SECTION 1010 – GENERAL SCOPE AND SPECIAL PROVISIONS

PART 1 – GENERAL

1.1 SCOPE OF WORK

The work under this contract includes all necessary equipment, materials, testing, and incidental items and labor as required to construct the improvements and all appurtenances as shown on the Construction Drawings.

It is the intent of these construction specifications to describe a complete functioning system in all respects, whether or not every sub-element of the total system is actually defined in writing and/or detail. Payment to the Contractor(s) shall be inferred to cover work and materials required for a complete functioning system or complete element within the system, such that when final payment is made, the system is completely operable and functions in all respects as required by the Contract Documents.

Where the word "Engineer" is referenced in these specifications, it shall also mean the Owner or Owner's Representative.

1.2 EXISTING SEWERS, MAINTENANCE OF FLOW

Flows in existing sewers shall not be disrupted due to construction related to this project. Existing flows (including those caused by rain events) shall be maintained by pumping (or some other approved method) around the construction area. Adequate sizing of the temporary pumps required to convey the existing flows is the responsibility of the contractor. Any temporary pumping required for satisfactory construction of this project shall come at no additional expense to the owner.

1.3 YARD RESTORATION (SEEDING AND MULCHING)

The Contractor shall restore all areas disturbed as a result of construction as a minimum to the original grade of the area prior to construction and to the satisfaction of the Owner's Representative. All trench backfill must be mechanically compacted to eliminate settlement. All debris (including rock, tree branches, and scrap materials) shall be removed from the site as ordered by the owner throughout the duration of the project. Seeding and mulching **is** in the scope of this project. The Contractor must ensure that all disturbed surfaces are sufficiently restored to allow for seeding and mulching (including final grading, backfill compaction, and rock and debris removal). The Contractor's restoration duties shall be performed at the discretion of the Owner's Representative and shall not be delayed until such time that it can be performed on a project wide basis. This work shall be accomplished as soon as finished grade can be accomplished on any significant portion of the project, as determined by the Owner's Representative.

1.4 STAINLESS STEEL

Unless otherwise noted, stainless steel shall be taken to mean 300 series stainless steel. For all types of stainless steel the contractor furnishing stainless steel components is responsible for

ensuring the corrosion resistance of those components, as installed, repairing/replacing any defective components at his cost. Care must be exercised during fabrication and installation, particularly while welding, to ensure corrosion resistant properties remain intact.

1.5 REFERENCE TO OTHER DOCUMENTS, SPECIFICATIONS, ETC. AND PAYMENT RELATIVE THERETO

Throughout the specifications, reference is made to other specification documents (i.e. ODOT Specifications). Payment for items, including those referencing other specification documents, shall be made at the Quantities and Unit Prices established by the Clermont County Water Resources Department Specifications ONLY. Units, quantities, indices, and asphalt binder price adjustments established by referenced specifications are not to be used to establish payment or adjust unit prices.

1.6 PRECONSTRUCTION VIDEO AND STILL PHOTOGRAPHY

Prior to mobilization of any equipment or commencement of construction, the Contractor shall prepare a preconstruction video and still photography performed regularly during the course of the work.

The purpose of the video inspection is to provide a reliable basis for restoring surface features affected by the work. Video inspection shall cover the entire project area to facilitate restoration to original condition with as little controversy as possible. Video inspection shall be performed no more than 6 months prior to construction in the area and shall include audio descriptions of surface features along the entire line of the project. The preconstruction video shall be delivered in color audio-video MPEG file format and saved on CDs or DVDs for submittal.

The purpose of the still photography is to provide a permanent photographic record of the progress of the work. The Contractor shall provide preconstruction still photos as well as monthly construction still photos, showing the major components of the work. The Contractor shall supply two (2) copies of each photo taken. Each print shall be in color, with smooth surface, glossy finish, single weight paper, 8x10 inches in size, with label on front identifying the project, location and orientation of view, and date. In addition, the photos will be saved on CDs or DVDs and submitted in JPEG format.

As a minimum, one (1) still photo will be taken of each property affected by the construction activities. Insufficient video and photo documentation may result in the Contractor's Liability for all disputes concerning property restoration or damage.

PART 2 – DEFINITIONS AND ABBREVIATIONS

2.1 DEFINITIONS

Unless the context specifically indicates otherwise, the meaning of terms in the Clermont County Water Resources Department Standard Specifications and Rules and Regulations shall be as follows:

Contractor. The party responsible for the wastewater collection and/or water distribution system work that is to be dedicated to, operated by or otherwise made part of the Water Resources Department, the legal representative of said party or the agent appointed to act for said party in the performance of the work.

Water Resources Department. The Clermont County Water Resources Department or any properly authorized representative designated by the County Sanitary Engineer to act for said Department.

Drawings. The Standard Drawings contained herein, designating minimum material and construction standards for wastewater collection and water distribution system work that is to be dedicated to, operated by or otherwise made a part of the Water Resources Department.

Specifications. The Standard Specifications contained herein, designating minimum material and construction standards for wastewater collection and water distribution system work that is to be dedicated to, operated by or otherwise made a part of the Water Resources Department.

2.2 ABBREVIATIONS

Common abbreviations which may be found in the Clermont County Water Resources Department Standard Specifications and Rules and Regulations are:

STANDARD ABBREVIATIONS

alternating current	a.c.	decibel	db
ante meridiem	a.m.	degree Centigrade (or Celsius) (i.e.)	$20^{o}C$
ampere	A	degree Fahrenheit (i.e.)	$68^{o}F$
Average	avg	biochemical oxygen demand	BOD
diameter	dia	dollars	$
direct current	d.c.	British thermal unit	BTU
brake horsepower	bhp	efficiency	eff
each	ea	Company	Co.
Centigrade	C	cubic inch	in^3 or cu in
Fahrenheit	F	cubic foot	ft^3 or cu ft
feet	ft	cubic yard	CY or cu yd
feet per hour	fph	cubic feet per minute	cfm
feet per minute	fpm	cubic feet per second	cfs
feet per second	fps	flange	flg
figure	Fig.	gallon	gal
foot-pound	ft-lb		

ounce	oz
outside diameter	OD
gram	g
phase	ph
post meridiem	p.m.
pound	lb
Pounds per foot	lbs./ft.
inch	in.
inch-pound	in.-lb
inside diameter	ID
pounds per square inch gauge	psig
kilowatt-hour	kwh
linear foot	lin ft
liter	l
square	sq
square foot	ft^2 or S.F.
square inch	in^2 or sq in
square yard	SY or sq yd
standard	std
standard cubic feet per minute	scfm
million gallons per day	mgd
minimum	min
net positive suction head	npsh
National Pipe Threads	NPT
gallons per minute	gpm
gallons per second	gps
parts per million	ppm
Hertz	Hz
hour	hr
horsepower	HP
pounds per square foot	psf
pounds per square inch	psi
pounds per square inch absolute	psia
kilovolt-ampere	kva
kilowatt	kw
revolution per minute	rpm
second	sec
specific gravity	SG
maximum	max
mercury	Hg
milligram	mg
milligrams per liter	mg/l
milliliter	ml
millimeter	mm
million gallon	MG or mil.gal.
totally-enclosed-fan-cooled	TEFC
volt	V
number	No.

ORGANIZATIONAL ABBREVIATIONS

ACS	American Chemical Society
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGMA	American Gear Manufacturers Association
AIChE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APHA	American Public Health Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
CEMA	Conveyor Equipment Manufacturers Association
CIPRA	Cast Iron Pipe Research Association

CMS	Construction and Material Specifications (ODOT)
CRSI	Concrete Reinforcing Steel Institute
EPA	Environmental Protection Agency
FM	Factory Mutual
HEW	Department of Health, Education and Welfare
HUD	Department of Housing and Urban Development
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurance
ISO	Insurance Services Office
MSS	Manufacturers' Standardization Society of the Valve and Fitting Industry
NAAMM	National Association of Architectural Metal Manufacturers
NBS	National Bureau of Standards, U.S. Dept. of Commerce
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OBBC	Ohio Basic Building Code
ODOT	Ohio Department of Transportation
OSHA	Occupational Safety and Health Act
PCI	Precast Concrete Institute
PFI	Pipe Fabrication Institute
SMACNA	Sheet Metal and Air Conditioning National Association
SSPC	Steel Structures Painting Council
TEMA	Tubular Exchanger Manufacturer's Association
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
USGS	United States Geological Survey
USPHS	United States Public Health Service
WEF	Water Environment Federation
WWEMA	Water and Wastewater Equipment Manufacturers Association
WPCF	Water Pollution Control Federation

END OF SECTION

SECTION 1020 – MOBILIZATION

PART 1 – GENERAL

1.1 SCOPE OF WORK

The work shall consist of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work required under the contract or as directed by the Owner's Representative.

Mobilization shall include all activities and associated costs for transportation of Contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, permits, project signage, and other necessary general facilities for the Contractor's operations at the site; premiums paid for performance and payment bonds, including coinsurance and reinsurance agreements as applicable; and other items specified in the contract documents.

Mobilization shall include the video tapping and the taking of still photographs of the entire project area with at least one photo of every driveway, ditch line and culvert pipe. All videos and photos shall be delivered to the Owner's Representative prior to the start of construction.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal and site clean-up of offices, buildings and other facilities assembled on the site specifically for this contract.

This work includes mobilization and demobilization required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted, or added items of work for which the Contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – SUBMITTALS (Not Applicable)

PART 4 – EXECUTION (Not Applicable)

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

Payment for Mobilization is full compensation for supplying and providing all materials, facilities, and services, and for performing all work necessary to complete this bid item.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

The total amount of this item shall not exceed 5 percent of the total bid for all work described in these contract documents.

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Lump Sum (LS) price bid for Item 1020 – MOBILIZATION. Progress payments will be made based on the following schedule:

Percent of Contract Completed*	Percent of Mobilization
0 to 10	25
11 to 50	75
51 to 100	85

*Excluding this item.

The remaining 15 percent will be paid for demobilization. Demobilization is considered complete when all restoration called for under this contract is completed and when all of the Contractor's equipment and personnel are removed from the project site.

END OF SECTION

SECTION 1030 – CONSTRUCTION LAYOUT STAKING

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to perform the fieldwork, measurements, and computations required for the horizontal layout and vertical grades of the project in accordance with the project plans and specifications.

PART 2 – PRODUCTS (NONE)

PART 3 – SUBMITTALS

3.1 GENERAL

Submit the company name and the name of the Professional Surveyor, licensed in the State of Ohio, who is designated responsible for and in responsible charge of the Professional Surveying activities and decisions associated with the construction layout staking.

PART 4 – EXECUTION

4.1 GENERAL

Obtain and calculate benchmark data, grades, and alignment from the project plans and specifications or other benchmark or method as approved by the Owner's Representative.

The Contractor is responsible for reestablishment of control points, additional control points and maintenance of the horizontal and vertical control points and control point ties as needed for construction of the project. This includes replacement of any stakes and markings removed by the Contractor, or as a result of any action of the Contractor, Subcontractor, or others during the life of this Contract.

The contractor shall (or shall retain the professional services of one qualified to) furnish, set, reference, and maintain all stakes and markings necessary to establish the alignment, location, benchmarks, elevations, and continuous profile-grades for all work as needed for and throughout the project. The contractor shall supervise and coordinate all construction staking.

The construction survey records shall be available at all times during the progress of the work for examination and use by the Owner's Representative and when requested, copies shall be made available. The original field notebooks and other records shall be provided to and become the property of the Owner before final payment and acceptance of all work.

All work shall follow recognized professional practice and the standards of the industry.

4.2 STAKING LOCATIONS

The Contractor shall provide staking at all line and grade changes, at all control points, and at minimum every 100 feet along the pipeline sufficient for layout of the work.

The Contractor shall be responsible for obtaining the proper line and grade from the above mentioned stakes. The Contractor may use reference lines, stakes, laser beams, or any other method acceptable to the Owner's Representative to obtain proper lines and grade between these points.

The Contractor shall provide all surveying and staking required to determine the limits of the project in the field where necessary, or where required by the Owner's Representative, including but not limited to: Right-of-ways, easements, construction limits and property lines.

PART 5 – TESTING (none)

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Lump Sum (LS) price bid for Item 1030 – CONSTRUCTION LAYOUT STAKING. Progress payments will be made based on the measured quantities of Item 1030 completed. The Contractor shall review the submitted units completed and provide confirmation to the Owner's Representative of the measurements prior to payment for work under this specification.

SECTION 1100 – CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary to perform clearing, grubbing, stockpiling of topsoil, and grading of topsoil as specified herein.

1.2 GENERAL

A. This work shall consist of clearing, grubbing, removal of trees and stumps, and removing and disposing of all vegetation and debris within the limits of the right-of-way and easement area, except such objects that are to remain or are to be removed in accordance with other sections of these specifications and/or identified on the plans.
B. Additional trees and other vegetation that are damaged as a result of the construction activities may be required, as directed by the Owner's Representative, to be removed in accordance with these specifications, at no additional cost to the Owner.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – SUBMITTALS (Not Applicable)

PART 4 – EXECUTION

4.1 CLEARING AND GRUBBING

A. All surface objects, brush, roots, and other protruding obstructions, not designated to remain, and all trees and stumps, shall be cleared and/or grubbed as required except for special treatment as follows:

    1. In locations to be seeded, stumps shall be removed to a minimum of 6 inches below ground surface.
    2. In locations along stream banks, stumps shall cut to the ground surface with roots left in place to assist with prevention of erosion.

4.2 TOPSOIL STOCKPILE AND GRADING

A. This item shall also include stripping of a minimum 12 inch layer of topsoil from the limits of excavation and stockpiling on-site.
B. Topsoils are those humus-bearing soils that can sustain plant life. Topsoil shall not be a mixture of contrasting textured subsoils, and shall contain less than 5 % by volume of cinders, stones, slag, coarse fragments, gravel, sticks, roots, trash, or other materials larger than 1 1/2 " in diameter.

C. If the stockpiled topsoil is determined to not be sufficient for restoration by the Owner's Representative, the contractor must provide the appropriate topsoil from an offsite source.
D. The topsoil being used for restoration can be subjected to a Soil Analysis Test, at the Contractor's expense, from the onsite or offsite stockpiles to determine the percent of organic matter present. The topsoil shall contain between 4 percent and 20 percent organic matter.

E. Upon completion of construction in the adjacent area, topsoil shall be uniformly spread over the area previously stripped.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Lump Sum (LS) price bid for Item 1100 – CLEARING AND GRUBBING. Progress payments will be made based on the percentage of Item 1100 completed.

END OF SECTION

SECTION 1110 – TRAFFIC CONTROL AND MAINTENANCE

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary to maintain and protect vehicular and pedestrian traffic as specified herein.

1.2 GENERAL

A. The contractor shall maintain traffic in accordance with the "Ohio Manual of Uniform Traffic Control Devices for Streets and Highways", current edition, latest revisions.
B. Traffic Control and Maintenance is required within all public right-of-way in conjunction with and/or in addition to the requirements of any permits issued and in accordance with ODOT Item 614 Specifications.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – SUBMITTALS

3.1 24-HOUR CONTACT

A. The Contractor shall supply to the Owner's Representative the name and phone number of a person designated to be on call to repair or maintain the traffic control devices and driveway access in the event of an accident or emergency. This contact information must be provided prior to the commencement of any construction activities.

PART 4 – EXECUTION

4.1 TRAFFIC MAINTENANCE

A. If a lane closure is required, the appropriate right-of-way office must be immediately notified. Signs, cones, necessary barricades, and a minimum of two (2) properly trained flag persons shall be in place before any work requiring a lane closure begins.

B. Under no circumstance will lane closures remain in effect when work is suspended.

C. Access to private property within construction area shall be provided at all times. Occupants of affected properties shall be notified by the Contractor twenty-four (24) hours prior to removal of existing driveways. Existing driveways shall be replaced with suitable temporary driveways as soon as possible and shall not be out of service for more than two (2) hours at a time.

D. The CONTRACTOR shall fully cover with plywood any signs, either existing, permanent or temporary, which do not properly apply to the current traffic phasing, and shall maintain the covering until the signs are applicable or are removed.

E. Road construction and End Construction signs shall be installed at the limits of the construction project before any work begins. These signs shall be removed as soon as construction is completed.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

6.1 TRAFFIC CONTROL AND MAINTENANCE

Payment for all labor, material, and equipment necessary to perform traffic control and maintenance in conformance with approved right-of-way permits, the "Ohio Manual of Uniform Traffic Control Devices for Streets and Highways", current edition, latest revisions, and ODOT 614 specifications shall be at the Lump Sum (LS) price bid for Item 1110 – TRAFFIC CONTROL AND MAINTENANCE.

6.2 ROAD CLOSURES GRANTED POST BID

If approved permits, supplied during the bidding phase of the project, require maintenance of traffic and DO NOT account for any road closures, the Contractor must bid accordingly. If the Contractor requests and is granted a road closure after the bidding phase of the project, the Lump Sum bid for TRAFFIC CONTROL AND MAINTENANCE will be adjusted based on an agreed to DEDUCT in contract price between the Contractor and Owner's Representative.

END OF SECTION

SECTION 1120 – SOIL EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary to install and maintain erosion protection and sediment control as shown on the plans and specified herein.

GENERAL

A. The contractor shall perform soil erosion and sediment control in accordance with the most current "Clermont County Water Management and Sediment Control Regulations" and all applicable regulations of the Ohio Environmental Protection Agency.
B. The contractor is responsible for providing and maintaining effective temporary erosion and sediment control measures during construction and until permanent controls become effective. The Owner's Representative will determine whether the controls are properly utilized.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – SUBMITTALS (Not Applicable)

PART 4 – EXECUTION

4.1 SOIL EROSION AND SEDIMENT CONTROL

A. Perform no clearing, grading, excavating, grubbing, or filling until erosion and sediment control measures are in place.
B. All controls must be inspected by the Contractor at least once every seven (7) calendar days, and within 24 hours of any rain event that produces more than 0.5 inches over the preceding 24 hours.
C. If controls are found to be non-performing, the Contractor must take immediate corrective action.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

4.1 SOIL EROSION AND SEDIMENT CONTROL

Payment for all labor, material, and equipment necessary to perform soil erosion and sediment control in conformance with the most current "Clermont County Water Management and Sediment Control Regulation" and all applicable regulations of the Ohio Environmental Protection Agency shall be at the Lump Sum (LS) price bid for Item 1120 – SOIL EROSION AND SEDIMENT CONTROL. 50% of the Lump Sum price bid shall be paid

upon approved installation of initial controls and the remaining 50% will be paid upon final completion of project and removal of temporary controls.

END OF SECTION

SECTION 1125 – SEEDING AND MULCHING

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to restore all non-paved surface areas to their pre-construction condition or better. Work shall include surface preparation, furnishing and placement of topsoil, seed, fertilizer, and mulch. Mulch shall include biodegradable fabric netting as indicated in these specifications.

