. The tubing connection arrangement provides a floating check valve to vent any sump pressure but not discharge any sewage into the valve pit.

e. The internal sump breather shall be arranged to ensure proper valve opening by preventing vacuum to be present in the valve lower housing when the sump breather is in the closed position and the valve is attempting to open. This shall be done by an air inlet check valve in the tubing connection that will admit air from the valve pit to release any vacuum in the valve lower housing.

f. Breather high sewage level switch: The breather position switch shall be IP67 rated and shall be internally installed in the sump breather. The breather high sewage level switch shall not use a floating switch in the sewage sump. Breather position switches that require the use of magnetic sensors are prohibited.

g. Lower housing electrical connections: An IP68 rated thermoplastic electrical connection shall be installed into the sump breather housing. Connection contacts shall be gold plated and supplied with a rubber cover plug. Connectors shall have molded-in elastomer seal faces. Loose O-rings are prohibited. All electrical connections shall be epoxy encapsulated or plastic over-molded. The electrical connection is for use in a wired or wireless monitoring system which is not required for system operation.

2.1.13 6" Molded Dedicated Air Terminal

a. When used: A 6" molded dedicated air terminal is to be used in-lieu of individual 4" air-intakes that are normally provided by the homeowner's plumber and were common on earlier vacuum system installations.

b. Complete Dedicated Air-Terminal: One 6" air-terminal assembly as shown on the construction plan details shall be connected to each valve pit sump through one of the four (4) sump openings provided. Connecting any gravity inlet piping to the air-terminal is not permitted.

c. Height: The air-terminal's slotted door shall be above the highest expected flood water level as shown on the construction plan details. The molded air-terminal is intended to be installed flush with the ground but may be partially buried up to a maximum of 12 inches.

d. Piping: 6" pressure rated SDR-21 PVC pipe and Sch 40 pressure rated fittings shall be used to connect the air-terminal to the valve sump. The 6" SDR-21 PVC pipe should extend a minimum of 12" above grade or as shown on the construction plan detail.

e. Molded Air-Terminal: Molded polyethylene construction with approximately 3/16" wall thickness and equipped with a 6" pipe grommet for sealing against ground water intrusion and a 6.4" x 8.8" hinged door. Standard color: Simulated Brown Stone.

f. Support: This product is intended to be self-supporting but may also be attached to a permanent structure if so desired.

2.1.14 Marker Balls and Marker Tape

a. Vacuum sewer main marker balls shall be 3M 4 inch marker ball model 1424XR/ID and green in color.

b. Vacuum main marker tape stripes shall be green in color.

2.1.15 3" Pipe Coupling

a. 3-inch pipe coupling: Complete assembly shall be composed of a plastic hinged clamp, rubber sleeve, and worm gear clamp all of which shall be chemically resistant to sewage. Assembly to hinge open for easy installation when coupling the 3" interface valve to the suction line and the outgoing 3" vacuum service line. No-hub coupling and Fernco couplings are not allowed.

b. Plastic clamp portion: Shall be composed of 2 pieces of glass filled polypropylene and a 0.30" thick walled band for heavy duty clamping.

c. Rubber sleeve: Shall be manufactured from Buna-N rubber with a wall thickness of 0.125" and a length of 3" with a center stop ring.

d. Worm gear clamp, screw, and housing shall be 316 stainless steel and rated for 60 in-lb clamping torque.

2.1.16 Buffer Tanks

a. Buffer tanks are typically used for large volume water users like schools and apartments. They function in a similar manner to a valve pit but have additional storage capacity in the sump area

to allow for large, instantaneous flow inputs to be temporarily stored while the vacuum valve evacuates the sump. Buffer tanks are only to be furnished and installed if shown on the construction plans.

b. The buffer tank outer wall is to be fabricated from filament wound fiberglass that includes an integral three-inch bottom flange to accept an anti-flotation ballast ring. Depths are to be as indicated on the construction plans. A 48-inch diameter 304 stainless steel cover that includes a hinged access door with hasp for padlock is to be provided.

c. The use of buffer tanks can lead to irregular air to liquid ratios, inefficient vacuum pump performance and sluggish system operation. For these reasons, buffer tanks should only be utilized under the following conditions:

1. Buffer tanks should not be used where individual valve pits could otherwise be utilized unless additional sump storage is desired or required.

2. Buffer tanks should never be used to accept flow from a gravity system serving large groups of houses (e.g.: connecting 20 houses on a street by gravity with flow going to a buffer tank).

3. Buffer tanks should be limited to users where connection at only one or two locations is possible (e.g.: a commercial user where all flow from the building is manifolded into 1 or 2 sewer lines).

d. In general, the closer to the vacuum station, the fewer lifts to overcome and the fewer other buffer tanks connected to the same vacuum main, the less likely it is that the buffer tank will have an adverse effect on the system operation.

e. If a buffer tank is used to serve a restaurant, hotel or any other establishment that serves meals it is very important that the establishment have a grease trap because grease could be a problem in operation of the buffer tank.

2.1.17 Electronic Air Admission Control (EAAC)

a. Using an Electronic Air Admission Control (EAAC) device is an optional method to improve transport characteristics. The EAAC is an accessory to a typical 3-in. vacuum valve and shall be furnished and installed if shown on the construction plans and required in the contract.

b. The EAAC device monitors line vacuum and will open if vacuum falls below a pre-set limit for an extended period. The opening of this valve injects large quantities of atmospheric air to boost liquid through various lifts and downstream towards the vacuum station. The result is an increase of available vacuum for valve operation.

c. Under certain conditions this device can be included as a design feature when static losses are slightly more than the recommended 13 feet. The device may be added to improve the transport characteristics of a system after it is placed into operation.

d. Multiple EAAC devices should not be installed on the same vacuum main or branch line since there are limits to their use.

2.1.18 High Density Polyethylene (HDPE) Pipe and Fittings

a. The use of HDPE for road crossings may be permitted in lieu of jack and bore of a casing pipe and installation of the vacuum main PVC piping if it is demonstrated through Value Engineering that due to physical constraints and environmental conditions the successful installation of a casing pipe cannot be guaranteed. HDPE pipe shall be DR-11. In some cases, DR-9 may be required. Any HDPE pipe that is installed must pass a bucket test and shall be installed within the allowed grade tolerance for the vacuum piping the HDPE is replacing before it can be accepted for use in the vacuum collection system.

b. Any HDPE pipe and fittings used must meet the requirements for HDPE covered in the Section 002325 Force Mains.

2.1.19 Cycle Counter

a. Cycle Counter: The vacuum valve manufacturer shall provide a cycle counter with a 6-digit electronic display and capable of counting 4 cycles per minute, with a 2nd count delay period of 9 seconds.

b. Batteries: Lithium batteries with a 6-year life.

c. Enclosure: 4” x 5-1/4” x 3-1/2” glass filled ABS with clear cover.

2.1.20 Special Tools

The vacuum valve manufacturer shall provide one (1) set of special tools which consists of the following:

2 PIECE VALVE PITS	
Qty	Description
1 ea	Sensor pipe puller
2 ea	No-hub torque wrenches
1 ea	2 ½” vacuum gauge
1 ea	Portable Test Box
1 ea	Valve repair stand
3 ea	Cycle counters
2 ea	HP controller activation tool

2.1.21 Spare Parts – Valve Related (1 Set Per 100 Valve Pits)

a. The vacuum valve manufacturer shall provide one (1) set of spare parts for every 100 valve pits (rounded to the nearest 100).

b. One (1) set of spare parts consists of the following:

2 PIECE VALVE PITS	
Qty	Description
3 ea	3” Vacuum valves
3 ea	Installation parts bag

3 ea	Sump Breathers
6 ea	3” pipe coupling
1 ea	Tube of valve shaft grease
3 ea	Valve rebuild kit
3 ea	Controllers
3 ea	Controller mounting O-rings
3 ea	Controller mounting keys
3 ea	Controller rebuild kit
3 ea	Sump breather rebuild kits
25 ft	3/8” clear tubing
50 ft	5/8” clear tubing
12 ea	Tubing clamps
3 ea	6” grommets
3 ea	4” grommets

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

3.1.1 Delivery, Unloading, Storage, and Handling

a. The contractor shall inspect each shipment of pipe, fittings, valve pits, vacuum valves, division (gate) valves and accessories and make provisions for a timely replacement of any damaged material at no cost to CCU.

b. The contractor shall unload by hand or use canvas slings to avoid scratching the material delivered. The contractor shall not sling or drag delivered material over an abrasive surface.

c. Pipe, fittings, valve pits, vacuum valves, division (gate) valves and accessories damaged during handling shall be removed from the site and replaced in kind.

d. The contractor shall follow the manufacturer’s storage specification and store material in such a manner that prevents damage due to crushing, piercing, excessive heat, harmful chemicals, and exposure to sunlight.

e. All material shall be stored in a dry and secure area.

f. All components that make up the hybrid two-piece valve pit may be stored outside. If any such material is to be stored in excess of 2 years (such as spares for future work), temporary shading is required. Simple covering of these products which allows temperature buildup or exposure to direct or indirect sunlight is not permitted.

g. Valve pit cones: Vave pit cones may be stacked or laid on their sides. Stacks shall be limited to a maximum of eight (8) valve pit cones.

h. Collection sumps: Collection sumps shall be stacked upside-down on pallets

i. Suction and sensor pipes and flexible service laterals shall be stored in a manner that will keep them at ambient outdoor temperatures and out of direct sunlight. Shading shall be provided to meet this requirement. Simple covering of the pipe and fittings, which allows temperature buildup or exposure to direct or indirect sunlight, is not permitted.

j. 3" Vacuum valves with controllers, sump breathers, and installation parts bags shall be kept in a dry area. For safe storage, the individual cartons are to remain intact while in storage. Temperature surrounding the boxes while in storage shall not exceed 110 degrees.

k. Boxed grommets shall be kept in a dry area.

l. Cast iron rings and covers shall be stacked on pallets. Rings and covers shall be on separate pallets.

3.1.2 Vacuum Mains and Gravity Sewer Laterals Installation

a. All vacuum sewers shall be laid to the line and grade with the use of construction laser beam equipment. All direct bury vacuum main pipe and gravity sewer laterals shall be installed at a minimum depth of forty-eight (48) inches. All pipe which has been designed to slope downward shall be installed to slope continuously downward. There shall be no sags or bellies in the line as these will negatively affect operation of the system. The maximum deviation from planned elevations shall not exceed +/- 0.05 feet per 100 feet of length or 0.05% for all pipe sizes. The target slope is 0.20% which means the slope could vary from 0.15% to 0.25%. This plus or minus tolerance applies to all pipe sizes.

b. Installation of vacuum main piping by the horizontal directional drilling (HDD) method is not acceptable unless prior written approval is obtained from CCU. Approval would be on a case-by-case basis. Requests to use HDD is a major deviation requiring different pipe materials, joints, etc. Should CCU approve the use of HDD, the installation tolerances specified in Section 3.1.1a would apply, no abrupt sags or belies are allowed, and the Contractor shall verify such through electronic means while the pipe is being installed. After installation the pipe must pass a bucket test before being accepted.

c. Use proper tools and equipment for handling and laying of pipe and installing fittings.

d. Prevent entrance of dirt or foreign matter or damage to pipe lining or coating. Plug the pipe any time that work is stopped.

e. Do not allow trench water to enter the pipe at any time.

f. No defective pieces are permitted. Defective pieces discovered after installation shall be removed and replaced with a sound piece at no additional cost to CCU.

g. Fully bare pipe along its entire length.

h. Lay and join pipe in accordance with manufacturer's instructions to insure pipe thermal expansion and contraction. Lay pipe with spigot-end downstream.

i. Vertical Profile Changes (lifts): Lifts or vertical profile changes in vacuum mains are used to maintain shallow trench depths as well as for uphill liquid transport. These lifts are made in a saw-tooth fashion using 45-degree ells. A single lift consists of two (2) 45-degree fittings connected with a short length of pipe. For efficient use of the energy available, lifts should be

as small as possible. Numerous smaller lifts are recommended over one large lift. It is recommended that lifts be made in either 1.0 ft. or 1.5 ft. increments depending on pipe size. For 3" and 4" diameter pipe the maximum lift height should be 1.0 feet. For pipe sizes 6" to 10" the maximum lift height is 1.5 feet. In the rare event that 12" vacuum main is shown to be installed the maximum lift height is 2.0 feet.

j. Horizontal directional changes can be made with elbows of 45-degrees or less. A minimum of 2-feet is required for spacing between elbows used for horizontal directional changes.

k. Assemble lifts or horizontal directional changes as shown on the construction plans using either solvent welded or Reiber gasketed joints, assembled under controlled environmental conditions.

l. All fittings on vacuum mains, pit connection to vacuum main, and change of directions shall be field assembled by the Contractor using either solvent welds or Reiber type gasketed joints in accordance with the construction plans and as directed.

m. Where crossing of storm sewers are necessary on the vacuum mains, lifts shall be planned to pass either over or under the storm sewer depending upon the storm sewer depth and size.

n. Install pipe identification marker tape along the entire length of the vacuum sewer system.

o. Place compacted fill in entire space between the pipe/fittings and the trench walls.

p. Use temporary plugs in end of pipes when work is not in progress.

q. Where a casing must be used, provide pipe through casing with support skids to hold pipe in center of casing as shown on the detail. Alternate support methods may be acceptable contingent upon CCU review.

r. Bed pipe in accordance with CCU Standard Detail.

s. Verify pipe grade and elevation at each change in grade and change in direction, and record on the plans and in a notebook in a manner acceptable to CCU.

3.1.3 Vacuum Line Gate Valves (Division Valves)

a. Furnish and install gate valves that conform to the requirements of paragraph 2.1.4.

b. Gate valves are to be installed where shown on the construction plans but, in general, they should be installed at the beginning of each branch from the vacuum main and on the mainline near these branch connections. Should branch spacing exceed 1,500 linear feet, an additional division valve should be installed for that section. The purpose of the division valves is to isolate sections of the vacuum system for trouble shooting purposes.

c. Concrete collars are to be provided around each gate valve, where installed.

3.1.4 Valve Pit Installation - General

a. The end of the stub-out pipe that passes through the valve pit grommet shall be beveled. A stop ring shall be used to ensure the pipe does not protrude more than 4" inside the collection sump with an allowable tolerance of ±1/8".

b. All pipes that penetrate the valve pit through grommets shall be Sch 40 or SDR 21 pressure rated PVC pipe. No other pipe is acceptable.

c. Water-soluble soap or silicone spray shall be used when installing PVC pipes through grommets. Use of petroleum lubricant or pipe lube is prohibited.

3.1.5 Valve Pit Installation (2-Piece Pits)

a. Valve pit assembly is the responsibility of the Contractor and the valve pit shall be assembled in accordance with manufacturer's instructions.

b. Valve pits shall be installed using the following procedures:

1. Install the suction and sensor pipes.

2. Remove the PVC spacer from inside the collection sump if one is present.

3. Determine proper location and alignment with vacuum main and wye connection.

4. Determine grade elevation for the top of the pit package.

5. Determine the gravity line depth from the home to the pit package and verify that adequate slope exists between the house and the sump inlet. If sufficient fall does not exist, consult the Engineer or inspector prior to completing the valve pit installation.

6. Determine which raised flat area of the sump will require a gravity line stub out. Mark and cut the holes in the raised flat area as required. Each coupon shall be removed from the hole saw and hung inside the upper chamber as proof of its removal.

i. For 4" laterals a 5" opening is required with the centerline of the opening 18" from the outside bottom of the sump.

II. For 6" laterals, a 6-7/8" opening is required with the centerline of the opening 19" from the outside bottom of the sump.

7. Install the appropriate size rubber grommets into the field cut holes.

8. Excavate and prepare the bedding for the valve pit package as shown on the construction plans or as field instructed.

9. Lower the collection sump assembly into the prepared excavated hole, taking care that no material enters the collection sump.

10. Install the prefabricated house gravity line stub-outs through the grommet into the collection sump tank with the stop coupling firmly against the grommet. Use lubricant as specified in Part 2.1.5e when installing the stub outs. Ensure that grommet remains in place after pipe stub is installed.

11. Level entire assembly.

12. Backfill and compact suitable soil in lifts to the top of the collection sump. Once the valve pit is completely backfilled to grade the soil compaction must meet the compaction requirements of Charlotte County Public Works and the issued right-of-way permit so proper backfill and compaction of the collection sump is required.

13. Conduct the sump pressure test as described in Section 3.2.2.

14. Keep all mating surfaces clean and dry. Place the valve pit top on top of the collection sump.

15. Re-check level of valve pit package. Use of hydraulic machinery to obtain final level of valve pit may result in sump drainage and is strictly prohibited.

16. Install the flotation collar, if specified.

17. Insert the beveled end of the 3" flexible connector into the 3" pit opening hole. Push flexible connector all the way to the 3" suction elbow.

18. Use a 3" PVC coupling to attach the end of the flexible connector to the suction elbow (do not glue) to insure proper alignment.

19. After bedding the flexible connector, backfill to the top of the valve pit package. Compact the soil in accordance with Charlotte County Public works requirements and the issued right-of-way permit.

20. Remove the 3" coupling and cut the PVC end of the flexible connector to the center of the pit package (+/-1"). This is the only time the flexible connector may be cut during installation. The flexible connector must remain aligned concentrically with the suction pipe +/-1/2" after cutting.

21. Glue a PVC cap onto the end of the 3" flexible connector inside the pit package. NOTE: It is important to glue the PVC cap onto the end of the flexible connector prior to any vacuum being applied to the 3" vacuum service lateral. Failure to do this may result in the collapse of the lower collection sump.

22. Place the frame and cover on top of the valve pit assembly.

23. Pour a concrete ring, when shown on the plans or as directed by CCU.

24. Complete the installation of vacuum service piping from end of the flexible connector to the wye connection at vacuum main. Ensure downward slope from pit to main and that any lifts installed meet design requirements.

25. Complete the back-fill of the service lateral (flexible connector to main line wye) and compact to meet the requirements of Charlotte County Public Works.

26. Record information on the Valve Pit Information Form.

3.1.6 Marker Balls and Metallic Marker Tape

a. Contractor shall provide and install metallic marker tape and provide, program, and install marker balls for all installed trenched pipe. For trenchless pipe installations the Contractor shall provide, program, and install marker balls. Metallic marker tape is not required on trenchless pipe installations. The metallic marker tape shall be marked green for wastewater. The metallic tape shall be laid 12 to 18 inches above the pipe and the ball markers placed directly on top of the pipe or fitting. For trenchless pipe installations the marker balls shall be placed with a minimum of 18 inches of cover with the exception that no marker balls are required for that portion of pipe that lies beneath the water surface at a subaqueous crossing.

b. Installation: The balls shall be installed at all changes of direction and fittings absent of any valve. On straight runs of pipe, the balls shall be installed at every power pole. If power poles do not exist, the balls shall be placed every 150 feet from the nearest change of direction or fitting. At

road and driveway crossings the marker balls shall be placed on each side of the road or driveway, two feet from the pavement or driveway edge, or as otherwise approved in writing by CCU. On vertical deflections the marker ball shall be placed on the top fitting only.

c. Programming: The contractor shall program all balls and provide a copy of the programmed data in each marker ball in either Microsoft EXCEL or Access electronic format to CCU.

3.1.7 Buffer Tanks

If buffer tanks are included as part of the project their installation and testing shall be in accordance with manufacturer's requirements.

3.1.8 Electronic Air Admission Control (EAAC)

If an EAAC device is to be installed as an accessory to a vacuum valve, the device shall be installed in accordance with manufacturer's requirements,

3.2 TESTING AND LINE FLUSHING

3.2.1 Trailer Mounted Vacuum Pump (TMVP)

a. CCU will provide a TMVP, paperless chart recorder and 0-50 magnehelic test kit to the Contractor for use during construction unless otherwise provided in the contract that the TMVP is to be purchased by the Contractor and turn it over to CCU upon project completion.

b. If the TMVP is supplied by CCU, the Contractor must return the TMVP to CCU upon completion of the project in the same conditions as received.

3.2.2 Vacuum Line Testing – Daily Testing

a. A two (2) hour vacuum tightness test of all sewer mains and lateral connections shall be conducted daily as follows:

1. Plug all open connections with rubber stoppers or temporary caps, fitted to the pipe by "no-hub" couplings.

2. Apply a vacuum of 22 inches Hg to the pipes and allow the pressure to stabilize for 15 minutes. (If data logger is used, apply vacuum of -0.73 bar).

3. There should be no loss of vacuum in excess of ½ inch Hg over a two hour test period (if data logger is used, no loss in excess of 0.02 bar. Passing test is a reading anywhere between -0.73 and -0.71 bar).

4. There shall be absolutely no water allowed to be admitted into the piping network during this test.

5. The daily test shall include the new section of pipe laid that day in addition to all pipe connected to the same vacuum main that was laid and tested previously.

b. If the Contractor successfully passes the daily 2-hour test for seven (7) consecutive working days or two thousand (2,000) feet of pipe, a request to modify the test procedures may be made to the Engineer. If so, approved by the Engineer, the daily two (2) hour vacuum test procedure may by modified as follows:

1. The procedure may be altered to relax the requirement for daily testing with testing done in the intervals deemed necessary by the Contractor and approved by the Engineer and CCU.

2. Should a line fail the vacuum test while utilizing this test modification, the Contractor shall take whatever action necessary at his own expense to successfully pass the test including the re-excavation of the trench, leak detection, line repair, and additional cleanup as required by the Engineer and CCU.

3. After a failure, the Contractor must return to the standard testing procedures to "re-qualify" for the modified testing.

4. This test modification is optional, and as such, the Contractor assumes all liability in its use, even if approved by the Engineer and CCU.

3.2.3 Valve Pit Sump Testing – 2 Piece Pits

a. One sump test shall be performed. This test is performed after all holes have been field cut, grommets and stub-out pipes installed, and the entire valve pit assembly installed in the ground. This test is done to test the grommets, the entire length of the stub-outs including any pipe in the public right-of-way, and the overall sump assembly.

b. Sump testing shall be done as follows:

1. Attach provided sump test assembly onto the end of the 3" suction pipe inside

the valve pit with a 3" No-hub or Fernco coupling and PVC test cap.

2. Secure 1/8" tubing to the HIGH port on a 0-50" magnehelic gauge, and then connect the other end to the tubing port on the PVC test cap.

3. Install a test plug in the sump breather hole using the rubber seal provided. Apply water soluble soap to the rubber seal before installation. Turn 90 degrees to make a tight seal.

4. Pressurize the collection sump though the air chuck on the PVC test cap.

5. Test at 40" water gauge pressure. Leakage must be under 5" water gauge in one (1) minute.

6. If leak test fails the Contractor must locate the leak, repair it and retest.

3.2.4 Vacuum Line testing – Final Acceptance Test

a. A four (4) hour vacuum tightness test of the complete vacuum piping network, including all sewer mains and lateral connections, shall be conducted prior to the installation of the 3-inch vacuum valves as follows:

1. Subject the entire sewerage system to a vacuum of 22 inches Hg and allow it to stabilize for 15 minutes (if data logger is used, apply vacuum of -0.73 bar).

2. There shall be no loss greater than 1-inch Hg over a four (4) hour test period (if data logger is used, no loss in excess of 0.4 bar. A passing test is a reading anywhere between -0.73 and -0.69 bar).

3. There shall be absolutely no water allowed to enter the piping system or the vacuum station during this test.

b. Contractor to provide 48 hours' notice to the Engineer and CCU prior to test.

c. Contractor to assure all division valves are open prior to beginning test.

d. Final Acceptance Test shall be recorded on approved vacuum chart recorder. This chart will not be considered valid unless witnessed by the Engineer or CCU on test equipment at the beginning and the end of the vacuum test period.

e. The Engineer or CCU representative will sign and date the chart to verify witness of test. This signature does not indicate acceptance of the system.

3.2.5 Line Flushing

a. After successful four (4) hour acceptance testing, flush lines to remove debris and foreign materials that accumulated during construction.

b. Suggested procedure. (In the absence of special test apparatus, this procedure will require the use of the existing vacuum station)

1. Place system under vacuum.

2. Add water and air in controlled amounts to valve pits at extreme ends of system.

3. Utilize system vacuum to transport water and debris to collection point.

4. Continue procedure until water entering at collection point is free of contamination or debris.

5. If the vacuum collection tank is used as the collection point, monitor volume of liquid in tank and pump out as necessary.

6. Use system sewage pumps only after verifying that not debris is present in the collection tank.

7. If debris is present, use other methods to empty the collection tank.

8. At completion of flushing, clean collection tank of all collected debris.

9. Seal system and make ready to place into operation.

c. Alternate flushing procedure subject to Engineer's review and approval.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and construction of potable water mains. Potable water mains, if applicable, shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit.

1.1 SCOPE

1.1.1 General

This specification provides the requirements for potable water main construction for the project.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the work required under the contract to include but not limited to unloading, hauling, and distributing all pipe, fittings, valves, and appurtenances. The Contractor shall also remove any surfacing, as required; excavate the trenches and pits to the required dimensions; construct and maintain all required for traffic control devices and appurtenances; sheet, brace, and support the adjoining ground or structures where necessary; furnish all pipe, pipe bend sections, jointing material, restraints, stainless steel stiffeners, bedding material and all other appurtenances; laying, furnishing and installing flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures; handle all drainage or ground water; provide barricades, guards, and warning lights; lay and test the pipe, fittings, valves, and appurtenances; place all marking and locating devices, backfill and consolidate the trenches and pits; maintain all surfaces over the trench until surface restoration is completed; restore the surfaces unless otherwise stipulated; remove surplus excavated material; and clean the site of the work.

The Contractor shall also furnish all labor, materials, equipment, tools, and all other associated appurtenances required to rearrange sewers, conduits, ducts, pipes, or other structures encountered in the installation of the work.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the construction of the potable water mains with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the written consent of the Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Potable Water Main

Direct bury and directional bore potable water and reclaimed water pipe shall be paid for at the contract bid price per lineal foot for each size and type of material specified which shall include the cost of furnishing all pipe, pipe bend sections, jointing material, restraints, stainless steel stiffeners, bedding material and all other appurtenances, and of delivering, handling, laying, dewatering, trenching, sheeting and backfilling, maintain all existing potable water main flows, furnishing and installing flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures (unless separate bid item is provided), testing, restoring the surface (unless separate bid item is provided), necessary permits, and all material or work necessary to install the pipe complete in place at the depth specified on the plans and/or as directed by CCU.

The length of pipe for direct bury installation for which payment is made shall be the actual overall length measured along the axis of the pipe without regard to tee sections or bend sections. All lengths shall be measured in a horizontal plane unless the grade of the pipe is more than fifteen percent (15%). No payment consideration will be given to depth zones for the installation of the potable water main.

The length of pipe for directional bore of potable water main pipe and reclaimed water main pipe shall be measured by measuring the length pipe before installation and subtracting the lengths of the pipe cut from the ends of pipe when the bore pipe is connected to the pipe on either end. The difference is the length of the pipe in the ground.

1.2.2 Automatic Flushing Assembly

The automatic flushing assembly shall be paid for at the contract bid price per each which shall include the cost of furnishing flushing device, piping, tees, fittings, valves, and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering,

restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans. Testing shall be included in the piping test.

1.2.3 Main End Blow Off Assembly

The main end blow off assembly shall be paid for at the contract bid price per each which shall include the cost of furnishing main end blow off assembly device, piping, tees, fittings, ball valves, meter box, restraints and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans. Testing shall be included in the piping test.

1.2.4 Tie Back Assembly (for Existing Facilities Only)

The tie back assembly, if required, for connection to existing facilities which are not properly restrained, shall be paid for at the contract bid price per each which shall include the cost of furnishing tie back assembly device, stainless steel threaded rods, fittings, concrete blocking, restraints and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans.

1.2.5 Thrust Block

Thrust blocks, if required, for connection to existing facilities which are not properly restrained, shall be paid for at the contract bid price per tie back assembly for the size of pipe involved which shall include the cost of furnishing thrust block and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans.

1.2.6 Ductile Iron Fittings

Ductile iron fittings shall be paid for by the contract bid price by weight (latest revision of AWWA C153) and shall include all labor, equipment, materials, and all associated appurtenances to install the ductile iron fittings. Restraints shall be considered incidental to the ductile iron fittings contract bid price and no direct payment will be made. Any other items necessary for the installation of the ductile iron fittings that are not included in the manufacturer's specified weight, including but not limited to bolts, gaskets, jointing materials, labor, and testing shall be considered incidental to the project.

1.2.7 Locate Balls and Marker Tape

a. Locate balls shall be paid for at the contract bid price per each which shall include all labor, equipment, materials, and associated appurtenances to install and program the marker balls and submit the marker ball data to the CCU.

b. Marker tape shall be considered incidental to the mains.

1.2.8 Service Connections

a. Service connections shall be paid for as outlined below and shall include all labor, equipment, materials, and all associated appurtenances to completely install service connections. The CCU will provide all meters to the contractor for installation. The meter shall be paid for under a separate bid item or per developer agreement .

b. Service connection piping shall be paid for as per contract bid price per lineal foot installed for each potable water service size and include all connections to piping, meters and/or other assemblies for a complete operable service. Service fittings shall be incidental to the service connection piping bid item unit price.

c. Corporations and curb stops shall be paid for as per contract bid price per each installed for each potable water service size.

d. U-branch shall be paid for as per contract bid price per each installed for each potable water service size.

e. Service saddles shall be paid for as per contract bid price per each installed for each potable water service size.

f. Backflow prevention devices, if required, shall be paid for as per contract bid price per each installed for each size.

g. The measurement and payment for all labor, materials, equipment, and all other appurtenances for potable water meter removal and/or replacement shall be per each potable water meter removed and/or replaced.

h. The measurement and payment for all labor, materials, equipment and all other appurtenances for potable water meter box removal and/or replacement shall be per each potable water meter box removed and/or replaced.

i. The measurement and payment for all labor, materials, equipment and all other appurtenances for bollards shall be per each bollard constructed and installed.

j. Measurement and payment shall be as per the unit price bid per each residential or commercial potable water service connection to existing plumbing irrespective of size and shall include any and all items required to connect the existing service line to the newly installed potable water meter, or existing water meter to a newly installed service line for a complete and operational connection. The removal of the existing potable water service plumbing shall be considered incidental to the new potable water service connection bid unit price.

1.2.9 Testing

All required testing shall be considered incidental to the project and no direct payment will be made.

1.2.10 Line Stops

The installation of line stops shall be paid for at the contract bid price per each based on size specified in the bid form and shall include the cost of labor, material, equipment and all other associated appurtenances required to complete the installation of line stops in accordance with the Contract Documents. The installation of line stops on existing potable water mains shall be approved by CCU EOR before Contractor proceeds and coordinated with CCU Operations.

1.2.11 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct payment will be made.

1.3 REFERENCED STANDARDS (Latest Revision)

AWWA/ANSI:
C-105, Polyethylene Encasement for Ductile-Iron Pipe Systems
C-110, Ductile-Iron and Gray-Iron Fittings
C-111, Rubber – Gasket Joints for Ductile-Iron Pressure Pipe Fittings
C-151, Ductile-Iron Pipe, Centrifugally Cast
C-153, Ductile-Iron Compact Fittings
C-600, Installation of Ductile-Iron Mains and their Appurtenances
C-651, Disinfecting Water Mains
C-652 Disinfection of Water-Storage Facilities
C-900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
C-901, Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. (19mm) Through 3 In. (76 mm), for Water Service
C-906, Polyethylene (PE) Pressure Pipe Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
C-909, Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger

ASTM:
A-139, Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over
D-1120 Standard Test Method for Boiling Point of Engine Coolants
D-1248 Polyethylene Plastics Extrusion Materials for Wire and Cable
D-1785 Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
D-1869, Rubber Rings for Fiber-Reinforced Cement Pipe
D-2241 Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series
D-3350 Polyethylene Plastics Pipe and Fittings Materials
D-1598, Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D-1599 Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

AASHTO Code
NSF: Standard 61
Florida Administrative Code
Ten States Recommended Standards for Water Works

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
001760 – Surveying and Record Drawings
002340 – Valves
002240 – Dewatering
002345 – Fire Hydrants
002930 – Grassing
009900 – Surface Preparation, Painting and Coating

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

The Contractor shall submit complete detailed documentation of all materials for approval by the CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

The Contractor shall provide proof of supplier certification/training for thermal butt-fusion of pipe for any employee fusing pipe.

Final written approval is at the discretion of the CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions.

2.1.1 General

The materials used in this work shall be all new and conform to the requirements for class, kind, size, and material as specified below:

All pipes furnished for potable water mains and for service connection installations shall be of the type, kind, size, and class indicated for each particular line segment as shown on the engineering drawings and/or designated in the Contract items. Potable water mains shall be a minimum of six (6) inches in diameter unless otherwise approved by the CCU.

2.1.2 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

a. PVC Pipe: PVC pipe for potable water mains shall conform to the requirements of AWWA C-900 (4" through 60"), , and AWWA C-909 (4" through 24") and shall be Class 150 DR 18 for all open cut and direct bury installations with a minimum of thirty six inches (36") of cover for potable water mains and 12" and under and 60" of cover for water mains over 12" in diameter. For shallower depth, the type of pipe and installation shall require prior written approval by the CCU. The manufacturer shall insure all quality control test and AWWA requirements are complied with during the production of PVC pipe.

b. C-900 and C-909 pipes shall have an integral bell formed with a race designed to accept the gasket in accordance with their respective AWWA requirements. The spigot end shall have a bevel and a stop mark on the outside diameter to indicate proper insertion depth. Provisions shall be made for expansion and contraction at each joint. All surfaces of the joint where the gasket may bear shall be smooth, free of cracks, fractures, or imperfections that could adversely affect the performance of the joint.

c. Pipe Color: All C-900 and C-909 potable water main pipes shall be blue in color with a PVC ASTM D-1120 and ASTM D-2241 reference, the class pressure rating, and the DR number permanently and legibly marked on the pipe.

d. Rubber Gasket Joints: C-900, and C-909 polyvinylchloride pipe joints shall be the bell and spigot type using rubber gasket push-on type joints. Rubber gaskets shall be molded to a circular form to the proper cross section and shall consist of a vulcanized high grade elastomeric compound conforming to ASTM D-1869 and AWWA C-900 elastomeric seals for joining plastic pipe.

e. Fittings: All ductile iron fittings shall be in accordance with AWWA Specification C-153 and as a minimum have the same pressure rating of the connecting pipe. All ductile iron fittings shall be cement mortar or fusion bonded epoxy coated. All coatings in contact with potable water shall be certified to NSF 61. All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel and all buried fasteners such as bolts, nuts, fasteners, and washers shall be "Cor-Ten" steel or Cor-blue coated. Threaded rod for buried applications shall be Type 316 stainless steel. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

f. Fastener Threads: All stainless-steel fastener threads shall be coated with an anti-seize compound as approved in writing, by CCU.

2.1.3 High Density Polyethylene (HDPE) Pipe and Fittings

a. High Density Polyethylene (HDPE) pipe shall meet the requirements of AWWA C-906 for polyethylene pressure pipe and fittings and for PE-3408 SDR 11. HDPE pipe shall meet ASTM D-3350 cell classification of 345434C. Permanent identification of the pipe shall be provided by co-extruding blue longitudinal stripes into the pipe's outside surface for potable water All polyethylene piping shall have ductile iron pipe nominal outside diameters.

   Individual sections of HDPE piping shall be joined together by thermal butt-fusion to make a continuous section of pipe as recommended by the pipe manufacturer. Bends in HDPE pipe shall not be within ten (10) pipe diameters from any fitting or valve. The minimum radius of curvature shall be per the pipe manufacturers recommendations and bending shall not cause kinking. HDPE piping shall not be joined by solvent cements, adhesive or threaded type connections.

   The color marking stripes shall be aligned during the fusing process and the pipe shall be pulled through the bore to allow identification of the type of system utilizing the HDPE pipe.

b. All mechanical joint fittings and sleeves used with high density polyethylene (HDPE) pipe shall be cement mortar or fusion bonded epoxy coated ductile iron with mechanical joints rated to 350 psi and conforming to AWWA C-153 and C-111. All coatings in contact with potable water shall be certified to NSF-61. All MJ fitting connections to polyethylene pipe shall be restrained with Mega-Lug restrainers. The HDPE pipe shall be reinforced on the ends using stainless steel internal stiffeners.

   The mechanical connection to MJ fittings and sleeves shall use mechanical restraints that meet specification requirements. Size-on-size mechanical connection to PVC or DI pipe shall be by long ductile iron solid sleeves with Mega-Lug restrainers.

   No electro fusion fittings shall be used with HDPE unless written approval is provided by CCU.

   HDPE molded butt fittings and couplings for non-standard fittings and couplings shall require written approval from CCU for installation.

2.1.4 Polyethylene (PE) Pipe and Fittings for Service Connections

a. PE pipe two inches or less in size shall meet AWWA C-901, ASTM D-3350 cell classification of 334434C and be permanently marked with the type/size/use of the pipe. PE pipe two and one half (2 ½) inches or three (3) inches in size shall meet AWW C-901, ASTM D-3350 cell classification of 334434C and be permanently marked with the type/size/use of the pipe and shall only be permitted by specific written approval by CCU. The minimum radius of curvature shall be per manufacturers recommendations and bending shall not cause kinking. The potable water pipe shall be blue in color.

b. Brass Compression Coupling Fittings: Brass compression coupling fittings shall be permitted as approved by the CCU.

c. HDPE Compression Coupling Fittings: PE piping with HDPE compression fittings shall be permitted as approved by the CCU. PE piping with the HDPE 4710 molded fittings does not require stainless steel stiffeners.

d. Mechanical Coupling Fittings: The mechanical coupling fittings shall meet and/or exceed the maximum design pressure requirements of the piping system. The couplings shall prevent the entry of dust, dirt, and moisture. Mechanical coupling fittings shall not be permitted unless approved in writing by CCU.

e. PVC Compression Coupling Fittings: PE piping with PVC compression fittings shall not be permitted unless approved in writing by CCU.

2.1.5 Ductile Iron Pipe and Fittings

a. The ductile iron (DI) pipe covered by this specification shall be the push-on joint type or mechanical joint type, centrifugally cast to conform to all requirements of AWWA Specifications C-151 and C-153, latest revisions.

The maximum allowable deflection of the pipe shall be per the pipe manufacturers recommendations. Ductile iron pipe will be fully encased in an 8-mil polyethylene sleeve, in accordance with AWWA C-105, Method A. The pipe and the polyethylene sleeve shall be color coded blue for potable water by a means acceptable to CCU.

b. All pipes shall have a cement mortar or fusion bonded epoxy coating in accordance with the AWWA Specifications, latest revision. All coatings in touch with potable water shall be certified to NSF-61.

c. Polyethylene material shall conform to ASTM Standard Specification D1248-68, latest revision. All ductile iron piping shall be marked "DUCTILE IRON" in large letters. The nominal wall thickness shall be legibly marked on each piece of pipe and the pipe installed so that the markings can be read from the top of the trench.

Minimum thickness of ductile iron pipe shall be as follows:

3" Ductile Iron Pipe	0.27"	Class 52
4" Ductile Iron Pipe	0.29"	Class 52
6" Ductile Iron Pipe	0.31"	Class 52
8" Ductile Iron Pipe	0.33"	Class 52
10" Ductile Iron Pipe	0.35"	Class 52
12" Ductile Iron Pipe	0.37"	Class 52
14" Ductile Iron Pipe	0.36"	Class 51

16" Ductile Iron Pipe	0.37"	Class 51
18" Ductile Iron Pipe	0.38"	Class 51
20" Ductile Iron Pipe	0.39"	Class 51
24" Ductile Iron Pipe	0.41"	Class 51
30" Ductile Iron Pipe	0.43"	Class 51
36" Ductile Iron Pipe	0.48"	Class 51
42" Ductile Iron Pipe	0.53"	Class 51

d. Rubber gasket joints shall be in accordance with AWWA Specification C111 latest revision.

e. All fittings shall be in accordance with AWWA Specification C-153 latest revision and have the same pressure rating of the connecting pipe. All ductile iron fittings shall be cement mortar or fusion bonded epoxy coated. All coatings in touch with potable water shall be certified to NSF61. All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel. All buried fasteners such as bolts, nuts, washers, and threaded rod shall be “Cor-Ten” steel or Cor-blue coated steel. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

f. All stainless-steel fasteners threads shall be coated with an anti-seize compound as approved in writing, by the CCU.

g. All tapping sleeves shall be 316 stainless steel

2.1.6 Service Connections

The existing CCU approved products are listed on the Approved Products list, posted on the CCU website.

a. Corporation Stops

All corporation stops shall conform to AWWA standards and shall comply with the CCU standard details as determined by CCU. Corporation stops shall meet a 300 psi rating.

b. Curb Stops

All curb stops shall conform to AWWA standards and shall meet CCU standard details as determined by CCU. Curb stops shall meet a 300 psi rating.

c. Service Saddles

All service saddles shall conform to AWWA standards and shall meet CCU standard details as determined by CCU. Service Saddles for HDPE pipe include fusion bonded HDPE saddles as per AWWA standards. Service saddles shall meet a 200 psi rating.

d. U Branch

All U Branches shall conform to AWWA standards and shall meet CCU standard details as determined by CCU.

e. Brass service fittings shall conform to AWWA standards, FDEP regulations and shall meet CCU standard details as determined by CCU and NSF 61 / ANSI 372.

f. Backflow Prevention Devices

All backflow prevention devices shall conform to AWWA standards, FDEP regulations, and shall meet CCU standard details as determined by CCU.

2.1.7 Pipe and Fittings Unloading at Site

The contractor shall inspect each shipment of pipe and fittings and make provisions for a timely replacement of any damaged material. The contractor shall unload by hand or use canvas slings to avoid scratching the pipe. The contractor shall not sling or drag pipe over an abrasive surface. Pipe or fittings damaged during handling shall be removed from the site and replaced with new pipe and/or fittings. The contractor shall follow the manufacturer's storage specification and store pipe and fittings in such a manner that prevents damage due to crushing, piercing, excessive heat, harmful chemicals, and exposure to sunlight. Pipe and fittings shall be stored in a dry and secure area.

2.1.8 Marker Balls and Marker Tape

a. Potable water marker balls shall be 3M 4 inch marker ball blue in color.

b. Marker tape stripes shall be blue in color for potable water.

2.1.9 Automatic Flushing Assembly

The automatic flushing assembly shall meet the requirements of the CCU standard details or as determined by CCU.

2.1.10 Potable Water Service Connections

a. All potable water service connections up to 2 inches in size shall be constructed with polyethylene pipe. Service connections for 1½ inch and 2 inch meters shall have a 2 inch polyethylene pipe for service between the main and the meter connection, for ¾ inch and 1 inch meters shall have a 1 inch polyethylene pipe for service between the main and meter connection Service connections 4 inches or greater in size shall be constructed of PVC pipe meeting AWWA C-900 requirements.

b. Service connections including backflow prevention devices shall meet the marking, color, materials, configuration, and installation requirements of these standard technical specifications and CCU standard details.

c. Potable water meter boxes and covers installation shall be rated as follow:

For low vehicle traffic areas such as sidewalk, property line/easement shall be at a minimum ANSI/SCTE Tier 8 rated potable water meter boxes and covers.

For medium vehicle traffic areas such as residential driveways, roadways, and parking lots shall be at a minimum ANSI/SCTE Tier 15 rated water meter boxes and covers.

For high vehicle traffic areas such as county arterial roadways, state roads, commercial driveways, industrial parks shall be at a minimum ANSI/SCTE Tier 22 rated water meter boxes and covers.

d. Water meter boxes and covers shall be blue in color for potable water.

e. All water meter boxes shall be delivered with the water source and service access holes installed.

f. Potable water meters, required to be purchased from CCU, shall be installed either in a double or single configuration as determined by CCU.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

Direct Bury, Directional Bore, and Jack and Bore: All direct bury, directional bore, and jack and bore, potable water main pipe shall be installed to a minimum depth of thirty-six (36) inches to the top of the potable water main for 12" and below or 60" depth on pipe over 12" or as approved in writing by CCU. If additional fittings are required where not shown on the engineering drawings to maintain alignment around curves, the Contractor shall provide the required number and be compensated at the contract bid price as proposed on the bid form.

NOTE: If the new construction is tying into existing utilities, the Contractor shall verify the existing utilities, such as fittings and valves, are restrained prior to the start of installation of the valve or piping. If not properly restrained, the contractor shall notify CCU and shall restrain the existing utility as approved by CCU in writing.

3.1.1 Direct Bury of Material

a. Open cut PVC potable water main piping shall be Class 150 DR 18 for all areas with a minimum of thirty-six (36) inches of cover for potable water mains and 12" in diameter and below or 60" depth on pipe over 12" in diameter. For shallower depth, the type of pipe and installation shall require prior written approval by CCU. Any pipe left in the trench overnight shall be plugged or capped and watertight. Bags, plastic and tape will not be allowed. Potable water mains shall be installed at a consistent depth.

b.

c. Proper implements, tools, and facilities satisfactory to the CCU shall be provided and used by the Contractor for the safe and convenient execution of the work and the testing. All pipe, fittings, and valves shall be carefully lowered into the trench in such a manner as to prevent damage to potable water main materials and protective coatings and linings. Under no circumstances shall potable water main materials be dropped or dumped into the trench. The pipe shall be laid with the manufacturers lettering designating the type and size of pipe visible from the top of the open trench. Wherever it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane to avoid obstructions or where long-radius curves are permitted, the amount of pipe or joint deflection shall not exceed fifty (50) percent of the manufacturer's recommended limit. Pipelines intended to be straight shall not deviate from the straight line.

d. Open cutting of roads for trenching and direct bury of potable water mains shall not exceed eight feet (8') in width unless specified otherwise in contract documents. All effort shall be made to minimize the width of the trench and in-turn, the amount of restoration.

e. As directed by CCU all existing materials removed to facilitate the tunneling or deflecting of direct bury piping under or adjacent to an existing storm piping and/or structures shall be replaced by flowable fill. Prior to placing flowable fill the area between the direct bury piping and existing piping or structure shall be hollowed out to a defined cavity along the length of the direct bury piping. The Contractor is responsible for filling the cavity with flowable fill and replacing the flowable fill as necessary throughout the contract and warranty period should erosion occur.

f. PVC pipe may be laid in the trench in single sections or preassembled multiple sections including no more than 1 full stick of pipe, 1 partial stick of pipe, and intervening required fittings and/or valves. Preassembled sections of pipe shall be carefully fed by hand or with the use of approved equipment on the pipe bed. The contractor shall provide pockets in the pipe bed material to eliminate any concentration of loads on the bell ends or joints. The ends of mechanical joint pipe and fittings and rubber gasket joint pipe and fittings shall be clean of all dirt, grease and foreign matter prior to installing fittings or joining of pipe sections. A joint lubricant shall be applied to all gaskets prior to joining two pipe sections together. The joint lubricant shall have been tested and approved for potable water service. No lubricant shall be used that will harbor bacteria or damage the gaskets.

g. Cutting pipe for inserting valves, fittings, or closure pieces shall be in a neat and workmanlike manner without damaging the pipe or lining and so as to leave a smooth end at right angles to the axes of the cut pipe. The cut end of mechanical joint pipe shall be dressed to remove sharp edges or projections which may damage the rubber gasket. For push-on joints, the Contractor shall dress the pipe cut ends by beveling as recommended by the manufacturer.

3.1.2 Directional Bore of Material

a. Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and convenient execution of the work. The Contractor shall meet the jointing and cutting pipe direct bury potable water main piping requirements as they apply to the directional bore. A log

of the bore depths shall be based on one-foot intervals staking from the entry and exit locations and intermediate centerline. The vertical and horizontal location readings shall be plotted on a one inch (1") equals twenty feet (20') natural scale drawing which shall be provided to the CCU within 48 hours of completion of the bore.

No electro fusion fittings shall be used with HDPE unless written approval is provided by the CCU.

b. For potable water mains eight (8”) inches in size or smaller, the HDPE pipe shall have the same outside diameter as the connecting mains. For larger sizes, the HDPE pipe shall have the same size or larger inside diameter as the connecting mains unless otherwise noted on the plans; provided for in the Special Provisions; or approved in writing by the CCU.

c. The depth of all directional bores for FDOT roads shall be in accordance with the FDOT permit requirements.

d. The slurry may be recycled for reuse in additional hole opening operations if approved in writing by the CCU or it shall be removed and disposed of at an approved dump site. No fluids shall be allowed to enter any unapproved areas or any waterways.

e. For directional bores under any surface water (subaqueous) the drilling contractor must submit a ‘frac-out’ response plan for review and approval prior to starting the directional bore. During execution of all subaqueous directional bores, the drilling contractor must have at the site the necessary material, equipment, and manpower to properly respond to a ‘frac-out’ in accordance with the ‘frac-out’ response plan.

f. All bores two (2”) inches or larger in diameter (except for service lines) shall have two tracer wires attached to the bore. All tracer wire shall be a 10 AWG,, steel reinforced, insulated copper tracer wire, with a minimum of 2,000-pound break load. The Contractor shall submit the selected tracer wire to CCU for written approval. It shall run continuously with and shall be securely fastened to the utility main. All tracer wire shall be in compliance with the following:

   I. All tracer wire termination points must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose and with t CCU approved load rating.

   II. All grade level/in-ground access boxes shall be appropriately identified with “sewer” cast into the cap and be color coded.

   III. A minimum of 20 ft. of excess/slack wire is required in all tracer wire access boxes after meeting final elevation.

   IV. All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the tracer wire connection and the terminal for the grounding anode wire connection.

V. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

VI. The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the project with the CCU staff present.

g. Boring Failure

The Contractor shall maintain a copy of a Frac-out contingency plan on the construction site and provide a copy to the CCU. The Contractor's Frac-out plan shall meet FDEP permit regulations and other regulatory agency requirements in accordance with the project regulatory permits where applicable. (Frac-out is a condition where drilling mud is released through fractured rock or soil and travels toward the surface.)

If conditions warrant removal of any materials installed in a failed bore path, as determined by the CCU, it will be at no cost to the CCU. Promptly fill all voids with excavatable flowable fill.

If an obstruction is encountered during boring which prevents completion of the installation in accordance with the design location and specification, the pipe may be taken out of service and left in place at the discretion of the CCU. Immediately fill the product left in place with excavatable flowable fill or capped at the discretion of the CCU. Submit a new installation procedure and revised plans to the CCU for approval before resuming work at another location.

h. Quality Control

The Contractor shall submit a description of the quality control methods they propose to use in the directional drilling operations to the CCU for approval at least 10 days prior to the start of directional drilling. The submittal shall include procedures for controlling and checking line and grade and field forms for establishing and checking line and grade to comply with the required limitations.

i. Control of Line and Grade

The Contractor shall establish and be fully responsible for the accuracy of their own control for the construction of the entire project, including structures, bore hole line and grade.

j. The Contractor shall:

a. Establish control points a sufficient distance away from the bore hole operation not to be affected by construction operations.
b. Check control for the bore alignment against an above ground undisturbed reference at least once each hour and once for each 50 feet of bore hole constructed, or more often as needed or directed by the CCU.
c. Drill pilot holes to ensure the required vertical clearances from ditch, river, or wetland bottoms, and horizontal clearances from buffers or easement lines are maintained. The contractor shall monitor and record horizontal and vertical boring hole locations at twenty-five-foot (25') intervals or any change in line and grade. If the pilot hole exists in buffers or outside of easements as shown on the plans the Contractor shall be responsible for grouting the hole to the satisfaction of the CCU. If the pilot hole deviates outside of its permitted limits, the drill string shall be withdrawn, and the borehole grouted to the satisfaction of the CCU.

k. As-Built plans for on-grade bores shall indicate the depth of both pipe inverts and verify the grade. As-Built plans shall conform to the Charlotte County Utility 's "Minimum Drawing Requirements".

3.1.4 Fire Hydrants

Fire hydrant potable water main piping between the fire hydrant tee and the fire hydrant shall be installed level. Refer to the latest CCU Fire Hydrants Specification posted on the CCU website.

3.1.5 Marker Balls and Metallic Marker Tape

a. Marker balls and metallic marker tape: Contractor shall provide and install metallic marker tape and provide, program, and install marker balls for all installed trenched pipe. For trenchless pipe installations the Contractor shall provide, program, and install marker balls. Metallic marker tape is not required on trenchless pipe installations. The tape shall be marked blue for potable water. The metallic tape shall be laid 12 to 18 inches above the pipe and the ball markers placed directly on top of the pipe or fitting. For trenchless pipe installations the marker balls shall be placed with a minimum of 18 inches of cover and no deeper than 3 feet of cover with the exception that no marker balls are required for that portion of pipe that lies beneath the water surface at a subaqueous crossing.

b. Installation: The balls shall be installed at all changes of direction and fittings absent of any valve. For cul-de-sacs having continuous fused or roll piping with no in-line fittings, the balls shall be placed starting at the point of curvature of the cul-de-sac and every 50 linear foot to the end of the line. On straight runs of pipe, the balls shall be installed at every power pole. If power poles do not exist, the balls shall be placed every 150 feet from the nearest change of direction or fitting. At road and driveway crossings the marker balls shall be placed on each side of the road or driveway, two feet from the pavement or driveway edge, or as otherwise approved in writing by the CCU. On vertical deflections the marker ball shall be placed on the top fitting only.

c. Programming: The Contractor shall program all balls and provide a copy of the programmed data in each marker ball in either Microsoft EXCEL or Access electronic format to the CCU. The Contractor as-built drawings shall show the location of all marker balls.

3.1.6 Fittings

When tightening bolts, the contractor shall bring the gland up toward the flange evenly while maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. Tighten all nuts progressively a little at a time. DO NOT over stress bolts to compensate for poor alignment. If effective sealing is not attained at the maximum allowable torque, disassemble the joint and reassemble again after cleaning. Fittings shall be installed in accordance with the manufacturer's published instructions.

3.1.7 Restraints

Piping shall be restrained in accordance with the CCU standard details restraint table. The table is based on a safety factor of 2.0 and takes into account variables such as type of soil, type and depth of the trench, and depth and type of pipe. In addition, the restraints may be supplemented with thrust blocks or tie-back assemblies. The CCU may require the engineer to provide the dimensions and calculations of the thrust block for written approval prior to construction.

3.1.8 Storm Sewer Conflicts

Potable water mains that must be installed with less than 12 inches of clearance under storm sewer pipes or structures due to existing physical limitations that prohibit deflection or directional drilling, require construction of a bridging structure that is acceptable to the CCU to support the storm sewer prior to installation of the potable water main. The potable water main pipe section under the storm sewer pipe or structure shall be replaced with a single 20 LF stick of ductile iron pipe centered under the storm sewer pipe or structure. The ductile iron pipe shall be fully encased in an 8-mil polyethylene sleeve in accordance with AWWA C-105, Method A. Polyethylene material shall conform to ASTM Standard Specification D 1248. The contractor shall submit details of the proposed bridging structure and potable water main pipe installation to CCU for review and written approval prior to the start of construction at the conflict location. Potable Water Mains that must be installed over storm sewer with less than adequate depth shall be armored in accordance with Standard Details and as approved by CCU.

3.1.9 Water Main Crossing

All reclaimed water mains shall cross water mains at ninety (90) degrees or as approved by CCU.

3.1.10 Service Connections

a. The meter boxes and covers and backflow prevention devices shall be installed/positioned in accordance with CCU standard details.

b. The 1” long services shall be installed in a two (2) inch schedule 40 PVC carrier pipe extending beyond the edge-of-pavement in accordance with CCU standard details. Larger poly tubing services will require a larger carrier pipe. Marker balls shall be placed at each end of the carrier pipe.

c. The installed water meter boxes and covers shall meet the loading requirements for sidewalk and property line/easement installation and high vehicle traffic locations such as driveways, roadways, and parking lots. Meter boxes shall be placed outside of the sidewalk in the grassy area on the customer side of the sidewalk. Water meters 3/4" and 1" will be supplied with a 1" poly tubing form the main to the meter fitting. Water meters 1.5" and 2" are to be supplied by a poly tubing water service 2" in size from the water main to the water meter connections.

All water meters are to be located at the county ROW line on the street side of the property. All fire line backflow devices and county shut off valve are to be located at the county ROW line on the street side of the property. All meter banks are to be located at the county ROW line on the street side of the property.

3.2 TESTING MAINS AND TAPPING SLEEVES

All pressure and bacteriological tests shall be in accordance with AWWA Standards C-600, C651, and C-652, latest revision. A pressure test shall be required for all installations of potable water mains and all appurtenances. Bacteriological testing shall be done for all installations of potable water mains except as noted hereafter. No bacteriological testing is required for certain limited pipe installations as approved in writing by the CCU such as a new potable water service connection installation, the addition of a fire hydrant assembly to an existing potable water main, or the installation of limited additional piping and fittings such as a dive under new storm sewer to an existing potable water main. Upon completion of the installation of the potable water service connection, the service connection shall be flushed prior to connection to the on-site potable water service connection. The inside of the fire hydrant assembly or the inside of the new limited potable water main piping and fittings shall be wiped clean and shall be wiped with a chlorine-soaked rag in compliance with FDEP regulations prior to installation. All such potable water mains and service connections and potable water mains taken out of service for inspection, alteration, or any other activity exposing the interior pipeline to the possibility of contamination shall be disinfected in compliance with FDEP regulations before they are placed in and/or returned to service. All operations of existing water main valves shall be operated by the water system personnel in conjunction with the CCU inspector. The contractor is prohibited from operating any valves connected to the live system.

3.2.1 Pressure Test

a. Pipe:

The contractor shall hydrostatically pressure test all PVC, HDPE, and DI potable water mains in accordance with the latest revision of AWWA C-600 series as applicable. Only oil filled gauges shall be used for all pressure tests. The tests shall be at 150 psi for a period of two (2) hours. The allowable loss for one (1) hour shall be determined by the following formula:

$$\text{Allowable Leakage} = \frac{(D)(L)(PY)}{133{,}200}$$

Where: D = nominal diameter of the pipe in inches
L = length of pipe in feet
PY = square root of test pressure during the leakage test in pounds per square inch

Calibrated test equipment shall be on site to verify the loss of water during the testing period.

Pressure testing shall not exceed 1500 linear feet unless otherwise approved in writing by the CCU.

b. Tapping Sleeves:

All potable water tapping sleeves shall be hydrostatically pressure tested in accordance with the latest revision of AWWA C-600. The test shall be conducted at 150 psi for a period of two (2) hours. No loss of pressure is allowed.

c. Procedures:

Each section of pipe between valves, between the tapping sleeve and the pipe, and/or the valve and the tapping sleeve shall be slowly filled with water from a safe source, and the specified test pressure shall be applied by means of a water pump in a manner satisfactory to the CCU. In the case of testing a pipe where valves do not exist, the contractor shall plug the end of the line as approved in writing by CCU. The pump, pipe, and/or tapping sleeve connections, gauge, and all necessary apparatus shall be furnished by the contractor and shall be approved in writing by CCU prior to the conduct of any test. All necessary pipe taps for testing shall be made by the contractor as approved in writing by CCU. CCU may request testing of isolated portions between valves within the test section if a portion of that main has critical components such as multiple fittings at an extreme deflection. The contractor shall be responsible to remove any pipe taps installed for this purpose upon completion of the test as approved in writing by CCU.

Pressure shall be measured from sample points, blow-off assemblies, water services, or fire and flush hydrants for potable water main pressure tests. CCU shall witness all tapping sleeve and potable water main pressure tests.

3.2.2 Bacteriological Test

a. All disinfection shall be in accordance with AWWA C-651, the Ten States Recommended Standards for Water Works as incorporated by FDEP, other pertinent FDEP regulations, and the Florida Administrative Code unless other specific written approval by CCU is issued. Materials and equipment for keeping the pipe clean (during construction), chlorinating the main, flushing/disposing of the heavily chlorinated water, bacteriological sampling and any redisinfection, if required, shall be provided by the contractor. Chlorination shall be done by the continuous feed method using either a liquid chlorine gas-water mixture or a calcium or sodium hypochlorite solution. Direct feed chlorination or placing concentrated quantities of commercial disinfectants such as calcium hypochlorite granules in the line prior to filling with water shall not be used.

b. Chlorine residuals shall be tested using a chloridimeter. NOTE: A color wheel shall not be used.

Sample points shall be identified by the EOR and approved by CCU. Samples shall be collected from sample points, blow-off assemblies, or water services. Fire hydrants or flushing devices shall

not be used as bacteriological sample points. Test samples shall be collected and transported by certified laboratory personnel. CCU shall witness the collection of all samples.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and installation of valves. All valves shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit.

1.1 SCOPE

1.1.1 General:

This specification provides the requirements for main lines three inch (3") in size and larger: gate, plug, butterfly, wet tapping and check valves for potable water, reclaimed water, wastewater force mains, low pressure sewer system force mains, and air release valves for installation for the project. Vacuum sewer system valves are included in the vacuum sewer specification, Section 002332 and not within this Section 002340, Valves.

1.1.1 Work Included

The Contractor shall install, unless specified otherwise, the gate, plug, butterfly, wet tapping, check valves, and all other associated appurtenances for potable water, reclaimed water, force mains, low pressure sewer system force mains and air release valves in accordance with the project's engineering drawings and Specifications.

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools and all other associated appurtenances, necessary to do the work required under the contract to include but not limited to unloading, hauling and distributing all valves restraints, valve boxes and appurtenances.

The Contractor shall also remove any surfacing as required; excavate the trenches and pits to the required dimensions; construct and maintain all roads and bridges for traffic control; sheet, brace, and support the adjoining ground or structures; where necessary; handle all drainage or ground water; provide barricades, guards, and warning lights; install and test the valves, fittings and appurtenances; backfill and consolidate the trenches and pits; maintain all surfaces over the trench until surface restoration is completed; restore the surfaces unless otherwise stipulated; remove surplus excavated material; and clean the site of the work.

The Contractor shall also furnish all labor, materials, equipment, tools, and all other associated appurtenances required to rearrange sewers, conduits, ducts, pipes or other structures encountered in the installation of the valves.

1.1.2 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.3 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the installation of the potable water, reclaimed water, force mains and low-pressure sewer system force mains valves with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.4 Working Hours

The work shall be carried out in accordance with local ordinance and so as not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Check, Plug, Gate, Butterfly, Air Release, Cut-in Valve or Insert Valve and Wet Tapping Valves

a. Check, plug, gate, butterfly valves and air release valves shall be paid for at the contract unit price per each size installed including the valve, restraints, valve boxes, bedding material, dewatering, testing, all equipment, materials, labor and all other associated appurtenances to install and test the valves complete in place at the depth and location shown on the plans and/or as directed by CCU and restoration unless a separate bid contract item is provided.

In addition, air release valves installed on reclaimed water, force mains and low-pressure sewer system force mains shall also include odor control and all other associated appurtenances in accordance with CCU standard details the cost of which shall be included in the contract bid price for air release valves.

Note: Hydrant gate valves are to be supplied as part of the fire hydrant assembly, the cost of which shall be included in the contract bid price for each size specified for fire hydrant assemblies.

b. Wet tapping valve shall be paid for at the contract unit price per each size installed including the tapping sleeve, the wet tap into the main, the valve, restraints, fittings, valve boxes, bedding material, dewatering, testing, all equipment, materials, labor and all other associated

appurtenances to install and test the wet tapping valve complete in place at the depth and location shown on the plans and/or as directed by CCU and restoration unless a separated bid contract item is provided.

c. Cut-in valve or insert valve shall be paid for at the contract unit price per each size installed including the tapping into the main, the valve, restraints, fittings, valve boxes, bedding material, dewatering, testing, all equipment, materials, labor and all other associated appurtenances to install and test the cut-in or insert valve complete in place at the depth and location shown on the plans and/or as directed by CCU and restoration unless a separated bid contract item is provided.

1.3 REFERENCED STANDARDS (Latest Revision)

ANSI: 21.11, B16.1, 61, 77

AWWA:
C-111, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C-207, Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3600 mm)
C-500, Metal-Seated Gate Valves for Water Supply Service
C-504, Rubber-Seated Butterfly Valves
C-509, Resilient- Seated Gate Valves for Water Supply Service
C-512, Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
C-515, Reduced-Wall, Resilient- Seated Gate Valves for Water Supply Service
C-550, Protective Interior Coatings for Valves and Hydrants

ASTM:

A-126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
A-153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A-276, Standard Specification for Stainless Steel Bars and Shapes
A-307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
A-536, Standard Specification for Ductile Iron Castings
D-2000, Standard Classification System for Rubber Products in Automotive Applications

AASHTO Code

NSF: Standard 61

ISO

FDEP: Wastewater Collection/Transmission System Requirements

Florida Administrative Code

Ten States Recommended Standards for Water

Ten States Recommended Standards for Wastewater

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
001760 - Surveying and Record Drawings
002325 - Force Mains
002330 - Low Pressure Sewer Systems
002335 - Potable Water and Reclaimed Mains
002345 - Fire Hydrants
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design
002240 - Dewatering
002930 - Grassing

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 The Contractor shall submit complete detailed documentation of all materials for approval by the CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

The Contractor shall provide proof of supplier certification/training for thermal butt-fusion of pipe for any employee fusing pipe.

Final written approval is at the discretion of the CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions.

2.1.1 Gate Valves:

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below.

All valves furnished shall be of the type, kind, size, and class indicated for each particular line segment as shown on the engineering drawings and/or designated in the Contract Items.

2.1.1.1 General:

a. All gate valves in applications such as hydrant valves, in-line valves, wet tapping valves, and cut-in valves shall meet all the gate valve material, manufacturer, installation, performance, and execution requirements.

b. Gate valves shall be used on all potable and reclaimed water mains for all sizes.

c. Gate (tapping) valves shall be used for all tapping sleeves.

2.1.1.2 Manufacture:

a. Gate valves shall conform to the latest revision of AWWA C-500 "Gate Valves - 2 inch through 48 inches for Water and Sewage Systems" and be resilient wedge seated. The additional requirements and exceptions to the AWWA standards contained herein shall also be applicable. All components of this type of joint shall conform to AWWA Standard C-111, "Rubber-Gasket Joints Ductile-Iron Pressure Pipe and Fittings". All ductile iron valves shall be fusion bonded epoxy coated.

All coatings on valves in contact with potable water shall be certified to NSF 61.

Valves and required operating appurtenances shall be the product of the same manufacturer. All valves shall have the manufacturer, country of manufacturer, and size of the valve visibly cast on the body or on a plate attached to the body of the valve. All valves shall be suitable for throttling service and/or frequent operation as well as service involving long periods of inactivity. All cast in markings on the valve shall be stated and defined in the Contractor's submittal including manufacturing location and assembly location.

The operating pressure for all sizes shall be a minimum of 150 psi gage or of the adjacent piping whichever is greatest. Buried valves with diameters of 2" to 12" shall be installed vertically on horizontal pipelines without gearing, bypasses, rollers, or tracks.

b. Valves shall be provided with a fully enclosed, permanently lubricated actuator of the traveling nut or worm gear design. The actuator shall be connected to the valve shaft by means of a key and keyway connection. All actuators shall have adjustable, mechanical stop limits in accordance with AWWA C-504 Section 3.8.2. All valve actuators shall be capable of withstanding 450 ft-lbs of input torque against the open or closed stops without damage.

c. Valves for below ground applications shall have an AWWA 2” Operating nut with a cast-in with an arrow indicating the direction on of opening. For a smooth shaft, the wrench nut shall be fastened to the input shaft by means of a minimum 5/16" diameter steel pin passing entirely

through the shaft and the wrench nut; a key with keyway is acceptable. For a splined shaft, the wrench nut shall be formed to fit the splined shaft. The actuator shall be designed to produce the specified torque with a maximum input of 150 ft-lbs applied to the wrench nut. For above ground valves, a hand wheel will be used with a cast-in arrow indicating the direction of the opening. The hand wheel shall be fastened to the actuator input shaft to produce the specified torque with a maximum pull of 80 pounds of the hand wheel rim.

d. Cut-in gate valves shall be resilient full seat and capable of handling working pressures up +250 psi. The insert valve shall have the capability of insertion into steel; C-900, , and C-909 PVC; cast iron; and ductile iron piping. The cut-in valve shall be capable of installation and placing into operation in active potable and reclaimed water mains and active wastewater force mains and low-pressure systems force mains without spillage or stopping the flow by isolating the inserting valve during installation.

e. Insert Valves, Ductile Iron 250 p.s.i.g., shall be a Resilient Wedge Gate Valve including ductile iron body, bonnet and wedge shall provide a strength and a pressure rating that meets or exceeds the requirements of AWWA C-515. The insert valves shall be designed for use in potable water, raw water, reclaimed water, and sewage. The design shall allow the valve to be installed into an existing pressurized pipeline while maintaining constant pressure and service as usual. The resilient wedge shall seat on the valve body and not the pipe to obtain the optimum seating and flow control results. The resilient wedge shall be totally independent of the carrier pipe. The resilient wedge shall not come into contact with the carrier pipe or depend on the carrier pipe to create a seal.

f. All interior and exterior ferrous surfaces of the valve, including the disc, shall be coated with fusion bonded epoxy, NSF 61 certified when in contact with potable water. The epoxy shall be fusion bonded and have a nominal thickness of 8 mils and be in accordance with AWWA C550.

g. All exposed bolts, nuts, fasteners, and washers shall be Type 316 stainless steel and all buried bolts, nuts, fasteners, and washers shall be “Cor-Ten” steel or Cor-blue coated. Mechanical joints bolts shall not protrude more than ½ inch through the nut after joints are assembled. Accessories for the mechanical joint consisting of the gasket, gland and fasteners shall be furnished and packaged separately from the valves. Each package shall be labeled in such a manner as to provide for proper identification and number of units per package or bundle.

h. All stainless-steel fasteners threads shall be coated with an anti-seize compound as approved by CCU.