Seeding and Mulching shall include a one year warranty on all work performed as outlined in Section B of the Project Specifications. The contractor shall be required to restore, reseed, and mulch, as needed, those areas of the project where seeding does not take hold or has washed out, during the warranty period.

Contractor is responsible for erosion control as outlined in Item 1120 – Erosion and Sediment Control throughout the life of the contract including the warranty period.

PART 2 – PRODUCTS

2.1 TOPSOIL

Contractor is responsible to stock pile existing top soil on site for reuse during site restoration as indicated in Item 1100 – Clearing and Grubbing. Any additional top soil required to complete the restoration activities shall be the responsibility of the contractor.

In areas where sufficient topsoil was not stock piled to provide the necessary material to establish a new grass surface, the contractor shall be responsible to provide the additional top soil as required.

Topsoil shall consist of a mixture of contrasting textured subsoils that are specifically blended to sustain grass seed to be planted.

2.2 SEED SPECIFICATIONS

New grass seed shall match the existing grass in all areas disturbed during the construction of this project, or as directed by owner. Where possible, the new grass seed shall be of type that is resistant to drought conditions.

2.3 EROSION CONTROL (MULCH) BLANKET

Erosion control blanket shall provide a temporary, biodegradable cover material to prevent slope and channel erosion. The blanket shall be suitable for the slope protection, channel and ditch linings,

reservoir embankments, culvert inlets and outfalls, and dikes, levees, and riverbanks. Blankets shall be made of non-plastic biodegradable material having a life expectancy of not more than 12 months.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of all material to be used for the seeding and mulching on this project. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 GENERAL

A. Contractor shall preform Seeding and Mulching activities in phases where indicated in the contract documents.
B. Contractor shall maintain erosion and sediment control during the seeding and mulching process.

4.2 PREPARATION

A. The Contractor shall loosen all disturbed areas to a depth of 3"-6". In areas where repeated access by heavy equipment or trucks has caused compaction, the Contractor shall loosen the soil to a depth of 12". The Contractor may use agricultural or construction equipment to perform the task.
B. The Contractor shall conduct final grading of all disturbed areas in conformance with the Project Drawings. All surfaces shall be smooth and free of rocks. On sloped areas (greater than 3:1), the Contractor shall use track equipment to compact the slope and produce ridges parallel to the slope contour.
C. Where topsoil has been stockpiled during the construction of the project, the contractor shall spread the topsoil on the disturbed areas after the soil has been loosened and the rough grading completed.
D. In all areas to be restored, the Contractor shall rake the seedbed surface to remove rocks and other debris. The surface shall be clear of obstructions and debris and must be suitable for mowing upon establishment of the seeding.

4.3 TOPSOIL

A. The topsoil shall be placed and uniformly spread over the areas to be restored, at a minimum depth of 3", as necessary to provide a proper soil layer for grass growth, unless otherwise specified or directed by the Owners Representative.
B. All surfaces shall be prepared to allow for proper drainage.

C. Topsoil shall be placed during favorable weather conditions that allow for proper placement of materials and germination of grass seed.

4.4 SEEDING

A. Hydro-seeding - The application of a combination of seed, fertilizer and mulch in a slurry mixture.

   Hydro-seeding mixtures shall be prepared on site, and applied immediately. No seed/mulch mix that has been left in the seeder for more than eight (8) hours shall be used.

B. Dry Seeding - This includes the use of conventional drop or broadcast spreader.
   - Upon seeding, the Contractor shall use a weighted roller over the area to provide for good seed to soil contact.
   - Where practical, seed shall be applied in two directions perpendicular to each other. Apply half of the seeding rate in each direction.
   - Dry seeding shall include the installation of mulch or mulch blankets to prevent erosion of the top soil and grass seed. Mulch blankets shall be installed, as necessary, in areas susceptible to wash out or wind blowing, including wind as a result of traffic flow.

All seed shall be incorporated into the top soil at a rate that provides for a finished grass thickness that is equal to or better that the pre-construction grass thickness.

PART 5 – TESTING

5.1 GENERAL

All seed must meet all applicable state and federal regulations and must include labeling indicating the supplier, formulation, germination rates and seed date. Seed may be subject to re-testing by a certified lab.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Lump Sum (LS) price bid for Item 1125 – SEEDING AND MULCHING. Progress payments will be made based on the percent of Item 1125 completed. The Contractor shall review the submitted units completed and provide confirmation to the Owners Representative of the measurements prior to payment for work under this specification. Payment for restoration of stockpile and storage areas or for areas outside of the construction limits (as defined on the plans) will not be approved.

All costs associated with additional mobilization and traffic control to complete this work shall be included in Items 1020 – Mobilization and 1110 – Traffic Control.

END OF SECTION

SECTION 1130 – CONCRETE PAVEMENT REPLACEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for concrete pavement replacement shown in the typical details and/or specified herein. Concrete pavement replacement shall include restoration of all concrete pavement damaged by, or as a result of, construction operations, equal or better than the condition that existed at the start of work.

PART 2 – PRODUCTS

2.1 CONCRETE

Concrete shall be Class C Concrete with a 28 day compressive strength of 4000 psi.

2.2 REINFORCING STEEL

Equal to or better than existing reinforcements. Contractor to field verify upon existing concrete removal. At minimum concrete reinforcements shall be welded steel wire fabric designation 6x6-W2 . 9xW29. (42 pounds per 100 square feet).

PART 3 – SUBMITTALS

Submit literature with product's physical properties. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 CONCRETE PAVEMENT REPLACEMENT

This item shall consist of furnishing and installing concrete and reinforcement for roadway, driveway, parking lot, sidewalk, curb and gutter, medians, and traffic island restoration at the locations and in accordance with the dimensions and instructions as shown on the plans and in accordance with CCWRD Standard Detail Drawings.

A. **Removal of Existing Pavement** - The pavement to be removed shall be marked with straight lines to a width beyond the damaged area, at least 12" on each side of the trench, or as directed by the owner's representative, and cut on neat lines by saw cutting and carefully removed to avoid damage to the remainder of the pavement. The pavement base shall then be loosened by air hammer, spade or point to break the bond with adjacent base. If saw cuts are within 4 feet of a formed joint in the existing pavement, then the existing slab shall be broken and removed to the joint.

B. Backfilling - After the bedding and pipe is installed as required by Section 1200, install backfill as directed by the road permit or as Section 1210 or 1220 requires.

Dowelled joints must be used when covering large areas, such as parking lots and roads, consistent with ODOT 451.08.

An asphalt or fibre expansion joint shall be used on light-use applications, such as driveway and sidewalks, when encountering a concrete slab or other fixed feature.

The depth/thickness of the concrete shall be equal to or greater than the existing concrete. Minimum thickness for driveways shall be 7".

Contractor is to maintain traffic until concrete pavement is restored.

C. Finish – The pavement must be properly placed on a leveled and compacted subgrade, placed with minimum slump, and finished as nearly as is possible to match the surface of the existing pavement, covered, protected and cured until traffic can be permitted upon it.

4.2 PAVEMENT MARKINGS

All pavement markings (lines, symbols, wording, etc.) shall be equal or better than the condition that existed at the start of work. The cost of this shall be incidental to all other work.

PART 5 – TESTING (As determined necessary)

PART 6 – BASIS OF PAYMENT

6.1 ROADWAY, DRIVEWAY, PARKING LOT, SIDEWALK, MEDIANS, AND TRAFFIC ISLANDS

Payment for all labor, material, and equipment necessary to perform concrete pavement replacement shall be based on the following bid items, units, and unit prices, and in conformance with CCWRD Standard Detail Drawings:

Item	Unit	Description
1130	Square Yard (SY)	Roadway
1130	Square Yard (SY)	Driveway
1130	Square Yard (SY)	Parking Lot
1130	Square Yard (SY)	Sidewalk
1130	Square Yard (SY)	Median, Traffic Island

The pay quantity for this item shall be calculated as follows:

L = length of trench parallel to pipe

W = width of trench (pipe OD + 48”) perpendicular to pipe
If authorized by the Owner’s Representative, concrete will be replace from edge of road to existing drive joint or saw cut.

SY = square yards

Pay quantity (SY) = (L x W)/9

The quantity of Concrete Pavement incorporated into the project is to be supported by original weight tickets from the material supplier and shall be approved by the Owner's Representative. The Contractor shall mark in writing on the ticket the appropriate Item of this contract for which this material was provided. The original weight tickets are for the use of the Owner or their representative and are not used as the basis for payment.

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid for specified Concrete Pavement item.

Removal of pavement, reinforcements, and pavement markings shall be incidental to all other work.

Careless or over excavation by the Contractor does not justify additional payment beyond the standard trench dimensions (ie dimensions of maximum payment).

6.2 CURB AND GUTTER

Payment for all labor, material, and equipment necessary to perform concrete pavement replacement shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
1130	Linear Foot (LF)	Curb and Gutter

The quantity of Curb and Gutter incorporated into the project is to be supported by original weight tickets from the material supplier and shall be approved by the Owner's Representative. The Contractor shall mark in writing on the ticket the appropriate Item of this contract for which this material was provided. The original weight tickets are for the use of the Owner or their representative and are not used as the basis for payment.

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid for specified Concrete Curb and Gutter item.

Careless or over excavation by the Contractor does not justify additional payment beyond the standard trench dimensions (ie dimensions of maximum payment).

END OF SECTION

SECTION 1140 – ASPHALT PAVEMENT REPLACEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for asphalt pavement replacement shown in the typical details and/or specified herein. Asphalt surface replacement shall include restoration of all asphalt pavement damaged by, or as a result of, construction operations, equal or better than the condition that existed at the start of work.

RELATED SPECIFICATION MATERIAL

- **A.** CCWRD, General Specification: Section 1200 Granular Bedding and Backfill Material
- **B.** CCWRD, General Specification: Section 1210 Controlled Density Fill (CDF)
- **C.** CCWRD, General Specification: Section 1220 Granular Backfill / Aggregate Base

PART 2 – PRODUCTS

2.1 Asphalt Concrete Base

Shall meet the composition requirements of ODOT Item 301.

2.2 Asphalt Concrete

Shall meet the description requirements of ODOT Item 448.

PART 3 – SUBMITTALS

Submit literature with product's physical properties to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 ASPHALT PAVEMENT REPLACEMENT OVER TRENCH AREA

This item shall consist of furnishing and installing asphalt pavement for roadway, driveway, parking lot, and sidewalk restoration at the locations and in accordance with the dimensions and instructions as shown on the plans.

- **A. Removal of Existing Pavement** - The pavement to be removed shall be marked with straight lines to a width beyond the damaged area, at least 12" on each side of the trench, or as directed by the owner's representative, and cut on neat lines by saw cutting and carefully removed to avoid damage to the remainder of the pavement. The pavement base shall then be loosened by air hammer, spade or point to break the bond with adjacent base.

B. **Backfilling** - After the bedding and pipe is installed as required by Section 1200, install backfill as directed by the road permit or as Section 1210 or 1220 requires. Driveway and sidewalk restoration will require 2 - 4 inch lifts of Granular Base (Section 1220) and roadways and parking lots will require 2 - 4 inch lifts of Asphalt Concrete Base. A 2 inch final layer, Asphalt Concrete, will be required for all asphalt pavement restoration. Tack coats are required anytime a surface course is placed on an intermediate course or an intermediate course on a base course. Contractor is to maintain traffic until asphalt pavement is restored.

C. **Finish** – The pavement must be properly placed on a leveled and compacted subgrade and finished as nearly as is possible to match the surface of the existing pavement, covered, protected and cured until traffic can be permitted upon it.

4.2 ASPHALT PAVEMENT DAMAGED DURING CONSTRUCTION

This item shall consist of furnishing and installing asphalt pavement for roadway, driveway, parking lot, and sidewalk restoration at the locations and in accordance with the dimensions and instructions as shown on the plans.

A. **Removal of Existing Pavement** - The pavement to be removed shall be marked with straight lines to a width beyond the damaged area and cut on neat lines by saw cutting and carefully removed to avoid damage to the remainder of the pavement. The pavement base shall then be loosened by air hammer, spade or point to break the bond with adjacent base.

B. **Backfilling** - After the bedding and pipe is installed as required by Section 1200, install backfill as directed by the road permit and as Section 1210 or 1220 requires. Driveway and sidewalk restoration will require 2 - 4 inch lifts of Granular Base (Section 1220) and roadways and parking lots will require 2 - 4 inch lifts of Asphalt Concrete Base. A 2 inch final layer, Asphalt Concrete, will be required for all asphalt pavement restoration. Tack coats are required anytime a surface course is placed on an intermediate course or an intermediate course on a base course. Contractor is to maintain traffic until asphalt pavement is restored.

C. **Finish** – The pavement must be properly placed on a leveled and compacted subgrade and finished as nearly as is possible to match the surface of the existing pavement, covered, protected and cured until traffic can be permitted upon it.

4.3 PAVEMENT MARKINGS

All pavement markings (lines, symbols, wording, etc.) shall be equal or better than the condition that existed at the start of work. The cost of this shall be incidental to all other work.

PART 5 – TESTING (Not Applicable)

PART 6 - BASIS OF PAYMENT

6.1 ASPHALT PAVEMENT REPLACEMENT OVER TRENCH AREA

Payment for Granular Base required for asphalt pavement replacement shall be paid under Section 1220, Granular Backfill & Bedding. Payment for all other labor, material, and equipment necessary to perform asphalt pavement replacement shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
1140	Cubic Yard (CY)	Asphalt Concrete Base
1140	Cubic Yard (CY)	Asphalt Concrete

The pay quantity for this item shall be calculated as follows:

L = length of trench parallel to pipe

W= width of trench (pipe OD + 48”) perpendicular to pipe

D = depth of material

CY = cubic yards

Pay quantity (CY) = (L x W x D)/27

The quantity of Asphalt Concrete Base and Asphalt Concrete incorporated into the project is to be supported by original weight tickets from the material supplier and shall be approved by the Owner's Representative. The Contractor shall mark in writing on the ticket the appropriate Item of this contract for which this material was provided. The original weight tickets are for the use of the Owner or their representative and are not used as the basis for payment.

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid for specified Asphalt Concrete Base and Asphalt Concrete items.

Removal of pavement, tack coat, joint sealer, and pavement markings shall be incidental to all other work.

Careless or over excavation by the Contractor does not justify additional payment beyond the standard trench dimensions (ie dimensions of maximum payment).

END OF SECTION

SECTION 1150 – GRAVEL DRIVEWAY REPLACEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for gravel driveway replacement shown in the typical details and/or specified herein. Gravel driveway replacement shall include restoration of all gravel surfaces damaged by, or as a result of, construction operations, equal or better than the condition that existed at the start of work.

PART 2 – PRODUCTS

2.1 GRAVEL

Gravel shall match the color and consistency of the existing driveway material.

PART 3 – SUBMITTALS (Not Applicable)

PART 4 – EXECUTION

4.1 GRAVEL DRIVEWAY REPLACEMENT

This item shall consist of furnishing, placing, and compacting one or more courses of aggregate on a prepared surface.

A. **Backfilling** - The bedding, backfill, and pipe shall be installed as required by Section 1200, 1210, or 1220.

B. **Finish** –The surface course must be equal to that of the existing drive.

PART 5 – TESTING (Not applicable)

PART 6 – BASIS OF PAYMENT

6.1 GRAVEL DRIVEWAY

Payment for all labor, material, and equipment necessary to perform gravel driveway replacement shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
1150	Cubic Yard (CY)	Gravel

The pay quantity for this item shall be calculated as follows:

L = length of gravel

W = width of gravel (pipe OD + 48”)

D = depth of gravel

CY = cubic yards

Pay quantity (CY) = (L x W x D)/27

The quantity of Gravel Driveway incorporated into the project is to be supported by original weight tickets from the material supplier and shall be approved by the Owner's Representative. The Contractor shall mark in writing on the ticket the appropriate Item of this contract for which this material was provided. The original weight tickets are for the use of the Owner or their representative and are not used as the basis for payment.

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid for specified Gravel Driveway Replacement item.

Careless or over excavation by the Contractor does not justify additional payment beyond the standard trench dimensions (ie dimensions of maximum payment).

END OF SECTION

SECTION 1160 – DRIVEWAY CULVERT / DRAIN TILE REPLACEMENT

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary for removing existing, furnishing and installing new driveway culvert pipe or drain tile pipe damaged during construction, as shown on the Contract Drawings or as directed by the Owner's Representative.

PART 2 – PRODUCTS

Replacement driveway culvert pipe or drain tile pipe shall be replaced in like kind (equal size and material) unless otherwise directed by Owner's Representative or applicable permit.

New driveway culvert pipe or drain tile pipe shall be 12 inches or greater corrugated metal pipe or HDPE plastic pipe or as directed by the Owner's Representative or applicable permit.

PART 3 – SUBMITTALS

Submit literature and/or catalog cut sheets of the driveway culvert/drain tile pipe to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Prior to the removal of the existing driveway culvert or drain tile pipe, the Contractor shall establish the existing size, elevation and location of the pipe inverts for the pipe that is to be removed. All information is to be made available to the Owner's Representative prior to the pipe's removal.

The Contractor shall reestablish the ditch line leading to and from the replaced driveway culvert or drain tile pipe immediately following the driveway culvert or drain tile pipe installation, unless the continuing pipe installation activities interfere with that reestablishment.

The Contractor is responsible for maintaining erosion control in the area of the newly installed driveway culvert or drain tile pipe. During the life of the contract, the contractor is responsible to remove any material that may enter and settle in the culvert or drain tile pipe.

This item includes all bedding and backfill material to install the driveway culvert pipe or drain tile.

Driveway culvert pipe and drain tile that is damaged during construction and is located outside of the trench limits as described on the contract drawings, shall be replaced by the Contractor at the contractor's expense.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid per Linear Feet (LF) for Item 1160 – DRIVEWAY CULVERT OR DRAIN TILE REPLACEMENT. Progress payments will be made based on the installed linear feet of Item 1160 completed.

END OF SECTION

SECTION 1170 – STREAM CROSSINGS

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary to furnish and install all stream crossings shown on the plans and/or specified herein.

PART 2 – PRODUCTS

2.1 CONCRETE

Concrete used for encasement of stream crossings shall be of 4,000 psi compressive strength installed according to the Standard Drawings of the Clermont County Water Resources Department.

2.2 RIP RAP

Rip Rap used for protection of stream crossings shall be Class "C" Rip Rap installed according to the Standard Drawings of the Clermont County Water Resources Department. Rip Rap shall be installed where shown on the drawings or where directed by the OWNER'S REPRESENTATIVE.

2.3 PIPE JOINT RESTRAINT

Pipe joint restraints shall be Field Lok Gasket, American Fast Grip, or approved equal as determined by Owner's Representative.

PART 3 – SUBMITTALS (Not Applicable)

PART 4 – EXECUTION

4.1 GENERAL

The stream crossings shall be installed to protect the pipe, streambed and banks from erosion. As much as practicable, the stream banks and streambed shall be restored to equal to or better than their original condition. It is the CONTRACTOR'S responsibility to minimize the impacts of construction and to implement the requirements of the specifications for the stream crossing(s).

The top foot of excavated material within the streambed, stream bank and riparian area shall be temporarily stored outside of the riparian area, if possible, for use during restoration, unless otherwise shown on the plans or approved by the OWNER'S REPRESENTATIVE. Silt fence shall be installed and

maintained around all stored material. At locations where construction equipment will be crossing the stream, the CONTRACTOR shall construct a temporary stream crossing using culverts or another acceptable method as approved by the OWNER'S REPRESENTATIVE.

Each stream crossing shall be completed within twenty-four (24) hours, unless otherwise approved *in writing* by the OWNER'S REPRESENTATIVE. Stream bank and stream bed restoration shall be completed within forty-eight (48) hours of completing the stream crossing construction.

4.2 CLEARING OF VEGETATION

Clearing for all stream crossings shall be limited to a 20-foot width through the riparian area unless otherwise specified or shown on the plans. Tree removal within the riparian area shall be performed only where absolutely necessary for construction. In cases where a tree (or, any other vegetation) must be removed for construction purposes, the tree (or, any other vegetation) should be either cut at the ground or one to two feet above the ground so the root mass is maintained.

4.3 DIVERSION OF STREAM FLOW

The CONTRACTOR will be responsible to maintain all flow within the stream channel. This may be accomplished by use of a temporary dam of sand bags and culvert pipe(s). At no time shall excavated material be used to create a temporary dam or divert stream flow. All stream bed and stream bank restoration within the dammed area shall be completed prior to removal of the temporary dam(s).

4.4 PIPE INSTALLATION/ CONCRETE ENCASEMENT

Gravity sewer mains shall be protected from erosion by use of concrete encasement when the depth of the sewer is less than eight (8) feet. Concrete encasement shall be installed in accordance with the Standard Drawings of the Clermont County Water Resources Department. Where the depth of the gravity sewer exceeds eight (8) feet, the use of compacted backfill is acceptable. Unless, otherwise directed by the OWNER'S REPRESENTATIVE.

Water mains and sewage force mains shall be installed a minimum of five (5) feet below the bottom of the streambed and shall be protected from erosion by use of concrete encasement in accordance with the Standard Drawings of the Clermont County Water Resources Department. Pipe joint restraints shall be installed at all creek crossings to at least twenty foot outside of the concrete encasement both directions.

4.5 STREAM BANK RESTORATION

Stream bank restoration includes final grading of stream banks to an acceptable grade and vegetating and/or placing of rip rap. All backfill shall be mechanically compacted. The top foot of excavated material that was temporarily stored shall be replaced during restoration. In some cases, where shown

on the plans or directed by the OWNER'S REPRESENATIVE, compacted earth backfill shall be placed to approximately two (2) feet below the final ground surface and rip rap shall be placed in accordance with the Standard Drawings of the Clermont County Water Resources Department.

4.6 STREAMBED RESTORATION

The trench within the streambed shall be backfilled with mechanically compacted earth to approximately one (1) foot below the original ground surface. The top foot of excavated material that was temporarily stored shall be replaced during restoration. Where shown on the plans or directed by the OWNER'S REPRESENATIVE, compacted earth backfill shall only be placed to approximately two (2) feet below the original ground surface and rip rap will be placed in accordance with the Standard Drawings of the Clermont County Water Resources Department.

In the event that bedrock is encountered during excavation of the trench through the streambed, concrete shall be used for backfill from the top of the bedrock down a maximum of three (3) feet.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

6.1 STREAM CROSSINGS

Payment for all labor, material, and equipment necessary to perform and restore stream crossings shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
1170	Cubic Yard (CY)	Concrete Encasement
1170	Cubic Yard (CY)	Rip Rap

Payment will not be made for materials installed beyond the limits required by the plans, specifications and/or Standard Drawings of the Clermont County Water Resources Department. Concrete placed where bedrock is encountered shall be paid at the unit price bid for Concrete Encasement. All other costs associated with stream crossings shall be included in the unit bid prices for the pipe.

END OF SECTION

SECTION 1180 – KEYBLOCK ANCHORS

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to install keyblock anchors for water or sewer mains on steep slopes as shown on the plans or as directed by the owner's representative.

PART 2 – PRODUCTS

2.1 GENERAL

Acceptable products shall meet or exceed the CCWRD Standard Detail Drawings and shall be installed under the direction of the Owners Representative.

2.2 REINFORCING BARS

All reinforcing steel shall conform to ASTM A 615 including Supplementary Requirements. All reinforcing steel shall be 60,000 psi yield strength.

All reinforcement shall be cold bent, unless otherwise specifically permitted by the Owners Representative.

Reinforcing bar layout to be as shown on CCWRD Standard Detail Drawings.

2.3 CONCRETE

Concrete shall be Class C with a minimum compressive strength of 4000 PSI.

PART 3 – SUBMITTALS

3.1 GENERAL

Acceptable products shall meet or exceed the requirements for keyblock anchors as shown on CCWRD Standard Detail Drawings.

PART 4 – EXECUTION

4.1 PIPELINE

Where keyblock anchors are required, all pipeline shall be Ductile Iron Class 52 with restrained joints unless otherwise indicated on drawings or as directed by the Owners Representative.

4.2 MINIMUM SPACING

Water or sewer pipelines constructed on 15% slope or greater shall be anchored securely with concrete anchors or equal as shown in the CCWRD Standard Detail Drawings. Required minimum anchorage is as follows:

a. Not over 36 feet center-to-center on grades 15% and up to 35%.

b. Not over 24 feet center-to-center on grades 35% and up to 50%.

c. Not over 16 feet center-to-center on grades 50% and over.

4.2 ELEVATION AND SECTION

Dimensions of keyblock anchor as shown on CCWRD Standard Detail Drawings.

4.3 FORMWORK

Keyblock anchors may be trenched (excavated neat) and cast without formwork if the soil is suitable (in undisturbed earth) as determined by the Owner's Representative.

Forms, where necessary, shall be constructed and removed in such a manner that will not cause damage to the concrete. Concrete work shall be protected from damage during construction. The Contractor is responsible for repairing any damage to the concrete without any additional expense to the Owner or delay in construction.

4.4 REINFORCEMENT

All reinforcing steel shall conform to ASTM A 615 including Supplementary Requirements. All reinforcing steel shall be 60,000 psi yield strength.

All reinforcement shall be cold bent, unless otherwise specifically permitted by the Owner's Representative.

PART 5 – TESTING

5.1 GENERAL

The Contractor is responsible for correction of concrete work which does not conform to the Specifications and Drawings including strength, tolerances and finishes. This includes correcting deficient concrete at no additional expense to the Owners Representative to the satisfaction of the Owners Representative.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Each (EA) price bid for Item 1180 – KEYBLOCK ANCHORS. Progress payments will be made based on the measured quantities of Item 1180 completed. The Contractor shall review the submitted units completed and provide confirmation to the Owners Representative of the measurements prior to payment for work under this specification.

SECTION 1190 – JACK AND BORE WITH STEEL CASING

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to complete the construction of steel casing pipe and to complete the construction of boring to the lines and grades detailed on the plans including all excavation, backfilling, jacking, tunneling, sealing, jointing, dewatering, construction of bulkheads, additional flagmen and safety devises as may be required and all necessary and miscellaneous items detailed as required to complete the work as shown on the Plans, including casing spacers and end seals.

PART 2 – PRODUCTS

2.1 STEEL CASING PIPE

Steel pipe used for casing shall be smooth steel with minimum yield strength of 35,000 psi. The inside diameter of the casing pipe shall be a minimum of four (4) inches larger than the largest outside diameter of the water or sewer line. Wall thickness and casing diameter shall be based on the following schedule for PVC and Class 52 Ductile Iron Pipe:

Pipe Size (inches)	Casing OD (inches)	Wall Thickness (inches)
6 to 8	16	3/8
10	18	3/8
12	22	3/8
14 to 20	30	½
21 to 24	36	½
27 to 30	40	½

Larger diameter casing pipe may be substituted by the CONTRACTOR; however, there will be no extra cost to the OWNER for this substitution.

2.2 SPACERS AND END SEALS

Casing spacers shall be model CCS stainless steel casing spacers as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, IL (1-800-426-4301), Model BWM-SS as manufactured by BWM Company or approved equal. End seals shall be model CCES as manufactured by Cascade Waterworks, model BWM-PO as manufactured by BWM Company or approved equal.

2.3 RESTRAINED JOINTS

Within the casing pipe, all pressure pipe shall have restrained joints in accordance with Section 2110 for Ductile Iron Water Main, Section 2120 for PVC Water Main, and/or Section 3310 for PVC Sewer Force Main.

PART 3 – SUBMITTALS

3.1 STEEL CASING PIPE

Submit literature and/or catalog cut sheets of the steel casing pipe to be used. Submit to the Owner's Representative for review and approval prior to ordering.

3.2 SPACERS AND END SEALS

Submit literature and/or catalog cut sheets of the spacer and end seal system to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 STEEL CASING

Steel casing pipe shall be bored and/or jacked in place at the grade and elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth, non-obstructing joint inside.

4.2 CARRIER PIPE

Carrier pipe shall be installed after the casing is in place. Restrained joints are required for all pressure pipe (water main or sanitary force main) within the casing pipe.

4.3 SPACERS AND END SEALS

Spacers and end seals shall be installed in accordance with the manufacturer's recommendations. For the Cascade and BWM Spacer Systems and ductile iron pipe, one spacer shall be placed not more than two (2) feet from each end of the casing. Subsequent spacers shall be placed at 10 foot intervals within the casing.

For the Cascade and BWM Spacer Systems and PVC pipe, one (1) spacer shall be placed on the spigot end of each segment at the line marking the limit of insertion into the bell. When the joint is complete, the spacer shall be in contact with the bell of the joint so that the spacer pushes the joint and relieves compression within the joint. Subsequent spacers shall be placed at six (6) foot intervals.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

Payment for all labor, material, and equipment necessary to install steel pipe encasement shall be paid at the Contract unit price per lineal foot, complete in place, and shall include the price for casing spacers, end seals, and all other items necessary for construction as shown on the drawings and/or described in the specifications. Measurement for the steel casing pipe will be from end to end of the completed casing pipe in place.

END OF SECTION

SECTION 1200 – GRANULAR BEDDING AND INITIAL BACKFILL MATERIAL

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to place and compact the granular bedding and initial backfill material where shown on the plans, required by these specifications, or where directed by the Owner's Representative.

PART 2 – PRODUCTS

2.1 GRANULAR BEDDING AND INITIAL BACKFILL FOR PIPE WITH ≤15' OF COVER

Granular Bedding and Initial Backfill Material for pipes with 15' or less cover shall meet all material requirements of ODOT Item 703.11, Structural Backfill Type 2, except that no slag material will be accepted.

In cases where the trench bottom consists of mucky and/or unstable conditions, which requires over-excavation to reach stable soils, AASHTO #57 stone shall be used for bedding and initial backfill, regardless of depth.

2.2 GRANULAR BEDDING AND INITIAL BACKFILL FOR PIPE WITH >15' OF COVER

Granular Bedding and Initial Backfill Material for pipes with depth of cover that exceeds 15' shall be AASHTO #57 stone.

PART 3 – SUBMITTALS

Submit sieve analysis and/or literature for all bedding and initial backfill material to be used, including identification of the supplier. Submit to Owner's Representative for review and approval. A submittal is not required for bulkhead material used in accordance with Paragraph 4.3 of this Section.

PART 4 – EXECUTION

4.1 BEDDING PREPARATION

After preparation of the trench bottom, a minimum 6" depth of pipe bedding shall be placed the full width of the trench bottom and should be prepared to provide appropriate line and grade of the pipe. <u>Blocking must not be used to bring the pipe to grade.</u>

In cases where the trench bottom consists of mucky and/or unstable conditions, the Contractor shall remove the unstable soil to a depth as directed by the Owner's Representative. The soils removed shall be replaced with AASHTO #57 stone and installed in 6 inch loose lifts and mechanically compacted.

4.2 INITIAL BACKFILL

Backfill shall be carefully placed in the trench as to not damage the pipe. The backfill material shall be so placed as to fill the void under the lower part of the pipe by slicing under the haunches with a shovel to the springline of the pipe. The haunching material provides side support for the pipe and is most important for controlling pipe deflection. The remainder of the backfill material shall be carefully placed to a minimum of 12" over the top of the pipe.

4.3 BULKHEADS

The CONTRACTOR shall place bulkheads of clean clay soil around the pipe and across the full width of the trench at 100 foot intervals to resist the movement of groundwater through the granular material and erosion of the granular material. Such bulkheads shall be carefully compacted and shall extend 3 feet in a direction parallel to the pipe and shall extend from the bottom of the trench to a height 12 inches over the top of the pipe.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

Payment for all labor, material, and equipment necessary to install the granular bedding and initial backfill in accordance with theses specifications shall be included in the unit price of the pipe.

Where special bedding and backfill is required due to wet and/or unstable soil conditions that are outside the control of the CONTRACTOR, the CONTRACTOR will be compensated in accordance with Paragraph 19, Changes in Work, of the Standard General Conditions of the Construction Contract.

Additional compensation will not be granted for wet and/or unstable soil conditions created due to actions of the CONTRACTOR.

END OF SECTION

SECTION 1210 – CONTROLLED DENSITY FILL (CDF)

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to place a flowable mixture of portland, fly ash, and sand and/or low strength mortar backfill for backfilling trenches under various combinations of pavement within the public Right-of-Way or other locations as shown on the Project Drawings, as specified or as directed by the Owner's Representative.

1.2 GENERAL

CDF is to be trench backfill below subgrade level for all trenches in or within three (3) feet of the edge of existing pavement. The Right-of-Way permitting agency reserves the right to make modifications to these requirements. Any permitted modifications shall be in writing by the Right-of-Way permitting agency and may include other engineering and/or construction requirements not shown in this specification.

PART 2 – PRODUCTS

2.1 GENERAL

CDF shall conform to ODOT's low strength mortar backfill specification and/or HAM/CIN CLSM Specification or approved equal. CDF shall be installed under the direction of the Owners Representative or as outlined in the plans and specifications.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of the materials to be used for review & approval by the Owners Representative prior to ordering.

PART 4 – EXECUTION

4.1 GENERAL

Mixing Equipment: Sufficient mixing capacity and delivery equipment shall be provided to permit the CDF mixture to be placed without interruption as much as practicable. CDF mixtures may be placed in intermittent horizontal lifts as approved by the Right-of-Way permitting agency.

Placing Mixtures: CDF mixtures shall be discharged from the mixing and/or delivery equipment by any reasonable means into the spaces to be filled. The placing of other materials over the low strength mortar backfill may commence as specified further herein, as soon as the surface water has dissipated, or as directed by the Right-of-Way permitting agency.

Type I mixtures - For these mixtures, the placing of asphaltic concrete materials shall not occur until a minimum of twenty-four (24) hours had elapsed following placement of the backfill or until approved by the Clermont County Engineer or his representative.

Type III mixtures - For these mixtures, the placing of asphaltic concrete materials shall not occur until a minimum of four (4) hours has elapsed following placement of the backfill unless a pentrometer test in accordance with ASTM C-403.88 indicates average resistance strength of 400 PSI in less time to until approved by the Right-of-Way permitting agency or his Representative.

Limitation Of Operations:

- The mixtures shall not be placed on frozen ground.
- The placed mixtures shall be protected from freezing.
- Each filling stage shall be as continuous as possible.
- Curing time of CDF may be affected by temperature. At temperatures near freezing or below, additional time may be needed for proper cure of the material prior to any type of paving operation.

PART 5 – TESTING

5.1 GENERAL

The Contractor is responsible for correction of concrete work which does not conform to the Specifications and Drawings including strength, tolerances and finishes. This includes correcting deficient concrete at no additional expense to the Owners Representative to the satisfaction of the Owners Representative.

PART 6 – BASIS OF PAYMENT

Calculated quantities shall be paid in cubic yards based on the actual field measured dimensions and should coincide with the dimensions of maximum payment as specified in the Plans unless otherwise authorized by the Owner's Representative.

The pay quantity of Item 1210 - Controlled Density Fill shall be calculated as follows:

L = length of trench parallel to pipe containing Controlled Density Fill

W = width of trench perpendicular to pipe containing Controlled Density Fill

D = depth of trench containing Controlled Density Fill

CY = cubic yards

Pay quantity (CY) = (L x W x D)/27

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Cubic Yard (CY) price bid for Item 1210 – CONTROLLED DENSITY FILL (CDF). Progress payments will be made based on the measured quantities of Item 1210 completed. The Contractor shall review the submitted units completed and provide confirmation to the Owners Representative of the measurements prior to payment for work under this specification.

Careless or over excavation by the Contractor does not justify additional payment beyond the standard trench dimensions (ie dimensions of maximum payment).

SECTION 1220 – AGGREGATE BACKFILL & BASE MATERIAL

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to place and compact the aggregate backfill / aggregate base material where shown on the plans, required by these specifications, or where directed by the Owner's Representative.

PART 2 – PRODUCTS

2.1 AGGREGATE BACKFILL & BASE

Aggregate Backfill & Base Material shall meet all material requirements of ODOT Item 304.

PART 3 – SUBMITTALS

Submit sieve analysis and/or literature for aggregate backfill material to be used, including identification of the supplier. Submit to Owner's Representative for review and approval.

PART 4 – EXECUTION

4.1 AGGREGATE BACKFILL & BASE

Where aggregate backfill & base is required, the trench shall be backfilled with aggregate material so placed and compacted as to make a satisfactory pavement subgrade and prevent further settlement. Aggregate material shall be placed in maximum layers of 6 inches in thickness and mechanically compacted. Use of the excavator bucket to obtain compaction is not permissible.

PART 5 – TESTING

5.1 COMPACTION TESTING

Where required, the CONTRACTOR will be responsible to provide an independent testing agency to perform backfill compaction testing and provide written reports. Testing and reporting will be in accordance with appropriate right-of-way permits and as directed by the OWNER'S REPRESENTATIVE.

PART 6 – BASIS OF PAYMENT

Payment for all labor, material, and equipment necessary to perform aggregate backfill shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
1220	Cubic Yard (CY)	Aggregate Backfill & Base

Calculated quantities shall be paid in cubic yards based on the actual field measured dimensions and should coincide with the dimensions of maximum payment as specified in the Plans unless otherwise authorized by the Owner's Representative. Unless authorized by the Owner's Representative, additional quantities required for restoration beyond the dimensions specified on the plans and below shall be at the Contractor's expense.