2.1.1.3 Flanged Joints:

a. Flanges shall be drilled in accordance with ANSI-B16.1 Class 150 Cast-Iron Flange Specifications. Flanges shall be machined to a flat face with a finish of 250 micro-inches AARH maximum or machined to a flat surface with a serrated finish in accordance with AWWA Standards C-207, Section 6 for Steel Pipe Flanges. Flange gaskets shall be one-eighth inch ring type of a synthetic rubber material. All thread studs shall be used on all valve flange

connections in accordance with ASTM Standard Designations A-307, Grade B, with heavy hex nuts.

2.1.1.4 Bolting Material:

a. All exposed bolts, nuts, fasteners, washers, shall be Type 316 stainless steel and all buried bolts, nuts, fasteners, and washers shall be “Cor-Ten” steel or Cor-blue coated. Bolts and hex nuts used on the valve shall be the manufacturer's standard either fabricated from a low-alloy steel for corrosion resistance or electroplated with zinc or cadmium. The hot-dip process in accordance with ASTM Standard Designate A-153 is not acceptable for the threaded portion of the bolts and nuts.

b. All stainless-steel fasteners threads shall be coated with an anti-seize compound as approved by CCU.

2.1.1.5 Approved Products

All valves and tapping sleeves shall conform to AWWA standards and shall meet CCU standard details as determined by CCU.

2.1.2 Plug Valves:

2.1.2.1 General

a. Plug valves shall be full port and used on low pressure sewer systems force mains, wastewater force mains, and reclaimed delivery sites.

b. Valves and required operating appurtenances shall be the product of the same manufacturer. All plug valves shall have the manufacturer and size of the valve visibly cast on the body or on a plate attached to the body of the valve. Valve components shall withstand the environmental conditions in contact and provide continuous trouble-free services. Valve seals shall be able to provide tight closure and prevent metal-to-metal contact.

c. Plug valves 8 inch and larger in size require gear reduction actuators.

2.1.2.2 Manufacture

a. Plug valves design, component material construction, manufacture, and testing shall be in accordance with AWWA C-504 and shall provide for nominal pipe size flow with no interference or restrictions. The plug valve body shall be of ductile iron conforming to ASTMA-536, Class B, for working pressures up to 150psi. The words “Seat End” shall be cast on the exterior of the body seat end. All below ground gear actuators for plug valves shall be operated by a standard 2" AWWA operating nut. For above ground applications, stop limiting devices shall be provided in the operators for the open and closed portions and valve operators shall be provided with position indicators to show the position of the valve disc or plug.

b. Plug shall be of one-piece construction and made of ASTM A-124, grade B ductile iron with a resilient facing per ASTM D2000-BG and AWWA C-504 requirements. Cover bolts shall be316 stainless steel.

c. All plug valves shall be provided with a fully enclosed, permanently lubricated actuator of the worm gear design. The actuator shall be connected to the valve shaft by means of a key and keyway connection. Shaft seals shall conform to AWWA C-504 and consist of V-type packing in a fixed gland with an adjustable follower. Radial bearings shall be constructed of self-lubricating type 316 stainless steel. The top thrust bearing shall be Teflon, and the bottom thrust bearing shall be type 316 stainless steel.

d. All interior ferrous surfaces of the valve, including the plug, shall be coated with fusion bonded epoxy, NSF 61 certified for use in potable water. The epoxy shall have a nominal thickness of 8 mils and be in accordance with AWWA C-550.

2.1.2.3 Valve Ends Installations

a. Flanged ends (non-buried installation): Flanged fittings shall be faced and drilled in accordance with ANSI Specification B16.1, Class 125.

b. Mechanical Joint Ends (buried installation): Mechanical joint bell dimensions shall conform to AWWA C-111.

2.1.2.4 Approved Products

All valves shall conform to AWWA standards and shall meet CCU standard details as determined by CCU.

2.1.3 Rubber-Seated Butterfly Valves

2.1.3.1 General

Rubber-Seated Butterfly Valves shall only be used in specifically approved applications as per written CCU approval.

This section addresses class 150 rubber-seated butterfly valves, 3 inches through 72 inches. All products furnished shall be in conformance with the latest revision of American National Standards Institute and American Water Works Association C-504 Standard (ANSI/AWWA C504) or latest revision thereof. All coatings in contact with potable water shall be certified to NSF 61. Valves shall be Class 150 of the short-body type with a 150 psi bi-directional shut-off rating. Valve shall be in the same alignment as a horizontal pipe and shall be for buried service, unless otherwise specified. Valve shall be configured with a horizontal valve shaft and a vertical actuator shaft with standard 2" AWWA operating nut. The actuator shall be side mounted.

2.1.3.2 Manufacture

a. The valve body shall be of ductile iron conforming to ASTM SpecificationA-536, Class B with flat faced flanged valve body ends in accordance with ANSI B16.1, Class 125. All valves shall conform to AWWA C-504, Table 2 of Section 3.1 Valve Bodies, laying lengths for flanged valves and minimum body shell thickness for all body types and AWWA C-509. The valve design shall be of such design that the disc will seat at 90 degrees with the pipe axis and the disc will not flutter or vibrate when operated in a throttled position.

b. The valves disc shall be of Ductile Iron
ASTM A-536, grade 65-45-12 with a disc design to provide 360-degree uninterrupted seating. The valve seat shall be natural or synthetic rubber resilient seating applied integrally to the body or disc. For valves 24 inches or larger, the rubber seat shall be capable of mechanical adjustment in the field and shall be field replaceable. Special tools required for seat adjustment and replacement shall be furnished with the valve and the seat respectively. Mechanical adjustment or attachment of the seat and seat ring shall not include welding. The mating seat surface shall be type 316 stainless steel. Sprayed or plate mating seat surfaces shall not be used.

c. Valve shafts shall be type 304 stainless steel conforming to ASTM A-276 and shall have a diameter equal to or greater than that shown for Class 150B in Table 3 of AWWA C504. Shafts shall conform to the requirements of Section 3.3, Valves Shaft of AWWA C504 for one-piece or stub shaft types. Connection between the shaft and disc shall be dowel or taper pins, which are mechanically secured. The valve assembly shall be furnished with a factory-set, non-adjustable disc shaft thrust bearing that ensures the valve disc is centered within the valve body seat at all times. Valve shaft bearings shall be permanent, self-lubricated bearings providing continuous, low-friction maintenance-free operation. Shaft bearing shall be contained in integral hubs of the valve body. Valve shaft seal shall consist of O-ring, V-type, or U-cup type packing where the shaft projects through the valve body for the actuator connection.

d. The valve shall be provided with a fully enclosed, permanently lubricated actuator of the traveling nut or worm gear design. The actuator shall be connected to the valve shaft by means of a key and keyway connection. All actuators shall have adjustable, mechanical stop limits in accordance with AWWA C504 Section 3.8.2 and shall be capable of withstanding 450 ft-lbs of input torque against the open or closed stops without damage.

e. Valves for below ground applications shall have an AWWA 2” operating nut with a cast-in arrow indicating the direction of opening. For a smooth shaft, the wrench nut shall be fastened to the input shaft by means of a minimum 5/16" diameter steel pin passing entirely through the shaft and the wrench nut; a key with keyway is acceptable. For a splined shaft, the wrench nut shall be formed to fit the splined shaft. The actuator shall be designed to produce the specified torque with a maximum input of 150 ft-lbs applied to the wrench nut. For aboveground valves, a hand wheel will be used with a cast-in arrow indicating the direction of the opening. The hand wheel shall be fastened to the actuator input shaft to produce the specified torque with a maximum pull of 80 pounds of the hand wheel rim.

f. All interior and exterior ferrous surfaces of the valve, including the disc, shall be coated with fusion bonded epoxy, NSF 61 certified for use in potable water. The epoxy shall have a nominal thickness of 8 mils and shall be in accordance with AWWA C550 latest revision.

2.1.3.3 Approved Products

All valves shall conform to AWWA standards and shall meet CCU standard details as determined by CCU.

2.1.4 Check Valves

2.1.4.1 General

The in-line check valves shall be of the swing flex, full body, flanged type with a domed access cover; shall have only one moving part, the valve disc; and shall be fully operational when mounted in the vertical position.

2.1.4.2 Manufacture

a. The valve body shall have full flow equal to nominal pipe diameter at any point through the valve. The seating surface shall be on a 45-degree angle to minimize disc travel. The top access port shall be full size to allow removal of the disc without removing the valve from the pipeline. The access cover shall be domed in shape to allow the disc to be fully operational in lines containing high solids content. The disc shall be of one-piece precision molded construction with an integral O-ring type sealing surface and contain steel and nylon reinforcements in both the Memory Flex and central disc areas. Non slam closing characteristic shall be provided through a short 35-degree disc stroke and a Memory Flex disc return action. The valve body and cover shall be ASTM A-536, ductile iron. The disc shall be Buna-N (BNR), ASTM D2000-BG.

i. All interior and exterior ferrous surfaces of the valve shall be coated with fusion bonded epoxy, NSF 61 certified when in contact with potable water. The epoxy shall be fusion bonded and have a nominal thickness of 8 mils and be in accordance with AWWA C550 and in accordance with the specification of the connecting pipe. .

2.1.4.3 Approved Products

All valves shall conform to AWWA standards and shall meet CCU standard details as determined by CCU.

2.1.5 Air Release Valves

2.1.5.1 General

This section includes air release valves, automatic air release valves, and automatic combination air release/vacuum release valves that are to be used for potable water mains, reclaimed water mains, low pressure sewer system force mains and force mains as specified.

a. Automatic water air release valves shall be used on potable water mains. Automatic wastewater air release valves shall be used on force mains, and low-pressure sewer system force mains. The automatic air release valves shall be constructed in accordance with CCU standard details.

b. Automatic wastewater air release valves installed on force mains and low-pressure sewer system force mains shall include odor control in accordance with CCU standard details.

c. Automatic Combination Air Release/Vacuum Release Valves shall be used for reclaimed water mains and shall include odor control and shall be constructed in accordance with CCU standard details.

d. Automatic air release valves and automatic combination air release/vacuum release valves shall have a high-density polyethylene enclosure blue in color for potable water mains, green in color for force mains and low-pressure sewer system force mains, and purple in color for reclaimed water mains.

e. The vacuum portion of the automatic combination air release/vacuum release valves shall be deactivated in all applications unless otherwise directed by CCU.

2.1.5.2 Manufacture

a. Automatic air release valves and automatic combination air release/vacuum release valves shall be manufactured in accordance with AWWA C-512.

b. Type 316 stainless steel shall be used for all internal components of automatic air release valves and automatic combination air release/vacuum release valves, unless otherwise approved by CCU.

c. All automatic air release valves and automatic combination air release/vacuum release valves shall be fusion bonded epoxy coated and shall be certified to NSF 61 for use in potable water.

2.1.5.3 Approved Products

All valves shall conform to AWWA standards and shall meet CCU standard details as determined by CCU.

2.1.6 Valve Box and Valve Box Cover

2.1.6.1 Manufacture

a. The valve box shall be in cast iron material and screw type only.

b. The valve box cover shall be reinforced, high density polymer concrete including an ultraviolet (UV) inhibiting agent and a solid color throughout the cover.

c. The valve box cover shall include a 3M read and write capable locater marker for the function of the valve.

d. The valve box cover loading shall exceed the Tier-15 load rating in accordance with ANSI/SCTE 77. When installed, the top valve box cover shall be below the top rim/edge of the valve riser.

e. Valve box covers shall be standard type ductile iron in roadways under 45 mph and Deep Depth type ductile iron in roadways above 45 mph. Composite lids will only be used in grassy areas with a valve pad.

f. The valve box cover shall meet the dimensions and marking requirements of the CCU standard details and include a three (3)" round brass identification plate to be inserted into the concrete valve pad. The identification plate shall include the valve size, date of installation, and number of turns as shown on the brass identification plate used on the valve pad.

2.1.6.2 Approved Products

All valve boxes and valve box covers shall conform to ANSI/SCTE 77 and shall meet CCU standard details as determined by CCU.

PART 3 - EXECUTION

3.1 Construction Requirements

3.1.1 General:

Handling, Storage, Protection and Delivery: Unloading, distribution, and storage of pipe and appurtenant materials on the job site shall be as approved by CCU. All materials shall be handled carefully to prevent damage to protective coatings, linings, and joint fittings; to preclude contamination of interior areas; and to avoid jolting contact and dropping or dumping.

3.1.2 Valve Installation

a. All below ground valves that are not in a roadway shall be installed with a 30" x 30" x 6" concrete valve pad including a brass identification tag, ductile iron riser, specified cap, with main designation, and extension if required, in accordance with CCU standard details.

b. Installation shall conform to manufacturer's recommendations.

c. The Contractor shall verify the existing utilities such as fittings and valves are restrained prior to the start of installation of the valve. If not restrained, the Contractor shall notify CCU in writing and shall restrain the existing utility as approved by CCU.

d. The Contractor shall carefully clean the valves flanged faces and threaded ends of all foreign material and inspect valves in open and closed positions. The contractor shall notify CCU and not install the valves if the valves do not function properly for the intended purpose. After cleaning flanges, the contractor shall insert the gasket and tighten the nuts progressively and uniformly. If flanges leak under pressure, the contractor shall loosen the nuts, reseat or replace the gasket, retighten the nuts, and retest the joints.

e. Bolt holes of flanged valves shall straddle the centerline of the pipe run.

f. All above ground valves shall be prepped, primed, and finish painted in accordance with the installed assembly and CCU standard specifications.

g. The operating nut on a valve or extension bar shall be set between eighteen (18) and thirty (30) inches.

h. All valves shall have a centering ring that sits below the operating nut of the valve and centers the valve in the middle of the valve box.

i. Automatic potable water air release valves installed on potable water mains shall be located directly over the pipe in accordance with CCU standard details if located above grade in an enclosure or over a waterway crossing without an enclosure. In those instances where the enclosure cannot be located directly above the potable water main piping, the automatic air release valve shall be located in a subgrade valve pit whose cover shall be flush with the finished grade and whose construction is in accordance with CCU's standard detail or with the construction detail called out on the plans.

j. Automatic wastewater air release valves installed on force mains and low-pressure sewer system force mains shall be located directly over the pipe and include odor control in accordance with CCU standard details if located above grade in enclosure. In those instances where the enclosure cannot be located directly above the wastewater force main or low-pressure force main piping, the automatic air release valve shall be located in a subgrade valve pit whose cover shall be flush with the finished grade and whose construction is in accordance with CCU's standard detail or with the construction detail called out on the plans.

k. Automatic air release valves and automatic combination air release/vacuum release valves shall have a self-locking, self-supportive, UV-protected enclosure that allows for 360° accessibility for apparatuses that need protection from the elements as well as vandalism. The enclosures shall be blue in color for potable water mains, green in color for force mains and low-pressure sewer system force mains, and purple in color for reclaimed water mains. All enclosures shall be in accordance with the generic requirements for pedestal terminal closures, Telcordia GR-13, ANSI C57 Enclosure Integrity, UV Degradation per ASTM G-53; Fire Resistance per RUS7CFR

1755.910, UL 94, WUC 3.6 SECTION 6.7; Chemical Resistance per ASTM D-543, Water Absorption per ASTM D-570, Impact Resistance per ASTM D-2444, Accelerated Service per ASTM D-756, and Weathering per ASTM D-82.

3.1.3 Valve Cap Color Coding Schedule

a. Valve caps shall be color coded as per the following:

Legend:	Color code:
Wastewater cap	Green Pantone 341C
Potable water cap	Blue Pantone 287
Reclaimed water cap	Purple Pantone 522C
Fire hydrant cap	Safety Yellow

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and installation of fire hydrants. All fire hydrants shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit.

1.1 SCOPE

1.1.1 General:

This specification provides the requirements for supplying, installation, and testing of standalone fire hydrants and fire hydrant assemblies for the project.

1.1.1 Work Included

The Contractor shall, unless otherwise specified, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the work required under the contract to include but not limited to unloading, hauling and distributing all fire hydrant assemblies or standalone fire hydrants and appurtenances.

The Contractor shall also remove any surfacing; as required; excavate the trenches and pits to the required dimensions; construct and maintain all required for traffic control; sheet, brace, and support the adjoining ground or structures where necessary; handle all drainage or ground water; provide barricades, guards, and warning lights; tap existing water mains, install valves, lay pipe, install fire hydrant, and pressure and bacteriological test the pipe, fittings, valves, and appurtenances; backfill and consolidate the trenches and pits; maintain all surfaces over the trench until surface restoration is completed; restore the surfaces unless otherwise stipulated; remove surplus excavated material; and clean the site of the work.

The Contractor shall also furnish all labor, materials, equipment, tools, and all other associated appurtenances required to rearrange sewers, conduits, ducts, pipes or other structures encountered in the installation of the work.

1.1.2 Location of the Work

The location of this work is as shown on the Contract Documents

1.1.3 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the installation of the stand alone fire hydrants and fire hydrant assemblies with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.4 Working Hours

The work shall be carried out in accordance with local ordinance and so as not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Fire Hydrant Assembly

a. The fire hydrant assembly shall be paid for at the contract bid price for each hydrant assembly which shall include furnishing the fire hydrant, hydrant riser pipe, foot valve assembly, hydrant gate valve with pad/valve box/cover, up to 5 feet of pipe from the hydrant fitting at the water main to the foot valve assembly, pipe jointing material, restraints, bollards (where necessary), bedding material, concrete support blocks, concrete thrust blocks, and all other appurtenances, and of delivering, handling, laying, dewatering, trenching, sheeting and backfilling, furnishing and installing flowable fill used for tunneling/deflecting pipe under and adjacent to existing storm piping/structures, testing, restoration of the surface (unless separate bid item is provided), final painting, necessary permits, and all material and work necessary to install the fire hydrant assembly complete in place at the location specified.

b. The fire hydrant assembly fitting (tee, cross, or other) at the water main shall be paid for separately at the contract bid price for fittings or as otherwise specified in the contract documents.

c. When the fire hydrant assembly is connected to an existing water main by wet tap, the tapping sleeve and all equipment, material, and work to install the tapping sleeve, tap the existing main, and test the connection shall be paid for separately at the contract bid price for wet tapping for each size specified. The tapping valve shall replace the normal hydrant valve in the fire hydrant assembly and therefore the tapping valve shall be considered part of the hydrant assembly and shall be paid for as part of the contract bid price for the hydrant assembly.

d. Any piping in excess of 5 feet installed from the hydrant fitting at the water main to the foot valve assembly shall be paid for at the contract bid price for the pipe size specified. Any fittings required for deflection of the hydrant piping between the hydrant fitting at the water main and the

foot valve assembly shall be paid for separately at the contract bid price for fittings or as otherwise specified in the contract documents.

e. All restraints required for installation of the fire hydrant assembly at the location shown on the plans including restraints for any additional piping in excess of 5 feet and restraints for any additional fittings for deflection of the hydrant piping to avoid conflicts shall be considered incidental to the work and no direct payment will be made.

1.2.2 End of Line Fire Hydrant

a. The fire hydrant assembly installed at the end of a potable water main shall be considered to start at and include the hydrant gate valve and shall be paid for at the contract bid price for each end of line hydrant assembly which shall include furnishing the fire hydrant, hydrant riser pipe, foot valve assembly, hydrant gate valve with pad/valve box/cover, up to 5 feet of pipe from the hydrant gate valve at the water main to the foot valve assembly, pipe jointing material, restraints, bollards (where necessary), bedding material, concrete support blocks, concrete thrust blocks, and all other appurtenances, and of delivering, handling, laying, dewatering, trenching, sheeting and backfilling, furnishing and installing flowable fill used for tunneling/deflecting pipe under and adjacent to existing storm piping/structures, testing, restoration of the surface (unless separate bid item is provided), final painting, necessary permits, and all material and work necessary to install the end of line fire hydrant assembly complete in place at the location specified.

b. Any piping in excess of 5 feet installed from the hydrant gate valve to the foot valve assembly shall be paid for at the contract bid price for the pipe size specified. Any fittings required for deflection of the hydrant piping between the hydrant gate valve at the water main and the foot valve assembly shall be paid for separately at the contract bid price for fittings or as otherwise specified in the contract documents.

c. All restraints required for installation of the end of line fire hydrant assembly at the location shown on the plans including restraints for any additional piping in excess of 5 feet and restraints for any additional fittings for deflection of the hydrant piping to avoid conflicts shall be considered incidental to the work and no direct payment will be made.

1.2.3 Fire Hydrant Extension

a. Fire hydrant extension (as required to bring each hydrant up to the proper elevation as directed by CCU) shall be one continuous piece. Payment for all materials and labor necessary to complete this item shall be made incidental to contract bid items.

1.2.4 Fire Hydrant Grade Adjustment

The adjustment of fire hydrants to match grade shall be incidental to contract bid items including the cost of labor, material, equipment and all other associated appurtenances.

1.3 REFERENCED STANDARDS (Latest Revision)

ANSI/AWWA:
C-502 Dry-Barrel Fire Hydrants
C-600 Installation of Ductile-Iron Mains and their Appurtenances
UL/FM
NFPA 2003, Standard for Fire Hose Connections, SPP-60, Standard 1231
AASHTO Code
ISO
FDEP: Water Distribution System Requirements
Florida Administrative Code
Ten States Recommended Standards for Water

1.4 PARTIAL LISTING OF RELATED SECTIONS

002340 Valves
002240 Dewatering
001760 Surveying and Record Drawings
002930 Grassing
002335 Potable Water and Reclaimed Water Mains
009900 Surface preparation painting and coating

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 The Contractor shall submit complete detailed documentation of all materials for approval by the CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

Final written approval is at the discretion of the CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions

.

2.1.1 <u>General</u>

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below.

2.1.2 Requirements

a. This product specification covers post-type, dry-barrel fire hydrants with compression shut off (opening against pressure) or gate shutoff. All products furnished shall conform to the latest revision of the American National Standards Institute and American Water Works Association C-502 Standard (ANSI/AWWA C502) and shall be UL/FM approved.

b. Each hydrant shall be designed for a minimum working pressure of 200 psig. All parts of the hydrant shall be designed to withstand without being functionally impaired or structurally damaged a hydrostatic test of not less than 400 psig or twice the rated working pressure, whichever is greater, with the hydrant completely assembled and pressurized as follows:

    1. With the nozzle caps in place, the main valve open, the hydrant inlet capped, and the test pressure applied to the interior of the hydrant.

    2. With the main valve closed, the hydrant inlet capped, and the test pressure applied at the hydrant inlet.

    3. The design safety factor of the operating mechanism shall not be less than 5 and shall be based on the foot-pounds of torque required for the closing and opening of the hydrant at a working pressure of 200 psig.

c. Hydrants shall be functional and capable of being opened or closed without difficulty following an application of an operating torque of 200 lb-ft at the operating nut in the opening direction with the hydrant fully closed and the closing direction with the hydrant fully opened. The torque requirements apply only to hydrants of 5-ft bury or less.

d. The fire hydrant shall have 2 hose nozzles and 1 pumper nozzle. The nominal inside diameter of the hose nozzle shall be 2 ½ inches. The nominal inside diameter for the pumper nozzle shall be 4 inches. The outlet-nozzle threads are to conform to the latest version of the National Fire Protection Association (NFPA), Standard for Fire Hose Connections and in accordance with Charlotte County code. The nominal diameter of the main valve opening shall be 5 ¼ inches. The hydrant shoe shall be provided with a 6 inches mechanical joint connection to fit the connecting pipe.

e. The fire hydrant shall open left (counterclockwise).

f. The fire hydrant shall have a non-rising stem. No more than one six (6) inch stem extension shall be provided if required to make the base of the fire hydrant grade level without prior written CCU approval.

g. The bonnet section shall have all bearing surfaces and stem threads sealed in a lubricant reservoir. If oil is used as a lubricant, the reservoir shall be designed to allow for easy filling

through a fitting or plug. Where grease is used as a lubricant, the reservoir shall be sealed. The reservoir shall be adequately sealed with "O" rings.

h. The fire hydrant shall have a safety flange or breakaway flange at the ground line as stipulated in Section 3.1 General Design of ANSI/AWWA C-502 latest revision.

i. Parts that require lubrication and come into contact with water shall be lubricated with an NSF approved nontoxic food grade lubricant that does not pose a health hazard to the public if consumed.

j. Fire hydrant nozzles shall have cast iron weather caps with chain retainers.

k. Fire hydrants shall be painted with two (2) coats of Federal Safety yellow above the finished grade or factory coated with electrode position (e-coat) epoxy primer and catalyzed with a two-part yellow polyurethane top coating. Surface preparation and field painting shall be in accordance with CCU specifications.

l. Fire hydrants shall have the manufacture's name and the date of manufacture in raised one (1) inch letters cast into the barrel of the fire hydrant above the installed ground line.

m. All hydrant valves shall have a valve pad in accordance with the CCU valve specification requirements including the installation of the three (3) inch bronze disc with the valve size, date of installation, etc.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

3.1.1 General

a. Hydrant water pipes shall be installed to the depth and the locations shown on the contract engineering drawings and the CCU Standard Details. Hydrants shall not be installed on water mains less than six (6) inches in diameter.

b. Four (4) each six (6) inch in diameter bollards shall be installed to protect the hydrants in high vehicle traffic areas in accordance with the engineering drawings.

c. Water services or other connections are not allowed between the hydrant isolation valve and the hydrant.

d. Fire lines are not allowed to be connected between the hydrant connection to the potable water main and the hydrant.

3.1.2 Installation Location

3.1.2.1 Right-of-Way:

a. All hydrants shall be installed in accordance with the Charlotte County code and as defined in the NFPA No. SPP-60. Distances shall be measured by "hose lay" along the path of vehicle travel. Hydrants shall be installed one (1) foot inside the right-of-way on lot line between two (2) properties or at roadway intersections as specified in the approved plans. Hydrants and hydrant isolation valves are to remain outside of the swale on flat, level surfaces.

3.1.2.2 Hydrant Separation:

a. Mobile home parks, mobile home subdivisions, and recreational vehicle parks: fire hydrants shall be installed such that the distance between the hydrants does not exceed 800 feet. All hydrants shall be designed to deliver a minimum flow of 500 gallons per minute at 20 pounds per square inch residual pressure for a minimum of one (1) hour.

b. Single family residences except as defined in "a" above include single-family, duplex, and triplex units: fire hydrants shall be installed such that the distance between hydrants does not exceed 700 feet. All hydrants shall be designed to deliver a minimum flow of 750 gallons per minute and at 20 pounds per square inch residual pressure for a minimum of one (1) hour.

c. Industrial, commercial, apartment areas, and other high-value areas as defined but not limited to in NFPA Standard 1231 and Annex B to Ordinance No. 85-9: fire hydrants shall be installed such that the distance between the hydrants does not exceed 500 feet. All hydrants shall be designed to deliver a minimum flow of 1250 gallons per minute at 20 pounds per square inch residual pressure for a minimum of one (1) hour.

d. Heavy manufacturing and heavy industrial areas as defined but not limited to NFPA Standard 1231: fire hydrants shall be installed such that the distance between hydrants does not exceed 600 feet. All hydrants shall be designed to deliver a minimum flow of 1250 gallons per minute and at 20 pounds per square inch residual pressure for a minimum of one (1) hour.

3.1.3 Testing

3.1.3.1 Pressure and bacteriological tests:

Pressure and bacteriological tests shall be conducted for all installations of fire hydrants as specified in standard specification 002335 - Potable Water Mains. These tests shall be conducted as part of the water main. The hydrant valve shall remain open as part of the pressure testing.

3.1.3.2 Installation with a wet tap on an existing water main:

Pressure and bacteriological tests shall be conducted for all installations of fire hydrants as specified in standard specification 002335 - Potable Water Mains. The hydrant gate valve shall remain open as part of the pressure testing.

3.1.4 Water Pressure Classification (If Required)

3.1.4.1 The Contractor shall request from CCU Operations a fire flow test on individual hydrants to determine the class of the hydrant and paint the hydrant to the current Water Distribution Dept. SOP in the colors as noted below.

3.1.4.2 The hydrants shall be classified in accordance with their rated capacities at 20 psi (1.4 bar) residual pressure or other designated value and the hydrant shall be painted with two (2) coats of the following capacity-indicating color scheme as per the current Water Distribution Dept. SOP.

Class	Color	Rated Capacity (gpm)	Rated Capacity (L/min)
AA	Light Blue	1500	5680 or greater
A	Green	1000 to 1499	3785 to 5675
B	Orange	500 to 999	1900 to 3780
C	Red	Less than 500	1900

END OF SECTION

PART 1 - GENERAL

It is the intent of this specification to provide the requirements for any jacking-boring for the project. All jack-bore installations shall meet the requirements of the Florida Department of Transportation (FDOT) permit, if applicable

1.1 SCOPE

1.1.1 General:

This specification provides the requirements for using the jack-bore for the project.

1.1.1 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the work required under the contract to include but not limited installing the steel casing, installing the carrier pipe and the placement of spacers, between the carrier pipe and the steel casing, and sealing the ends of the casing pipe.

1.1.2 Location of the Work

The location of this work is as shown on the Contract Documents

1.1.3 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the jack-bore with other construction and activities in the project area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.4 Working Hours

The work shall be carried out in accordance with local ordinance and so as not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte county Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the compensation determined in the following manner:

1.2.1 Jacking-Boring

Jacking-Boring of the casing pipe shall be paid for at the contract bid price per lineal foot installed for each size specified which shall included the cost of furnishing all casing pipe, casing end seals, casing pipe jointing material and all other appurtenances and the cost of the jacking pits, grouting, dewatering, trenching, sheeting, backfilling, restoring the surface (unless separate bid item is provided), necessary permits and all other labor, equipment, and materials, necessary to install the casing pipe complete in place at the depth specified and in accordance with the plans and these specifications.

Carrier pipe shall be paid as per the applicable type of pipe specifications.

Restraints and carrier pipe spacers shall be considered incidental to the carrier pipe and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (Latest Revision)

- ASTM Designation A252 (Standard Specification for Welded and Seamless Steel Pipe Piles)
- ASTM Designation A139 (Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over))
- AASHTO Code
- NSF: Standard 61
- Florida Administrative Code
- FDEP: Wastewater Collection/Transmission System Requirements
- Ten States Recommended Standards for Wastewater
- Florida DOT Standard Specifications for Road and Bridge Construction
- FDOT Utility Accommodation Guide
- Specifications for Pipelines Conveying Nonflammable Substances (American Railway Engineering Association)

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
001760 - Surveying and Record Drawings
002240 - Dewatering
002320 - Gravity Sewer Systems
002325 - Force Mains
002330 - Low Pressure Sewer Systems
002335 - Potable Water and Reclaimed Water Mains

002340 - Valves
002345 - Fire Hydrants
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design 002930
- Grassing

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 For only those materials that the Contractor is requesting deviations from these specifications, the Contractor shall submit in writing documentation to justify approval of these materials by Charlotte County Utilities (CCU) prior to the start of the project. The Contractor shall submit four (4) signed copies of the material submittals.

1.5.2 The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

1.5.3 Final approval is at the discretion of CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions.

2.1.1 General

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below.

Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and convenient execution of the work. The Contractor shall meet the jointing and cutting pipe direct bury force main, low pressure sewer systems, potable water and reclaimed water mains requirements as they apply to the jack-bore.

2.1.2 Steel Casing Pipe for Jacking-Boring

Steel casing pipe for jacking-boring shall conform to ASTM Designation A252, Grade 2 or ASTM Designation A139, Grade B. Recycled steel casing pipe conforming to the requirements of this section as approved by CCU may be used. Proper documentation shall be provided.

The minimum casing pipe size and wall thickness shall be as shown in the following table. For sizes not included, or for special design considerations and/or in the case of known aggressive soils, approval shall be obtained from CCU. The casing pipe nominal diameter shall be 10 inches larger than the carrier pipe outside diameter.

Casing Pipe Nominal diameter (Inches)	Casing Pipe Minimum Shell Thickness (Inches)
12	0.250
14	0.282
16	0.282
18	0.312
20	0.343
22	0.375
24	0.403
26	0.438
28	0.469
30	0.469
32	0.500
34	0.532
36	0.532
38	0.563
40	0.563
42	0.563

2.1.3 Carrier Pipe for Jacking-Boring:

The carrier pipe shall be PVC, ductile iron or HDPE in accordance with CCU technical specifications.

2.1.4 Casing End Seals for Jacking-Boring:

Casing end seals shall be installed.

2.1.5 Joints for Jacking-Boring:

All carrier pipe joints shall be restrained to include the first joint outside of the casing.

2.1.6 Casing spacer:

Casing spacers shall be installed to support the carrier pipe. Stainless steel nuts and bolts shall be used.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor shall comply with all appropriate regulatory agency requirements respectively as per the permits issued for this project.

3.2 CONSTRUCTION REQUIREMENTS

Steel casing pipe shall be jacked-bored in place to provide a casing for the carrier pipe.

Jack-bore pits or shafts shall be excavated and maintained to the minimum dimension necessary to perform the operation. Said excavations shall be adequately barricaded, sheeted, braced and dewatered, as required, in accordance with CCU Specifications and OSHA requirements. Jack-bore pits will normally be no closer than four feet from the edge of pavement, with the permitting agency having final determination of the required setback distance.

The jack-bore operations shall be done simultaneously, with continuous installation, until the casing pipe is in final position. Correct line and grade shall be carefully maintained. Add on sections of casing pipe shall be full-ring welded to the preceding length, developing watertight total pipe strength joints. The casing installation shall produce no upheaval, settlement, cracking, movement, or distortion of the existing roadbed or other facilities.

Casing pipes crossing under roadways/railroads shall be located at suitable approved alignments in order to eliminate possible conflicts with existing or future utilities and structures, with a minimum 36-inch depth of cover between the top of the casing pipe and the surface of the roadway. For casing pipe crossings under roadways/railroads, the Contractor shall comply with the regulations of said authority in regard to design, specifications, and construction. State highway casing installations shall be as specified in the FDOT, "Utility Accommodation Manual," and for railroads the American Railway Engineering Association, "Specifications for Pipelines Conveying Nonflammable Substances," shall be applicable.

Casing pipe holes shall be mechanically bored through the soil by a cutting head on a continuous auger mounted inside the pipe. The auger shall extend a minimum distance beyond the end of the casing pipe to preclude formation of voids outside of the pipe shell.

The casing pipe shall be adequately protected to prevent crushing or other damage under jacking pressures. Backstops shall be provided for adequately distributing the jack thrust without causing deformation of the soil or other damage. Should the casing pipe be damaged, such damaged

portion, if not in the hole, shall be replaced; however, if inserted, the encasement pipe shall be abandoned in place, grouted full, and suitably plugged, and an alternate installation made.

The ends of the casing pipe shall extend on both sides a minimum distance of four feet beyond the edge of pavement or as specified in the permit requirements or designated on the engineering drawings, whichever is greater.

The casing pipe shall be cut and trimmed. Once cut and trimmed the ends of the casing pipe shall be sealed to the carrier pipe using casing end seals, mechanically fastened to both pipes.

Once the casing pipe is in place, the actual carrier pipe shall be installed inside the casing. All carrier pipes shall be installed with restrained joints as shown on CCU Standard Details. The carrier pipe shall be installed within the casing pipe using stainless steel casing spacers to center the carrier pipe within the casing pipe. The casing runner height shall be large enough so that it does not interfere with the pipe-restrained joints. The spacers shall be equally spaced along the length of the casing pipe. All carrier pipe joints in the casing shall be restrained to include the first joints outside of the casing and the carrier pipe shall be restrained to the adjoining mains.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and construction of reclaimed water mains. Reclaimed water mains, if applicable, shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit.

1.1 SCOPE

1.1.1 General

This specification provides the requirements for the design, selection of materials and construction of reclaimed water mains for the project.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the work required under the contract to include but not be limited to unloading, hauling and distributing all pipe, fittings, valves and appurtenances. The Contractor shall also remove any surfacing, as required; excavate the trenches and pits to the required dimensions; construct and maintain all required traffic control devices and appurtenances; sheet, brace, and support the adjoining ground of all adjacent structures where necessary; furnish all pipe, pipe bend sections, jointing material, restraints, stainless steel stiffeners, bedding material and all other appurtenances; maintain all existing system flows, lay, furnish and install flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures, handle all drainage or ground water; provide barricades, guards, and warning lights; lay and test the pipe, fittings, valves, and appurtenances; place all marking and locating devices; backfill and consolidate the trenches and pits; maintain all surfaces over the trench until surface restoration is completed; restore the surfaces, unless otherwise stipulated; remove surplus excavated material; and clean the site of the work.

The Contractor shall also furnish all labor, materials, equipment, tools, and all other associated appurtenances required to rearrange sewers, conduits, ducts, pipes or other structures encountered in the installation of the work.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the construction of the reclaimed water mains with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra payment by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the written consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the payment determined in the following manner:

1.2.1 Reclaimed Water Mains

Reclaimed water pipe shall be paid for at the contract bid price per lineal foot for each size and type of material specified which shall include the cost of furnishing all pipe, pipe bend sections, jointing material, restraints, stainless steel stiffeners, bedding material and all other appurtenances, and of delivering, handling, laying, dewatering, trenching, sheeting and backfilling, maintain all existing reclaimed system flows furnishing and installing flowable fill used for tunneling/defecting pipe under and adjacent to existing storm piping/structures (unless separate bid item is provided), testing, restoring the surface (unless separate bid item is provided), necessary permits, and all material or work necessary to install the pipe complete in place at the depth specified on the plans and/or as directed by CCU.
The length of pipe for direct bury installation for which payment is made shall be the actual overall length measured along the axis of the pipe without regard to tee sections or bend sections. All lengths shall be measured in a horizontal plane unless the grade of the pipe is more than fifteen percent (15%). No payment consideration will be given to depth zones for the installation of the reclaimed water mains.

The length of pipe for directional bore of reclaimed water main pipe shall be measured by the length pipe before installation and subtracting the lengths of the pipe cut from the ends of pipe when the bore pipe is connected to the pipe on either end. The difference is the length of the pipe in the ground.

1.2.2 Pond Discharge Assembly

The pond discharge assembly shall be paid for on a lump sum basis at the contract bid price which shall include the pond discharge meter assembly, the scada, pond discharge piping, pond

level assembly, meter pad, fittings, equipment and all other related appurtenances in accordance with the contract documents. The cost of the actual meter shall be invoiced separately.

1.2.2 Main End Blow Off Assembly

The main end blow off assembly shall be paid for at the contract bid price per each which shall include the cost of furnishing main end blow off assembly device, piping, tees, fittings, ball valves, meter box, restraints and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans. Testing shall be included in the piping test.

1.2.3 Tie Back Assembly (for Existing Facilities Only)

The tie back assembly, if required, for connection to existing facilities which are not properly restrained, shall be paid for at the contract bid price per each which shall include the cost of furnishing tie back assembly device, stainless steel threaded rods, fittings, concrete blocking, restraints and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans.

1.2.4 Thrust Block

Thrust blocks, if required, for connection to existing facilities which are not properly restrained, shall be paid for at the contract bid price per each thrust block for the size of pipe involved which shall include the cost of furnishing thrust block and any other appurtenances and of delivering, handling, excavation, sheeting, backfilling, dewatering, restoring of the surface and all material or work necessary to install the unit complete in place at the depth specified on the plans.

1.2.5 Ductile Iron Fittings

Ductile iron fittings shall be paid for by the contract bid price by weight (latest revision of AWWA C153) and shall include all labor, equipment, materials and all associated appurtenances to install the ductile iron fittings. Restraints shall be considered incidental to the ductile iron fittings contract bid price and no direct payment will be made for restraints. Any other items necessary for the installation of the ductile iron fittings that are not included in the manufacturer's specified weight, including but not limited to bolts, gaskets, jointing materials, labor, and testing shall be considered incidental to the project.

1.2.6 Locate Balls and Marker Tape

a. Locate balls shall be paid for at the contract bid price per each which shall include all labor, equipment, materials, and associated appurtenances to install and program the marker balls and submit the marker ball data to CCU.

b. Marker tape shall be considered incidental to the reclaimed water main.

1.2.7 Service Connections

Service connections shall be paid for as outlined below and shall include all labor, equipment, materials, and all associated appurtenances to completely install service connections. CCU will provide all meters to the contractor for installation. The meter shall be paid for under a separate bid item or per developer agreement.

a. Service connection piping shall be paid for as per contract bid price per lineal foot installed for each reclaimed water service size and include all connections to piping, meters and/or other assemblies for a complete operable service. Service fittings shall be incidental to the service connection piping bid item unit price.

b. Corporations and curb stops shall be paid for as per contract bid price per each installed for each reclaimed water service size.

c. U-branch shall be paid for as per contract bid price per each installed for each reclaimed water service size.

d. Service saddles shall be paid for as per contract bid price per each installed for each reclaimed water service size.

e. Backflow prevention devices, if required, shall be paid for as per contract bid price per each installed for each reclaimed water service size.

f. The measurement and payment for all labor, materials, equipment, and all other appurtenances for reclaimed water meter removal and/or replacement shall be per each reclaimed water meter removed and/or replaced.

g. The measurement and payment for all labor, materials, equipment and all other appurtenances for reclaimed water meter box removal and/or replacement shall be per each reclaimed water meter box removed and/or replaced.

h. The measurement and payment for all labor, materials, equipment and all other appurtenances for bollards shall be per each bollard constructed and installed.

i. Measurement and payment shall be as per the unit price bid per each commercial reclaimed water service connection to existing plumbing irrespective of size and shall include any and all items required to connect the existing service line to the newly installed reclaimed water meter, or existing reclaimed water meter to a newly installed service line for a complete and operational

connection. The removal of the existing reclaimed water service plumbing shall be considered incidental to the new reclaimed water service connection bid unit price.

1.2.8 Line Stops

The installation of line stops shall be paid for at the contract bid price per each based on size specified in the bid form and shall include the cost of labor, material, equipment and all other associated appurtenances required to complete the installation of line stops in accordance with the Contract Documents. The installation of line stops on existing reclaimed water mains shall be approved by CCU EOR before Contractor proceeds and coordinated with CCU Operations.

1.2.9 Testing

All required testing shall be considered incidental to the project and no direct payment will be made.

1.2.10 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct payment will be made.

1.3 REFERENCED STANDARDS (Latest Revision)

AWWA/ANSI:

C-105 Polyethylene Encasement for Ductile-Iron Pipe Systems
C-110 Ductile-Iron and Gray-Iron Fittings
C-111 Rubber – Gasket Joints for Ductile-Iron Pressure Pipe Fittings
C-151 Ductile-Iron Pipe, Centrifugally Cast
C-153 Ductile-Iron Compact Fittings
C-600 Installation of Ductile-Iron Mains and their Appurtenances
C-651 Disinfecting Water Mains
C-652 Disinfection of Water-Storage Facilities
C-900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
C-901 Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. (19mm) Through 3 In. (76 mm), for Water Service,
C-906 Polyethylene (PE) Pressure Pipe Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
C-909 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger

ASTM:

A-139 Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over,
D-1120 Standard Test Method for Boiling Point of Engine Coolants
D-1248 Polyethylene Plastics Extrusion Materials for Wire and Cable
D-1785 PolyVinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

D-1869 Rubber Rings for Fiber-Reinforced Cement Pipe
D-2241 Poly Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
D-3350 Polyethylene Plastics Pipe and Fittings Materials,
D-1598 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
D-1599 Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

AASHTO Code

NSF: Standard 61

Florida Administrative Code

Ten States Recommended Standards for Water Works

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
001760 – Surveying and Record Drawings
002340 – Valves
002240 – Dewatering
002345 – Fire Hydrants
002930 – Grassing
009900 – Surface Preparation, Painting and Coating

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

The Contractor shall submit complete detailed documentation of all materials for approval by CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

The Contractor shall provide proof of supplier certification/training for thermal butt-fusion of pipe for any employee fusing pipe.

Final written approval is at the discretion of CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions.

2.1.1 General

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below:

All pipes furnished for reclaimed water mains and for service connection installations shall be of the type, kind, size, and class indicated for each particular line segment as shown on the engineering drawings and/or designated in the Contract items.

2.1.2 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

a. PVC Pipe: PVC pipe for reclaimed water mains shall conform to the requirements of AWWA C-900 (4" through 60"), and AWWA C-909 (4” through 24”) and shall be Class 150 DR 18 for all open cut and direct bury installations with a minimum of forty-eight (48”) inches of cover for reclaimed water mains. For shallower depth, the type of pipe and installation shall require prior written approval. The manufacturer shall insure all quality control test and AWWA requirements are complied with during the production of PVC pipe.

b. C-900 and C-909 pipes shall have an integral bell formed with a race designed to accept the gasket in accordance with their respective AWWA requirements. The spigot end shall have a bevel and a stop mark on the outside diameter to indicate proper insertion depth. Provisions shall be made for expansion and contraction at each joint. All surfaces of the joint where the gasket may bear shall be smooth, free of cracks, fractures, or imperfections that could adversely affect the performance of the joint.

c. Pipe Color: All C-900 and C-909 reclaimed water mains shall be purple in color with a PVC ASTM D-1120 and ASTM D-2241 reference, the class pressure rating, and the DR number permanently and plainly marked on the pipe.

d. Rubber Gasket Joints: C-900, , and C-909 polyvinylchloride pipe joints shall be the bell and spigot type using rubber gasket push-on type joints. Rubber gaskets shall be molded to a circular form to the proper cross section and shall consist of a vulcanized high grade elastomeric compound conforming to ASTM D-1869 and AWWA C-900 elastomeric seals for joining plastic pipe.

e. Fittings: All ductile iron fittings shall be in accordance with AWWA Specification C-153 and as a minimum have the same pressure rating of the connecting pipe. All ductile iron fittings shall be cement mortar or fusion bonded epoxy coated. All coatings in contact with reclaimed water shall be certified to NSF 61. All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel and all buried fasteners such as bolts, nuts, fasteners and washers shall be “Cor-Ten” steel or Cor-blue coated. Threaded rod for buried applications shall

be Type 316 stainless steel. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

f. Fastener Threads: All stainless-steel fastener threads shall be coated with an anti-seize compound as approved in writing by CCU.

2.1.3 High Density Polyethylene (HDPE) Pipe and Fittings

a. High Density Polyethylene (HDPE) pipe shall meet the requirements of AWWA C-906 for polyethylene pressure pipe and fittings and for PE-3408 SDR 11. HDPE pipe shall meet ASTM D-3350 cell classification of 345434C. Permanent identification of the pipe shall be provided by co-extruding purple longitudinal stripes into the pipes outside surface for reclaimed water. All polyethylene piping shall have ductile iron pipe nominal outside diameters.

Individual sections of HDPE piping shall be joined together by thermal butt-fusion to make a continuous section of pipe as recommended by the pipe manufacturer. Bends in HDPE pipe shall not be within ten (10) pipe diameters from any fitting or valve. The minimum radius of curvature shall be per the pipe manufacturers recommendations and bending shall not cause kinking. HDPE piping shall not be joined by solvent cements, adhesive or threaded type connections.

The color marking stripes shall be aligned during the fusing process and the pipe shall be pulled through the bore to allow identification of the type of system utilizing the HDPE pipe.

b. All mechanical joint fittings and sleeves used with high density polyethylene (HDPE) pipe shall be cement mortar or fusion bonded epoxy coated ductile iron with mechanical joints rated to 350 psi and conforming to AWWA C-153 and C-111. All coatings in contact with reclaimed water shall be certified to NSF-61. All MJ fitting connections to polyethylene pipe shall be restrained with Mega-Lug restrainers. The HDPE pipe shall be reinforced on the ends using stainless steel wedge internal stiffeners.

The mechanical connection to MJ fittings and sleeves shall use mechanical restraints that meet specification requirements. Size-on-size mechanical connection to PVC or DI pipe shall be by long ductile iron solid sleeves with Mega-Lug restrainers.

No electro fusion fittings shall be used with HDPE unless written approval is provided by ~~the~~ CCU.

HDPE molded butt fittings and couplings for non-standard fittings and couplings shall require written approval from CCU for installation.

2.1.4 Polyethylene (PE) Pipe and Fittings for Service Connections

a. PE pipe two inches or less in size shall meet AWWA C-901, ASTM D-3350 cell classification of 334434C and be permanently marked with the type/size/use of the pipe. PE pipe two and one

half (2 ½) inches or three (3) inches in size shall meet AWW C-901, ASTM D-3350 cell classification of 334434C and be permanently marked with the type/size/use of the pipe and shall only be permitted by specific written approval by CCU. The minimum radius of curvature shall be thirty (30) pipe diameters and bending shall not cause kinking. The reclaimed water pipe shall be purple in color.

b. Brass Compression Coupling Fittings: Brass compression coupling fittings shall be permitted as approved by CCU.

c. HDPE Compression Coupling Fittings: PE piping with HDPE compression fittings shall be permitted as approved by CCU. PE piping with the HDPE 4710 molded fittings does not require stainless steel stiffeners.

d. Mechanical Coupling Fittings: The mechanical coupling fittings shall meet and/or exceed the maximum design pressure requirements of the piping system. The couplings shall prevent the entry of dust, dirt, and moisture. Mechanical coupling fittings shall not be permitted unless approved in writing by CCU.

e. PVC Compression Coupling Fittings: PE piping with PVC compression fittings shall not be permitted unless approved in writing by CCU.

2.1.5 Ductile Iron Pipe and Fittings

a. The ductile iron (DI) pipe covered by this specification shall be the push-on joint type or mechanical joint type, centrifugally cast to conform to all requirements of AWWA Specifications C-151 and C-153, latest revisions.

The maximum allowable deflection of the pipe shall not exceed two percent (2%) of the pipe diameter. Ductile iron pipe will be fully encased in an 8-mil polyethylene sleeve, in accordance with AWWA C-105, Method A. The pipe and the polyethylene sleeve shall be color coded purple for reclaimed water by a means acceptable to CCU.

b. All pipes shall have a cement mortar or fusion bonded epoxy coating in accordance with the AWWA Specifications, latest revision. All coatings in touch with reclaimed water shall be certified to NSF-61.

c. Polyethylene material shall conform to ASTM Standard Specification D1248, latest revision. All ductile iron piping shall be marked "DUCTILE IRON" in large letters. The nominal wall thickness shall be legibly marked on each piece of pipe and the pipe installed so that the markings can be read from the top of the trench.

Minimum thickness of ductile iron pipe shall be as follows:

3" Ductile Iron Pipe	0.27"	Class 52
4" Ductile Iron Pipe	0.29"	Class 52

6" Ductile Iron Pipe	0.31"	Class 52
8" Ductile Iron Pipe	0.33"	Class 52
10" Ductile Iron Pipe	0.35"	Class 52
12" Ductile Iron Pipe	0.37"	Class 52
14" Ductile Iron Pipe	0.36"	Class 51
16" Ductile Iron Pipe	0.37"	Class 51
18" Ductile Iron Pipe	0.38"	Class 51
20" Ductile Iron Pipe	0.39"	Class 51
24" Ductile Iron Pipe	0.41"	Class 51
30" Ductile Iron Pipe	0.43"	Class 51
36" Ductile Iron Pipe	0.48"	Class 51
42" Ductile Iron Pipe	0.53"	Class 51

d. Rubber gasket joints shall be in accordance with AWWA Specification C-111 latest revision.

e. All fittings shall be in accordance with AWWA Specification C-153 or C-110 latest revision and have the same pressure rating of the connecting pipe. All ductile iron fittings shall be cement mortar or fusion bonded epoxy coated. All coatings in touch with reclaimed water shall be certified to NSF61. All exposed fasteners such as bolts, nuts, washers, and threaded rod shall be Type 316 stainless steel. All buried fasteners such as bolts, nuts and washers shall be “Cor-Ten” steel or Cor-blue coated steel. Threaded rod shall be Type 316 stainless steel for buried applications. Mechanical joint bolts shall not protrude more than ½ inch through the nut after joints are assembled.

f. All stainless-steel fasteners threads shall be coated with an anti-seize compound as approved in writing, by CCU.

2.1.6 All tapping sleeves shall be 316 stainless steel.

2.1.7 Service Connections

Existing CCU approved products are listed on the Approved Products list, posted on the CCU website for each category.

a. Corporation Stops

All corporation stops shall conform to AWWA standards and shall comply with CCU standard details as determined by CCU. Corporation stops shall meet a 300 psi rating.

b. Curb Stops

All curb stops shall conform to AWWA standards and shall meet CCU standard details as determined by CCU. Curb stops shall meet a 300 psi rating.

c. Service Saddles

All service saddles shall conform to AWWA standards and shall meet CCU standard details as determined by CCU. Service Saddles for HDPE pipe include fusion bonded HDPE saddles as per AWWA standards. Service saddles shall meet a 200 psi rating.

d. U Branch

All U Branches shall conform to AWWA standards and shall meet CCU standard details as determined by CCU.

e. Brass service fittings shall conform to AWWA standards, FDEP regulations and shall meet CCU standard details as determined by CCU and NSF 61 / ANSI 372.

f. Backflow Prevention Devices

All backflow prevention devices shall conform to AWWA standards, FDEP regulations, and shall meet CCU standard details as determined by CCU.

2.1.7 Pipe and Fittings Unloading at Site

The contractor shall inspect each shipment of pipe and fittings and make provisions for a timely replacement of any damaged material. The contractor shall unload by hand or use canvas slings to avoid scratching the pipe. The contractor shall not sling or drag pipe over an abrasive surface. Pipe or fittings damaged during handling shall be removed from the site and replaced with new pipe and/or fittings. The contractor shall follow the manufacturer's storage specification and store pipe and fittings in such a manner that prevents damage due to crushing, piercing, excessive heat, harmful chemicals, and exposure to sunlight. Pipe and Fittings shall be stored in a dry and secure area.

2.1.8 Marker Balls and Marker Tape

a. Reclaimed water marker balls shall be 3M 4 inch marker ball purple in color.

b. Marker tape stripes shall be purple in color for reclaimed water.

2.1.9 Reclaimed Water Service Connections

a. All reclaimed water service connections up to 2 inches in size shall be constructed with polyethylene pipe. Service connections two and one half (2 ½) inches or 3 inches in size shall be constructed with polyethylene pipe and shall only be permitted by specific written approval by CCU. Service connections 4 inches or greater in size shall be constructed of PVC pipe meeting AWWA C-900 requirements.

b. Service connections including backflow prevention devices shall meet the marking, color, materials, configuration, and installation requirements of these standard technical specifications and CCU standard details.

c. Reclaimed water meter boxes and covers installation shall be rated as follows:

d. For low vehicle traffic areas such as sidewalk, property line/easement shall be at a minimum ANSI/SCTE Tier 8 rated reclaimed water meter boxes and covers.

e. For medium vehicle traffic areas such as residential driveways, roadways, and parking lots shall be at a minimum ANSI/SCTE Tier 15 rated reclaimed water meter boxes and covers.

f. For high vehicle traffic areas such as county arterial roadways, state roads, commercial driveways, industrial parks shall be at a minimum ANSI/SCTE Tier 22 rated reclaimed water meter boxes and covers.

g. Reclaimed water meter boxes and covers shall be purple in color for reclaimed water.

h. All reclaimed water meter boxes shall be delivered with the water source and service access holes installed. Reclaimed water meter boxes shall not be cut or modified unless approved by CCU.

i. Reclaimed water meters, required purchase from CCU, shall be installed either in a double or single configuration as determined by CCU.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

Direct Bury, Directional Bore and Jack and Bore: All direct bury, directional bore and, jack and bore reclaimed water main pipe shall be installed to a minimum depth of forty-eight (48) inches to the top of the reclaimed water main or as approved by CCU. If additional fittings are required where not shown on the engineering drawings to maintain alignment around curves, the Contractor shall provide the required number and be compensated at the contract bid price as provided on the bid form.

NOTE: If the new construction is tying into existing utilities, the Contractor shall verify the existing utilities, such as fittings and valves, are restrained prior to the start of installation of the valve or piping. If not properly restrained, the contractor shall notify CCU and shall restrain the existing utility as approved by CCU in writing.

3.1.1 Direct Bury of Material

a. Open cut PVC reclaimed water main piping shall be Class 150 DR 18 for all areas with a minimum of forty-eight (48) inches of cover for reclaim water mains. For shallower depth, the

type of pipe and installation shall require prior written approval by CCU. Any pipe left in the trench overnight shall be plugged or capped and watertight. Bags, plastic and tape will not be allowed. Reclaimed water mains shall be installed at a consistent depth.

b. Proper implements, tools, and facilities satisfactory to CCU shall be provided and used by the Contractor for the safe and convenient execution of the work and the testing. All pipe, fittings, and valves shall be carefully lowered into the trench in such a manner as to prevent damage to reclaimed water main materials and protective coatings and linings. Under no circumstances shall reclaimed water main materials be dropped or dumped into the trench. The pipe shall be laid with the manufacturers lettering designating the type and size of pipe visible from the top of the open trench. Wherever it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane to avoid obstructions or where long-radius curves are permitted, the amount of pipe or joint deflection shall not exceed fifty (50) percent of the manufacturer's recommended limit. Pipelines intended to be straight shall not deviate from the straight line.

c. Open cutting of roads for trenching and direct bury of reclaimed water mains shall not exceed eight feet (8') in width unless specified otherwise in contract documents. All effort shall be made to minimize the width of the trench and in-turn, the amount of restoration.

d. As directed by CCU, all existing materials removed to facilitate the tunneling or deflecting of direct bury piping under or adjacent to an existing storm piping and/or structures shall be replaced by flowable fill. Prior to placing flowable fill the area between the direct bury piping and existing piping or structure shall be hollowed out to a defined cavity along the length of the direct bury piping. The Contractor is responsible for filling the cavity with flowable fill and replacing the flowable fill as necessary throughout the contract and warranty period should erosion occur.

e. PVC pipe may be laid in the trench in single sections or preassembled multiple sections including no more than 1 full stick of pipe, 1 partial stick of pipe, and intervening required fittings and/or valves. Preassembled sections of pipe shall be carefully fed by hand or with the use of approved equipment on the pipe bed. The contractor shall provide pockets in the pipe bed material to eliminate any concentration of loads on the bell ends or joints. The ends of mechanical joint pipe and fittings and rubber gasket joint pipe and fittings shall be clean of all dirt, grease and foreign matter prior to installing fittings or joining of pipe sections. A joint lubricant shall be applied to all gaskets prior to joining two pipe sections together. The joint lubricant shall have been tested and approved for ~~potable~~ reclaimed water service. No lubricant shall be used that will harbor bacteria or damage the gaskets.

f. Cutting pipe for inserting valves, fittings, or closure pieces shall be in a neat and workmanlike manner without damaging the pipe or lining and so as to leave a smooth end at right angles to the axes of the cut pipe. The cut end of mechanical joint pipe shall be dressed to remove sharp edges or projections which may damage the rubber gasket. For push-on joints, the Contractor shall dress the pipe cut ends by beveling as recommended by the manufacturer.

3.1.2 Directional Bore of Material

a. Proper implements, tools, and facilities shall be provided and used by the Contractor for the safe and convenient execution of the work. The Contractor shall meet the jointing and cutting pipe direct bury reclaimed water main piping requirements as they apply to the directional bore. A log of the bore depths shall be based on one-foot intervals staking from the entry and exit locations and intermediate centerline. The vertical and horizontal location readings shall be plotted on a one inch (1") equals twenty feet (20') natural scale drawing which shall be provided to CCU within 48 hours of completion of the bore.

   No electro fusion fittings shall be used with HDPE unless written approval is provided by ~~the~~ CCU.

b. For reclaimed water mains eight (8”) inches in size or smaller, the HDPE pipe shall have the same outside diameter as the connecting mains. For larger sizes, the HDPE pipe shall have the same size or larger inside diameter as the connecting mains unless otherwise noted on the plans; provided for in the Special Provisions; or approved in writing by CCU.

c. The depth of all directional bores for FDOT roads shall be in accordance with the FDOT permit requirements.

d. The slurry may be recycled for reuse in additional hole opening operations if approved by CU or it shall be removed and disposed of at an approved dump site. No fluids shall be allowed to enter any unapproved areas or any waterways.

e. For directional bores under any surface water (subaqueous), the drilling contractor must submit a ‘frac-out’ response plan to CCU and, as required, to permitting agencies for review and approval prior to starting the directional bore. During execution of all subaqueous directional bores, the drilling contractor must have at the site the necessary material, equipment, and manpower to properly respond to a ‘frac-out’ in accordance with the ‘frac-out’ response plan.

f. All bores two (2”) inches or larger in diameter (except for service lines) shall have two tracer wires attached to the bore. All tracer wire shall be a # 10 AWG, steel reinforced, insulated copper tracer wire, with a minimum of 2,000-pound break load. The Contractor shall submit the selected tracer wire to CCU for written approval. It shall run continuously with and shall be securely fastened to the utility main. All tracer wire shall be in compliance with the following:

   i. All tracer wire termination points must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose and with the CCU approved load rating.

   ii. All grade level/in-ground access boxes shall be appropriately identified with “reclaimed water” cast into the cap and be color coded.

   iii. A minimum of 20 ft. of excess/slack wire is required in all tracer wire access boxes after meeting final elevation.

iv. All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the tracer wire connection and the terminal for the grounding anode wire connection.

v. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

vi. The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the project with CCU staff present.

g. Boring Failure

The Contractor shall maintain a copy of an approved Frac-out contingency plan on the construction site and provide a copy to CCU. The Contractor's Frac-out plan shall meet FDEP permit regulations and other regulatory agency requirements in accordance with the project regulatory permits where applicable. (Frac-out is a condition where drilling mud is released through fractured rock or soil and travels toward the surface.)

If conditions warrant removal of any materials installed in a failed bore path, as determined by CCU, it will be at no cost to CCU. Promptly fill all voids with excavatable flowable fill or other method as approved by the permitting agencies and CCU.

If an obstruction is encountered during boring which prevents completion of the installation in accordance with the design location and specification, the pipe may be taken out of service and left in place at the discretion of CCU. Immediately fill the product left in place with excavatable flowable fill or capped at the discretion of CCU. Submit a new installation procedure and revised plans to CCU for written approval before resuming work at another location.

h. Quality Control

The Contractor shall submit a description of the quality control methods they propose to use in the directional drilling operations to CCU for approval at least 10 days prior to the start of directional drilling. The submittal shall include procedures for controlling and checking line and grade and field forms for establishing and checking line and grade to comply with the required limitations.

i. Control of Line and Grade

The Contractor shall establish and be fully responsible for the accuracy of their own control for the construction of the entire project, including structures, bore hole line and grade.
The Contractor shall:

a. Establish control points a sufficient distance away from the bore hole operation not to be affected by construction operations.
b. Check control for the bore alignment against an above ground undisturbed reference at least once each hour and once for each 50 feet of bore hole constructed, or more often as needed or directed by CCU.
c. Drill pilot holes to ensure the required vertical clearances from ditch, river, or wetland bottoms, and horizontal clearances from buffers or easement lines are maintained. The contractor shall monitor and record horizontal and vertical boring hole locations at twenty-five-foot (25') intervals or any change in line and grade. If the pilot hole exists in buffers

or outside of easements as shown on the plans the Contractor shall be responsible for grouting the hole to the satisfaction of CCU. If the pilot hole deviates outside of its permitted limits, the drill string shall be withdrawn, and the borehole grouted to the satisfaction of CCU.

j. As-Built Plans

As-Built plans for on-grade bores shall indicate the depth of both pipe inverts and verify the grade and also provide the horizontal alignment. As-Built plans shall conform to the Charlotte County Utility Department's "Minimum Drawing Requirements".

3.1.4 Marker Balls and Metallic Marker Tape

a. Marker balls and metallic marker tape: Contractor shall provide and install metallic marker tape and provide, program, and install marker balls for all installed trenched pipe. For trenchless pipe installations, the Contractor shall provide, program, and install marker balls. Metallic marker tape is not required on trenchless pipe installations. The tape shall be marked purple for reclaimed water. The metallic tape shall be laid 12 to 18 inches above the pipe and the ball markers placed directly on top of the pipe or fitting. For trenchless pipe installations the marker balls shall be placed with a minimum of 18 inches of cover and no deeper than 3 feet of cover with the exception that no marker balls are required for that portion of pipe that lies beneath the water surface at a subaqueous crossing.

b. Installation: The balls shall be installed at all changes of direction and fittings absent of any valve. For cul-de-sacs having continuous fused or roll piping with no in-line fittings, the balls shall be placed starting at the point of curvature of the cul-de-sac and every 50 linear foot to the end of the line. On straight runs of pipe, the balls shall be installed at every power pole. If power poles do not exist, the balls shall be placed every 150 feet from the nearest change of direction or fitting. At road and driveway crossings, the marker balls shall be placed on each side of the road or driveway, two feet from the pavement or driveway edge, or as otherwise approved in writing by CCU. On vertical deflections the marker ball shall be placed on the top fitting only.

c. Programming: The Contractor shall program all balls and provide a copy of the programmed data in each marker ball in either Microsoft EXCEL or Access electronic format to ~~the~~ CCU. The Contractor as-built drawings shall show the location of all marker balls.

3.1.5 Fittings

When tightening bolts, the contractor shall bring the gland up toward the flange evenly while maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. Tighten all nuts progressively a little at a time. DO NOT over stress bolts to compensate for poor alignment. If effective sealing is not attained at the maximum allowable torque, disassemble the joint and reassemble again after cleaning. Fittings shall be installed in accordance with the manufacturer's published instructions.

3.1.6 Restraints

Piping shall be restrained in accordance with CCU standard details restraint table. The table is based on a safety factor of 2.0 and takes into account variables such as type of soil, type and depth of the trench, and depth and type of pipe. In addition, the restraints may be supplemented with thrust blocks or tie-back assemblies. CCU may require the engineer to provide the dimensions and calculations of the thrust block for written approval prior to construction.

3.1.7 Storm Sewer Conflicts

Reclaimed water mains that must be installed with less than 12 inches of clearance under or over storm sewer pipes or structures due to existing physical limitations that prohibit deflection or directional drilling, require construction of a bridging structure that is acceptable to CCU to support the storm sewer prior to installation of the reclaimed water main. The reclaimed water main pipe section under the storm sewer pipe or structure shall be replaced with a single 20 LF stick of ductile iron pipe centered under the storm sewer pipe or structure. The ductile iron pipe shall be fully encased in an 8 mil polyethylene sleeve in accordance with AWWA C-105, Method A. Polyethylene material shall conform to ASTM Standard Specification D 1248-68. The contractor shall submit details of the proposed bridging structure and reclaimed water main pipe installation to CCU for review and approval prior to the start of construction at the conflict location. Reclaimed mains that must be installed over storm sewer with less than adequate depth shall be armored in accordance with Standard Details and as approved by CCU.

3.1.8 Potable Water Main Crossing

All reclaimed water mains and potable water mains shall cross at ninety (90) degrees or as approved by CCU.

3.1.9 Service Connections

a. The reclaimed water meter boxes and covers and backflow prevention devices shall be installed/positioned in accordance with the CCU standard details and as approved by CCU.

b. The 1” long services shall be installed in a two (2) inch schedule 40 PVC or equivalent HDPE carrier pipe extending beyond the edge-of-pavement in accordance with the CCU standard details. Larger poly tubing services will require a larger carrier pipe. Marker balls shall be placed at each end of the carrier pipe.

c. The installed reclaimed water meter boxes and covers shall meet the loading requirements for sidewalk and property line/easement installation and high vehicle traffic locations such as driveways, roadways, and parking lots. Reclaimed water meter boxes shall be placed outside of the sidewalk in the grassy area on the customer side of the sidewalk. Reclaimed water meters 3/4" and 1" will be supplied with a 1" poly tubing from the main to the meter fitting. Reclaimed water meters 1.5" and 2" are to be supplied by a poly tubing reclaimed water service 2" in size from the reclaimed water main to the reclaimed water meter connections.

3.2 TESTING MAINS AND TAPPING SLEEVES

All pressure tests shall be in accordance with AWWA Standards C-600, C651, and C-652, latest revision. A pressure test shall be required for all installations of reclaimed water mains and all appurtenances. Upon completion of the installation of the reclaimed water service connection, the service connection shall be flushed prior to connection to the on-site reclaimed water service connection.

3.2.1 Pressure Test

a. Pipe:

The contractor shall hydrostatically pressure test all PVC, HDPE, and DI reclaimed water mains in accordance with the latest revision of AWWA C-600 series as applicable. Oil filled gauges shall only be used for all pressure tests. The tests shall be at 150 psi for a period of two (2) hours. The allowable loss for one (1) hour shall be determined by the following formula:

$$\text{Allowable Leakage} = \frac{(D)(L)(PY)}{133{,}200}$$

Where: D = nominal diameter of the pipe in inches
L = length of pipe in feet
PY = square root of test pressure during the leakage test in pounds per square inch

Calibrated test equipment shall be on site to verify the loss of water during the testing period.

Pressure testing shall not exceed 1500 linear feet unless otherwise approved by CCU.

b. Tapping Sleeves:

All reclaimed water tapping sleeves shall be hydrostatically pressure tested in accordance with the latest revision of AWWA C-600. The test shall be conducted at 150 psi for a period of two (2) hours. No loss of pressure is allowed.

c. Procedures:

Each section of pipe between valves, between the tapping sleeve and the pipe, and/or the valve and the tapping sleeve shall be slowly filled with water from a safe source, and the specified test pressure shall be applied by means of a water pump in a manner satisfactory to CCU. In the case of testing a pipe where valves do not exist, the contractor shall plug the end of the line as approved in writing, by CCU. The pump, pipe, and/or tapping sleeve connections, gauge, and all necessary apparatus shall be furnished by the contractor and shall be approved in writing, by CCU prior to the conduct of any test. All necessary pipe taps for testing shall be made by the contractor as approved in writing, by CCU. –CCU may request testing of isolated portions between valves within the test section if a portion of that main has critical components such as

multiple fittings at an extreme deflection. The contractor shall be responsible to remove any pipe taps installed for this purpose upon completion of the test as approved in writing by CCU.

Pressure shall be measured from sample points and blow-off assemblies, services, for reclaimed water main pressure tests. CCU shall witness all tapping sleeve and reclaimed water main pressure tests.