The pay quantity of Item 1220, Aggregate Backfill & Base, shall be calculated as follows:

L = length of trench parallel to pipe containing Aggregate Backfill & Base

W = width of trench (pipe O.D. + 24", max.) perpendicular to pipe containing Aggregate Backfill AND width of trench (pipe O.D. + 48", max.) perpendicular to pipe containing Aggregate Base

D = depth of trench containing Aggregate Backfill AND depth of Aggregate Base

CY = cubic yards

Pay quantity (CY) = (L x W x D)/27

The quantity of Aggregate Backfill & Base incorporated into the project is to be supported by original weight tickets from the material supplier and shall be approved by the OWNER'S REPRESENTATIVE. The CONTRACTOR shall mark in writing on the ticket the appropriate Item of this contract for which this material was provided. The original weight tickets are for the use of the OWNER'S REPRESENTATIVE and are not used as the basis for payment. Removal and disposal of excess material due to using aggregate material shall be included in this item.

Careless or over excavation by the CONTRACTOR does not justify additional payment beyond the standard trench dimensions (i.e. dimensions of maximum payment).

END OF SECTION

SECTION 2110 – DUCTILE IRON WATER MAIN AND DUCTILE IRON FITTINGS

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary for furnishing and installing ductile iron water main pipe and ductile iron water main fittings as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 GENERAL

This work shall consist of providing all labor, materials, and equipment necessary for furnishing and installing ductile iron water main pipe and fittings including all bends, reducers, tees, sleeves, and special castings required for the installation of the valves, strapping, placement of concrete thrust blocks, and all other work required for furnishing and installing water mains complete and ready for service as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

The water main and fittings shall be installed in accordance with the Contract Drawings, the American Water Works Association (AWWA) for potable water main and fittings installation, the Clermont County Water Resources Department Standard Specifications and Rules and Regulations, and the Owner's Representative.

1.3 RELATED WORK

A. Section 1130 Concrete Pavement Replacement
B. Section 1140 Asphalt Pavement Replacement
C. Section 1150 Gravel Driveway Replacement
D. Section 1170 Stream Crossings
E. Section 1180 Keyblock Anchors
F. Section 1190 Jack and Bore with Steel Casing
G. Section 1200 Granular Bedding and Initial Backfill Material
H. Section 1210 Controlled Density Fill (CDF)
I. Section 1220 Aggregate Backfill & Base Material

PART 2 – PRODUCTS

2.1 DUCTILE IRON PIPE

Ductile iron pipe shall be of ductile, centrifugally cast type in accordance with ANSI A21.51 (AWWA C-151), except as herein modified:

Hardness:	Rockwell B-90 maximum
Corrosion Allowance:	0.08 inches minimum

For inside structures and for outside installation above ground, all pipes shall be Class 53 in accordance with ANSI A 21.15 (AWWA C-115). Additionally, all outside above ground pipe shall have foamglass insulation and corrugated metal sleeve of appropriate sizes to prevent freezing, as approved by the Owner's Representative.

For all in-ground installations the pressure class shall be Class 52, unless a higher class is required by laying conditions or pressure in accordance with ANSI A21.50 and approved by the Owner's Representative.

All ductile iron pipes shall have a bituminous coated cement lining complying with AWWA C-104 and shall have an outside coating of bitumastic enamel or approved equal.

All ductile iron pipes shall be provided with either mechanical joint ends or push-on joints ends.

2.2 DUCTILE IRON FITTINGS

All fittings, wall pipes and specials shall be of ductile iron or in accordance with ANSI A21.10 (AWWA C-153).

All fittings shall have a bituminous coated cement lining complying with AWWA C-104 and shall have an outside coating complying with AWWA C-153 or an epoxy coating complying with AWWA C-116.

All ductile iron fittings shall be provided with and assembled using mechanical joint ends and retainer glands.

2.3 CONCRETE THRUST BLOCKING

Concrete thrust blocking, supports and/or buttresses shall be provided at all tees and bends and at any other locations required by the District. These concrete structures shall be built to the lines, grades and dimensions shown on the Standard Drawings. Concrete used for blocking shall conform to Class C Concrete, having a compressive strength of 4,000 pounds per square inch.

All concrete shall be mixed by mechanical means prior to installation. The installation of dry concrete will not be permitted.

2.4 PIPE JOINT RESTRAINT

Pipe joint restraints shall be Field Lok Gasket, American Fast Grip, or approved equal as determined by Owner's Representative, except as modified herein.

All fire hydrant leads and fire hydrant assemblies shall be restrained using Megalug Series 1100 Mechanical Joint Restraint or Sigma Corporation One-Lock Series SLDE Mechanical Joint Restraint for Ductile Iron Pipe or approved equal as determined by Owner's Representative.

2.5 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall be installed in accordance with ANSI/AWWA C105/A21.5 and these Specifications. The polyethylene encasement shall be a low-density polyethylene film made from virgin low-density polyethylene raw material conforming to ASTM D4976 and shall be a minimum of eight mils in thickness.

PART 3 – SUBMITTALS

3.1 DUCTILE IRON WATER MAIN PIPE AND FITTINGS

Submit literature and/or catalog cut sheets of the ductile iron water main pipe and fittings to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 GENERAL

The Contractor shall furnish all necessary labor, material, tools, and equipment required in the installation of the water main pipe and fittings. This work includes furnishing all materials, the proper storage of those materials, saw cutting, excavation, laying and joining the pipe, installation of concrete blocking and joint restraints, bedding, initial backfilling, repairing or replacing all drains, sewers, utilities, and any other structures that may be disturbed or damaged by the Contractor's operations including driveway culvert pipes, and restoration of all disturbed surfaces, including all pavement restoration. Also included in this item are the disposition of all excavated materials and the chlorination of the pipe line and fittings in place. All work shall be completed as shown on the Contract Drawings and as directed by the Owner's Representative.

Pipe and fittings shall be handled so that the joints, coating and/or lining will not be damaged. If, however, any part of the jointing coating or lining is damaged, the repair or replacement of such material shall be made by the Contractor at his own expense in a manner satisfactory to the Owner's Representative.

All pipe and fittings stored on the job site shall be placed on blocks and suitably chocked to eliminate any possibility of rolling or shifting. Blocks and chocks shall have a minimum thickness of 2 inches and shall be high enough to assure that the pipe and fittings will not be touched by surface drainage.

The Contractor is responsible to repair or replace all pavement and roadway surface disturbed by the contractor, as a result of the water main and fittings installation, to the satisfaction of the governing entity of said pavement or roadway surface.

The Contractor is responsible to notify all affected property owner's in writing a minimum of 48 hours prior to all shutdowns per the Clermont County Water Resources Department's Standard Operating Procedures and as directed by the Owner's Representative.

4.2 INSTALLATION

The general proposed location of the water mains and connections to the existing water mains are shown on the Plans. If, during the course of work, unforeseen conditions arise, the location of the pipeline may be changed as directed by the Owner's Representative to meet such conditions. Long radius curves or small angular changes in the pipeline can be formed by deflecting joints of straight pipe not more than 3 degrees to the axis of the pipe.

Only full length gauged pipe may be cut for use in the installation of the water main. When cut all rough edges must be filed to provide a smooth, beveled edge.

The Contractor shall furnish, place, and maintain sheeting and bracing as may be required to securely support the sides and ends of the excavation and to prevent injury to the structure being built or to personal property or adjacent utilities.

Proper tools and facilities satisfactory to the Owner's Representative shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench by means of derricks, ropes, or other suitable tools or equipment, in such a manner to prevent damage to the water main materials and protective coating and lining. Under no circumstances should water main or fitting material be dropped or dumped into the trench.

All pipe and fittings shall be brushed to remove all foreign matter and carefully examined for cracks and other defects while suspended above the trench immediately before installation. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed into the trench.

When pipe installation is not in progress, the open ends of the installed pipe shall be closed by a water tight plug or other means approved by the Owner's Representative.

If water is in the trench, the seal shall remain in place until the trench is pumped dry.

Ends of pipe shall be carefully wiped clean and dry before joining.

The trench shall have a uniform bottom conforming to the grade to which the pipe will be laid and the depth of the bedding material in the area of the pipe shall be in accordance with the dimensions as specified in the Plans. The surface shall be graded smooth to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints.

Joining of pipe shall be in strict accordance of the manufacturer's recommendations. The Contractor shall also furnish and install a concentric reducer with either plain ends and/or mechanical joints as required at the proposed connection points.

In locations where the ductile iron water mains and fittings are installed under roadway or driveway surfaces and when the trench is within 3 feet from the edge of those surfaces, the Contractor shall install bedding and initial backfill material as described in Item 1200 Granular Bedding and Initial Backfill Material.

Restraints shall be installed where called for on the contract drawings and as directed by the Owner's Representative.

Polyethylene Encasement

Polyethylene encasement shall be installed with all new underground ductile iron pipe, fittings, and appurtenances in accordance with ANSI/AWWA C105/A21.5 and these Specifications. The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material; however, it is not intended to be completely air tight or watertight enclosure. Lumps of clay, mud, cinders, or other materials that might be on the pipe surface shall be removed prior to installation of the polyethylene encasement

The polyethylene film shall be fitted to the contour of the pipe creating a snug, but not tight, encasement with minimum space between the polyethylene and the pipe. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene when bridging irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings, and to prevent damage to the polyethylene during backfill operations. Overlaps and ends shall be secured with adhesive tape or plastic straps.

For installation below the water table or in areas subject to water infiltration, tube-form polyethylene shall be used with both ends thoroughly sealed with adhesive tape or plastic tie straps at the joint overlap. Circumferential wraps of tape shall be placed at 2-foot intervals along the barrel of the pipe to minimize the space between the polyethylene wrap and the pipe.

Methods of Installation

Method A - Cut polyethylene tube to a length approximately 2 ft. longer than the pipe section. Slip the tube around the pipe, centering it to provide a 12-in. overlap on each adjacent pipe section and bunching it accordion-fashion lengthwise until it cleared the pipe ends.

Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at the joints to facilitate installation of the polyethylene tube.

After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure it in place. Slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place.

Take up the slack width at the top of the pipe to make a snug but not tight fit along the barrel of the pipe, securing the fold at quarter points along the pipe section.

Cuts, tears, punctures, or other damage to the polyethylene shall be repaired immediately.

Method B - Cut polyethylene tube to a length approximately 12-in. shorter than the pipe section. Slip the tube around the pipe, centering it to provide 6-in. of bare pipe at each end. Take up the slack width at the top of the pipe to make a snug but not tight fit along the barrel of the pipe, securing the fold at quarter points along the pipe section.

Before making up a joint, slip a 3-ft. length of polyethylene tube over the end of the preceding pipe section, bunching it accordion-fashion lengthwise. Alternatively, place a 3-ft. length of polyethylene sheet in the trench under the joint to be made. After completing the joint, pull the 3-ft. length of polyethylene over or around the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least 12-in. Make each end snug and secure. A shallow bell hole is necessary and shall be made at the joints to facilitate installation of the polyethylene tube or sheet.

Cuts, tears, punctures, or other damage to the polyethylene shall be repaired immediately. Proceed with the installation of the next section of pipe in the same manner.

Pipe-shaped appurtenances - Bends, reducers, offsets, and other pipe-shaped appurtenances shall be covered with polyethylene in the same manner as the pipe.

Odd-shaped appurtenances - When it is not practical to wrap valves, tees, crosses, and other odd-shaped pieces in a tube, wrap with a flat sheet or split length of polyethylene tube by passing the sheet under the appurtenance and bringing the sheet around the body. Make seams by bringing the edges of the polyethylene sheet together, folding them over twice, and taping them. Handle width and overlaps as previously described. Tape the polyethylene securely in place at the valve stem and other penetrations.

Service Connection- Wrap two or three layers of tape completely around the pipe where the tapping machine will be placed. Mount the tapping machine on the taped area and make the tap directly through the tape and polyethylene wrap. Install corporation stop. Inspect the entire area for damage and repair if necessary. Wrap any connected copper service line within three (3) feet of the pipe with polyethylene.

Junctions between Wrapped and Unwrapped Pipe – Where polyethylene wrapped pipe joins an adjacent pipe that is not wrapped, extend the polyethylene wrap to cover the adjacent pipe for a distance of at least 3 ft. Secure the end with circumferential turns of adhesive tape.

Service lines of dissimilar metals shall be wrapped with polyethylene or a suitable dielectric tape for a minimum clear distance of 3 ft. away from the ductile-iron pipe.

Contractor shall backfill carefully to avoid damage to polyethylene encasement. Any damage to the polyethylene encasement shall be repaired immediately.

Backfill and pavement replacement shall be installed as described in Item 1130-Concrete Pavement Replacement, Item 1140-Asphalt Pavement Replacement, Item 1210-Controlled Density Fill (CDF), and Item 1220-Granular Backfill.

The proposed ductile iron water main pipe and fittings shall be installed with a minimum 4 feet cover from finished ground elevation to the top of the water line, unless otherwise noted on the contract drawings or approved by the Owner's Representative.

PART 5 – TESTING

5.1 GENERAL

The Clermont County Water Resources Department is responsible for the first two (2) hydraulic pressure and Bacteriological testing. Should the pipe line fail either of these tests twice, the contractor is shall be responsible to locate and repair the damages section of pipe and to pay the County's costs for each additional test thereafter.

All testing and disinfection of the water main shall be as specified in the AWWA specifications and shall be inspected and approved in writing by the Clermont County Water Resources Department. All water lines must pass a hydraulic pressure testing of 250 psi or as directed by the Owner's Representative.

5.2 DISINFECTION

The contractor is responsible for providing all Labor, Material, and Equipment necessary to disinfect the complete water pipe line in accordance with AWWA 651 and as directed by the Owner's Representative except as modified herein.

All piping and appurtenances must be properly disinfected with a minimum 50 milligrams per liter total chlorine residual for 48 hours. The piping must then be flushed to remove any excess chlorine. Chlorine solution shall be evenly applied and distributed throughout the piping.

5.3 HYDROSTATIC TESTING

A hydrostatic test as required in Section 4 of the Standard AWWA Specifications C-600 shall be applied to individual valved-off sections of the mains and fire hydrant leads either before or after the trench is backfilled. The pressure during the test shall be maintained at 250 psi, or as directed by the Owner's Representative, in any section being tested. The duration of each pressure test shall be at least two hours. The Contractor shall furnish all materials, make all taps or connections required, and provide any necessary piping and all necessary assistance for conducting the test. All tests shall be performed by the Owner's Representative.

The following table lists the maximum allowable leakage limits.

ALLOWABLE LEAKAGE PER 1000 FT. OF PIPE (GALLONS PER HOUR)

Test Pressure psi	Nominal Pipe Diameter (inches) 2	3	4	6	8	10	12	14	16
250	0.21	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90

Test Pressure psi	Nominal Pipe Diameter (inches) 18	20	24	30	36	42	48	54	60
250	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41	7.12

Before applying the specified pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made by the Contractor at points of highest elevation, or as required.

In the event that leakage exceeds that shown in the above table, the water main will not be accepted by the District and will require retesting using these same procedures after such time as the necessary corrections have been made to the system.

Leakage shall be defined as the quantity of water that must be supplied to any valved section of newly laid pipe to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Any testing performed against existing valves shall be at the Contractor's risk and in strict compliance with the requirements of the District. Any damage caused to existing facilities as a result of testing shall be repaired at the Contractor's expense.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid per Linear Feet (LF) for Item 2110 – DUCTILE IRON WATER MAIN AND DUCTILE IRON FITTINGS. Progress payments will be made based on the installed linear feet of Item 2110 completed.

END OF SECTION

SECTION 2120 – PVC WATER MAIN AND DUCTILE IRON FITTINGS

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary for furnishing and installing PVC water main pipe and ductile iron water main fittings as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 GENERAL

This work shall consist of providing all labor, materials, and equipment necessary for furnishing and installing PVC water main pipe and ductile iron fittings including all bends, reducers, tees, sleeves and special castings required for the installation of the valves, strapping, placement of concrete thrust blocks and all other work required for furnishing and installing water mains complete and ready for service as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

The water main and fittings shall be installed in accordance with the Contract Drawings, the American Water Works Association (AWWA) for potable water main and fittings installation and the Clermont County Water Resources Department Standard Specifications and Rules and Regulations.

1.3 RELATED WORK

A. Section 1130 Concrete Pavement Replacement
B. Section 1140 Asphalt Pavement Replacement
C. Section 1150 Gravel Driveway Replacement
D. Section 1170 Stream Crossings
E. Section 1180 Keyblock Anchors
F. Section 1190 Jack and Bore with Steel Casing
G. Section 1200 Granular Bedding and Initial Backfill Material
H. Section 1210 Control Density Fill (CDF)
I. Section 1220 Granular Backfill

PART 2 – PRODUCTS

2.1 PVC WATER MAIN

PVC pressure pipe shall be manufactured in accordance with AWWA C-900. The outside diameters shall match ductile iron pipe outside diameters. The wall thickness shall meet the DR 14 requirement in AWWA C-900.

2.2 DUCTILE IRON FITTINGS

All fittings, wall pipes and specials shall be of ductile iron or in accordance with ANSI A21.10 (AWWA C-153).

All fittings shall have a bituminous coated cement lining complying with AWWA C-104 and shall have an outside coating complying with AWWA C-153 or an epoxy coating complying with AWWA C-116.

All ductile iron fittings shall be provided with and assembled using mechanical joint ends and retainer glands.

2.3 CONCRETE THRUST BLOCKING

Concrete thrust blocking, supports and/or buttresses shall be provided at all tees and bends and at any other locations required by the District. These concrete structures shall be built to the lines, grades and dimensions shown on the Standard Drawings. Concrete used for blocking shall conform to Class C Concrete, having a compressive strength of 4,000 pounds per square inch.

All concrete shall be mixed by mechanical means prior to installation. The installation of dry concrete will not be permitted.

2.4 TRACER WIRE

The tracer wire system shall include THW size 10 AWG copper electrical wire. The boxes shall be equal to Mueller H-10365 roadway screw type valve boxes.

2.5 PIPE JOINT RESTRAINT

Pipe joint restraints shall be Field Lok Gasket, American Fast Grip, or approved equal as determined by Owner's Representative, except as modified herein.

All fire hydrant leads and fire hydrant assemblies shall be restrained using Megalug Series 2000PV Mechanical Joint Restraint for AWWA C 900 & C 905 PVC Pipe or approved equal as determined by Owner's Representative.

PART 3 – SUBMITTALS

3.1 PVC WATER MAIN PIPE

Submit literature and/or catalog cut sheets of the PVC water main pipe to be used. Submit to the Owner's Representative for review and approval prior to ordering.

3.2 DUCTILE IRON WATER MAIN FITTINGS

Submit literature and/or catalog cut sheets of the ductile iron water main fittings to be used. Submit to the Owner's Representative for review and approval prior to ordering.

3.3 TRACER WIRE AND LOCATOR TAPE

Submit literature and/or catalog cut sheets of the tracer wire and locator tape to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 GENERAL

The Contractor shall furnish all necessary labor, material, tools, and equipment required in the installation of the water main pipe and fittings. This work includes furnishing all materials, the proper storage of those materials, saw cutting, excavation, laying and joining the pipe, installation of concrete blocking and joint restrains, backfilling, installation of tracer wire and locator tape, repairing or replacing all drains, sewers, utilities, and any other structures that may be disturbed or damaged by the Contractor's operations including driveway culvert pipes, and restoration of all disturbed surfaces, including all pavement restoration. Also included in this item are the disposition of all excavated materials and the chlorination of the pipe line and fittings in place. All work shall be completed as shown on the Contract Drawings and as directed by the Owner's Representative.