END OF SECTION

Section 002530

SUBMERSIBLE SEWAGE PUMP LIFT STATION INDIVIDUAL DESIGN

PART 1 - GENERAL

1.1 SCOPE

1.1.1 General

It is the intent of this specification to provide the requirements for use of the design, selection of materials and all appurtenances for an off-site pre-fabricated modular individual submersible sewage lift station, hereinafter referred to as "individual lift station", to be installed at a designated lift station site.

A individual lift station shall be restricted to the following applications:

- 4 foot inside diameter wet well structure
- shallower depth installations based on structural product limitations
- serving limited number of properties
- commercially available
- commercial and residential uses

All individual lift station installations shall meet the requirements of the Florida Department of Environmental Protection (FDEP) permit, and the Florida Administrative Code (FAC) as applicable.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all materials, equipment, tools, labor, and appurtenances necessary for site preparation, dewatering, construction, testing, and start-up that is necessary to accomplish the work required under the contract to include, but not limited to, furnishing and installing the individual lift station as described herein and as shown on the engineering drawings and CCU Standard Details.

The equipment shall form a completely operable grinder or non-clog submersible sewage pump system complete with pumps and rails, wet well liquid level sensors, wet well, valve vault, hatch covers, valves, piping, water service, motor control center (MCC), grounding rods, all wiring and conduits with the service drop, individual lift station concrete pad, fencing if required, driveway, landscaping and all associated appurtenances.

The contractor shall install the Florida Power and Light (FPL) meter can and install/connect the electrical service to the FPL service point at a hand hole for electrical service as shown on the engineering drawings and as defined in the specification.

1.1.3 Location of the Work

The construction shall be at the location shown on the engineering drawings.

The accessibility to the work sites shall vary, as the individual lift station may be located in landscape areas, utility easements, residential and/or commercial backyards, and various other locations. Damage to existing pavement surfaces, base courses and/or other surface improvements as a result of the contractor's activities shall be restored to like-new condition by the Contractor at provided for in the contract bid documents. The Contractor shall implement all required measures to provide CCU personnel and equipment with complete access to all work site areas during the entire course of performing this project.

1.1.4 Coordination of Work

The contractor shall be responsible for the satisfactory coordination of the individual lift station construction with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Responsibilities

a. Notice to Residents: The contractor shall be responsible for notifying affected residents by the means of door hangers, mailings and/or all other appropriate means to alert residents at various times of the different phases of the construction of the individual lift station. The notifications shall indicate the various work activities that the Contractor will be performing on their street and what they can expect as far as service outages, disruption of traffic, access inconvenience, unusual odors and other activities affecting residents.

b. Licenses and Permits: The contractor shall be responsible for obtaining all licenses, permits, authorizations, approvals, access agreements, consent from utilities/persons/organizations upon whose property is impacted, written releases of responsibility and all other required documents.

c. Work Access: The access to the site is shown on the contract documents. Additional accessibility to the site, as deemed necessary by the Contractor beyond what is shown on the engineering drawings, shall be the responsibility of the contractor, and all expenses associated with work site additional accessibility shall be taken into consideration as part of the contractor's bid unit prices. Written releases from the property owner impacted by additional accessibility obtained by the contractor shall be provided to CCU.

d. Clearance of Blockages or Obstructions in the Sanitary Sewer System: The contractor shall be responsible for clearance of blockages or obstructions in the sanitary sewer system created by the contractor’s construction methods.

e. Location and Exposure of Manholes: The contractor shall expose only those sanitary sewer structures necessary to perform the work as shown on the engineering drawings.

f. Existing Utility Operations: CCU shall shut down or manually operate all existing potable water, reclaimed water and sanitary sewer systems necessary for performance of the work. The

Contractor shall submit a request to CCU for shut down or operational changes a minimum of 24 hours in advance.

g. By-Pass Operations: The contractor shall be responsible for continuous maintenance of flow of all existing utilities at the project site, unless otherwise agreed to by CCU.

h. Water Access: The contractor shall be responsible for obtaining water access necessary for performance of work under the contract from designated fire hydrants at the site of work or other suitable designated sources.

i. Disposal: The contractor shall clean up and dispose of all waste materials from the construction activities including all materials removed from the sanitary sewer system in conformance with all laws, regulations and standard practices.

j. Secure Storage Area: The contractor shall find secure storage areas of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract. CCU will not provide any space or place to store materials.

k. Maintenance of Traffic: The contractor shall be responsible for all maintenance of traffic and obtaining approval of a Maintenance of Traffic (MOT) Plan from the Charlotte County Community Development Engineering Department (CCCDED) for work within the right-of-way of any County Road and from the Florida Department of Transportation (FDOT) for work within the right-of-way of any State Road.

1.1.6 Working Hours

The contractor shall carry out work in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of CCU.

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the compensation determined in the following manner including all labor, materials, equipment, installation, testing, startup, painting, training, technical support, operation and maintenance manuals and appurtenances necessary to complete all the work in accordance with the contract documents:

- Note: Measurement and payment provided in this individual lift station specification supersedes the measurement and payment provided in other specifications.

1.2.1 Site Work:

Site work including satisfactory coordination of utility construction, project site clearing and grubbing, fence removal and restoration, removal and disposal of existing bituminous and/or concrete materials, existing structures, existing culvert or other pipe, furnishing and installing fill material, all necessary grading of the site and all other associated work required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis unless otherwise provided in the bid form.

1.2.2 Wet Well, Valve Vault, Access Hatches and Concrete Slab:

Wet well, valve vault, access hatches and concrete slab including excavation, dewatering, base materials, backfilling, provisions for pipe openings, joint sealing and wrapping, exfiltration testing of the wet well, and all other associated work required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis unless otherwise provided in the bid form.

1.2.3 Submersible Sewage Pumps:

Submersible sewage pumps including associated hardware, cables, guide rails, support brackets, chains, all electrical wiring to the MCC, conduits and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per each basis per each submersible sewage pump size specified.

1.2.4 Main Power Electrical Services:

Main power electrical services including wiring and conduit from the service point in the FPL installed hand hole to the FPL meter can, wiring and conduit from the FPL meter can to the individual lift station MCC, the main power disconnect in the MCC, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.5 Piping and Valves:

Piping and valves, located within the easement/designated area limits of the individual lift station site, including fittings, flexible couplings, flange adaptors, flange connectors, gauges, pipe supports, brackets, vents, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

All piping and appurtenances outside the easement/designated area limits of the individual lift station site shall be measured and paid for within other bid items as provided in the bid form.

1.2.6 Motor Control Center (MCC):

MCC including the following general components: wet well liquid level sensors, electrical wiring and connectors, supports, switches, sensors, controllers, alarms, indicator lights, meters, electrical equipment, back-up battery, emergency generator receptacle, enclosure, panels, controls, indicators, terminal strips, terminal blocks, posts, motor starters, main circuit breaker, operating handles, magnetic contactor coils, seal leak probe, permanent labels, alternator relay, fused control circuit transformer, adjustable three phase power or voltage monitor, wiring diagram, grounding rods, explosion proof fittings, surge protector equipment, suppressors fittings, brackets, conduits, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

Odor Control is optional equipment for each individual lift station. If required, the control documents shall be measured and paid for as a separate bid item as provided in the bid proposal.

1.2.7 Water Service

The water service including tap, piping, meter box assembly, backflow prevention device, spigot, hardware, fittings, brackets, supports and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.8 Driveways (if required)

The driveways including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.9 Culverts

The culvert pipe, end sections, base material and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per linear foot basis per each size specified.

1.2.10 Fence and Gates (if required)

The fence and gates including posts, pipes, fabric, bars and straps, fasteners, gate latches, coating, pig ring ties, hardware and accessories, concrete footings and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.11 Odor Control System (if required)

The odor control system (biofilter unit only, biofilter unit with optional secondary activated carbon polishing unit or stand-alone activated carbon filter unit) including motors, enclosure, skids, wiring, valves, media, absorption material, absorber system, absorber vessel, VFD controlled centrifugal fan with sound attenuation enclosure, switches, control transformer, gauges, sample probes, screen, grates, ductwork, conduits, and connectors, piping, concrete pad, anchors all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.12 Miscellaneous:

All items required for the completion of the individual lift station and not included as a specific bid item shall be considered incidental to the project and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (LATEST REVISION)

Wherever reference is made to any published standard, code, or standard specification, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to which is in effect at the date of the opening of bids.

AWWA: C-153, C-900, C-905, C-909, C-906-90, C-151, C-153, C-111, C-600, C-651, and C-652, C913

ASTM: A-139, D-883, D-1785, D-1869, D-1120, D-2241, D-3350, D-3753 D-1248-68, D-1598, D-1599, D-2583, D-2563, D-4097-82

PS 15-69: National Bureau of standards Voluntary Product Standard "Custom contact molded Reinforced Polyester Chemical Resistant Process Equipment".

ASME: PTC 8.2

FDEP: Wastewater Collection/Transmission System Requirements

AASHTO Code

Florida Administrative Code (FAC)

Recommended Standards for Wastewater Facilities

National Electrical Code (NEC)

NEMA

Underwriters Laboratories (UL)

Federal Communication Commission

Institute of Electrical and Electronics Engineers (IEEE)

Internal Corrosion Direct Assessment (ICDA)

National Fire Protection Association (NFPA)

National Bureau of Standards (NBS)

Air Movement and Control Association (AMCA)

The Contractor shall, when required, furnish evidence satisfactory to CCU that materials and methods are in accordance with these codes, specifications, standards, etc. where so specified. In the event any questions arise as to the application of these codes, specifications, standards etc., copies shall be supplied on site by the Contractor. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

1.4 PARTIAL LISTING OF RELATED SECTIONS

001760 – Surveying and Record Drawings
002310 – Pipe Removal, Disposal, Alteration, Modification or Pipe Abandonment
002320 – Gravity Sewer System
002325 – Force Mains
002340 – Valves
002240 – Dewatering
002540 – Submersible Sewage Pump Lift Station Standard Design
002742 – Sidewalks, Driveways, Streets
002920 – Landscaping
002930 – Grassing
003310 – Cast-in-Place Concrete
009900 – Surface preparation, painting and coating

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 General:

The Contractor shall submit complete detailed documentation of all materials for approval by the CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor shall include the statement that the submittals have been reviewed and the materials meet CCU specifications and/or Standard details.

The Contractor shall provide proof of supplier certification/training for thermal butt-fusion of pipe for any employee fusing pipe.

Final written approval is at the discretion of the CCU.

For materials that the contractor is requesting deviations from this specification and/or Standard details, the contractor shall submit in writing a minimum of 60 days prior to construction, documentation to justify approval of these materials by CCU. The Contractor shall submit one (1) signed electronic copy of the material submittals. No fabrication/construction shall take place until the final shop drawings are reviewed by CCU. Final approval is at the discretion of CCU.

1.5.2 By-Pass Operations: The Contractor shall submit a by-pass plan to CCU for review a minimum of 20 days prior to the start of by-pass operations.

1.5.2.1 Shop Drawings:

1.5.2.2 Structure(s): The contractor shall provide shop drawings for the structure(s) certified by the manufacturer. The submittals shall include the specifics being proposed for the wet well, valve vault, access hatches, structural loading, buoyance provisions, outside seam wrap, sealant between structure sections, invert and clocking of piping, size and location of openings, water proof gaskets and any other appurtenances applicable to the structure(s).

1.5.2.3 Submersible Sewage Pumps: The contractor shall provide shop drawings for the submersible sewage pumps certified by the manufacturer. The submittals shall include at a minimum: pump characteristic curves showing capacity in GPM, NPSH, TDH, efficiency, pumping horsepower from 0 to 110 percent of design capacity, impeller type, discharge diameter, passible spherical solids size, design drawings, a written description of the interchangeability of rails and discharge between the supplied submersible sewage pump and all CCU acceptable manufacturers, and any other appurtenances applicable to the submersible sewage pumps. The shop drawings shall include certification data in the form of testing results indicating that all AWWA, state, federal, and engineering standards are met. If requested by CCU, the Contractor shall provide certified factory pump performance test data in the form of Section 6 of ASME PTC 8.2.

1.5.2.4 MCC: The contractor shall provide shop drawings for the MCC. The shop drawings shall include schematics, manufacturer brochures, and test results for pump settings, all MCC components, all other electrical components and appurtenances applicable to the MCC. The shop drawings shall include certification data in the form of testing results indicating that all NEMA, UL, AWWA, state, federal, and engineering standards are met.

1.5.2.5 Odor Control:

a. General:

The odor control system shall be supplied by a manufacturer who has been regularly engaged in the design and manufacture of the equipment having a minimum of 5 years' experience in its design, fabrication, and testing of odor control systems of the type specified. The equipment supplier shall provide a list of a minimum of 10 identical installations of the type specified that have been in operation for a minimum of 5 years. Other manufacturers shall demonstrate to CCU its equipment is of equal quality of the manufacturer specifically named herein.

The contractor shall submit complete shop drawings for the odor control system, together with all piping, ductwork, valves, and control for review by CCU. The shop drawings shall include schematics, manufacturer brochures, and test results for all odor control components and appurtenances applicable to the proposed odor control. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, and engineering standards are met.

The contractor shall complete the "TBDs" in table "A" below for the odor control system being proposed based on the size of the wetwell, influent flows, inlet, outlet, individual lift station operational temperatures and the estimated inlet H2S concentration in ppm. The design documents shall be provided by the manufacturer to CCU certifying that the odor control system meets the contract requirements.

Table A

Air Flow Rate, cfm	TBD
Estimated Inlet H2S Concentration, ppm	TBD

The contractor shall submit the following information for review before the equipment is fabricated:

1) Letters of Certification of Compliance of materials, equipment, etc.
2) Final certified drawings showing outline dimensions, foundation layout or mounting information, and other pertinent dimensions.
3) Field assembly drawings and/or diagrams.
4) Schematic and wiring diagrams of power, control, and piping systems with all devices, terminal, and wires uniquely numbered and clearly indicating between factory and field wiring. All field wiring shall be included for each diagram to describe all modes of operation of the system indicated. Where the integrated system requires interlocking and control and other components in normal operation, these components shall be included in the description of operation.
5) Drawings of system showing assemblies, arrangements, piping, electrical, mounting details, equipment outline dimensions, fitting size and location, motor data, operating weights of all equipment and sufficient information to allow CCU to check clearances, connections, and conformance with the specifications .
6) Renewal parts list with diagrammatic or cross-section drawing showing part identification. Material analysis or trades designation for each significant part shall be noted on parts lists or on a separate sheet.
7) Materials of construction of all equipment.
8) Control panel drawings shall indicate all equipment installed inside and outside of the panel including the location of all alarms (for biofilter); lamps; complete instrumentation; and control, logic and power wiring diagrams.
9) Electrical equipment rating and data sheets for all devices.
10) Design calculations certified by a Registered Professional Engineer with demonstrated experience in the design of these systems.
11) Pump data and performance curves showing flow, pressure, and horsepower (for biofilter)
12) Specifications, performance data, and calibration curves for exhaust fan and auxiliary components

b. Biofilter:

Any manufacturer whose main business is Fiberglass Reinforced Plastic (FRP) manufacturing shall not be accepted as a supplier of the complete system.

c. Activated Carbon Adsorber:

Any manufacturer whose main business is HDPE manufacturing shall not be accepted as a supplier of the complete system.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions.

2.1.1 GENERAL

All equipment and products shall be permanently identified with the model number and manufacture's nomenclature.

2.1.2 EQUIPMENT

The equipment used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below and/or as provided in other sections of the contract documents.

2.2.1 Submersible Sewage Pumps

2.2.1.1 General

a. The submersible sewage pumps covered by this specification are intended to be standard pumping equipment of proven.

b. The submersible sewage pumps shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactory when installed as shown on the engineering drawings and/or standard details.

c. The submersible sewage pumps shall be heavy duty electric submersible, centrifugal non-clog units designed for handling raw and unscreened wastewater with a minimum of 3" passible spherical solids. For grinder pump units a minimum of 0.5" passible spherical solids. The submersible sewage pumps shall be capable of operating in a liquid temperature up to 115°F and to a depth of 65 feet.

d. All grinder pump (GP) units must be capable of comminuting all material normally found in domestic or commercial wastewater, including reasonable amounts of foreign objects such as glass, eggshells, sanitary napkins, and disposable diapers into particles that will pass through the 32mm (1-1/4-inch) standard discharge piping and downstream valves. Stationary and rotating cutter blades on bases should be made of hardened stainless steel. Single-phase motors are available in 208 or 230 volts and shall be of the capacitor start/capacitor run type for high starting torque. Three-phase motors are available in 208, 230, 460 or 575 volts. GPs shall be standard commercial shop-tested to include visual inspection to confirm construction in accordance with the specifications for correct model, horsepower, cord length, impeller size, voltage, phase, and hertz. The pump and seal housing chambers should be tested for moisture and insulation defects. After connection of the discharge piping, the GP should be submerged, and amperage readings taken in each electrical lead to check for an imbalanced stator winding.

e. The submersible sewage pump and motor unit shall be suitable for continuous operation at full data plate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary submersible sewage pumps or

cooling fans to cool the motor shall not be acceptable. The submersible sewage pumps mechanical seals and motor units shall be from the same manufacturer to achieve standardization of operation, maintenance, spare parts, manufacturer's service, and warranty.

f. The submersible sewage pump shall be tested and approved by Factory Mutual or U.L. as explosion proof for use in Class I, Groups C and D, Division 1 hazardous locations.

g. The submersible sewage pump shall have a sliding bracket for connecting to the dual guide stainless steel rail system. The sliding bracket, either directly or with an adaptor, shall allow for the interchangeability of all CCU acceptable submersible sewage pump manufacturers at alternative locations.

h. The submersible sewage pump shall have a manufactured sized electrical cable and shall be a minimum of 50 linear feet. The cable shall conform to NEC and ICDA Standards with P-MSHA approval. The cable shall be sealed with a protective covering prior to installation.

i. The submersible sewage pump shall include a 316 stainless steel chain capable of supporting the weight of the submersible sewage pump for installation and removal of the submersible sewage pump. The chain shall be connected to the submersible sewage pump bail using a 316 stainless steel clevis. The length of the chain shall be equivalent to the depth of the wet well plus additional 6 feet.

j. The submersible sewage pump discharge diameter shall be as specified on the engineering drawings and/or CCU standard details. For non-clog submersible sewage pumps with pump discharge diameters of 4", the manufacturer supplied submersible sewage pump discharge shall be compatible among all CCU acceptable manufacturers' submersible sewage pump discharge base elbows.

k. The submersible sewage pump shall be cast iron with appropriate coating to protect submersible sewage pump from corrosive properties of wastewater.

l. The impeller shall be mounted directly on the motor shaft extension in such a manner that it shall not become detached if the submersible sewage pump is operated in the wrong direction. The impeller shaft shall be 420 stainless steel or greater and shall extend from the motor to the impeller cap nut.

m. All submersible sewage pump mated surfaces shall be machine fitted for watertight sealing.

n. A 316 stainless steel lifting bail handle shall be provided on the submersible sewage pump housing suitable for lifting the entire submersible sewage pump assembly and attaching the lift chain.

o. The submersible sewage pump shall operate to a maximum submergence of 65 feet including electrical cable entry.

p. All electrical parts shall be housed in an air or oil filled cast iron, water-tight casing.

q. All external hardware shall be 316 stainless steel.

r. The motor shall be designed to allow a minimum of 15 starts per hour.

s. The motors shall include thermal and moisture protection to shut down the motor due to high operational temperatures or infiltration of moisture. The motor shall be automatic restarted once the operational temperature is achieved.

t. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.2 Motor Control Center (MCC)

2.2.2.1 General

The submersible sewage pump motor control elements shall be installed in a 316 stainless steel NEMA 4X enclosure and include the following equipment:

a. The panel shall be constructed of a heavy-duty box frame of all welded construction, utilizing specially formed #12-gauge 316 stainless steel angle and channel members.

b. The dead front interior panel(s) for instrument mounting shall be constructed of a minimum of #11-gauge aluminum.

c. The interior panel(s) for instrument mounting shall be constructed of a minimum of #14-gauge epoxy coated steel.

d. Panel mounted controls and indicators shall maintain panel integrity. Suitable stiffness shall be provided when required to maintain flatness and provide extra rigidity.

e. All panels wiring to external equipment shall be terminated on screw-type terminal strips.

f. Terminal blocks shall be separated into groups (power, AC control, DC signal, etc.). All terminals shall be shall be marked with legible permanent labels or otherwise identified.

g. The MCC shall be mounted on 4” tubular top capped aluminum posts installed in concrete above the 100 year flood plain in accordance with the engineering drawings and standard details.

h. All circuit breakers shall be accessible without opening the MCC dead front door(s).

i. The MCC shall include at a minimum the following for each submersible sewage pump: a motor starter, a HOA switch, a circuit breaker mounted with the operating handles through the dead front door(s), a leak seal indicating light, and an elapsed time meter.

j. The MCC shall contain a manual pump control operated by a manual Hand/Off/Auto (HOA) by-pass switch located in the main MCC which is NOT an automatic redundant switch.

k. The MCC shall include at a minimum: a 24-volt AC wet well liquid level sensors control circuit, 120-volt AC audio and visual alarms, an emergency generator receptacle with circuit breaker,

a main circuit breaker, a control circuit breaker, and a 12-volt DC audio and visual battery backup alarm system.

l. All power shall be disconnected from the control elements when the individual lift station main disconnect is in the “OFF” position.

m. In each motor, a heat sensor thermister and a seal leak probe shall be wired to a red warning signal light on the dead front door and shall be marked with legible permanent labels.

n. An alternator relay shall be supplied to alternate the individual submersible sewage pump on each successive cycle.

o. A fused wet well liquid level sensors control circuit transformer shall be supplied to operate controls.

p. An adjustable single or three phase power monitor shall be provided to indicate and protect the pump via the control circuit in the event of loss of any phase, low and high voltage on any or all phases, and phase reversal with automatic reset and built-in time delay on trip.

q. Audio and visual alarms shall be installed for monitoring high water levels, system equipment failures, and main input power levels failures. Audio and visual alarms shall be wired to sensors provided for a high water levels. Water level and system equipment failure alarms shall be powered directly from the main power supply to the MCC. The audio alarm shall be disabled by a manual silence switch; however, the visual alarm shall remain on until the alarm condition is corrected. If the alarm is a result of a loss of power to the individual lift station, the alarms shall automatically reset with the restoration of land line power or from a portable generator set. The loss of power audio and visual alarms shall be connected to a continually charged 24 hour back-up 12 volt battery.

r. The panels shall be wired and assembled per UL 508 Standards. All electrical components and materials shall be listed by UL and shall bear the appropriate UL listing mark or classification. Each panel shall be listed and labeled as UL 508 Industrial MCC. Panels shall comply with NFPA 79 - Industrial Machinery. A permanent, non-paper wiring diagram shall be mounted on the inside of the cabinet door.

s. All MCCs shall include a grounding rod with 10-gauge wire that is installed in accordance with current local, state and national codes.

t. 316 Stainless steel and schedule 80 polyvinyl chloride conduit piping shall be provided and installed as shown on the CCU design detail for connections between the MCC and the wet well structure, the MCC and the odor control (if required), the MCC and the ground rod, and the MCC and the FPL service point. Explosion proof fittings shall be provided and installed on the conduit as shown on the CCU design detail for connections between the MCC and the wet well structure.

u. A trouble light including switches shall be mounted in the MCC.

v. Surge protector equipment in accordance with UL 1449 Standards shall be installed on the load side of the MCC main circuit breaker for protection of all AC electrical equipment in the

MCC and the motors from the effects of lightning induced currents, substation switching transients, and internally generated transients.

w. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.2.2 Approved Products:

All electrical and accessories shall meet CCU standard details and specifications and shall be reviewed by CCU with the individual lift station submittals except as noted below.

- Emergency Generator Connector: Pyle National MFG JRE 4100 PR.
- Trouble Light: Leviton 9880
- 120 Volt Alarm Light: Ingram LXR-40 or Ohio Electric RL-3K
- 120 Volt Alarm Horn: Edwards ALA-896-N5
- 12 Volt Alarm Light: Ingram SLR-123
- 12 Volt Alarm Horn: Ingram AH-122DG
- Elapsed Time Meter: ETMAC 200-10NG7 Round Mount
- Surge Suppressor: Current Technology Transguard 150

2.2.3 Wet Well Liquid Level Sensors

2.2.4.1 General

a. The wet well liquid level sensors shall be operated by reduced voltage, intrinsically safe mercury switch sealed in a solid polyurethane float ball.

b. The wet well liquid level sensors cords shall be suspended from a 316 stainless steel bracket attached to the lip of the access hatch at the depth specified as shown on the CCU design detail.

2.2.4.2 Approved Products:

All mercury wet well liquid level sensors and accessories shall meet CCU standard details and specifications.

The following mercury wet well liquid level sensors manufacturer is approved:

- Roto-Float Type S Liquid Level Sensor

2.2.4 Odor Control (if required)

2.2.9.1 General

a. The odor control system shall be a primary biofilter unit including a built-in carbon filter stage and, if required, an optional secondary activated carbon polishing unit connected to the biofilter unit; a VFD controlled centrifugal fan installed in a with sound attenuation enclosure; interconnecting ductwork; electrical wiring and conduit; and appurtenances for a complete operating system.

b. The odor control system shall treat in a single pass odorous air from the wet well. The system shall be designed for manual and continuous automatic operation. Access man ways shall be provided to allow access to the internals of the system. The system shall be designed to withstand a temperature up to 120 degrees F. The module and all accessories shall be factory mounted, piped, and wired to the maximum extent possible. The system shall be installed on the lift station pad with stainless steel fasteners.

c. The odor control system shall be skid mounted and designed to maintain proper alignment of the installed unit on a concrete pad as detailed on the engineering drawings using properly sized epoxy HILTI anchors. The controls shall be attached to the skid assembly and shall be housed in a water proof NEMA 4X enclosure.

d. The overall system size, including the fan, controls, and appurtenances shall not exceed the dimensions shown on the engineering drawings. At a minimum, access man ways shall be provided between the treatment stages. A portion of the system top shall be removable for access to the top of the second stage.

e. The odor control system shall meet the following performance when operating:

INLET	OUTLET
1-10 ppm H_2S	0.1 ppm H_2S
Greater than 10 ppm H_2S	1.0% of inlet (99.0% removal)

2.2.9.2 Biofilter

a. The biofilter odor control unit shall be a two-stage, biological absorption/adsorption system that shall include but not be limited to a fiberglass reinforced plastic (FRP) vessel, nozzles, two independent stages of inorganic treatment media (biological and built-in carbon polishing), moisture controls, nutrient supply system, VFD controlled air supply fan, ductwork, dampers, and all necessary accessories. The biological treatment stage shall utilize a granular inorganic media to facilitate absorption and adsorption of odor compounds designed to remove minimum of 99% of H2S vapor in a single pass. The polishing stage shall utilize a granular media designed to adsorb odorous compounds with the ability to support biological degradation of the compounds. The first stage shall operate from an independent water distribution system to irrigate the top of the first media bed with complete and even coverage via spray nozzles to maintain optimum wetted conditions to support unique microbial growth for biological destruction of the odorous compounds and removal of toxic metabolites. Biofilter odor control units using any type of organic media and biofilter odor control units using a single inorganic media shall not be acceptable. The complete treatment vessel shall be fabricated of premium grade FRP.

    1) The air enters the vessel through the humidification section. After humidification, the first treatment stage contains media specifically designed to support biological growth for degradation of odor compounds. This stage absorbs odors from the air stream. The second polishing stage contains media specifically designed to adsorb odor compounds and to support biological degradation of those compounds. This stage provides final removal of odors to the specified level. Overall media depth shall be a minimum of 48 inches.

2) The first stage of media shall be wetted with fresh potable or re-use make-up water.

b. The system shall include all piping, valves, control panel and internals pre-mounted and piped on the unitary constructed system. The material of construction of internals shall be as follows:

Packing Media Support	HDPE and FRP
Liquid Distributor	PVC
Spray Nozzles	PVC
Humidifier Nozzles	316 SS

c. The multi-stage individuald FRP unit shall be of unitary construction. The system shall be shipped as a single piece.

d. Design and Performance Criteria:

1) Criteria: The biofilter odor control unit shall be capable of removing foul air at a rate no lower than the rate shown on the following table.

INLET	OUTLET
1-10 ppm H2S	0.1 ppm H2S
Greater than 10 ppm H2S	1% of inlet

2) System Performance: The biofilter odor control unit shall demonstrate the following performance when operating under design flow conditions listed above:

Maximum Pressure Drop: The pressure drop across the odor control unit shall not exceed 5.0 in. w.c. at the maximum air flow rate specified above.

e. Miscellaneous Material of Construction

1) The vessel and accessories shall be contact molded manufactured in accordance with NBS PS 15-69, ASTM D 4097 for contact molding. Any material of construction other than FRP with premium grade resin will not be allowed.

2) Resin used in the system liner shall be a premium vinyl ester type such as Hetron 922 by Ashland Chemicals, Derakane 411 by Dow Chemical, Vipel F010 by AOC, or CCU approved equal. The resin shall be reinforced with an inner veil of a suitable synthetic organic fiber such as Nexus 111-00010.

3) Glass fiber reinforcement used shall be commercial grade corrosion resistance borosilicate glass. All glass fiber reinforcement shall be Type C, chemical grade, Type E electrical grade. Surfacing veil shall be 10 mil Nexus 111-00010 or equal. Mat shall be Type "E" (electrical grade) glass, 1.5 ounce per square foot with a nominal fiber length of 1.25 + 0.25 inches, with a silane finish and styrene soluble binder. Continuous glass roving, used in chopper gun spray-up applications shall be type "E" grade with chrome or silane coupling agent. Alternate layers of mat and woven roving shall be used for reinforcement.

4) Unless otherwise specified, all fasteners, and metal attachments such as anchors, brackets etc. shall be ANSI 316 SS. Unless otherwise specified, all gaskets shall be EPDM.

f. Fabrication:

1) Fabrication shall be in accordance with NBS PS 15-69, ASTM D 3299, and ASTM D-4097. All non-molded surfaces shall be resin incorporating paraffin coated to facilitate a full cure of the surface. All cut edges, bolt holes, and secondary bonds shall be sealed with a resin coat prior to the final resin paraffin resin coat. All voids shall be filled with a resin paste.

2) The inner surface of all laminates shall be resin rich and reinforced with one layer of NEXUS 111-00010 with a minimum thickness of 10 mils. The interior corrosion liner shall consist of two layers of 1.5 ounce per square foot. chopped strand mat. If the application is by chopper gun, the spray upglass fiber shall be 1/2 inch to 2 inch long. The total corrosion liner thickness shall be a minimum of 100 mils and have a resin to glass ratio of 80/20. All edges of reinforcement to be lapped a minimum of one inch.

3) Structural laminates shall consist of alternating layers of 1.5 ounce per square foot mat or chopped glass and 24 ounce per square yard woven roving applied to reach the designed thickness. The exterior surface shall be relatively smooth and shall have no exposed glass fibers. The exterior shall be surface coated with gel coat containing ultra violet light inhibitors.

4) Accessories: Air inlet, air outlet, spray headers, baffles, media support, drain, and all connections shall be provided by the manufacturer. Tie down lugs shall be integrally molded into the walls of the vessel. All external bolts shall be 316 SS and designed for the specified loads. Interior fasteners shall be of corrosion resistant materials such as PVC or FRP.

g. Neoprene Pad: A ¼-inch thick, 60 durometer neoprene rubber sheet shall be placed underneath the vessel before installation on lift station pad.

h. Exhaust Fan

1) The exhaust fan shall be centrifugal design manufactured of FRP with a statically and dynamically balanced radial blade wheel. The fan inlet shall be slip type, and the fan outlet shall have a flanged nozzle. The fan shall have a neoprene shaft seal.

2) Fan shall be supplied with a TEFC motor with 1.15 service factor suitable for three-phase, 60 Hz, 480 volt service and rated for Class 1, Div. 2, Group D installation. The fan shall be direct driven. The motor shall be inverter-duty and controlled by a VFD.

3) The fan shall be tested and rated in accordance with AMCA and bear the AMCA seal.

i. One of the two mineral vessels shall be fitted with a top-mounted, five-cycle multiport control valve to operate the backwash, brining, slow rinse, fast rinse, and refill cycles. An additional

piston assembly shall be included to control the duty/standby status of the two vessels. A brass control valve including fixed and self-adjusting flow regulators shall be provided. A hydraulically balanced teflon coated piston shall be provided to perform the cycles of regeneration.

j. Instrumentation and System Controls

1) The electrical control panel shall provide electrical control for the exhaust fan and water addition system. A 3-phase power supply shall be supplied to the panel from the MCC to power the system.

2) The control panel enclosure shall be rated NEMA 4X. The panel shall be remote-mounted by the contractor next to the system assembly at least 3 feet away to comply with requirements of a Class 1, Division 2, and Group D installation. The Contractor shall install and wire the local control panel to the bio filter mounted fan, metering pump, and solenoid valve. The control panel shall be factory tested to full operation with all other components prior to shipment.

3) The panel shall have the following components or capabilities:

i Fan switch (ON-OFF).
ii Push-to-test button for water valve.
iii Timer relay for on/off control of water valve.
iv Blower VFD
v Nutrient Pump (ON-OFF-AUTO)

4) The water control cabinet shall be constructed from a NEMA 12 rated FRP cabinet with all internal piping SCH 80 PVC. The cabinet shall be mounted to the system assembly. The cabinet shall contain the following components:

I Pressure reducing valve
ii Nutrient Pump (rated for installation in a Class 1, Division 2, Group D area)
iii Irrigation solenoid valve (Explosion-proof rating)
iv Valve for pre-humidification
v Irrigation system pressure gauge

5) Water pressure regulator, solenoid valve, and Rota meter shall be provided for control of water application rates. These components shall be mounted in the water control cabinet.

k. Accessories

1) The direct reading Rota meter shall be a variable area type with a Teflon float, EPR "O" rings, and PVC fittings. The Rota meter shall be sized to the pipe and have a direct reading scale.

2) A nutrient containment and metering system shall be provided with the system. Nutrients supplied as a coating to the support media shall not be allowed.

3) All water and drain piping shall be SCH 80 PVC.

l. Nutrient Reservoir

The nutrient reservoir shall be integrated into the system sump. No loose external tanks shall be provided with the system.

2.2.9.3 Carbon Media Odor Control Unit

2.2.9.3.1 Stand Alone Activated Carbon Unit

a. If required, the Contractor shall install a carbon media odor control unit in accordance with the engineering plans. The carbon media odor control unit shall meet the requirements of this specification.

b. The unit shall have an AMCA certified centrifugal industrial fiberglass reinforced V-belt Arrangement No. 10 driven plastic fan equipped with undrilled inlet flange, outlet flange, Viton shaft seal, fan guard, and motor enclosure. Each fan and drive motor shall be mounted on a common base assembly designed for mounting on a concrete pad. The fan motor shall be high efficiency type, TEFC, with a 1.15 service factor and matched to the electrical service at the individual lift station. Accommodation to accept a hand-held tachometer shall be available for each fan. Each fan shall have a drain with plug. The fan shall include graphite impregnation for grounding.

c. The contractor shall complete the “TBDs” for the unit fan being proposed for the following maximum operating conditions:

Air Flow Rate, cfm	TBD
S.P. up to Fan Inlet, in WC	TBD
Adsorbed Pressure Drop, in WC	TBD
Total S.P., in WC	TBD
Minimum Motor HP	3.0

d. The unit shall have a fan sound attenuation individual capable of reducing the sound level by a minimum of 25 dB which shall be placed over the fan and motor assembly. The doors shall be equipped with heavy duty hardware and with seals to minimize noise leakage. Stainless steel sheet flashing shall be provided to enclose the penetrations in the enclosure for the fan inlet and outlet ducting. The enclosure shall be fitted with louvered vents as required for heat dissipation/ventilation.

e. The fan shall be factory wired to a stainless steel NEMA 4X panel. The panel shall have a fan control switch with a pilot lamp to indicate the fan running status. The power supplied to the panel shall be matched to the electrical service at the individual lift station. The panel shall be provided with a power disconnect switch, VFD, and control transformer. The fan speed shall be manually adjusted by the operating the VFD.

f. The contractor shall provide the necessary ductwork between the fan ductwork and the adsorber vessel. The ductwork shall include a volume control damper with lockable louver for flow adjustment. The material of construction shall be same as that of adsorber vessel.

g. The carbon adsorber vessel shall be constructed of non-corrosive polypropylene with a minimum thickness of 1/8-inch is required for a vessel diameter between 18 inch and 24 inch and a 1/4-inch thickness for vessel diameter up to 60-inch and designed for the following criteria:

h. The

Vessel Diameter, ft	TBD
Vessel Straight Side Height, ft	TBD
Internal Positive Pressure, in. WC	+15
Maximum Operating Temperature, °F	150
Carbon Bed Depth, ft.	3.0

carbon adsorber vessel shall have a differential pressure gauge to continuously monitor the pressure drop across the carbon bed. The differential pressure gauge shall be isolated with isolation valves and mounted on the vessel.

i. The carbon absorber vessel shall have shall have three 1 inch diameter sample probes per bed extending into the bed a minimum of 12 inches. The sample probes shall be blocked off with a PVC ball valve.

j. The carbon absorber vessel shall accommodate a single bed of activated carbon having an average depth of 3 feet. The carbon bed shall be supported on a polypropylene screen through an FRP support grating system. The screen and the support system shall be removable through the top cover. The top cover shall use quick release tie downs that are integral to the cover and not require the use of separate tools for the removal of the cover. The support system shall consist of removable grating.

NOTE: Pall rings or other dumped packing media as a means of carbon support shall not be used. The support system shall be designed to withstand a load of at least 150 pound per square foot with a minimum deflection of ¼-inch under all conditions.

k. The carbon absorber vessel shall have a “gooseneck” type outlet to prevent rain water from entering into the system.

l. The activated carbon media shall be virgin, pelletized, and derived from high grade bituminous coal vapor phase type suitable for the control of sewage odors. The carbon shall have the following specifications:

Iodine Number, mgI_2/g	1050 min
MPD,mm	3.9-4.1
Apparent Density, g/cc	0.46-0.52
Hardness No.	95 min
Butane Activity	26 min
H_2S Capacity, gH_2S/cc*	0.30 min

* The H_2S breakthrough capacity is determined using ASTM standard method D6646-01. Prior to testing, the test sample shall be completely humidified by exposing the sample to a flow of humid air (>85% RH) for at least 4 hours. Testing shall be accomplished by passing a moist (85% RH) stream of air containing 1 vol. % H_2S and the selected concentration of CO_2 through a 1 inch diameter tube with a nine-inch deep bed of closely packed carbon at a rate of 1,450 cc/min and monitoring to a 50 ppmv H_2S breakthrough. The results shall be reported as grams of H_2S adsorbed per cc of carbon.

m. All steel hardware shall be 316 Stainless Steel unless stipulated in this specification or on the engineering drawings. Gaskets shall be full face with a minimum of 1/8-inch thickness and made of EPDM or neoprene suitable for the intended service.

n. The unit shall include a grounding rod with 10-gauge wire in accordance with current local, state and national codes.

o. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.9.3.2 Optional secondary activated carbon polishing unit

If the optional secondary activated carbon polishing unit is required, the contractor shall provide, as a minimum, the major components as specified under the stand-alone unit section including the concrete pad, the vessel, the carbon media, the connecting duct work and all other appurtenances necessary for a fully operational odor control system in accordance with this specification.

2.2.9.4 Approved Products:

The following manufacturer is approved:

- Odor Control units shall be SIEMENS / Evoqua, or CCU approved equal.

2.3 MATERIAL

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below and/or as provided in other sections of the contract documents.

All stainless steel shall be 316 austenitic, non-magnetic unless otherwise required.

2.3.1 Wet Well, Valve Vault, Access Hatches and Concrete Slab

2.3.1.1 General

a. The wet well and the valve vault shall each be a constructed fiberglass monolithic units constructed of glass-fiber reinforced, supplier certified, and unsaturated commercial grade polyester resin containing chemically enhanced silica to improve corrosion resistance, strength, and overall performance. The wet well shall be a circular cylinder and the vault rectangular sized in accordance with the plans for the applicable lift station. Wet wells shall be produced as per dimensions shown on the plans. Tolerance on the inside diameter shall be +/- 1%.

b. The wet well design shall assume a soil density of 130 pounds per cubic foot and a concrete density of 150 pounds per cubic foot and shall resist flotation under the conditions of an empty wet well and a groundwater level from the wet well base to the finished grade including a minimum safety factor of 1.5.

c. Cast in place concrete slab shall comply with ACI and ASTM standards. Concrete shall be ASTM C-150 Portland Type II 3,500 psi air entrained at 6% plus or minus 1% unless otherwise noted on the engineering plans. Fine aggregate shall be ASTM C33 and course aggregate ASTM C33 ¾" maximum size. Reinforcing shall be ASTM A615 Grade 60 deformed bars and stirrups and Grade 40 ties, welded wire fabric shall meeting the requirements of ASTM A185, and fabricated reinforcing steel shall be in accordance with ACI 315. Form lumber shall be in accordance with ACI 347 and shall be used with removable metal form ties, non-staining and moisture absorbing form release agents, and stainless steel dovetail anchor slots, and water stops as shown on the engineering drawings.

d. The wet well shall be set on a No. 57 stone base in accordance with Section 901 "Coarse Aggregate" of the latest revision FDOT Standard Specifications for Road and Bridge Construction.

e. The wet well access hatches and frames shall be compatible with the lift-out rail system in accordance with the engineering drawings and approved shop drawings. The wet well access hatch and frame shall be aluminum with 316 stainless steel hinges, handles, and associated hardware in accordance with CCU standard details.

f. The individual lift station influent piping inverts shall be a minimum of 36 inches above the base invert.

g. The valve vault piping inverts shall be a minimum of 12 inches above the base invert. The valve vault cover shall be minimum 24 inches from the top of the pipe to the finished grade.

2.3.1.2 Fiberglass Wet Well

The fiberglass wet well shall be designed and fabricated to provide sufficient strength for the following loading conditions:

a. Resistant to buckling when empty and when the groundwater elevation is at grade.

b. The anchoring of the wet well structure to the reinforced concrete base shall be designed to resist external hydrostatic water forces of an empty cylinder with the groundwater at grade elevation.

c. Load Bearing Capacity: The wet well and valve vault shall be capable of withstanding AASHTO HS-20 dynamic loading (16,000 lbs.) applied vertically. The wet well and valve vault shall be capable of supporting the top cover, frame, soil overburdens plus a live load equivalent to AASHTO HS-20 Loading.

d. All wet well and valve vault cutouts shall be capable of maintaining the wet well and valve vault structural integrity.

e. The wet well and valve vault top sides and edges shall be designed to withstand backfill and concrete slab loading.

f. The wet well bottom shall be designed to withstand the hydrostatic head pressure with the ground water at grade elevation and the wet well empty. The center of the empty wet well bottom shall not deflect more than 1/8-inch when the water table is estimated to be equal to the finished grade.

g. The wet well shall be designed with top and bottom integral reinforced anchoring flanges a minimum of 3 inch wide for anti-floatation.

h. The installed wet well and valve vault shall be capable of supporting accessory equipment such as pumps, rails, valves, etc. as shown on the engineering design drawings.

i. The wet well shall have a continuous 1:1 inside sloped molding attached to the walls and the base around the circumference of the base as noted on the engineering plans. This sloped molding can be fabricated in initial layup of the wet well or added after completion of the wet well. If added after completion of the wet well, the sloping material shall be the same material as the wet well and shall meet the material structural requirements of the wet well and not delaminate from the walls or bottom of the wet well.

j. Fiberglass ribs and/or structural members may be utilized to meet the design criteria. Stiffeners shall be of non-corrosive materials encapsulated in fiberglass. FRP encapsulated wood or lumber are not permitted.

k. The lift station influent pipe inverts shall be a minimum of 36-inches above the wet well invert. The final distance between the influent pipe and the wet well invert shall be calculated based on elevation of the installed high/low/alarm floats.

l. The valve vault dimensions are provided in the engineering drawings.

m. The wet well cover plate shall have a bolt down cover of ¼ inch aluminum diamond plate, reinforced to withstand a live load of 300 pound per square foot Uniform live load with a maximum allowable deflection of 1/150 of the span. The cover plate shall have a flush fitting access door. The door shall open to 90 degrees and automatically lock with a T-316 stainless steel hold open arm with aluminum release handle. All fastening hardware and

hinges shall be T-316 Stainless Steel. The unit shall lock with a non-corrosive locking bar and have non-corrosive handle.

n. The wet well shall include a cast iron inlet hub sealed with epoxy for inlets. All other penetrations other than the inlet shall use a rubber grommet for all outlet piping. The rubber grommet shall have a tapered inner diameter that forces the outer diameter to expand and seal the penetrating pipe and tubing along a curved outer wall.

2.3.1.3 Concrete Wet Well

a. Pre-cast circular concrete wet wells and the wet well concrete cover shall comply with the structural requirements of ASTM C478, Type II, acid resistant cement and shall attain a minimum compressive strength of 4000 pounds per cubic foot in 28 days. The wet well pre-cast base section shall be monolithic with the bottom section of the wet well. The pre-cast wet well top shall include the access cover frame.

b. The individual wet well sections shall fit together with interlocking tongue and groove joints. Four (4) foot diameter wet wells shall be sealed with a R-4 rubber gasket and 6 foot or larger diameter wet wells shall be sealed with two 1.5 inch butyl rubber or plastic wet wells joint seal squeezed in and out to verify sealing. The outside of the groove joints for all wet wells shall be covered with a continuous overlapping butyl rubber wrap a minimum of 8 inches wide.

c. The wet well shall include elastomeric gasket(s) for all piping. The gasket(s) shall have a stainless steel adjustable strap to seal the gasket to the pipe. An elastomeric gasket(s) with a stainless steel adjustable strap to seal the gasket to the pipe shall be installed in all on site core bored holes.

d. The outside surface of the wet well shall be covered with 3 coats (black/red/black or color changes to allow CCU to verify multiple coats) of coal tar epoxy coating with a minimum dry film thickness of 10 mils per coat for a total of 30 mils dry film thickness. Subsequent coats shall be applied within 48 hours of the previous coat. The coal tar epoxy coating shall be Koppers Bitumastic No. 300m or CCU approved equal.

e. The internal wet well coatings (including cover) shall be a polymorphic resin, a calcium aluminate mortar, an epoxy coating, or a polyurethane coating. Coatings shall be installed in accordance with the manufacturer's specifications.

f. The wet well access hatches and frames shall be compatible with the lift-out rail system in accordance with the engineering drawings and approved shop drawings. The wet well access hatch and frame shall be aluminum with 316 stainless steel hinges, handles, and associated hardware in accordance with CCU standard details.

2.3.1.4 Approved Products:

The fiberglass wet well shall be designed and fabricated to provide sufficient strength for the following loading conditions:

The following access hatch and frame is approved:

- Halliday C1R aluminum access cover with standard locking bar and frame

The following cast iron inlet hub is approved:

- Steele Plastics, Inc Cast Iron Inlet Hub

2.3.2 Discharge Piping and Valves

2.3.3.1 General

a. The discharge piping and valves shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactory when installed as shown on the drawings. The piping and valves shall be supported to the wetwell walls and above ground as shown on the engineering drawings and the CCU standard details.

b. The piping and valves shall be furnished and installed in accordance with CCU Specification Section# 002325 “Force Mains” or CCU Specification Section# 002330 “Low Pressure Sewer System” and CCU Specification Section# 002340 “Valves”. The 2-inch and 2.5- inch PVC pressure sewer pipes, valves and fittings shall be Schedule 80.

2.3.3.2 Approved Products:

The following aluminum clean-out coupler with cap and chain manufacturer is approved:

- Kamlock

2.3.4 Water Service

The contractor shall provide a water service as shown on the engineering drawings and CCU standard details. The service shall include the labor and materials for the tap at the water main source, polyethylene piping, meter box, fittings, backflow prevention device, spigot, mounting brackets and connectors, etc. CCU will provide and install the water meter.

A separate water service is required for the odor control.

2.3.5 Fence and Gates (if required)

The contractor shall provide and install fence and double 8 foot gates (total 16 foot width) with hold-backs, and wheels in accordance with the engineering drawings and CCU standard details. All the fencing and gate components shall be adequate to meet the required wind resistance loading.

2.3.6 Driveways (if required)

The contractor shall construct a 16 foot minimum concrete driveway as shown on the engineering drawings and CCU standard details and CCCDED Specifications. The driveway

shall include right-of-way culverts, if required, and drainage shall be in accordance with CCCDED specifications.

2.3.7 Landscaping

The contractor shall provide landscaping, if required, in accordance with CCU Specification Section 002920 “Landscaping”.

PART 3 - EXECUTION

3.1 GENERAL

a. The contractor shall prepare the individual lift station site for construction. This shall include the establishing of maintenance of traffic, surveying, site clearing, installation of silt fence, exposure of existing underground utilities, and notification of residences that may be impacted by the construction. The individual lift station wetwell, valve vault, concrete slab, valves, piping, pump/motor assemblies and rails, MCC, water service(s), electrical wiring/conduit, pad, fencing and gates (if required), access panel and frame, driveway/culverts (if required), odor control (if required), and accessories shall be installed in accordance with the contract documents.

b. Installation shall be made by skilled and licensed technicians and coordinated with other trades as necessary.

c. The individual lift station receives wastewater flows continuously at varying rates and the level of the flow in the wet well is monitored by liquid level sensors. The wet well liquid level sensors shall be suspended at various levels in the wet well and transmit the level of the wastewater in the wet well directly to the MCC. The level sensors shall be set for the following conditions in coordination with CCU operational personnel:

- Pump off
- Pump on
- Lag pump on
- High liquid level alarm

d. The MCC is an integrated system. The contractor shall furnish and install the MCC as one complete individual to include all equipment and appurtenances regardless of the manufacturer and shall be responsible for the MCC to perform as a fully integrated operable system.

The MCC shall be designed to provide the following functions:

- Turns pump off
- Turns pump on
- Turns lag pump on
- Provides for alternate pumps operation
- Activates the audio and visual alarms in the event of high liquid wet well levels
- Activates the battery backup high liquid level alarm in event of power loss and resets the alarm when the power is restored
- Allows for the manual connection to a portable generator
- Provides phase monitoring and protection

- Monitor and indicates pump seal failures

e. The contractor shall coordinate the work of all of the sub-contractors, suppliers, manufacturers, etc. for the complete installation, integration, interconnection, testing, calibration, and startup of the instruments, sensors, controls, and related accessories.

f. The contractor shall provide for all temporary utilities and services required for his operations including but not limited to electrical power, water, sanitary facilities, etc. The contractor shall furnish, install, and maintain all temporary utilities and services during the contract period including removal and restoration of disturbed areas upon completion of the work. Such facilities shall comply with regulations and requirements of the National Electrical Code, OSHA, FPL, and applicable Federal, State, and Local codes, rules, regulations.

g. The contractor shall be prepared to maintain wastewater flow as a part of his operations and provide all pumps, piping, and other equipment to accomplish this task, perform all construction, obtain all permits, pay all costs, and perform complete restoration of all existing facilities to equal or better condition to the satisfaction of CCU.

3.2 INSTALLATION

a. Grounding rods shall be provided to adequately and independently ground the MCC and odor control in accordance with the contract documents.

b. The contractor shall connect the biofilter unit (if required) to the lift station water supply in accordance with the engineering drawings.

c. All wire ends shall be identified with wire markers at both ends.

d. All instrumentation wiring shall be shielded from a continuous source to destination and shall be grounded in accordance with the manufacture's recommendation.

3.3 BEDDING, BACKFILL, AND COMPACTION

a. All bedding, backfill and compaction shall meet the requirements of CCU Standard details and CCCDED specifications.

3.4 CALIBRATION

The contractor shall ensure the following:

a. The instruments shall be calibrated by the manufacturer in accordance with the contract documents.

b. A calibration sticker noting the date, calibration data and the technician's initials shall be affixed to the instrument. A calibration data sheet and log shall be prepared for CCU.

3.5 TESTING

a. The contractor shall not initially energize the equipment without the approval of CCU.

b. After installation and calibration, the contractor shall functionally test the major equipment and electrical components to verify their compliance with the manufacturers recommended specifications and the contract documents.

c. The contractor shall not activate or turn on any equipment until each control circuit has been red-lined for completeness and functionality and safety interlocks are tested.

d. The contractor shall document site testing activities by written test procedures and a testing log shall be maintained at the project site or given to CCU.

e. Wet well and valve vault shall be exfiltration tested in accordance with the CCU Quality Assurance Standard details.

3.6 STARTUP OPERATIONS

a. The system integrator/supplier shall provide equipment startup services for the project.

b. The system integrator/supplier shall be responsible for providing factory trained representatives for the startup of equipment requiring factory assistance during startup.

c. The system integrator/supplier shall coordinate with CCU to assist with the startup activities and provide necessary training of CCU personnel in the operation and maintenance of the system.

d. Upon construction installation of CCU -maintained sewer lift stations, startup operations and testing shall be conducted prior to final acceptance and release of sewer flows under the supervision of the CCU Engineering Department. At a minimum, a representative of the pump Supplier, a representative of the Contractor, and a representative of CCU-Wastewater Resources Department's Lift Station Maintenance Division will be present for startup testing. A "CCU Lift Station Startup Check List", as provided in CCU Standard Details, shall be completed and signed off in entirety before a facility shall be accepted by CCU.

3.7 SPARE PARTS

Per each lift station, the Contractor shall provide on or before final inspection:

a. one spare submersible pump identical to the one(s) being placed

Plus the following additional items:

b. two seal assemblies: top and bottom at impeller and at winding of motor
c. bearings: one complete set of bearings for each pump
d. o-ring and gasket kit for pump motor and impeller housing

In addition, the contractor shall provide level switches, one additional float (normally open type) with 50-ft of cable.

3.8 TECHNICAL MANUALS

a. The contractor shall provide operation and maintenance data in the form of an instructional manual. The manual shall be in a three ring binder and be arranged in sections and include a table of contents. The manual shall include appropriate drawings, schematics, pictures, sketches, specifications, flow diagrams, manufacturer's documents, etc. required to operate and maintain the individual individual lift station functions and the overall individual lift station as a system.

b. Two (2) copies of the O&M manuals shall be made available to CCU 30 days prior to the individual lift station start-up for review prior to start up. Upon CCU validation, the contractor shall provide two (2) hard copies and one electronic copy of the approved O&M manuals including copies of certified tests and inspection data.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

1.1.1 General

It is the intent of this specification to provide the requirements for use of the design, selection of materials, and construction of a standard submersible sewage pump lift station, hereinafter referred to as “standard lift station”, and all appurtenances. All standard lift station installations shall also meet the requirements of the Florida Department of Environmental Protection (FDEP) permit and the Florida Administrative Code, as applicable.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all materials, equipment, tools, labor, and appurtenances necessary for site preparation, dewatering, construction, testing, and startup that is necessary to accomplish the work required under the contract to include, but not limited to, furnishing and installing the standard lift station as described herein and as shown on the engineering drawings and CCU Standard Details.

The equipment shall form a completely operable non-clog submersible sewage pump system complete with pumps and rails, wet well liquid level sensors, wet well, hatch cover, valves, piping, water service(s), motor control center (MCC), grounding rods, all wiring and conduits, standard lift station concrete pad, fencing, driveway, landscaping and all associated appurtenances.

The contractor shall install the Florida Power and Light meter can and install/connect the electrical service to the FPL service point at a hand hole for electrical service as shown on the engineering drawings and as defined in this specification.

1.1.3 Location of the Work

The construction shall be at the location shown on the engineering drawings.

The accessibility to the work sites shall vary, as the standard lift station may be located in landscape areas, utility easements, residential and/or commercial backyards, and various other

locations. Damage to existing pavement surfaces, base courses and/or other surface improvements as a result of the contractor's activities shall be restored to like-new condition by the Contractor at provided for in the contract bid documents. The Contractor shall implement all required measures to provide CCU personnel and equipment with complete access to all work site areas during the entire course of performing this project.

1.1.4 Coordination of Work

The contractor shall be responsible for the satisfactory coordination of the standard lift station construction with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Responsibilities

a. Notice to Residents: The contractor shall be responsible for notifying affected residents by the means of door hangers, mailings and/or all other appropriate means to alert residents at various times of the different phases of the construction of the standard lift station. The notifications shall indicate the various work activities that the Contractor will be performing on their street and what they can expect as far as service outages, disruption of traffic, access inconvenience, unusual odors and other activities affecting residents.

b. Licenses and Permits: The contractor shall be responsible for obtaining all licenses, permits, authorizations, approvals, access agreements, consent from utilities/persons/organizations upon whose property is impacted, written releases of responsibility and all other required documents.

c. Work Access: The access to the site is shown on the contract documents. Additional accessibility to the site, as deemed necessary by the Contractor beyond what is shown on the engineering drawings, shall be the responsibility of the contractor, and all expenses associated with work site additional accessibility shall be taken into consideration as part of the contractor's bid unit prices. Written releases from the property owner impacted by additional accessibility obtained by the contractor shall be provided to CCU.

d. Clearance of Blockages or Obstructions in the Sanitary Sewer System: The contractor shall be responsible for clearance of blockages or obstructions in the sanitary sewer system created by the contractor’s construction methods.

e. Location and Exposure of Manholes: The contractor shall expose only those sanitary sewer structures necessary to perform the work as shown on the engineering drawings.

f. Existing Utility Operations: CCU shall shut down or manually operate all existing potable water, reclaimed water and sanitary sewer systems necessary for performance of the work. The Contractor shall submit a request to CCU for shut down or operational changes a minimum of 24 hours in advance.

g. By-Pass Operations: The contractor shall be responsible for continuous maintenance of flow of all existing utilities at the project site, unless otherwise agreed to by CCU.

h. Water Access: The contractor shall be responsible for obtaining water access necessary for performance of work under the contract from designated fire hydrants at the site of work or other suitable designated sources.

i. Disposal: The contractor shall clean up and dispose of all waste materials from the construction activities including all materials removed from the sanitary sewer system in conformance with all laws, regulations and standard practices.

j. Secure Storage Area: The contractor shall find secure storage areas of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract. CCU will not provide any space or place to store materials.

k. Maintenance of Traffic: The contractor shall be responsible for all maintenance of traffic and obtaining approval of a Maintenance of Traffic (MOT) Plan from the Charlotte County Public Works Department (CCPW) for work within the right-of-way of any County Road and from the FDOT for work within the right-of-way of any State Road.

1.1.6 Working Hours

The contractor shall carry out work in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of CCU.

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the compensation determined in the following manner including all labor, materials, equipment, installation, testing, startup, painting, training, technical support, operation and maintenance manuals and appurtenances necessary to complete all the work in accordance with the contract documents:

1.2.1 Site Work:

Site work including satisfactory coordination of utility construction, project site clearing and grubbing, fence removal and restoration, removal and disposal of existing bituminous and/or concrete materials, existing structures, existing culvert or other pipe, furnishing and installing fill material, all necessary grading of the site and all other associated work required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis unless otherwise provided in the bid form.

1.2.2 Wet Well, Access Hatch and Concrete Cover and Slab:

Wet well, access hatch and concrete cover and slab including excavation, dewatering, base materials, backfilling, external and internal coatings, provisions for pipe openings, joint sealing and wrapping, exfiltration testing of the wet well, and all other associated work required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis unless otherwise provided in the bid form.

1.2.3 Submersible Sewage Pumps:

Submersible sewage pumps including associated hardware, cables, guide rails, support brackets, chains, all electrical wiring to the Motor Control Center (MCC), conduits and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per each basis per each submersible sewage pump size specified.

1.2.4 Main Power Electrical Services:

Main power electrical services including wiring and conduit from the service point in the FPL installed hand hole to the FPL meter can, wiring and conduit from the FPL meter can to the standard lift station MCC, the main power disconnect in the MCC, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.5 Piping and Valves:

Piping and valves, located within the fenced in area limits of the standard lift station site, including fittings, flexible couplings, flange adaptors, flange connectors, gauges, pipe supports, brackets, vents, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

All piping and appurtenances outside the fenced in area limits of the standard lift station site shall be measured and paid for within other bid items as provided in the bid form.

1.2.6 Motor Control Center (MCC):

MCC including the following general components: wet well liquid level sensors, electrical wiring and connectors, supports, switches, sensors, controllers, alarms, indicator lights, meters, electrical equipment, back-up battery, enclosure, panels, controls, indicators, terminal strips, terminal blocks, posts, motor starters, main circuit breaker, operating handles, magnetic contactor coils, seal leak probe, permanent labels, alternator relay, fused control circuit transformer, adjustable three phase power monitor, wiring diagram, grounding rods, explosion proof fittings, surge protector equipment, suppressors fittings, brackets, conduits, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.7 Soft Starter

The soft starter including any additional wiring, separate panel, control logic, controller, input circuit breaker, integrated motor and load protection, LCD screen, key-pads, contactors, reactors, controls, switches, signals, relays, conduits, connectors, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per each basis.

1.2.8 Water Service

The water service including tap, piping, meter box assembly, backflow prevention device, spigot, hardware, fittings, brackets, supports and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.9 Driveways

The driveways including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.10 Culverts

The culvert pipe, end sections, base material and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per linear foot basis per each size specified.

1.2.11 Fence and Gates

The fence and gates including posts, pipes, fabric, bars and straps, fasteners, gate latches, coating, pig ring ties, hardware and accessories, concrete footings and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.12 Flood Light

A weather-proof 300 W quartz flood light, 120 V GE qhf-300, suitable for mounting to TCU antenna tower or other structure as provided on the engineering drawings including posts, conduits, wiring, MCC switch, hardware and accessories, concrete footings and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.13 Emergency Portable Generator Connection

The emergency portable generator connection including the receptacle, wiring, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.14 Optional Equipment

1.2.14.1 Variable Frequency Drive

The variable frequency drive including the wiring, separate panel, control logic, controller, input circuit breaker, harmonic suppression equipment, contactors, reactors, controls, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.14.2 Standby Generator

The standby generator including the Automatic Transfer Switch (ATS), standby generator concrete pad, wiring, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.14.3 Odor Control System

The odor control system (biofilter unit only, biofilter unit with optional secondary activated carbon polishing unit or stand-alone activated carbon filter unit) including motors, enclosure, skids, wiring, valves, media, absorption material, absorber system, absorber vessel, VFD controlled centrifugal fan with sound attenuation enclosure, switches, control transformer, gauges, sample probes, screen, grates, ductwork, conduits, and connectors, piping, concrete pad, anchors all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.14.4 Telemetry Control Unit (TCU)

The Telemetry Control Unit (TCU) including concrete base, tower, enclosure, galvanized steel piping, tie wraps, antenna, coax cables, conduits, ground rod, default screen or indicating LED, site signal survey and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.15 Miscellaneous:

All items required for the completion of the standard lift station and not included as a specific bid item shall be considered incidental to the project and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (LATEST REVISION)

Wherever reference is made to any published standard, code, or standard specification, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to which is in effect at the date of the opening of bids.

AWWA:
C-111 Rubber – Gasket Joints for Ductile-Iron Pressure Pipe Fittings
C-151 Ductile-Iron Pipe, Centrifugally Cast
C-153 Ductile-Iron Compact Fittings
C-600 Installation of Ductile-Iron Mains and their Appurtenances
C-651 Disinfecting Water Mains
C-652 Disinfection of Water-Storage Facilities
C-900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
C-901, Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. (19mm) Through 3 In. (76 mm), for Water Service
C-906 Polyethylene (PE) Pressure Pipe Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
C-909 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger

ASTM:
A-139Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
D-883, Standard Terminology Relating to Plastics
D-1120Standard Test Method for Boiling Point of Engine Coolants
D-1248 Polyethylene Plastics Extrusion Materials for Wire and Cable
D-1598 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
D-1599 Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
D-1785Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
D-1869 Rubber Rings for Fiber-Reinforced Cement Pipe
D-2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
D-2563 Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts

D-2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
D-3350 Polyethylene Plastics Pipe and Fittings Materials
D-4097 Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks

National Bureau of standards Voluntary Product Standard "Custom contact molded Reinforced Polyester Chemical Resistant Process Equipment".
PTC 8.2

Wastewater Collection/Transmission System Requirements

AASHTO Code

Florida Administrative Code (FAC)

Recommended Standards for Wastewater Facilities

National Electrical Code (NEC)

NEMA

Underwriters Laboratories (UL)

Federal Communication Commission

Institute of Electrical and Electronics Engineers (IEEE)

Internal Corrosion Direct Assessment (ICDA)

National Fire Protection Association (NFPA)

National Bureau of Standards (NBS)

Air Movement and Control Association (AMCA)

The Contractor shall, when required, furnish evidence satisfactory to CCU that materials and methods are in accordance with these codes, specifications, standards, etc. where so specified. In the event any questions arise as to the application of these codes, specifications, standards etc., copies shall be supplied on site by the Contractor. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

1.4 PARTIAL LISTING OF RELATED SECTIONS

001760 – Surveying and Record Drawings

002310 – Pipe Removal, Disposal, Alteration, Modification or Pipe Abandonment
002320 – Gravity Sewer System
002325 – Force Mains
002340 – Valves
002240 – Dewatering
002742 – Sidewalks, Driveways, Streets
002920 – Landscaping
002930 – Grassing
003310 – Cast-in-Place Concrete
003300 – Pre-Cast Concrete Products
003600 – Grout
009900 – Surface preparation, painting and coating
009910 – Sanitary Sewer System Rehabilitation
009920 – Sanitary Sewer Structures Rehabilitation

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 General:

The Contractor shall submit complete detailed documentation of all materials for approval by the CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor shall include the statement that the submittals have been reviewed and the materials meet CCU specifications and/or Standard details.

The Contractor shall provide proof of supplier certification/training for thermal butt-fusion of pipe for any employee fusing pipe.

Final written approval is at the discretion of the CCU.

For materials that the contractor is requesting deviations from this specification and/or Standard details, the contractor shall submit in writing a minimum of 60 days prior to construction, documentation to justify approval of these materials by CCU. The Contractor shall submit one (1) signed electronic copy of the material submittals. No fabrication/construction shall take place until the final shop drawings are reviewed by CCU. Final approval is at the discretion of CCU.

1.5.2 By-Pass Operations: The Contractor shall submit a by-pass plan to CCU for review a minimum of 20 days prior to the start of by-pass operations.

1.5.3 Shop Drawings:

1.5.3.1 Structure(s): The contractor shall provide shop drawings for the structure(s) certified by the manufacturer. The submittals shall include the specifics being proposed for the outside coatings, inside coatings of the wet well top, concrete and reinforcement, access hatch, structural loading, buoyance provisions, outside seam wrap, sealant between structure sections, invert and clocking of piping, size and location of openings, waterproof gaskets and any other appurtenances applicable to the structure(s).

1.5.3.2 Submersible Sewage Pumps: The contractor shall provide shop drawings for the submersible sewage pumps certified by the manufacturer. The submittals shall include at a minimum: pump characteristic curves showing capacity in GPM, NPSH, TDH, efficiency, pumping horsepower from 0 to 110 percent of design capacity, impeller type, discharge diameter, passible sphere size, design drawings, a written description of the interchangeability of rails and discharge between the supplied submersible sewage pump and all CCU acceptable manufacturers, and any other appurtenances applicable to the submersible sewage pumps. The shop drawings shall include certification data in the form of testing results indicating that all AWWA, state, federal, and engineering standards are met. If requested by CCU, the Contractor shall provide certified factory pump performance test data in the form of Section 6 of ASME PTC 8.2.

1.5.3.3 MCC: The contractor shall provide shop drawings for the MCC. The shop drawings shall include schematics, manufacturer brochures, and test results for pump settings, all MCC components, all other electrical components and appurtenances applicable to the MCC. The shop drawings shall include certification data in the form of testing results indicating that all NEMA, UL, AWWA, state, federal, and engineering standards are met.

1.5.3.4 Standby Generator and ATS: The contractor shall provide shop drawings for the standby generator and ATS. The shop drawings shall include schematics, manufacturer brochures and test results for all standby generator and ATS components and appurtenances applicable to the proposed standby generator and ATS. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, and engineering standards are met.

1.5.3.5 Odor Control:

a. General:

The odor control system shall be supplied by a manufacturer who has been regularly engaged in the design and manufacture of the equipment having a minimum of 5 years' experience in its design, fabrication, and testing of odor control systems of the type specified. The equipment supplier shall provide a list of a minimum of 10 identical installations of the type specified that have been in operation for a minimum of 5 years. Other manufacturers shall demonstrate to CCU its equipment is of equal quality of the manufacturer specifically named herein.

The contractor shall submit complete shop drawings for the odor control system, together with all piping, ductwork, valves, and control for review by CCU. The shop drawings shall include schematics, manufacturer brochures, and test results for all odor control components and

appurtenances applicable to the proposed odor control. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, and engineering standards are met.

The contractor shall complete the “TBDs” in table “A” below for the odor control system being proposed based on the size of the wetwell, influent flows, inlet, outlet, standard lift station operational temperatures and the estimated inlet H2S concentration in ppm. The design documents shall be provided by the manufacturer to CCU certifying that the odor control system meets the contract requirements.

Table A

Air Flow Rate, cfm	TBD
Estimated Inlet H2S Concentration, ppm	TBD

The contractor shall submit the following information for review before the equipment is fabricated:

1) Letters of Certification of Compliance of materials, equipment, etc.
2) Final certified drawings showing outline dimensions, foundation layout or mounting information, and other pertinent dimensions.
3) Field assembly drawings and/or diagrams.
4) Schematic and wiring diagrams of power, control, and piping systems with all devices, terminal, and wires uniquely numbered and clearly indicating between factory and field wiring. All field wiring shall be included for each diagram to describe all modes of operation of the system indicated. Where the integrated system requires interlocking and control and other components in normal operation, these components shall be included in the description of operation.
5) Drawings of system showing assemblies, arrangements, piping, electrical, mounting details, equipment outline dimensions, fitting size and location, motor data, operating weights of all equipment and sufficient information to allow CCU to check clearances, connections, and conformance with the specifications .
6) Renewal parts list with diagrammatic or cross-section drawing showing part identification. Material analysis or trades designation for each significant part shall be noted on parts lists or on a separate sheet.
7) Materials of construction of all equipment.
8) Control panel drawings shall indicate all equipment installed inside and outside of the panel including the location of all alarms (for biofilter) ; lamps; complete instrumentation; and control, logic and power wiring diagrams.
9) Electrical equipment rating and data sheets for all devices.
10) Design calculations certified by a Registered Professional Engineer with demonstrated experience in the design of these systems.
11) Pump data and performance curves showing flow, pressure, and horsepower (for biofilter)
12) Specifications, performance data, and calibration curves for exhaust fan and auxiliary components

b. Biofilter:

Any manufacturer whose main business is Fiberglass Reinforced Plastic (FRP) manufacturing shall not be accepted as a supplier of the complete system.

c. Activated Carbon Adsorber:

Any manufacturer whose main business is HDPE manufacturing shall not be accepted as a supplier of the complete system.