Pipe and fittings shall be handled so that the joints, coating and/or lining will not be damaged. If, however, any part of the jointing coating or lining is damaged, the repair or replacement of such material shall be made by the Contractor at his own expense in a manner satisfactory to the Owner's Representative.

All pipe and fittings stored on the job site shall be placed on blocks and suitably chocked to eliminate any possibility of rolling or shifting. Blocks and chocks shall have a minimum thickness of 2 inches and shall be high enough to assure that the pipe and fittings will not be touched by surface drainage.

The Contractor is responsible to repair or replace all pavement and roadway surface disturbed by the contractor, as a result of the water main and fittings installation, to the satisfaction of the governing entity of said pavement or roadway surface.

The Contractor is responsible to notify all affected property owner's prior to all shutdowns per the Clermont County Water Resources department's Standard Operating Procedures and as directed by the Owner's Representative.

4.2 INSTALLATION

The general proposed location of the water mains and connections to the existing water mains are shown on the Plans. If, during the course of work, unforeseen conditions arise, the location of the pipeline may be changed as directed by the Owner's Representative to meet such conditions. Long

radius curves or small angular changes in the pipeline can be formed by deflecting joints of straight pipe not more than 3 degrees to the axis of the pipe.

When cut all rough edges must be filed to provide a smooth, beveled edge.

The Contractor shall furnish, place, and maintain sheeting and bracing as may be required to securely support the sides and ends of the excavation and to prevent injury to the structure being built or to personal property or adjacent utilities.

Proper tools and facilities satisfactory to the Owner's Representative shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench by means of derricks, ropes, or other suitable tools or equipment, in such a manner to prevent damage to the water main materials and protective coating and lining. Under no circumstances should water main or fitting material be dropped or dumped into the trench.

All pipe and fittings shall be brushed to remove all foreign matter and carefully examined for cracks and other defects while suspended above the trench immediately before installation. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed into the trench.

When pipe installation is not in progress, the open ends of the installed pipe shall be closed by a water tight plug or other means approved by the Owner's Representative.

If water is in the trench, the seal shall remain in place until the trench is pumped dry.

Ends of pipe shall be carefully wiped clean and dry before joining.

All PVC water mains shall include and shall be installed in bedding and initial backfill material as described in Item 1200-Granular Bedding and Initial Backfill Material.

Restraints shall be installed where called for on the contract drawings and as directed by the Owner's Representative.

Backfill and pavement replacement shall be installed as described in Item 1130-Concrete Pavement Replacement, Item 1140-Asphalt Pavement Replacement, Item 1210-Controlled Density Fill (CDF), and Item 1220-Granular Backfill.

The proposed PVC water main pipe and fittings shall be installed with a minimum 4 feet cover from finished ground elevation to the top of the water line, unless otherwise noted on the contract drawings or approved by the Owner's Representative.

4.3 TRACER WIRE

A complete tracer wire system shall be furnished and installed on all PVC pipe used underground. The wire shall be continuously wrapped around the entire length of the PVC pipe, shall be THW size 10 AWG copper electrical wire, and shall terminate and be looped through location boxes at 400 foot intervals. Sufficient wire shall be looped in the location boxes that the wire can extend to above the boxes. The boxes shall be equal to Mueller H-10365 roadway screw type valve boxes. In addition, locator tape properly installed 12" above the pipe is required with proper backfill.

PART 5 – TESTING

5.1 GENERAL

The Clermont County Water Resources Department is responsible for the first two (2) hydraulic pressure and Bacteriological testing. Should the pipe line fail either of these tests twice, the contractor is shall be responsible to locate and repair the damages section of pipe and to pay the County's costs for each additional test thereafter.

All testing and disinfection of the water main shall be as specified in the AWWA specifications and shall be inspected and approved in writing by the Clermont County Water Resources Department. All water lines must pass a hydraulic pressure testing of 250 psi or as directed by the Owner's Representative.

5.2 DISINFECTION

The contractor is responsible for providing all Labor, Material, and Equipment necessary to disinfect the complete water pipe line in accordance with AWWA 651 and as directed by the Owner's Representative except as modified herein.

All piping and appurtenances must be properly disinfected with a minimum 50 milligrams per liter total chlorine residual for 48 hours. The piping must then be flushed to remove any excess chlorine. Chlorine solution shall be evenly applied and distributed throughout the piping.

5.3 HYDROSTATIC TESTING

A hydrostatic test as required in Section 4 of the Standard AWWA Specifications C-600 shall be applied to individual valved-off sections of the mains and fire hydrant leads either before or after the trench is backfilled. The pressure during the test shall be maintained at 250 psi, or as directed by the Owner's Representative, in any section being tested. The duration of each pressure test shall be at least two hours. The Contractor shall furnish all materials, make all taps or connections required, and provide any necessary piping and all necessary assistance for conducting the test. All tests shall be performed by the Owner's Representative.

The following table lists the maximum allowable leakage limits.

ALLOWABLE LEAKAGE PER 1000 FT. OF PIPE (GALLONS PER HOUR)

Test Pressure psi	Nominal Pipe Diameter (inches) 2	3	4	6	8	10	12	14	16
250	0.21	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90

Test Pressure psi	Nominal Pipe Diameter (inches) 18	20	24	30	36	42	48	54	60
250	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41	7.12

Before applying the specified pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made by the Contractor at points of highest elevation, or as required.

In the event that leakage exceeds that shown in the above table, the water main will not be accepted by the District and will require retesting using these same procedures after such time as the necessary corrections have been made to the system.

Leakage shall be defined as the quantity of water that must be supplied to any valved section of newly laid pipe to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Any testing performed against existing valves shall be at the Contractor's risk and in strict compliance with the requirements of the District. Any damage caused to existing facilities as a result of testing shall be repaired at the Contractor's expense.

The Clermont County Water Resources Department is responsible for the first hydraulic pressure and Bacteriological testing. Should the pipe line fail either of these tests, the contractor is responsible to locate and repair the damaged section of pipe and to pay the County's costs for each additional test thereafter.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid per Linear Feet (LF) for Item 2120 – PVC WATER MAIN AND DUCTILE IRON FITTINGS. Progress payments will be made based on the installed linear feet of Item 2120 completed.

END OF SECTION

SECTION 2210 – GATE VALVES

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Materials, and Equipment necessary for furnishing and installing new gate valves and valve boxes, as shown on the Contract Drawings or as directed by the Owner's Representative.

1.2 RELATED WORK

A. Section 2110 – Ductile Iron Water Main and Ductile Iron Fittings
B. Section 2120 – PVC Water Main and Ductile Iron Fittings

PART 2 – PRODUCTS

2.1 GATE VALVES

All new valves 12-inches and larger shall be butterfly valves as described in Section 2220 – Butterfly Valves.

All new gate valves shall conform to AWWA C-509 or C-515 except as modified herein.

New gate valves shall be fully encapsulated resilient wedge, parallel seats, non-rising stem, left hand open (counter clockwise), and shall have rubber "O"-ring, packing seals and mechanical joint ends with a 250 psi pressure rating, unless otherwise approved by the Owner's Representative. The internal valve coating shall be in accordance with AWWA-C550.

Where flanged joint ends are specified, they shall conform to requirements of AWWA C-500 and shall include all bolts, nuts and full-face rubber gaskets.

Approved models are: American Flow Control Series 2500, Mueller 2360, US Pipe MetroSeal 250, and M&H 4067.

2.2 VALVE BOXES

Valve boxes shall be equal to F-2450 Series as manufactured by Clow Corp or Sigma Corporation VB261-8. Valve box assembly shall be of cast iron with stay put cover and properly sized base for the valve being fitted. Covers shall be marked "WATER". All boxes shall be furnished with the necessary extensions to bring the top of the box to the finished grade.

PART 3 – SUBMITTALS

Submit literature and/or catalog cut sheets for all new gates valves, valve boxes, and tapping valves, to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Install all gate valves and valve boxes as called for on the contract drawings, as detailed in the Clermont County standard drawings and as directed by the Owner's Representative.

All valve boxes shall be installed such that they are centered vertically over the valve operating nut and such that the box provides maximum cover of the operating housing.

The operating nut shall be installed between 24 and 60 inches below grade. Contractor shall provide extension, if necessary to complete installation.

PART 5 – TESTING

New valves shall be included in the testing of the new water main as described in Section 2110 – Ductile Iron Water Main and Ductile Iron Fittings or Section 2120 - PVC Water Main and Ductile Iron Fittings.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
2210	Each (Ea.)	Gate Valve & Valve Box

END OF SECTION

SECTION 2220 – BUTTERFLY VALVES

PART 1 – GENERAL

1.1 GENERAL

Provide all Labor, Material, and Equipment necessary for furnishing and installing new butterfly valves and valve boxes, as shown on the Contract Drawings or as directed by the Owner's Representative.

1.2 RELATED WORK

A. Section 2110 – Ductile Iron Water Main and Ductile Iron Fittings
B. Section 2120 – PVC Water Main and Ductile Iron Fittings

PART 2 – PRODUCTS

2.1 BUTTERFLY VALVES

New valves less than 12-inches shall be gate valves as described in Section 2210-Gate Valves.

Install all butterfly valves and valve boxes as called for on the contract drawings, as detailed in the Clermont County standard drawings and as directed by the Owner's Representative.

Butterfly valves shall conform to the AWWA Standard Specification for Rubber Seated Butterfly Valves; Designation AWWA C-504 of latest revision except as modified herein. Valves shall be suitable for flow in either direction and shall be bubble tight in either direction. Water valves shall not be acceptable. Internal valve coating should be in accordance with AWWA-C550.

Valves shall be AWWA Class 250B designed for 250 psi non-shock shut-off pressure and a velocity of 16 feet per second. Valves and appurtenances, including operators, shall be cast iron suitable for buried and submerged service.

Valves for use with ductile iron pipe shall have mechanical joint ends furnished with high strength cast iron tee head bolts and hex nuts, and rubber gaskets.

Bodies shall be either cast iron conforming to ASTM A126, Class B or ASTM A48, Class 40 or ductile iron conforming to ASTM A536 Grade 65-45-12.

Unless otherwise approved, shafts shall be stainless steel, ASTM A276, Type 304, or monel, turned, ground and polished and secured to the valve disc by one or more tangentially fitted monel or stainless

steel taper pins driven into reamed tapered holes and held snug by means of a locking nut or hex-mated to valve disc and designed to exclude exposure to water.

Valves shall be designed to seat at 90 degrees to the pipe axis and shall be constructed of corrosion-resistant materials.

Seats shall be of a rubber compound complying with the requirements of Section B of AWWA C-504-75. Rubber seats shall be on the body.

Operators suitable for buried and submerged service shall be furnished with each valve. Operators shall be designed to deliver an output torque to the valve shaft equal to that shown on the following table:

Maximum Operating Torques:

Valve Diameter (Inches)	Torque (Foot-Pounds)
3	19
4	36
6	93
8	175
10	320
12	510
14	720
16	1030

Operators shall be designed to produce the specified output torque with a maximum input torque of 150 foot-pounds applies to the operating nut. Traveling nut type operators shall be Type MDT as manufactured by Pratt, or approved equal.

The total number of turns applied to the wrench nut required to completely open (close) the valve from completely closed (open) position shall be not less than twice the nominal valve diameter in inches for valves less than 16 inches in diameter and shall be not less than 30 turns for 16 inch and larger valves. All operators shall be for left-hand (counter clockwise) opening.

Approved Butterfly Valves are: DeZurik-250B, Mueller Lineseal XP-250B, or Henry Pratt Company-Model HP250.

2.2 VALVE BOXES

Valve boxes shall be equal to F-2450 Series as manufactured by Clow Corp or Sigma Corporation VB261-8. Valve box assembly shall be of cast iron with stay put cover and properly sized base for the valve being fitted. Covers shall be marked "WATER". All boxes shall be furnished with the necessary extensions to bring the top of the box to the finished grade.

PART 3 – SUBMITTALS

Submit literature and/or catalog cut sheets of the butterfly valve and valve box to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Install all butterfly valves and valve boxes as called for on the contract drawings and as directed by the Owner's Representative.

All valve boxes shall be installed such that they are centered vertically over the valve operating nut and such that the box provides maximum cover of the operating housing.

If the top of the operating nut is more than 60 inches below the finished grade, an extension stem shall be provided and installed to locate the operating stem nut between 24 inches and 36 inches below the finished grade.

PART 5 – TESTING

New valves shall be included in the testing of the new water main as described in Section 2110 – Ductile Iron Water Main and Ductile Iron Fittings or Section 2120 - PVC Water Main and Ductile Iron Fittings.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
2220	Each (Ea.)	Butterfly Valve & Valve Box

END OF SECTION

SECTION 2230 – ISOLATION/ACCESS VALVE AND MANHOLE

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for furnishing and installing an isolation/access valve and manhole as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 RELATED WORK

A. CCWRD, General Specification: Section 2110 Ductile Iron Water Main and Ductile Iron Fittings
B. CCWRD, General Specification: Section 2120 PVC Water Main and Ductile Iron Fittings
C. CCWRD, General Specification: Section 2210 Gate Valves
D. CCWRD, General Specification: Section 2220 Butterfly Valves

PART 2 – PRODUCTS

2.1 VALVES

Valves shall conform to Section 2210 and 2220 of these specifications.

2.2 CORPORATION STOP

Approved corporation stops are:

- 1" – Ford F1000-3-G-NL
- 2" – Ford FB-1000-7-G-NL

2.3 TAPPING SADDLE

Approved tapping saddles are Ford 202-BS with stainless steel strap and brass body with CC thread outlet.

2.4 ACCESS MANHOLE

This item shall consist of constructing a precast concrete access manhole, as shown in the CCWRD Standard Detail Drawings, for the proposed water main at the locations shown on the plans. Access manholes shall rest on a concrete ring footing made of 4000 psi class C concrete. Within the footing 6" of aggregate base #57 stone shall be placed. The precast concrete flat slab top shall be reinforced for highway loadings.

2.5 MANHOLE FRAME AND LID

The manhole frame shall be a Neenah Type R1775 or East Jordan 2045. The lid shall be a self sealing Neenah Type R1664 or East Jordan 2045. Lid must be stamped WATER.

PART 3 – SUBMITTALS

Submit literature and/or catalog cut sheets of the valves, corporation stops, tapping saddles, access manhole, and manhole frame and lid to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

All isolation/access valves and manholes shall be installed as shown on the CCWRD Standard Drawings specified herein, complete and ready for operation.

Valves shall be installed per manufacturer's recommendations with proper tools and equipment.

Corporation stop shall be installed per manufacturer's recommendations with proper tools and equipment. Care should be taken to use the proper drill bit when tapping the water main to correspond to the material that the main is made of. Corporation stop shall be installed at the top of the pipe at the 12 o'clock position.

Manhole frame and lid shall be installed so that valve operator is accessible from above.

PART 5 – TESTING

All testing will be performed in conjunction with the water main as stated in Sections 2110 and 2120.

PART 6 – BASIS OF PAYMENT

6.1 ISOLATION/ACCESS VALVE AND MANHOLE

Payment for all labor, material, and equipment necessary to install isolation/access valve shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
2230	Each	Isolation/access valve and manhole complete

END OF SECTION

SECTION 2240 – TAPPING SLEEVE AND VALVE

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for furnishing and installing a tapping sleeve and valve as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 RELATED WORK

- **A.** CCWRD, General Specification: Section 2210 Gate Valves
- **B.** CCWRD, General Specification: Section 2110 Ductile Iron Water Main and Ductile Iron Fittings
- **C.** CCWRD, General Specification: Section 2120 PVC Water Main and Ductile Iron Fittings

PART 2 – PRODUCTS

2.1 TAPPING VALVE

The tapping valves shall meet the requirements for gate valves under Section 2210 of these specifications except as modified herein. One end shall be flanged, for connecting to the tapping sleeve and the other shall be mechanical joint. The body shall be modified to accept the tapping machine.

Approved Tapping Valves are: Mueller 2360, US Pipe MetroSeal 250, or M&H 4751

2.2 TAPPING SLEEVE

The tapping sleeve shall meet the requirements of ANSI/NSF 61. The body shall be made of iron with 3/4" NPT test plug. The sleeve shall be a split fitting which can be assembled around an existing main. Tapping sleeves shall have a working pressure of 250 psi for pipe 4" – 12" and 200 psi for pipe larger than 12".

Approved Tapping Sleeves are: Mueller H-615, US Pipe T-9, or M&H 1574

2.3 VALVE BOX

Valve boxes shall be equal to F-2450 Series as manufactured by Clow Corp. Valve box assembly shall be of cast iron with stay put cover and properly sized base for the valve being fitted. Covers shall be marked "WATER". All boxes shall be furnished with the necessary extensions to bring the top of the box to the finished grade.

PART 3 – SUBMITTALS

Submit literature and/or catalog cut sheets of the tapping valve, tapping sleeve, and valve box to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 EXCAVATION

The Contractor shall make the excavation of sufficient size to allow the tapping machine and crew room to perform the tap.

4.2 TAPPING SLEEVE AND VALVE INSTALLATION

Before assembly of the tapping sleeve and valve, the Contractor shall clean the existing pipe thoroughly to provide a smooth, hard surface for the gasket of the tapping sleeve. The Contractor shall verify the pipe type and outside diameter dimension.

Tapping sleeves (outside sleeve edge) shall not be installed within 2 feet of a pipe joint/fitting of an existing main, tapping sleeve or tapped corp.

Tapping sleeve and valve shall be installed in accordance with the manufacturer's recommendations. Valves and sleeves shall be properly installed onto the existing pipe and the openings cut on the existing pipe under pressure. The face of the outlet flange shall be plumb. The tapping valve shall be bolted securely to the tapping sleeve outlet flange and rest on concrete blocking. Any leak in the installation shall be corrected as approved by the Owner's Representative.

4.3 TAPPING OF MAIN

The use of a shell type cutter with pilot drill shall be required. Whenever tapping a potable water main, the shell cutter shall be disinfected with straight bleach or super-chlorinated solution prior to start of tapping operation. The shell cutter shall be of the size required to cut full opening.

Only qualified operators shall operate the tapping machine. The "coupon" shall be withdrawn and be given to the Owner's Representative for inspection and storage.

PART 5 – TESTING

The Contractor shall furnish all equipment and labor required, including necessary piping/hoses, injection booster pump, test pressure gauge, ductile iron MJ plug and a water source for testing the tapping sleeve and valve.