1.5.3.6 TCU: The contractor shall provide shop drawings for the TCU. The shop drawings shall include schematics, manufacturer brochures, and test results for pump settings, flood light, antenna, tower, all other TCU components and appurtenances applicable to the TCU. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, AWWA, state, federal, and engineering standards are met.

1.5.3.7 VFD: The contractor shall provide documentation with the material submittals on the experience of the VFD manufacturer and his interfacing with the submersible pump manufacturer.

The contractor shall also submit a manufacturer's statement that the variable frequency drive meets the requirements of Federal Communication Commission and IEEE. Adequate IC (inductance-capacitor) filters shall be provided as required to meet this criteria.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website. Any products not listed on this approved APL will be required to go through the CCU submittal process.

2.1.1 GENERAL

All equipment and products shall be permanently identified with the model number and manufacture's nomenclature.

2.2 EQUIPMENT

The equipment used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below and/or as provided in other sections of the contract documents.

2.2.1 Submersible Sewage Pumps

2.2.1.1 General

a. The submersible sewage pumps covered by this specification are intended to be standard pumping equipment of proven ability.
b. The submersible sewage pumps shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactory when installed as shown on the engineering drawings and/or standard details.

c. The submersible sewage pumps shall be heavy duty electric submersible, centrifugal non-clog units designed for handling raw and unscreened wastewater (minimum of 3" sphere). The submersible sewage pumps shall be capable of operating in a liquid temperature up to 115°F and to a depth of 65 feet.

d. The submersible sewage pump and motor unit shall be suitable for continuous operation at full data plate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary submersible sewage pumps or cooling fans to cool the motor shall not be acceptable. The submersible sewage pumps mechanical seals and motor units shall be from the same manufacturer to achieve standardization of operation, maintenance, spare parts, manufacturer's service, and warranty.

e. The submersible sewage pump shall be tested and approved by Factory Mutual or U.L. as explosion proof for use in Class I, Groups C and D, Division 1 hazardous locations.

f. The submersible sewage pump shall have a sliding bracket for connecting to the dual guide stainless steel rail system. The sliding bracket, either directly or with an adaptor, shall allow for the interchangeability of all CCU acceptable submersible sewage pump manufacturers at alternative locations.

g. The submersible sewage pump shall have a manufactured sized electrical cable and shall be a minimum of 50 linear feet. The cable shall conform to NEC and ICDA Standards with P-MSHA approval. The cable shall be sealed with a protective covering prior to installation.

h. The submersible sewage pump shall include a 316 stainless steel chain capable of supporting the weight of the submersible sewage pump for installation and removal of the submersible sewage pump. The chain shall be connected to the submersible sewage pump bail using a 316 stainless steel clevis. The length of the chain shall be equivalent to the depth of the wet well plus additional 6 feet.

i. The submersible sewage pump discharge diameter shall be as specified on the engineering drawings and/or CCU standard details. For discharge diameters 4" or larger, the manufacturer supplied submersible sewage pump discharge shall be compatible among all CCU acceptable manufacturers' submersible sewage pump discharge base elbows.

j. The submersible sewage pump shall be cast iron with appropriate coating to protect submersible sewage pump from corrosive properties of wastewater.

k. The impeller shall be mounted directly on the motor shaft extension in such a manner that it shall not become detached if the submersible sewage pump is operated in the wrong direction. The impeller shaft shall be 420 stainless steel or greater and shall extend from the motor to the impeller cap nut.

l. All submersible sewage pump mated surfaces shall be machine fitted for watertight sealing.

m. A 316 stainless steel lifting bail handle shall be provided on the submersible sewage pump housing suitable for lifting the entire submersible sewage pump assembly and attaching the lift chain.

n. The submersible sewage pump shall operate to a maximum submergence of 65 feet including electrical cable entry.

o. All electrical parts shall be housed in an air or oil filled cast iron, water-tight casing.

p. All external hardware shall be 316 stainless steel.

q. The motor shall be designed to allow a minimum of 15 starts per hour.

r. The motors shall include thermal and moisture protection to shut down the motor due to high operational temperatures or infiltration of moisture. The motor shall be automatic restarted once the operational temperature is achieved.

s. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.2 Motor Control Center (MCC)

2.2.2.1 General

The submersible sewage pump motor control elements shall be installed in a 316 stainless steel NEMA 4X enclosure and include the following equipment:

a. The panel shall be constructed of a heavy-duty box frame of all welded construction, utilizing specially formed #12-gauge 316 stainless steel angle and channel members.

b. The dead front interior panel(s) for instrument mounting shall be constructed of a minimum of #11-gauge aluminum.

c. The interior panel(s) for instrument mounting shall be constructed of a minimum of #14-gauge epoxy coated steel.

d. Panel mounted controls and indicators shall maintain panel integrity. Suitable stiffness shall be provided when required to maintain flatness and provide extra rigidity.

e.

f. All panels wiring to external equipment shall be terminated on screw-type terminal strips.

g. Terminal blocks shall be separated into groups (power, AC control, DC signal, data, etc.). All terminals shall be shall be marked with legible permanent labels or otherwise identified.

h. The MCC shall be mounted on 4” tubular top capped aluminum posts installed in concrete above the 100 year flood plain in accordance with the engineering drawings and standard details.

i. All circuit breakers shall be accessible without opening the MCC dead front door(s).

j. The MCC shall include at a minimum the following for each submersible sewage pump: a motor starter, a HOA switch, a circuit breaker mounted with the operating handles through the dead front door(s), a leak seal indicating light, and an elapsed time meter.

k. The MCC shall contain a manual pump control operated by a manual Hand/Off/Auto (HOA) by-pass switch located in the main MCC which is NOT an automatic redundant switch.

l. The MCC shall include at a minimum: a 24-volt AC wet well liquid level sensors control circuit, 120-volt AC audio and visual alarms, an emergency generator receptacle with circuit breaker, a main circuit breaker, a control circuit breaker, and a 12-volt DC audio and visual battery backup alarm system.

m. All power shall be disconnected from the control elements when the standard lift station main disconnect is in the “OFF” position.

n. In each motor, a heat sensor thermister and a seal leak probe shall be wired to a red warning signal light on the dead front door and shall be marked with legible permanent labels.

o. An alternator relay shall be supplied to alternate the individual submersible sewage pump on each successive cycle.

p. A fused wet well liquid level sensors control circuit transformer shall be supplied to operate controls.

q. In 480-volt AC applications, a fused control circuit transformer shall be supplied to provide 120-volts AC auxiliary equipment power.

r. An adjustable single or three phase power monitor shall be provided to indicate and protect the pump via the control circuit in the event of loss of any phase, low and high voltage on any or all phases, and phase reversal with automatic reset and built-in time delay on trip.

s. Audio and visual alarms shall be installed for monitoring high water levels, system equipment failures, and main input power levels failures. Audio and visual alarms shall be wired to sensors provided for a high water levels. Water level and system equipment failure alarms shall be powered directly from the main power supply to the MCC. The audio alarm shall be disabled by a manual silence switch; however, the visual alarm shall remain on until the alarm condition is corrected. If the alarm is a result of a loss of power to the standard lift station, the alarms shall automatically reset with the restoration of land line power or from a portable generator set. The loss of power audio and visual alarms shall be connected to a continually charged 24 hour back-up 12 volt battery.

t. The panels shall be wired and assembled per UL 508 Standards. All electrical components and materials shall be listed by UL and shall bear the appropriate UL listing mark or classification. Each panel shall be listed and labeled as UL 508 Industrial MCC. Panels shall comply with NFPA 79 - Industrial Machinery. A permanent, non-paper wiring diagram shall be mounted on the inside of the cabinet door.

u. A 120 VAC time delay relay (0 to 60 second adjustable on delay) to re-energize control circuit of lag submersible sewage pump after power restoration shall be provided for step loading on submersible sewage pumps over 20 HP. VFDs or soft starts shall be provided for submersible sewage pumps over 20 HP as approved by CCU.

v. All MCCs shall include a grounding rod with 10-gauge wire that is installed in accordance with current local, state and national codes.

w. 316 Stainless steel and schedule 80 polyvinyl chloride conduit piping shall be provided and installed as shown on the CCU design detail for connections between the MCC and the wet well structure, the MCC and the TCU (if required), the MCC and the standby generator (if required), the MCC and the odor control (if required), the MCC and the ground rod, and the MCC and the FPL service point. Explosion proof fittings shall be provided and installed on the conduit as shown on the CCU design detail for connections between the MCC and the wet well structure.

x. A trouble light including switches shall be mounted in the MCC.

y. Surge protector equipment in accordance with UL 1449 Standards shall be installed on the load side of the MCC main circuit breaker for protection of all AC electrical equipment in the MCC and the motors from the effects of lightning induced currents, substation switching transients, and internally generated transients.

z. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.2.2 Approved Products:

All electrical and accessories shall meet CCU standard details and specifications and shall be reviewed by CCU with the standard lift station submittals except as noted below.

Emergency Generator Connector: Pyle National MFG JRE 4100 PR.

Trouble Light:	Leviton 9880
120 Volt Alarm Light:	Ingram LXR-40 or Ohio Electric RL-3K
120 Volt Alarm Horn:	Edwards ALA-896-N5
12 Volt Alarm Light:	Ingram SLR-123
12 Volt Alarm Horn:	Ingram AH-122DG
Elapsed Time Meter:	ETMAC 200-10NG7 Round Mount
Surge Suppressor:	Current Technology Transguard 150

2.2.3 Soft Starter

2.2.3.1 General

a. A dedicated soft starter for each submersible sewage pump and connecting wiring shall be supplied by the submersible sewage pump manufacturer for all motors equal to or greater than twenty (20) horsepower unless a VFD is required as per the Special Provisions. The soft starter shall be installed in a separate MCC, if required in the Special Provisions. No supplementary cooling in the form of an air conditioning unit shall be used, unless required in the Special Provisions.

b. All of the components shall be a complete unit, factory wired, and tested as a complete system. Each soft starter shall operate as a stand-alone unit with no interaction with each other.

c. The soft starter is a function control integrated in the lift station control panel sized to operate a variable torque load at the rated pump horsepower. The speed range shall be from a minimum speed of 0.5 Hz to a maximum speed of 60 Hz with an input voltage frequency range between 47.5 to 63 Hz.

d. The soft starter shall be adjustable between 30-70% of the normal line voltage and shall be adjustable between 200 and 500% of the soft starter's full load current.

e. The ramp time between initial torque and full load torque shall be adjustable between 1 and 120 seconds in increments of one second. The soft start shall include a jog function initialized directly from the keypad.

f. The soft starter shall have Deceleration Control (soft stop) as a standard feature with an adjustable deceleration time from 1 to 120 seconds in increments of one second.

g. The soft starter shall include the following integrated motor and load protection:

1) Overload protection based on dynamic thermal register retained in the memory even upon loss of power.
2) A manual reset and an automatic reset for unattended remote applications.
3) Phase imbalance protection - adjustable sensitivity of two phases between 10% to 80% of the rated current.
4) Phase reversal protection - motor will not run the inappropriate direct.
5) High current protection - unit shall trip if the current exceeds eight times the set rated current.
6) Under load protection - trip level shall be programmable from 40 to 100% of the full load motor current.
7) Fault detection - all fault signals are to be reported to the LCD screen and the system shall not be disabled with a minimum recording of the last 20 events.

h. Two programmable input signals shall be available, and each input shall have the capability of being programmed for None, Reset, Jog, and Enable Motor.

i. All input and control devices shall be rated for 24 VDC control.
j. Three physical signal relays and one virtual relay for communication shall be provided and individually programmed for Run, Top of Ramp, and Event listing.

k. The soft starter shall be provided with a 2-line 20 character per line LCD display screen that does not use any type of code to allow for operator interface.
l. Serial communications shall be a built-in function as a standard feature and shall include MODBUS, DeviceNet, Profibus DP, and ASI as the communication protocol available through the Field Bus Plug.
m. The soft starter shall be programmable with a key pad and display that can be viewed/operated from the inside dead-front panel.
n. Internal calibration adjustments are as follows:
   1) Minimum speed.
   2) Maximum speed.
   3) DC boost.
   4) Acceleration/deceleration rates.
   5) Stop mode (ramp or coast).
   6) Automatic restart after fault trip with lockout after five attempts to restart.
   7) Anti-wind milling adjustable brake time. 8) Adjustable volts/Hertz.
o. Unit mounted operator controls are as follows:
   1) Drive keypad display and a keypad Control Panel with a setting dial for each drive.
   2) PID values (optional).
   3) Speed – manually adjustable.
   4) Indicating speed meter.
   5) Power ON light.
   6) Alarm reset switch.
p. The soft starter shall include the following standard features which shall be enabled if a TCU unit is specified:
   1) Built-in communication via a cable connection or terminal block.
   2) Built-in Modbus-TCU communications via a terminal block connection.

3) One (1) connector slot for internally mounting plug-in options.
4) Removable control terminal block.
5) Sink/source selectable control logic.

q. The soft starter shall include the following provisions for remote external controls, if a TCU is specified:
1) Two (2) wire ON-OFF control.
2) One (1) analog input for speed set point.
3) Two (2) analog outputs: one for motor current and one optional for motor speed tied to PLC.
4) Two (2) digital outputs: one for drive running and one for drive fault.
5) Four (4) digital inputs: one for start/stop, one for enable (trips, low wet well level, and emergency stop push button), one for auxiliary for high motor winding temperature, and one for speed select signal for Hand-Off-Auto.
6) One (1) hand-off auto switch.

2.2.4 Wet Well Liquid Level Sensors

2.2.4.1 General

a. The wet well liquid level sensors shall be operated by reduced voltage, intrinsically safe mercury switch sealed in a solid polyurethane float ball.

b. The wet well liquid level sensors cords shall be suspended from a 316 stainless steel bracket attached to the lip of the access hatch at the depth specified as shown on the CCU design detail.

2.2.5 Telemetry Control Unit (TCU) (if required)

2.2.5.1 General

a. The TCU transmits analog signals from the lift station MCC to the CCU central monitoring location and from the CCU central monitoring location to the lift station MCC.

b. The TCU includes a grounding rod with 10-gauge wire and shall be installed in accordance with current local, state and national codes.

c. The TCU data shall be displayed continuously at the TCU by a default screen and indicating LED and shall indicate, at a minimum:

1) Operating status of each submersible sewage pump
2) Operating mode of the standard lift station
3) Wet well liquid level sensors status

d. All other components and appurtenances including tower, antenna, control box, conduits, etc. shall be as specified on the engineering drawings and in the CCU standard details.

e. CCU will provide the TCU frequency to the contractor.

2.2.5.2 Approved Products:

The TCU and accessories shall meet CCU standard details and specifications as determined by CCU.

The following TCU manufacturer is approved:

Data Flow Systems, Inc.

2.2.6 Variable Frequency Drive (VFD) (if required)

2.2.6.1 General

a. A dedicated VFD for each submersible sewage pump and connecting wiring shall be supplied by the submersible sewage pump manufacturer. The VFDs shall be installed in a separate MCC, if required. No supplementary cooling in the form of an air conditioning unit shall be used.

b. The VFD shall consist of a variable frequency controller, input circuit breaker, harmonic suppression equipment, output isolation contactor, input and output line reactors, and controls. All of the components shall be a complete unit, factory wired, and tested as a complete system. Each VFD shall operate as a stand-alone unit with no interaction with the other VFDs.

c. The VFD shall maintain a .95 minimum true power factor though out the entire speed range and shall be used with any standard NEMA-B squirrel-cage induction motor having a 1.15 service factor.

d. Additional specific requirements are stipulated in the contract Special Provisions.

2.2.7 Standby Generator and Automatic Transfer Switch (ATS) (if required)

2.2.7.1 General

a. A standby generator shall be diesel powered and shall provide the same kW as the land line power source with a maximum voltage dip of 15% if the rated load is applied in three steps with 15 second increments.

b. A standby generator shall be permanently connected to the lift station MCC via an ATS supplied by the generator manufacturer.

c. The standby generator shall be provided with a non-rusting weather housing; a 500 gallon sub-base fuel tank; a 316 stainless steel NEMA 3R enclosure for the ATS; water and temperature gauges; a factory compatible DC battery charger including ammeter; an AC voltage regulator; a voltage adjusting rheostat; start-stop and VM-AM phase selector switches; an AC voltmeter and ammeter; frequency and elapsed time meters; two (2) dry contacts closure rated for 10 amperes at 120 volts; an automatic start/stop control with fault indication lights and corresponding safety switches for pre-warn and shutdown low oil pressure; and a pre-warn and shutdown high water temperature, low water temperature, over-speed, over-crank, battery charger malfunction and selection switch (off, auto, manual) with light.

d. The standby generator shall automatically start and attain the rated kW and frequency upon the closing of a remote starting contact with the ATS within 10 seconds.
e. The standby generator shall be mounted on a structural steel sub-base designed to maintain proper alignment of the unit and shall be installed on a concrete pad as detailed in the contract documents using properly sized epoxy HILTI anchors.

f. The standby generator shall include all required components to allow pre-programed self-operation under load in compliance with manufacturer's recommendations.

g. The standby generator shall include a grounding rod with 10-gauge wire and installed in accordance with current local, state and national codes.

h. All other components and appurtenances shall be as specified on the engineering drawings.

2.2.8 Emergency Generator Connector (if required)

2.2.8.1 General

a. An emergency generator connector with a switching device shall be provided.

b. All other components and appurtenances shall be as specified on the engineering drawings and on the CCU standard details.

2.2.8.2 Approved Products:

The following manufacturer is approved:

Pyle National

2.2.9 Odor Control (if required)

2.2.9.1 General

a. The odor control system shall be a primary biofilter unit including a built-in carbon filter stage and, if required, an optional secondary activated carbon polishing unit connected to the biofilter unit; a VFD controlled centrifugal fan installed in a with sound attenuation enclosure; interconnecting ductwork; electrical wiring and conduit; and appurtenances for a complete operating system.

b. The odor control system shall treat in a single pass odorous air from the wet well. The system shall be designed for manual and continuous automatic operation. Access man ways shall be provided to allow access to the internals of the system. The system shall be designed to withstand a temperature up to 120 degrees F. The module and all accessories shall be factory mounted, piped, and wired to the maximum extent possible. The system shall be installed on the lift station pad with stainless steel fasteners.

c. The odor control system shall be skid mounted and designed to maintain proper alignment of the installed unit on a concrete pad as detailed on the engineering drawings using properly sized epoxy HILTI anchors. The controls shall be attached to the skid assembly and shall be housed in a water proof NEMA 4X enclosure.

d. The overall system size, including the fan, controls, and appurtenances shall not exceed the dimensions shown on the engineering drawings. At a minimum, access man ways shall be provided between the treatment stages. A portion of the system top shall be removable for access to the top of the second stage.

e. The odor control system shall meet the following performance when operating:

INLET	OUTLET
1-10 ppm H_2S	0.1 ppm H_2S
Greater than 10 ppm H_2S	1.0% of inlet (99.0% removal)

2.2.9.2 Biofilter

a. The biofilter odor control unit shall be a two-stage, biological absorption/adsorption system that shall include but not be limited to a fiberglass reinforced plastic (FRP) vessel, nozzles, two independent stages of inorganic treatment media (biological and built-in carbon polishing), moisture controls, nutrient supply system, VFD controlled air supply fan, ductwork, dampers, and all necessary accessories. The biological treatment stage shall utilize a granular inorganic media to facilitate absorption and adsorption of odor compounds designed to remove minimum of 99% of H2S vapor in a single pass. The polishing stage shall utilize a granular media designed to adsorb odorous compounds with the ability to support biological degradation of the compounds. The first stage shall operate from an independent water distribution system to irrigate the top of the first media bed with complete and even coverage via spray nozzles to maintain optimum wetted conditions to support unique microbial growth for biological destruction of the odorous compounds and removal of toxic metabolites. Biofilter

odor control units using any type of organic media and biofilter odor control units using a single inorganic media shall not be acceptable. The complete treatment vessel shall be fabricated of premium grade FRP.

1) The air enters the vessel through the humidification section. After humidification, the first treatment stage contains media specifically designed to support biological growth for degradation of odor compounds. This stage absorbs odors from the air stream. The second polishing stage contains media specifically designed to adsorb odor compounds and to support biological degradation of those compounds. This stage provides final removal of odors to the specified level. Overall media depth shall be a minimum of 48 inches.

2) The first stage of media shall be wetted with fresh potable or re-use make-up water.

b. The system shall include all piping, valves, control panel and internals pre-mounted and piped on the unitary constructed system. The material of construction of internals shall be as follows:

Packing Media Support	HDPE and FRP
Liquid Distributor	PVC
Spray Nozzles	PVC
Humidifier Nozzles	316 SS

c. The multi-stage packaged FRP unit shall be of unitary construction. The system shall be shipped as a single piece.

d. Design and Performance Criteria:

1) Criteria: The biofilter odor control unit shall be capable of removing foul air at a rate no lower than the rate shown on the following table.

INLET	OUTLET
1-10 ppm H2S	0.1 ppm H2S
Greater than 10 ppm H2S	1% of inlet

2) System Performance: The biofilter odor control unit shall demonstrate the following performance when operating under design flow conditions listed above:

Maximum Pressure Drop: The pressure drop across the odor control unit shall not exceed 5.0 in. w.c. at the maximum air flow rate specified above.

e. Miscellaneous Material of Construction

1) The vessel and accessories shall be contact molded manufactured in accordance with NBS PS 15-69, ASTM D 4097 for contact molding. Any material of construction other than FRP with premium grade resin will not be allowed.

2) Resin used in the system liner shall be a premium vinyl ester type such as Hetron 922 by Ashland Chemicals, Derakane 411 by Dow Chemical, Vipel F010 by AOC, or CCU approved equal. The resin shall be reinforced with an inner veil of a suitable synthetic organic fiber such as Nexus 111-00010.

3) Glass fiber reinforcement used shall be commercial grade corrosion resistance borosilicate glass. All glass fiber reinforcement shall be Type C, chemical grade, Type E electrical grade. Surfacing veil shall be 10 mil Nexus 111-00010 or equal. Mat shall be Type "E" (electrical grade) glass, 1 1/2 oz. per sq. ft with a nominal fiber length of 1.25 + 0.25 inches, with a silane finish and styrene soluble binder. Continuous glass roving, used in chopper gun spray-up applications shall be type "E" grade with chrome or silane coupling agent. Alternate layers of mat and woven roving shall be used for reinforcement.

4) Unless otherwise specified, all fasteners, and metal attachments such as anchors, brackets etc. shall be ANSI 316 SS. Unless otherwise specified, all gaskets shall be EPDM.

f. Fabrication:

1) Fabrication shall be in accordance with NBS PS 15-69, ASTM D 3299, and ASTM D4097. All non-molded surfaces shall be resin incorporating paraffin coated to facilitate a full cure of the surface. All cut edges, bolt holes, and secondary bonds shall be sealed with a resin coat prior to the final resin paraffin resin coat. All voids shall be filled with a resin paste.

2) The inner surface of all laminates shall be resin rich and reinforced with one layer of NEXUS 111-00010with a minimum thickness of 10 mils. The interior corrosion liner shall consist of two layers of 1and1/2 oz. per sq. ft. chopped strand mat. If the application is by chopper gun, the spray upglass fiber shall be 1/2 in. to 2 in. long. The total corrosion liner thickness shall be a minimum of 100 mils and have a resin to glass ratio of 80/20. All edges of reinforcement to be lapped a minimum of one (1) inch.

3) Structural laminates shall consist of alternating layers of 1and 1/2 oz. per sq. ft. mat or chopped glass and 24 oz. per sq. yard woven roving applied to reach the designed thickness. The exterior surface shall be relatively smooth and shall have no exposed glass fibers. The exterior shall be surface coated with gel coat containing ultra violet light inhibitors.

4) Accessories: Air inlet, air outlet, spray headers, baffles, media support, drain, and all connections shall be provided by the manufacturer. Tie down lugs shall be integrally molded into the walls of the vessel. All external bolts shall be 316 SS and designed

for the specified loads. Interior fasteners shall be of corrosion resistant materials such as PVC or FRP.

g. Neoprene Pad: A ¼ inch thick, 60 durometer neoprene rubber sheet shall be placed underneath the vessel before installation on lift station pad.

h. Exhaust Fan

1) The exhaust fan shall be centrifugal design manufactured of FRP with a statically and dynamically balanced radial blade wheel. The fan inlet shall be slip type, and the fan outlet shall have a flanged nozzle. The fan shall have a neoprene shaft seal.

2) Fan shall be supplied with a TEFC motor with 1.15 service factor suitable for threephase, 60 Hz, 480 volt service and rated for Class 1, Div. 2, Group D installation. The fan shall be direct driven. The motor shall be inverter-duty and controlled by a VFD.

3) The fan shall be tested and rated in accordance with AMCA and bear the AMCA seal.

i. One of the two mineral vessels shall be fitted with a top-mounted, five-cycle multiport control valve to operate the backwash, brining, slow rinse, fast rinse, and refill cycles. An additional piston assembly shall be included to control the duty/standby status of the two vessels. A brass control valve including fixed and self-adjusting flow regulators shall be provided. A hydraulically balanced teflon coated piston shall be provided to perform the cycles of regeneration.

j. Instrumentation and System Controls

1) The electrical control panel shall provide electrical control for the exhaust fan and water addition system. A 3-phase power supply shall be supplied to the panel from the MCC to power the system.

2) The control panel enclosure shall be rated NEMA 4X. The panel shall be remote mounted by the contractor next to the system assembly at least 3 feet away to comply with requirements of a Class 1, Division 2, and Group D installation. The Contractor shall install and wire the local control panel to the bio filter mounted fan, metering pump, and solenoid valve. The control panel shall be factory tested to full operation with all other components prior to shipment.

3) The panel shall have the following components or capabilities:

i Fan switch (ON-OFF). ii Push-to-test button for water valve. iii Timer relay for on/off control of water valve.
iv Blower VFD
v Nutrient Pump (ON-OFF-AUTO)

4) The water control cabinet shall be constructed from a NEMA 12 rated FRP cabinet with all internal piping SCH 80 PVC. The cabinet shall be mounted to the system assembly. The cabinet shall contain the following components:

I Pressure reducing valve
ii Nutrient Pump (rated for installation in a Class 1, Division 2, Group D area) iii Irrigation solenoid valve (Explosion-proof rating) iv Valve for pre-humidification v Irrigation system pressure gauge

5) Water pressure regulator, solenoid valve, and Rota meter shall be provided for control of water application rates. These components shall be mounted in the water control cabinet.

k. Accessories

1) The direct reading Rota meter shall be a variable area type with a Teflon float, EPR "O" rings, and PVC fittings. The Rota meter shall be sized to the pipe and have a direct reading scale.

2) A nutrient containment and metering system shall be provided with the system. Nutrients supplied as a coating to the support media shall not be allowed.

3) All water and drain piping shall be SCH 80 PVC.

l. Nutrient Reservoir

The nutrient reservoir shall be integrated into the system sump. No loose external tanks shall be provided with the system.

2.2.9.3 Carbon Media Odor Control Unit

2.2.9.3.1 Stand Alone Activated Carbon Unit

a. If required, the Contractor shall install a carbon media odor control unit in accordance with the engineering plans. The carbon media odor control unit shall meet the requirements of this specification.

b. The unit shall have an AMCA certified centrifugal industrial fiberglass reinforced V-belt Arrangement No. 10 driven plastic fan equipped with undrilled inlet flange, outlet flange, Viton shaft seal, fan guard, and motor enclosure. Each fan and drive motor shall be mounted on a common base assembly designed for mounting on a concrete pad. The fan motor shall be high efficiency type, TEFC, and a with a 1.15 service factor and matched to the electrical service at the standard lift station. Accommodation to accept a hand-held tachometer shall

be available for each fan. Each fan shall have a drain with plug. The fan shall include graphite impregnation for grounding.

c. The contractor shall complete the "TBDs" for the unit fan being proposed for the following maximum operating conditions:

Air Flow Rate, cfm	TBD
S.P. up to Fan Inlet, in WC	TBD
Adsorbed Pressure Drop, in WC	TBD
Total S.P., in WC	TBD
Minimum Motor HP	3.0

d. The unit shall have a fan sound attenuation package capable of reducing the sound level by a minimum of 25 dB which shall be placed over the fan and motor assembly. The doors shall be equipped with heavy duty hardware and with seals to minimize noise leakage. Stainless steel sheet flashing shall be provided to enclose the penetrations in the enclosure for the fan inlet and outlet ducting. The enclosure shall be fitted with louvered vents as required for heat dissipation/ventilation.

e. The fan shall be factory wired to a stainless steel NEMA 4X panel. The panel shall have a fan control switch with a pilot lamp to indicate the fan running status. The power supplied to the panel shall be matched to the electrical service at the standard lift station. The panel shall be provided with a power disconnect switch, VFD, and control transformer. The fan speed shall be manually adjusted by the operating the VFD.

f. The contractor shall provide the necessary ductwork between the fan ductwork and the adsorber vessel. The ductwork shall include a volume control damper with lockable louver for flow adjustment. The material of construction shall be same as that of adsorber vessel.

g. The carbon adsorber vessel shall be constructed of non-corrosive polypropylene with a minimum thickness of 1/8" is required for a vessel diameter between 18" and 24" and a 1/4" thickness for vessel diameter up to 60" and designed for the following criteria:

Vessel Diameter, ft	TBD
Vessel Straight Side Height, ft	TBD
Internal Positive Pressure, in. WC	+15
Maximum Operating Temperature, °F	150
Carbon Bed Depth, ft.	3.0

h. The carbon adsorber vessel shall have a differential pressure gauge to continuously monitor the pressure drop across the carbon bed. The differential pressure gauge shall be isolated with isolation valves and mounted on the vessel.

i. The carbon absorber vessel shall have shall have three (3) one (1) inch diameter sample probes per bed extending into the bed a minimum of twelve (12) inches. The sample probes shall be blocked off with a PVC ball valve.

j. The carbon absorber vessel shall accommodate a single bed of activated carbon having an average depth of three (3) feet. The carbon bed shall be supported on a polypropylene screen through an FRP support grating system. The screen and the support system shall be removable through the top cover. The top cover shall use quick release tie downs that are integral to the cover and not require the use of separate tools for the removal of the cover. The support system shall consist of removable grating. NOTE: Pall rings or other dumped packing media as a means of carbon support shall not be used. The support system shall be designed to withstand a load of at least 150 lbs/ft^2 with a minimum deflection of 1/4" under all conditions.

k. The carbon absorber vessel shall have a "gooseneck" type outlet to prevent rain water from entering into the system.

l. The activated carbon media shall be virgin, pelletized, and derived from high grade bituminous coal vapor phase type suitable for the control of sewage odors. The carbon shall have the following specifications:

Iodine Number, mgI_2/g	1050 min
MPD,mm	3.9-4.1
Apparent Density, g/cc	0.46-0.52
Hardness No.	95 min
Butane Activity	26 min
H_2S Capacity, gH_2S/cc*	0.30 min

* The H_2S breakthrough capacity is determined using ASTM standard method D6646-01. Prior to testing, the test sample shall be completely humidified by exposing the sample to a flow of humid air (>85% RH) for at least 4 hours. Testing shall be accomplished by passing a moist (85% RH) stream of air containing 1 vol. % H_2S and the selected concentration of CO_2 through a 1 inch diameter tube with a nine-inch deep bed of closely packed carbon at a rate of 1,450 cc/min and monitoring to a 50 ppmv H_2S breakthrough. The results shall be reported as grams of H_2S adsorbed per cc of carbon.

m. All steel hardware shall be 316 stainless steel unless stipulated in this specification or on the engineering drawings. Gaskets shall be full face with a minimum of 1/8" thickness and made of EPDM or neoprene suitable for the intended service.

n. The unit shall include a grounding rod with 10-gauge wire in accordance with current local, state and national codes.

o. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.9.3.2 Optional secondary activated carbon polishing unit

If the optional secondary activated carbon polishing unit is required, the contractor shall provide, as a minimum, the major components as specified under the stand-alone unit section including the concrete pad, the vessel, the carbon media, the connecting duct work and all other appurtenances necessary for a fully operational odor control system in accordance with this specification.

:

2.3 MATERIAL

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below and/or as provided in other sections of the contract documents.

All stainless steel shall be 316 austenitic, non-magnetic unless otherwise required.

2.3.1 Wet Well, Access Hatch and Concrete Cover and Slab

2.3.1.1 General

a. Pre-cast circular concrete wet wells and the wet well concrete cover shall comply with the structural requirements of ASTM C478, Type II, acid resistant cement and shall attain a minimum compressive strength of 4000 pounds per cubic foot in 28 days. The wet well pre-cast base section shall be monolithic with the bottom section of the wetwell. The precast wetwell top shall include the access cover frame.
b. The wet well design shall assume a soil density of 130 pounds per cubic foot and a concrete density of 150 pounds per cubic foot and shall resist flotation under the conditions of an empty wet well and a groundwater level from the wet well base to the finished grade including a safety factor of 1.5.

c. Cast in place concrete slab shall comply with ACI and ASTM standards. Concrete shall be ASTM C-150 Portland Type II 3,500 psi air entrained at 6% plus or minus 1% unless otherwise noted on the engineering plans. Fine aggregate shall be ASTM C33 and course aggregate ASTM C33 ¾" maximum size. Reinforcing shall be ASTM A615 Grade 60 deformed bars and stirrups and Grade 40 ties, welded wire fabric shall meeting the requirements of ASTM A185, and fabricated reinforcing steel shall be in accordance with ACI 315. Form lumber shall be in accordance with ACI 347 and shall be used with removable

metal form ties, non-staining and moisture absorbing form release agents, and stainless steel dovetail anchor slots, and water stops as shown on the engineering drawings.

d. The wet well shall be set on a number 57 stone base in accordance with section 901 "Coarse Aggregate" of the latest revision Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

e. The individual wet well sections shall fit together with interlocking tongue and groove joints. Four (4) foot diameter wet wells shall be sealed with a R-4 rubber gasket and six (6) foot or larger diameter wet wells shall be sealed with two (2) 1-½" butyl rubber or plastic wet wells joint seal squeezed in and out to verify sealing. The outside of the groove joints for all wet wells shall be covered with a continuous overlapping butyl rubber wrap a minimum of eight (8) inches wide.

f. The wet well shall include elastomeric gasket(s) for all piping. The gasket(s) shall have a stainless steel adjustable strap to seal the gasket to the pipe. An elastomeric gasket(s) with a stainless steel adjustable strap to seal the gasket to the pipe shall be installed in all on site core bored holes.

g. The outside surface of the wet well shall be covered with 3 coats (black/red/black or color changes to allow CCU to verify multiple coats) of coal tar epoxy coating with a minimum dry film thickness of 10 mils per coat for a total of 30 mils dry film thickness. Subsequent coats shall be applied within 48 hours of the previous coat. The coal tar epoxy coating shall be Koppers Bitumastic No. 300m or CCU approved equal.

h. The internal wet well coatings (including cover) shall be a polymorphic resin, a calcium aluminate mortar, an epoxy coating, or a polyurethane coating. Coatings shall be installed in accordance with the manufacturer's specifications.

i. The wet well access hatches and frames shall be compatible with the lift-out rail system in accordance with the engineering drawings and approved shop drawings. The wet well access hatch and frame shall be aluminum with 316 stainless steel hinges, handles, and associated hardware in accordance with CCU standard details.

j. The standard lift station influent piping inverts shall be a minimum of sixty (60) inches above the base invert.

2.3.2 Valve Vault, Access Hatch and Concrete Cover (if required)

2.3.2.1 General

a. A valve vault, access hatch and concrete cover and all other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

b. Pre-cast rectangular concrete valve vault and the valve vault concrete cover shall comply with the structural requirements of ASTM C913, Type II, acid resistant cement and shall attain a minimum compressive strength of 4000 pounds per cubic foot in 28 days. The valve vault pre-cast base section shall be monolithic with the bottom section of the valve vault. The pre-cast valve vault cover shall include a cast-in-place access hatch frame.

c. The valve vault design shall assume a soil density of 130 pounds per cubic foot and a concrete density of 150 pounds per cubic foot and shall resist flotation under the conditions of an empty valve vault and a groundwater level from the valve vault base to finished grade, including a safety factor of 1.5.

d. The valve vault shall be set on a number 57 stone base in accordance with section 901 “Coarse Aggregate” of the latest revision Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

e. The individual valve vault sections shall fit together with interlocking tongue and groove joints. The valve vault precast top and walls shall be sealed with a R-4 rubber gasket or with two (2) 1-½” butyl rubber or plastic valve vaults joint seal squeezed in and out to verify sealing. The outside of the groove joints for all valve vaults shall be covered with a continuous overlapping butyl rubber wrap a minimum of eight (8) inches wide.

f. The outside and inside surfaces (including cover) of the valve vault shall be covered with 3 coats (black/red/black or color changes to allow CCU to verify multiple coats) of coal tar epoxy coating with a minimum dry film thickness of 10 mils per coat for a total of 30 mils dry film thickness. Subsequent coats shall be applied within 48 hours of the previous coat. The coal tar epoxy coating shall be Koppers Bitumastic No. 300m or CCU approved equal.

g. The valve vault access hatch and frame shall be aluminum with 316 stainless steel hinges, handles, and associated hardware in accordance with CCU standard details.

h. The valve vault piping inverts shall be a minimum of eighteen (18) inches above the base invert. The valve vault cover shall be minimum thirty six (36) inches from the top of the pipe to the finished grade.

2.3.3 Discharge Piping and Valves

2.3.3.1 General

a. The discharge piping and valves shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactory when installed as shown on the drawings. The piping and valves shall be supported to the wetwell walls and above ground as shown on the engineering drawings and the CCU standard details.

b. The piping and valves shall be furnished and installed in accordance with CCU Specification Section# 002325 “Force Mains” and CCU Specification Section# 002340 “Valves”.

2.3.4 Water Service

The contractor shall provide a water service as shown on the engineering drawings and CCU standard details. The service shall include the labor and materials for the tap at the water main source, polyethylene piping, meter box, fittings, backflow prevention device, spigot, mounting brackets and connectors, etc. CCU will provide and install the water meter.

A separate water service is required for the odor control.

2.3.5 Fence and Gates

The contractor shall provide and install fence and double eight (8) foot gates (total sixteen (16) foot width) with hold-backs, and wheels in accordance with the engineering drawings and CCU standard details. All the fencing and gate components shall be adequate to meet the required wind resistance loading.

2.3.6 Driveways

The contractor shall construct a sixteen (16) foot minimum concrete driveway as shown on the engineering drawings and CCU standard details and CCCDED Specifications. The driveway shall include right-of-way culverts, if required, and drainage shall be in accordance with Charlotte County Building Department specifications.

2.3.7 Landscaping

The contractor shall provide landscaping, if required, in accordance with CCU Specification Section 002920 “Landscaping”.

PART 3 - EXECUTION

3.1 GENERAL

a. The contractor shall prepare the standard lift station site for construction. This shall include the establishing of maintenance of traffic, surveying, site clearing, installation of silt fence, exposure of existing underground utilities, and notification of residences that may be impacted

by the construction. The standard lift station wetwell and concrete cover and slab, valves, piping, pump/motor assemblies and rails, MCC, water service(s), electrical wiring/conduit, pad, fencing and gates, access panel and frame, driveway/culverts, optional equipment, and accessories shall be installed in accordance with the contract documents.

b. Installation shall be made by skilled and licensed technicians and coordinated with other trades as necessary.

c. The standard lift station receives wastewater flows continuously at varying rates and the level of the flow in the wet well is monitored by liquid level sensors. The wet well liquid level sensors shall be suspended at various levels in the wet well and transmit the level of the wastewater in the wet well directly to the MCC. The level sensors shall be set for the following conditions in coordination with CCU operational personnel:

Pump off
Pump on
Lag pump on
High liquid level alarm

d. The MCC is an integrated system. The contractor shall furnish and install the MCC as one complete package to include all equipment and appurtenances regardless of the manufacturer and shall be responsible for the MCC to perform as a fully integrated operable system.

The MCC shall be designed to provide the following functions:

Turns pump off
Turns pump on
Turns lag pump on
Provides for alternate pumps operation
Activates the audio and visual alarms in the event of high liquid wet well levels
Activates the battery backup high liquid level alarm in event of power loss and resets the alarm when the power is restored
Allows for the manual connection to a portable generator
Provides phase monitoring and protection
Monitor and indicates pump seal failures

If a TCU is required, the applicable MCC functions shall be transferred to the TCU/PLC unit to control as outlined in the TCU section.

e. The TCU shall be designed to provide the following functions:

- Lead/Lag: One pump operates as the lead or in-service pump and one acts as the lag or backup pump. The PLC alternates the lead and lag pump at operator settable intervals as required.

- Monitors lift station operational status and notifies County Central Control of normal and abnormal operations such as, but not limited to: status of power, generator operations, pump trip, high/low alarm levels in the wet well discharge flow, and records pump run time and pump starts.

- Pump on, Pump off

- High level, Low level

- Phase Voltage

- Liquid Level Control Sequence

Refer to CCU standard details for the complete list of the functions

f. The contractor shall coordinate the work of all of the sub-contractors, suppliers, manufacturers, etc. for the complete installation, integration, interconnection, testing, calibration, and startup of the instruments, sensors, controls, and related accessories.

g. The contractor shall provide for all temporary utilities and services required for his operations including but not limited to electrical power, water, sanitary facilities, etc. The contractor shall furnish, install, and maintain all temporary utilities and services during the contract period including removal and restoration of disturbed areas upon completion of the work. Such facilities shall comply with regulations and requirements of the National Electrical Code, OSHA, Florida Power and Light, and applicable Federal, State, and Local codes, rules, regulations and in accordance with CCU Specification Section 009910 – Sanitary Sewer System Rehabilitation.

h. The contractor shall be prepared to maintain wastewater flow as a part of his operations and provide all pumps, piping, and other equipment to accomplish this task, perform all construction, obtain all permits, pay all costs, and perform complete restoration of all existing facilities to equal or better condition to the satisfaction of CCU in accordance with CCU Specification Section 009910 – Sanitary Sewer System Rehabilitation.

3.2 INSTALLATION

a. Grounding rods shall be provided to adequately and independently ground the MCC, standby generator, TCU, and odor control in accordance with the contract documents. A grounding loop with a single ground rod may be substituted if approved by CCU.
b. The contractor shall connect the biofilter unit to the lift station water supply in accordance with the engineering drawings.

c. All wire ends shall be identified with wire markers at both ends.

d. All instrumentation wiring shall be shielded from a continuous source to destination and shall be grounded in accordance with the manufacture's recommendation.

3.3 BEDDING, BACKFILL, AND COMPACTION

a. All bedding, backfill and compaction shall meet the requirements of CCU Standard details and CCCDED specifications.

3.4 CALIBRATION

The contractor shall ensure the following:

a. The instruments shall be calibrated by the manufacturer in accordance with the contract documents.

b. A calibration sticker noting the date, calibration data and the technician's initials shall be affixed to the instrument. A calibration data sheet and log shall be prepared for CCU.

3.5 TESTING

a. The contractor shall not initially energize the equipment without the approval of CCU.

b. After installation and calibration, the contractor shall functionally test the major equipment and electrical components to verify their compliance with the manufacturers recommended specifications and the contract documents.

c. The contractor shall not activate or turn on any equipment until each control circuit has been red-lined for completeness and functionality and safety interlocks are tested.

d. The contractor shall document site testing activities by written test procedures and a testing log shall be maintained at the project site or given to CCU.

e. Wet well and valve vault exfiltration test shall consist of plugging all inlets and outlets, filling the wet well or valve vault with water to the rim of the structure, and letting the water remain for 24 hours. The water level is returned to the top of the rim and let stand for two (2) hours. No leakage shall be allowed for the test to pass.

3.6 STARTUP OPERATIONS

a. The system integrator/supplier shall provide equipment startup services for the project.

b. The system integrator/supplier shall be responsible for providing factory trained representatives for the startup of equipment requiring factory assistance during startup.

c. The system integrator/supplier shall coordinate with CCU to assist with the startup activities and provide necessary training of CCU personnel in the operation and maintenance of the system.

d. Upon construction installation of CCU -maintained sewer lift stations, startup operations and testing shall be conducted prior to final acceptance and release of sewer flows under the supervision of the CCU Engineering Department. At a minimum, a representative of the pump Supplier, a representative of the Contractor, and a representative of CCU-Wastewater Resources Department's Lift Station Maintenance Division will be present for startup testing. A "CCU Lift Station Startup Check List", as provided in CCU Standard Details, shall be completed and signed off in entirety before a facility shall be accepted by CCU.

3.7 SPARE PARTS

Per each lift station, the Contractor shall provide on or before final inspection:

a. one spare submersible pump identical to the one(s) being placed

Plus the following additional items:

b. two seal assemblies: top and bottom at impeller and at winding of motor
c. bearings: one complete set of bearings for each pump
d. o-ring and gasket kit for pump motor and impeller housing

In addition, the contractor shall provide level switches, one additional float (normally open type) with 50-ft of cable.

3.8 TECHNICAL MANUALS

a. The contractor shall provide operation and maintenance data in the form of an instructional manual. The manual shall be in a three ring binder and be arranged in sections and include a table of contents. The manual shall include appropriate drawings, schematics, pictures, sketches, specifications, flow diagrams, manufacturer's documents, etc. required to operate and maintain the individual standard lift station functions and the overall standard lift station as a system.

b. Two (2) copies of the O&M manuals shall be made available to CCU 30 days prior to the standard lift station start-up for review prior to start up. Upon CCU validation, the contractor shall provide two (2) hard copies and one electronic copy of the approved O&M manuals including copies of certified tests and inspection data.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

1.1.1 General

It is the intent of this specification to provide the requirements for use of the design, selection of materials, and construction of a master submersible sewage pump lift station, hereinafter referred to as “master lift station”, and all appurtenances. All mastermaster lift station installations shall also meet the requirements of the Florida Department of Environmental Protection (FDEP) permit and the Florida Administrative Code, as applicable.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all materials, equipment, tools, labor, and appurtenances necessary for site preparation, dewatering, construction, testing, and startup that is necessary to accomplish the work required under the contract to include, but not limited to, furnishing and installing the master lift station as described herein and as shown on the engineering drawings and CCU Standard Details.

The equipment shall form a completely operable non-clog submersible sewage pump system complete with pumps and rails, wet well liquid level sensors, wet well, hatch cover, valves, piping, water service(s), motor control center (MCC), grounding rods, all wiring and conduits, master lift station concrete pad, fencing, driveway, landscaping and all associated appurtenances.

The contractor shall install the Florida Power and Light meter can and install/connect the electrical service to the FPL service point at a hand hole for electrical service as shown on the engineering drawings and as defined in this specification.

1.1.3 Location of the Work

The construction shall be at the location shown on the engineering drawings.

The accessibility to the work sites shall vary, as the master lift station may be located in landscape areas, utility easements, residential and/or commercial backyards, and various other

locations. Damage to existing pavement surfaces, base courses and/or other surface improvements as a result of the contractor's activities shall be restored to like-new condition by the Contractor at provided for in the contract bid documents. The Contractor shall implement all required measures to provide CCU personnel and equipment with complete access to all work site areas during the entire course of performing this project.

1.1.4 Coordination of Work

The contractor shall be responsible for the satisfactory coordination of the master lift station construction with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Responsibilities

a. Notice to Residents: The contractor shall be responsible for notifying affected residents by the means of door hangers, mailings and/or all other appropriate means to alert residents at various times of the different phases of the construction of the master lift station. The notifications shall indicate the various work activities that the Contractor will be performing on their street and what they can expect as far as service outages, disruption of traffic, access inconvenience, unusual odors and other activities affecting residents.

b. Licenses and Permits: The contractor shall be responsible for obtaining all licenses, permits, authorizations, approvals, access agreements, consent from utilities/persons/organizations upon whose property is impacted, written releases of responsibility and all other required documents.

c. Work Access: The access to the site is shown on the contract documents. Additional accessibility to the site, as deemed necessary by the Contractor beyond what is shown on the engineering drawings, shall be the responsibility of the contractor, and all expenses associated with work site additional accessibility shall be taken into consideration as part of the contractor's bid unit prices. Written releases from the property owner impacted by additional accessibility obtained by the contractor shall be provided to CCU.

d. Clearance of Blockages or Obstructions in the Sanitary Sewer System: The contractor shall be responsible for clearance of blockages or obstructions in the sanitary sewer system created by the contractor’s construction methods.

e. Location and Exposure of Manholes: The contractor shall expose only those sanitary sewer structures necessary to perform the work as shown on the engineering drawings.

f. Existing Utility Operations: CCU shall shut down or manually operate all existing potable water, reclaimed water and sanitary sewer systems necessary for performance of the work. The Contractor shall submit a request to CCU for shut down or operational changes a minimum of 24 hours in advance.

g. By-Pass Operations: The contractor shall be responsible for continuous maintenance of flow of all existing utilities at the project site, unless otherwise agreed to by CCU.

h. Water Access: The contractor shall be responsible for obtaining water access necessary for performance of work under the contract from designated fire hydrants at the site of work or other suitable designated sources.

i. Disposal: The contractor shall clean up and dispose of all waste materials from the construction activities including all materials removed from the sanitary sewer system in conformance with all laws, regulations and standard practices.

j. Secure Storage Area: The contractor shall find secure storage areas of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract. CCU will not provide any space or place to store materials.

k. Maintenance of Traffic: The contractor shall be responsible for all maintenance of traffic and obtaining approval of a Maintenance of Traffic (MOT) Plan from the Charlotte County Public Works Department (CCPW) for work within the right-of-way of any County Road and from the FDOT for work within the right-of-way of any State Road.

1.1.6 Working Hours

The contractor shall carry out work in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of CCU.

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the compensation determined in the following manner including all labor, materials, equipment, installation, testing, startup, painting, training, technical support, operation and maintenance manuals and appurtenances necessary to complete all the work in accordance with the contract documents:

1.2.1 Site Work:

Site work including satisfactory coordination of utility construction, project site clearing and grubbing, fence removal and restoration, removal and disposal of existing bituminous and/or concrete materials, existing structures, existing culvert or other pipe, furnishing and installing fill material, all necessary grading of the site and all other associated work required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis unless otherwise provided in the bid form.

1.2.2 Wet Well, Access Hatch and Concrete Cover and Slab:

Wet well, access hatch and concrete cover and slab including excavation, dewatering, base materials, backfilling, external and internal coatings, provisions for pipe openings, joint sealing and wrapping, exfiltration testing of the wet well, and all other associated work required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis unless otherwise provided in the bid form.

1.2.3 Submersible Sewage Pumps:

Submersible sewage pumps including associated hardware, cables, guide rails, support brackets, chains, all electrical wiring to the Motor Control Center (MCC), conduits and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per each basis per each submersible sewage pump size specified.

1.2.4 Main Power Electrical Services:

Main power electrical services including wiring and conduit from the service point in the FPL installed hand hole to the FPL meter can, wiring and conduit from the FPL meter can to the master lift station MCC, the main power disconnect in the MCC, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.5 Piping and Valves:

Piping and valves, located within the fenced in area limits of the master lift station site, including fittings, flexible couplings, flange adaptors, flange connectors, gauges, pipe supports, brackets, vents, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

All piping and appurtenances outside the fenced in area limits of the master lift station site shall be measured and paid for within other bid items as provided in the bid form.

1.2.6 Motor Control Center (MCC):

MCC including the following general components: wet well liquid level sensors, electrical wiring and connectors, supports, switches, sensors, controllers, alarms, indicator lights, meters, electrical equipment, back-up battery, enclosure, panels, controls, indicators, terminal strips, terminal blocks, posts, motor starters, main circuit breaker, operating handles, magnetic contactor coils, seal leak probe, permanent labels, alternator relay, fused control circuit transformer, adjustable three phase power monitor, wiring diagram, grounding rods, explosion proof fittings, surge protector equipment, suppressors fittings, brackets, conduits, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.7 Soft Starter

The soft starter including any additional wiring, separate panel, control logic, controller, input circuit breaker, integrated motor and load protection, LCD screen, key-pads, contactors, reactors, controls, switches, signals, relays, conduits, connectors, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per each basis.

1.2.8 Water Service

The water service including tap, piping, meter box assembly, backflow prevention device, spigot, hardware, fittings, brackets, supports and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.9 Driveways

The driveways including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.10 Culverts

The culvert pipe, end sections, base material and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per linear foot basis per each size specified.

1.2.11 Fence and Gates

The fence and gates including posts, pipes, fabric, bars and straps, fasteners, gate latches, coating, pig ring ties, hardware and accessories, concrete footings and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.12 Flood Light

A weather-proof 300 W quartz flood light, 120 V GE qhf-300, suitable for mounting to TCU antenna tower or other structure as provided on the engineering drawings including posts, conduits, wiring, MCC switch, hardware and accessories, concrete footings and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.13 Standby Generator

The standby generator including the Automatic Transfer Switch (ATS), standby generator concrete pad, wiring, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.14 Rain Gauge

1.2.15 Groundwater Monitoring Station

1.2.16 Flow Meter

1.2.17 Odor Control System

The odor control system (biofilter unit only, biofilter unit with optional secondary activated carbon polishing unit or stand-alone activated carbon filter unit) including motors, enclosure, skids, wiring, valves, media, absorption material, absorber system, absorber vessel, VFD controlled centrifugal fan with sound attenuation enclosure, switches, control transformer, gauges, sample probes, screen, grates, ductwork, conduits, and connectors, piping, concrete pad, anchors all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.18 Optional Equipment

1.2.18 Variable Frequency Drive

The variable frequency drive including the wiring, separate panel, control logic, controller, input circuit breaker, harmonic suppression equipment, contactors, reactors, controls, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.19 Telemetry Control Unit (TCU)

The Telemetry Control Unit (TCU) including concrete base, tower, enclosure, galvanized steel piping, tie wraps, antenna, coax cables, conduits, ground rod, default screen or indicating LED, site signal survey and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

1.2.20 Miscellaneous:

All items required for the completion of the master lift station and not included as a specific bid item shall be considered incidental to the project and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (LATEST REVISION)

Wherever reference is made to any published standard, code, or standard specification, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to which is in effect at the date of the opening of bids.

AWWA:
C-111 Rubber – Gasket Joints for Ductile-Iron Pressure Pipe Fittings
C-151 Ductile-Iron Pipe, Centrifugally Cast
C-153 Ductile-Iron Compact Fittings
C-600 Installation of Ductile-Iron Mains and their Appurtenances
C-651 Disinfecting Water Mains
C-652 Disinfection of Water-Storage Facilities
C-900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
C-901, Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. (19mm) Through 3 In. (76 mm), for Water Service
C-906 Polyethylene (PE) Pressure Pipe Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
C-909 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger

ASTM:
A-139Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
D-883, Standard Terminology Relating to Plastics
D-1120Standard Test Method for Boiling Point of Engine Coolants
D-1248 Polyethylene Plastics Extrusion Materials for Wire and Cable
D-1598 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D-1599 Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
D-1785Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
D-1869 Rubber Rings for Fiber-Reinforced Cement Pipe
D-2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
D-2563 Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts
D-2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
D-3350 Polyethylene Plastics Pipe and Fittings Materials
D-4097 Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks

National Bureau of standards Voluntary Product Standard "Custom contact molded Reinforced Polyester Chemical Resistant Process Equipment".
PTC 8.2

Wastewater Collection/Transmission System Requirements

AASHTO Code

Florida Administrative Code (FAC)

Recommended Standards for Wastewater Facilities

National Electrical Code (NEC)

NEMA

Underwriters Laboratories (UL)

Federal Communication Commission

Institute of Electrical and Electronics Engineers (IEEE)

Internal Corrosion Direct Assessment (ICDA)

National Fire Protection Association (NFPA)

National Bureau of Standards (NBS)

Air Movement and Control Association (AMCA)

The Contractor shall, when required, furnish evidence satisfactory to CCU that materials and methods are in accordance with these codes, specifications, standards, etc. where so specified.

In the event any questions arise as to the application of these codes, specifications, standards etc., copies shall be supplied on site by the Contractor. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

1.4 PARTIAL LISTING OF RELATED SECTIONS

001760 – Surveying and Record Drawings
002310 – Pipe Removal, Disposal, Alteration, Modification or Pipe Abandonment
002320 – Gravity Sewer System
002325 – Force Mains
002340 – Valves
002240 – Dewatering
002742 – Sidewalks, Driveways, Streets
002920 – Landscaping
002930 – Grassing
003310 – Cast-in-Place Concrete
003300 – Pre-Cast Concrete Products
003600 – Grout
009900 – Surface preparation, painting and coating
009910 – Sanitary Sewer System Rehabilitation
009920 – Sanitary Sewer Structures Rehabilitation

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 General:

The Contractor shall submit complete detailed documentation of all materials for approval by the CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

The contractor shall include the statement that the submittals have been reviewed and the materials meet CCU specifications and/or Standard details.

The Contractor shall provide proof of supplier certification/training for thermal butt-fusion of pipe for any employee fusing pipe.

Final written approval is at the discretion of the CCU.

For materials that the contractor is requesting deviations from this specification and/or Standard details, the contractor shall submit in writing a minimum of 60 days prior to construction, documentation to justify approval of these materials by CCU. The Contractor shall submit one

(1) signed electronic copy of the material submittals. No fabrication/construction shall take place until the final shop drawings are reviewed by CCU. Final approval is at the discretion of CCU.

1.5.2 By-Pass Operations: The Contractor shall submit a by-pass plan to CCU for review a minimum of 20 days prior to the start of by-pass operations.

1.5.3 Shop Drawings:

1.5.3.1 Structure(s): The contractor shall provide shop drawings for the structure(s) certified by the manufacturer. The submittals shall include the specifics being proposed for the outside coatings, inside coatings of the wet well top, concrete and reinforcement, access hatch, structural loading, buoyance provisions, outside seam wrap, sealant between structure sections, invert and clocking of piping, size and location of openings, waterproof gaskets and any other appurtenances applicable to the structure(s).

1.5.3.2 Submersible Sewage Pumps: The contractor shall provide shop drawings for the submersible sewage pumps certified by the manufacturer. The submittals shall include at a minimum: pump characteristic curves showing capacity in GPM, NPSH, TDH, efficiency, pumping horsepower from 0 to 110 percent of design capacity, impeller type, discharge diameter, passible sphere size, design drawings, a written description of the interchangeability of rails and discharge between the supplied submersible sewage pump and all CCU acceptable manufacturers, and any other appurtenances applicable to the submersible sewage pumps. The shop drawings shall include certification data in the form of testing results indicating that all AWWA, state, federal, and engineering standards are met. If requested by CCU, the Contractor shall provide certified factory pump performance test data in the form of Section 6 of ASME PTC 8.2.

1.5.3.3 MCC: The contractor shall provide shop drawings for the MCC. The shop drawings shall include schematics, manufacturer brochures, and test results for pump settings, all MCC components, all other electrical components and appurtenances applicable to the MCC. The shop drawings shall include certification data in the form of testing results indicating that all NEMA, UL, AWWA, state, federal, and engineering standards are met.

1.5.3.4 Standby Generator and ATS: The contractor shall provide shop drawings for the standby generator and ATS. The shop drawings shall include schematics, manufacturer brochures and test results for all standby generator and ATS components and appurtenances applicable to the proposed standby generator and ATS. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, and engineering standards are met.

1.5.3.5 Odor Control:

a. General:

The odor control system shall be supplied by a manufacturer who has been regularly engaged in the design and manufacture of the equipment having a minimum of 5 years' experience in its design, fabrication, and testing of odor control systems of the type specified. The equipment supplier shall provide a list of a minimum of 10 identical installations of the type specified that have been in operation for a minimum of 5 years. Other manufacturers shall demonstrate to CCU its equipment is of equal quality of the manufacturer specifically named herein.

The contractor shall submit complete shop drawings for the odor control system, together with all piping, ductwork, valves, and control for review by CCU. The shop drawings shall include schematics, manufacturer brochures, and test results for all odor control components and appurtenances applicable to the proposed odor control. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, and engineering standards are met.

The contractor shall complete the "TBDs" in table "A" below for the odor control system being proposed based on the size of the wetwell, influent flows, inlet, outlet, standard lift station operational temperatures and the estimated inlet H2S concentration in ppm. The design documents shall be provided by the manufacturer to CCU certifying that the odor control system meets the contract requirements.

Table A

Air Flow Rate, cfm	TBD
Estimated Inlet H2S Concentration, ppm	TBD

The contractor shall submit the following information for review before the equipment is fabricated:

1) Letters of Certification of Compliance of materials, equipment, etc.
2) Final certified drawings showing outline dimensions, foundation layout or mounting information, and other pertinent dimensions.
3) Field assembly drawings and/or diagrams.
4) Schematic and wiring diagrams of power, control, and piping systems with all devices, terminal, and wires uniquely numbered and clearly indicating between factory and field wiring. All field wiring shall be included for each diagram to describe all modes of operation of the system indicated. Where the integrated system requires interlocking and control and other components in normal operation, these components shall be included in the description of operation.
5) Drawings of system showing assemblies, arrangements, piping, electrical, mounting details, equipment outline dimensions, fitting size and location, motor data, operating weights of all equipment and sufficient information to allow CCU to check clearances, connections, and conformance with the specifications .
6) Renewal parts list with diagrammatic or cross-section drawing showing part identification. Material analysis or trades designation for each significant part shall be noted on parts lists or on a separate sheet.
7) Materials of construction of all equipment.

8) Control panel drawings shall indicate all equipment installed inside and outside of the panel including the location of all alarms (for biofilter) ; lamps; complete instrumentation; and control, logic and power wiring diagrams.
9) Electrical equipment rating and data sheets for all devices.
10) Design calculations certified by a Registered Professional Engineer with demonstrated experience in the design of these systems.
11) Pump data and performance curves showing flow, pressure, and horsepower (for biofilter)
12) Specifications, performance data, and calibration curves for exhaust fan and auxiliary components

b. Biofilter:

Any manufacturer whose main business is Fiberglass Reinforced Plastic (FRP) manufacturing shall not be accepted as a supplier of the complete system.

c. Activated Carbon Adsorber:

Any manufacturer whose main business is HDPE manufacturing shall not be accepted as a supplier of the complete system.

1.5.3.6 TCU: The contractor shall provide shop drawings for the TCU. The shop drawings shall include schematics, manufacturer brochures, and test results for pump settings, flood light, antenna, tower, all other TCU components and appurtenances applicable to the TCU. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, AWWA, state, federal, and engineering standards are met.

1.5.3.7 VFD: The contractor shall provide documentation with the material submittals on the experience of the VFD manufacturer and his interfacing with the submersible pump manufacturer.

The contractor shall also submit a manufacturer's statement that the variable frequency drive meets the requirements of Federal Communication Commission and IEEE. Adequate IC (inductance-capacitor) filters shall be provided as required to meet this criteria.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website. Any products not listed on this approved APL will be required to go through the CCU submittal process.

2.1.1 GENERAL

All equipment and products shall be permanently identified with the model number and manufacture's nomenclature.

2.2 EQUIPMENT

The equipment used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below and/or as provided in other sections of the contract documents.

2.2.1 Submersible Sewage Pumps

2.2.1.1 General

a. The submersible sewage pumps covered by this specification are intended to be standard pumping equipment of proven ability.

b. The submersible sewage pumps shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactory when installed as shown on the engineering drawings and/or standard details.

c. The submersible sewage pumps shall be heavy duty electric submersible, centrifugal non-clog units designed for handling raw and unscreened wastewater (minimum of 3" sphere). The submersible sewage pumps shall be capable of operating in a liquid temperature up to 115°F and to a depth of 65 feet.

d. The submersible sewage pump and motor unit shall be suitable for continuous operation at full data plate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary submersible sewage pumps or cooling fans to cool the motor shall not be acceptable. The submersible sewage pumps mechanical seals and motor units shall be from the same manufacturer to achieve standardization of operation, maintenance, spare parts, manufacturer's service, and warranty.

e. The submersible sewage pump shall be tested and approved by Factory Mutual or U.L. as explosion proof for use in Class I, Groups C and D, Division 1 hazardous locations.

f. The submersible sewage pump shall have a sliding bracket for connecting to the dual guide stainless steel rail system. The sliding bracket, either directly or with an adaptor, shall allow for the interchangeability of all CCU acceptable submersible sewage pump manufacturers at alternative locations.

g. The submersible sewage pump shall have a manufactured sized electrical cable and shall be a minimum of 50 linear feet. The cable shall conform to NEC and ICDA Standards with P-MSHA approval. The cable shall be sealed with a protective covering prior to installation.

h. The submersible sewage pump shall include a 316 stainless steel chain capable of supporting the weight of the submersible sewage pump for installation and removal of the submersible sewage pump. The chain shall be connected to the submersible sewage pump bail using a 316 stainless steel clevis. The length of the chain shall be equivalent to the depth of the wet well plus additional 6 feet.

i. The submersible sewage pump discharge diameter shall be as specified on the engineering drawings and/or CCU standard details. For discharge diameters 4" or larger, the manufacturer supplied submersible sewage pump discharge shall be compatible among all CCU acceptable manufacturers' submersible sewage pump discharge base elbows.

j. The submersible sewage pump shall be cast iron with appropriate coating to protect submersible sewage pump from corrosive properties of wastewater.

k. The impeller shall be mounted directly on the motor shaft extension in such a manner that it shall not become detached if the submersible sewage pump is operated in the wrong direction. The impeller shaft shall be 420 stainless steel or greater and shall extend from the motor to the impeller cap nut.

l. All submersible sewage pump mated surfaces shall be machine fitted for watertight sealing.

m. A 316 stainless steel lifting bail handle shall be provided on the submersible sewage pump housing suitable for lifting the entire submersible sewage pump assembly and attaching the lift chain.

n. The submersible sewage pump shall operate to a maximum submergence of 65 feet including electrical cable entry.

o. All electrical parts shall be housed in an air or oil filled cast iron, water-tight casing.

p. All external hardware shall be 316 stainless steel.

q. The motor shall be designed to allow a minimum of 15 starts per hour.

r. The motors shall include thermal and moisture protection to shut down the motor due to high operational temperatures or infiltration of moisture. The motor shall be automatic restarted once the operational temperature is achieved.

s. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.2 Motor Control Center (MCC)

2.2.2.1 General

The submersible sewage pump motor control elements shall be installed in a 316 stainless steel NEMA 4X enclosure and include the following equipment:

a. The panel shall be constructed of a heavy-duty box frame of all welded construction, utilizing specially formed #12-gauge 316 stainless steel angle and channel members.

b. The dead front interior panel(s) for instrument mounting shall be constructed of a minimum of #11-gauge aluminum.

c. The interior panel(s) for instrument mounting shall be constructed of a minimum of #14-gauge epoxy coated steel.

d. Panel mounted controls and indicators shall maintain panel integrity. Suitable stiffness shall be provided when required to maintain flatness and provide extra rigidity.

e.

f. All panels wiring to external equipment shall be terminated on screw-type terminal strips.

g. Terminal blocks shall be separated into groups (power, AC control, DC signal, data, etc.). All terminals shall be shall be marked with legible permanent labels or otherwise identified.

h. The MCC shall be mounted on 4” tubular top capped aluminum posts installed in concrete above the 100 year flood plain in accordance with the engineering drawings and standard details.

i. All circuit breakers shall be accessible without opening the MCC dead front door(s).

j. The MCC shall include at a minimum the following for each submersible sewage pump: a motor starter, a HOA switch, a circuit breaker mounted with the operating handles through the dead front door(s), a leak seal indicating light, and an elapsed time meter.

k. The MCC shall contain a manual pump control operated by a manual Hand/Off/Auto (HOA) by-pass switch located in the main MCC which is NOT an automatic redundant switch.

l. The MCC shall include at a minimum: a 24-volt AC wet well liquid level sensors control circuit, 120-volt AC audio and visual alarms, an emergency generator receptacle with circuit breaker, a main circuit breaker, a control circuit breaker, and a 12-volt DC audio and visual battery backup alarm system.

m. All power shall be disconnected from the control elements when the standard lift station main disconnect is in the “OFF” position.

n. In each motor, a heat sensor thermister and a seal leak probe shall be wired to a red warning signal light on the dead front door and shall be marked with legible permanent labels.

o. An alternator relay shall be supplied to alternate the individual submersible sewage pump on each successive cycle.

p. A fused wet well liquid level sensors control circuit transformer shall be supplied to operate controls.

q. In 480-volt AC applications, a fused control circuit transformer shall be supplied to provide 120-volts AC auxiliary equipment power.

r. An adjustable single or three phase power monitor shall be provided to indicate and protect the pump via the control circuit in the event of loss of any phase, low and high voltage on any or all phases, and phase reversal with automatic reset and built-in time delay on trip.

s. Audio and visual alarms shall be installed for monitoring high water levels, system equipment failures, and main input power levels failures. Audio and visual alarms shall be wired to sensors provided for a high water levels. Water level and system equipment failure alarms shall be powered directly from the main power supply to the MCC. The audio alarm shall be disabled by a manual silence switch; however, the visual alarm shall remain on until the alarm condition is corrected. If the alarm is a result of a loss of power to the standard lift station, the alarms shall automatically reset with the restoration of land line power or from a portable generator set. The loss of power audio and visual alarms shall be connected to a continually charged 24 hour back-up 12 volt battery.

t. The panels shall be wired and assembled per UL 508 Standards. All electrical components and materials shall be listed by UL and shall bear the appropriate UL listing mark or classification. Each panel shall be listed and labeled as UL 508 Industrial MCC. Panels shall comply with NFPA 79 - Industrial Machinery. A permanent, non-paper wiring diagram shall be mounted on the inside of the cabinet door.

u. A 120 VAC time delay relay (0 to 60 second adjustable on delay) to re-energize control circuit of lag submersible sewage pump after power restoration shall be provided for step loading on submersible sewage pumps over 20 HP. VFDs or soft starts shall be provided for submersible sewage pumps over 20 HP as approved by CCU.

v. All MCCs shall include a grounding rod with 10-gauge wire that is installed in accordance with current local, state and national codes.

w. 316 Stainless steel and schedule 80 polyvinyl chloride conduit piping shall be provided and installed as shown on the CCU design detail for connections between the MCC and the wet well structure, the MCC and the TCU (if required), the MCC and the standby generator (if required), the MCC and the odor control (if required), the MCC and the ground rod, and the MCC and the FPL service point. Explosion proof fittings shall be provided and installed on the conduit as shown on the CCU design detail for connections between the MCC and the wet well structure.

x. A trouble light including switches shall be mounted in the MCC.

y. Surge protector equipment in accordance with UL 1449 Standards shall be installed on the load side of the MCC main circuit breaker for protection of all AC electrical equipment in the MCC and the motors from the effects of lightning induced currents, substation switching transients, and internally generated transients.

z. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.2.2 Approved Products:

All electrical and accessories shall meet CCU standard details and specifications and shall be reviewed by CCU with the standard lift station submittals except as noted below.

Emergency Generator Connector:	Pyle National MFG JRE 4100 PR.
Trouble Light:	Leviton 9880
120 Volt Alarm Light:	Ingram LXR-40 or Ohio Electric RL-3K
120 Volt Alarm Horn:	Edwards ALA-896-N5
12 Volt Alarm Light:	Ingram SLR-123
12 Volt Alarm Horn:	Ingram AH-122DG
Elapsed Time Meter:	ETMAC 200-10NG7 Round Mount
Surge Suppressor:	Current Technology Transguard 150

2.2.3 Soft Starter

2.2.3.1 General

a. A dedicated soft starter for each submersible sewage pump and connecting wiring shall be supplied by the submersible sewage pump manufacturer for all motors equal to or greater than twenty (20) horsepower unless a VFD is required as per the Special Provisions. The soft starter shall be installed in a separate MCC, if required in the Special Provisions. No supplementary cooling in the form of an air conditioning unit shall be used, unless required in the Special Provisions.

b. All of the components shall be a complete unit, factory wired, and tested as a complete system. Each soft starter shall operate as a stand-alone unit with no interaction with each other.

c. The soft starter is a function control integrated in the lift station control panel sized to operate a variable torque load at the rated pump horsepower. The speed range shall be from a minimum speed of 0.5 Hz to a maximum speed of 60 Hz with an input voltage frequency range between 47.5 to 63 Hz.

d. The soft starter shall be adjustable between 30-70% of the normal line voltage and shall be adjustable between 200 and 500% of the soft starter's full load current.

e. The ramp time between initial torque and full load torque shall be adjustable between 1 and 120 seconds in increments of one second. The soft start shall include a jog function initialized directly from the keypad.

f. The soft starter shall have Deceleration Control (soft stop) as a standard feature with an adjustable deceleration time from 1 to 120 seconds in increments of one second.

g. The soft starter shall include the following integrated motor and load protection:

    1) Overload protection based on dynamic thermal register retained in the memory even upon loss of power.
    2) A manual reset and an automatic reset for unattended remote applications.
    3) Phase imbalance protection - adjustable sensitivity of two phases between 10% to 80% of the rated current.
    4) Phase reversal protection - motor will not run the inappropriate direct.
    5) High current protection - unit shall trip if the current exceeds eight times the set rated current.
    6) Under load protection - trip level shall be programmable from 40 to 100% of the full load motor current.
    7) Fault detection - all fault signals are to be reported to the LCD screen and the system shall not be disabled with a minimum recording of the last 20 events.

h. Two programmable input signals shall be available, and each input shall have the capability of being programmed for None, Reset, Jog, and Enable Motor.

i. All input and control devices shall be rated for 24 VDC control.

j. Three physical signal relays and one virtual relay for communication shall be provided and individually programmed for Run, Top of Ramp, and Event listing.

k. The soft starter shall be provided with a 2-line 20 character per line LCD display screen that does not use any type of code to allow for operator interface.

l. Serial communications shall be a built-in function as a standard feature and shall include MODBUS, DeviceNet, Profibus DP, and ASI as the communication protocol available through the Field Bus Plug.

m. The soft starter shall be programmable with a key pad and display that can be viewed/operated from the inside dead-front panel.

n. Internal calibration adjustments are as follows:
    1) Minimum speed.
    2) Maximum speed.
    3) DC boost.
    4) Acceleration/deceleration rates.
    5) Stop mode (ramp or coast).

6) Automatic restart after fault trip with lockout after five attempts to restart.
7) Anti-wind milling adjustable brake time. 8) Adjustable volts/Hertz.

o. Unit mounted operator controls are as follows:
1) Drive keypad display and a keypad Control Panel with a setting dial for each drive.
2) PID values (optional).
3) Speed – manually adjustable.
4) Indicating speed meter.
5) Power ON light.
6) Alarm reset switch.

p. The soft starter shall include the following standard features which shall be enabled if a TCU unit is specified:
1) Built-in communication via a cable connection or terminal block.
2) Built-in Modbus-TCU communications via a terminal block connection.
3) One (1) connector slot for internally mounting plug-in options.
4) Removable control terminal block.
5) Sink/source selectable control logic.

q. The soft starter shall include the following provisions for remote external controls, if a TCU is specified:
1) Two (2) wire ON-OFF control.
2) One (1) analog input for speed set point.
3) Two (2) analog outputs: one for motor current and one optional for motor speed tied to PLC.
4) Two (2) digital outputs: one for drive running and one for drive fault.
5) Four (4) digital inputs: one for start/stop, one for enable (trips, low wet well level, and emergency stop push button), one for auxiliary for high motor winding temperature, and one for speed select signal for Hand-Off-Auto.
6) One (1) hand-off auto switch.

2.2.4 Wet Well Liquid Level Sensors

2.2.4.1 General

a. The wet well liquid level sensors shall be operated by reduced voltage, intrinsically safe mercury switch sealed in a solid polyurethane float ball.

b. The wet well liquid level sensors cords shall be suspended from a 316 stainless steel bracket attached to the lip of the access hatch at the depth specified as shown on the CCU design detail.

2.2.5 Telemetry Control Unit (TCU) (if required)

2.2.5.1 General

a. The TCU transmits analog signals from the lift station MCC to the CCU central monitoring location and from the CCU central monitoring location to the lift station MCC.

b. The TCU includes a grounding rod with 10-gauge wire and shall be installed in accordance with current local, state and national codes.

c. The TCU data shall be displayed continuously at the TCU by a default screen and indicating LED and shall indicate, at a minimum:

    1) Operating status of each submersible sewage pump
    2) Operating mode of the master lift station
    3) Wet well liquid level sensors status

d. All other components and appurtenances including tower, antenna, control box, conduits, etc. shall be as specified on the engineering drawings and in the CCU standard details.

e. CCU will provide the TCU frequency to the contractor.

2.2.5.2 Approved Products:

The TCU and accessories shall meet CCU standard details and specifications as determined by CCU.

The following TCU manufacturer is approved:

Data Flow Systems, Inc.

2.2.6 Variable Frequency Drive (VFD) (if required)

2.2.6.1 General

a. A dedicated VFD for each submersible sewage pump and connecting wiring shall be supplied by the submersible sewage pump manufacturer. The VFDs shall be installed in a separate MCC, if required. No supplementary cooling in the form of an air conditioning unit shall be used.

b. The VFD shall consist of a variable frequency controller, input circuit breaker, harmonic suppression equipment, output isolation contactor, input and output line reactors, and controls. All of the components shall be a complete unit, factory wired, and tested as a complete system. Each VFD shall operate as a stand-alone unit with no interaction with the other VFDs.

c. The VFD shall maintain a .95 minimum true power factor though out the entire speed range and shall be used with any standard NEMA-B squirrel-cage induction motor having a 1.15 service factor.

d. Additional specific requirements are stipulated in the contract Special Provisions.

2.2.7 Standby Generator and Automatic Transfer Switch (ATS) (if required)

2.2.7.1 General

a. A standby generator shall be diesel powered and shall provide the same kW as the land line power source with a maximum voltage dip of 15% if the rated load is applied in three steps with 15 second increments.

b. A standby generator shall be permanently connected to the lift station MCC via an ATS supplied by the generator manufacturer.

c. The standby generator shall be provided with a non-rusting weather housing; a 500 gallon sub-base fuel tank; a 316 stainless steel NEMA 3R enclosure for the ATS; water and temperature gauges; a factory compatible DC battery charger including ammeter; an AC voltage regulator; a voltage adjusting rheostat; start-stop and VM-AM phase selector switches; an AC voltmeter and ammeter; frequency and elapsed time meters; two (2) dry contacts closure rated for 10 amperes at 120 volts; an automatic start/stop control with fault indication lights and corresponding safety switches for pre-warn and shutdown low oil pressure; and a pre-warn and shutdown high water temperature, low water temperature, over-speed, over-crank, battery charger malfunction and selection switch (off, auto, manual) with light.

d. The standby generator shall automatically start and attain the rated kW and frequency upon the closing of a remote starting contact with the ATS within 10 seconds.
e. The standby generator shall be mounted on a structural steel sub-base designed to maintain proper alignment of the unit and shall be installed on a concrete pad as detailed in the contract documents using properly sized epoxy HILTI anchors.

f. The standby generator shall include all required components to allow pre-programed self-operation under load in compliance with manufacturer's recommendations.

g. The standby generator shall include a grounding rod with 10-gauge wire and installed in accordance with current local, state and national codes.

h. All other components and appurtenances shall be as specified on the engineering drawings.

Rain Gauge

Groundwater Monitoring Station

Flow Meter

2.2.9 Odor Control

2.2.9.1 General

a. The odor control system shall be a primary biofilter unit including a built-in carbon filter stage and, if required, an optional secondary activated carbon polishing unit connected to the biofilter unit; a VFD controlled centrifugal fan installed in a with sound attenuation enclosure; interconnecting ductwork; electrical wiring and conduit; and appurtenances for a complete operating system.

b. The odor control system shall treat in a single pass odorous air from the wet well. The system shall be designed for manual and continuous automatic operation. Access man ways shall be provided to allow access to the internals of the system. The system shall be designed to withstand a temperature up to 120 degrees F. The module and all accessories shall be factory mounted, piped, and wired to the maximum extent possible. The system shall be installed on the lift station pad with stainless steel fasteners.

c. The odor control system shall be skid mounted and designed to maintain proper alignment of the installed unit on a concrete pad as detailed on the engineering drawings using properly sized epoxy HILTI anchors. The controls shall be attached to the skid assembly and shall be housed in a water proof NEMA 4X enclosure.

d. The overall system size, including the fan, controls, and appurtenances shall not exceed the dimensions shown on the engineering drawings. At a minimum, access man ways shall be provided between the treatment stages. A portion of the system top shall be removable for access to the top of the second stage.

e. The odor control system shall meet the following performance when operating:

INLET	OUTLET
1-10 ppm H_2S	0.1 ppm H_2S
Greater than 10 ppm H_2S	1.0% of inlet (99.0% removal)

2.2.9.2 Biofilter

a. The biofilter odor control unit shall be a two-stage, biological absorption/adsorption system that shall include but not be limited to a fiberglass reinforced plastic (FRP) vessel, nozzles, two independent stages of inorganic treatment media (biological and built-in carbon polishing), moisture controls, nutrient supply system, VFD controlled air supply fan, ductwork, dampers, and all necessary accessories. The biological treatment stage shall utilize a

granular inorganic media to facilitate absorption and adsorption of odor compounds designed to remove minimum of 99% of H2S vapor in a single pass. The polishing stage shall utilize a granular media designed to adsorb odorous compounds with the ability to support biological degradation of the compounds. The first stage shall operate from an independent water distribution system to irrigate the top of the first media bed with complete and even coverage via spray nozzles to maintain optimum wetted conditions to support unique microbial growth for biological destruction of the odorous compounds and removal of toxic metabolites. Biofilter odor control units using any type of organic media and biofilter odor control units using a single inorganic media shall not be acceptable. The complete treatment vessel shall be fabricated of premium grade FRP.

1) The air enters the vessel through the humidification section. After humidification, the first treatment stage contains media specifically designed to support biological growth for degradation of odor compounds. This stage absorbs odors from the air stream. The second polishing stage contains media specifically designed to adsorb odor compounds and to support biological degradation of those compounds. This stage provides final removal of odors to the specified level. Overall media depth shall be a minimum of 48 inches.

2) The first stage of media shall be wetted with fresh potable or re-use make-up water.

b. The system shall include all piping, valves, control panel and internals pre-mounted and piped on the unitary constructed system. The material of construction of internals shall be as follows:

Packing Media Support	HDPE and FRP
Liquid Distributor	PVC
Spray Nozzles	PVC
Humidifier Nozzles	316 SS

c. The multi-stage packaged FRP unit shall be of unitary construction. The system shall be shipped as a single piece.

d. Design and Performance Criteria:

1) Criteria: The biofilter odor control unit shall be capable of removing foul air at a rate no lower than the rate shown on the following table.

INLET	OUTLET
1-10 ppm H2S	0.1 ppm H2S
Greater than 10 ppm H2S	1% of inlet

2) System Performance: The biofilter odor control unit shall demonstrate the following performance when operating under design flow conditions listed above:

Maximum Pressure Drop: The pressure drop across the odor control unit shall not exceed 5.0 in. w.c. at the maximum air flow rate specified above.

e. Miscellaneous Material of Construction

1) The vessel and accessories shall be contact molded manufactured in accordance with NBS PS 15-69, ASTM D 4097 for contact molding. Any material of construction other than FRP with premium grade resin will not be allowed.

2) Resin used in the system liner shall be a premium vinyl ester type such as Hetron 922 by Ashland Chemicals, Derakane 411 by Dow Chemical, Vipel F010 by AOC, or CCU approved equal. The resin shall be reinforced with an inner veil of a suitable synthetic organic fiber such as Nexus 111-00010.

3) Glass fiber reinforcement used shall be commercial grade corrosion resistance borosilicate glass. All glass fiber reinforcement shall be Type C, chemical grade, Type E electrical grade. Surfacing veil shall be 10 mil Nexus 111-00010 or equal. Mat shall be Type "E" (electrical grade) glass, 1 1/2 oz. per sq. ft with a nominal fiber length of 1.25 + 0.25 inches, with a silane finish and styrene soluble binder. Continuous glass roving, used in chopper gun spray-up applications shall be type "E" grade with chrome or silane coupling agent. Alternate layers of mat and woven roving shall be used for reinforcement.

4) Unless otherwise specified, all fasteners, and metal attachments such as anchors, brackets etc. shall be ANSI 316 SS. Unless otherwise specified, all gaskets shall be EPDM.

f. Fabrication:

1) Fabrication shall be in accordance with NBS PS 15-69, ASTM D 3299, and ASTM D4097. All non-molded surfaces shall be resin incorporating paraffin coated to facilitate a full cure of the surface. All cut edges, bolt holes, and secondary bonds shall be sealed with a resin coat prior to the final resin paraffin resin coat. All voids shall be filled with a resin paste.

2) The inner surface of all laminates shall be resin rich and reinforced with one layer of NEXUS 111-00010with a minimum thickness of 10 mils. The interior corrosion liner shall consist of two layers of 1and1/2 oz. per sq. ft. chopped strand mat. If the application is by chopper gun, the spray upglass fiber shall be 1/2 in. to 2 in. long. The total corrosion liner thickness shall be a minimum of 100 mils and have a resin to glass ratio of 80/20. All edges of reinforcement to be lapped a minimum of one (1) inch.

3) Structural laminates shall consist of alternating layers of 1and 1/2 oz. per sq. ft. mat or chopped glass and 24 oz. per sq. yard woven roving applied to reach the designed thickness. The exterior surface shall be relatively smooth and shall have no exposed

glass fibers. The exterior shall be surface coated with gel coat containing ultra violet light inhibitors.

4) Accessories: Air inlet, air outlet, spray headers, baffles, media support, drain, and all connections shall be provided by the manufacturer. Tie down lugs shall be integrally molded into the walls of the vessel. All external bolts shall be 316 SS and designed for the specified loads. Interior fasteners shall be of corrosion resistant materials such as PVC or FRP.

g. Neoprene Pad: A ¼ inch thick, 60 durometer neoprene rubber sheet shall be placed underneath the vessel before installation on lift station pad.

h. Exhaust Fan

1) The exhaust fan shall be centrifugal design manufactured of FRP with a statically and dynamically balanced radial blade wheel. The fan inlet shall be slip type, and the fan outlet shall have a flanged nozzle. The fan shall have a neoprene shaft seal.

2) Fan shall be supplied with a TEFC motor with 1.15 service factor suitable for threephase, 60 Hz, 480 volt service and rated for Class 1, Div. 2, Group D installation. The fan shall be direct driven. The motor shall be inverter-duty and controlled by a VFD.

3) The fan shall be tested and rated in accordance with AMCA and bear the AMCA seal.

i. One of the two mineral vessels shall be fitted with a top-mounted, five-cycle multiport control valve to operate the backwash, brining, slow rinse, fast rinse, and refill cycles. An additional piston assembly shall be included to control the duty/standby status of the two vessels. A brass control valve including fixed and self-adjusting flow regulators shall be provided. A hydraulically balanced teflon coated piston shall be provided to perform the cycles of regeneration.

j. Instrumentation and System Controls

1) The electrical control panel shall provide electrical control for the exhaust fan and water addition system. A 3-phase power supply shall be supplied to the panel from the MCC to power the system.

2) The control panel enclosure shall be rated NEMA 4X. The panel shall be remote mounted by the contractor next to the system assembly at least 3 feet away to comply with requirements of a Class 1, Division 2, and Group D installation. The Contractor shall install and wire the local control panel to the bio filter mounted fan, metering pump, and solenoid valve. The control panel shall be factory tested to full operation with all other components prior to shipment.

3) The panel shall have the following components or capabilities:

i Fan switch (ON-OFF). ii Push-to-test button for water valve. iii Timer relay for on/off control of water valve.
iv Blower VFD
v Nutrient Pump (ON-OFF-AUTO)

4) The water control cabinet shall be constructed from a NEMA 12 rated FRP cabinet with all internal piping SCH 80 PVC. The cabinet shall be mounted to the system assembly. The cabinet shall contain the following components:

I Pressure reducing valve
ii Nutrient Pump (rated for installation in a Class 1, Division 2, Group D area) iii Irrigation solenoid valve (Explosion-proof rating) iv Valve for pre-humidification v Irrigation system pressure gauge

5) Water pressure regulator, solenoid valve, and Rota meter shall be provided for control of water application rates. These components shall be mounted in the water control cabinet.

k. Accessories

1) The direct reading Rota meter shall be a variable area type with a Teflon float, EPR "O" rings, and PVC fittings. The Rota meter shall be sized to the pipe and have a direct reading scale.

2) A nutrient containment and metering system shall be provided with the system. Nutrients supplied as a coating to the support media shall not be allowed.

3) All water and drain piping shall be SCH 80 PVC.

l. Nutrient Reservoir

The nutrient reservoir shall be integrated into the system sump. No loose external tanks shall be provided with the system.

2.2.9.3 Carbon Media Odor Control Unit

2.2.9.3.1 Stand Alone Activated Carbon Unit

a. If required, the Contractor shall install a carbon media odor control unit in accordance with the engineering plans. The carbon media odor control unit shall meet the requirements of this specification.

b. The unit shall have an AMCA certified centrifugal industrial fiberglass reinforced V-belt Arrangement No. 10 driven plastic fan equipped with undrilled inlet flange, outlet flange, Viton shaft seal, fan guard, and motor enclosure. Each fan and drive motor shall be mounted on a common base assembly designed for mounting on a concrete pad. The fan motor shall be high efficiency type, TEFC, and a with a 1.15 service factor and matched to the electrical service at the master lift station. Accommodation to accept a hand-held tachometer shall be available for each fan. Each fan shall have a drain with plug. The fan shall include graphite impregnation for grounding.

c. The contractor shall complete the "TBDs" for the unit fan being proposed for the following maximum operating conditions:

Air Flow Rate, cfm	TBD
S.P. up to Fan Inlet, in WC	TBD
Adsorbed Pressure Drop, in WC	TBD
Total S.P., in WC	TBD
Minimum Motor HP	3.0

d. The unit shall have a fan sound attenuation package capable of reducing the sound level by a minimum of 25 dB which shall be placed over the fan and motor assembly. The doors shall be equipped with heavy duty hardware and with seals to minimize noise leakage. Stainless steel sheet flashing shall be provided to enclose the penetrations in the enclosure for the fan inlet and outlet ducting. The enclosure shall be fitted with louvered vents as required for heat dissipation/ventilation.

e. The fan shall be factory wired to a stainless steel NEMA 4X panel. The panel shall have a fan control switch with a pilot lamp to indicate the fan running status. The power supplied to the panel shall be matched to the electrical service at the master lift station. The panel shall be provided with a power disconnect switch, VFD, and control transformer. The fan speed shall be manually adjusted by the operating the VFD.

f. The contractor shall provide the necessary ductwork between the fan ductwork and the adsorber vessel. The ductwork shall include a volume control damper with lockable louver for flow adjustment. The material of construction shall be same as that of adsorber vessel.

g. The carbon adsorber vessel shall be constructed of non-corrosive polypropylene with a minimum thickness of 1/8" is required for a vessel diameter between 18" and 24" and a 1/4" thickness for vessel diameter up to 60" and designed for the following criteria:

Vessel Diameter, ft	TBD
Vessel Straight Side Height, ft	TBD
Internal Positive Pressure, in. WC	+15
Maximum Operating Temperature, °F	150
Carbon Bed Depth, ft.	3.0

h. The carbon adsorber vessel shall have a differential pressure gauge to continuously monitor the pressure drop across the carbon bed. The differential pressure gauge shall be isolated with isolation valves and mounted on the vessel.

i. The carbon absorber vessel shall have shall have three (3) one (1) inch diameter sample probes per bed extending into the bed a minimum of twelve (12) inches. The sample probes shall be blocked off with a PVC ball valve.

j. The carbon absorber vessel shall accommodate a single bed of activated carbon having an average depth of three (3) feet. The carbon bed shall be supported on a polypropylene screen through an FRP support grating system. The screen and the support system shall be removable through the top cover. The top cover shall use quick release tie downs that are integral to the cover and not require the use of separate tools for the removal of the cover. The support system shall consist of removable grating. NOTE: Pall rings or other dumped packing media as a means of carbon support shall not be used. The support system shall be designed to withstand a load of at least 150 lbs/ft^2 with a minimum deflection of 1/4" under all conditions.

k. The carbon absorber vessel shall have a "gooseneck" type outlet to prevent rain water from entering into the system.

l. The activated carbon media shall be virgin, pelletized, and derived from high grade bituminous coal vapor phase type suitable for the control of sewage odors. The carbon shall have the following specifications:

Iodine Number, mgI_2/g	1050 min
MPD,mm	3.9-4.1
Apparent Density, g/cc	0.46-0.52
Hardness No.	95 min
Butane Activity	26 min
H_2S Capacity, gH_2S/cc*	0.30 min

* The H_2S breakthrough capacity is determined using ASTM standard method D6646-01. Prior to testing, the test sample shall be completely humidified by exposing the sample to a flow of humid air (>85% RH) for at least 4 hours. Testing shall be accomplished by passing a moist (85% RH) stream of air containing 1 vol. % H_2S and the selected concentration of CO_2 through a 1 inch diameter tube with a nine-inch deep bed of closely packed carbon at a rate of 1,450 cc/min and monitoring to a 50 ppmv H_2S breakthrough. The results shall be reported as grams of H_2S adsorbed per cc of carbon.

m. All steel hardware shall be 316 stainless steel unless stipulated in this specification or on the engineering drawings. Gaskets shall be full face with a minimum of 1/8" thickness and made of EPDM or neoprene suitable for the intended service.

n. The unit shall include a grounding rod with 10-gauge wire in accordance with current local, state and national codes.

o. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

2.2.9.3.2 Optional secondary activated carbon polishing unit

If the optional secondary activated carbon polishing unit is required, the contractor shall provide, as a minimum, the major components as specified under the stand-alone unit section including the concrete pad, the vessel, the carbon media, the connecting duct work and all other appurtenances necessary for a fully operational odor control system in accordance with this specification.

2.3 MATERIAL

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below and/or as provided in other sections of the contract documents.

All stainless steel shall be 316 austenitic, non-magnetic unless otherwise required.

2.3.1 Wet Well, Access Hatch and Concrete Cover and Slab

2.3.1.1 General

a. Pre-cast circular concrete wet wells and the wet well concrete cover shall comply with the structural requirements of ASTM C478, Type II, acid resistant cement and shall attain a minimum compressive strength of 4000 pounds per cubic foot in 28 days. The wet well pre-cast base section shall be monolithic with the bottom section of the wetwell. The precast wetwell top shall include the access cover frame.
b. The wet well design shall assume a soil density of 130 pounds per cubic foot and a concrete density of 150 pounds per cubic foot and shall resist flotation under the conditions of an empty wet well and a groundwater level from the wet well base to the finished grade including a safety factor of 1.5.

c. Cast in place concrete slab shall comply with ACI and ASTM standards. Concrete shall be ASTM C-150 Portland Type II 3,500 psi air entrained at 6% plus or minus 1% unless otherwise noted on the engineering plans. Fine aggregate shall be ASTM C33 and course aggregate ASTM C33 ¾" maximum size. Reinforcing shall be ASTM A615 Grade 60 deformed bars and stirrups and Grade 40 ties, welded wire fabric shall meeting the

requirements of ASTM A185, and fabricated reinforcing steel shall be in accordance with ACI 315. Form lumber shall be in accordance with ACI 347 and shall be used with removable metal form ties, non-staining and moisture absorbing form release agents, and stainless steel dovetail anchor slots, and water stops as shown on the engineering drawings.

d. The wet well shall be set on a number 57 stone base in accordance with section 901 "Coarse Aggregate" of the latest revision Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

e. The individual wet well sections shall fit together with interlocking tongue and groove joints. Four (4) foot diameter wet wells shall be sealed with a R-4 rubber gasket and six (6) foot or larger diameter wet wells shall be sealed with two (2) 1-½" butyl rubber or plastic wet wells joint seal squeezed in and out to verify sealing. The outside of the groove joints for all wet wells shall be covered with a continuous overlapping butyl rubber wrap a minimum of eight (8) inches wide.

f. The wet well shall include elastomeric gasket(s) for all piping. The gasket(s) shall have a stainless steel adjustable strap to seal the gasket to the pipe. An elastomeric gasket(s) with a stainless steel adjustable strap to seal the gasket to the pipe shall be installed in all on site core bored holes.

g. The outside surface of the wet well shall be covered with 3 coats (black/red/black or color changes to allow CCU to verify multiple coats) of coal tar epoxy coating with a minimum dry film thickness of 10 mils per coat for a total of 30 mils dry film thickness. Subsequent coats shall be applied within 48 hours of the previous coat.

h. The internal wet well coatings (including cover) shall be a polymorphic resin, a calcium aluminate mortar, an epoxy coating, or a polyurethane coating. Coatings shall be installed in accordance with the manufacturer's specifications.

i. The wet well access hatches and frames shall be compatible with the lift-out rail system in accordance with the engineering drawings and approved shop drawings. The wet well access hatch and frame shall be aluminum with 316 stainless steel hinges, handles, and associated hardware in accordance with CCU standard details.

j. The master lift station influent piping inverts shall be a minimum of sixty (60) inches above the base invert.

2.3.3 Discharge Piping and Valves

2.3.3.1 General

a. The discharge piping and valves shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactory when installed as shown

on the drawings. The piping and valves shall be supported to the wetwell walls and above ground as shown on the engineering drawings and the CCU standard details.

b. The piping and valves shall be furnished and installed in accordance with CCU Specification Section# 002325 “Force Mains” and CCU Specification Section# 002340 “Valves”.

2.3.4 Water Service

The contractor shall provide a water service as shown on the engineering drawings and CCU standard details. The service shall include the labor and materials for the tap at the water main source, polyethylene piping, meter box, fittings, backflow prevention device, spigot, mounting brackets and connectors, etc. CCU will provide and install the water meter.

A separate water service is required for the odor control.

2.3.5 Fence and Gates

The contractor shall provide and install fence and double eight (8) foot gates (total sixteen (16) foot width) with hold-backs, and wheels in accordance with the engineering drawings and CCU standard details. All the fencing and gate components shall be adequate to meet the required wind resistance loading.

2.3.6 Driveways

The contractor shall construct a sixteen (16) foot minimum concrete driveway as shown on the engineering drawings and CCU standard details and CCCDED Specifications. The driveway shall include right-of-way culverts, if required, and drainage shall be in accordance with Charlotte County Building Department specifications.

2.3.7 Landscaping

The contractor shall provide landscaping, if required, in accordance with CCU Specification Section 002920 “Landscaping”.

PART 3 - EXECUTION

3.1 GENERAL

a. The contractor shall prepare the master lift station site for construction. This shall include the establishing of maintenance of traffic, surveying, site clearing, installation of silt fence, exposure of existing underground utilities, and notification of residences that may be impacted by the construction. The master lift station wetwell and concrete cover and slab, valves, piping, pump/motor assemblies and rails, MCC, water service(s), electrical wiring/conduit, pad, fencing and gates, access panel and frame, driveway/culverts, optional equipment, and accessories shall be installed in accordance with the contract documents.

b. Installation shall be made by skilled and licensed technicians and coordinated with other trades as necessary.

c. The master lift station receives wastewater flows continuously at varying rates and the level of the flow in the wet well is monitored by liquid level sensors. The wet well liquid level sensors shall be suspended at various levels in the wet well and transmit the level of the wastewater in the wet well directly to the MCC. The level sensors shall be set for the following conditions in coordination with CCU operational personnel:

Pump off
Pump on
Lag pump on
High liquid level alarm

d. The MCC is an integrated system. The contractor shall furnish and install the MCC as one complete package to include all equipment and appurtenances regardless of the manufacturer and shall be responsible for the MCC to perform as a fully integrated operable system.

The MCC shall be designed to provide the following functions:

Turns pump off
Turns pump on
Turns lag pump on
Provides for alternate pumps operation
Activates the audio and visual alarms in the event of high liquid wet well levels
Activates the battery backup high liquid level alarm in event of power loss and resets the alarm when the power is restored
Allows for the manual connection to a portable generator
Provides phase monitoring and protection
Monitor and indicates pump seal failures

If a TCU is required, the applicable MCC functions shall be transferred to the TCU/PLC unit to control as outlined in the TCU section.

e. The TCU shall be designed to provide the following functions:

- Lead/Lag: One pump operates as the lead or in-service pump and one acts as the lag or backup pump. The PLC alternates the lead and lag pump at operator settable intervals as required.

- Monitors lift station operational status and notifies County Central Control of normal and abnormal operations such as, but not limited to: status of power, generator operations, pump trip, high/low alarm levels in the wet well discharge flow, and records pump run time and pump starts.

- Pump on, Pump off

- High level, Low level

- Phase Voltage

- Liquid Level Control Sequence

Refer to CCU standard details for the complete list of the functions

f. The contractor shall coordinate the work of all of the sub-contractors, suppliers, manufacturers, etc. for the complete installation, integration, interconnection, testing, calibration, and startup of the instruments, sensors, controls, and related accessories.

g. The contractor shall provide for all temporary utilities and services required for his operations including but not limited to electrical power, water, sanitary facilities, etc. The contractor shall furnish, install, and maintain all temporary utilities and services during the contract period including removal and restoration of disturbed areas upon completion of the work. Such facilities shall comply with regulations and requirements of the National Electrical Code, OSHA, Florida Power and Light, and applicable Federal, State, and Local codes, rules, regulations and in accordance with CCU Specification Section 009910 – Sanitary Sewer System Rehabilitation.

h. The contractor shall be prepared to maintain wastewater flow as a part of his operations and provide all pumps, piping, and other equipment to accomplish this task, perform all construction, obtain all permits, pay all costs, and perform complete restoration of all existing facilities to equal or better condition to the satisfaction of CCU in accordance with CCU Specification Section 009910 – Sanitary Sewer System Rehabilitation.

3.2 INSTALLATION

a. Grounding rods shall be provided to adequately and independently ground the MCC, standby generator, TCU, and odor control in accordance with the contract documents. A grounding loop with a single ground rod may be substituted if approved by CCU.
b. The contractor shall connect the biofilter unit to the lift station water supply in accordance with the engineering drawings.

c. All wire ends shall be identified with wire markers at both ends.

d. All instrumentation wiring shall be shielded from a continuous source to destination and shall be grounded in accordance with the manufacture's recommendation.

3.3 BEDDING, BACKFILL, AND COMPACTION

a. All bedding, backfill and compaction shall meet the requirements of CCU Standard details and CCCDED specifications.

3.4 CALIBRATION

The contractor shall ensure the following:

a. The instruments shall be calibrated by the manufacturer in accordance with the contract documents.

b. A calibration sticker noting the date, calibration data and the technician's initials shall be affixed to the instrument. A calibration data sheet and log shall be prepared for CCU.

3.5 TESTING

a. The contractor shall not initially energize the equipment without the approval of CCU.

b. After installation and calibration, the contractor shall functionally test the major equipment and electrical components to verify their compliance with the manufacturers recommended specifications and the contract documents.

c. The contractor shall not activate or turn on any equipment until each control circuit has been red-lined for completeness and functionality and safety interlocks are tested.

d. The contractor shall document site testing activities by written test procedures and a testing log shall be maintained at the project site or given to CCU.

e. Wet well and valve vault exfiltration test shall consist of plugging all inlets and outlets, filling the wet well or valve vault with water to the rim of the structure, and letting the water remain for 24 hours. The water level is returned to the top of the rim and let stand for two (2) hours. No leakage shall be allowed for the test to pass.

3.6 STARTUP OPERATIONS

a. The system integrator/supplier shall provide equipment startup services for the project.

b. The system integrator/supplier shall be responsible for providing factory trained representatives for the startup of equipment requiring factory assistance during startup.

c. The system integrator/supplier shall coordinate with CCU to assist with the startup activities and provide necessary training of CCU personnel in the operation and maintenance of the system.

d. Upon construction installation of CCU -maintained sewer lift stations, startup operations and testing shall be conducted prior to final acceptance and release of sewer flows under the supervision of the CCU Engineering Department. At a minimum, a representative of the pump Supplier, a representative of the Contractor, and a representative of CCU-Wastewater Resources Department's Lift Station Maintenance Division will be present for startup testing. A "CCU Lift Station Startup Check List", as provided in CCU Standard Details, shall be completed and signed off in entirety before a facility shall be accepted by CCU.

3.7 SPARE PARTS

Per each lift station, the Contractor shall provide on or before final inspection:

a. one spare submersible pump identical to the one(s) being placed

Plus the following additional items:

b. two seal assemblies: top and bottom at impeller and at winding of motor
c. bearings: one complete set of bearings for each pump
d. o-ring and gasket kit for pump motor and impeller housing

In addition, the contractor shall provide level switches, one additional float (normally open type) with 50-ft of cable.

3.8 TECHNICAL MANUALS

a. The contractor shall provide operation and maintenance data in the form of an instructional manual. The manual shall be in a three ring binder and be arranged in sections and include a table of contents. The manual shall include appropriate drawings, schematics, pictures, sketches, specifications, flow diagrams, manufacturer's documents, etc. required to operate and maintain the individual master lift station functions and the overall master lift station as a system.

b. Two (2) copies of the O&M manuals shall be made available to CCU 30 days prior to the master lift station start-up for review prior to start up. Upon CCU validation, the contractor shall provide two (2) hard copies and one electronic copy of the approved O&M manuals including copies of certified tests and inspection data.

END OF SECTION

SEE CHARLOTTE COUNTY UTILITIES DESIGN MANUAL FOR REQUIREMENTS

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and construction of sidewalks, driveways, streets, pathways, parking lots, concrete gutter, curb elements, and traffic separator, etc.
These construction items shall meet the requirements of Charlotte County Public Works (CCPW) and the Florida Department of Transportation (FDOT).

1.1 SCOPE

1.1.1 General:

The work specified in this section consists of the preparation of sub-grade, construction of the stabilized sub-base, placement of the base material, and placement of the surfacing material.

1.1.1 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools and all other associated appurtenances, necessary to do the work required as specified in the Contract Documents.

1.1.2 Location of the Work

The location of this work is as shown on the contract documents.

1.1.3 Coordination of Work

The Contractor shall be responsible for the satisfactory coordination of the placement of these construction items with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.4 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the compensation determined in the following manner:

1.2.1 Sidewalk

The sidewalk including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing, testing, necessary permits and all other required appurtenances in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.2 Driveway

The driveways including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing, testing, necessary permits and all other required appurtenances in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.3 Streets

The streets including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing, replacement of pavement markings, testing, necessary permits and all other required appurtenances in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.4 Pathways

The pathways including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing, testing, necessary permits and all other required appurtenances in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.5 Parking Lots

The parking lots including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing, replacement of pavement markings, testing, necessary permits and all other required appurtenances in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.6 Gutter/Swale

The gutter/swale including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous gutter/swale, replacement of pavement markings, testing, necessary permits and all other required appurtenances in accordance with the contract documents shall be measured and paid for on a linear foot basis.

1.2.7 Curb Elements

The curbs elements including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous curb elements, replacement of pavement markings, testing, necessary permits and all other required appurtenances in accordance with the contract documents shall be measured and paid for on a linear foot basis.

1.2.8 Traffic separator

The traffic separator including removal of existing concrete/bituminous and aggregate base sections saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous traffic separator, replacement of pavement markings, testing, necessary permits and all other required appurtenances in accordance with the contract documents shall be measured and paid for on a square yard basis.

1.2.9 Pavement Markings

All pavement markings removed during the project construction shall be replaced in kind and shall be considered incidental to the project unless a specific bid item is provided.

1.2.10 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (latest revisions)

ACI 301
ASTM A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete, ,
C150 Standard Specification for Portland Cement
D-1500 (Standard Test Method for ASTM Color of Petroleum Products
FDOT Standard Specifications for Road and Bridge Construction (applicable sections)
FDOT Design Standards
FDOT "Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways" also known as the "Florida Green Book".
FDOT Specifications Division III
FDOT Standard Index
CCPW Specifications
AASHTO (applicable sections)
ADA standards

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
001760 - Surveying and Record Drawings
002240 - Dewatering
002340 - Valves
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design
002930 - Grassing
003300 - Precast Concrete Products
009900 - Surface Preparation, Painting and Coating
002310 - Pipe Removal, Disposal, Alteration, Modification or Pipe Abandonment

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 Submittals are required in accordance with the CCPW Specifications requirements or as required by CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 <u>General</u>

a. The materials used in this work shall be in accordance with the appropriate section of the current FDOT Standard Specifications for Road and Bridge Construction.

b. The materials used in this work shall be all new, and conform to the requirements for class, kind, size and material as specified below.

c. This specification includes references to designated manufacturers to illustrate minimum acceptable requirements for products.

d. Material of equal quality, detail, function, and performance may be proposed for substitution. All requests for substitutions shall be submitted to Charlotte County Utilities (CCU) for approval.

2.1.2 Concrete

2.1.2.1 Additives

The following additives shall not be used unless otherwise approved by CCU:

- Accelerating admixtures.
- Retarding admixtures.
- Damp-proofing admixtures.
- Water repelling admixtures.
- Series "100" or "15" type admixtures.
- Calcium chloride.

2.1.2.2 Streets

a. The streets concrete shall meet the requirements specified in FDOT Standard Specifications Section 346-3 Class I (Special) having a minimum compressive strength of 3,000 PSI after 28 days, and shall have fibermesh reinforcement. "Reinforcement shall be achieved by the addition and distribution of either glass fibers or virgin polypropylene fibers throughout freshly mixed concrete. ASTM C-1116 establishes standards and covers the mixing of fiber-reinforced concrete at the batching plant and its delivery to the job site. Reinforcing fibers shall be used in strict accordance with the fiber-reinforcement manufacturer's instructions and recommendations as to type and amount for uniform and complete distribution. The fiber manufacturer or approved supplier shall provide the services of a qualified technical representative for a pre-job meeting and initial concrete driveway construction. Only fibers designed and manufactured specifically for use in concrete so certified by the manufacturer shall be acceptable. In the event that the specified test taken on the job site indicates that the mixture of fibers does not produce concrete of the desired strength, the Contractor shall adjust the mix accordingly to obtain the required strength, at no additional cost to the County."

b. Curing compound shall be applied in accordance with FDOT Section 520-8.

2.1.2.3 Sidewalks, Driveways and Pathways

a. Sidewalk, driveways and pathway concrete shall meet the requirements specified in FDOT Standard Specifications Section 346-3 Class I (Special).

b. Sidewalks, driveways, pathway and curb cut ramps concrete shall be reinforced using fibermesh. The fibermesh fibers will be mixed in accordance to standards set forth in ASTM C-1116. Reinforcing fibers shall be used in strict accordance with the manufacturer's instructions and recommendations as to the type and amount for uniform distribution. Only fibers specifically designed and manufactured for use in concrete and so certified by the manufacturer shall be acceptable. The curb ramps shall be supplied with detectable warning devices per FDOT Standard Specifications Section 527.

c. Contraction joints caps with removable cap strips as manufactured by Vinylex Corporation.

d. Expansion joint sealer shall be Sikaflex-1CSL as manufactured by Silka.

2.1.2.4 Concrete Gutter, Curb Elements, and Traffic Separator

a. Concrete gutter, curb elements, and traffic separator shall conform to the requirements of Section 520 of the current FDOT Standard Specifications for Road and Bridge Construction.

2.1.2.5 Preformed cork joint filler

a. No. 4323 Standard Cork Expansion Joint Filler as manufactured by Construction Products Division - W. R. Grace and Company or CCU approved equal.

b. Sealtight Cork Expansion Joint as manufactured by W. R. Meadows of Pennsylvania, Inc. or CCU approved equal.

2.1.2.6 Dowels and reinforcing bars:

a. Dowels and reinforcing bars shall be of new billet steel deformed bars, Grade 60, sized to match existing reinforcement.

2.1.2.7 Hot Poured Joint Sealer:

a. Joint seal, Product #9005 as manufactured by Allied Materials Corp. or CCU approved equal.

b. No. 2350 Para-plastic (R) as manufactured by Construction Products Division, W. R. Grace and Co. or CCU approved equal.

2.1.3 Base Materials

2.1.3.1 Stabilized Subgrade

a. Stabilized subgrade shall conform to the requirements of Section 160 of the current FDOT Standard Specifications for Road and Bridge Construction.

2.1.3.2 Optional Base Group 9

a. Optional Base Group 9 shall conform to the requirements of Section 285 of the current FDOT Standard Specifications for Road and Bridge Construction and FDOT Index 514 utilizing one (1) of the following materials below:

- Limerock – LBR 100
- Shell Rock - LBR 100
- ABC-3 (minimum Marshall Stability 1500) *(*)*

(*) ***Note:*** *Type S-I (minimum Marshall Stability 1800) may be substituted in lieu of ABC-3, upon written request. All references to asphalt shall be in conformance with Section 285 of the FDOT Standard Specifications for Road and Bridge Construction, latest edition.*

The Contractor shall notify CCU of the specific material he intends to utilize. Volume of base material will increase or decrease depending on the type of base used.

2.1.3.3 Soil Cement Base
(To be used only if specifically approved in writing by CCPW and CCU)

The base shall be designed to have in-situ strength of 300 psi. Seven-day laboratory design compressive strength shall be a minimum of 300 psi for plant mixed unless statistical data for the materials used justifies a lesser laboratory strength.

The materials used in this work shall be all new, and conform to the requirements for class, kind, size and material as specified below.

Portland cement shall comply with the latest specifications for Portland cement, AASHTO M-85, or AASHTO M-134, or ASTM C-150, for the type specified. A one (1) cubic foot sack of Portland cement shall be considered to weigh 94 pounds.

Water for use with cement shall be clean and free of substances deleterious to the hardening of the soil-cement.

The base course soil shall consist of on-site material in the area to be paved, approved borrow material, or a combination of these materials proportioned as approved by the County. The soil shall not contain gravel or stone retained on a two (2) inch sieve or more than 45 percent retained on a No. 4 sieve. The soil shall be free or organic debris, trash, roots, or any other substance considered deleterious to the hardening of the soil cement.

2.1.4 Prime and Tack Coats

a. Prime and Tack Coats shall conform to the requirements of Section 300-2 of the FDOT Standard Specifications for Road and Bridge Construction and the FDOT Specifications Division III, latest edition.

2.1.5 Asphaltic Concrete Mix

2.1.5.1 Recycled Asphaltic Concrete Mix

a. Recycled asphaltic concrete mix shall conform to the requirements of Section 320 and 330 of the FDOT Standard Specifications for Road and Bridge Construction and the FDOT Specifications Division III, latest edition and as specifically noted below:

- **Recycled Aggregate:** The recycled aggregate shall consist of a mixture of milled asphalt pavement.

- **Fine Aggregate:** The fine aggregate used in combination with the recycled aggregate to meet final mix tolerance shall conform to the requirement of FDOT Specifications Section 902.

- **Coarse Aggregate:** The course aggregate used in combination with the recycled aggregate to meet final mix tolerances shall conform with the requirements of FDOT Specifications Section 901.

- **Recycling Agent/Asphalt Rejuvenator:** The asphalt rejuvenator shall be an asphalt cement or asphalt cement blended with a softening agent or flux oil conforming to the following criteria:

TABLE I

Absolute Viscosity, (V60) after TFOT (Thin Film Oven Test)	3:1 Ratio Minimum
Smoke Point	260 F. Minimum
Flash Point	400 F. Minimum
Solubility	97.5 Percent

The asphalt rejuvenator shall contain an approved anti-stripping agent.

- **Asphalt Emulsion/Rejuvenator:** The asphaltic emulsion rejuvenator shall meet the following criteria:

TABLE II

Storage Stability	24 Hr. 1.0 percent maximum
Sieve Test	0.1 percent maximum
Residue by Evaporation	65.0 percent maximum

Residue from the asphaltic emulsion rejuvenator shall conform to the requirements of TABLE I. The asphaltic emulsion rejuvenator shall contain an approved antistripping agent.

- **Recycled Mixture:** The recycled asphaltic concrete, new aggregate (as required), new bituminous material (as required) conforming to the requirements of the "TYPE" of asphaltic concrete mix specified for the project. The milled material shall constitute a maximum thirty percent (30%) for ABC-3, Type S-1 and Type S-III Asphalt of the total aggregate used in the job mix formulas. The established target values for the job mix formula for the recycled asphalt concrete mixture shall be maintained within the following tolerance:

½" Sieve	±7%
No. 10 Sieve	±5.5%
No. 200 Sieve	±2%
Asphalt Content	±0.55%
Mix Temperature	±30º F from design

2.1.5.2 Asphalt Concrete Type “S”

a. Asphalt Concrete Type “S” shall conform to the requirements of Section 320 and 330 of the latest edition of the FDOT Standard Specifications for Road and Bridge Construction.

2.1.6 Pavement Marking

a. Pavement markings shall be in accordance with Section 710 of the current FDOT Standard Specifications for Road and Bridge Construction.

PART 3 - EXECUTION

3.1 GENERAL

3.1.1 Construction shall be in compliance with the applicable FDOT Specification(s) and Design Standard(s), CCPW permits, MOT and all other requirements as outlined in the Contract Documents.

3.1.2 All MOT considerations shall apply as it relates to egress and ingress of residents, roadway traffic and any and all pedestrian traffic.

3.1.3 Contractor shall provide a diligent means of ensuring safety for pedestrians, vehicles, and the working crew. The Contractor shall maintain traffic in both directions while crossing a secondary street in a perpendicular direction as it relates to the direction of the pipe path.

3.1.4 All test results shall be reported in writing to CCPW and CCU. The costs of all tests shall be borne by the contractor.

3.2 DRIVEWAYS

3.2.1 The driveways, if necessary, shall be saw cut and removed at the locations determined by the County. No work shall be performed beyond the County right of way unless so directed by the County.

3.2.2 Driveways shall not be removed until the actual day of the utility installation.

3.2.3 Driveways shall be restored by the end of each construction day, and made operational, allowing full egress and ingress, by employing existing stone base, if applicable, or installing a new stone base.

3.2.4 Temporary driveways, only if specifically authorized by CCU, may be allowed in those cases where the permanent driveways cannot be restored by the end of each construction day.

3.2.5 The driveway shall be maintained daily until the asphalt and/or concrete driveway has been reconstructed.

3.2.6 Final driveway repair shall be completed within 10 calendar days from original disturbance.

3.2.7 Driveways shall be reconstructed to match their original configuration or as designated by the County. This work shall include the disposal of all unwanted materials associated with the driveway reconstruction, i.e. concrete, asphalt, pipes, etc.

3.2.8 All concrete driveways shall have, as indicated on CCU Standard Details; a footer with two (2) #5 rebar, set one (1) above the other, adjacent to the roadway.

3.2.9 Residential driveways:

Asphalt driveways shall have a minimum 6 inch shell base. (Min. LBR 100, 98% compaction by AASHTO T-180), 6” stable subgrade, and 1 inch type S-III asphalt concrete surface.

Concrete shall have a minimum 6-inch shell base (min. LBR 100, 98% compaction by AASHTO T-180), a 6” stable subgrade, and (a 6-inch x 6-inch #6 Section 2.1.2.3 indicates fibermesh mesh) and have fibermesh reinforcement with a minimum thickness of 4-inch 3000 PSI concrete.

3.2.10 Commercial driveways:

Asphalt driveways shall have a minimum 8 inch shell base (Min. LBR 100, 98% compaction by AASHTO T-180), 6” stable subgrade and 1" type S-III asphalt concrete surface minimum.

Concrete shall have a minimum 8-inch shell base, (min. LBR 100, 98% compaction by AASHTO T-180), a 6” stable subgrade, and (a 6-inch x 6-inch #6 Section 2.1.2.3 indicates fibermesh mesh) and have fibermesh reinforcement with a minimum thickness of 6-inch 3000 PSI concrete.

3.2.8 Concrete driveways contraction joints shall be tooled.

3.2.9 All driveways shall be sloped in such a manner that they do not hold water or pond water. Driveways with "birdbaths" (according to County) shall be reconstructed at the Contractor's expense. The surface shall show no variation more than ¼ inch under a 10 foot straight edge. All drives not falling within tolerances shall be reconstructed at the Contractor's expense. The Contractor shall be required to schedule driveway construction with resident and to maintain access to residence.

3.2.10 The County, at his discretion, will sample the fresh concrete and perform the appropriate tests at frequencies established in FDOT's 1988 "Sampling, Testing and Reporting Guide", or as otherwise required.

3.2.11 Concrete, which fails to comply with the specifications, shall be removed and replaced at the Contractor’s expense. Concrete shall not be delivered to the site until the County has approved all forms and sub-grade compaction tests.

3.2.12 In the event that the specified test taken on the job site indicates that the mixture of fibers does not produce concrete of the desired strength, the Contractor shall adjust the mix accordingly to obtain the required strength, at no additional cost to the County.

3.2.13 Curing compound shall be applied in accordance with FDOT Section 520-8.

3.3 SIDEWALKS AND PATHWAYS

3.3.1 Construction of concrete sidewalks and curb cut ramps shall be in accordance with Section 522 of the current FDOT Standard Specifications and FDOT Design Standards, except as modified herein, and shall be in conformity with the lines, grades, dimensions and notes shown in the plans.

3.3.2 Prior to placing concrete sidewalk the subgrade shall be stabilized with commercial stabilizing material to provide a firm and unyielding base, achieving a minimum Limerock Bearing Ratio (LBR) of 40. No sidewalk concrete shall be placed until the subgrade has been accepted by the County.

3.3.3 Materials shall meet the requirements specified in FDOT Standard Specifications Section 3463 Class I (Special). Sidewalks and curb cut ramps concrete shall be reinforced using fibermesh. The fibermesh fibers will be mixed in accordance to standards set forth in ASTM C1116.

Reinforcing fibers shall be used in strict accordance with the manufacturer's instructions and recommendations as to the type and amount for uniform distribution. Only fibers specifically designed and manufactured for use in concrete and so certified by the manufacturer shall be acceptable. The curb ramps shall be supplied with detectable warning devices per FDOT Standard Specifications Section 527.

3.3.4 Contraction joints shall be tooled. Tooled joints shall be straight and perpendicular to the edge of the sidewalk. Saw cutting of contraction joints will not be allowed. All contraction joints shall be tooled ¼ of the pavement depth. Expansion joints shall be provided between existing sidewalks and curbs or driveways and at intersections between sidewalk and other fixed objects, at new pours, and at all cold joints. In no case shall the distance between two consecutive expansion joints exceed a length of 30 feet. The Contractor shall use expansion joint caps with removable cap strips as manufactured by Vinylex Corporation. Expansion joint sealer shall be Sikaflex-1CSL as manufactured by Silka.

3.3.5 Expansion joint sealer shall not be placed in depths greater than ¾ inch at any one time. If the joint requires greater than ¾ inch of joint sealer, the Contractor shall place the material in two placements, only after the first placement has sufficiently cured. All removable cap strips shall be placed above the finished sidewalk surface and shall not be tooled over. The removable cap strips shall be pulled and filled with joint sealer within twenty-four (24) hours of the placement of the concrete. The Contractor shall use expansion joint caps with removable cap strips and joint sealer for all sidewalks.

3.3.6 All sidewalks proposed for construction shall adhere to all current applicable ADA standards including, but not limited to, cross slopes of 1.75%, +/-0.25% max, longitudinal slopes no steeper than 5% and all edge treatment standards. Sidewalks having cross slopes greater than 2% shall be corrected by the Contractor at no additional cost to the County. Sidewalks having a longitudinal slope greater than 5% are considered ramps under current ADA standards. If the Contractor's grading of the proposed sidewalk necessitates a longitudinal slope greater than 5% than the Contractor shall be responsible for providing all necessary ramp features as specified under current ADA standards. Such necessary ramp features shall not be placed as to impact vehicle turning movements or vehicle sight distances in accordance with the current addition of the FDOT "Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways" also known as the "Florida Green Book". Any additional ramp features as may be necessary based on the Contractors grading of the proposed sidewalk, not specifically called out or itemized within the proposed plan set shall be supplied and installed by the Contractor at no additional cost to the County. The cross slope of the proposed sidewalk shall be no less than 1%.

3.3.7 TESTING - The County, at its discretion, will sample and perform the appropriate quality assurance tests at frequencies established in FDOT's 1988 "Sampling, Testing and Reporting Guide," or as otherwise required.

3.3.8 Concrete, which fails to comply with the specifications, shall be removed and replaced at the Contractor's expense. Concrete shall not be delivered to the site until the County has approved all forms and sub-grade compaction tests.

3.3.9 In the event that the specified test taken on the job site indicates that the mixture of fibers does not produce concrete of the desired strength, the Contractor shall adjust the mix accordingly to obtain the required strength, at no additional cost to the County.

3.3.10 Curing compound shall be applied in accordance with FDOT Section 520-8.

3.4 STABILIZED SUBGRADE

3.4.1 General: The work specified in this Technical Specification consists of the stabilizing of designated portions of the roadbed to provide a firm and unyielding subgrade, having the required bearing value specified in the plans.

3.4.2 All submerged stumps, roots, or other organic matter encountered in the preparation of the subgrade shall be removed.

3.4.3 Subgrade thickness will be a minimum of 12". The subgrade shall be stabilized to the minimum bearing ratio and depth shown on the engineering drawings and/or as specified herein. If the natural in-situ soils do not meet the required stability, sufficient borrow materials for stabilization shall be uniformly mixed with in-place soils to produce the load bearing ratio. For roadways classified as either "Local or Urban Collector/Rural Minor Collector", the lime rock bearing ratio (LBR) shall be not less than forty 40 with a compaction of 98% of the maximum density. For roadways classified "Rural Major Collector, Minor Arterial or Principal Arterial" the limerock bearing ratio (LBR) shall be not less than seventy (70) with a compaction of 98% of the maximum density.

3.4.4 The subgrade shall be shaped prior to making the density tests. Density tests shall be made before work proceeds. The required density shall be maintained until the base of pavement has been laid or until the aggregate material for the base of pavement course has been spread in place.

3.4.5 After the subgrade has been prepared and immediately before the base course is laid, the subgrade shall be tested for substantial compliance as to crown and elevation. Material shall be removed or added as the conditions necessitate and again stabilized and compacted to bring all portions of the subgrade to the specified elevation, stability, and density.

3.5 OPTIONAL BASE GROUP 9

3.5.1 This work consists of base construction of one (1) of the optional materials. It shall be constructed on the prepared subgrade in accordance with these specifications and in conformity with the

lines, grades and notes and typical cross- section shown in the plans and in conformance with Section 285 of the FDOT Standard Specifications for Road and Bridge Construction, current edition, and FDOT Index 514 except as amended herein. The materials shall meet the requirements set forth for Optional Base Group, according to FDOT Index 514, utilizing one (1) of the following materials below:

Limerock – LBR 100
Shell Rock – LBR 100
ABC-3 (minimum Marshall Stability 1500) *Note: Type S-I (minimum Marshall Stability 1800) may be substituted in lieu of ABC-3, upon written request. All references to asphalt shall be in conformance with Section 285 of the FDOT Standard Specifications for Road and Bridge Construction, dated 2000.

3.5.2 When alternate pavement sections are shown on the plans, they shall be constructed in accordance with the FDOT Standard Specifications for Road and Bridge Construction. An optional base course shall be used if approved by the County in accordance with FDOT Specification Section 285, Optional Base Course of the Standard Specifications for Road and Bridge Construction.

3.5.3 Spreading of Base

a. The base material shall be spread uniformly. All segregated areas of fine or coarse material shall be removed and replaced with well graded product. For double course base, the material shall be spread in two (2) courses. The thickness of the first course shall be approximately one-half (1/2) the total thickness of the finished base or a sufficient thickness to bear the weight of the construction equipment without disturbing the subgrade.

3.5.4 Compacting and Finishing Base

a. After spreading the base is completed, the entire surface shall be scarified and shaped to produce the exact grade and cross section after compaction. For double course bases, the scarifying shall extend to a depth sufficient to penetrate slightly the surface of the first course.

b. As soon as proper conditions of moisture are attained, the material shall be compacted to an average density of ninety-eight (98%) percent of the maximum density. Where the base is being constructed in one course and the specified thickness is more than six (6) inches, the density specified above shall be obtained in both the bottom half and the top half of the base. If blading of any areas during final compacting operations is necessary to obtain the true grade and cross section, the compacting operations shall be completed prior to testing the density of the finished base.

c. If the subgrade material becomes mixed with the base course material, the contractor shall excavate and remove the mixture and shall reshape and compact the subgrade and replace the removed materials with clean base materials. The clean base material shall be shaped and compacted as specified above.

3.5.5 Base Testing

a. One density test for every 1,000 square yards of material shall be taken with a minimum of one density test taken at each location under 1,000 square yards. The base material shall be compacted to not less than 98% maximum density (ASTM D-1557).

b. One LBR sample shall be taken for every 4,500 square yards of material or at every change in material and shall have a minimum value of 100. A minimum of one LBR sample shall be taken at each location under 4,500 square yards.

3.6 SOIL CEMENT BASE

(To be used only if specifically approved in writing by CCPW and CCU)

3.6.1 General

a. The construction of the cement treated aggregate base shall be in general conformance with FDOT specification 270, of the Standard Specifications for Road and Bridge Construction 2000. The sub-grade shall be constructed to FDOT specification section 2705 and be compacted to 98 percent AASHTO T-180 density. The sub-grade shall be a minimum of 12" thick, constructed of material having a minimum LBR of 40.

b. The cement treated base shall have a minimum laboratory cured field mix seven (7) day compressive strength of 300 psi by bag sample. Base material shall be mixed with minimum cement content by weight of two (2%) percent.

c. Base material shall have a minimum LBR of 100 prior to mixing with cement unless otherwise stated in the contract specifications.

d. Any area represented by a 400 psi seven-day break or greater is subject to rejection by CCU representative after observation, evaluation, and testing. Values from 350 psi to 400 psi shall be subject to review and comparison to the design mix.

e. Since the moisture content, rapidity of compaction effort and final compaction results may influence the compressive strength as well as the cement content, in order to give the contractor and CCPW a referenced acceptance standard, lower and upper values of 300 psi and 350 psi respectively shall be provided.

3.6.2 Equipment

The Contractor shall use any machine, combination of machines, or equipment that produce the completed soil cement base course meeting the requirements for soil pulverization, cement application, mixing, water application, incorporation of materials, compaction, finishing, and curing as controlled by these specifications. Special attention is directed to the

necessity of utilizing compaction equipment which will produce the required density in a particular soil cement blend.

3.6.3 Construction Methods

a. Preparation: Before other construction operations begin, the area to be paved shall be graded and shaped as required to construct the soil cement base in conformance with the grades, lines, thickness, and typical cross-sections shown on the plans. Additional soil shall be placed as approved by the County. The sub-grade shall be firm and able to support without displacement the construction equipment and compaction hereinafter specified. Any unsuitable soil or materials, including material retained on 3-inch sieve, shall be removed and replaced with acceptable material. Soft or yielding sub-grade shall be corrected and made stable before construction proceeds.

The sub-grade in both cuts and fills shall be compacted to a density of 98% of the maximum density as determined by AASHTO T-180 (modified). The sub-grade shall be shaped prior to making the density tests.

b. Pulverization: The soil shall be pulverized such that, at the completing of moist-mixing, one hundred (100) percent by dry weight passes a one (1) inch sieve and a minimum of eighty (80) percent passes a No. 4 sieve.

c. Application of Cement: The specified quantity of Portland cements outlined by the laboratory design strength shall be applied uniformly on the soil. When bulk cement is used, equipment suitable for handling, weighing, and uniformly spreading the cement shall be used. The percentage of moisture in the soil at the time of cement application shall be continuous. Spread cement that has been displaced shall be replaced before mixing is started. The amount of cement used shall be sufficient to obtain the required compressive strength. Under no circumstances shall the amount be less than six (6) percent by weight. No cements shall be applied when the soil or sub-grade is frozen. The air temperature shall be at least forty (40) degrees Fahrenheit in the shad and rising or over fifty (50) degrees Fahrenheit.

d. Mixing: After applied, the cement shall be mixed with the soil. Mixing shall continue until the cement has been sufficiently blended with the soil to prevent formation of cement balls when water is applied. Any soil cement mixture not compacted and finished shall not remain undisturbed for more than 30 minutes.

e. Application of Water and Moist-Mixing: Immediately after the soil and cement have been mixed, water shall be applied uniformly and incorporated into the mixture. Excessive concentrations of water on or near the surface shall be avoided. Water supply and pressure-distribution equipment shall be provided to assure all required water will be applied within three (3) hours. After all water has been applied, mixing shall continue until a homogenous mixture of soil, cement, and water has been obtained. When the water application and mixing have been completed, the percentage of moisture in the mixture and in un-pulverized soil lumps, based on dry weights, shall be within 2% of the specified optimum moisture

content and shall be less than that quantity which will cause the soil cement mixture to become unstable during compaction and finishing. The specified optimum moisture content and density shall be determined in the field by a moisture density test (AASHTO T-99 standard) on representative samples of soil cement mixture obtained from the area being processed. The average density required of all tests shall be ninetyeight (98) percent. A density of less than ninety-five (95) percent shall not be accepted. Densities above one hundred (100) percent shall be calculated as one hundred (100) percent.

f. Plant Mix Contractor Option: The contractor may use a plant mixture of soil cement material if approved by the County. The plant shall demonstrate the ability to properly proportion the cement to obtain a uniform mix meeting all specifications.

g. Compaction: Prior to the beginning of compaction, the mixture shall be in a loose condition for its full depth and shall be within 2% of optimum moisture. As a continuation of mixing operations, the loose mixture shall be uniformly compacted to the specified density within three (3) hours. During compaction operations, shaping may be required to obtain uniform compaction, required grade, and cross-section.

h. Finishing: After the mixture has been compacted, the surface of the soil cement shall be shaped to the required lines, grades, and cross-section. During shaping operations, the surface shall be lightly scarified to loosen any imprints left by the compacting or shaping equipment. The resulting surface shall be compacted to the specified density with steelwheel or pneumatic-tire rollers or both. Rolling shall be supplemented by broom-dragging as required. Surface compaction and finishing shall be done in such a manner to produce, in not longer than three (3) hours, a smooth, dense surface free of surface compaction planes, cracks, ridges, or loose materials.

i. Uniformity: Any portion of soil cement that has a density less than ninety-five (95) percent of the maximum density shall be corrected by additional rolling. If the time limits set forth herein have been exceeded, the base shall be left undisturbed and shall be tested after 7 days of curing to determine its suitability. If unsuitable, it shall be removed and replaced by the contractor without additional compensation. The contractor, at his option, shall remove and replace the deficient base rather than wait the results of the 7-day test.

3.6.4 Construction Joints

At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face. The formed construction joint shall be located to exclude all of the part of the base at the end of the run from being considered a part of the finished base if it does not have full depth, is not thoroughly compacted, is not properly proportioned, or is not properly mixed.

3.6.5 Curing

After being finished, the soil cement base shall be protected against drying for 14 days. The finished soil cement base shall be maintained in a moist condition by application of water until the curing material is applied. The curing material shall not be applied until the finished soil cement base has been inspected by the County and such inspection has determined that the base material is hardening in a uniform and satisfactory manner. The bituminous material and construction shall be in accordance with the Charlotte County Community Development, Engineering Division specifications. The actual rate of application shall be sufficient to provide complete coverage without excessive runoff. At the time the bituminous material is applied, the soil cement surface shall be dense and free of all loose and extraneous material and shall contain sufficient moisture to permit penetration of the bituminous material. Water shall be applied in sufficient quantity to fill the surface voids of the soil cement immediately before the bituminous curing material is applied.

3.6.6 Opening to Traffic

After 14 day curing period, the completed portion shall be open to all traffic provided that soil cement is either protected or has hardened sufficiently to prevent marring or distorting of the surface by the equipment or traffic and provided the curing as specified is not impaired.

a. The curing material shall be adequately maintained during the 7 day protection period so that all of the soil cement shall be covered effectively during this period.

b. Finished portions of soil cement that are used by equipment during the construction of an adjoining section shall be protected in such a manner as to prevent the equipment from marring or damaging the completed work.

c. If the air temperature may reach the freezing point, sufficient protection from freezing shall be given the soil cement for 7 days after its construction and until it has hardened. Other curing materials such as moist earth, straw, or hay may be used upon approval by the County.

3.6.7 Maintenance

The contractor shall maintain the base to a true and satisfactory surface until the wearing surface is constructed. Any repairs or patching shall extend to the full depth of the base and shall be made in a manner to assure restoration of a uniform base course conforming to the requirements of these specifications. No repairs shall be made by adding a thin layer of soil cement to the completed work. With County approval, the contractor shall make full depth repairs with concrete to small or minor areas such as manholes, inlets, or the like.

3.6.8 Testing and Inspection

a. All sampling, collecting, testing, and inspection shall be performed by an independent certified laboratory approved by County.

b. All material shall be collected by the sack method and shall be transported to lab in a sealed/moisture retaining enclosure and tested within two hours of field sampling.

c. The contractor shall make available all materials to the laboratory for the purpose of performing routine tests as specified. This includes samples for soil cement mixture design, maximum density determination, sieve analysis, or other tests as directed by the County.

d. The pills cast from project operations shall break at 300 psi or higher at seven days.

e. Cores shall be taken at 14 day intervals to provide additional information regarding the strength of the cement treated base. All cores obtained shall meet current ASTM Standards.

f. Before the asphalt concrete surface course is placed, the compressive strength of the base shall achieve a minimum in-situ strength of 250 psi.

g. In-place density tests shall be made on the sub-grade and base course. At least one test shall be performed for every 500 square yard maximum area of pavement. A minimum of two (2) strength test value specimens shall be taken each day (one in the morning and one in the afternoon). Tests are a necessary part of soil cement base construction. The following tests shall be made by a certified laboratory:

   - Determination of Cement Applied
   - Moisture-Density Test
   - Bag Samples shall be taken at least once daily at intervals not to exceed 5,000 square yards and molded in the laboratory at field moisture content based on standard proctor density test (AASHTO T-99). Each specimen shall be 4 inches in diameter and 6 inches in height. The specimens shall be cured for 7 days and tested for compressive strength. The bag samples shall be a minimum strength of 250 psi.
   - Field cores shall be taken after 7 days curing time for each day's placement of base material at intervals of one every 500 square yards. or at intervals closer, if necessary, to isolate areas showing below minimum requirements. The cores shall be used to determine thickness of base and compression tested to determine strength of base material. The cores shall have an average compressive strength of 200 psi. The minimum compressive strength core break shall be 180 psi. Cores with less than 180 psi shall require the Contractor to isolate the area of base with additional cores and compressive tests for determining limits of the unacceptable base. The contractor shall remove that portion determined unacceptable, replace with new material, and retest after 7 days as outlined above.

h. Test Results: the County may allow the wearing surface to be placed after receipt of the test reports from the laboratory stating there is a satisfactory soil cement base.

i. All tests shall be performed by a certified testing laboratory approved by the County. The testing laboratory shall be under the direction of a Professional Engineer with at least five years of materials testing experience. All tests shall be performed at the contractor's expense.