After installing the tapping sleeve and valve, and prior to tapping of a pressurized main/line, a hydrostatic and leakage test shall be performed. The Contractor shall install an MJ plug on the tapping valve and conduct the specified test with the valve in the open position. The tapping sleeve with valve in the open position shall be capable of maintaining a test pressure of 200 psi for a 20 minute duration, with no sign of pressure loss.

PART 6 – BASIS OF PAYMENT

Payment for all labor, material, and equipment necessary to install a tapping sleeve and valve shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
2240	Each	Tapping sleeve and valve

END OF SECTION

SECTION 2300 – FIRE HYDRANT ASSEMBLY, COMPLETE

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for furnishing and installing a fire hydrant assembly as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 RELATED WORK

- **A.** CCWRD, General Specification: Section 2210 Gate Valves
- **B.** CCWRD, General Specification: Section 2110 Ductile Iron Water Main and Ductile Iron Fittings
- **C.** CCWRD, General Specification: Section 2120 PVC Water Main and Ductile Iron Fittings

PART 2 – PRODUCTS

2.1 FIRE HYDRANT

The hydrants shall conform to AWWA Specifications C-502 except as modified herein.

The hydrants shall be dry top design with two (2) 2-1/2 inch hose nozzles having 3-1/16 inch O.D. x 7-1/2 threads per inch (NST), one (1) 4 inch pumper outlet having 5 inch O.D. x 4 threads per inch (NST) and a 6 inch mechanical joint shoe connection. A sealed oil or grease reservoir shall be provided, with oil or grease filled at the factory. O-ring seals shall be included to provide positive water and lubricant sealing with no packing adjustments or stem binding. The hydrants shall be equipped with breakable safety flange (or breakable bolts) and stem couplings. The main valve shall be 5-1/4 inch compression type, shall close with water pressure and shall incorporate a double drain valve to drain the hydrant when not in use. The hydrant shall be low profile type extending approximately 27 to 32 inches above the ground. The outlets shall have caps with chains and National Standard Threads. The operating nut shall be a standard 1-1/2 inch pentagon, open left. Hydrants shall be draining type.

The maximum head loss of the hydrant through a 4 inch outlet shall be 4.0 psi at 1,000 gallons per minute.

Each standpipe of all new hydrants shall be painted with a prime (shop) coat and an enameled finish coat above ground and two shop coats of asphalt varnish below ground. Enamel finish coat color shall be factory applied International Harvester Red.

Approved hydrants (unless in a high pressure zone, as determined by CCWRD) are:

(200 psi) Mueller Super Centurion 200
American Darling B-62-B
Kennedy K-81-D
M&H Style 129

Approved high pressure hydrants are:

(250 psi)	Mueller Super Centurion 250
	American Darling B-84-B

Note: The necessity for high pressure hydrants will be determined by CCWRD.

2.2 6" GATE VALVE

Gate Valves shall conform to Section 2210 of these specifications.

2.3 6" DUCTILE IRON PIPE

Ductile Iron Pipe shall conform to Section 2110 of these specifications.

2.4 MECHANICAL JOINT RESTRAINT

Mechanical Joint Restraint shall conform to Section 2110 of these specifications.

PART 3 – SUBMITTALS

Submit literature and/or catalog cut sheets of the fire hydrant, gate valve, pipe, and mechanical joint restraint to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

All fire hydrant assemblies shall be installed using ductile iron pipe, mechanical joint restraint, and blocking as shown on the Standard Drawings specified herein, complete and ready for operation. Anchor Tees may be approved on a case-by-case basis by CCWRD.

Unless otherwise approved by CCWRD, fire hydrants shall be located one (1) foot outside the road right-of-way, inside a 15'x15' permanent easement, as shown on the plans. They shall be of proper length to suit the depth of cover over the water lines at the locations to be installed. Fire hydrants shall be located to clear driveway openings by a minimum of five (5) feet.

The pit or trench for the fire hydrant shall be so excavated that when the hydrant is installed, the base shall rest on blocking and the hydrant shall be set plumb with nozzle outlet approximately 18 inches from ground line. Hydrants shall be set in accordance with grade line which is approximately 2 inches below bottom of break connection on the hydrant stand pipe.

Hydrants shall be set plumb with 4.0 foot bury and with nozzles parallel with or at right angles to the street. The pumper nozzle shall face the street.

Washed granular material shall be used as bedding and backfill below and around the fire hydrant as shown on the Standard Detail.

PART 5 – TESTING

All testing will be performed in conjunction with the water main as stated in Sections 2110 and 2120.

PART 6 – BASIS OF PAYMENT

Payment for all labor, material, and equipment necessary to install fire hydrant assembly shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
2300	Each	Fire Hydrant Assembly

END OF SECTION

SECTION 2400 – WATER SERVICE, FITTINGS, AND METER SETTING (SINGLE, DOMESTIC SERVICE 2" AND SMALLER)

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary to furnish and install, replace and/or relocate, all Single, Domestic 2" and smaller water services, fittings, and meters shown on the plans and/or specified herein. This item includes the Labor, Material, and Equipment necessary to tap the water main, extend the water service onto the Customer's property, install the meter and other necessary equipment, and extend the service line a distance of 3 feet past the meter chamber. In cases of reconnection, replacement or relocation, this item includes Material, Labor, and Equipment necessary to reconnect to the Customer's existing service line.

For new customer connections, all work described above is performed by the Clermont County Water Resources Department.

PART 2 – PRODUCTS

All products that will contact potable water once incorporated in the project must meet or exceed all applicable AWWA rules and regulations.

2.1 TAPPING SADDLE

Tapping saddles for connections 2" and smaller shall be manufactured from the Ford Meter Box Company style 202BS with stainless steel strap and brass body with CC thread outlet.

2.2 CORPORATION STOP

Approved Corporation Stops shall be:

¾" and 1" – Ford Meter Box Company F1000-3-G-NL
1 ½" – Ford Meter Box Company FB1000-6-G-NL
2" – Ford Meter Box Company FB1000-7-G-NL

2.3 2" AND SMALLER SERVICE LINE

Water service lines, which extend from the water main to 3' beyond the meter, shall be Type "K" Copper conforming to ASTM B-88 Specifications.

2.4 METER BOX

Meter boxes shall be:

¾" meter – Old Castle Heavy Wall Meter Pit 0020-30 B Body B-W 2 MsHI

1” meter – Old Castle Heavy Wall Meter Pit 0020-30 Body B-W 2 MsHI
1 ½” and 2” – Old Castle Heavy Wall Meter Pit 0030-30 B Body B-W 2 MsHI
or approved equal.

2.5 METERS

All meters used in the Clermont County Water Resources Department distribution system must be purchased from the Water Resources Department and installed according to the Water Resources Department Standard Drawings. Where existing water services are being relocated or reconnected, the existing water meter can be re-used.

2.6 ANGLE VALVES

Angle valves for relocated 5/8” x ¾” and 1” water meters shall be in accordance with the following schedule and installed according to the Clermont County Water Resources Department Standard Drawings:

Meter Size	Angled Yoke Valve, w/ Padlock Wing	Angle Check Valve
5/8” x ¾”	Ford AV94-323-W-G-NL or Approved Equal	Ford HA94-323-G-NL or Approved Equal
1”	Ford AV94-444-W-G-NL or Approved Equal	Ford HA91-444-NL-W or Approved Equal

Provided the existing meter setting is re-installed in the exact same location, the existing water meter, yoke and expansion wheel assembly shall be re-used and re-installed by the CONTRACTOR.

2.7 1 ½” AND 2” DOMESTIC CUSTOM METER ASSEMBLY

Meter Assemblies for relocated 1 ½” and 2” Domestic Meters shall be in accordance with the following schedule and installed according to Clermont County Water Resources Department Standard Drawings:

Meter Size	Complete Assembly
1 ½”	Ford VH76-18-11-66-G-NL
2”	Ford VH77-18-11-77-G-NL

Provided the existing meter setting is re-installed in the exact same location, the existing water meter shall be re-used and re-installed by the CONTRACTOR.

2.8 COMPRESSION FITTINGS

Compression Fittings used for relocated and reconnected water meters shall be Ford Grip Joint Coupling (C44-xx-G-NL style), Ford Pack Joint Coupling (C44-xx-NL style), or approved equal.

PART 3 – SUBMITTALS

3.1 MATERIALS AND FITTINGS

Submit literature and/or catalog cut sheets of all material and fittings to be used associated with the installation of 2" and smaller single, domestic water services. Submit to the Owner's Representative for review and approval prior to ordering.

3.2 TRENCHLESS WATER SERVICE INSTALLATION METHOD

Submit literature detailing the construction method to be used to provide trenchless installation of water services for review and approval. Trenchless service line installation is required for all services crossing public roadways.

PART 4 – EXECUTION

4.1 GENERAL

Water service connection shall be made only after the water main has passed all pressure and bacteria testing and has been approved for connections by the OWNER'S REPRESENTATIVE. The CONTRACTOR is responsible to notify, in writing, all affected customers 48 hours in advance of any disruption in water service. Water service connections shall be performed in accordance with these specifications and the Clermont County Water Resources Department Standard Drawings.

4.2 TAPPING THE WATER MAIN

The tap to the water main will be performed while the main is under pressure, so that water main service is not interrupted. Care should be taken to use the proper drill bit when tapping the water main to correspond to the material that the main is made of.

For ductile iron water main, service taps shall be made directly to the main. For PVC water main, service taps shall be completed using an approved tapping saddle with stainless steel straps.

4.3 CONNECTING TO EXISTING WATER SERVICE LINE, INSTALLATION OF FITTINGS

The CONTRACTOR will be responsible to freeze service lines to make connections. CRIMPING IS NOT PERMITTED on new, existing, or abandoned water service lines. Abandoned water service lines shall be made water tight with a pack joint valve or cap. All service branches shall remain in service until the new tap connection is in place. The CONTRACTOR shall freeze the existing service branch at the point where the reconnection is to the new service branch is to be made. Care should be taken to protect that portion of the existing service line that is to remain in service. All new service lines shall be installed with a minimum 36" of cover and backfilled with clean, native soil free of rock and debris. All new service lines will be of a single piece of copper, with fittings only at the point of connection at the meter.

The CONTRACTOR must exercise care when installing and reconnecting the new service line and fittings to avoid contamination from surrounding soils and ground water. Prior to reconnecting the Customer's water service, the CONTRACTOR should adequately flush the line to remove any debris that may have entered.

4.4 LOCATION OF WATER METER

All water meters are to be installed one (1) foot outside the right-of-way or easement line in a grassy, non-paved, area. All water meters are to be located within the property lines of the property served, unless the property is served via an easement in accordance with Article 5.4 of the Clermont County Water Resources Department Rules and Regulations.

4.5 RELOCATED WATER METERS

Where indicated on the construction drawings or directed by the OWNER'S REPRESENTATIVE, the CONTRACTOR shall relocate existing water meters. The CONTRACTOR shall re-use the existing water meter box, lid, and frame. In cases where the meter box is constructed of fiber board, or directed by the OWNER'S REPRESENTATIVE, the CONTRACTOR shall supply and install a new meter box and re-use the existing lid and frame. In all cases, the CONTRACTOR shall re-use the existing Meter. Relocated water meters will include replacement of Angle Valves, Compression Fittings, Custom Meter Assembly, and Compression Fittings as specified in Parts 2.6, 2.7, and 2.8 of this Specification.

4.6 GROUND ELEVATION ADJUSTMENTS

In locations where the existing surface elevation at the water meter setting is altered, the water meter setting including the meter and service lines into and out of the meter setting, shall be adjusted such that the service lines are set at a cover of 42". The water meter shall be located as shown on Standard Detail W 3.4.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

6.1 WATER SERVICE, FITTINGS, AND METER SETTING (SINGLE, DOMESTIC SERVICE 2" AND SMALLER)

Payment for all Labor, Material, and Equipment necessary to furnish and install, replace and/or relocate, all Single, Domestic 2" and smaller water services, fittings, and meters shown on the plans and/or specified herein. This item includes the Labor, Material, and Equipment necessary to tap the water main, extend the water service onto the Customer's property, install the meter and other necessary equipment, and extend the service line a distance of 3 feet past the meter chamber and reconnect to the Customer's existing service line. Payment shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
2400 Reconnection	Each (EA)	Type I & II Water Service/Meter, Includes all fittings
2400	Each (EA)	Type III Water Service/Meter, Relocation and Reconnection; Includes all fittings
2400	Each (EA)	3/4" Meter Box
2400	Lineal Feet (LF)	3/4" Type K Copper Service Line
2400	Lineal Feet (LF)	1" Type K Copper Service Line
2400	Lineal Feet (LF)	2" Type K Copper Service Line

Payment for all Type K Copper Service Line will be for water service line actually installed, as measured by the OWNER'S REPRESENTATIVE. Payment will not be made for wasted or scrapped copper service line.

END OF SECTION

SECTION 2420 – WATER SERVICE, FITTINGS, 3" AND LARGER, AND DUAL SERVICE 2" AND SMALLER

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to tap the water main and install the water service line to the water system chamber on the customer's property and extend the service line(s) three feet past the chamber.

PART 2 – PRODUCTS

2.1 TAPPING SLEEVES

Approved tapping sleeves shall conform to Section 2240.

2.2 WATER SERVICE LINE MATERIAL

Water service line, 3" and larger, material shall be ductile iron pipe conforming to Section 2110. Dual service lines, 2" and smaller, shall conform to Section 2400.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of the materials to be used for review & approval by the Owners Representative prior to ordering.

PART 4 – EXECUTION

4.1 TAPPING THE WATER MAIN

Taps shall be made by the Contractor in accordance with the standard drawings and Section 2240.

PART 5 – TESTING

5.1 GENERAL

Testing is required for water service lines, 3" and larger, that serve water chambers if it meets both of the following criteria (as determined by the Owner's Representative):

1) The water service line involves a road crossing (bore or open cut). If the main is in the road and the extension is more than 20', it will require testing (considered a road crossing).
2) There is a public hydrant installed at the vault (i.e. the hydrant is on the street side of the vault). Without the hydrant, there is no way of testing.

If required, testing shall be in accordance with Section 2110.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Lineal Feet (LF) price bid for Item 2420 – WATER SERVICE, FITTINGS, 3” AND LARGER, AND DUAL SERVICE 2” AND SMALLER. Progress payments will be made based on the measured quantities of Item 2420 completed. The Contractor shall review the submitted units completed and provide confirmation to the Owners Representative of the measurements prior to payment for work under this specification.

SECTION 2425 – WATER SYSTEM CHAMBER

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to install the chamber, meter, detector check or double check valve and appurtenances.

PART 2 – PRODUCTS

2.1 WATER CHAMBER

Water chambers for 3" and larger and dual service branch setting consist of the enclosure which houses meter, detector check or double check valve and appurtenances. All meters used in the Clermont County Water Resources Department distribution system must be purchased from the Water Resources Department.

Concrete used for the chambers shall be 4,000 psi compressive strength class C. Reinforcing steel shall conform to ASTM 615 for grade 60 steel. Water stops shall be made of extruded or molded polyvinyl chloride and shall be 6 inch, type 4c as manufactured by W.R. Grace and Company or equal.

Manhole frame and covers shall be equal to Halliday Products Model No. S1R024024 or S2R024048 Aluminum with recessed lift handle(s), stainless steel hardware, stainless steel and aluminum hold open arm(s), and stainless steel slam lock with key or approved equal. Features include 300 psi load rating, ¼" aluminum diamond plate cover and ¼" aluminum frame.

Mechanically expandable link type rubber seals shall be installed where shown on the standard drawings and as called for herein. All pipe lines which pass through walls shall be sealed. Such seals shall fill the annular space between the pipe and the cored hole through with the pipe passes. In general, one seal shall be provided at each such annular opening, flush with the inner face of the wall. All metal parts of the seals shall be 300 series stainless steel. Links shall be EPDM rubber, pressure plates shall be delrin. The seals shall provide air and water tightness as well as electrical insulation between the pipe and the wall opening. Seals shall be watertight to 40 feet of head.

A fabricated aluminum ladder shall be furnished and permanently installed in the chamber according to the Water Resources Department Standard Drawings.

All coring of holes for passage of pipe lines shall be included in this item.

The chamber shall be provided with adequate drainage to a storm sewer or natural channel as approved by the Owner's Representative. Where this is not possible, a sump pit shall be included and located and

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sized as shown on the standard drawings so that a portable submersible pump can be lowered into to pump water out. The floor drain shall be equal to Josam 32226 with 6 inch outlet size and sediment bucket and located as shown on the Water Resources Department Standard Drawings.

The dimensions and arrangements shall be installed according to the Water Resources Department Standard Drawings.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of the materials to be used for review & approval by the Owners Representative prior to ordering.

PART 4 – EXECUTION

4.1 LOCATION OF WATER CHAMBER

Water system chambers shall be located entirely on the customer's property at the edge of the road right-of-way or easement. They should be located as close to the water main as possible and in an unpaved, grassy area or a paved area restricted from traffic..

PART 5 – TESTING (none)

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Each (EA) price bid for Item 2425 – WATER SERVICE CHAMBER. Progress payments will be made based on the measured quantities of Item 2425 completed. The Contractor shall review the submitted units completed and provide confirmation to the Owners Representative of the measurements prior to payment for work under this specification.

END OF SECTION

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SECTION 2430 – TESTING/SAMPLING TAPS

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to install the corporation stops specified herein.

PART 2 – PRODUCTS

2.1 CORPORATION STOPS

Only 2" taps and tapping saddles per Section 2400 of this standard will be used.

Approved 2" corporation stops are Ford FB–1000-7 with a saddle strap.

Fittings shall be compression-style for CTS tubing, Ford "Pack Joint", A.Y. McDonald "Mac-Pak" or approved equal. Couplings with set screws or grip rings will not be acceptable.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of the materials to be used for review & approval by the Owners Representative prior to ordering.

PART 4 – EXECUTION

4.1 LOCATION OF CORPORATION STOPS

As directed by the Owner's Representative for adequate testing.

4.2 ABANDONMENT

Contractor shall remove copper and leave the corporation stop in the off position.

PART 5 – TESTING (none)

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Each (EA) price bid for Item 2430 – TESTING/SAMPLING TAPS. Progress payments will be made based on the measured quantities of Item 2430 completed. The Contractor shall review the submitted units completed and provide confirmation to the Owner's Representative of the measurements prior to payment for work under this specification.

SECTION 3110 – PVC GRAVITY SEWER MAIN

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary for furnishing and installing PVC gravity sewer main pipe as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 GENERAL

This work shall consist of providing all labor, materials, and equipment necessary for furnishing and installing PVC gravity sewer mains (8" to 27" diameter), including granular bedding and initial backfill in accordance with Section 1200, complete and ready for service as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.3 RELATED WORK

A. Section 1200 Granular Bedding and Initial Backfill Material

PART 2 – PRODUCTS

2.1 PVC GRAVITY SEWER MAIN

All PVC Gravity Sewer Main through 15" diameter shall conform to ASTM D-3034. All PVC Gravity Sewer Main 18" diameter and larger shall conform to ASTM F-679, Type I. Elastomeric gasket joints for both types of PVC Gravity Sewer Main shall conform to ASTM D-3212. Material for PVC Gravity Sewer Main shall conform to the requirements of ASTM D-1784 for cell classification 12364 or 12454. PVC Gravity Sewer Main pipe shall also conform to the following schedule:

Depth of Cover (from top of pipe)	SDR Schedule
<15' of Cover	35
15' up to <28' of Cover	26
28' and over of Cover	17

All PVC Gravity Sewer Main shall be installed in accordance with ASTM D-2321.