3.6.9 THICKNESS

A. After the base is completed, test cores shall be taken at intervals of one every 500 square yards or at closer intervals if necessary. Where the base is more than 1/2 inch deficient in thickness, the area covered by this deficient base shall be replaced. The 1/2 inch deficiency in thickness will be accepted only if found in minor isolated areas as approved by the County. Additional cores shall be required to determine size of deficient area at no cost to CCU.

3.7 PRIME AND TACK COATS

3.7.1 General: This work consists of applying bituminous materials as a Prime Coat on the specified base course, and a Tack Coat between the specified asphalt surface courses including existing pavements to be resurfaced. All items and all work shall conform to the lines, grade, dimensions, and notes as specified on the plans.

3.7.2 Cleaning the Base: Before any bituminous material is applied, all loose material, dust, caked clay and foreign materials, which might prevent proper bond with the existing surface, shall be removed. Where the prime or tack coat is applied adjacent to driveways, curb and gutter or valley gutter, such concrete surfaces are to be protected and kept free of bituminous material. The Contractor shall utilize dust abatement measures at all times. All related dust abatement measures shall be considered incidental to the work under this section and no additional compensation will be made.

3.7.3 Application of Prime Coat: The surface to be primed shall be cleaned and shall not contain more than 90% of the optimum moisture content. The surface shall be "hard-planed" with a blade grader immediately prior to the application of the prime coat to remove the thin glazed or cemented surface leaving a granular porous condition that will allow free penetration of the prime material. The materials planed from the base shall be removed from the base area. Bituminous material shall be applied at the rate established within the current FDOT Standard Specifications for Road and Bridge Construction, and shall be sufficient so as to coat the surface thoroughly. Bituminous material shall not be applied in excess so as to pool or run off of the base material. The base shall be sufficiently moist in order to obtain maximum penetration of the asphalt. In all cases, upon application of bituminous material, the primed base shall be covered by a light uniform application of sand or screenings for protection prior to opening the primed base to vehicular travel. The sand or screenings shall be lightly dragged with a drag broom, after which the entire area shall be rolled with a traffic roller. If warranted by traffic conditions, the application may be made on one-half (½) of the width of the base at a time; care shall be taken to apply the correct amount of bituminous material at the joint.

3.7.4 Application of Tack Coat:

a. Where a bituminous surface is to be laid and tack coat is required, both shall be applied as per the current FDOT Standard Specifications for Road and Bridge Construction. On the newly constructed base course, application of the tack coat (when one is required) shall follow the application of the prime coat and be applied immediately before the surface course is applied. A tack coat is not required on primed bases except in areas which have become excessively dirty and cannot be cleaned or in areas where the prime has cured and lost bonding effect. The bituminous material shall be applied only in the amount necessary to bond the asphalt surface to the base. Bituminous material shall not be applied is such a way that it is exposed to dust or other foreign material that may impact its adhesiveness. The tack coat shall be kept free from traffic until the wearing course is laid.
b. The rate of application shall be between 0.02 and 0.08 gallons per square yard on standard overlay sections and between 0.08 and 0.12 on milled surfaces. The tack coat shall be applied sufficiently in advance of the wearing surface to permit drying. NOTE: it shall not be applied so far in advance or over such an area as to lose it's adhesiveness as a result of being covered with dust or other foreign material.

3.8 MILLING EXISTING ASPHALT PAVEMENT

The work in this section shall conform to Section 327 of the current FDOT Standard Specifications for Road and Bridge Construction.

3.9 RECYCLED ASPHALTIC CONCRETE MIX

a. Recycled asphaltic concrete mix placement shall conform to the requirements of Section 320 and 330 of the current FDOT Standard Specifications for Road and Bridge Construction.

b. The density control shall be in accordance with the Nuclear Method as specified in the current FDOT Standard Specifications for Road and Bridge Construction Section 330.

3.10 ASPHALT CONCRETE, TYPE ‘S’

a. Asphaltic concrete type ‘S’ placement shall conform to the requirements of Section 320 and 330 of the latest edition of the FDOT Standard Specifications for Road and Bridge Construction.

b. All items and all work shall conform to the lines, grade, thickness, dimensions, cross sections, and notes as specified on the Construction Plans.

c. Materials shall not be placed on private property. All hazardous material(s) from paver at the clean-out or from any other equipment shall be legally disposed of by the Contractor offsite.

d. Allowable temperature variances for application of asphalt mixes shall be as specified within the 2000 edition of the FDOT “Standard Specifications for Road and Bridge Construction”, except as follows. Any load of asphalt, or portion of a load of asphalt mix, at the plant or on the project,

with a temperature exceeding 330° F or under 270° F shall be categorically rejected for use on the project.

e. The mixture shall be delivered on the road in ample time to permit the spreading and rolling and surface testing during daylight hours. The mixture shall be compacted to a minimum of ninety-five (95) percent of the laboratory compacted density.

f. Depressions developing after the initial rolling shall be remedied by loosening or removing the mixture laid and by adding new material to bring such depressions to a true surface. Such portions of the completed course defective in surface, compressions, or composition or that do not comply with the requirements of these specifications shall be taken up and replaced with a suitable mixture properly laid in accordance with these specifications.

g. Testing of the finished surface in the areas that are suspected of ponding water will be performed by the County after a rain storm or by applying water to the area. Any area that will pond water over 1/8 of an inch shall be repaired to provide positive drainage. This work shall be performed at no extra cost to CCU and the method of repair is subject to approval by CCU.

h. Tests: Any or all of the following tests may be required by the County:

- Determination for the job-mix formula
- Test of the asphalt cement
- Sieve analysis of the aggregate
- Determination of bitumen content of the asphaltic concrete
- Plant inspection and verification of aggregate mix
- Smoothness of finished pavement by use of a 15’ rolling straight edge from which the paved surface shall not vary more than 3/16”

i. In place density shall be determined by the nuclear density method (FM-1-T-238) during placement of pavement. Any correction to rolling patterns shall be adjusted at time of placement. The asphalt producer shall supply laboratory density (FM-T166) results prior to the placement of the asphalt pavement. In place density tests shall be taken at a frequency determined by the County.

j. Extraction and gradation testing shall be in accordance with FM 5-563 and shall be performed on each material type for each day’s placement to assure mixture quality.

k. A thickness determination shall be made by taking 2 inch cores. No core shall exceed 1/4" in deficient thickness.

3.11 CONCRETE GUTTER, CURB ELEMENTS, AND TRAFFIC SEPARATOR

Concrete gutter, curb elements, and traffic separator shall conform to the requirements of Section 520 of the latest editions of the FDOT Standard Specifications for Road and Bridge Construction and FDOT Standard Index.

3.12 PAVEMENT MARKING

a. Pavement markings shall be in accordance with Section 710 of the current FDOT Standard Specifications for Road and Bridge Construction and FDOT Design Standards.

b. Contractor shall provide a diligent means of ensuring safety for pedestrians, vehicles, and the working crew. The Contractor shall maintain traffic in both directions while crossing a secondary street in a perpendicular direction as it relates to the direction of the pipe path.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and completion of landscaping projects. The landscaping projects shall meet the requirements of Florida Grades and Standards for Nursery Plants.

1.1 SCOPE

1.1.1 General:

This specification defines the requirements for the typical Charlotte County Utilities (CCU) Type "A" landscaping*(*)* of lift stations, reclaimed water meters, booster stations, interconnects, deep injection wells, or other projects as directed by CCU in accordance with Charlotte County Ordinance 2003-062.

(*) Landscape Plan Approved Subject to Compliance with Charlotte County Codes, Date: 10/2/09, By: LDM. Reference: LS/09-29 #2009040220 Master Landscape Permit, available on line at:
http://www.charlottecountyfl.com/CCU/Engineering/LandscapingDetails.pdf

Modifications to the Type "A" landscaping shall be as specified in the Special Provisions.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, trees and shrubs, equipment, tools and all other associated appurtenances, necessary to do the work required under the contract to include but not limited to installation, maintenance service and warranty.

1.1.3 Location of the Work

The location of this work is as shown on the contract documents.

1.1.4 Coordination of Work

The Contractor shall be responsible for the satisfactory coordination of the installation of the landscaping with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the compensation determined in the following manner:

1.2.1 Landscaping

The landscaping work shall be measured at the acceptance of the completed installation of all landscaping and associated support structures.

The compensation for Type “A” landscaping buffer shall be made on a lump sum basis.

Any additional landscaping shall be paid for as specified in the Special Provisions.

1.2.2 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (latest revisions)

- Florida Grades and Standards for Nursery Plants (to order a copy, call 352.375.3505)
- Florida Friendly Landscaping
- ANSI 260.1 American Standard for Nursery Stock, Standardized Plant Names
- Horticultural Standards published by the American Association of Nurserymen
- Principles and Practice of Planting Trees and Shrubs

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control

001760 - Survey for Record Drawings
001770 - Record Drawings
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design 002930
- Grassing

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 The contractor shall submit certificates from the nursery verifying that the individual plants and/or trees meet the requirements as specified in the Contract Documents.

PART 2 – PRODUCTS

2.1 MATERIALS

2.1.1 General

a. The contractor shall provide healthy, vigorous stock, grown in a recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae, and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.

b. The contractor shall provide trees, shrubs, and plants of quantity, size, genus, species, and variety as shown and scheduled for landscape work which shall comply with sizing and grading standards of the latest edition of Florida Grades and Standards for Nursery Plants (to order a copy, call 352.375.3505).

c. All plant material shall be Florida Fancy or Florida #1.

d. All other locations shall follow recommendations and requirements of ANSI Z60.1 American Standard for Nursery Stock, Standardized Plant Names, latest edition, as adopted by the American Joint Committee on Horticultural Nomenclature, Principles and Practice of Planting Trees and Shrubs, latest edition.

e. All trees with double leaders originating in the lower half of the tree shall be rejected.

f. Plant material shall be grown in the project area zone.

2.1.2 Plants:

Plants shall be of species and sizes called for on the engineering drawings and shall conform to all applicable provisions of the Horticultural Standards published by the American Association of Nurserymen. All plants shall have well developed and vigorous branch and root systems and shall be healthy and free of injury or any form of damage. All plant material are subject to inspection and approval by the County.

2.1.3 Planting Soil:

Planting soil shall be five (5) parts topsoil mixed with one (1) part peat moss. Fertilizer shall be added as required. Topsoil shall be loam or sandy loam with greater than 2% organic matter (not more than 20%) with pH between 6 and 7.

2.1.4 Peat Moss:

Peat moss shall be horticultural grade Class A decomposed plant material and elastic and homogeneous. Peat moss shall be free of decomposed colloidal residue, wood, sulphur, and iron. It shall have a pH value of 5.9 to 7.0, 60% organic matter by weight, moisture content not exceeding 15%, and water absorption capacity of not less than 300% by weight on oven dry basis.

2.1.5 Mulching Material:

Mulching material shall follow the recommendations in Sec. 3-5-400 Florida Friendly Landscaping such as 3 to 4 inch length shredded pine straw installed as intertwined matting. The pine straw shall be free from leaves, twigs, wood shavings, insects, wood, or other deleterious material. Mulching material shall be applied to all plants over the entire backfilled saucer area to a depth of 3 inches. A slight saucer made of soil shall be maintained around each plant for watering.

2.1.6 Fertilizer:

Fertilizer shall be 5-10-10 delivered in standard manufacturer's bags showing the weight, chemical analysis of the contents, and the name of the manufacturer. At least 50% of the nitrogen in the fertilizer shall be from natural organic sources. Fertilizer shall be carefully stored and dry and free-flowing at the time of application.

2.1.7 Bone Meal:

Bone meal shall be commercial steamed bone meal; finely ground with a minimum of 2.0% nitrogen and a minimum of 20% phosphoric acid; and delivered in standard manufacturer packages showing weight, analysis, and name of manufacturer.

2.1.8 Tree wrap:

Tree wrap shall be burlap or special crepe weatherproof tree wrapping tape in 2 to 8 inch width rolls.

2.1.9 Anti-desiccant Emulsion:

Anti-desiccant emulsion for tree spraying shall be an anti-transparent wax or similar concentrate specifically manufactured for horticultural use. It shall be delivered in manufacturer's original containers and mixed and applied according to manufacturer's directions.

2.1.10 Support Stakes:

Support stakes shall be wood.

2.1.11 Cables, Wire, Eye Bolts, and Turnbuckles:

Cables, wire, eye bolts, and turnbuckles shall be non-corrosive and of sufficient strength to withstand wind pressure.

PART 3 – EXECUTION

3.1 QUALITY ASSURANCE

3.1.1 The work shall be performed with personnel experienced in the work under direction of a skilled foreman.

3.1.2 The contractor shall obtain County approval of the landscaping and all final inspections in addition to Landscaping, Tree and Zoning inspection prior to receiving a Certificate of Completion for the project equipment.

3.2 DELIVERY, STORAGE, AND HANDLING

3.2.1 Plant material shall be in “healthy vigorous condition” such as live foliage out to the tips of all branches and stems and having a trunk caliper that is bigger, 12 months after planting, than at planting. Healthy vigorous palms shall have new fronds developing with no necrosis or chlorosis and are green in color. Plant material shall be “nursery-grown” in the nursery from liners or collected and then grown in a nursery not less than 2 years.

3.2.2 Plant materials shall be moved with solid root balls wrapped in burlap.

3.2.3 Plant materials shall be delivered immediately prior to placement.

3.2.4 Plant materials shall be kept moist at all times until planted.

3.2.5 Plants shall be rejected when the root ball of earth surrounding roots has been cracked or broken preparatory to or during process of planting.

3.2.6 Plants shall be rejected when burlap, staves, and ropes required for transplanting have been displaced prior to acceptance.

3.2.7 Plants shall be dug with root balls having minimum sizes as specified in ANSI 260.1.

3.2.8 Plants shall be dug, transported, and handled with care to insure against injury and to provide adequate protection against wind and sun. Plants shall be securely covered with tarpaulin, canvas, or other cover to minimize wind whipping and drying. Balled plants shall not be dropped to the ground. A suitable method of handling shall be employed to preclude cracked or mushroomed root balls at the point of delivery. All plant material shall be protected from freezing at all times prior to transplanting.

3.2.9 All plants shall have securely attached durable legible labels stating in weather resistant ink the correct botanical plant name.

3.2.10 All plants shall be subject to inspection by the County during digging operations and after planting. No plants shall be planted before inspection and approval by the County. Any plants damaged by the contractors' operations shall be removed from the site and replaced with acceptable plants without additional compensation.

3.3 PREPARATION

3.3.1 The contractor shall verify topsoil is ready to receive the work of this Section.

3.3.2 The contractor shall prepare topsoil to receive plant materials.

3.4 INSTALLATION

3.4.1 The contractor shall place the plant materials for inspection and final orientation by the County prior to installation.

3.4.2 Excavations for all plant material shall allow a minimum of 1 foot clearance around the sides of the root ball and 6 inches below the root ball to receive the backfill material.

3.4.3 All plants shall stand plumb and after settlement shall be at the same ground level at which they were growing before digging. Burlap and twine shall be cut away from the upper half of all root balls and the remaining burlap adjusted to prevent the formation of air pockets. Exposed and curled roots shall be spread in a natural position.

3.4.4 The contractor shall backfill around plant balls with planting soil. The plant ball shall be placed on a compacted planting base of the prepared planting soil with a minimum depth of 6 inches. Bone meal shall be mixed in the compacted base soil mixture at the rate of one cup per diameter inch for trees and one-half cup per shrub. Planting soil shall be backfilled in 6-inch layers and

firmly tamped and watered at each layer. Excess topsoil shall be used to form a berm approximately 4 inches high around the pit planting area to provide a saucer for watering.

3.4.5 Fertilizer shall be evenly distributed on the surface of the backfilled saucer area at the rate of one (1) pound per tree before mulching.

3.4.6 The contractor shall prune with sharp tools to make a clean cut. Care shall be taken to preserve the natural appearance of the plant. Pruning shall consist of removal of selected small branches rather than a general cutting back of all branches and shall be limited to removal of damaged branches and cutting back of longer lateral branches. The central leader shall not be cut.

3.4.7 Mulching material shall be applied to all plants over the entire backfilled saucer area to a depth of three (3) inches. A slight saucer shall be maintained around each plant for watering.

3.4.8 All stems and leaves of plant materials shall be uniformly covered with an anti-desiccant emulsion using an approved low pressure power sprayer to apply an adequate film over trunks, branches, twigs, and/or foliage. The spray material shall not be applied at temperatures below 32 degrees F. and shall be protected from freezing at all times.

3.4.9 All plants shall be carefully and thoroughly watered during planting and as often as necessary thereafter to provide the best growing conditions until acceptance of the work by the County.

3.5 PLANT SUPPORT AND WRAPPING

3.5.1 All stakes or guying shall be done immediately after planting, and stakes and wire shall be maintained. Plants shall stand plumb after staking.

3.5.2 The contractor shall brace plants upright in position by guy wires with turnbuckles or stakes as follows:

Tree Caliper	Tree Support Method
1 inch	1 stake with one tie
1 - 2 inches	2 stakes with two ties
2 - 4 inches	3 guy wires
over 4 inches	4 guy wires

3.5.3 The trunks of all deciduous trees shall be spirally wrapped immediately after planting and inspection starting at the base with burlap or approved tree wrap. The wrap shall overlap half the width of the tape and be securely tied around the tree stem at two foot intervals. The wrapping shall cover the entire surface of the trunk to a height of 6 feet or the first main branches.

3.6 MAINTENANCE SERVICE

3.6.1 The contractor shall begin maintenance of plant materials immediately after planting and continue until the end of the warranty period.

3.6.2 Maintenance shall include measures necessary to establish and maintain plants in a vigorous and healthy growing condition as follows:

a. The contractor shall cultivate and weed plant beds and tree pits. Herbicides used for weed control shall be applied in accordance with manufacturer's instructions. The contractor shall remedy damage resulting from use of herbicides.

b. The contractor shall water sufficiently to saturate root system and at a frequency to establish healthy trees and shrubs as specified by the supplying nursery.

c. The contractor shall prune, including removal of dead or broken branches, and treat pruning wounds.

d. The contractor shall implement disease and insect control.

e. The contractor shall maintain wrappings, guys, turnbuckles, and stakes. This includes adjusting turnbuckles to keep guy wires tight and the repair and/or replacement of accessories when required.

3.6.3 The final maintenance inspection shall occur at the end of the warranty period.

3.7 WARRANTY

3.7.1 The warranty shall be ninety (90) days from date of substantial completion.

3.7.2 During the warranty period, the contractor shall replace plant materials found dead or not in a healthy growing condition. Replacement plant materials shall be of same species with the warranty commencing on date of replacement.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the selection of materials, and installation of restoration grassing.

1.1 SCOPE

1.1.1 General:

1.1.1.1 This specification provides the requirements for the restoration grassing for the project. This specification applies to right-of-way restoration, easement restoration, common area restoration, and private and public property restoration. Restoration in right-of-ways or easements under the jurisdiction of the County, FDOT or other agency shall be restored in accordance with the requirements of the agency having jurisdiction. In the absence of any specific restoration requirements of the agency with jurisdiction, this specification shall apply.

1.1.1.2 Restoration of disturbed areas shall start within 14 calendar days after utility installation and shall be completed within 21 calendar days except as follows: Between October 1st and March 31st, for those disturbed areas specifically designated in the contract documents to be seeded, sodding as a substitute is allowed, but seeding shall be delayed until the following April at which time all seeding operations for these areas shall be initiated and completed during the months of April and May. During the delayed period, the contractor shall be responsible for maintenance, erosion control, dust control, etc. of the disturbed area to the satisfaction of the County. Once an area is disturbed, it shall be maintained by the contractor until restoration is completed to the satisfaction of the County and thereafter throughout the warranty period specified in the section entitled “Guarantee” in the General Provisions. Drought conditions shall not relieve the contractor from its responsibility to comply with this specification.

1.1.1.3 During removal of existing utilities and installation of new utilities, the contractor shall maintain (except at locations of utility street crossings), an undisturbed existing buffer strip of ground cover measuring a minimum of 3 feet in width from the edge-of-pavement (EOP) in order to minimize potential erosion along the pavement edge. The contractor shall be responsible for all costs to restore this buffer strip if disturbed during construction.

1.1.1.4 The existing ground cover must be replaced in-kind with the cover that existed prior to disturbance. Except that if the existing ground cover in the project area is sparse grass mixed with weeds then it shall be seeded as per these specifications (hydro seeding is acceptable), except as follows:

a. Sod shall be placed around all catch basins at a minimum of 3' all sides.

b. Sod shall be placed around all pipe ends, inverts and around top of pipe at a minimum of 5’ by 5’.

c. Swales/slopes at 2:1 or steeper shall be fully sodded.

d. Swales/slopes at 3:1 to 2:1 shall be strip sodded with 2 strips on the front plus the one strip along the edge-of-pavement (EOP) and 2 strips on the back.

e. At all four way intersections where utilities are installed, a 20 foot wide sod strip measured from the EOP shall be installed from a line perpendicular to the point of curvature of the EOP line to a line perpendicular to the point of tangency of the EOP line. Sod shall be placed only on corners of the intersection where utilities are installed unless otherwise directed by the County.

f. At all tee intersections where utilities are installed, a 20 foot wide sod strip measured from the edge of pavement shall be installed from a line perpendicular to the point of curvature of the EOP line to a line perpendicular to the line of tangency of the EOP line. On the straight section of the tee, the 20 foot wide sod strip shall be installed across the entire length from lines perpendicular to the lines of tangency of the EOP on the opposite side of the roadway. Sod shall only be placed where utilities are installed unless otherwise directed by the County.

g. All disturbed areas outside the ROW in easements shall be permanently restored by seeding (hydro seeding is acceptable).

h. During the dry season months from October 1st to March 31st, the contractor at his/her option and cost, may temporarily restore disturbed areas that are to be seeded by planting seeds of an approved quick-growing species of grass, such as gulf rye, Italian rye, brown top millet, or other cereal grass. Temporary seeding includes the mulch required to hold the seed in place until growth is established. Temporarily restored areas shall be permanently restored by seeding during the wet season as stated previously.

1.1.1.5 All pervious areas disturbed during the construction shall be stabilized by a uniform perennial vegetative cover with a density of 100 percent over the entire pervious surface area, or other equivalent means necessary to prevent soil failure under erosive conditions.

1.1.2 Work Included

Unless specified otherwise, the Contractor shall furnish all materials, water, equipment, tools, labor and all other appurtenances necessary to do the work required under the contract to include, but not limited to, preparing the sub-base, placing topsoil, placing sod, seeding, temporary seeding, mulching, watering the sod and/or seed, mowing, and clean-up the site throughout the period of performance of the contract and the contract warranty period.

1.1.3 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of laying the sod, seeding, and/or temporary seeding with other construction and activities in the project area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and so as not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte county Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the compensation determined in the following manner:

1.2.1 Sod:

Sod shall be paid for per square yard which shall include all equipment, materials, labor and all other appurtenances to prepare the sub-base, placing/grooming the topsoil, fertilizing, placing the sod, watering the sod, site cleanup and maintaining sodded area throughout the warranty period.

1.2.2 Seeding:

Seeding shall be paid for per square yard which shall include all equipment, materials, labor and all other appurtenances to prepare the sub-base, placing/grooming the topsoil, fertilizing, seeding, mulching, watering, site cleanup, and maintaining seeded area throughout the Warranty period.

1.2.3 Temporary Seeding:

A temporary seed cover during the dry season shall be considered incidental to the permanent restoration seeding, and shall include all equipment, materials, labor and all other appurtenances to prepare the sub-base, placing/grooming the topsoil, seeding, mulching,

watering the seed, site cleanup, and maintaining the temporary seeded area throughout the warranty period.

1.2.4 Topsoil:

Import or stockpile of topsoil and the placement of topsoil shall be considered incidental to the sod or seeding bid unit prices and no additional compensation will be made. The contractor shall consider removing and stockpiling of the existing topsoil material as part of the construction process as a means of assisting in the restoration of the disturbed areas.

1.2.5 Fertilizer:

Fertilizer shall be considered incidental to the sod or seeding, and no additional compensation shall be made.

1.2.6 Watering:

Watering shall be considered incidental to the sod or seeding, and no additional compensation shall be made.

1.2.7 Mulch:

The supplying and placement of mulch shall be considered incidental to seeding, and no additional compensation shall be made.

1.3 REFERENCED STANDARDS (Latest Revision)

Florida DOT Standard Specifications for Road and Bridge Construction

1.4 RELATED SECTIONS

001570 – Erosion and Sediment Control
002320 – Gravity Sewer System
002325 – Force Mains
002330 – Low Pressure Sewer Systems
002335 – Potable Water and Reclaimed Mains
002345 – Fire Hydrants
002530 – Submersible Sewage Pump Lift Station-Package Design
002540 – Submersible Sewage Pump Lift Station- Standard Design
002240 – Dewatering

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 General:

The contractor shall submit four (4) signed copies of the material submittals with the statement that the submittals have reviewed and the materials meet the contract specifications and/or standard details.

1.5.2 Sod:

The contractor shall submit a certificate from the sod producer stating the sod meets the requirements for "Florida Standard Grade" as defined by the Turfgrass Producers Association of Florida.

1.5.3 Seed:

The contractor shall submit a certificate for each bag of seed indicating present purity, active germination, and total germination.

1.5.4 Fertilizer:

The contractor shall submit a manufacture's certificate of the analysis of the nitrogen, phosphorus potash, and complete micro-nutrients.

PART 2 - PRODUCTS

2.1 WARRANTY REQUIREMENTS

During the Contract warranty period, sodded, seeded, and temporary seeded (if applicable) areas that wash away shall be re-sodded and re-seeded (seeded or temporary seeded, which ever applies) at no additional cost to the County. If as a result of sodded, seeded, or temporary seeded areas washing away, damage to private and/or public property occurs, any damaged public and/or private property shall be repaired by the contractor to the satisfaction of the County at no additional cost to the County. Washing away can be a result of watering and/or rains. Damage includes soil filling storm culverts; water undercutting driveways, storm structures, and roads; etc. Where the area to be repaired has drainage inverts and side slopes, the drainage inverts and side slopes shall be restored the entire length prior to "Grassing". If requested, the contractor shall provide the County with surveying documentation that the inverts and slopes have been restored.

2.2 SOD

Existing sod disturbed by construction activity shall be replaced in-kind. In all other areas where sod is required the sod shall be Argentine Bahia and shall be well matted with grass roots. The sod shall have no visible broad leaf weeds or no patches of foreign grasses. Florida standard grade sod shall be neatly mowed and mature enough that when grasped at one end, it can be picked-up and handled without damage. The sod shall be sufficiently thick to secure a dense stand of live grass; grass plugs shall not be used. The sod shall be live, fresh, and uninjured at the time of planting. The sod shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand handling during laying. The sod shall be shaded and kept moist from the time of digging until laying of the sod.

2.3 SEEDING

2.3.1 All seed shall meet the requirements of the Florida Department of Agriculture and Consumer Service and all applicable Florida state laws and shall be approved by the County before use. The seed shall have been harvested from the previous year's crop. All seed bags shall have a label attached stating the date of harvest.

2.3.2 Argentine Bahia grass seed shall have a minimum pure seed content of 95% with a minimum active germination of 85% and contain less than 0.5% weed and crop seed.

2.3.3 Bermuda grass seed shall be of a common variety with a minimum pure seed content of 95%, and a minimum germination of 85%.

2.3.4 Gulf rye or an approved annual type rye grass (or brown top millet as approved) to be used in conjunction with seed, to establish early ground cover. Annual rye grass seed shall have a minimum pure seed content of 95% with a minimum germination of 90% and a maximum of 150 noxious seeds per pound.

2.3.5 Brown top millet seed shall have a minimum per seed content of 98% with a minimum total germination of 80% and a maximum of 150 noxious seeds per pound.

2.4 TEMPORARY SEEDING

2.4.1 Gulf rye or an approved annual type rye grass shall be used to establish temporary ground cover. Annual rye grass seed shall have a minimum pure seed content of 95% with a minimum germination of 90% and a maximum of 150 noxious seeds per pound.

2.4.2 Brown top millet may also be used to establish temporary ground cover and shall have a minimum per seed content of 98% with a minimum total germination of 80% and a maximum of 150 noxious seeds per pound.

2.5 FERTILIZER

Fertilizer shall be commercial grade, controlled release, granular fertilizer consisting of blend of coated prilled granule urea with iron composite included in a slowly soluble, freed flowing, and

uniform form conforming to Florida DOT Specification 982-1 and bearing the manufacturer's guaranteed statement of analysis by weight of 12 parts nitrogen, 8 parts phosphoric acid, and 8 parts potash plus complete micronutrient including magnesium, sulfur, zinc, manganese, copper, and boron.

2.6 WATERING

The water shall be free of petroleum products, pesticides, any other deleterious constituents, acid, alkali, or organic materials and shall have a pH of 7.0 to 8.5.

2.7 MULCH

2.7.1 Dry mulch material for non-hydro-seed areas shall be straw or hay consisting of oat, rye, or wheat straw or Pongola, peanut, coastal Bermuda, or Bahia grass hay. Only un-deteriorated mulch which can be readily be cut into the soil shall be used. The mulch shall be free of weeds, weed seed, and other deleterious materials and shall have a system to stabilize the mulched area to stop erosion from either rain or wind as approved by the County.

2.7.2 If areas are hydro seeded, the mulch material shall be wood cellulose fiber material for use in hydro seeding slurry, especially prepared for this purpose, or an approved substitute.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

3.1.1 The area to be restored shall be brought to finish grade and shall be prepared by diskharrowing and thoroughly pulverizing the soil to a depth of at least 6 inches. The prepared soil shall be loose and reasonably smooth. It shall be reasonably free of large clods, roots, and other material which will interfere with the work or subsequent mowing and maintenance. No subsequent operations shall be commenced until the OWNER has approved the condition of the prepared areas.

3.1.2 Soil shall have a pH of at least 6.5 and less than or equal to 8.0, and if not, a required amount of dolomite limestone designated for agricultural use shall be added.

3.1.3 Fertilizer shall be uniformly applied at a rate of 10 pounds per 1000 square feet and mix into soil at a depth of approximately 4 inches.

3.1.4 All sodded, seeded, and temporary seeded areas shall be thoroughly watered until growth is established.

3.1.5 Areas to be restored shall be completed to a condition equal to or better than original condition and to the satisfaction of the County.

3.2 WATERING PROGRAM

3.2.1 The contractor shall maintain a watering program throughout the project contract warranty period in order to assure optimum growth conditions. The watering program shall be balanced between the contractor watering and rainfall.

3.2.2 Once the seed is planted, the contractor shall ensure the soil is kept evenly moist until germination. After germination, the grass shall be watered (rainfall and/or irrigation) daily (not less than one (1) inch per week) until the lawn is well established (a minimum of two (2) inches high). The watering shall not cause saturation of the germinated seed and shall not be done using a strong spray. The contractor shall provide for CCU approval the method he will use to measure the quantity of water being applied to the germinated grass.

3.2.3 Sod: After rolling the sod to ensure good root contact with the soil and to eliminate air pockets, the sod shall be watered at least 2 times a day for at least the first ten (10) days to keep the sod constantly moist.

3.3 SODDING

3.3.1 All sod shall be used within 3 days of cutting.

3.3.2 The sod shall be stacked and be properly watered if not laid within 24 hours of cutting. The sod shall be shaded and kept moist from the time of digging until laying.

3.3.3 The sod shall be laid in 12” x 24” blocks or larger except where the area to be sodded is smaller. The joints between blocks of sod perpendicular to the roadway shall be staggered. The individual blocks shall be firmly fitted against adjacent blocks and lightly tamped to provide uniform contact with the soil.

3.3.4 Cracks or gaps shall be filled with sod and rolled with a minimum one ton roller.

3.3.5 Sod in drainage ditches shall be staggered to avoid a continuous seam along the line of flow.

3.3.6 On areas where the sod may slide due to height and slope, the sod shall be secured with wooden stakes or metal pins driven through the sod blocks into the firm earth at intervals approved by the County.

3.3.7 The sod shall be fertilized twice per year through the warranty period after laying. Prior to the application of fertilizer, the turf quality shall be evaluated for need and the proposed fertilizer nutrient mix shall be approved by the County.

3.3.8 The Contractor shall maintain disturbed areas until acceptable vegetation is reestablished.

3.4 SEEDING

3.4.1 The seed mixture shall be in the following pounds per acre: Bermuda 30 lbs., Argentine Bahia 120 lbs. and brown top millet 75 lbs. unless otherwise approved by the County.

3.4.2 Mulching – When the mulch material is to be included in the slurry mixture, it shall be applied at the rate of 1000 pounds of mulch material per acre when the moisture content of the "airdry" mulch does not exceed ten percent. If the moisture content exceeds ten percent, a proportional increase of mulch material shall be made and approved by the County. The application of the slurry over the seeding areas shall be in accordance with the directions of the manufacturer of the hydro seeding equipment. The slurry mixture shall be maintained uniform by continuous agitation during the application.

3.4.3 While the soil is still loose and moist, the seed shall be spread uniformly over the grassing area using either a rotary or drop wheeled mechanical spreader. Hand held spreaders shall only be used where steep slopes make machine-spreading impractical when approved by the County.

3.4.4 When mulching, approximately two inches of loose thickness mulch material shall be applied uniformly over the seeded area, and the mulch material shall be cut into the soil so as to produce a loose mulch thickness of three to four inches.

3.4.5 Immediately after completion of the seeding, the entire grassed or mulched area shall be rolled thoroughly with a cult packer, traffic roller, or other suitable equipment.

3.4.6 Fertilizer shall be re-applied approximately five weeks after germination.

3.4.7 The Contractor shall maintain disturbed areas until acceptable vegetation is reestablished.

3.5 TEMPORARY SEEDING

3.5.1 Prior to seeding the proposed mixture of gulf rye and brown top millet shall be approved by the County. While the soil is still loose and moist, the seed shall be spread uniformly over the grassing area using either a rotary or drop wheeled mechanical spreader. Hand held spreaders shall only be used where steep slopes make machine-spreading impractical when approved by the County.

3.5.2 When mulching, approximately two inches of loose thickness of mulch material shall be applied uniformly over the seeded area, and the mulch material shall be cut into the soil so as to produce a loose mulch thickness of three to four inches.

3.5.3 Immediately after completion of the seeding, the entire grassed or mulched area shall be rolled thoroughly with a cult packer, traffic roller, or other suitable equipment.

3.6 MOWING

3.6.1 The grass shall be mowed when it reaches a height of 9 inches and subsequently each time when it reaches a height of 9 inches to a height of 6 inches.

3.6.2 The contractor shall maintain the mowing program until accepted by the County and through the project's contract warranty period.

END OF SECTION

PART 1 - GENERAL

The following specification is intended for use for the design, selection of materials, and construction of Charlotte County Utility Projects.

1.1 SCOPE

1.1.1 General

This specification addresses the furnishing all labor, materials, equipment and incidentals required for manufacture, installation, coating, and testing of precast manholes, wet wells, valve vaults, wet well top pads and manhole risers with access covers, and appurtenant materials.

1.1.1 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the work required under the contract.

1.1.2 Location of the Work

The location of this work is as shown on the Contract Documents.

1.1.3 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of delivering Precast Concrete Products with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.4 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

Measurement and payment of Precast Concrete Products shall be as specified in CCU specification 002320 “Gravity Sewer System”, 002530 “Submersible Sewage Pump Lift Station Package Design” and 002540 “Submersible Sewage Pump Lift Station- Standard Design”.

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1.3 REFERENCED STANDARDS (Latest Revision)

AASHTO – Standard Specifications for Highway Bridges
ACI 318 – Building Code Requirements for Reinforced Concrete
ACI 350R – Concrete Sanitary Engineering Structures
ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement
ASTM A615 – Deformed and Plain Billet – Steel Bars for Concrete Reinforcement
ASTM C109 – Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50 mm Cube Specimens)
ASTM C827 – Early Volume Change of Cementitious Mixtures
ASTM C890 – Minimum Structural Design Loading for Monolithic or Sectional Precast and Wastewater Structures
ASTM C913 – Precast Concrete Water and Wastewater Structures
ASTM C478 “Standard Specification for Precast Reinforced Concrete Manhole Sections”

1.4 PARTIAL LISTING OF RELATED SECTIONS

002320 - Gravity Sewer System
002335 - Potable Water and Reclaimed Water Mains
002340 - Valves
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 The Contractor shall submit complete detailed documentation of all materials for approval by CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals

1.5.2 Shop drawings shall include as a minimum, material specifications, details of construction, reinforcing, lifting devices, joint details, access openings, pipe penetrations, design calculations, and lifting and buoyancy analysis.

1.5.3 The contractor shall submit manufacturer's product data if available.

1.5.4 The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or design details.

1.5.5 Final approval is at the discretion of CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions

2.1.1 General

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below.

a. Concrete: ACI 318, Portland Cement Type II.

b. Reinforcing steel: ASTM A615, Grade 60.

c. Welded wire fabric: ASTM A185.

2.1.2 Design Criteria:

a. The design of the precast structures shall confirm to ACI 350 R and ASTM C890.

b. The precast structures shall withstand AASHTO H-20 loading with 30% soil loading at 130 #/cubic ft., and surcharge and ground water elevations as shown on the engineering drawings without failure or leakage.

c. The concrete shall have a minimum compressive strength of 4000 psi for 28 days.

2.1.3 Source Criteria:

a. Concrete shall be tested in accordance with ACI 3118.

b. The plant records and quality control program used during production of the precast structures shall be retained and such records and test results shall be made available to CCU.

c. All sections shall have the date of manufacture indelibly marked on the inside of the wall.

2.1.4 Precast Sections Construction

a. All bases shall have a monolithic floor, anti-flotation ring, floor to wall transition wedge, and wall section.

b. All items such as sleeves, piping holes, and cover frames shown on the engineering plans shall be cast in.

c. The precast concrete structure shall be delivered to the job site with pre-installed elastomeric gasket(s) for all piping. The gasket(s) shall have a stainless steel adjustable strap to seal the gasket to the pipe. An elastomeric gasket(s) with a stainless steel adjustable strap to seal the gasket to the pipe shall be installed in all on site core bored holes.

d. Fabrication shall be in accordance with ASTM C890 and C913.

2.1.5 Grout

a. Grout shall be in accordance with CCU Specification 003600 “Grout”.

2.1.6 Waterproofing

a. All coatings shall be in accordance with CCU Specification 002320 “Gravity Sewer System”

a. Manufacturers of the contract precast structures not listed in the CCU Approved Products List shall provide to CCU documentation of a minimum of five (5) years of manufacturing experience of like products, their manufacturing quality control procedures, testing capability, coating processes, and references for approval.

PART 3 - EXECUTION

3.1 INSPECTIONS

3.1.1 CCU shall have access to the quality of all materials, manufacturing processes, coating process, and the product prior to shipment to the project site. Any section shall be subject to rejection due to failure to meeting the engineering drawings and/or CCU specification requirements even if accepted prior to shipping. Sections rejected after delivery shall be marked for identification and removed from the job site. Sections damaged after delivery and/or installation shall be removed and replaced at no cost to CCU.

3.1.2 All sections shall be inspected for general appearance, dimensions, and soundness. The surfaces shall be dense and close-textured and free of blisters, cracks, roughness, and exposed reinforcement.

3.1.3 Repair of imperfections shall be made only with CCU approval of the demonstrated manufacturers repair materials and processes. All repairs shall be approved by CCU prior to acceptance of the project.

3.2 DELIVERY, STORAGE AND HANDLING

3.2.1 Precast sections shall not be shipped until the concrete has attained 4000 psi at 28 days.

3.2.2 Precast sections shall conform to manufacturer's delivery and handling requirements.

3.2.3 The structure's edges shall be protected to prevent shipping and/or spalling damage.

3.2.4 The structure shall be lifted and/or supported using lifting points and/or handling devices.

3.3 INSTALLATION

3.3.1 Precast bases shall be placed in a properly dewatered and completely drained sub-grade on a layer of compacted bedding material in accordance with the CCU design details.

3.3.2 Inlet and outlet piping shall be connected and sealed in accordance with the manufacturer's specifications and the engineering drawings.

3.3.3 The exterior waterproofing coat shall be touched up after installation.

3.3.4 Interior concrete fill shall be placed on a clean base slab and against clean walls after the leakage test has been performed and accepted and water used for the test has been completely removed.

3.3.5 The access door and frame shall be placed on the top of the structure or some other means shall be provided to prevent accidental/unauthorized entry until the contractor makes the final adjustments to grade.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

1.1.1 General

This Specification provides for the furnishing all labor, materials, equipment, and incidentals required for all cast-in-place concrete including reinforcing steel, forms, water stops and miscellaneous related items such as sleeves, reglets, anchor bolts, inserts, and embedded items specified under other Sections.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the work required under the contract.

1.1.3 Location of the Work

The location of this work is as shown on the bidding documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of construction of cast-inplace concrete with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

The work shall be measured and the compensation determined in the following manner:

1.2.1 Cast-in-place concrete

The cast-in-place concrete shall be considered part of the completed items such as lift station pads, valve pads, and reclaimed water meter bases and paid as defined by that specification.

1.2.2 Miscellaneous

All other items required for the completion of the project and not included as a specific bid item shall be considered incidental to the project and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (Latest Revision)

ACI 301 - Structural Concrete for Buildings
ACI 305 - Recommended Practice for Hot Weather Concreting
ACI 306 - Recommended Practice for Cold Weather Concreting
ACI 315 - Details and Detailing of Concrete Reinforcement
ACI 347 - Recommended Practice for Concrete Formwork
ACI 350R – Concrete Sanitary Engineering Structure
ASTM A1064- Welded Steel Wire Fabric for Concrete Reinforcement
ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C33 - Concrete Aggregates
ASTM C94 - Ready-Mixed Concrete
ASTM C150 - Portland Cement

1.4 PARTIAL LISTING OF RELATED SECTIONS

002340 - Valves
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 Shop Drawings: The Contractor shall submit complete detailed documentation of all materials for approval by the CCU prior to the start of the project. The Contractor shall submit one (1) signed electronic copy of the material submittals.

1.5.2 The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

1.5.3 Final approval is at the discretion of CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 General

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below:

2.1.2 Cement

a. Cement: ASTM C150, Portland Type II

2.1.3 Aggregates

a. Fine aggregate: ASTM C33.

b. Coarse aggregate: ASTM C33, 3/4 inch maximum size.

2.1.4 Admixtures

a. Air Entraining: W.R. Grace "Darex AEA" or equal as approved by CCU.

b. Water Reducing: W.R. Grace "WRDA with Hycol" by W.R. Grace or equal as approved by CCU.

2.1.5 Concrete

a. The proportions of ingredients shall be selected in accordance with ACI 301 Section 3.8.

b. Concrete shall be 3,500 psi except where noted otherwise.

c. All concrete shall be air entrained 6% ± 1%.

2.1.6 Reinforcing

a. Reinforcing Steel: ASTM A615, Grade 60 deformed bars; stirrups and ties Grade 40.

b. Welded Wire Fabric: ASTM A185.

c. Fabricate reinforcing steel per ACI 315.

2.1.7 Forms And Accessories

a. Form Lumber: Form lumber shall be in accordance with ACI 347.

b. Form Ties: Form ties shall be removable metal of fixed length; cone type, 1-1/4 inch maximum diameter; 1 inch break back dimension; and waterproofing washer. Wire ties and wood spreaders not permitted.

c. Form Release Agent: Form release agents shall be a non-staining, non-moisture absorbing, or non-imparing colorless material which will not stain the concrete.

d. Dovetail Anchor Slots: Dovetail anchor slots shall be galvanized steel; easily removed foam filler; bent tab anchors; and securable to concrete formwork.

e. Water stop: Water stop shall be extruded polyvinyl chloride or cold joint water stop (volclay) as shown on the engineering drawings.

PART 3 - EXECUTION

3.1 GENERAL

3.1.1 The Contractor shall design and construct formwork, false work, shoring, and bracing to meet all loads during placement and curing required for the finishes, shapes, lines, and dimensions.

3.1.2 The Contractor shall provide for inserts, openings, sleeves, offsets, recesses, anchorage, blocking, and other penetrations and embedment.

3.1.3 The Contractor shall set required steel frames, angles, bolts, inserts, and other imbedded items required to be anchored in the concrete before the concrete is placed.

3.1.4 The form release agent shall not be applied where concrete surfaces are scheduled to receive special finishes which may be affected by agent. Contact surfaces of untreated forms shall be soaked with clean water, and the surfaces kept wet prior to placing concrete. The form release agent shall be applied in accordance with manufacturer's instructions.

3.2 REINFORCING

3.2.1 Fabrication

3.2.1.1 The Contractor shall fabricate all reinforcement in strict accordance with the contract specifications, engineering drawings, and the approved shop drawings.

3.2.1.2 The Contractor shall not use bars with kinks or bends not shown on the engineering drawings or the approved shop drawings.

3.2.1.3 The Contractor shall not bend or straighten steel in a manner that will damage the material.

3.2.2 Placement

3.2.2.1 The Contractor shall accurately place all concrete reinforcement, securing, and supporting by concrete bricks, metal chairs or spacers, and/or metal hanger.

3.2.2.2 Splicing

a. The Contractor shall place bars with minimum 30 bar diameter overlap at splices.

b. Lapped ends of bars shall be placed in contact and securely wired or shall be separated 1-1/2 inches minimum to permit the embedment of the entire surface of each bar in concrete.

c. The contractor shall stagger the splices of adjacent bars.

d. The contractor shall splice wire fabric at least 1-1/2 meshes wide.

3.2.3 The Contractor shall securely place all required steel dowels in accordance with this specification and engineering drawings.

3.2.4 The Contractor shall notify CCU of any conflicts with conduits, piping, inserts, sleeves, or any other items interfering with placing reinforcement as indicated on the engineering drawings or as otherwise required before placing concrete.

3.2.5 Steel reinforcement shall be free from rust scale, loose mill scale, oil, paint, and all other coatings which will destroy or reduce bond between steel and concrete.

3.3 INSPECTION

3.3.2 The Contractor shall verify that all formwork, reinforcing, and work of other trades are complete and ready for placement of concrete.

3.3.3 The Contractor shall notify CCU for its approval to proceed at least 48 hours before placing concrete.

3.4 CONCRETE MIXING AND PLACEMENT

3.4.2 All cast-in-place concrete shall be transit-mix concrete in accordance with ASTM C94.

3.4.3 Re-tempering of concrete is not permitted.

3.4.4 The Contractor shall not pour concrete when weather conditions are not suitable for the proper placing, finishing, or curing of the concrete unless approved by CCU. The Contractor shall pour

concrete only during dry weather. In the event of sudden rainstorms, the Contractor shall cover the exposed, freshly placed concrete to protect from damage. When cold or hot weather concreting is authorized by CCU, the contractor shall comply with ACI 305 and ACI 306.

3.4.5 The Contractor shall convey concrete to the forms as rapidly as practicable utilizing methods to not cause segregation or loss of ingredients. Free fall from mixer or truck to conveyance shall not exceed 3 feet. When pouring concrete in final position, the free fall shall not exceed 5 feet. The Concrete shall be poured in horizontal layers approximately 2 feet thick and avoid the formation of cold joints and poorly bonded sections between layers. The horizontal distribution of concrete by spading or vibration is prohibited.

3.4.6 Unless otherwise specified or directed by CCU, the Contractor shall vibrate all reinforced concrete. Use only approved mechanical vibrators operated by experienced operators. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Vibrate concrete sufficiently to produce satisfactory consolidation without causing segregation. Do not use vibrators to transport concrete in the forms or insert them into lower layers of concrete that have begun to set.

3.5 CONCRETE TESTING

3.5.2 The Contractor shall prepare and cure and have tested by an independent certified laboratory in accordance with ASTM standards: one (1) set of four (4) test cylinders for each concrete placement for each 50 cubic yards of concrete placed in any one day or fraction thereof.

3.5.3 The Contractor shall provide all results to CCU for review.

3.5.4 The Contractor shall pay for all supplemental testing required if the cylinders break at lower than the required strength and replace all inferior concrete material.

3.6 CURING

3.6.2 Concrete shall be water cured, cured using curing compounds or waterproof paper and sheeting, or other ASTM approved methods. The minimum curing period shall be 7 days.

3.7 REMOVAL OF FORMS

3.7.2 The Contractor shall remove forms in accordance with ACI 347 only after concrete has attained sufficient strength to support its own weight, construction live loads placed thereon, and lateral loads all without excessive deflection or damage to the structure.

3.7.3 The Contractor shall be responsible for the proper removal of forms, installing all shoring and reshoring, and removal of shores and reshores. The contractor shall replace any work damage due to improper or early removal of forms, shores, and reshores at no additional cost to CCU.

3.7.4 The Contractor shall remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surface and pointing up and rubbing the resulting pockets to match the surrounding areas.

3.8 FINISHING CONCRETE

3.8.2 The Contractor shall provide finishes in accordance with ACI 301 as follows:

a. Rough Form Finish: All concrete surfaces not exposed to view
b. Grout Cleaned Finish: All concrete surfaces exposed to view
c. Floated Finish: Concrete floor slabs
d. Trowel with Broom Finish: Horizontal slabs exposed to the weather

3.9 QUALITY ASSURANCE

3.9.2 The concrete work shall conform to ACI 301 and ACI 347 except as modified herein.

3.9.3 The concrete reinforcement shall be stored in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond breaking coatings.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

1.1.1 General

This Specification provides for the furnishing all labor, materials, equipment, and incidentals required for filling joints and setting and anchoring items to masonry and concrete.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, tools, and all other associated appurtenances necessary to do the work required under the contract.

1.1.3 Location of the Work

The location of this work is as shown on the bidding documents.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of grouting with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

Grouting shall be incidental to the work accomplished and compensation shall be included in the cost of the final product such as a manhole, valve vault, grease interceptor, or wetwell.

1.3 REFERENCED STANDARDS (Latest Revision)

ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars Using 2-in. or [50 mm] Cube Specimens

C827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures

1.4 PARTIAL LISTING OF RELATED SECTIONS

002320 - Gravity Sewer System
002530 - Submersible Sewage Pump Lift Station-Package Design
002540 - Submersible Sewage Pump Lift Station- Standard Design

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 Product data and manufacturer's mixing and installation instructions shall be submitted in accordance with contract requirements. The Contractor shall submit one (1) signed electronic copy of the material submittals.

1.5.2 The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details.

1.5.3 Final approval is at the discretion of CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions

2.1.1 General

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below:

2.1.2 Acceptable Manufacturers

a. Specifications include references to designated manufacturers to illustrate minimum acceptable requirements for products.

b. Substitutions: Products of equal or better quality, function, and performance may be proposed for substitution with approval by CCU.

2.1.3 Non-shrink Cement Grout

2.1.3.1 Non-shrink, non-metallic cement based grout can be used with a minimum compressive strength of 5,000 psi at 28 days when tested in accordance with ASTM C109 and with no shrinkage when tested in accordance with ASTM C827. Grout shall consist of premixed, prepackaged materials requiring only the addition of potable water. Grout shall be Embeco 153 Grout by Master Builders, Five Star Grout by U.S. Grout Corporation, or CCU approved equal.

2.1.3.2 Non-shrink Epoxy Grout: Non-shrink, non-metallic epoxy-based grout shall have a minimum compressive strength of 10,000 psi at 28 days when tested in accordance with ASTM C109 and with no shrinkage when tested in accordance with ASTM C827. The grout shall be a pourable 100% solids epoxy system consisting of three premeasured pre-packaged components. The grout shall be Five Star Grout by U.S. Grout Corporation or CCU approved equal.

PART 3 - EXECUTION

3.1 GENERAL

3.1.1 The Contractor shall only use non-shrink grout for setting equipment, anchor bolts, dowels, bearing plates, and similar applications where shrinkage is not allowed.

3.2 GROUTING

3.2.1 Base and Bearing Plate Grouting: Mix, place, compact, and cure non-shrink cement grout in accordance with manufacturer's instructions.

3.2.2 Machinery and Equipment Base Grouting: Coarse aggregate having a maximum size of 1/4 inch shall be added to non-shrink cement grout. Mixing and installation shall be in accordance with manufacturer's instructions.

3.2.3 Anchor Bolts and Dowels: Drill holes in concrete shall be twice the bolt or dowel diameter. Dowels shall be drilled at a 30° downward angle. Drilled holes shall be thoroughly cleaned using compressed air to remove all deleterious material including dust, debris, and water prior to filling with non-shrink epoxy grout. Grouted holes shall be immediately embedded with items.

3.3 TESTING

3.3.1 The Contractor shall prepare and cure and have tested by an independent certified laboratory in accordance with ASTM standards: one (1) set of four (4) test cylinders for each grout placement for each 50 cubic yards of grout placed in any one day or any fraction thereof.

3.3.2 The Contractor shall provide all results to CCU for review.

3.3.3 The Contractor shall pay for all supplemental testing required if the cylinders break at lower than the required strength and replace all inferior grout material.

3.4 CURING

3.4.1 Grout shall be water cured, cured using curing compounds or waterproof paper and sheeting, or other ASTM approved methods. The minimum curing period shall be 7 days.

END OF SECTION

PART 1 - GENERAL

The following specification defines the furnishing of all labor, materials, equipment and incidentals required to perform all surface preparation and application of shop primers on ferrous metals, shop and field painting and/or coating, excluding stainless steels, as specified herein.

1.1 SCOPE

1.1.1 General

This specification shall apply to all exposed structural and miscellaneous steel; all mechanical and electrical equipment, operators, posts, conveying systems, pipe, fittings and valves; and all electrical conduit and appurtenances as specified in the attached painting schedules and all other work required to be surface prepared, primed, painted and coated unless otherwise specified on the engineering drawings. Minor items not stated in the schedule of work shall be included in the work of this Section if they come within the general intent of the specification.

1.1.2 Work Included

The Contractor shall furnish all labor, materials, equipment, tools and all other associated appurtenances required to perform the surface preparation and application of shop primers all shop painting, field painting and coating as specified herein for the project.

The following items shall not be painted:

- Stainless steels unless specifically noted otherwise.
- Packing glands and other adjustable parts and name plates of mechanical equipment.

Painting shown in schedules may not provide the Contractor with complete indication of all painting Work.

All new and specifically identified existing surfaces and items except where the natural finish of the material is specified as a corrosion resistant material not requiring paint; or is specifically

indicated in the Contract Documents as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint them the same as adjacent similar materials or areas.

1.1.3 Location of the Work

The location of this work is as shown on the bidding documents. All exposed surfaces shall be painted in accordance with this specification and CCU standard details.

1.1.4 Coordination of Work

The Contractor shall be responsible for the satisfactory coordination of the surface preparation and application of shop primers, all shop and field painting with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

Surface preparation, shop prime painting, shop and field painting activities shall be considered incidental to the cost of the final product and no direct compensation will be made therefore.

1.3 REFERENCED STANDARDS (latest revisions)

- Society for Protective Coatings (SSPC) SP 1 Solvent Cleaning SSPC SP 3, Power Tool Cleaning.
- SSPC SP 6, Commercial Blast Cleaning.
- SSPC SP 10, Near-White Blast Cleaning.
- SSPC SP 11, Power Tool Cleaning To Bare Metal.
- SSPC VIS 1, Visual Standard for Abrasive Blast Cleaned Steel.
- SSPC VIS 2, Method of Evaluating Degree of Rusting/Painted Steel Surfaces.
- SSPC Volume 2, Systems and Specifications.
- U.S. Green Building Council, “LEED Reference Guide,” Version 2.2, Credit 4.2.
- ANSI Z535.1, Safety Color Code
- ANSI/NSF Standard 60, Drinking Water Treatment Chemicals – Health Effects.
- ANSI/NSF Standard 61, Drinking Water System Components – Health Effects.
- ASTM D16, Terminology for Paint, Related Coatings, Materials and Applications.
- ASTM D2200, Pictoral Surface Preparation Standards for Painting Steel Surfaces.

- National Association of Piping Fabricators, NAPF 500-03, Surface Preparation Standard For Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings And/or Special Internal Linings.
- Steel Structures Painting Council (SSPC) PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
- AWWA C 550
- Federal, State, and Local regulations

1.4 PARTIAL LISTING OF RELATED SECTIONS

011307 - Submersible Sewage Pump and Rail System
002330 - Low Pressure Sewer Systems
002325 - Force Mains
002335 - Potable Water and Reclaimed Water Mains
002530 - Package Lift Stations
002540 - Standard Lift Stations
002340 - Valves
002345 - Fire Hydrants

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 For only those materials that the Contractor is requesting deviations from these specifications, the Contractor shall submit in writing documentation to justify approval of the proposed primers and detailed surface preparation, shop and field paint application procedures and dry film thicknesses, and complete schedule of paints by Charlotte County Utilities (CCU) prior to the start of the project.

1.5.2 The Contractor shall submit four (4) signed copies of the material submittals.

1.5.3 The Contractor shall submit representative physical samples of the proposed primers.

1.5.4 The Contractor shall submit color cards for initial color selections.

1.5.5 The contractor submittals shall include the statement that the submittals have been reviewed and the materials meet the contract specifications and/or standard details. Final approval is at the discretion of CCU.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions

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2.1.1 General

a. All painting materials shall be delivered to the mixing room in unbroken packages bearing the manufacturer's brand and name.

b. All painting materials shall be used without adulteration and mixed, thinned, and applied in strict accordance with manufacturer's directions for the applicable materials and surface.

c. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish coats to be used.

d. No paint containing lead shall be used.

e. Oil shall be pure boiled linseed oil.

f. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations.

2.1.2 Approved products

2.1.2.2 The painting schedule shall be prepared on the basis of each manufacturer's recommendation for application. Specific products are listed below for particular applications:

A. New and Existing Ferrous Metals, Structural Steel (With or Without Sprayed Fireproofing), Miscellaneous Ferrous Metals, Exterior Surfaces of Valves, Exterior Surfaces of Ferrous Piping, and Exterior Surfaces of All Ferrous Metal (Both Exposed and to be Later Covered With Insulation); Non-submerged, Interior:

a) Shop Primer: Minimum 67 percent volume solids, build, two component, cycloaliphatic amine-catalyzed epoxy or polyamido-amine epoxy coating; 250 grams per liter VOC, maximum, or functional equivalent.

One coat, 4.0 to 6.0 dry mils.

b) Field Primer and Touch-Up: Minimum 67 percent volume solids,high-build, twocomponent, Polyamidoamin-catalyzed epoxy; 250 grams per liter VOC, maximum, or functional equivalent.

c) Finish: High-Gloss: Minimum 67 percent high build, two component, cycloaliphatic amine-catalyzed epoxy or polyamido-amine epoxy coating; 250 grams per liter VOC, maximum, or functional equivalent.

Vertical Surfaces: One coat, 3.0-5.0 dry mils.

B. New and Existing Ferrous Metals, Galvanized Metals and Non-Ferrous Metals and Exterior Surfaces of Piping; Submerged and Intermittently Submerged, including up to 4.0 feet above liquid surface; Certified per ANSI/NSF Standard 61; Low VOC Content, Interior:

a) Prime/Finish: Semi-Gloss: Minimum 100 percent solids, modified polyamine epoxy or flakefilled epoxy; 8 grams per liter VOC, maximum, or functional equivalent.

C. New and Existing Ferrous Metals, Non-Ferrous Metals, and Galvanized Metals, including Water Storage Tanks; Low VOC Content, Non-Submerged, Exterior:

a) Ferrous Metal Primer: Minimum 67 percent volume solids, build, two-component, cycloaliphatic amine-catalyzed epoxy coating; 250 grams per liter VOC, maximum, or functional equivalent.

One coat, 4.0 to 6.0 dry mils.

b) Ferrous Metal Touch-Up: For Low-temperature Curing Conditions: Minimum 80 percent solids, modified polyamido-amine or polyamine epoxy; 296 grams per liter VOC, maximum. For Warm-temperature Curing Conditions: Minimum 80 percent volume solids, modified polyamido-amine or polyamine epoxy; 296 grams per liter VOC, maximum, or functional equivalent.

c) Finish Gloss: Minimum 66 percent volume solids, two-component, waterborne acrylic polyurethane or aliphatic acrylic polyurethane coating; 297 grams per liter VOC, maximum, or functional equivalent.

D. New and Existing Galvanized Metal, Non-Ferrous Metal, and Fiberglass; Nonsubmerged, Interior:

a) Primer: Minimum, 39 percent volume solids single-component, self-cross linking acrylic primer-sealer, 140 grams per liter VOC, maximum, or functional equivalent.

One coat, 2.0 to 4.0 dry mils.

b) Finish: Satin: Minimum, 41 percent volume solids, single component, self-cross linking acrylic; 208 grams per liter VOC, maximum, or functional equivalent.

One coat, 2.0-3.0 dry mils.

E. New and Existing Pipe and Duct Insulation, Cloth, Paper and Canvas Jacketed; Nonsubmerged, Interior:

a) Primer: Minimum 38 percent volume solids single-component, self-cross linking acrylic primer-sealer; 159 grams per liter VOC, maximum, or functional equivalent.

1.

One coat, 2.0 to 3.0 dry mils.

b) Finish: Satin: Minimum 37 percent volume solids, single component, self-cross linking acrylic; 226 grams per liter VOC, maximum, or functional equivalent.

One coat, 2.0 to 3.0 dry mils.

F. New and Existing PVC and CPVC Piping and Fiberglass Insulation Covering; Nonsubmerged, Interior:

a) Primer: Minimum 37 percent volume solids single-component, self-cross linking acrylic primer-sealer; 226 grams per liter VOC, maximum, or functional equivalent.

One coat, 2.0 to 4.0 dry mils.

Finish: Satin: Minimum 37 percent volume solids, single component, self-cross linking acrylic; 226 grams per liter VOC, maximum, or functional equivalent. One coat, 2.0 to 3.0 dry mils.

2.1.3 Color Coding for Pipes and Equipment

A. Guidelines:

a. CCU reserves the right to select non-standard colors for paint systems specified within ability of paint manufacturer to produce such non-standard colors. Provide such colors at no additional expense to the COUNTY.

b. The color code establishes, defines, and assigns a definite color for each process system.

c. All elements originating from the equipment and/or supplying the equipment shall be painted between and up to, but not including, the fixed flanges nor the flexible conduit connections on the equipment.

d. Valves and fittings shall be painted in the color of the main body of the pipe.

e. Stainless steel components, bolts, washers, and nuts shall not be painted.

f. All pipes and equipment shall be "paint and color coding schedule" as described in this specification. Elements not listed on the schedule shall be assigned a color by CCU and shall be treated as an integral part of the contract.

g. All hanger saddles and pipe support floor stands shall be painted the same color and with the same paint as the pipe it supports unless made of stainless steel.

h. For equipment on roofs or exposed to view, such as on exterior building facades and in offices and lobbies, color shall be selected by CCU.

B. Color Codes:

Unless otherwise specified, use the following color codes:

TABLE 09900-A TABLE OF STANDARD COLORS

Standard Colors	**Color Designation***
POTABLE WATER LINES	BLUE (PANTONE 287)
POTABLE WATER VALVE CAPS	BLUE (PANTONE 287)
FIRE LINES	ANSI SAFETY RED (PANTONE 485)
FIRE LINE VALVE CAPS	ANSI SAFETY RED (PANTONE 485)
WASTE WATER LINES	ANSI SAFETY GREEN (PANTONE 3415)
WASTE WATER VALVE CAPS	ANSI SAFETY GREEN (PANTONE 3415)
RECLAIMED WATER LINES	PURPLE (PANTONE 522C)
RECLAIMED WATER VALVE CAPS	PURPLE (PANTONE 522C)
FIRE HYDRANTS	ANSI SAFETY YELLOW (PANTONE 109)

FIRE HYDRANTS VALVE CAPS	ANSI SAFETY YELLOW (PANTONE 109)

**Equivalent colors matching these colors are acceptable. Provide with Shop Drawing submittal direct color comparisons of color numbers available from manufacturer submitted.*

PART 3 - EXECUTION

3.1 GENERAL

Any work involving surface preparation, application of shop primers, shop and field painting and/or coating shall be completed in accordance with all the latest applicable federal, state and local requirements and regulations as well as the applicable AWWA standards.

All painters shall be equipped with the appropriate personal protective equipment in accordance with Federal, State, and Local environmental, health, and safety regulations.

3.2 SURFACE PREPARATION

3.2.1 Surface Preparation and Priming

a. All waste residues resulting from surface preparation and priming shall be handled in accordance with all applicable federal, state, and local regulations.

b. Non-submerged components scheduled for priming shall be blast cleaned in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.

c. Submerged components scheduled for priming shall be blast cleaned in accordance with SSPC-SP-10.

d. Surfaces shall be dry and free of dust, oil, grease, and other foreign material before priming.

e. Field and Shop prime shall be in accordance with approved manufacturer's recommendations.

f. All metal welds, blisters, etc., shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected so as to provide a smooth surface for painting. All rust, loose scale, oil, tar, and asphalt bearing coatings, grease, and dirt shall be removed by use of approved solvents, wire brushing, grinding, or sanding.

g. All PVC pipe and other plastic matrix surfaces to be painted shall be lightly sanded and cleaned of residue before painting.

h. Galvanized surfaces shall have all oxidation and foreign material removed before painting by SSPC SP 1, Solvent Cleaning using an approved V.O.C. compliant method.

i. Surfaces required to support 24 mils (or more) of coating shall have a minimum Anchor Profile of 3.0 mils.

3.2.2 Non Primed Surfaces

Approved coating shall be applied in accordance with manufacturer's recommendations.

3.2.3 Painted and Coated Surfaces

All surfaces to be painted and coated shall be prepared as follows and shall be dry and clean before painting:

a. Painting and coating shall be in accordance with approved manufacturer's recommendations.

b. Connection points of all surfaces for products shop painted shall be covered to retain a clean surface and allow for proper installation to adjoining materials and there after field painted as required.

c. Valves and fittings shall be painted in the color of the main body of the pipe.

d. Stainless steel components, bolts, washers, and nuts shall not be painted.

e. All pipes and equipment shall be painted to meet the “paint and color coding schedule” as described in this specification. Elements not listed on the schedule shall be assigned a color by CCU and shall be treated as an integral part of the contract.

f. All hanger saddles and pipe support floor stands shall be painted the same color and with the same paint as the pipe it supports unless made of stainless steel.

3.2.4 Application

a. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is uniform finish, color, and appearance, particularly for intense chroma primary colors. Ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a film thickness equivalent to that of flat surfaces.

b. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint before final installation of registers or grilles.

c. Paint backs of access panels and removable or hinged covers to match exposed surfaces.

d. Paint aluminum parts in contact with dissimilar materials with specified paint system.

e. Paint tops, bottoms, and side edges of doors the same as exterior surfaces.

f. Omit field-applied primer on metal surfaces that have been primed in the shop. Touch-up paint shop-primed coats and pre-finished items only when approved by CCU using compatible primers and manufacturer's recommended compatible field-applied finishes.

g. Welds shall be stripe-coated with intermediate or finish coat of paint after application of prime coat.

3.2.5 Surface Preparation and Priming, Painting, and Coating of Existing and Previously Painted or Coated Surfaces and Existing Non Primed Surfaces

a. Surface preparation and priming, painting and coating of existing or previously painted or coated surfaces and existing non primed surfaces shall be in accordance with approved manufacturer's recommendations.

b. The condition of existing paint or coating shall be determined by approved manufacturer and CCU approval.

c. Existing paint or coating shall be scarified to produce an anchor profile to support the new coatings per approved manufacturer and CCU.

d. The thickness of new coatings applied to old existing coatings shall be in accordance with approved manufacturer recommendations and with CCU approval.

e. During surface preparation of old coatings, bare steel surfaces shall be spot surface prepared and spot primed. Additionally, the edges of the surrounding coatings shall be feathered so that the new coatings may blend with the old coatings.

3.3 **WORKMANSHIP**

3.3.1 General

a. At the request of CCU, samples of the finished work prepared in strict accordance with these Specifications shall be furnished and all painting shall be equal in quality to the approved samples. Finished areas shall be adequate for the purpose of determining the quality of workmanship. Experimentation with color tints shall be furnished to the satisfaction of CCU where standard chart colors are not satisfactory.

b. Protection of movable objects, equipment, fittings and accessories shall be provided throughout the painting operation. Remove all electric plates, surface hardware, etc., before painting, protect and replace when completed. Mask all machinery name plates and all machined parts not receiving a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to adequately protect flooring and other work from all damage during the operation and until the finished job is accepted.

c. On metal surfaces, apply each coat of paint at the rate specified by the manufacturer to the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of an additional coat(s). On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

d. Protection of Property and Structures:

- Protect property and structures adjacent to the Work from waste residues resulting from cleaning, surface preparation and paint application.

- Use shrouding, vacuum blasting, or other approved methods for cleaning and surface preparation of exterior surfaces.

- During blast cleaning and surface preparation of interior and exterior surfaces, control discharge of dust and grit, using shrouding, negative-pressure containment/dust collection systems, or other means to protect adjacent property and structures and prevent dust/grit from escaping. Similarly control removal and temporary storage of residues to protect adjacent property and structures.

- For painting of exterior surfaces, use rollers, shrouding or other approved methods as required to protect adjacent property and structures from wind-blown paint residues.

- Submit proposed procedures for cleaning, surface preparation and paint application describing methods for protecting adjacent property and structures from residues. Do not proceed with cleaning, surface preparation or painting until proposed procedures are approved by CCU.

- Tint undercoats to match color of finish coat of paint, but provide sufficient difference in shade of undercoats to distinguish each separate coat. Provide a code number to identify material tinted by manufacturer.

- Non Primed Surfaces Gears, bearings surfaces, and other similar surfaces shall not to be painted and shall be given a heavy shop coat of grease or other suitable rust resistant coating. This coating shall be maintained by the contractor as necessary to prevent corrosion during all periods of storage, erection, final acceptance test and acceptance by CCU.

3.3.2 Field Priming

a. Steel members, metal castings, mechanical and electrical equipment, and other metals which are shop primed before delivery at the site will not require a prime coat on the job. All piping and other bare metals to be painted shall receive one coat of primer before exposure to the weather, and this prime coat shall be the first coat as specified in the painting schedule.

b. Equipment which is specified to receive a baked-on enamel finish or other factory finish shall not be field painted unless the finish has been damaged in transit or during installation. Surfaces that have been shop painted and have been damaged or where the shop coat or coats of paint have deteriorated shall be properly cleaned and retouched before any successive painting is done on them in the field. All such field painting shall match as nearly as possible the original finish.

c. Equipment shipped with a protective shop painting coat or coats shall be touched up to the satisfaction of CCU with primers as recommended by the manufacturer of the finish paint.

3.3.3 Field Painting

a. All painting at the site shall be designated as field painting and shall be under the direct and complete control of the contractor and only skilled painters and specialists, and where required, shall be used on the work.

b. All paint shall be at room temperature before applying and no painting shall be done when the temperature is below 50° F, in dust-laden air, when rain is falling, or until all traces of moisture have completely disappeared from the surface to be painted.

c. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Materials subject to weather shall be primed coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.

d. All painting shall be performed by approved methods with number of coats modified as required to obtain the total dry film thickness specified. Spray painting shall be performed specifically by methods submitted and as approved by CCU.

e. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept dry by heating and ventilation, if necessary, until each coat of paint has hardened. Any defective paint shall be scraped off and repainted in accordance with CCU approval.

f. Before final acceptance of the work, all damaged surfaces of paint shall be cleaned and repainted as approved by CCU.

3.4 CLEANUP

3.4.1 The premises shall be free from accumulation of waste material and rubbish caused by employees or work.

3.4.2 The contractor shall remove all paint where it has been spilled, splashed, or spattered on all surfaces at the completion of all painting.

3.4.3 All clean up and disposal of waste materials from the surface preparation, painting and coating activities shall be disposed of, by the Contractor, in conformance with all laws, regulations and standard practices.

END OF SECTION

PART 1 - GENERAL

It is the intent of this specification to provide the requirements for the trenchless rehabilitation of the existing sanitary sewer lines shown on the drawings, and/or specified and directed by CCU.

The sanitary sewer lines trenchless rehabilitation shall consist of Cured-in-Place Pipe, PE Fold and Form Pipe, and Fold-and-Formed PVC Pipe Lining Rehabilitation systems as specified herein.

1.1 SCOPE

1.1.1 General:

The intent of trenchless sewer pipe Insertion is to rehabilitate the existing sewer line in a manner which will correct the following deficiencies:

- Cracked/broken/etc. pipe which may be caused by poor construction, unstable soil, earth movement, infiltration, root damage, destructive loading, cleaning tool damage, etc.
- Corrosion of pipe caused by acid attack above flow level.
- Erosion of pipe caused by abrasion below the flow level.
- Degradation/deformation of pipe caused by loss of masonry.
- Infiltration of groundwater and soil through leaking pipe joints and structural defects.
- Exfiltration of sewage through leaking pipe joints and structural defects.
- Inflow of surface water and infiltration of groundwater through abandoned or illegal connections.
- Root re-growth after removal.
- Pipe Capacity Problems; Smooth, tight fitting sewer pipe can usually improve the sewage flow characteristics of the existing line.

Note: sewer pipe refers to the installation of a structural pipe as opposed to coatings or membranes for corrosion or infiltration and exfiltration prevention.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, supervision, tools, and all other associated appurtenances necessary to rehabilitate the designated gravity sanitary sewer lines for the purpose of eliminating infiltration, providing

corrosion protection, repair of voids, and restoration of the structural integrity of the gravity sanitary sewer pipes as required under the contract.

The Contractor shall also furnish all labor, materials, equipment, tools, and all other associated appurtenances required to notify affected residents, prepare the construction site, including cleaning and flushing of existing piping; flow control bypass pumping; pre-installation and postinstallation closed-circuit television inspections, protection of existing conditions during installation work; unloading; hauling; distributing and installation; testing of all pipe, fittings, scaffolding, piping, valves, boilers, etc. and other accessories as required for the proper installation; protection of the site during the life of the Contract, including providing of necessary watchmen, warning lights, barricades, traffic control, dust control and maintenance of detours, as needed; and finally the cleanup of the work site, including maintenance of surfaces such as paving, and seeding, sodding and graveling, as needed, if damaged and all other item required to complete the rehabilitation.

The work shall consist of, but not necessarily be limited to, performing the following tasks where specified:

- Sewer Line Chemical Root Treatment
- Sewer Line Cleaning
- Sewer Flow Control
- Television Inspection, Main Sewers
- Sewer Pipe Joint Testing, Main Sewers
- Sewer Pipe Joint Sealing, Main Sewers
- Lateral Sewer Sealing
- Sewer Line Section Sealing
- Trenchless Point Repair
- Mainline Sewer Pipe Lining and Pipe Insertion
- Sewer Manhole Sealing

1.1.3 Location of the Work

- The area of work and the type of maintenance or rehabilitation to be performed shall be at those locations shown on the tables and/or drawings and made part of the specifications and Contract Documents.

- The potential project sites may be located at any of the existing sanitary sewer manholes that are a part of the Charlotte County Utilities (CCU) sanitary sewer collection and pumping system.

- The accessibility to the work sites shall vary, as manholes may be located in streets, alleys, utility easements, residential backyards, and various other locations. Accessibility to all manholes shall be the responsibility of the Contractor, and all expenses associated with work site accessibility should be taken into consideration as part of the Contractor's bid pricing. Damage to existing pavement surfaces and base courses, and/or other surface improvements, as a result of the Contractor's activities, shall be restored to like-new condition by the Contractor at his sole expense. The Contractor shall implement all required measures to provide CCU

personnel and equipment with complete access to all work site areas during the entire course of performing this project.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the sanitary sewer lines rehabilitation with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Responsibilities

a) Safety: All aspects of the trenchless rehabilitation shall be done in strict accordance to the manufacturer's instructions and the requirements of NASSCO, the National Association of Sewer Service Companies. It is also the Contractor's responsibility to comply with OSHA standards and all regulations pertaining to work in confined space entry.

b) Notice of Residents: The contractor shall be responsible for notifying affected residents by the mean of door hangers to alert residents that a Sanitary sewer lines rehabilitation installer will be working on their street and what they can expect as far as service outages, water usage and unusual odors.

c) Licenses and Permits: The contractor shall be responsible for obtaining municipal and other Licenses and Permits and assistance in obtaining approvals or consent from utilities or carriers such as the telephone company or other persons or organizations upon whose property or authority performance of work under the contract might impinge or a written release from responsibility for the performance of work under the contract if and to the extent such work is precluded by the inability to obtain approvals or consent.

d) Work Access: The contractor shall be responsible for obtaining legal access to site of work to the extent that the CCU is legally able to so provide or, if not so able, a written release from responsibility for the performance of work at sites where access cannot be made available.

e) Clearance of Blockages or Obstructions in the Sewer System: The contractor shall be responsible for obtaining clearance of blockages or obstructions in the sewer system, if any, if such clearance is required for performance of work under the contract and if such clearance is not otherwise provided for within the contract.

f) Location and Exposure of Manholes: CCU shall be responsible for providing locations of all sanitary sewer structures. It shall be the responsibility of CCU to locate and designate all sanitary sewer structure access points, and to provide rights of access to these points. It shall be the responsibility of the Contractor to expose all sanitary sewer structure access points.

g) Manhole and wetwell numbering system: CCU shall be responsible for a manhole and wetwell numbering system for all areas of the project.

h) Pump Stations: CCU shall be responsible for shutting down or manually operate certain pump stations if such becomes necessary for performance of the work.

i) Water Access: The contractor shall be responsible for obtaining water access necessary for performance of work under the contract from fire hydrants at the site of work or other suitable designated sources.

j) Disposal: The Contractor shall be responsible for disposal of all materials removed from the sewers during the performance of the work at an appropriately permitted disposal site.

k) Secure Storage Area: The contractor shall be responsible for finding secure storage areas of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract.

1.1.6 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of Charlotte County Utilities (CCU).

1.2 METHOD OF MEASUREMENT & PAYMENT

1.2.1 General:

Payments to the Contractor shall be made on the basis of the proposal Bid Form as full and complete payment for furnishing all materials, labor, tools, and equipment, and for performing all operations necessary to complete the work included in the Contract Documents. Such compensation shall also include payments for any loss or damages arising directly or indirectly from the work, or from any discrepancies between the actual quantities of work and those shown in the Contract Documents, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the CCU.

The prices stated on the Bid Form include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the details and specified herein. The Basis of Payment for an item at the price shown in the Bid Form shall be in accordance with its description of the item in this section and as related to the work specified. Unit prices will be applied to the actual quantities furnished and installed in conformance with the Contract Documents.

The bids for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item of work has not been established in the Bid Form or this section, the cost for that work shall be included in some other applicable Bid Item, so that his proposal for the project reflects the total price for completing the work in its entirety.

1.2.2 Measurement

The quantities for payment under this Contract shall be full compensation determined by actual measurement of the completed items, in place, ready for service and accepted by CCU unless otherwise specified. CCU will witness all field measurements.

The quantities stated in the Bid Form are approximate only and are intended to serve as a basis for the comparison of bids and to fix the approximate amount of the cost of the project. CCU does not expressly or impliedly agree that the actual amount of the work to be done in the performance of the contract will correspond with the quantities in the Bid Form; the amount of work to be done may be more or less than the said quantities and may be increased or decreased by CCU as circumstances may require. The increase or decrease of any quantity shall not be regarded as grounds for an increase in the unit price or in the time allowed for the completion of the work, except as provided in the Contract Documents.

CCU will not provide any space or place to store materials for this project. No payment will be made for stored materials.

It is intended that all work required to complete this Contract will be included in the various bid items as described in the following paragraphs.

a) Cured-in-Place Pipe Lining:

Each unit price bid shall include all necessary or required traffic control, preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; pre and post television inspections; chemical joint sealing if necessary; pipe liner; cleaning; testing; cleanup; all labor, materials and equipment required to provide a complete and acceptable liner installation, including all appurtenances, in accordance with the Contract Documents, the manufacturer's specifications and compliance with all applicable regulatory requirements.

This item will be measured and paid at the unit price per linear feet of Cured in Place Pipe Lining as delineated by the pipe size and depth in brackets named in the Bid Form. Measurement shall be made based on the horizontal projection of the centerline of the permanently installed liner between manholes, including the laying length of fittings along the run, measured to the nearest foot from inside wall of manhole to inside wall of manhole for each section lined, not including the manhole chamber.

Payment for bypass pumping (for main line only), if required (other than because of damage caused by the Contractor) will be paid under a separate item, Payment for bypass to reinstate service laterals shall be included in this line item.

Rear lot easement main line sewers are the sanitary sewer mains located in easements, usually behind residential or commercial properties or within easements through woods. Properties are not easily accessible from at least one (1) manhole in run.

Roadway right-of-way main line sewers are the sanitary sewer mains located in roadway rightof-way. Both manholes are easily accessible.

Also included in this item, if repairs are required due to damage caused by the Contractor's operation, shall be materials for repair, if required, including pipe, fittings and specials, pipe bedding, and materials for surface restoration; transportation and handling costs delivered to the work site; any bypass pumping; providing provisional sewers to maintain service; complying with the State of Florida Trench Safety Act, including shoring; removal, transportation and disposal of existing sewer excavation; supporting and protecting existing utilities as required; dewatering; sheeting and shoring, if necessary; furnishing and installing replacement pipe, fittings and repair couplings; unloading material and placing it in the trench; cutting pipe; furnishing and installing joint materials including lubricant; making all connections within the lines to existing sewers, laterals and structures; placing and compacting bedding and backfill; furnishing and installing additional suitable backfill material, If required; furnishing all materials and equipment required to clean and test the sewer; cleaning and testing the sewer; temporary paving installation and removal; permanent paving replacement; replacement of pavement markings as existed before repair; replacing utilities, catch basins, manholes, trees, grass, shrubs, mail boxes, sprinkler systems, concrete or rock bed driveways, sidewalk and all other similar Items, to original locations and to equal or better than original conditions; obtaining and paying for any necessary permits; satisfying all requirements of the permits, and all other appurtenant and miscellaneous items and work including final cleanup.

b) PE Fold and Form Pipe Lining:

Each unit price bid shall include all necessary or required traffic control, preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; pre and post television inspections, chemical joint sealing if necessary; pipe liner; cleaning; testing; cleanup; and all labor, materials and equipment required to provide a complete and acceptable liner installation.

This item will be measured and paid at the unit price per linear feet of Fold and Formed Pipe Lining as delineated by the pipe size and depth in brackets named in the Bid Form. Measurement shall be made based on the horizontal projection of the centerline of the permanently installed liner between manholes, including the laying length of fillings along the run, measured to the nearest foot from inside wall of manhole to inside wall of manhole for each section lined.

Payment for bypass pumping (for main line only), if required (other than because of damage caused by the Contractor) will be paid under a separate item. Payment for bypass pumping of service laterals, if required, shall be included with the lining operation.

Rear lot easement main line sewers are the sanitary sewer mains located in easements usually behind residential or commercial properties or within easements through woods. Properties are not easily accessible from at least one (1) manhole in run.

Roadway right-of-way main line sewers are the sanitary sewer mains located in roadway rightof-way. Both manholes are easily accessible.

Also included in this item, if repairs are required due to damage caused by the Contractor's operation, shall be materials for repair, if required, including pipe, fittings and specials, pipe bedding, and materials for surface restoration; transportation and handling costs delivered to the work site; any bypass pumping; providing provisional sewers to maintain service; complying with the State of Florida Trench Safety Act, including shoring; removal, transportation and disposal of existing sewer excavation; supporting and protecting existing utilities as required; dewatering; sheeting and shoring, if necessary; furnishing and installing replacement pipe, fittings and repair couplings; unloading material and placing it in the trench; cutting pipe; furnishing and installing joint materials including lubricant; making all connections within the lines to existing sewers, laterals and structures; placing and compacting bedding and backfill; furnishing and installing additional suitable backfill material, If required; furnishing all materials and equipment required to clean and test the sewer; cleaning and testing the sewer; temporary paving installation and removal; permanent paving replacement; replacement of pavement markings as existed before repair; replacing utilities, catch basins, manholes, trees, grass, shrubs, mail boxes, sprinkler systems, concrete or rock bed driveways, sidewalk and all other similar Items, to original locations and to equal or better than original conditions; obtaining and paying for any necessary permits; satisfying all requirements of the permits, and all other appurtenant and miscellaneous items and work including final cleanup.

c) Fold-and-Formed PVC Pipe Lining:

Each unit price bid shall include all necessary or required traffic control, preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; pre and post television inspections; chemical joint sealing if necessary; pipe liner; cleaning; testing; cleanup; all labor, materials and equipment required to provide a complete and acceptable liner installation.

This item will be measured and paid at the unit price per linear feet of Pipe Lining as delineated by the pipe size and depth in brackets named in the Bid Form. Measurement shall be made based on the horizontal projection of the centerline of, the permanently installed liner between manholes, including the laying length of fittings along the run, measured to the nearest foot from inside wall or manhole to inside wall of manhole for each section lined.

Payment for bypass pumping (for main line only), if required (other than because of damage paused by the Contractor) will be paid under a separate item. Payment for bypass pumping of service laterals, if required, shall be included with the lining operation.

Rear lot easement main line sewers are the sanitary sewer mains located in easements usually behind residential or commercial properties or within easements through woods. Properties are not easily accessible from at least one manhole in run.

Roadway right-of-way main line sewers are the sanitary sewer mains located in roadway rightof-way. Both manholes are easily accessible.

Also included in this item, if repairs are required due to damage caused by the Contractor's operation, shall be materials for repair, if required, including pipe, fittings and specials, pipe bedding, and materials for surface restoration; transportation and handling costs delivered to the work site; any bypass pumping; providing provisional sewers to maintain service; complying with the State of Florida Trench Safety Act, including shoring; removal, transportation and disposal of existing sewer excavation; supporting and protecting existing utilities as required; dewatering; sheeting and shoring, if necessary; furnishing and installing replacement pipe, fittings and repair couplings; unloading material and placing it in the trench; cutting pipe; furnishing and installing joint materials including lubricant; making all connections within the lines to existing sewers, laterals and structures; placing and compacting bedding and backfill; furnishing and installing additional suitable backfill material, If required; furnishing all materials and equipment required to clean and test the sewer; cleaning and testing the sewer; temporary paving installation and removal; permanent paving replacement; replacement of pavement markings as existed before repair; replacing utilities, catch basins, manholes, trees, grass, shrubs, mail boxes, sprinkler systems, concrete or rock bed driveways, sidewalk and all other similar Items, to original locations and to equal or better than original conditions; obtaining and paying for any necessary permits; satisfying all requirements of the permits, and all other appurtenant and miscellaneous items and work including final cleanup.

d) Reinstatement of Service Lateral:

Contractor shall reconnect sanitary sewer service laterals, any size, to the new liner which shall include, but not be limited to, blocking or plugging incoming line; removal, transportation and disposal of material generated by cleaning and preparation; television inspections; furnishing the equipment necessary to internally cut out, removing the liner to at least 95%, minimum, of the circumference of the lateral, cutting out and labeling the coupon in accordance with the "Quality Control" section of these specifications; recovering all waste material from the sewer; service pipe cleaning; sealing the lateral connection to the liner; grouting the service lateral; testing; locating and exposing clean-outs when necessary; using the clean-out to locate the sewer connection; performing all repairs required due to damage caused by the Contractor and all appurtenant and miscellaneous items and work.

A smoothing device shall be used to smooth rough edges of the re-established lateral connection. A locater log shall be provided to CCU to identify the location of the lateral connection and the connections that were re-established.

This item of work will be measured and paid at the unit price per each lateral connected. Payment for bypass pumping of service laterals if required, shall be included with the lining operation.

e) Hydraulic Cleaning & Inspection of Gravity Sewer and Mechanical Cleaning of Gravity Sewer:

The Contractor shall furnish all labor, materials, and equipment to provide cleaning and inspection of the existing gravity sewer prior to rehabilitation. Hydraulic cleaning requires use of standard water jet equipment regardless of the number of passes required. Mechanical cleaning includes the use of a porcupine, bucket, or any other additional cleaning equipment. Cleaning includes all dirt, grease and sludge removal from the existing sewer.

The work includes furnishing all related work to provide cleaning of the existing sewer and inspecting the cleaned sewer with a radial view, closed circuit television.

Hydraulic and Mechanical Cleaning & Inspection is considered incidental to the project and no direct compensation shall be made.

The cleaning methods (hydraulic or mechanical) to be employed shall be determined by the Contractor based upon the material and condition of the pipe, and shall be approved by CCU.

f) Cleaning & Inspection of Tuberculated Cast Iron or Ductile Iron Pipe:

The Contractor shall furnish all labor, materials, and equipment to provide cleaning and inspection of the existing gravity sewer prior to rehabilitation.

The work comprises cleaning of the existing tuberculated Cast Iron Pipe (C.I.P) or Ductile Iron Pipe (D.I.P) by hydraulic means including high pressure cleaning and by mechanical means including a radial chain cutter, as approved by CCU, inspecting the cleaned sewer in accordance with the Contract Specifications. High pressure cleaning includes the use of high pressure equipment to clean extremely tuberculated C.I.P. or D.I.P. Use of high pressure equipment shall be as approved by CCU prior to commencement of the work.
Measurement for payment will be the actual length in linear feet of tuberculated pipe cleaned and inspected.

Payment for Cleaning and Inspection of Tuberculated C.I.P. or D.I.P. will be made at the appropriate Contract Unit Price per linear feet.

g) Root Removal and Chemical Root Treatment in Sewer Lines:

This item of work will be measured and paid at the unit price per linear feet, Measurement of lines shall be made based on the horizontal projection of the centerline of the pipe between manholes, measured to the nearest foot from inside wall of manhole to inside wall of manhole, not including the manhole chamber, in the pipe which root removal/treatment was performed.

Each unit price bid for root removal and chemical root treatment in sewer lines shall include cleaning; all mechanical methods of root removal specified or not; all herbicides or chemical treatment specified or not; and/or all equipment, materials and labor which shall be used to

provide an open sewer (no blockage or constrictions due to roots or vegetation) to an acceptable for television inspection and ready for any and all repairs.

h) Removal of protruding services:

The Contractor shall furnish all materials and equipment to remove the existing service connections that protrude into the existing gravity sewers.

The work includes the removal of the portion of the service lateral, which protrudes into the inner diameter of the existing gravity sewer.

The number of protruding services to be measured for payment will be the actual number of service removed.

Payment for Removal of Protruding Services will be made at the Contract Unit Price per removal.

i) Sewer Bypass Operations with Tanker Truck:

These pay items provide complete compensation for operations required for sewer liner installations, the Contractor shall first attempt to perform the sewer rehabilitation work without bypass operations.

However, if the Contractor deems bypass pumping to be necessary and if CCU agrees with the reasons, this request for bypass operations will be paid for with these pay items.

Further, if bypass operations are required due to difficulties encountered due to the methods of installation, the Contractor shall be held responsible for all bypass operations at no additional cost to CCU. If this situation requires CCU to perform all or some of the by-pass operations, the Contractor shall compensate CCU accordingly.

Plugging or blocking a sewer line shall be included in the appropriate bid item for which the flow must be stopped; this is considered incidental work and no additional payment shall be considered for the activities under this item.

Plugging or blocking of the sewer lines and bypass operations for the reinstatement of service laterals, if required, shall be considered incidental to the work and shall not be considered for payment.

The Contractor shall furnish all materials, labor, and equipment to operate the sewer tanker truck, which will effectively collect, pump, transport and discharge all sewage entering the construction area during the work. The discharge location will be designated by CCU.

The use and quantity of a tanker truck(s) for sewer bypass must be approved in advance by CCU. Precautions must be taken to make certain that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

The number of days for sewer bypass operations with Tanker Truck to be included for payment under the Contract Item will be the total number of 24-hour days or fraction thereof during which bypass operations is ordered by CCU in writing.

Payment for sewer bypass operations with Tanker Truck will be made at the appropriate Contract Item Unit Price per day of truck use.

j) Sewage Bypass Pumping:

These pay items provide complete compensation for operations required for sewer liner installations, the Contractor shall first attempt to perform the sewer rehabilitation work without bypass pumping.

However, if the Contractor deems bypass pumping to be necessary and if CCU agrees with the reasons, this request for bypass pumping will be paid for with these pay items.

Further, if bypass pumping is required due to difficulties caused by or encountered during the rehabilitation process, the Contractor shall be held responsible for all bypass pumping operations at no additional cost to CCU. If this situation requires CCU to perform all or some of the by-pass pumping, the Contractor shall compensate CCU accordingly.

Plugging or blocking a sewer line shall be included in the appropriate bid item for which the flow must be stopped; this is considered incidental work and no additional payment shall be considered for the activities under this item.

Plugging or blocking of the sewer line and bypass pumping for the reinstatement of service laterals, if required, shall be considered incidental to the work and shall not be considered for payment.

These items shall include, but are not limited to all necessary or required traffic controls; pumps; piping; gasoline/diesel fuel; maintenance; transportation and storage; temporary bypass and service piping; labor; materials and/or any other costs associated with bypass pumping.
The pay item is a one (1) time charge per day for all bypass pumping operations during lining installation, regardless of the number of pumps required or the duration of the pumping period, Bypass pumping of sewers shall be bid on the basis of sewer size which is bypassed.

k) Testing of coupon by an approved independent certified material testing laboratory

The pay item is a one (1) time charge for each coupon test against applicable ASTM specifications. CCU selected coupon shall be tested for thickness and initial physical properties (bending strength, flex modulus, long-term performance, and chemical resistivity) to determine if material standards have been met.

1.3 REFERENCED STANDARDS (LATEST REVISION)

Wherever reference is made to any published standards, codes, or standard specifications, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to, which is in effect at the date of the opening of bids.

This specification references standards from:

- OSHA Standard and Regulations
- NAASCO Publications & Specifications
- The American Society for Testing and Materials (ASTM), such as:

ASTM

F-1071 Standard Specification for Expanded-Metal Bulkhead Panels
F-1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
F-1504 Standard Specification for Folded Poly (Vinyl Chloride) (PVC) Pipe for Existing Sewer and Conduit Rehabilitation.
F-1871 Standard Specification for Folder/Formed Poly (Vinyl Chlorine) Pipe Type A for Existing Sewer and Conduit Rehabilitation
F-1533 Standard Specification for Deformed Polyethylene (PE) Liner
F-1743 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)
C-940 Standard test method for expansion and bleeding of freshly mixed grouts for preplaced-aggregate concrete in the laboratory
C-950 Standard Practice for Repair of a Rigid Cellular Polyurethane Insulation System on Outdoor Service Vessels
D-638 Standard Test Method for Tensile Properties of Plastics
D-790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D-1248 Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable
D-1693 Standard Specification for Polyethylene Plastics ExtrusionMaterials For Wire and Cable
D-1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
D-1928 Standard Practice for Preparation of Compression-Molded Polyethylene Test Sheets and Test Specimens (Withdrawn 2001)
D-2122 Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
D-2152 Standard Test Method for Adequacy of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion
D-2444 Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)

D-2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

D-2990 Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics) which are made a part hereof by such reference and shall be the latest edition and revision thereof

D-3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

D-5813 Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems

The Contractor shall, when required, furnish evidence satisfactory to CCU that materials and methods are in accordance with such standards where so specified. In the event any questions arise as to the application of these standards or codes, copies shall be supplied on site by the Contractor. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
002930 - Grassing

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 General

a) All sewer lines rehabilitation products shall meet this specification.

b) All submittals listed in this section must be provided in writing prior to the start of the project by the contractor to CCU for approval. The Contractor shall submit one (1) signed electronic copy of the material submittals.

c) Submittal shall be made in a timely manner so that the project schedule can be met.

d) The Contractor submittals shall include the statement that the submittals have been reviewed and meet the contract specifications and/or standard details. All submissions shall bear the Contractor's stamp certifying that they have been checked for conformance and accuracy. Submissions without the Contractor's stamp of approval will not be reviewed by CCU and will be returned to the Contractor.

e) All required submittals must be satisfactory to CCU.

1.5.2 Manufacturer/Installer Qualification Requirements

Acceptable documentation of the minimum requirements listed below must be submitted to CCU. These requirements include detailed resume of the field superintendent and installer(s).

a) Contractor Qualifications:

- The Contractor shall be specialized in the trenchless rehabilitation system for a minimum of 5 years.

- The Contractor shall have successfully installed at least 50,000 L.F. of the product in wastewater collection systems in the State of Florida and shall submit a minimum of five (5) references of completed projects in the State of Florida within the last five (5) years. Reference submittals shall include project names, locations, work performed, contract amounts, completion dates, contact persons and phone numbers, where similar works, in quantity and quality, as specified herein has been performed successfully.

- All installers shall be trained, approved and certified in writing by the manufacturer in the handling, mixing and application of the products to be used including leak repair and surface preparation.

- The field superintendent must have a minimum of two (2) years experience in trenchless pipeline rehabilitation and must be present during all steps of the entire rehabilitation process.

- The Contractor shall initiate and enforce quality control procedures consistent with applicable ASTM, NAASCO, NACE and SSPC standards and the lining manufacturer's recommendations.

1.5.3 Equipment Certifications

The contractor shall provide the following for CCU approval:

- Description of all the equipment to be used for the rehabilitation

- Certification that the equipment to be used for applying the products has been manufactured or approved by the product manufacturer and Applicator personnel have been trained and certified for proper use of the equipment.

- Safety plan describing all safety equipment to be utilized in compliance with OSHA standards pertaining to work in confined space entry.

1.5.4 Progress Schedule

- A progress schedule shall be prepared and be submitted to CCU for review and comments within fourteen (14) days of date issue of Purchase Order.

- The schedule shall detail the proposed sequence of the work and identify pertinent construction activities of each Bid Item. The schedule shall be time-scaled, identifying the estimated date of starting and completion of each bid item in order to complete the Purchase Order within the time specified in the Purchase Order.

- Subsequent changes to the schedule shall be accompanied by a letter of explanation with appropriate reference and revision date on the schedule.

- Review of schedule by Engineer does not relieve the Contractor of any errors or omissions.

1.5.5 Product Data

For each product proposed to be furnished, the contractor shall provide the following for CCU approval:

a) Vendor's specific technical data sheets showing full details about component materials and their complete physical properties, demonstrating compliance with the latest revisions of the ASTM requirements including independent ASTM test results indicating the product conforms to the published technical data. A certificate of "Compliance with Specification" shall be furnished for all materials supplied Bids containing exceptions to the material requirements shall be considered non-responsive.

b) Material Safety Data Sheets (MSDS)

c) Liner dimensions pertinent to this job

1.5.6 Independent Third Party Testing Verification

Sewer rehabilitation products submitted for approval must provide third party test results supporting the structural performance (short-term and long-term) of the product and such data shall be satisfactory to CCU. No product will be approved without independent third party testing verification.

1.5.7 Quality Management System Certification

Both the rehabilitation manufacturing and installation processes shall operate under a quality management system which is third-party certified to ISO 9000 or other recognized organization standards. Proof of certification shall be required for approval.

1.5.8 Labeling

Proposals must be labeled clearly on the outside of the proposal envelope, listing the product name and installer being proposed. Only proposals using pre-approved products and installers will be opened and read. Proposals submitted on products and/or from installers that have not been pre-approved will be returned unopened

1.5.9 Installation Procedures

a) The Contractor shall submit a work plan to CCU for acceptance. The work plan shall address preparation steps required for pre-installation

b) The procedure and steps to be followed for the pre-installation and installation of the liner with project specific guidelines and recommendations (even if the process is named in the specification)

c) Proof of any required federal, state or local permits or licenses necessary for the project.

d) Design details for any ancillary systems and equipment to be used in site and surface preparation, application and testing.

1.5.10 Samples

a) The Contractor shall furnish for review all samples as required by the Contract Documents or requested by CCU.

b) A minimum of two (2) samples shall be submitted. Samples shall be of sufficient size or quantity to clearly illustrate the quality, type, range of color, finish or texture and shall be properly labeled to show the nature of the work where the material represented by the sample will be used.

1.5.11 Schedule of Payment Values

a) The Contractor shall submit a separate Schedule of Payment Values for the work in accordance with the "Method of Measurement and Payment" section of these specifications for all items in the bid that are to be paid for on unit bid item basis. The schedule shall contain the installed value of the component parts of work for the purpose of making progress payments during the construction period.

b) The schedule shall be given in sufficient detail for the proper identification of work accomplished. Each item shall include a complete installation with all construction costs, the Contractor's overhead, contingencies and profit. The sum of all unit bid items multiplied by their respective quantities shall equal the total value of the Contract.

1.5.12 Television recordings

- The Contractor shall submit all pre and post television recordings in color DVD format to CCU for acceptance prior to payment.

1.5.13 Written warranty.

The Applicator shall warrant all work against defects in materials and workmanship for a period of five (5) years, unless otherwise noted, from the date of final acceptance of the project. This warranty shall be a guarantee against failure for the warranty period. Failure shall be defined to occur if the rehabilitation system fails to:

a) Prevent the internal damage or corrosion of the sewer line.

b) Prevent groundwater infiltration.

If any failures occur within the specified warranty period after final acceptance, the Contractor shall repair or restore the sewer lines to its previously accepted state including all materials, labor, and at no additional cost to CCU. Repair shall be completed within 30 days of written notification of the failure.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions

2.1.1 General

a) Materials to be incorporated in the work shall be delivered sufficiently in advance of their installation and use to prevent delay in the execution of the work, and they shall be delivered as nearly as feasible in the order required for executing the work.

b) All materials and equipment to be incorporated into the work shall be properly designed for the use intended.

c) Actual Pipe Size: The nominal pipe size is not necessarily the size of the pipe in the field. The Contractor shall verify (and measure wherever it is exposed) the actual inside diameter of the actual sewer pipe prior to ordering pipe materials and before trenchless pipe insertion is undertaken.

d) All materials, products, or devices incorporated in this project shall be new and unused and shall conform to the requirements of all applicable laws, ordinances, and codes unless indicated otherwise in the Contract Documents and shall be the products of reliable manufacturers, which

unless otherwise specified, have been regularly engaged in the manufacture of such material or devices. Procedures and additional requirements regarding manufacturer's experience and substitutions are included in the “Submittals" section of these specifications.

e) Pipe liner with gashes, nicks, abrasions, or any such physical damage which may have occurred during storage and/or handling, which are larger/deeper than 10% of the wall thickness shall not be used and shall be removed from the construction site.

f) Materials and/or equipment which, in the opinion of CCU, are inferior or of a lower grade than specified, or required, will not be accepted and shall be removed immediately from the project site.

g) The Contractor shall protect all devices and materials from deterioration and damage. All materials and equipment shall be handled and stored in strict accordance with the manufacturer's recommendations. Products shall also be stored and handled according to their Material Safety Data Sheets (MSDS). The materials shall be handled and stored by the manufacturer, fabricator supplier and Contractor before, during, and after shipment to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, damage or theft of any kind whatsoever. Any material exhibiting any of the above shall be removed and replaced at the Contractor's expense for both labor and materials.

h) The Contractor shall store his equipment and materials at the Contractor's base of operations in a secure storage area of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract and in accordance with the manufacturer's recommendations. No storage facility is provided by CCU.

i) Only materials that meet the latest revisions of the applicable American Society of Testing and Materials (ASTM) material standards are acceptable for this work.

j) Design Loads: CCU usually determines the design loads for the pipe to be installed and determines the required thickness with regard to the materials specified. External loads (earth loads/live loads/hydrostatic pressure), construction loads (external grout pressure/jacking force), support developed by annulus grouting, long-term flexural strength/modulus, together with appropriate safety factors are engineering considerations. The Design is specific to the Process.

k) Corrosion Resistance: The finished pipe in place shall be fabricated from materials which, when installed, will be chemical resistant to withstand internal exposure to domestic sewage. All exposed surfaces shall remain corrosion resistant.

l) Dimensional Change: For certain processes, dimensional changes can occur during forming, installation or after installation. The liner shall be fabricated to a size that, when installed, will neatly and tightly fit the internal circumference of the conduit. Allowance for longitudinal stretching during insertion shall be made.

m) Length: The minimum length shall span the distance from inlet to the outlet of the respective pipe to be rehabilitated. The contractor shall verify the lengths in the field before starting work.

n) Thickness: The minimum thickness for the liner shall be as verified by design calculations prepared by a professional engineer for each specific pipe location

2.1.2 Cured In Place Pipe Lining

a) General

Cured in place pipe Lining introduced into sanitary sewers in order to rehabilitate the existing pipeline system without excavation, shall comply with ASTM F-1216 (Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin Impregnated Tube).

Liner shall be neither accepted nor installed until design calculations are acceptable to CCU.

b) Material Composition

The polyester fiber felt tubing and resin material shall be in accordance with the requirements with ASTM F-1216

Tube - The sewn Tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F-1216, Section 5.1 or ASTM F-1743, Section 5.2.1 or ASTM D5813, Sections 5 and 6. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections. The tube may also contain felt layers reinforced with glass or carbon fibers.

Resin - The resin system shall be a corrosion resistant polyester or vinyl ester system including all required catalysts, initiators that when cured within the tube create a composite that satisfies the requirements of ASTM F-1216, ASTM D-5813 and ASTM F-1743, the physical properties herein, and those which are to be utilized in the submitted and approved design of the CIPP for this project. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of this specification.

c) Material and Equipment Acceptance

At the time of manufacture, each lot of liner shall be reviewed for defects and tested in accordance with ASTM D-2837 and D-1693. At the time of delivery, the liner shall be homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters, or deleterious faults.

The Contractor shall provide certified test results for review by CCU, from the manufacturer that the material conforms to the applicable requirements.

For testing purposes, a production lot shall consist of all liner having the same marking number. It shall include any and all items produced during any given work shift and must be so identified as opposed to previous or ensuing production.

The wet out Tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design CIPP wall thickness.

The Tube shall be manufactured to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during installation.

The outside layer of the Tube shall be coated with an impermeable, flexible membrane that will contain the resin and allow the resin impregnation (wet out) procedure to be monitored.

The Tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the Tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.

The wall color of the interior pipe surface of CIPP after installation shall be a relatively light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
Seams in the Tube shall be stronger than the non-seamed felt material.

d) Marking

The Tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings code shall identify the manufacturer name, SDR, size, material, date, and shift on which the liner was extruded. The tubes must be manufactured in the USA.

At the end of the production shift during which a production lot has been extruded, the marking code on the liner shall be changed to indicate that said time intervals have elapsed and then a new production shift has begun.

e) Chemical and Physical Testing

CCU may, at any time, direct the manufacturer to obtain compound samples and to prepare test specimens in accordance with ASTM D-1928. These specimens shall comply with the minimum property values as follows with the applicable ASTM F-1216 requirements.

The polyester fiber felt tubing and resin material shall be in accordance with the requirements with ASTM F-1216 and be fabricated to a size that when installed will neatly fit the interior of the host pipe. Allowance shall be made for circumferential stretching during inversion. The minimum tube length shall be that deemed necessary by the Contractor to effectively span the distance between the access points. Unless otherwise specified, the Contractor will use a polyester filter felt tube and an epoxy vinyl ester and catalyst system compatible with the inversion process and having the following physical properties for the cured pipe:

Property	Test Method	min. per ASTM F1216
Tensile Strength	ASTM D-638	3,000 psi
Flexural Stress	#101 (Modified ASTM D-790)	4,500 psi
Flexural Modulus of Elasticity	#101 (Modified ASTM D-790)	300,000 psi
Minimum Long-Term (50 Year)	Modulus of Elasticity	150,000 psi

The lining manufacturer shall submit to CCU for review complete design calculations for the liner, signed and sealed by a Professional Engineer registered in the State of Florida and certified by the manufacturer as to the compliance of his materials to the values used in the calculations. The liner shall be designed to withstand a live load equivalent to two (2) H20 passing trucks plus all pertinent dead loads, hydrostatic pressure and grout pressure (if any). For design purposes, the water table shall be considered at grade elevation. The liner shall be designed in accordance with ASTM F-1216 and resist buckling in accordance with AWWA C-950. The buckling analysis shall account for the combination of dead load, live load, hydrostatic pressure and grout pressure against the liner. Modulus of soil reaction shall not be taken higher than 1000, corresponding to a moderate degree of compaction of bedding (85% to 95% Proctor) and a fine-grained soil as shown on Table A4 of AWWA C-940.

As part of the design calculation submittal, the liner manufacturer shall submit a tabulation of time versus temperature. This tabulation shall show the lengths of time that exposed portions of the liner will endure without self-initiated cure or other deterioration beginning. This tabulation shall be at 5' F. increments ranging from 70' F. to 100' F. The manufacturer shall also submit his analysis of the progressive effects of such "pre-cure" on the insertion and cured properties of the liner. This information shall be submitted in a timely fashion prior to the preconstruction conference so that CCU may set procedures for dealing with such an instance caused by construction delays. Bidders with materials with other characteristics must supply complete information on their bids of the values as listed for ascertaining minimum thickness.

2.1.3 Polyethylene Pipe Lining

a) General

Deformed polyethylene pipe introduced into sanitary sewers in order to rehabilitate the existing pipeline system without excavation, shall comply with ASTM F-1533 and D-3350- Specification for Deformed Polyethylene P.E. Liner. This method applies to the rehabilitation of 8-inch through 12inch diameter pipe in terms of material and installation. Unless otherwise required by installation depth, liner shall have an SDR of 32.5, minimum. The polyethylene pipe liner shall be completely factory manufactured, jointless, seamless, deformed and/or folded under factory controlled temperature conditions, coiled, and packaged. The pipe liner producer's certification, in accordance with ASTM specifications, shall be furnished with the liner coils. The Contractor shall turn the pipe liner producer's certification and warranty over to CCU prior to installation.

b) Material Composition

Pipe shall be made from P.E. 3408 polyethylene resins complying with ASTM D-3350, cell classification: P.E. 345434 D for High Density. It shall be Type 3, Grade 4, Class D, according to ASTM D-1248. The Contractor shall provide certified test results for review by CCU, from the manufacturer that the material conforms to the applicable requirements.

c) Material and Equipment Acceptance

At the time of manufacture, each lot of liner shall be reviewed for defects and tested in accordance with ASTM D-2837 and D-1693. At the time of delivery, the liner shall be homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters, or deleterious faults.

The Contractor shall provide certified test results for review by CCU, from the manufacturer that the material conforms to the applicable requirements.

For testing purposes, a production lot shall consist of all liner having the same marking number. It shall include any and all items produced during any given work shift and must be so identified as opposed to previous or ensuing production.

d) Marking

Liner shall be marked at five feet (5') intervals or less with a coded number which identifies the manufacturer, SDR, size, material, date, and shift on which the liner was extruded.

At the end of the production shift during which a production lot has been extruded, the marking code on the liner shall be changed to indicate that said time intervals have elapsed and then a new production shift has begun.

e) Chemical and Physical Testing

CCU may, at any time, direct the manufacturer to obtain compound samples and to prepare test specimens in accordance with ASTM D-1928. These specimens shall comply with the minimum property values as follows with the applicable ASTM F-1533 and ASTM D-3350 requirements for P.E. 3408.

ASTM 03350 Cell Classification Values

Physical Properties	STM Test Method	Cell Class	Cell Class Limits	Typical Values
Density	D1505	3	0.941 to 0.955	0.0947
Melt Index	D1238	4	<0.15	<0.1

Flexural Modulus	D790	5	110,000 to <160,000 psi	120,000 psi
Tensile Strength at Yield	D638	4	3000 to <3500	3300 psi
Environmental Stress Crack Resistance	D1693	3	Condition C 192 hrs, F 20	>5000 hrs
Hydrostatic Design Basis at 23 C	D2837	4	1600 psi	1600 psi
Color and Stabilizer		D	Natural with UV Stabilizer	

2.1.4 PVC or PVC Alloy Pipe Lining

a) General

Contractors must clearly identify the applicable cell designation that corresponds to its pipe.

F1504-97 - Standard Specification for Folded Poly (Vinyl Chloride) (PVC) Pipe for Existing Sewer and Conduit Rehabilitation.

F1871-98 - Standard Specification for Folder/Formed Poly (Vinyl Chlorine) Pipe Type A for Existing Sewer and Conduit Rehabilitation.

ASTM F-1071-98 and D-1784-99A - Standard Specification, for rigid poly-vinyl chloride (PVC) pipe and rigid poly-compounds.

b) Material and Equipment Acceptance

Each production lot of pipe liner shall be inspected and tested at the time of manufacture for defects in accordance with ASTM D-2444, ASTM D-2152, and ASTM D-2122. All pipe liner shall be homogeneous, uniform in color, free of cracks, holes, foreign material, blisters and deleterious faults. Production lot of pipe liner shall include unique markings to clearly discern from other production lots.

c) Marking

The pipe liner shall be marked at maximum five-feet (5') intervals with coded number system to indicate manufacturer, size (diameter and SDR), material, extrusion date, and production shift that fabricated the pipe liner. The marking code shall be changed with each production shift change.

d) Chemical and Physical Testing

The outside diameter and minimum wall thickness shall be manufactured to a size that when installed will fit the internal circumference of the conduit specified (without annular space). Allowance shall be made for misaligned and missing conduit.

Standard Dimension Ration (SDR) of the pipe liner shall be as selected from the following table:

Liner Nominal Outside Diameter Inches	**Existing Pipe Inside Diameter Range. Inches** Minimum	Maximum	**Resulting SDR over Diameter** SDR35	SDR41	SDR5
4	3.70	4.20	33-42	39-50	48-61
6	5.60	6.30	33-42	39-50	48-61
8	7.40	8.40	33-42	39-50	48-61
9	8.30	9.40	33-42	39-50	48-61
10	9.30	10.50	33-42	39-50	48-61
12	11.30	12.80	33-42	39-50	48-61
15	13.90	15.70	33-42	39-50	48-61
18	17.50	19.50	33-42	39-50	48-61

The minimum length shall be that deemed necessary by the Contractor to effectively span the distance form the inlet to the outlet of the respective manholes unless otherwise specified. The Contractor shall verify the lengths in the field before manufacturing. Individual insertion runs can be made over one (1) or more manhole sections as determined in the field by the Contractor and approved by CCU.

2.2 QUALITY CONTROL

2.2.1 Review at Place of Manufacture

Unless otherwise specified, all products, materials, and time and equipment may be subject to review by CCU at the place of manufacture.

The presence of CCU at the place of manufacture, however, shall not relieve the Contractor of the responsibility for furnishing products, materials, and equipment which comply with all requirements of the Contract Documents, and said duty shall not be avoided by any act or omission on the part of CCU.

2.2.2 Sampling and Testing

Unless otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered.

The Contractor shall provide and identify a pipe "coupon" specimen from each run of pipe for testing after installation by an approved independent laboratory.

Each coupon shall be properly labeled with a permanent marker indicating the following information:

a) Date
b) Contractor's name
c) Line size
d) CCU Manhole identification numbers (both manholes)
e) Exact footage of the coupon location from the upstream manhole

CCU will keep all coupons and select which ones shall be sent for testing. The Contractor will be compensated for all expenses for the testing of these specimens as specified in the line item of the bid tabulation of this contract. The Contractor shall pay for all costs of retests made necessary by the failure of the samples of specimens to meet the specified ASTM requirements.

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

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

2.2.3 Site Investigation and Control

The Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the work due to his failure to comply with this requirement.
The Contractor shall inspect related and appurtenant work and shall report in writing to CCU any conditions which will prevent proper completion of the work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor within the scope of the project.

2.2.4 Additional Review and Testing

CCU reserves the right to employ and pay for the services of an independent testing laboratory for additional specified testing.

The work or actions of the testing laboratory shall in no way relieve the Contractor of his obligations under the Contract. The laboratory testing work will include such review and testing required by the Contract Documents, existing laws, codes, and ordinances. The testing laboratory will have no authority to change the requirements of the Contract Documents, nor perform, accept, or approve any of the Contractor's work.

The Contractor shall allow CCU ample time and opportunity for review and testing materials to be used in the work. The Contractor shall advise CCU promptly upon placing orders for materials so that arrangements may be made, if desired, for review before shipment from the place of manufacture. The Contractor shall at all times furnish CCU and his representatives, facilities including labor, and allow proper time for reviewing and testing materials, equipment, and workmanship. The Contractor must anticipate that possible delays may occur in the execution of its work due to the necessity of materials and equipment being reviewed and accepted for use. The Contractor shall furnish, at his own expense, all samples of materials required by CCU for testing, and shall make his own arrangements for providing dater, electric power, or fuel for the various reviews and tests of lines and manholes.

CCU will bear the costs of all tests, reviews, or investigations undertaken by the order of CCU for the purpose of determining conformance with the Contract Documents if such tests, reviews, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by CCU as a result of such tests, reviews, or investigations, the Contractor shall bear the full costs of any additional tests and investigations, which are ordered by CCU to ascertain subsequent conformance with the Contract Documents.

2.2.5 Right of Rejection

CCU or its representative shall have the right, at all times and places, to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the work at the site. If CCU or its representative, through an oversight or otherwise, has accepted materials or work which is defective or which is contrary to the Contract Documents, such materials, no matter in what stage or condition of manufacture, delivery, or erection, may be subsequently rejected by CCU or its representative.

The Contractor shall promptly remove rejected articles or materials from the site of the work after notification or rejection. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the Contractor.

2.2.6 Weather Conditions

Work that may be affected by inclement weather shall be suspended until proper conditions prevail. In the event of impending storms, the Contractor shall take necessary precautions to protect all work, materials and equipment from exposure.

2.2.7 Fire Protection

The Contractor shall take all necessary precautions to prevent fires at or adjacent to the work, including his own equipment and trailers. Adequate fire extinguisher stations shall be provided throughout the work area.

2.2.8 Final Remedy

If testing results do not meet the specifications, the Contractor shall be required to replace the liner.

PART 3 - EXECUTION

3.1 INSTALLATION PROCEDURES: GENERAL

3.1.1 Pipe Installation

- No pipe shall be relined without prior notification of CCU. Each prepared pipe shall be subject to inspection by CCU for cleanliness and smoothness immediately before the liner is installed and defective pipe may be rejected.
- Procedures for liner installation are specific to the method being used and may vary with material, thickness, pipe size, pipe shape, etc. When proprietary techniques are used, the licensor's Specification for proper installation should be used.
- All approved installation instructions and procedures submitted shall be carefully followed during installation.
- Any proposed changes in installation procedures shall require submittal of revised procedures and acceptance by CCU
- The contractor shall maintain in operating condition all active pipes encountered during the pipeline rehabilitation

3.1.2 Acceptance

- The finished pipe shall be continuous over the entire length of the host pipe from manhole to manhole in a continuous, jointless, tight fitting, watertight pipe.
- The liner shall be free as commercially practicable from visual defects (such as foreign inclusions, pin holes, concentrated ridges, discoloration, pitting, varying wall thickness and other deformities), damage, deflection, holes, delamination, uncured resin, and the like.
- The contractor shall make all required connections to existing pipes and manholes and carry out such work in accordance with local standards and requirements and as directed by CCU.
    - Extreme care shall be used to prevent debris from entering existing pipe prior to rehabilitation.

- Cut-ins and attachments at service connections shall be neat and smooth.
- The pipe liner passing through or terminating in a manhole shall be carefully cut out in a shape and manner approved by CCU.
- The invert and benches shall be streamlined and improved for smooth flow.
- There shall be no visible infiltration through the liner or from behind the liner at manholes and service connections. The installed pipe liner shall meet the leakage requirements of the pressure test as specified.

3.1.3 Cleanup

- No trash, rubbish, or any other debris, shall be stored at any site, whether the work is in progress or not.

- After installation has been completed and accepted, the Contractor shall clean up the project area and return the site ground cover to grade. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor.

- Sidewalks, driveways, and street surfaces disturbed by the installation shall be recovered and restored in conditions equal to that before the work began, to the satisfaction of CCU.

3.1.4 Warranty

During the warranty period any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner mutually agreed by CCU and the Contractor.

If any failures occur within the specified warranty period after final acceptance, the Contractor shall repair or restore the structure to CCU standard specifications including all materials, labor, and at no additional cost to CCU. Repair shall be completed within 30 days of written notification of the failure.

3.2 PRE-INSTALLATION PREPARATIONS

The Contractor's work plan shall address the following minimum preparation/steps, unless approved otherwise by CCU:

3.2.1 Safety

The Contractor shall carry out operations under this section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space. It shall be the Contractor's responsibility to comply with OSHA Standard and Regulations pertaining to all aspects of the work.

3.2.2 Cleaning of Sewer Lines

Immediately prior to the TV inspection and subsequent line installation, it shall be the responsibility of the Contractor to clean the existing sewer lines to be rehabilitated with a highpressure water jet and to remove all internal debris out of the sewer in accordance with the "Preparatory Cleaning & Root Removal" and the "Cleaning and Inspecting Cast Iron Pipe or Ductile Iron Pipe" sections of these specifications.

3.2.3 Pre-Installation Television Inspection

It shall be the responsibility of the Contractor to video (TV) inspect the sewer pipe immediately before the pipe liner installation to assure that the existing pipe conditions are acceptable for proper pipe liner installation. These video inspections of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections using close circuit television (CCTV) inspection techniques. The pipeline interior shall be carefully inspected to determine the location of any conditions that may prevent proper installation of the liner. These shall be noted and corrected. DVDs and suitable written log for each line section shall be produced for later reference by CCU. Refer to the "Television Inspection" section of these specifications for more details.

3.2.4 Sewer repairs

If conditions such as broken pipe and major blockages are found that will prevent proper cleaning or liner installation, the Contractor, with the concurrence of CCU, shall perform the necessary point repair(s). All point repairs and costs thereof shall be defined in writing and approved by CCU prior to initiating. All estimated costs for point repairs shall be based on time and material costs (utilizing Florida Department of Transportation Specifications) necessary to complete the repair. CCU reserves the right to complete point repairs in-house or by alternative contractor.

3.2.5 Flow Control

If necessary for effective TV inspection and line installation, the Contractor shall bypass the effluent around the section or sections designated for pipe insertion by use of a diversion pump in accordance with the "Wastewater Flow Control" section of these specifications.

3.2.6 Public Notification

The Contractor shall make every effort to maintain sewer service usage throughout the duration of the project. In the event that a connection will be out of service, the longest period of no service shall be 8 hours. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:

a) Written notice to be delivered to each home or business the day prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any potential problems.

b) Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.

3.2.7 Sewer Obstructions

It shall be the responsibility of the Contractor to clear the line of obstructions such as heavy solids, roots, dropped joints, protruding service connection or collapsed pipe that will prevent the insertion of the liner. If pre-installation inspection reveals an obstruction that will prevent the installation process, that was not evident on the pre-bid video and it cannot be removed by conventional sewer cleaning equipment, then the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by CCU's representative prior to the commencement of the work and shall be considered as a separate pay item.

3.2.8 Offset Joints

If pre-installation video (TV) inspection reveals an offset joint with less than 90% clearance, the Contractor shall take the necessary steps to eliminate the offset joint. The cost to do this elimination is incidental to the cost of the lines. If pre-installation video (TV) inspection reveals an offset joint with less than 80% clearance, the Contractor shall notify CCU. CCU may elect to correct the offset joint by use of a point repair. CCU shall be the individual to determine the percent of clearance.

3.2.9 Service Connection

The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing the liner.

3.3 TEMPORARY UTILITIES

3.3.1 General

The Contractor shall provide for utilities and services for his own operations. These shall include electrical power, water, ventilation, sanitary facilities and telephone service. The Contractor shall furnish, install and maintain all temporary utilities during the Contract period including removal upon completion of the work. Such facilities shall comply with regulations and requirements of the national Electrical Code, OSHA, Florida Power and Light, and applicable Federal, State, and Local codes, rules and regulations.

3.3.2 Temporary Water

The Contractor shall supply all water necessary for performance of work under the contract. The Contractor shall provide and maintain all piping, fittings, adapters, and valving required. It is the Contractor's responsibility to arrange through CCU for a water meter. A deposit to be paid by the

Contractor is required or meter rental and all water shall be purchased by the Contractor at the prevailing rate.

3.3.3 Temporary Ventilation

The Contractor shall provide and maintain adequate ventilation for a safe working environment. In addition, forced air ventilation shall be provided for the curing of installed materials, humidity control, and the prevention of hazardous accumulations of dust, gases, or vapors.

3.3.4 Temporary Sanitary Facilities

The Contractor shall provide and maintain adequate and clean sanitary facilities for the construction work force and visitors. The facilities shall comply with Local codes and regulations and be situated at approved locations.

3.4 TEMPORARY ENVIRONMENTAL CONTROLS

3.4.1 Chemicals:

All chemicals used during project construction or furnished for testing of project operations, whether herbicide, pesticide, disinfectant, polymer, reactant of other classifications, will be required to show approval of either EPA or HUD. The handling, use, storage and disposal of such materials, containers or residues shall be in strict conformance with manufacturer and/or supplier's secured storage. Copies of antidotes shall be kept at the storage site and at the job site. The Contractor shall be responsible for any leaked chemical that has permeated into the soil. Costs incurred for cleanup of any such contamination shall be borne by the Contractor.

3.4.2 Dust

During all work for this Contract, the Contractor shall be the application of water and/or calcium chloride or other means, acceptable to CCU, eliminate dust annoyance to adjacent property CCUs and business establishments.
The Contractor shall take all protective measures, to the satisfaction of CCU, necessary to ensure that dust and debris does not enter any of the mechanical or electrical equipment. The Contractor shall be responsible for the cleanup of existing buildings and property which have become soiled due to the lack of proper dust control as determined by CCU.

3.4.3 Rubbish Control

During the progress of the work, the Contractor shall keep the site of the work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the work site, and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be

off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to me particular requirements of Part 1926 or the OSHA Safety and Heath Standards for Construction.

3.4.4 Toilet Facilities

Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.

Such facilities shall be made available when the first employees arrive on the work, shall be properly secluded from public observation, and shall be constructed and maintained in suitable numbers and at such points and in such manner as may be required.

The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the work, on the lands of CCU, or an adjacent property.

CCU shall have the right to review any building or other facility erected, maintained, or used by the Contractor, to determine whether or not the sanitary regulations have been complied with.

3.4.5 Sanitary and Other Organic Wastes

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

3.4.6 Noise

Noise resulting from the Contractor's work shall not violate the local noise ordinances or exceed the noise levels and other requirements relating to noise abatement. The Contractor shall be responsible for curtailing noise resulting from his operation. He shall, upon written notification from CCU or the noise control officers, make any repairs, replacements, adjustments, additions, and furnish mufflers when necessary to fulfill requirements.

3.4.7 Erosion Abatement and Water Pollution

It is imperative that the Contractor's dewatering operations not contaminate or disturb properties adjacent to the work sites in accordance with the regulatory agencies having jurisdiction. The Contractor shall, therefore, schedule and control his operations to confine all runoff water from disturbed surfaces, water from dewatering and/or from excavation below the ground water table operations that becomes contaminated with lime silt, mulch, and other deleterious matter, fuels, oils, bituminous, calcium chloride, chemicals and other polluting materials.

The Contractor shall construct temporary stilling basin(s) of adequate size and provide all necessary temporary materials, operations and controls including, but not limited to, filters, coagulants, screens and other means necessary to attain the required discharge water quality.

The Contractor shall be responsible for providing, operating, and maintaining materials and equipment used for conveying the clear water to the point of discharge. All pollution prevention procedures, materials, equipment, and related items shall be operated and maintained until such time as the dewatering operation is discontinued.
Upon the removal of the materials, equipment, and related items, the Contractor shall restore the area to the condition prior to his commencing work.

3.4.8 Precautions During Adverse Weather

During adverse weather, and against the possibility thereof, the Contractor shall take all necessary precautions so that the work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building paper, shelters, or other acceptable means. The Contractor shall be responsible for all changes caused by adverse weather.

3.4.9 Hurricane and Storm Warnings

The Contractor shall be required to remove from and/or secure all loose construction materials and equipment and protect structures under construction at the job site in the event of a hurricane watch. The Contractor shall also remove all bulkheads and plugs in pipelines that would impede drainage in case of flooding. Structures that may be in danger of floatation shall be flooded.

3.4.10 Pests and Rodents

The Contractor shall be responsible for maintaining the job site free from litter, rubbish, and garbage. He shall provide containers for the disposal of garbage and other materials that attract and are breeding places for pests and rodents. The Contractor shall provide the services of an exterminator to inspect the job site if pest and rodents are suspected and shall provide service.

3.4.11 Periodic Cleanup: Basic Site Restoration

During construction, the Contractor shall regularly remove from the site all accumulated debris and surplus materials of any kind which result from his operations. Unused equipment and tools shall be stored at the Contractor's yard or base of operations for the project.

When the work involves installation of sewers, drains, water mains, manholes, underground structures, or other disturbance of existing features in or across streets, rights-of-ways, easements, or private property, the Contractor shall (as the work progresses) promptly backfill, compact, grade, and otherwise restore the disturbed area to a basic condition which will permit resumption of pedestrian or vehicular traffic and any other critical activity or function consistent

with the original use of the land. Unsightly mounds of each large stones, boulders, and debris shall be removed so that the site presents a neat appearance.

The Contractor shall perform the cleanup work on a regular basis and as frequently as requested by CCU. Basic site restoration in a particular area shall be accomplished immediately following the installation or completion of the required 'facilities in that area. Furthermore, such work shall also be accomplished, when ordered by CCU, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.
Upon failure of the Contractor to perform period clean-up and basic restoration of the site to CCU's satisfaction, CCU may, upon five (5) days prior written notice to the Contractor, employ such labor and equipment as he deems necessary for the purpose, and all costs resulting there from shall be charged to the Contractor and deducted from the amounts of money that may be due him.

Upon acceptance of the installation work and testing, the Contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

3.5 WASTEWATER FLOW CONTROL

3.5.1 Scope of Work

The work specified in this section includes all labor, materials, accessories, equipment, and tools for performing all operations required to bypass pump sewage around a manhole or sewer section in which work is to be performed. The Contractor shall be prepared to bypass pump sewage as a part of his operations.

The Contractor shall provide all pumps, piping, and other equipment to accomplish this task; perform all construction; obtain all permits; pay all costs; and perform complete restoration of all existing facilities or equal or better condition to the satisfaction of CCU.

3.5.2 General

When sewer line flows at the upstream manhole of the manhole section being repaired are above the maximum allowable requirements for television inspection, or do not allow the proper sewer or manhole repair, the flows shall be reduced to the levels indicated by one of the following methods: manual operation of pumping stations by CCU Operation Department, by the Contractor plugging/blocking of the flows, or by the Contractor pumping/bypassing of the flows as acceptable to CCU.

In some applications, the wastewater flow may be plugged and contained within the capacity of the collections system. This shall only be done when it has been determined the system can accommodate the surcharging without any adverse impact.
For the initial television inspection, before and after a lining is installed, the sewer line shall be blocked completely. No flow, except infiltration/inflow, will be allowed through the respective sewer line being televised on the pre-repair television inspection.

For all other television inspections, including warranty inspections and joint testing and sealing, the depth of flow within the sewer shall not exceed that shown below for the respective pipe sizes as measured in the manhole and the camera lens shall always be clear of the flow.

Maximum Depth of Flow	Television Inspection
6" -10" Pipe	20% of pipe diameter
12" - 24" Pipe	25% of pipe diameter
Above 24" Pipe	30% of pipe diameter

Maximum Depth of Flow	Joint Testing/Sealing
6" -12" Pipe	25% of pipe diameter
15" - 24" Pipe	30% of pipe diameter
Above 24" Pipe	35% of pipe diameter

When sewer line flows at the upstream manhole of the line being repaired, in the opinion of CCU, are too excessive to plug while the rehabilitation is being performed; the Contractor shall submit a written plan and pump/bypass the flow as acceptable to CCU.

3.5.3 Submittals

The Contractor shall submit complete, detailed plans for this aspect of the work to the work to CCU for review in accordance with the “Submittals” section of these specifications.

3.5.4 Workmanship

a) Plugging and Blocking

A sewer line plug shall be inserted into the line at a manhole upstream from the section being inspected, rehabilitated and/or repaired. The plug shall be so designed that all or any portion of the operation flows can be released. During the inspection portion of the operation, flows shall be shut off or reduced to within the maximum flow limits specified. During rehabilitation and/or repairs, the flows shall be shut off or pumped/bypassed, as acceptable to CCU. After the work tasks have been completed, flows shall be restored to normal.

b) Pumping and Bypassing

When pumping/bypassing is required, as determined by CCU, the Contractor will supply the necessary pumps, conduits, and other equipment to divert the flow of sewage around the manhole section in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of rain storms. The Contractor will be responsible for furnishing the necessary labor and supervision to

set up and operate the pumping and bypassing system. A "setup" consists of the necessary pumps, conduits and other equipment to divert the flow of sewage around a manhole section, from the start to finish of work performed in the manhole section.

Pumps and equipment shall be continuously monitored by a maintenance system capable of starting, stopping, refueling and maintaining these pumps during the rehabilitation, If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.

c) Surcharging Sewers

Where the raw sewage flow is blocked or plugged, sufficient precautions must be taken to protect the public health. The sewer lines shall also be protected from damage. The following occurrences shall not be allowed:

c1) No sewage shall be allowed to back up into any homes or buildings,

c2) No sewage shall overflow any manholes, clean-outs, or any other access to the sewers.

c3) Users upstream of the repair area shall be able to use all their water and sewer utilities without interruption.

If any of the above occur or are expected to occur, the contractor shall bypass pump to alleviate one (1) or all of the conditions. Additionally, the Contractor is required to observe the conditions upstream of the plug and be prepared to immediately start bypass pumping, if needed.

d) Pumps discharge material

Any sump pumps, bypass pumps, trash pumps, or any other type pump which pulls sewage/water or any type of material out of the manhole or sewer shall discharge this material into another manhole, or appropriate vehicle or container acceptable to CCU. Under no circumstances shall this material be discharged, stored, or deposited on the ground, swale, or open environment.

e) Traffic Control

The Contractor shall take appropriate steps to ensure that all pumps, piping, and hoses that carry raw sewage are protected from traffic. Traffic control shall be performed in accordance with the contract documents.

f) Sanitary Sewer Overflow (SSO) and/or Discharge

- In case of an SSO and/or discharge, the Contractor is responsible for immediately notifying CCU and supplying all information pertaining to the incident.

- The Contractor is solely responsible for all fines, labor, materials, equipment, and all other associated costs incurred by the Contractor and CCU associated with an SSO and/or discharge to the environment resulting from the Contractor's actions or the Contractor's negligence.

- In the event, during any work task(s) involved in "Sewage Flow Control," that raw sewage is spilled, discharged, leaked, or otherwise deposited in the open environment, due to the Contractor's work, the Contractor also shall immediately control, contain, and stop the spill or discharge and shall repair any damage. The Contractor is responsible for any clean up of solids and disinfection of the area affected.

- This work shall be performed at the Contractor's sole expense with no additional cost to CCU.

3.6 PREPARATORY CLEANING & ROOT REMOVAL

3.6.1 Scope of Work

This section covers the preparatory cleaning of sewer lines and manholes as needed prior to the internal inspection of the sewer lines and the cleaning of manholes prior to rehabilitation. The Contractor shall furnish all necessary material, labor, equipment, and services required for cleaning the specific sewer lines and manholes.

3.6.2 General

The intent of sewer line cleaning is to remove foreign materials from the lines and manholes and restore the sewer to a minimum of 95% of the original carrying capacity or as required for proper seating of internal pipe joint sealing packers. Since the success of other phases of work depends a great deal on the cleanliness of the lines and manholes, the importance of this phase of the operation is emphasized. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. Should such conditions be encountered, the Contractor will not be required to clean those specific sewer sections. If, in the course of normal cleaning operations, damage does result from pre-existing and unforeseen conditions such as broken pipe, the Contractor will not be held responsible.

Sewer line cleaning shall be performed with hydraulically propelled, high velocity jet, or mechanically powered equipment as approved by CCU. Selection of equipment shall be based on field conditions such as access to manholes, quantity of debris, size of sewer, depth of flow, etc. Reference is made to the NASSCO “Jetter Code of Practice”, a guide for the selection and operation of sewer Jetter equipment and the selection of nozzles for different applications.

3.6.3 Hydraulically Propelled Equipment

The equipment used shall be of a movable dam-type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against

flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure removal of grease. If sewer cleaning balls or other equipment which cannot be collapsed is used, special precautions to prevent flooding of the sewers and public or private property shall be taken.

3.6.4 High Velocity Jet (Hydrocleaninq) Equipment

All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two (2) or more high velocity nozzles. The nozzles shall be capable of producing a scouring action from 15" to 45" in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.

3.6.5 Mechanically Powered Equipment

Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod-type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

3.6.6 Workmanship

a) General

The designated sewer manhole sections shall be cleaned using hydraulically propelled, high velocity jet, or mechanically powered equipment. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes. If cleaning of an entire sewer section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it will be assumed that a major blockage exists and the cleaning effort shall be abandoned.

b) Cleaning Precautions

During all cleaning and preparation operations, all necessary precautions shall be taken to protect the sewer from damage. During these operations, precautions shall also be taken to insure that no damage is caused to public or private property adjacent to or served by the sewer or its branches.

Satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which -depend upon water pressure to provide their cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to insure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer. When possible, the flow of sewage in the sewer shall be utilized to provide the necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.

c) Material Removal

All sludge, dirt, sand, rocks, grease, roots, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section, which could cause line stoppages, accumulation of sand in wet wells, or damage pumping equipment, shall not be permitted.

Under no circumstances shall sludge or other debris removed during these operations be dumped or spilled into the streets, ditches, storm drains, or other sanitary sewers.
The Contractor is advised that he shall not dispose of this material by legal or illegal dumping on private or public property, by sale of others, or any means other than those given above. All sludge or other debris removed during these operations shall become the property of the Contractor and as such, any load of material, or any portion thereof, disposed of in a non permitted fashion shall become the sole responsibility of the Contractor. Any fines or clean-up costs associated with such dumping shall be paid by the Contractor; if necessary, monies shall be withheld from any monies due the Contractor until restitution is made.

d) Disposal of Materials

All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of by the Contractor in a legal and sanitary manner as approved by appropriate authorities, at the Contractor's cost. Copies of records of all disposals shall be furnished to CCU, indicating disposal site, date, amount and a brief description of material disposed. All materials shall be removed form the site no less often than at the end of each work day. Under no circumstances will the Contractor be allowed to accumulate any type of debris on the site of work beyond the stated time, except in totally enclosed containers and as acceptable to CCU.

e) Root Removal

Roots shall be removed in the designated sections and manholes where root intrusion is indicated on the work order. Special attention should be used during the cleaning operation to assure almost complete removal of roots from the joints. Any roots which could prevent the seating of the packer or could prevent the proper application of chemical sealants, or could prevent the proper seating and application of cured-in-place, fold-and-formed, or sectional cured-in-place liners, shall be removed. Procedures may include the use of mechanical

equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners. Chemical root treatment shall be used before or at the completion of the root removal operation, depending on the manufacturer's recommendation, and grouting will take place to remove infiltration. Contractor shall capture and remove all roots from the line.

f) Chemical Root Treatment

To aid in the removal of roots, manhole sections that have root intrusion shall be treated with an acceptable, non-systemic herbicide which will kill roots but which will not permanently affect parts of trees distant from the treated roots. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation. The active ingredient shall not adversely affect the performance of the wastewater treatment facility. Any damaged vegetation so designated by CCU shall be replaced by the Contractor at no additional cost to CCU. All safety precautions as recommended by the manufacturer shall be adhered to concerning handling and application of the herbicide.

g) Acceptance of Cleaning Operation

Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of CCU. If television inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line until the cleaning is shown to be satisfactory. In areas where television inspection is not performed, CCU may require the Contractor to pull a double squeegee (with each squeegee the same diameter as the sewer) through each manhole section as evidence of adequate cleaning. If internal sealing is to follow the television inspection, particular attention should be given to the adequacy of the cleaning to insure that proper seating of the sealing packer can be achieved.