PART 3 – SUBMITTALS

3.1 PVC GRAVITY SEWER MAIN PIPE and GASKETED JOINTS

Submit literature and/or catalog cut sheets of the PVC GRAVITY SEWER MAIN PIPE and GASKETED JOINTS to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 GENERAL

The Contractor shall furnish all necessary labor, material, tools, and equipment required in the installation of the PVC Gravity Sewer Main. This work includes furnishing all materials, the proper storage of those materials, saw cutting, dewatering, excavation, laying and joining the pipe, repairing or replacing all drains, sewers, utilities, and any other structures that may be disturbed or damaged by the Contractor's operations. Also included in this item is the disposal of all excavated materials and the testing of the installed pipe. All work shall be completed as shown on the Contract Drawings and as directed by the Owner's Representative. All pipe installation shall be in conformance with ASTM D-2321.

Pipe and fittings shall be handled so that the pipe, joints and gaskets will not be damaged. If damaged, the repair or replacement of such material shall be made by the Contractor at his own expense in a manner satisfactory to the Owner's Representative.

The Contractor is responsible to repair or replace all pavement and roadway surface disturbed by the contractor, as a result of the sewer main installation, to the satisfaction of the governing entity of said pavement or roadway surface.

Flow in existing sewers shall not be disrupted due to construction related to this project. Existing flow (including that caused by rain events) shall be maintained by pumping (or some other approved method) around the construction area. Adequate sizing of the temporary pumps required to convey the existing flow is the responsibility of the contractor. Any temporary pumping required for satisfactory construction of this project shall come at no additional expense to the Owner.

4.2 PIPE STORAGE

Pipe shall be stored, at the site, in unit packages. Do not stack unit packages more than eight (8) feet in height. When unit packages are stacked, ensure that the weight of upper units does not cause deformation to pipe in lower units. Support pipe unit packages on wood blocking to prevent damage to the bottom surfaces during storage. Space supports to prevent pipe bending.

4.3 HANDLING OF PIPE

When using mechanical equipment, exercise care to prevent damage to pipe. Lower pipe carefully into trenches, DO NOT DROP PIPE. Materials cracked, gouged, chipped, or otherwise damaged will be rejected.

In subfreezing temperatures, use caution to prevent impact damage. Handling methods considered acceptable for warm weather may be unacceptable during very cold weather.

4.4 PIPE INSTALLATION

The proposed location of the gravity sewer main is shown on the Plans. Construction shall begin at the furthest downstream point of the project, unless approved otherwise by the Owner's Representative. A water-tight bulkhead must be installed at the furthest downstream manhole to separate the new work from the existing sewer system. At the successful conclusion of testing, the Contractor must remove the bulkhead.

The laying of pipes in finished trenches shall be commenced at the lowest point so that the spigot ends point in the direction of flow. All pipes shall be laid accurately to the required lines and grades, and shall be uniformly supported along their entire lengths. All possible care shall be used when shoving the pipe together, with a steady pressure, so that the ends of each pipe shall abut against the adjacent pipe in such a manner that there will be no unevenness of any kind along the inverts and a minimum space between the abutting inside walls.

Special care shall be exercised to prevent the entrance of earth and other debris into the pipe. All such earth and debris resulting from construction operations shall be removed from the pipe.

At the close of each day's work, or when pipe is not being laid, the end of the pipe should be protected by a close-fitting stopper with adequate precautions taken to overcome possible uplift.

When cut all rough edges must be filed to provide a smooth, beveled edge.

The Contractor shall furnish, place, and maintain sheeting and bracing as may be required to securely support the sides and ends of the excavation and to prevent injury to the structure being built or to personal property or adjacent utilities.

All PVC gravity sewer mains shall include and shall be installed in bedding and initial backfill material as described in Item 1200-Granular Bedding and Initial Backfill Material.

Final Backfill and pavement replacement shall be installed in accordance with the Clermont County Water Resources Department Standard Drawings and Specifications.

PART 5 – TESTING

5.1 GENERAL

PVC gravity sewer pipe shall be capable of passing the infiltration and exfiltration tests specified herein.

The infiltration or leakage of ground or sub-surface water into the sanitary sewers and manholes shall not exceed the rate of 100 gallons per inch of tributary pipe diameter per 24 hours per mile of length, or the computed equivalent for shorter sections and shorter periods of time.

Sewer testing shall be as ordered by the Owner's Representative and may include infiltration, exfiltration, air testing, or televising.

Prior to testing, the Owner's Representative may require the lines to be flushed and swabbed. Swabbing shall be a rubber inflated ball or other approved method. When required, water for flushing shall be provided by the Contractor at no additional expense to the Owner. All debris debris shall be removed by methods approved by the Owner's Representative.

All testing shall be conducted under the supervision of the Owner's Representative, and the inspection fees include a maximum of two separate testings of the same pipe and if testing has not passed after two separate tests, additional inspection fees will be due prior to acceptance of testing and final inspection.

Upon completion of all required testing, the bulkhead shall be removed at the furthest downstream connection point.

5.2 INFILTRATION TESTING

The Owner's Representative may order the Contractor to make infiltration (leakage) tests of as many sections of the sanitary sewers, as, in the Owner's Representative opinion, may be necessary to determine whether work complies with the above required rate of infiltration. Generally, a section of sewer shall mean the distance between manholes. Such tests will be of 30 minute minimum duration and will only be made at the time of maximum height of ground water, provided that such maximum height of ground water must be at least two (2) feet above the elevation of the outside top of the sewer at the upstream limit of the section being tested. The infiltration test shall be made by installing a weir or other measuring device approved by the Owner's Representative in the lower end of the sewer section to be tested. The quantity of ground water infiltration into the sewer will be measured and shall not exceed the allowable leakage.

5.3 EXFILTRATION TESTING

The Water Resources Department may also order exfiltration tests to be made. For exfiltration tests, the Contractor shall fill the sewer with water to an elevation of two (2) feet above the outside top of the sewer at the upstream limit of the section being tested. The exfiltration shall not exceed the rate of 100 gallons per inch of tributary pipe diameter, per 24 hours per mile of length, as specified for infiltration.

5.4 LEAKAGE CORRECTION

In case the above requirements for either infiltration or exfiltration are not met, the Contractor shall caulk joints with acceptable materials or do such work as may be necessary until the rate of infiltration

or exfiltration is less than the above requirements, as determined by additional infiltration or exfiltration tests.

5.5 AIR TESTING

An approved type of low pressure air test may be used in lieu of the above exfiltration tests at the option of the Owner's Representative. Unless otherwise directed by the Owner's Representative, the sewer will be tested at 5 pounds of pressure for 5 minutes with no loss of pressure.

5.6 TELEVISION INSPECTION

The Owner's Representative may order the Contractor to inspect, by closed circuit television, and test joints of sections of sewers, including sewers with "live" service connections. The testing method shall be subject to the approval of the Owner's Representative. Joints that fail the joint test shall be sealed with an approved chemical grout or excavated for repairs and retested until the joints pass the joint test.

5.7 DEFLECTION TESTING

The Contractor shall also perform a deflection test in all sections of gravity sewer pipe. The test shall be conducted after the final backfill has been in place at least 30 days. Prior to making the deflection tests, the lines shall be flushed and swabbed. Swabbing shall be by an inflated rubber ball or other approved method. The deflection of any sewer pipe shall not exceed 5 percent.

The deflection test shall be made by using a rigid ball or mandrel and shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

Correction of any section of sewer pipe not meeting the deflection test shall be approved by the Owner's Representative.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid per Linear Feet (LF) for Item 3110 – PVC GRAVITY SEWER MAIN. Progress payments will be made based on the installed linear feet of Item 3110 completed.

END OF SECTION

SECTION 3130 – DUCTILE IRON GRAVITY SEWER MAIN

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary for furnishing and installing ductile iron gravity sewer main pipe as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 GENERAL

This work shall consist of providing all labor, materials, and equipment necessary for furnishing and installing ductile iron gravity sewer mains, including granular bedding and initial backfill in accordance with Section 1200 where required, complete and ready for service as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.3 RELATED WORK

A. Section 1180 Keyblock Anchors
B. Section 1200 Granular Bedding and Initial Backfill Material

PART 2 – PRODUCTS

2.1 DUCTILE IRON GRAVITY SEWER MAIN

All Ductile Iron Gravity Sewer Main shall be manufactured in accordance with AWWA C-151 and shall be in 18 to 20 foot lengths with single rubber gasket push-on joints. All Ductile Iron Gravity Sewer Main shall have a minimum wall thickness of class 50 in accordance with AWWA C-150 and have a cement mortar lining conforming to ANSI/AWWA C104/A21.4. Ductile Iron Gravity Sewer Mains shall be US Pipe Tyton Joint Pipe, American Fastite Joint Pipe, or approved equal.

PART 3 – SUBMITTALS

3.1 DUCTILE IRON GRAVITY SEWER MAIN PIPE

Submit literature and/or catalog cut sheets of the DUCTILE IRON GRAVITY SEWER MAIN PIPE to be used. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 GENERAL

The Contractor shall furnish all necessary labor, material, tools, and equipment required in the installation of the Ductile Iron Gravity Sewer Main. This work includes furnishing all materials, the proper storage of those materials, saw cutting, dewatering, excavation, laying and joining the pipe, repairing or replacing all drains, sewers, utilities, and any other structures that may be disturbed or damaged by the Contractor's operations. Also included in this item is the disposal of all excavated materials and the testing of the installed pipe. All work shall be completed as shown on the Contract Drawings and as directed by the Owner's Representative. All pipe installation shall be in conformance with ASTM A746-09.

Pipe and fittings shall be handled so that the pipe, joints and gaskets will not be damaged. If damaged, the repair or replacement of such material shall be made by the Contractor at his own expense in a manner satisfactory to the Owner's Representative.

The Contractor is responsible to repair or replace all pavement and roadway surface disturbed by the contractor, as a result of the sewer main installation, to the satisfaction of the governing entity of said pavement or roadway surface.

Flow in existing sewers shall not be disrupted due to construction related to this project. Existing flow (including that caused by rain events) shall be maintained by pumping (or some other approved method) around the construction area. Adequate sizing of the temporary pumps required to convey the existing flow is the responsibility of the contractor. Any temporary pumping required for satisfactory construction of this project shall come at no additional expense to the Owner.

4.2 PIPE STORAGE

Pipe shall be stored, at the site, in unit packages. When unit packages are stacked, ensure that the weight of upper units does not cause deformation to pipe in lower units. Support pipe unit packages on wood blocking to prevent damage to the bottom surfaces during storage. Space supports to prevent pipe bending.

4.3 HANDLING OF PIPE

When using mechanical equipment, exercise care to prevent damage to pipe. Lower pipe carefully into trenches, DO NOT DROP PIPE. Materials cracked, gouged, chipped, or otherwise damaged will be rejected.

4.4 PIPE INSTALLATION

The proposed location of the gravity sewer main is shown on the Plans. Construction shall begin at the furthest downstream point of the project, unless approved otherwise by the Owner's Representative. A water-tight bulkhead must be installed at the furthest downstream manhole to separate the new work

from the existing sewer system. At the successful conclusion of testing, the Contractor must remove the bulkhead.

The laying of pipes in finished trenches shall be commenced at the lowest point so that the spigot ends point in the direction of flow. All pipes shall be laid accurately to the required lines and grades, and shall be uniformly supported along their entire lengths. All possible care shall be used when shoving the pipe together, with a steady pressure, so that the ends of each pipe shall abut against the adjacent pipe in such a manner that there will be no unevenness of any kind along the inverts and a minimum space between the abutting inside walls.

Special care shall be exercised to prevent the entrance of earth and other debris into the pipe. All such earth and debris resulting from construction operations shall be removed from the pipe.

At the close of each day's work, or when pipe is not being laid, the end of the pipe should be protected by a close-fitting stopper with adequate precautions taken to overcome possible uplift.

When cut all rough edges must be filed to provide a smooth, beveled edge.

The Contractor shall furnish, place, and maintain sheeting and bracing as may be required to securely support the sides and ends of the excavation and to prevent injury to the structure being built or to personal property or adjacent utilities.

All ductile iron gravity sewer mains shall include and shall be installed in bedding and initial backfill material as described in Item 1200-Granular Bedding and Initial Backfill Material, where required by the standard detail drawings (i.e., under driveways, pavement, or when controlled density fill is required for backfill). In all other cases, clean native soil can be used for bedding and backfill.

Final Backfill and pavement replacement shall be installed in accordance with the Clermont County Water Resources Department Standard Drawings and Specifications.

PART 5 – TESTING

5.1 GENERAL

PVC gravity sewer pipe shall be capable of passing the infiltration and exfiltration tests specified herein.

The infiltration or leakage of ground or sub-surface water into the sanitary sewers and manholes shall not exceed the rate of 100 gallons per inch of tributary pipe diameter per 24 hours per mile of length, or the computed equivalent for shorter sections and shorter periods of time.

Sewer testing shall be as ordered by the Owner’s Representative and may include infiltration, exfiltration, air testing, or televising.

Prior to testing, the Owner’s Representative may require the lines to be flushed and swabbed. Swabbing shall be a rubber inflated ball or other approved method. When required, water for flushing shall be provided by the Contractor at no additional expense to the Owner. All debris debris shall be removed by methods approved by the Owner’s Representative.

All testing shall be conducted under the supervision of the Owner's Representative, and the inspection fees include a maximum of two separate testings of the same pipe and if testing has not passed after two separate tests, additional inspection fees will be due prior to acceptance of testing and final inspection.

Upon completion of all required testing, the bulkhead shall be removed at the furthest downstream connection point.

5.2 INFILTRATION TESTING

The Owner's Representative may order the Contractor to make infiltration (leakage) tests of as many sections of the sanitary sewers, as, in the Owner's Representative opinion, may be necessary to determine whether work complies with the above required rate of infiltration. Generally, a section of sewer shall mean the distance between manholes. Such tests will be of 30 minute minimum duration and will only be made at the time of maximum height of ground water, provided that such maximum height of ground water must be at least two (2) feet above the elevation of the outside top of the sewer at the upstream limit of the section being tested. The infiltration test shall be made by installing a weir or other measuring device approved by the Owner's Representative in the lower end of the sewer section to be tested. The quantity of ground water infiltration into the sewer will be measured and shall not exceed the allowable leakage.

5.3 EXFILTRATION TESTING

The Water Resources Department may also order exfiltration tests to be made. For exfiltration tests, the Contractor shall fill the sewer with water to an elevation of two (2) feet above the outside top of the sewer at the upstream limit of the section being tested. The exfiltration shall not exceed the rate of 100 gallons per inch of tributary pipe diameter, per 24 hours per mile of length, as specified for infiltration.

5.4 LEAKAGE CORRECTION

In case the above requirements for either infiltration or exfiltration are not met, the Contractor shall caulk joints with acceptable materials or do such work as may be necessary until the rate of infiltration or exfiltration is less than the above requirements, as determined by additional infiltration or exfiltration tests.

5.5 AIR TESTING

An approved type of low pressure air test may be used in lieu of the above exfiltration tests at the option of the Owner's Representative. Unless otherwise directed by the Owner's Representative, the sewer will be tested at 5 pounds of pressure for 5 minutes with no loss of pressure.

5.6 TELEVISION INSPECTION

The Owner's Representative may order the Contractor to inspect, by closed circuit television, and test joints of sections of sewers, including sewers with "live" service connections. The testing method shall be subject to the approval of the Owner's Representative. Joints that fail the joint test shall be sealed with an approved chemical grout or excavated for repairs and retested until the joints pass the joint test.

5.7 DEFLECTION TESTING

The Contractor shall also perform a deflection test in all sections of gravity sewer pipe. The test shall be conducted after the final backfill has been in place at least 30 days. Prior to making the deflection tests,

the lines shall be flushed and swabbed. Swabbing shall be by an inflated rubber ball or other approved method. The deflection of any sewer pipe shall not exceed 5 percent.

The deflection test shall be made by using a rigid ball or mandrel and shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

Correction of any section of sewer pipe not meeting the deflection test shall be approved by the Owner's Representative.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the unit price bid per Linear Feet (LF) for Item 3130 – DUCTILE IRON GRAVITY SEWER MAIN. Progress payments will be made based on the installed linear feet of Item 3130 completed.

END OF SECTION

SECTION 3140 – SANITARY SEWER LATERALS, GRAVITY SEWER

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for furnishing and installing sanitary sewer laterals as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 RELATED WORK

A. CCWRD, General Specification: Section 1200 Granular Bedding and Initial Backfill Material
B. CCWRD, General Specification: Section 3110 PVC Gravity Sewer Main

PART 2 – PRODUCTS

2.1 PVC PIPE AND FITTINGS

Lateral shall be constructed of 6 inch minimum diameter. Materials of construction shall be the same Standard Dimension Ratio (SDR) as the sewer main being connected to. If the sewer main is not PVC, the lateral shall be PVC with a Standard Dimension Ratio corresponding to the schedule established in Section 3110 PVC Gravity Sewer Main.

2.2 CONNECTION TO MAIN

Wyes for house connections shall be factory made in-line fittings for new sewer installation. Inserta Tee® type fittings shall be permitted when connecting to an existing sewer main. **No glue-on saddles or strap on fittings will be permitted.**

PART 3 – SUBMITTALS

Submit literature and/or catalog cut sheets of the PVC pipe, fittings and wye connection to be used. Submit to the Owner's Representative for review and approval prior to ordering

PART 4 – EXECUTION

4.1 GENERAL

The Contractor shall furnish and install all wye branches, stopper plates, and wye poles required for future service connections, and connect existing sanitary sewer services at the property line, complete, as determined in the field and as specified herein.

Wye branches shall be located where shown on the plans or where ordered by the Owner's Representative and shall be standard fittings of the same strength classification of the sewer main.

Existing sewer laterals shall be maintained at all times.

Lateral trenches shall be backfilled with native soil to 4 foot from wye fitting at cleanout to create an impermeable compacted plug.

Lateral connections shall be installed in accordance with Sections 3141 and 3142.

4.2 LATERAL CONNECTION

Lateral connections in conventional gravity systems, shall be constructed of 6 inch minimum diameter sewer pipe and shall include that portion of sewer extending between the sewer main and right-of-way or easement limiting line adjacent to the sewer main. The depth shall be determined by the depth of the lateral at the connection to the sewer main.

Laterals shall enter the gravity sewer main 45° from the 12 o'clock position at the top of the pipe.