In addition, on all those lines which have sags or dips, to an extent that the television camera lens becomes submerged for three (3) or more feet during the television inspection, the Contractor shall pull double squeegee and/or sponges through the line in order to remove the water form those dips or sags. Water removal through the squeegees and/or sponges shall be "performed until the television camera lens will no longer be submerged. This requirement may be waived by CCU if the water, in which the camera lens is submerged, is clean enough to allow the identification of pipe defects, cracks, holes, and location of service taps.

3.7 CLEANING AND INSPECTING CAST IRON PIPE OR DUCTILE IRON PIPE

3.7.1 General

In order to maximize the hydraulic capacity of the pipe and to prevent further tuberculation, the existing tuberculation must be removed until the internal diameter of the pipe is attained or until a smooth uniform surface is provided. In either case, it is not CCU's intent to remove sound

metal. However, it is essential that a smooth, uniform surface is established to allow the liner resins to migrate along the pipe wall and encapsulate any remaining tuberculation.

3.7.2 Workmanship

Depending upon the class of pipe, the internal diameter of the pipe varies. For the purpose of this Contract, the pipe shall be cleaned to achieve the minimum internal diameter reflected in Table A. If a bare metal surface is established before achieving the specified internal diameter, then the Contractor shall stop the cleaning operation. If the specified internal diameter is attained, then the Contractor shall verify the internal diameter by passing a radial chain cutter, or other approved method, followed by a video camera through the pipeline. The chain cutter shall be equipped with lengths of chain sized so that the spinning motion of the cutter produces the required internal diameter. As the chain cutter passes through the pipeline, the chains cannot contact the pipe wall. Contact with the pipe wall shall be verified by observing sparks during the passage of the cutter or by measuring a reduction in the original length of chain.

After the internal diameter has been verified, the Contractor shall provide CCU with color DVD recordings of the cleaned sewer during normal working hours (as defined in the General Provisions). CCU will review the DVD recordings to determine if additional pipe cleaning will be required.

TABLE A

Nominal Diameter (Inches)	Ductile Iron Pipe Internal Diameter* (Inches)	Cast Iron Pipe Internal Diameter** (Inches)
6	6.16	5.94
8	8.27	8.01
10	10.28	9.98
12	12.34	12.00
14	14.41	14.02
16	16.48	16.04
18	18.56	18.04
20	20.64	20.04
24	24.84	24.10
30	30.90	30.10

** Based on an assumed Class 54 pipe.*
***Based on an assumed thickness Class 25 pipe.*

3.8 CURED-IN-PLACE PIPE LINING

3.8.1 Scope

The work specified in this section includes all labor, materials, accessories, equipment and tools necessary to install and test cured-in-place pipe lining in main lines.

3.8.2 Workmanship

The Contractor shall present to CCU, for review, a description of his methods for avoiding liner stoppage due to conflict and friction with such points as the manhole entrance and the bend into the pipe entrance. He shall also present plans for dealing with a liner stopped by snagging within the pipe. This information shall be rendered to CCU in a timely fashion prior to the preconstruction conference.

The Contractor shall have on hand at all times, for use by his personnel and CCU, a digital thermometer or other means of accurately and quickly checking the temperature of exposed portions of the liner.

The Contractor shall immediately notify CCU of any construction delays taking place during the insertion operation. Such delays shall possibly require sampling and testing by an independent laboratory of portions of the cured liner at CCU's discretion. The cost of such test shall be born by the Contractor and no extra compensation will be allowed. Any failure of sample tests or a lack of immediate notification of delay shall be automatic cause for rejection of that part of the work at CCU's discretion.

The Contractor shall designate a location where the tube will be vacuum impregnated prior to installation. The Contractor shall allow CCU to inspect the materials and the "wet-out" procedure.

Resin Impregnation - The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the potential loss of resin during installation through cracks and irregularities in the original pipe wall, as applicable

A scaffold or elevated platform shall be erected at the upstream or downstream access point. The tube shall be inverted using an "inversion elbow" at the bottom of the manhole or an "inversion ring" above ground. If pulled into place, a power winch or its equivalent should be utilized and care should be exercised not to damage the tube as a result of pull-in friction. The tube should be pulled-in or inverted through an existing manhole or approved access point, in accordance with manufacturer's recommendations, and fully extend to the next designated manhole or termination point.

With the tube in place, the Contractor shall supply a suitable heat source and water recirculation equipment. The equipment shall be capable of uniformly raising the water temperature to a level required to effectively cure the resin.

The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Another such gage shall be placed between the tube and the host pipe in the downstream manhole at or near the bottom to determine the temperatures during the cure cycle. Water temperatures at both ends shall be recorded either electronically, or at 15-minute intervals for supply to CCU. Water temperature in the pipe during the cure period shall be' as recommended by the resin manufacturer.

Curing shall be accomplished by utilizing hot water under hydrostatic pressure or steam pressure in accordance with the manufacturer's recommended cure schedule.

Initial cure shall be deemed complete when the exposed portions of the tube appear to be hard and sound and the temperature sensor indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of duration recommended by the resin manufacturer and may require continuous recirculation of the water to maintain the temperature.

A cool-down process shall be conducted that complies with the resin manufacturer's specification. The Contractor shall cool the hardened pipe to a temperature below 100" F before relieving the hydrostatic head. Cool down may be accomplished by the Introduction of cool water to replace water being pumped out of the manhole.

The new pipe shall be cut off in the manhole at a suitable location. The finished product shall be continuous over the length of pipe reconstructed and be free from dry spots, delamination and lifts. Should the liner not make a tight seal at the inside manhole wall, a seal shall be made by use of extra polyester fiber felt and epoxy resin. Pipe entries and exits shall be smooth, free or irregularities, and watertight. No visible leaks shall be present and the Contractor shall be responsible for grouting to remove leaks or fill voids between the host pipe and the liner, During the warranty period, any defects which will affect the integrity or strength of the product shall be repaired at the Contractors expense, in a manner mutually agreed upon by CCU and the Contractor.

3.9 DEFORMED AND REFORMED (PE) PIPE LINING

3.9.1 Scope

The work specified in this section includes all labor, accessories, equipment, and tools necessary to install and test the deformed and reformed pipe lining.

3.9.2 Workmanship

A cable shall be strung through the existing pipe to be rehabilitated and attached to the liner through an existing manhole or access point. The liner shall be pulled through the existing conduit by this cable. Care shall be taken not to damage the deformed pipe during installation. Appropriate sleeves and rollers shall be used to protect the liner.

When the deformed and reformed pipe is in place, it shall be cut and the processing manifolds (pipe end closing assembly used for heat and pressure control within liner) shall be attached in and secured at both pipe ends. The temperature and pressure measuring instruments shall be attached to the deformed and reformed pipe at both ends.

Through the use of steam and air pressure, the deformed pipe shall be progressively reformed to conform to the existing pipe wall. The deformed pipe shall be pressurized up to 14.5 psig maximum, while the termination point valves are kept open to provide heat flow. The pressure shall then be increased in increments up to a maximum of 26 psi depending upon material cell classification and Standard Dimensional Ratio (SDR).

The Contractor shall cool the deformed pipe to the manufacturer's recommendations, when the temperature reduces to 100' F, the Contractor shall then slowly raise the pressure to a maximum of 33 psig. (Pressure to be determined as per an existing pipe condition) while applying air or water for continued cooling. The equipment shall be disconnected after ambient temperature is attained.

Temperature and pressures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the manufacturer's recommended temperature and pressure levels. Copies of these records shall be given to CCU at the completion of each installation.

The beginning and end of the new polyethylene pipe shall be seated to the rehabilitated pipeline. The sealing material shall be compatible with the polyethylene pipe and shall provide a watertight seal.

All manhole reconnections shall have fused PE blocks applied to the protruding liner to resist pipe shrinking.

3.10 FOLD AND FORM PIPE INSTALLATION, PVC

3.10.1 Scope

This section specifies the method and process for furnishing all labor, materials, tools, equipment, and incidentals necessary to provide for the complete rehabilitation of deteriorated gravity and force main sewer lines by the use of a Fold and Form PVC pipe liner, excluding liner manufactured from reprocessed, recycled, or reclaimed PVC.

3.10.2 Definition

The Fold and Form Pipe liner process is defined as the reconstruction of gravity and force main sanitary sewers by insertion of a folded PVC pipe liner into the existing sewer and the reformation of the pipe liner into a circular pipe liner. The liner shall be reformed into its original extruded configuration by a combination of steam and pressurization, which biaxially reorients the molecules of the PVC and allows the liner to conform to the shape of the existing pipe while locking at each joint and expanding into each service to form a concave dimple. Thus the PVC

pipe liner's new configuration is its new memory and is a continuous, tight fitting liner that allows no migration of water between the existing pipe and the pipe liner.

3.10.3 Workmanship

a) Liner Insertion

The pipe liner shall be inserted into the existing sewer with a power winch and steel cable connected to the end of the liner by use of an appropriate pulling head. The pipe to be lined shall be of equal 0.D. or greater than the liner, so that the liner can be fed into the existing sewer. Length of the pipe liner to be inserted at any time shall be governed by the winch drum capacity and winching power available, with consideration of the size and condition of the sewer.

During insertion, precautions such as some type of cover shall be provided on the leading edge of the pipe liner to prevent the ragged edges of the existing pipe from scarring the outside of the liner as it is pulled into the pipe. Once insertion is initiated, it is desirable to continue the pull at a rate of no greater than fifteen feet (15') to twenty feet (20') per minute to completion.

b) Liner Reformation and Processing

It is appropriate to check temperature and pressure while reforming and processing and may be accomplished through suitable temperature and pressure gauges placed at the insertion and termination points. Through the use of heat and pressure the PVC pipe liner should unfold and expand sufficiently to press against the wall of the existing sewer pipe, lock into the joints, and form dimples at the services. Processing temperatures range form 225º to 235º F. and pressures in the range of 5 to 10 psi, but may vary based on field conditions.

c) Pressure:

The Contractor shall maintain pressure on the liner, the heat should be discontinued, and cool air in sufficient volume should be injected to reduce the temperature to below 100º F before relieving the pressure. The pipe liner shall be continuous over the entire length of the insertion and be as free as commercially practical from visual defects such as foreign inclusions. Pressure testing should be completed prior to reestablishing services.

3.11 SERVICE CONNECTION REINSTATEMENT

After the pipe has been rehabilitated, the Contractor shall reconnect the existing service connections.

This shall be done from the interior of the pipeline without excavation utilizing a remotely controlled cutting device (robotic cutter), monitored by a CCTV. The Contractor shall certify a minimum of two complete functional cutters plus key spare components are on the job site before each installation or are in the immediate area of the jobsite and can be quickly obtained.

Where holes are cut through the liner, they shall be neat and smooth in order to prevent blockage at the service connections. Cut-in service connections shall be opened to a minimum of 95% of the sewer service pipe inside diameter. Unless otherwise directed by CCU, all laterals will be reinstated. All coupons shall be recovered at the downstream manhole and removed. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor will be responsible for all costs and liability The Contractor shall stop all visible leaks, and grout all service connections. Active leaks at reinstated service lateral connections (between the liner and the existing pipe) shall be grouted associated with such excavation and restoration work.

Payment shall be as outlined in section the measurement and payment section of this specification.

The Contractor should not reactivate any line sections until accepted by CCU.

3.12 SEWER SERVICE RECONNECTION SEALING AND INSPECTION

Sewer service reconnections shall be sealed with the use of equipment which shall consist of a closed circuit television system and a special sealing packer device along with any necessary materials including but not limited to chemical sealant containers, pumps, controls, regulators, valves, and hoses. The special sealing packer shall be so constructed that it can straddle fourinch (4") to six-inch (6") diameter service connections in eight inches (8") or larger main sewer lines.

When properly positioned and with the end elements inflated, a special inflatable sealing tube shall be extended up the service connection. When properly positioned and with the end elements inflated, a special inflatable sealing tube shall be extended to a minimum past the first joint of the service connection.

The controlling unit for the device shall have "provisions for accurately controlling the packer functions in addition to monitoring the inflatable pressure and the void pressure in the isolated area to be sealed.

All sewer service reconnections shall be sealed by use of the special packer device. After the packer device has been properly positioned in the main line with the inflatable tube extended into the service connection, the connection shall be sealed by the injection of the chemical sealant.
The chemical sealant shall be injected through the special packer device into the annual space between the inflatable tube and the service connection. The injection of the chemical sealant shall continue until the chemical fluid back pressure is sufficient to insure the complete sealing of all the defects along the lengths of the inflatable tube.

After the service connection has been successfully sealed, the following procedures shall be performed to insure that the sealing operation did not block the service connection.

a) The inflatable tube shall be removed from the connection.

b) The packer and elements shall be deflated.

c) The special packer shall be moved forward and the closed circuit 360° camera shall be positioned in the center of the service connection and rotated to look up the service connection to insure that the chemical sealant did not cause blockage.

If blockage is observed, the chemical sealant shall be removed to insure the service connection is free flowing. The Contractor is to orient the camera in such a position to assure that blockage is not present.

The chemical sealant used shall be in accordance with the requirements set forth in specifications or as approved.

After the packer device has been properly positioned in the mainline, the connection shall be sealed by the injection of chemical sealant. The chemical sealant shall be injected through the packer device, through the controlled hole and into the annular space between the liner pipe material and the mainline host pipe. The injection of chemical sealant shall continue until the chemical fluid back pressure is sufficient to insure the complete sealing of all the defects.

3.13 MULTIPLE MANHOLE RUNS

The liner within the manhole shall be neatly cut off at a maximum of four inches (4") away from the manhole wall. The invert in the manhole shall be a smooth continuation of the pipes and shall be merged with other lines, if any. Channel cross section shall be U-shaped with a minimum height of half pipe diameter to three-fourths (3/4) of the pipe diameter for fifteen inch (15") and larger. The side channels shall be built up with mortar/concrete to provide benches at a maximum of 1 in 12 pitch towards the channel. CCU will individually inspect all manholes for water migration, cut-offs, benches, and invert works.

3.14 INFILTRATION PREVENTION

a) General:

If there is an annulus between the existing pipe and the liner, infiltration must be prevented from entering the sewer at manholes and service connections by one or more of the following means:

- Annulus grouting
- Sealing liner at manholes
- Chemical grouting at service connection

b) Annulus Grouting:
Methods or products which have an annular space between the two (2) pipes require annulus grouting to develop the required strength and to prevent groundwater from entering the sewer. Precautions should be taken to prevent collapsing the line with grouting pressure. Various grouts

can be placed using low pressure and the newly installed pipe line can be hydrostatically pressurized during grouting. Grout must be prevented from flowing into service connections.

c) Sealing at Manholes:
Pulled-in-place pipes which are not sealed by the annulus grouting must be sealed where the line enters and exits each manhole. The annular space shall be sealed for a distance of at least one pipe diameter inside the host pipe. Foam sealant should not protrude into the manhole and should be finished over with a quick-set, nonshrink cement grout. Finishing inside the manhole shall be accomplished using a quickset cement type grout to raise the manhole trough to the invert of the liner pipe. NOTE: Only the upstream seal should be made prior to connecting services.

d) Chemical grouting at service connection
Chemical grouting at service connection shall be made as explain in the" Sewer Service Reconnection Sealing and Inspection" section of this specification.

3.15 TELEVISION INSPECTION

Television inspection shall be required to identify and document sewer line conditions and/or is performed in advance of, in conjunction with and after completion of pipe joint testing/sealing, pipe repair and pipe lining activities. All defects and pipe conditions shall be documented in accordance with the NASSCO Pipeline Assessment Certification Program (PACP) including the specific date and time of the inspection.

The work consists of furnishing all labor, materials, accessories, equipment tools, transportation services, and technical competence for performing all operations required to execute the internal closed circuit television inspection of sewers up to forty-eight inches (48") in diameter.

3.15.1 General

After cleaning and before and after rehabilitation work, the sewer line sections shall be visually inspected by means of closed-circuit television in the presence of CCU or its representative. The inspection shall be performed one sewer line section at a time and the flow in the section being inspected shall be suitable controlled as described in the "Wastewater Flow Control" section of these specifications.

3.15.2 Equipment

The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 700-line resolution color video picture. Picture quality and definition shall be to the satisfaction of CCU; and if unsatisfactory, equipment shall be removed and replaced with adequate equipment.

The video camera shall include a title feature capable of showing on the DVD recordings the following information:

- City and State
- Date
- Contractor's name
- Line size
- CCU Manhole identification numbers (both manholes)
- On-going footage counter

3.15.3 Submittals

The Contractor's submittals shall be in accordance with the “Submittals” section of these specifications and shall include color DVD recordings and a sample of the video titles to be used.

3.15.4 Products

Electronic media recording - VHS video tape are not acceptable. Only high quality color DVDs shall be supplied for all television inspections. All taping shall be performed at SP (Standard Play, 2hrs/DVD). All DVD recordings shall be submitted to CCU and will become the property of CCU.

3.15.5 Execution

a) Pre-construction Inspection

- Prior to any repair work, the entire sewer line (from manhole to manhole) shall be televised. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case shall the television camera be pulled at a speed greater than thirty feet (30') per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. The camera shall not be pulled through the sewer line by a hydraulic cleaning unit hose. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole.

- Whenever non remote-powered and controlled winches are used to pull the television camera through the line, telephones, or other suitable means of communication shall be set up between the two (2) manholes of the section being inspected to ensure good communications between members of the crew.

- The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement meters shall be accurate to tenths of a foot over the length of the section being inspected. Accuracy of the distance

meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device tape, or other suitable device, and the accuracy shall be satisfactory to CCU's Representative.

- Movement of the television camera shall be temporarily halted at each visible point source of infiltration and/or inflow until the leakage rate from that source is quantified. The camera shall also be stopped at active service connections where flow is discharging. If the discharge persists, the property involved shall be checked to determine whether or not the discharge is sewage. If no flows are being discharged form the building, it shall be considered that the observed flow is infiltration/inflow.

- If the estimated flow form the service connection is greater than the total wastewater discharge from the fixture from the building, then the infiltration/inflow can be determined by calculating the difference of the two (2) flows.

b) Post-construction Inspection

- Upon completion of the sewer line rehabilitation, the entire sewer line (from manhole to manhole) shall be televised.

- The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer repair. In no case shall the television camera be pulled at a speed greater than thirty feet (30') per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.

- The camera shall not be pulled through the sewer line by a hydraulic cleaning unit hose. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole.

- Whenever non remote-powered and controlled winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two (2) manholes of the section being inspected to insure good communications between members of the crew.

- Measurement for location of rehabilitations shall be above-ground by means of meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement meters shall be accurate to tenths of a foot over the length of the section being inspected. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device.

- Movement of the television camera shall be temporarily halted at each repair. The camera shall also be stopped at any unnoticed or non-repaired point source of infiltration and/or inflow until the leakage rate from that source is quantified.

- The Contractor shall provide CCU color DVD recordings showing the completed work, including the condition of the restored service connection.

- The DVD recordings shall be taken by a pan and tilt radial viewing pipe inspection camera that pans more or less 275° and rotates 360°.

- The camera shall have an accurate footage counter which shall display on the monitor the exact distance of the camera from the center line of the starting manhole.

c) Field Documentation

- *Television Inspection Logs*: Printed location records shall be kept by the Contractor and will clearly show the location, by distance in 1/10 of a foot or nearest mm, from the manhole wall, in relation to an adjacent manhole of each infiltration/repair point observed during inspection. In addition, other points of significance such as locations of building sewers, unusual conditions, roots, cracks, fractures, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to CCU.

- *Electronic media recordings (color DVDs)*: The purpose of color DVD recordings shall be to supply a visual and audio record of repaired sections of the line. DVD recordings playback shall be at the same speed that was recorded. Slow motion or stop motion playback features shall be supplied by the Contractor. Each original DVD recording of conditions and defects shall be delivered to CCU upon completion of a specific line section. Electronic media recordings become property of CCU.

  The Contractor shall have all DVD recordings and necessary playback equipment readily accessible for review by the CCU's representative during the project.

- *Photographs*: Digital photographs of the television picture of problems shall be taken by the Contractor upon request of CCU or its representative. Digital photographs of the pipe condition and all defects shall be taken by the Contractor. Photographs shall be located by distance in 1/10 of a foot or nearest mm, from the manhole wall, in relation to an adjacent manhole.

END OF SECTION

PART 1 - GENERAL

It is the intent of this specification to provide the requirements for the rehabilitation of the existing sanitary sewer structures (manholes, wetwells, and junction chambers) shown on the drawings, and/or specified and directed by CCU. The rehabilitation shall consist of a spray applied polyurethane resin system, 100% solids epoxy system, polymorphic resin or pure-fused calcium aluminate mortar rehabilitation systems as specified herein.

1.1 SCOPE

1.1.1 General:

The work includes mobilization, bypass pumping, removal of any existing deteriorated coating, preparation of sanitary sewer structures to be lined, furnishing and applying the specified coating materials to the interior surface areas of the sanitary sewer structures, testing, cleanup, and demobilization.

The intent of sanitary sewer structure coating is to rehabilitate the existing structures in a manner which shall correct the following deficiencies:

- Cracked/broken/collapsed structures which may have been caused by poor construction, unstable soil, earth movement, infiltration, root damage, destructive loading, cleaning tool damage, etc.
- Corrosion of the structures caused by acid attack above flow level.
- Erosion of the structures caused by abrasion below the flow level.
- Degradation/deformation of the structures caused by loss of masonry.
- Infiltration of groundwater and soil through leaking structures and structural defects.
- Exfiltration of sewage through leaking structures and structural defects.
- Inflow of surface water and infiltration of groundwater through abandoned or illegal connections.
- Root re-growth after removal.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, supervision, tools, and all other associated appurtenances necessary to rehabilitate the designated sanitary sewer structures as stipulated herein and as shown on the Contract Documents, all in accordance with the Specifications for the purpose of eliminating infiltration, providing corrosion protection, repair of voids, and restoration of the structural integrity of the sanitary sewer structures as required under the contract.

The Contractor shall also furnish all labor, materials, equipment, tools, and all other associated appurtenances required to notify affected residents, prepare the work site, including cleaning and flushing of existing sanitary sewer structures; flow control bypass pumping; pre-application (post-preparation) and post-application closed-circuit television inspections, protection of existing conditions during rehabilitation work; unloading; hauling; distributing and coating application; testing of all sanitary sewer structures and accessories as required for the proper rehabilitation; protection of the site during the life of the contract, including providing of necessary watchmen, warning lights, barricades, traffic control, dust control and maintenance of detours, as needed; and finally the cleanup of the work site, including maintenance of surfaces such as paving, and seeding, sodding and graveling, as needed, if damaged and all other item required to complete the rehabilitation.

1.1.3 Location of the Work

The area of work and the type of maintenance or rehabilitation to be performed shall be at those locations shown on the tables and/or drawings and made part of the specifications and contract documents.

The potential project sites may be located at any of the existing sanitary sewer structures that are a part of Charlotte County Utilities (CCU) sanitary sewer collection and pumping system.

The accessibility to the work sites shall vary, as sanitary sewer structures may be located in streets, alleys, utility easements, residential backyards, and various other locations. Accessibility to all sanitary sewer structures shall be the responsibility of the Contractor, and all expenses associated with work site accessibility should be taken into consideration as part of the Contractor's bid pricing. Damage to existing pavement surfaces and base courses, and/or other surface improvements, as a result of the Contractor's activities, shall be restored to like new condition by the Contractor at his sole expense. The Contractor shall implement all required measures to provide CCU personnel and equipment with complete access to all work site areas during the entire course of performing this project.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the sanitary sewer structures rehabilitation with other construction and activities in the area. Delays in work

resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Responsibilities

a) Safety: All aspects of the rehabilitation shall be done in strict accordance to the manufacturer's instructions and the requirements of NASSCO, the National Association of Sewer Service Companies. It is also the Contractor's responsibility to comply with OSHA standards and all regulations pertaining to work in confined space entry.

b) Notice of resident: The contractor shall be responsible for notifying affected residents by the mean of door hangers to alert residents that a sanitary sewer structure rehabilitation installer will be working on their street and what they can expect as far as service outages, water usage and unusual odors.

c) Licenses and Permits: The contractor shall be responsible for obtaining municipal and other Licenses and Permits and assistance in obtaining approvals or consent from utilities or carriers such as the telephone company or other persons or organizations upon whose property or authority performance of work under the contract might impinge or a written release from responsibility for the performance of work under the contract if and to the extent such work is precluded by the inability to obtain approvals or consent.

d) Work Access: The contractor shall be responsible for obtaining legal access to site of work to the extent that CCU is legally able to so provide or, if not so able, a written release from responsibility for the performance of work at sites where access cannot be made available.

e) Clearance of Blockages or Obstructions in the Sewer System: The contractor shall be responsible for obtaining clearance of blockages or obstructions in the sewer system, if any, if such clearance is required for performance of work under the contract and if such clearance is not otherwise provided for within the contract.

f) Location and Exposure of sanitary sewer structures: CCU shall be responsible for providing locations of all sanitary sewer structures. It shall be the responsibility of CCU to locate and designate all sanitary sewer structure access points, and to provide rights of access to these points. It shall be the responsibility of the Contractor to expose all sanitary sewer structure access points.

g) Sanitary sewer structure numbering system: CCU shall be responsible for a numbering system for all sanitary sewer structures to be rehabilitated under the project.

h) Pump Stations: CCU shall be responsible for shutting down or manually operate certain pump stations if such becomes necessary for performance of the work.

i) Water Access: The contractor shall be responsible for obtaining water access necessary for performance of work under the contract from fire hydrants at the site of work or other suitable designated sources.

j) Disposal: The Contractor shall be responsible for disposal of all materials removed from the sanitary sewers during the performance of the work at an appropriately permitted disposal site.

k) Secure Storage Area: The contractor shall be responsible for finding secure storage areas of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract.

1.1.6 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of CCU.

1.2 METHOD OF MEASUREMENT & PAYMENT

1.2.1 General:

Payments to the Contractor shall be made on the basis of the proposal Bid Form as full and complete payment for furnishing all materials, labor, tools, and equipment, and for performing all operations necessary to complete the work included in the Contract Documents. Such compensation shall also include payments for any loss or damages arising directly or indirectly from the work, or from any discrepancies between the actual quantities of work and those shown in the Contract Documents, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the County.

The prices stated on the Bid Form include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the details and specified herein. The Basis of Payment for an item at the price shown in the Bid Form shall be in accordance with its description of the item in this section and as related to the work specified. Unit prices shall be applied to the actual quantities furnished and installed in conformance with the Contract Documents.

The bids for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item of work has not been established in the Bid Form or this section, the cost for that work shall be included in some other applicable Bid Item, so that 're bid for the project reflects the total price for completing the work in its entirety.

1.2.2 Measurement

The quantities for payment shall be full compensation determined by actual measurement of the completed items, in place, ready for service and accepted by CCU unless otherwise specified. CCU will witness all field measurements.

The quantities stated in the Bid Form are approximate only and are intended to serve as a basis for the comparison of bids and to fix the approximate amount of the cost of the project. CCU does not expressly or impliedly agree that the actual amount of the work to be done in the performance of the contract will correspond with the quantities in the Bid Form; the amount of work to be done may be more or less than the said quantities and may be increased or decreased by CCU as circumstances may require. The increase or decrease of any quantity shall not be regarded as grounds for an increase in the unit price or in the time allowed for the completion of the work, except as provided in the Contract Documents.

It is intended that all work required to complete the sanitary sewer structure rehabilitation project will be included in the various bid items as described in the following paragraphs.

a) Sewer Bypass operations with Tanker Truck:

These pay items provide complete compensation for operations required for the sanitary sewer structure coating application, the Contractor shall first attempt to perform the sewer rehabilitation work without bypass operations.

However, if the Contractor deems bypass operations to be necessary and if CCU agrees with the reasons, this request for bypass operations will be paid for with these pay items.

Further, if bypass operations are required due to difficulties caused by or encountered during the rehabilitation process, the Contractor shall be held responsible for all bypass operations at no additional cost to CCU. If this situation requires CCU to perform all or some of the by-pass operations, the Contractor shall compensate CCU accordingly.

Plugging or blocking of sewer lines shall be included in the appropriate bid item for which the flow must be stopped; this is considered incidental work and no additional payment shall be considered for the activities under this item.

Plugging or blocking of the sewer lines and bypass operations for the reinstatement of service laterals, if required, shall be considered incidental to the work and shall not be considered for payment.

The Contractor shall furnish all materials, labor, and equipment to operate the sewer tanker truck(s), which will effectively collect, pump, transport and discharge all sewage entering the construction area during work. The discharge location shall be designated by CCU.

The use and quantity of a tanker truck(s) for sewer bypass must be approved in advance by the County. Precautions must be taken to make certain that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

The number of days for sewer bypass operations with Tanker Truck to be included for payment under the Contract Item will be the total number of 24-hour days or fraction thereof during which bypass operations is ordered by CCU in writing.

Payment for sewer bypass operations with Tanker Truck will be made at the appropriate Contract Item Unit Price per day of truck use.

b) Sewage Bypass Pumping:

These pay items provide complete compensation for operations required for the sanitary sewer structures coating application, the Contractor shall first attempt to perform the sewer rehabilitation work without bypass pumping.

However, if the Contractor deems bypass pumping to be necessary and if CCU agrees with the reasons, this request for bypass pumping will be paid for with these pay items.

Further, if bypass pumping is required due to difficulties caused by or encountered during the rehabilitation process, the Contractor shall be held responsible for all bypass pumping operations at no additional cost to CCU. If this situation requires CCU to perform all or some of the by-pass pumping, the Contractor shall compensate CCU accordingly.

Plugging or blocking a sewer lines shall be included in the appropriate bid item for which the flow must be stopped; this is considered incidental work and no additional payment shall be considered for the activities under this item.

Plugging or blocking of the sewer line and bypass pumping for the reinstatement of service laterals, if required, shall be considered incidental to the work and shall not be considered for payment.

These items shall include, but are not limited to all necessary or required traffic controls; pumps; piping; gasoline/diesel fuel; maintenance; transportation and storage; temporary bypass and service piping; labor; materials and/or any other costs associated with bypass pumping.

The pay item is a one (1) time charge per day for all bypass pumping operations during coating application, regardless of the number of pumps required or the duration of the pumping period, Bypass pumping of sewers shall be bid on the basis of sewer size which is bypassed.

c) Sanitary Sewer Structure Rehabilitation by Coating System:

The Contractor shall furnish all labor, materials and equipment to rehabilitate the existing sanitary sewer structures as shown on the Plans, specified, and directed by CCU and in accordance with this specification.

The sanitary sewer structures rehabilitation shall conform to the Workmanship and Materials section of this specification and to the requirements shown on the drawings.

The work comprises installing an approved coating system as specified including cleaning to a degree acceptable for inspection, chemical sealing (grouting), surface preparation, application of hydraulic cement or other means to fill voids and stop infiltration, curing, visually inspecting finished coating system; maintenance of traffic; flow control; disposal of material, protection of adjacent facilities, restoring all disturbed areas to preconstruction condition or better, and all appurtenant work.

Payment for the rehabilitation of existing sanitary sewer structures will be made at the Contract Unit Price per square feet of internal sanitary sewer structure surfaces rehabilitated.

d) Installation of New and/or resetting of existing Manhole Cover/Ring Assembly

Payment shall be made on the basis of the contract unit price bid in the Itemized Proposal for each manhole cover/ring assembly that is replaced or reset.

CCU shall supply new manhole rings, cover/ring assembly.

CCU shall be responsible for deciding whether or not a manhole cover/ring assembly needs to be replaced or reset.

e) Reconstructing Existing Manhole Bench & Invert Channels

Payment will be made on the basis of the contract unit price bid in the Proposal for each manhole bench and invert channel that is fully reconstructed.

CCU shall be responsible for deciding whether or not a bench and invert channel need to be fully reconstructed.

1.3 REFERENCED STANDARDS (LATEST REVISION)

Wherever reference is made to any published standards, codes, or standard specifications, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to, which is in effect at the date of the opening of bids.

This specification references standards from:

- OSHA Standard and Regulations
- NAASCO Publications & Specifications
- The American Society for Testing and Materials (ASTM), such as:

C-31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
C-33	Standard Specification for Concrete Aggregates
C-39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C-94	Standard Specification for Ready-Mixed Concrete
C-109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
C-143	Standard Test Method for Slump of Hydraulic-Cement Concrete
C-150	Standard Specification for Portland Cement
C-260	Standard Specification for Air-Entraining Admixtures for Concrete
C-293	Standard Test Method for Flexural Strength of Concrete
C-321	Standard Test Method for Bond Strength of Chemical Resistant Mortars
C-494	Standard Specification for Chemical Admixtures for Concrete
C-496	Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
C-579	Standard Test Method for Compressive Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars
C-596	Standard Test Method for Drying Shrinkage of Mortar Containing Cement
C-666	Standard Test Method for Resistance of Concrete to Rapid Freezing *I* Thawing
C-827	Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
C-1042	Standard Test Method for Bond Strength of Latex Systems Used With Concrete By Slant Shear
C-1244	Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test
D-543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
D-638	Standard Test Method for Tensile Properties of Plastics
D-695	Standard Test Method for Compressive Properties of Rigid Plastics
D-790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D-2240	Standard Test Method for Rubber Property—Durometer Hardness
D-2584	Standard Test Method for Ignition Loss of Cured Reinforced Resins
D-4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages

D-4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
D-5832	Standard Test Method for Volatile Matter Content of Activated Carbon Samples

The Contractor shall, when required, furnish evidence satisfactory to CCU that materials and methods are in accordance with such standards where so specified. In the event any questions arise as to the application of these standards or codes, copies shall be supplied on site by the Contractor. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
002930 - Grassing

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 General

a) All sanitary sewer structure rehabilitation products shall meet this specification.

b) All submittals listed in this section must be provided in writing prior to the start of the project by the contractor to CCU for approval.

c) Submittals include but are not limited to signed copies of:

- engineering data covering product,
- manufacturer/installer qualification requirements,
- progress schedule,
- design and installation of the materials to be used on the site.

d) Submittal shall be made in a timely manner so that the project schedule can be met.

e) The Contractor submittals shall include the statement that the submittals have been reviewed and meet the contract specifications and/or standard details. All submissions shall bear the Contractor's stamp certifying that they have been checked for conformance and accuracy. Submissions without the Contractor's stamp of approval will not be reviewed by CCU and will be returned to the Contractor.

f) All required submittals must be satisfactory to CCU.

1.5.2 Contractor /Equipment Qualification Requirements

Acceptable documentation of the minimum requirements listed below must be submitted to CCU. These requirements include detailed resume of the field superintendent and applicator(s).

a) Contractor Qualifications:

- The Contractor shall be specialized in the design and application method of the rehabilitation system for a minimum of 5 years.
- The Contractor shall submit a list of at least five (5) significant project references in the State of Florida (one of which must be a minimum of 5 years old), including project name, location, work performed, contract amount, completion date, contact person and phone number, where similar work, in quantity and quality, as specified herein has been performed successfully.
- The applicator shall be trained, approved and certified in writing by the manufacturer in the handling, mixing and application of the products to be used including leak repair and surface preparation.
- The on-site supervisor must have a minimum of 2 years of the product application experience and must be present during the entire rehabilitation process.
- The Contractor shall initiate and enforce quality control procedures consistent with applicable ASTM, NAASCO, NACE and SSPC standards and the coating manufacturer's recommendations.

b) Equipment Certifications:

The contractor shall provide the following for CCU approval:

- Description of all the equipment to be used for the rehabilitation
- Certification that the equipment to be used for applying the products has been manufactured or approved by the product manufacturer and Applicator personnel have been trained and certified for proper use of the equipment.
- Safety plan describing all safety equipment to be utilized in compliance with OSHA standards pertaining to work in confined space entry.

1.5.3 Progress Schedule

A progress schedule shall be prepared and be submitted to CCU for review and comments within fourteen (14) days of date issue of Purchase Order.

The schedule shall detail the proposed sequence of the work and identify pertinent work activities of each Bid Item. The schedule shall be time-scaled, identifying the estimated date of starting and completion of each bid item in order to complete the Purchase Order within the time specified in the Purchase Order.

Subsequent changes to the schedule shall be accompanied by a letter of explanation with appropriate reference and revision date on the schedule.

Review of schedule by Engineer does not relieve the Contractor of any errors or omissions.

1.5.4 Product Data

a) Technical data sheet on each product proposed to be furnished demonstrating compliance with the latest revisions of the ASTM requirements including independent ASTM test results indicating the product conforms to the published technical data. Bids containing exceptions to the material requirements shall be considered non-responsive.

b) Material Safety Data Sheets (MSDS) for each product proposed to be furnished.

1.5.5 Application Procedures

a) The rehabilitation plan shall detail the methods, materials and procedures proposed for the rehabilitation of all sanitary sewer structures, even if the process is named in the specification. Any proposed changes in application procedures shall require submittal of revised procedures for acceptance by CCU.

b) The Contractor shall submit a work plan to CCU for acceptance. The work plan shall address preparation steps required for pre-application.

c) All approved application instructions and procedures submitted shall be carefully followed during application. Any proposed changes in application procedures shall require submittal of revised procedures and acceptance by CCU.

d) Project specific guidelines and recommendations.

e) Proof of any required federal, state or local permits or licenses necessary for the project.

f) Design details for any ancillary systems and equipment to be used in site and surface preparation, application and testing.

1.5.6 Schedule of Payment Values

a) The Contractor shall submit a separate Schedule of Payment Values for the work in accordance with the “Method of Measurement and Payment” section of this specification for all items in the bid that are to be paid for on unit bid item basis. The schedule shall contain the installed value of the component parts of work for the purpose of making progress payments during the work period.

b) The schedule shall be given in sufficient detail for the proper identification of work accomplished. Each item shall include a complete installation with all installation costs, the Contractor's overhead, contingencies and profit. The sum of all unit bid items multiplied by their respective quantities shall equal the total value of the Contract.

1.5.7 Television recordings

The Contractor shall submit all pre-application (post-preparation) and post-application closed circuit television inspections recordings in color DVD format to CCU for acceptance prior to payment.

1.5.8 Written warranty.

The Contractor shall warrant all work against defects in materials and workmanship for a minimum period of five (5) years or as otherwise specified, from the date of final acceptance of the project. This warranty shall be a guarantee against failure for the warranty period. Failure shall be defined to occur if the rehabilitation system fails to:

a) Prevent the internal damage or corrosion of the structure.

b) Prevent groundwater infiltration.

c) Adhere to existing structure wall.

If any failures occur within the specified warranty period after final acceptance, the Contractor shall repair or restore the structure to CCU standard specifications including all materials, labor, and at no additional cost to CCU. Repair shall be completed within 30 days of written notification of the failure.

PART 2 - PRODUCTS

2.1 MATERIALS

All approved products are listed in the most current CCU Approved Products List, which is posted on the County website and the Contract Document Special Provisions

2.1.1 General

a) All materials, products, or devices incorporated in this project shall be new and unused and shall conform to the requirements of all applicable laws, ordinances, and codes unless indicated otherwise in the Contract Documents and shall be the products of reliable manufacturers, which unless otherwise specified, have been regularly engaged in the manufacture of such material or devices. Procedures and additional requirements regarding manufacturer's experience and substitutions are included in the “Submittals" section of this specification.

b) All materials and equipment to be incorporated into the work shall be properly designed for the use intended. Materials and/or equipment which, in the opinion of CCU, are inferior or of a lower grade than specified, or required, will not be accepted and shall be removed immediately from the project site.

c) Materials to be incorporated in the work shall be delivered sufficiently in advance of their use and use to prevent delay in the execution of the work, and they shall be delivered as nearly as feasible in the order required for executing the work.

d) The Contractor shall protect all devices and materials from deterioration and damage. All materials and equipment shall be handled and stored in strict accordance with the manufacturer's recommendations. Products shall also be stored and handled according to their Material Safety Data Sheets (MSDS). The materials shall be handled and stored by the manufacturer, fabricator supplier and Contractor before, during, and after shipment to prevent any injury, damage or theft of any kind whatsoever. Any material exhibiting any of the above shall be removed and replaced at the Contractor's expense for both labor and materials.

e) The Contractor shall store his equipment and materials at the Contractor's base of operations in a secure storage area of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract and in accordance with the manufacturer's recommendations.

f) Only materials that meet the latest revisions of the applicable American Society of Testing and Materials (ASTM) material standards are acceptable for this work.

g) CCU approved sanitary sewer structures rehabilitation systems are as follows:

- Sprayed applied Polyurethane resin
- Sprayed applied 100% Solids Epoxy
- Sprayed applied Polymorphic resin

- Sprayed applied pure-fused calcium aluminate mortar

h) All CCU approved sanitary sewer structure rehabilitation systems shall conform to the minimum physical standards

i) The Contractor shall provide certified independent, third party test results verifying the minimum physical properties. The tests shall be in conformance with the ASTM specifications listed.

j) The coating system application methodology shall be in strict accordance with the manufacturer's instructions and shall provide a uniform smooth surface.

k) The coating system shall be capable of being applied over wet/damp surfaces without degrading the final product.

l) The finished coating product shall be resistant to sulfuric acid attack associated with domestic sewage.

m) The finished coating product shall be cured in strict accordance with the manufacturer's instructions.

n) The existing sanitary sewer structures shall be prepared for the application of the coating system by cleaning and stoppage of infiltration. Prior to applying the coating product, the entire sanitary sewer structure surface and benches shall be patched and grouted to the extent needed to provide a smooth and even surface to which the coating product will adhere.

2.1.2 Polyurethane Resin System

a) A minimum thickness of 250 mils (1/4") shall be applied for structural integrity.

b) The cured polyurethane system shall conform to the minimum physical standards, as listed below:

CURED POLYURETHANE	STANDARD	LONG-TERM DATA
Tensile Strength	ASTM D-638	5,000 psi
Flexural Stress	ASTM D-790	10,000 psi
Flexural Modulus	ASTM D-790	550,000 psi

2.1.3 Epoxy Coating System

a) The Epoxy Coating System is a 100% solids, solvent-free two-component epoxy resin system thixotropic in nature and filled with select fillers to minimize permeability and provide sag resistance acceptable to this specification.

b) A minimum thickness of 125 mils shall be applied for structural integrity.

c) The Epoxy Coating System shall conform to the minimum physical standards, as listed below:

Epoxy Coating	STANDARD	LONG-TERM DATA
Tensile Strength	ASTM D-638	5,000 psi
Flexural Strength	ASTM D-790	10,000 psi
Flexural Modulus	ASTM D-790	550,000 psi

2.1.4 Polymorphic Resin Systems

a) The Polymorphic Resin shall be a solvent-free 100% solids epoxy, two component, highly modified isothalic polyester resin material.

b) The material shall form a mechanical and chemical bond to the sanitary sewer structure surface with <0,08% shrinkage (ASTM C596) in 28 days. The material shall have a minimum twenty-eight (28)-day compressive strength of 9,000-psi. The three coat system is:
1. Prime Coat: OS-101 5-10 mils thick
2. Intermediate Coat: OS-301 50-70 mils thick
3. Final Coat: OS-401 5-10 mils thick

c) The cured resin system shall conform to the minimum physical standards, as listed below:

CURED RESIN	STANDARD	LONG-TERM DATA
Tensile Strength	ASTM D-638	5,000 psi
Flexural Strength	ASTM D-790	8,630 psi
Flexural Modulus	ASTM D-790	15,120 psi

2.1.5 Pure-fused calcium aluminate mortar

a) The material shall form a mechanical and chemical bond the sanitary sewer structure surface with less than 0.08% shrinkage (ASTM C596) in 28 days. The product shall have a minimum twenty-eight (28) day compressive strength of 9,000 psi. The product is a one coat application. The product shall be spray applied directly to the damp the sanitary sewer structure surface, trowel smooth, and "brushed" finished.

b) The material shall completely cover the interior surface of the sanitary sewer structures with a minimum thickness of 1,000 mils (1 inch) as measured at the thinnest application point. The maximum thickness for per single lift application is 3 inches.

2.1.6 Chemical Grouting of Sanitary Sewer Structures

Materials, additives, mixture ratios, and procedures utilized for the grouting process shall be in accordance with the grout manufacturer's recommendations.

a) General - All chemical grout shall be a chemical sealant solution containing principal chemical sealant constituent, initiator (trigger) and catalyst specifically recommended for purpose of sealing leaks in sanitary sewer structures. The chemical sealant constituent, initiator (trigger) and catalyst shall be compatible when mixed. The solution shall have ability to tolerate dilution and react in moving water. After final reaction, it shall be a stiff, impermeable, yet flexible gel. The chemical sealant shall be designed to be a soil stabilizing grout.

b) Material Composition - Intimate mixtures in such proportions that dilute aqueous solutions, when properly catalyzed, will form a firm but flexible gel. Grout shall make true solution at concentrations as high as three (3) pounds per gallon of water. Solution shall have ability to accept dilution by groundwater of at least 50% by volume, without significantly changing sealing ability of gel when at rest or in motion. Solutions shall gel in predetermined time when exposed to normal groundwater Ph ranges, and be capable of formula adjustments to compensate for changing conditions. Solution as mixed shall have viscosity of less than two (2) centipoises. Reaction time shall be controllable from ten (10) seconds to sixty (60) minutes at temperatures from 320 F to 1400 F. Viscosity shall remain constant throughout induction period. The minimum concentration of chemicals mixed in tank, (computed as liquid or dry weight percentage of total solution weight) shall be 10%. Higher concentration may be used, when desirable, to increase strength or offset dilution during the induction period. Final reaction shall produce continuous, irreversible, impermeable stiff gel at chemical concentrations as low as 0.4 pounds per gallon of water. Gel shall not be rigid or brittle. Gel shall have negligible corrosion rate on mild steel plates. Only the following chemical grout alternatives will be accepted:

- AV-100 as manufactured by Avanti International, 822 Bay Star Boulevard, Webster, Texas 77589.
- AV-118 as manufactured by Avanti International, 822 Bay Star Boulevard, Webster, Texas 77589.
- 5610 (GEL) as manufactured by 3M Contractor Products, St. Paul, Minnesota 55144.
- AV-254 as manufactured by Avanti International, 822 Bay Star Boulevard, Webster, Texas 77589.

c) Initiator (Trigger) - initiator shall be in accordance with the manufacturer's recommendations.

d) Catalyst - Catalyst shall be in accordance with the manufacturer's recommendations.

e) Insoluble (particulate) Additives - Inactive solids such as diatomaceous earth may be mixed with grout as filler only upon written approval of CCU.

f) Other Additives - The Contractor must justify the use of other additives. The effects of additives shall be determined by test on project site, prior to approval for use.

2.2 QUALITY CONTROL

2.2.1 Review at Place of Manufacture

Unless otherwise specified, all products, materials, and time and equipment may be subject to review by CCU at the place of manufacture.

The presence of CCU at the place of manufacture, however, shall not relieve the Contractor of the responsibility for furnishing products, materials, and equipment which comply with all requirements of the Contract Documents, and said duty shall not be avoided by any act or omission on the part of CCU.

2.2.2 Sampling and Testing

Unless otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered.

The Contractor shall pay for all costs of retests made necessary by the failure of the samples of specimens to meet the specified ASTM requirements.

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

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

2.2.3 Site Investigation and Control

The Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the work due to his failure to comply with this requirement. The Contractor shall inspect related and appurtenant work and shall report in writing to CCU any conditions which will prevent proper completion of the work. Failure to report any such conditions shall constitute acceptance of all

site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor within the scope of the project.

2.2.4 Additional Review and Testing

CCU reserves the right to employ and pay for the services of an independent testing laboratory for additional specified testing.

The work or actions of the testing laboratory shall in no way relieve the Contractor of his obligations under the Contract. The laboratory testing work shall include such review and testing required by the Contract Documents, existing laws, codes, and ordinances. The testing laboratory will have no authority to change the requirements of the Contract Documents, nor perform, accept, or approve any of the Contractor's work.

The Contractor shall allow CCU ample time and opportunity for review and testing materials to be used in the work. The Contractor shall advise CCU promptly upon placing orders for materials so that arrangements may be made, if desired, for review before shipment from the place of manufacture. The Contractor shall at all times furnish CCU and his representatives, facilities including labor, and allow proper time for reviewing and testing materials, equipment, and workmanship. The Contractor must anticipate that possible delays may occur in the execution of its work due to the necessity of materials and equipment being reviewed and accepted for use. The Contractor shall furnish, at his own expense, all samples of materials required by CCU for testing, and shall make his own arrangements for providing dater, electric power, or fuel for the various reviews and tests of the sanitary sewer structures.

CCU will bear the costs of all tests, reviews, or investigations undertaken by the order of CCU for the purpose of determining conformance with the Contract Documents if such tests, reviews, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by CCU as a result of such tests, reviews, or investigations, the Contractor shall bear the full costs of any additional tests and investigations, which are ordered by CCU to ascertain subsequent conformance with the Contract Documents.

2.2.5 Right of Rejection

CCU or its representative shall have the right, at all times and places, to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the work at the site. If CCU or its representative, through an oversight or otherwise, has accepted materials or work which is defective or which is contrary to the Contract Documents, such materials, no matter in what stage or condition of manufacture, delivery, or erection, may be subsequently rejected by CCU or its representative.

The Contractor shall promptly remove rejected articles or materials from the site of the work after notification or rejection. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the Contractor.

2.2.6 Weather Conditions

Work that may be affected by inclement weather shall be suspended until proper conditions prevail. In the event of impending storms, the Contractor shall take necessary precautions to protect all work, materials and equipment from exposure.

2.2.7 Fire Protection

The Contractor shall take all necessary precautions to prevent fires at or adjacent to the work, including his own equipment and trailers. Adequate fire extinguisher stations shall be provided throughout the work area.

2.2.8 Final Remedy:

If testing results do not meet the specifications, the Contractor shall be required to replace the liner.

PART 3 - EXECUTION

3.1 GENERAL

All phases of the sanitary sewer structure rehabilitations such as surface preparation, bench reconstruction, coating application, annulus sealing, grouting, etc., will be inspected by the Department's Field Engineering personnel for conformance to the specifications, submittals and liner manufacturer's instructions. The Contractor shall, therefore, coordinate his schedule for the coating application of the structural coating system with the field office, and with due regard for site and weather conditions prevailing at the time.

3.2 SURFACE PREPARATIONS

3.2.1 General: Surface preparation shall be in strict accordance with the approved coating manufacturer’s instructions. All surfaces to be coated shall be cleaned with a high pressure water spray (minimum 4000 psi). The use of acid for cleaning purposes will not be allowed. All deteriorated concrete and loose or protruding brick and mortar shall be removed from the wall and benches in order to obtain a substrate suitable for the proposed coating system. All infiltration shall be stopped with hydraulic cement or other approved means to a smooth, uniform surface before application of the coating system. Any voids in the sanitary sewer structure walls shall be sealed with hydraulic cement.
The Contractor shall install plugs in order to prevent extraneous material from entering the sewer lines.

3.2.2 Applicator shall inspect all specified surfaces prior to surface preparation. Applicator shall notify CCU of any noticeable disparity in the surfaces that may interfere with the proper preparation or application of the specified repair materials.

3.2.3 Applicator personnel shall directly perform all aspects of surface preparation and shall not subcontract any element of surface preparation.

3.2.4 All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed. All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.

3.2.5 Surface preparation method(s) and repair materials should be based upon the conditions of the substrate, service environment and the requirements of the coating material to be applied. Surfaces to receive repair materials shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the repair materials and the substrate.

3.2.6 Infiltration shall be stopped by using a material that is compatible with the coating material to be applied. Moderate to severe infiltration control may require the use of chemical injection grouting. All costs associated with infiltration control shall be considered inclusive with the cost of the application of the appropriate coating application.

3.2.7 All surfaces shall be examined by the Inspector both during and after preparation and before the coating application.

3.3 TEMPORARY UTILITIES

3.3.1 General: The Contractor shall provide for utilities and services for his own operations. These shall include electrical power, water, ventilation, sanitary facilities and telephone service. The Contractor shall furnish, install and maintain all temporary utilities during the Contract period including removal upon completion of the work. Such facilities shall comply with regulations and requirements of the national Electrical Code, OSHA, Florida Power and Light, and applicable Federal, State, and Local codes, rules and regulations.

3.3.2 Temporary Water: The Contractor shall supply all water necessary for performance of work under the contract. The Contractor shall provide and maintain all piping, fittings, adapters, and valving required. It is the Contractor's responsibility to arrange through the water department for a water meter. A deposit to be paid by the Contractor is required or meter rental and all water shall be purchased by the Contractor at the prevailing rate.

3.3.3 Temporary Ventilation: The Contractor shall provide and maintain adequate ventilation for a safe working environment. In addition, forced air ventilation shall be provided for the curing of installed

materials, humidity control, and the prevention of hazardous accumulations of dust, gases, or vapors.

3.3.4 Temporary Sanitary Facilities: The Contractor shall provide and maintain adequate and clean sanitary facilities for the construction work force and visitors. The facilities shall comply with Local codes and regulations and be situated at approved locations.

3.4 TEMPORARY ENVIRONMENTAL CONTROLS

3.4.1 Chemicals

All chemicals used during project construction or furnished for testing of project operations, whether herbicide, pesticide, disinfectant, polymer, reactant of other classifications, will be required to show approval of either EPA or HUD. The handling, use, storage and disposal of such materials, containers or residues shall be in strict conformance with manufacturer and/or supplier's secured storage. Copies of antidotes shall be kept at the storage site and at the job site. The Contractor shall be responsible for any leaked chemical that has permeated into the soil. Costs incurred for cleanup of any such contamination shall be borne by the Contractor.

3.4.2 Dust

During all work for this Contract, the Contractor shall be responsible for the application of water and/or calcium chloride or other means, acceptable to CCU, to eliminate dust annoyance to adjacent property CCUs and business establishments.
The Contractor shall take all protective measures, to the satisfaction of CCU, necessary to ensure that dust and debris does not enter any of the mechanical or electrical equipment. The Contractor shall be responsible for the cleanup of existing buildings and property which have become soiled due to the lack of proper dust control as determined by CCU.

3.4.3 Rubbish Control

During the progress of the work, the Contractor shall keep the site of the work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the work site and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to me particular requirements of Part 1926 or the OSHA Safety and Health Standards for Construction.

3.4.4 Toilet Facilities

Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.

Such facilities shall be made available when the first employees arrive on the work, shall be properly secluded from public observation, and shall be constructed and maintained in suitable numbers and at such points and in such manner as may be required.

The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the work, on the lands of the County, or an adjacent property.

CCU and CCU shall have the right to review any building or other facility erected, maintained, or used by the Contractor, to determine whether or not the sanitary regulations have been complied with.

3.4.5 Sanitary and Other Organic Wastes

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

3.4.6 Noise

Noise resulting from the Contractor's work shall not violate the local noise ordinances or exceed the noise levels and other requirements relating to noise abatement. The Contractor shall be responsible for curtailing noise resulting from his operation. He shall, upon written notification from CCU or the noise control officers, make any repairs, replacements, adjustments, additions, and furnish mufflers when necessary to fulfill requirements.

3.4.7 Erosion Abatement and Water Pollution

It is imperative that the Contractor's dewatering operations not contaminate or disturb properties adjacent to the work sites in accordance with the regulatory agencies having jurisdiction. The Contractor shall, therefore, schedule and control his operations to confine all runoff water from disturbed surfaces, water from dewatering and/or from excavation below the ground water table operations that becomes contaminated with lime silt, mulch, and other deleterious matter, fuels, oils, bituminous, calcium chloride, chemicals and other polluting materials.

The Contractor shall construct temporary stilling basin(s) of adequate size and provide all necessary temporary materials, operations and controls including, but not limited to, filters, coagulants, screens and other means necessary to attain the required discharge water quality.

The Contractor shall be responsible for providing, operating, and maintaining materials and equipment used for conveying the clear water to the point of discharge. All pollution prevention procedures, materials, equipment, and related items shall be operated and maintained until such time as the dewatering operation is discontinued.
Upon the removal of the materials, equipment, and related items, the Contractor shall restore the area to the condition prior to his commencing work.

3.4.8 Precautions During Adverse Weather

During adverse weather, and against the possibility thereof, the Contractor shall take all necessary precautions so that the work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building paper, shelters, or other acceptable means. The Contractor shall be responsible for all changes caused by adverse weather.

3.4.9 Hurricane and Storm Warnings

The Contractor shall be required to remove from and/or secure all loose construction materials and equipment and protect structures under construction at the job site in the event of a hurricane watch. The Contractor shall also remove all plugs in pipelines that would impede drainage in case of flooding. Structures that may be in danger of floatation shall be flooded.

3.4.10 Pests and Rodents

The Contractor shall be responsible for maintaining the job site free from litter, rubbish, and garbage. He shall provide containers for the disposal of garbage and other materials that attract and are breeding places for pests and rodents. The Contractor shall provide the services of an exterminator to inspect the job site if pest and rodents are suspected and shall provide service.

3.4.11 Periodic Cleanup: Basic Site Restoration

During construction, the Contractor shall regularly remove from the site all accumulated debris and surplus materials of any kind which result from his operations. Unused equipment and tools shall be stored at the Contractor's yard or base of operations for the project.

When the work involves installation of sewers, drains, water mains, manholes, underground structures, or other disturbance of existing features in or across streets, rights-of-ways, easements, or private property, the Contractor shall (as the work progresses) promptly backfill, compact, grade, and otherwise restore the disturbed area to a basic condition which will permit resumption of pedestrian or vehicular traffic and any other critical activity or function consistent

with the original use of the land. Unsightly mounds of each large stones, boulders, and debris shall be removed so that the site presents a neat appearance.

The Contractor shall perform the cleanup work on a regular basis and as frequently as requested by CCU. Basic site restoration in a particular area shall be accomplished immediately following the rehabilitation or completion of the required facilities in that area. Furthermore, such work shall also be accomplished, when ordered by CCU, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.

Upon failure of the Contractor to perform period clean-up and basic restoration of the site to CCU's satisfaction, CCU may, upon five (5) days prior written notice to the Contractor, employ such labor and equipment as he deems necessary for the purpose, and all costs resulting there from shall be charged to the Contractor and deducted from the amounts of money that may be due him.

Upon acceptance of the rehabilitation work and testing, the Contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

3.5 WASTEWATER FLOW CONTROL

3.5.1 Scope of Work

The work specified in this section includes all labor, materials, accessories, equipment, and tools for performing all operations required to bypass pump sewage around a sanitary sewer structure or any sewer section in which work is to be performed. The Contractor shall be prepared to bypass pump sewage as a part of his operations.

The Contractor shall provide all pumps, piping, and other equipment to accomplish this task; perform all construction; obtain all permits; pay all costs; and perform complete restoration of all existing facilities or equal or better condition to the satisfaction of CCU.

3.5.2 General

In some applications, the wastewater flow may be plugged and contained within the capacity of the collections system. This shall only be done when it has been determined the system can accommodate the surcharging without any adverse impact.

When sewer line flows at the upstream manhole of the structure being rehabilitated, in the opinion of CCU, are too excessive to plug while the rehabilitation is being performed; the Contractor shall submit a written plan and pump/bypass the flow as acceptable to CCU.

3.5.3 Submittals

The Contractor shall submit complete, detailed plans for this aspect of the work to the work to CCU for review in accordance with the “Submittals” section of this specification.

3.5.4 Workmanship

a) Plugging and Blocking

A sewer line plug shall be inserted into the line at a manhole upstream from the structure being inspected, rehabilitated and/or repaired. The plug shall be so designed that all or any portion of the operation flows can be released. During the inspection portion of the operation, flows shall be shut off or reduced to within the maximum flow limits specified. During rehabilitation and/or repairs, the flows shall be shut off or pumped/bypassed, as acceptable to CCU. After the work tasks have been completed, flows shall be restored to normal.

b) Pumping and Bypassing

When pumping/bypassing is required, as determined by CCU, the Contractor shall supply the necessary pumps, conduits, and other equipment to divert the flow of sewage around the structure in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of rain storms. The Contractor shall be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. A "setup" consists of the necessary pumps, conduits and other equipment to divert the flow of sewage around a sanitary sewer structure section, from the start to finish of work performed in the sanitary sewer structure section.

Pumps and equipment shall be continuously monitored by a maintenance system capable of starting, stopping, refueling and maintaining these pumps during the rehabilitation. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.

Any requirement for bypass pumping shall be submitted by the Contractor to CCU for review and approval prior to commencement of actual sewer bypass. CCU shall have sole discretion in determining the necessity for any bypass pumping. No bypass pumping shall be executed without prior approval of CCU.

c) Surcharging Sewers

Where the raw sewage flow is blocked or plugged, sufficient precautions must be taken to protect the public health. The sewer lines shall also be protected from damage. The following occurrences shall not be allowed:

c1) No sewage shall be allowed to back up into any homes or buildings,

c2) No sewage shall overflow any sanitary sewer structure, clean-outs, or any other access to the sewers.

c3) Users upstream of the repair area shall be able to use all their water and sewer utilities without interruption.

If any of the above occur or are expected to occur, the contractor shall bypass pump to alleviate one (1) or all of the conditions. Additionally, the Contractor is required to observe the conditions upstream of the plug and be prepared to immediately start bypassing pumping, if needed.

d) Pumps discharge material

Any sump pumps, bypass pumps, trash pumps, or any other type pump which pulls sewage/water or any type of material out of the sanitary sewer structure shall discharge this material into another manhole, or appropriate vehicle or container acceptable to CCU. Under no circumstances shall this material be discharged, stored, or deposited on the ground, swale, or open environment.

e) Traffic Control

The Contractor shall take appropriate steps to ensure that all pumps, piping, and hoses that carry raw sewage are protected from traffic. Traffic control shall be performed in accordance with the contract documents.

f) Sanitary Sewer Overflow (SSO) and/or Discharge

- In case of an SSO and/or discharge, the Contractor is responsible for immediately notifying CCU and supplying all information pertaining to the incident.
- The Contractor is solely responsible for all fines, labor, materials, equipment, and all other associated costs incurred by the Contractor and CCU associated with an SSO and/or discharge to the environment resulting from the Contractor's actions or the Contractor's negligence.
- In the event, during any work task(s) involved in "Sewage Flow Control," that raw sewage is spilled, discharged, leaked, or otherwise deposited in the open environment, due to the Contractor's work, the Contractor also shall immediately control, contain, and stop the spill or discharge and shall repair any damage. The Contractor is responsible for any clean up of solids and disinfection of the area affected.
- This work shall be performed at the Contractor's sole expense with no additional cost to CCU.

3.6 RESETTING OF EXISTING MANHOLE RING AND COVER ASSEMBLY

3.6.1 General

If directed by CCU, some manholes will require the contractor to perform a grade adjustment and/or resetting of the existing manhole ring and cover assembly prior to manhole the rehabilitation. This work shall involve both unpaved and paved areas.

3.6.2 Provided by the Contractor

All materials, equipment, and work required to reset existing ring and cover assembly in unpaved or paved areas shall be provided by the Contractor.

3.6.3 Items included

This item shall include sawcutting existing asphalt or concrete and disposing of material (in paved areas only), any required excavation, manhole wall and ring preparation, removal and off-site disposal of existing materials, backfilling and compaction per CCU specifications and details, accessing manholes as specified, traffic control, coordination with and location of existing utilities, complete restoration of asphalt and concrete or grass, and for all else incidental thereto for which separate payment-is not provided under other bid items.

3.7 INSTALLATION OF NEW MANHOLE RING AND COVER ASSEMBLY

3.7.1 General

If directed by CCU, some manholes will require the Contractor to remove and replace the existing manhole ring and cover assembly prior to manhole rehabilitation. This work shall involve both unpaved and paved areas.

3.7.2 Provided by CCU

When manhole ring and cover assembly replacement is required, the new assembly shall be provided to the Contractor by CCU.

3.7.3 Provided by the Contractor

All additional materials, equipment, and work required to replace the existing manhole ring and cover assembly shall be provided by the Contractor.

3.7.4 Items included

This item shall include sawcutting existing asphalt or concrete and disposing of material (in paved areas only), any required excavation, manhole wall and ring preparation, new ring and cover assembly, removal and off-site disposal of existing materials, backfilling and compaction per the specifications and details, accessing manholes as specified, traffic control, coordination with and location of existing utilities, complete restoration of asphalt and concrete or grass, and for all else incidental thereto for which separate payment is not provided under other bid items.

3.8 REBUILDING EXISTING MANHOLE BENCH & INVERT CHANNELS

3.8.1 General

If directed by CCU, some manholes will require the Contractor to perform a rebuild of the existing manhole bench and invert channel prior to manhole rehabilitation.

3.8.2 Preconditions

Repairs shall be performed on all manhole benches and inverts that exhibit visible damage and/or infiltration, or require such repairs in order to facilitate successful manhole liner performance testing.

3.8.3 Items included

This item includes all materials, equipment, and work required to rebuild existing manhole bench areas. All manhole bench and invert channel repairs shall be approved by CCU prior to commencement of work. Prior to repairs, flow through the manhole shall be arrested via the use of either pipe plugs, flow-through plugging systems, or manhole by-pass pumping as required.

3.8.4 Cleaning

After manhole flow has been diverted, remove all loose material from manhole bench and invert areas and pressure wash using a minimum 4000 psi hydrablast.

3.8.5 Finishing and flow restoration

The quick setting patching and invert repair material shall be applied to the invert in an expeditious manner. The mix shall be troweled uniformly onto the invert at a minimum thickness of 0.5 inches, extending out onto the bench sufficiently to create an adjoining tie in region for the spray applied monolithic cementitious liner material. Care should be taken in the finishing of invert channel, so as to maintain the hydraulic performance of the manhole. The finished invert should be smooth and free of any ridges or other surface irregularities that might impede flow. Flow in the manhole should be restored as soon as the quick setting invert repair material achieves its initial set and not longer than 30 minutes from the time of initial service interruption.

3.9 CHEMICAL GROUTING OF SANITARY SEWER STRUCTURES

3.9.1 General

Sanitary sewer structures that exhibit moderate to severe groundwater infiltration will require the use of chemical injection grouting to arrest leakage prior to rehabilitation. The Contractor shall submit said structures to CCU for approval of the grouting procedure prior to commencement of work.

3.9.2 Scope

The work specified in this section includes all labor, materials, accessories, equipment, and tools necessary for chemical grouting/sealing the sanitary sewer structures.

3.9.3 Sealing Procedure

In the preparation and application of the sealing grout, the recommendations of the manufacturer of the grout materials shall be followed. Injection holes shall be drilled through the manhole wall at locations as recommended by the grout manufacturer. Grout shall be injected through the holes under pressure with a suitable probe. Injection pressure shall not cause damage to the manhole structure or surrounding surface features. Grout shall be injected through the lowest holes first. The procedure shall be repeated until the manhole is externally sealed with grout. Grouting from the ground surface shall not be allowed. Grout travel shall be verified by observation of grout to defects or adjacent injection holes. The contractor shall provide additional injection holes, if necessary to ensure grout travel. Injection holes shall be cleaned with a drill and patched with a waterproof quick setting mortar for brick and concrete manholes.

3.9.4 Visual Testing:

- After the grouting work has been completed, the sanitary sewer structure shall be visually reviewed by the contractor in the presence of CCU.
- Visual review shall be for water tightness against leakage of water into the structure.
- All visible leaks and defects observed during the review shall be repaired to CCU's satisfaction. There shall be no visible infiltration.

3.10 **INSPECTION OF THE WORK AND TESTING**

3.10.1 Coating Thickness Verification and Inspection

The Contractor shall provide a method of verifying the actual coating thickness installed to ensure it meets or exceeds the minimum values specified. The proposed liner thickness verification method shall be submitted to CCU for approval.

The Contractor may utilize a wet film thickness gage meeting ASTM D-4414 to ensure monolithic coating and uniform thickness during application. A minimum of three readings per 200 square foot area shall be recorded. Documentation on thickness readings shall be conveyed to the Inspector on a daily basis when the coating application occurs.

The final sanitary sewer structures shall be completely free of defects.

3.10.2 Spark Testing

The coating system shall be spark tested prior to acceptance. After the coating has set hard to touch, it shall be inspected with high-voltage holiday detection equipment. An induced holiday shall be made onto the coated concrete surface and will serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of minimum specified (not average) film thickness applied but may be increased if it is insufficient to detect the induced

holiday. All detected holidays shall be marked and repaired per the manufacturer's recommendations. All costs associated with the testing shall be born by the Contractor.

3.10.3 Television Survey

a) General:

Sanitary sewer structures shall be visually inspected by means of closed-circuit television pole camera after cleaning (Pre-application/post-preparation) and after rehabilitation (post-coating application).

Television inspection shall be performed in the presence of CCU or its representative.

All television inspections shall be performed and documented in accordance with the NASSCO Pipeline Assessment Certification Program (PACP).

b) Scope:

The work consists of furnishing all labor, materials, accessories, equipment tools, transportation services, and technical competence for performing all operations required to execute the internal closed circuit television inspection.

c) Equipment:

The television pole camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the structure. The camera shall be operative in 100% humidity conditions. Color picture quality and definition shall be to the satisfaction of CCU; and if unsatisfactory, equipment shall be removed and replaced with adequate equipment.

The video camera shall include a title feature capable of showing on the DVD recordings the following information:

- City and State
- Date
- Contractor's name
- CCU Sewer basin number
- CCU sanitary sewer structure identification numbers

d) Electronic media recording

- VHS video tapes are not acceptable.
- Only high quality color DVDs shall be supplied for all television inspections. All taping shall be performed at SP (Standard Play, 2hrs/DVD).

- DVD recordings playback shall be at the same speed that was recorded. Slow motion or stop motion playback features shall be supplied by the Contractor.

- The Contractor shall have all DVD recordings and necessary playback equipment readily accessible for review by the County' representative during the project.

- Each original DVD recording shall be delivered to CCU upon completion of the project. All DVD recordings shall be submitted to CCU and will become the property of the County.

e) Pre-application (post-preparation) and post-application closed-circuit television inspections

The entire sanitary sewer structure shall be televised. The camera shall be moved through the structure at a moderate rate, stopping when necessary to permit proper documentation of pre and post conditions.

Contractor shall repair deficiencies before acceptance for payment.

END OF SECTION