Inserta Tee® type fittings shall be installed based on manufacturer's recommendations. Penetrations into the existing sewer main shall be installed using a 6" diameter hole saw. HAMMER TAPS ARE PROHIBITED.

4.3 WYE POLES

Stoppers shall be installed in wye branches which are not immediately extended and at the end of all laterals with the exception only of those which are immediately connected to service connections. The stoppers shall be installed so as to give a watertight seal and shall be of type which may be removed from the pipe without damage to the bell or to the joint material within the bell.

At the end of each lateral connection, there shall be placed a 2 inch by 2 inch pole, painted with two (2) coats of white paint for the upper two feet. Wye poles must be set plumb and secure before any backfill is placed in the trench. The wye pole must be located on the backside of the 6" cleanout riser. The cleanout cap may be left buried three (3') during initial installation. When the structure is connected at a later date, the cleanout must be brought to grade. After the backfilling has been completed and the trench settled and dressed, the location of wye poles shall be measured from the nearest manhole and recorded. The wye poles shall then be driven down flush with the ground, but not until the Contractor has been so instructed by the Owner's Representative. Also where curb exists, sanitary sewer laterals shall be so marked by markings in the curb.

PART 5 – TESTING

All testing will be performed in conjunction with the gravity sewer main as stated in Sections 3110.

PART 6 – BASIS OF PAYMENT

6.1 SANITARY SEWER LATERALS, GRAVITY SEWER

Payment for all labor, material, and equipment necessary to perform lateral installation shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
3140	LF	Sanitary Sewer Lateral

Length of vertical pipe used to install cleanout is incidental to the cost of the lateral.

END OF SECTION

SECTION 3141 – SANITARY SEWER SERVICE CONNECTION, RESIDENTIAL BUILDING

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for a sanitary sewer service connection for a residential building, as shown in the typical details and/or specified herein.

1.2 RELATED WORK

- **A.** CCWRD, General Specification: Section 1200 Granular Bedding and Initial Backfill Material
- **B.** CCWRD, General Specification: Section 3110 PVC Gravity Sewer Main
- **C.** CCWRD, General Specification: Section 3140 Sanitary Sewer Laterals, Gravity Sewer

PART 2 – PRODUCTS

2.1 PVC PIPE AND FITTINGS

Residential sewer service connections shall be constructed of 4 inch minimum diameter, PVC Schedule-40, SDR 35, or SDR 26 (15' or deeper) solid wall sewer pipe and fittings.

2.2 FLEXIBLE PIPE CONNECTORS

Flexible elastomeric pipe couplings and donut type seals used in transition joints between pipes of different material or diameter shall be manufactured of an elastomeric PVC which is chemically resistant, light stable and fungus and mildew resistant. Metal clamps used to attach and clamp the coupling onto the piping, including wormgear and clamp strap, shall be manufactured of series 300 stainless steel. Flexible pipe connectors shall be "shielded" style and be manufactured by Fernco, Inc. or Mission Co.

PART 3 – SUBMITTALS

Submit literature with product's physical properties. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Residential sewer service connections shall be constructed in accordance with Sections 1200 and 3110.

Cleanouts shall be installed at the following individual service locations:

a) At the road right-of-way line and/or at the end of the public easement.

b) At each vertical and/or horizontal bend of 22-1/2° or 45° (no 90° bends permitted).

c) Not to exceed (100') one hundred feet.

d) The top of pipe must maintain a minimum 3’ of cover.

e) At a distance approximately 20 feet from the structure, native soil will be used as backfill for approximately 4 feet to create an impermeable compacted plug.

f) Inside the connecting structure or within (8) eight feet from the outside wall of said structure.

g) Cleanout caps shall match the PVC material used to construct the cleanout unless in non-grassy areas where cap is to be installed with Neenah R-1976 or approved equal cap.

h) On residential lots, cleanouts will not be located within the driveway or other paved areas. All cleanouts must be located in grassy areas, unless approved by the Owner’s Representative.

PART 5 – TESTING

As required by the Owner’s Representative and shall conform with Section 3110.

PART 6 – BASIS OF PAYMENT (Not applicable)

END OF SECTION

SECTION 3142 – SANITARY SEWER SERVICE CONNECTION, COMMERCIAL BUILDING

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for a sanitary sewer service connection for a commercial building, as shown in the typical details and/or specified herein.

1.2 RELATED WORK

A. CCWRD, General Specification: Section 1200 Granular Bedding and Initial Backfill Material
B. CCWRD, General Specification: Section 3110 PVC Gravity Sewer Main
C. CCWRD, General Specification: Section 3140 Sanitary Sewer Laterals, Gravity Sewer

PART 2 – PRODUCTS

2.1 PVC PIPE AND FITTINGS

Commercial sewer service connections shall be constructed of 6 inch minimum diameter, PVC Schedule-40, SDR 35, or SDR 26 (deeper than 15') solid wall sewer pipe and fittings.

2.2 FLEXIBLE PIPE CONNECTORS

Flexible elastomeric pipe couplings and donut type seals used in transition joints between pipes of different material or diameter shall be manufactured of an elastomeric PVC which is chemically resistant, light stable and fungus and mildew resistant. Metal clamps used to attach and clamp the coupling onto the piping, including wormgear and clamp strap, shall be manufactured of series 300 stainless steel. Flexible pipe connectors shall be as manufactured by Fernco, Inc. or Mission Co.

PART 3 – SUBMITTALS

Submit literature with product's physical properties. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Commercial sewer service connections shall be constructed in accordance with Sections 1200 and 3110.

Cleanouts shall be installed at the following individual service locations:

a) At the road right-of-way line and/or at the end of the public easement.

b) At each vertical and/or horizontal bend of 22-1/2° or 45° (no 90° bends permitted).

c) Not to exceed (100') one hundred feet.

d) The top of pipe must maintain a minimum 3' of cover.

e) At a distance approximately 20 feet from the structure, native soil will be used as backfill for approximately 4 feet to create an impermeable compacted plug.

f) Inside the connecting structure or within (8) eight feet from the outside wall of said structure.

g) Cleanout caps shall match the PVC material used to construct the cleanout unless in non-grassy areas where cap is to be installed with Neenah R-1976 or approved equal cap.

h) On commercial lots, cleanouts will not be located within the driveway or other paved areas. All cleanouts must be located in grassy areas, unless approved by the Owner's Representative.

PART 5 – TESTING

As required by the Owner's Representative and shall conform with Section 3110.

PART 6 – BASIS OF PAYMENT (Not applicable)

END OF SECTION

SECTION 3143 – SANITARY SEWER SERVICE CONNECTION, LOW PRESSURE FORCE MAIN (LPFM)

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to connect a sanitary sewer service connection for a low pressure force main as shown in the typical details and/or specified herein.

1.2 RELATED WORK

A. CCWRD, General Specification: Section 1200 Granular Bedding and Initial Backfill Material

PART 2 – PRODUCTS

2.1 PVC PIPE AND FITTINGS

Low pressure force main connections shall be constructed of PVC Schedule-80 solid wall sewer pipe and fittings rated for 200 psi. Discharge piping size shall be in accordance with pump manufacturer's recommendation.

PART 3 – SUBMITTALS

Submit literature with product's physical properties. Submit to the Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

4.1 GENERAL

The property owner shall be responsible for design, operation, maintenance and future replacement of the private pumping system, force main and related appurtenances.

Any pumping system shall be located within the structure it serves.

Check valves and all other portions of the low pressure force main shall meet the pump manufacturer's recommendation.

4.2 INSTALLATION

The Contractor shall furnish, place, and maintain sheeting and bracing as may be required to securely support the sides and ends of the excavation and to prevent injury to the structure being built or to personal property or adjacent utilities.

Discharge piping shall be installed with a minimum 4 feet of cover to prevent freezing. Bedding and backfill material shall be installed as stated in Section 1200. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed into the trench.

When cutting pipe, all rough edges must be filed to provide a smooth, beveled edge. All fittings shall be solvent welded.

A minimum of 10 feet (10') horizontal clearance (for parallel installations) and 18-inch vertical clearance (at crossings) shall be maintained between all force mains/service laterals and water mains/services
The low pressure force main shall discharge at the back of the wye fitting at the cleanout at the edge of the right-of-way.

PART 5 – TESTING (As determined necessary)

PART 6 – BASIS OF PAYMENT (Not applicable)

END OF SECTION

SECTION 3200 – GRAVITY SEWER MANHOLE

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to install the standard manholes conforming to the specifications and of the types and sizes shown on the Standard Drawings and shall construct the same in accordance with these Specifications at the locations and to the lines and grades shown on the Drawings.

1.2 LOCATION OF MANHOLES

Manholes shall be installed at points of change in sewer grade, size, or direction, at junctions, at intermediate points and at the end of each line.

Manholes for sewers 36 inches and larger in diameter shall be located near points of change in sewer grade, size or direction in order that standard components may be used.

Manholes shall be installed at maximum intervals of 400 feet for sewers 15 inches in diameter and smaller and 500 feet for sewers 18 inches to 48 inches in diameter.

PART 2 – PRODUCTS

2.1 MATERIALS

Precast concrete bases, risers and tops shall be constructed of reinforced concrete and shall conform to the requirements of the "Specifications for Precast Reinforced Concrete Manhole Sections", ASTM C-478, except as modified herein.

Pipe connection to manhole bases shall be made with flexible rubber compression gaskets conforming to ASTM C923. Pipe to manhole connector for sanitary systems shall be A-LOK X-CEL or equal as determined by the Water Resources Department.

Joints between precast manhole sections shall be flexible watertight rubber gaskets conforming to ASTM C-443. Additional flexible butyl rubber sealant equal to Conseal type CS-302 shall be applied to the outside and inside horizontal portion of each manhole joint. Care must be exercised to ensure the joints are clean and free of dirt, debris and grease to assure adhesion of the seal material.

1-1/4 inch holes for handling may be cast in the dome and rings. These holes shall be plugged and sealed once the manhole is in place.

Precast adjusting rings shall be reinforced with one (1) No. 3 gage wire or equivalent. A maximum of 12 inches in height of adjusting rings shall be allowed for each manhole. No more than two (2) adjusting rings will be permitted for each manhole. A flexible butyl rubber sealant equal to Conseal type CS-302

conforming to the requirements of ODOT Item 706.10 shall be used to seal the joint between the manhole top and first adjusting ring and each succeeding joint between said rings.

Composite adjusting rings shall be Infra-Riser Multi-Purpose Rubber Composite Adjustment Riser by East Jordan Iron Works or equal as determined by the Water Resources Department.

In general, the manholes shall be constructed so the top of the casting is at the elevation of the proposed street grade or to a point 2 inches above the present ground surface or to a point 24 inches above the ground surface of a cultivated field or as ordered. The manhole casting shall be set on a flexible butyl rubber sealant equal to Conseal type CS-302, to provide a seal between the manhole casting and the manhole structure. Care must be exercised to ensure the joints are clean and free of dirt, debris and grease to assure adhesion of the seal material.

Special care shall be exercised to prevent the entrance of earth or debris into manholes and pipe lines. All such earth and debris shall be removed from the manholes and pipe lines during construction operations.

Pipe trench over-excavation required for manhole installation shall be backfilled with compacted granular backfill as specified in the Water Resources Department Specifications for pipe bedding and initial backfill.

2.3 DROP MANHOLES

Drop manholes shall be used when the invert of the inflow sewer is two feet or more above the manhole invert. When this difference in elevation is less than two feet, the manhole invert shall be filleted to prevent solids deposition.

Drop manholes shall be constructed with:

A) Inside drop pipes as shown on the Water Resources Department Standard Drawings. Inside drop connections, when approved by the Department, shall be constructed of SDR-23.5 PVC sewer pipe, securely fastened to the inside face of the manhole with stainless anchors and pipe supports.
B) The Reliner Inside Drop System or equal as determined by the Water Resources Department.

2.5 MANHOLE FRAMES AND LIDS

Manhole castings shall conform to the requirements of the "Standard Specifications for Gray Iron Castings", ASTM Designation A-48. The frames and covers shall be sound, true to form and thickness and neatly finished.

Standard manhole frames shall be equal to Neenah R1775 or East Jordan Iron Works 2045. Standard manhole lids shall be equal to Neenah R1664 or East Jordan Iron Works 2045 and shall be furnished either vented or solid, as specified by the Owner’s Representative. Solid lids shall be machined to receive self-sealing gasket.

Four (4) bolt holes shall be furnished in the frame flange for anchoring the frame to the manhole. Four (4) - 1" round galvanized steel anchor bolts shall be used to anchor the manhole frame. Anchorage shall

be provided through one of the following methods: (a) manhole adjusting rings; (b) directly anchored into the precast manhole. The underside of the cover and the seal of the frame shall be machined to give a true bearing surface.

Manhole covers on sanitary sewers shall have the words "Sanitary Sewer" cast on cover.

2.6 MANHOLE STEPS

Manhole steps shall be either aluminum bar type steps, ASTM B-221, 6061-T6; or a copolymer type having a steel reinforcement bar encapsulated with copolymer polypropylene plastic, Number PS1-PF, as manufactured by M.A. Industries, Inc. or equal as determined by the Water Resources Department.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of the materials to be used for review & approval by the Owners Representative prior to ordering.

PART 4 – EXECUTION

4.1 MANHOLE CONSTRUCTION

Manholes shall be watertight structures constructed in accordance with one of the following methods:

1. Precast manhole bases, in combination with riser sections, transition sections, cones and/or flat slab tops as shown on the Drawings.
2. Monolithic concrete cast-in-place bases, in combination with precast riser sections, cones and/or flat slab tops.

Manholes with precast base sections shall be placed on a 6 inch compacted layer of aggregate base #57 stone.

Where shaping of manhole walls and bottoms is required or ordered to provide for pipe junctions, channels, etc.; such work shall be made with Class "F" concrete conforming to the requirements of ODOT Item 499 and 511. The invert channel and manhole bench shall be constructed as shown in the Standard Drawings. In general, the invert channel shall be a smooth continuation of the pipe and U-shaped. The bench shall provide good footing for workmen and have a 1 inch batter towards the invert channel.

Minimum wall thickness of circular precast manhole bases, risers and cones shall be as scheduled below:

Inside Diameter (feet)	Minimum Wall Thickness (inches)
4	5
5	6
6	7
6.5	7.5
8	9

Openings for the inlet and outlet sewer pipes shall be cast in the precast units.

All pipe entering manholes at precast openings and along all barrel sections shall be sealed by means of imbedded flexible rubber gaskets.

Flexible grout to be utilized on the inside of all manholes at all joints, steps, and pipe as directed by the Water Resources Department.

Manholes planned within any pavement will have the rim match the profile and section of the existing roadway.

PART 5 – TESTING

The manholes will be tested and inspected for damage prior to placing in service, under the Water Resources Department supervision, after installation is complete to show they are watertight.

A. This specification shall govern the vacuum testing of sanitary sewer manholes and structures and shall be used as a method of determining acceptability in accepting maintenance of a sanitary sewer manhole or structure. Vacuum testing shall be according to ASTM C1244, except as specified otherwise herein. All new sanitary sewer manholes and structures shall be tested by vacuum test as specified herein to test for leaks.

B. Manholes shall be tested after installation with all connections in place.
   1. Lift holes, if any, shall be plugged with an approved, no-shrinkable grout prior to testing.
   2. Drop connections shall be installed prior to testing.
   3. The vacuum test shall include testing of the seal between the cast iron frame and the cone, slab or grade rings.
   4. The manholes shall be backfilled and finished to design grade.
   5. If a coating or lining is to be applied to the interior of the manhole the vacuum test must not be performed until the coating or lining has been cured according to the manufacturer's recommendation.
   6. If existing manholes are to be vacuum tested (e.g. in the case of a sewer rehabilitation project), then Clermont County must deem the manhole structurally sound prior to vacuum testing.

C. Procedure for testing shall be as follows:
   1. Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least six inches into the sewer pipe(s). The plug must be inflated at a location past the manhole/pipe gasket.
   2. The test head shall be placed inside the frame at the top of the manhole and inflated, in accordance with the manufacturer's recommendations.
   3. A vacuum of ten inches of mercury (10"Hg) shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and shut off the pump or disconnect the vacuum line from the pump.
   4. The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to thirty inches of mercury.
   5. The manhole shall be considered to pass the vacuum test if the time for the vacuum reading to drop from 10" to 9" Hg meets or exceeds the values indicated in the following table:

   Unless otherwise directed by the Water Resources Department, all manhole vacuum testing shall include the manhole frame.

Minimum Test Times for Various Manhole Diameters (minutes and seconds)

MH Depth (feet)	4' Diameter MH	5' Diameter MH	6' Diameter MH
15 feet or less	50 sec.	1 min. & 5 sec.	1 min. & 20 sec.
15.01 to 30 feet	1 min. & 20 sec.	1 min. & 45 sec.	2 min. & 10 sec.

6. If a manhole fails the vacuum test, the manhole shall be repaired with material approved by Clermont County. The vacuum test shall then be repeated until a satisfactory test is obtained.
7. All temporary plugs and braces shall be removed after each test.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Each (EA) price bid for Item 3200 – GRAVITY SEWER X' DIAMETER MANHOLES.

Item	Unit	Description
3200	Each (EA)	GRAVITY SEWER X' DIAMETER MANHOLES
3200	Each (EA)	GRAVITY SEWER X' DIAMETER DROP MANHOLES

Progress payments will be made based on the manholes actually installed, as measured by the OWNER'S REPRESENTATIVE. The Contractor shall review the submitted units completed and provide confirmation to the Owner's Representative of the measurements prior to payment for work under this specification.

SECTION 3300 – SANITARY SEWER PUMP STATION, GENERAL

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary for furnishing and installing a sanitary sewer pump station as indicated on the Standard Drawings, except as identified in Section 3301-Sanitary Sewer Pump Station, Electrical, and as specified herein.

1.2 GENERAL

This work shall consist of providing all labor, materials, and equipment necessary for furnishing and installing a wet well, valve vault, bar screen manhole, a chemical feed tank, equipment support pads, duplex motor driven submersible sewage pumps, internal piping, and valves as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.3 RELATED WORK

A. Section 3200 Gravity Sewer Manhole
B. Section 3301 Sanitary Sewer Pump Station, Electrical
C. Section 3310 PVC Sewer Force Mains

PART 2 – PRODUCTS

2.1 CAST-IN-PLACE CONCRETE

Cast-In-Place Concrete shall be used only to construct equipment support pads, unless otherwise indicated on the drawings. Cast-in-place concrete shall be Class C Concrete with a minimum 28-day compressive strength of 4,000 psi and slump of 4" or less. Steel reinforcement for cast-in-place concrete shall be placed as indicated on the drawings, as recommended by the equipment manufacturer, or as directed by the Owner's Representative. Steel reinforcement bars shall meet the requirements of the "Standard Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcement", ASTM A 615, Grade 60.

2.2 CIRCULAR PRECAST PUMP STATION STRUCTURES

All Pump Station structures, except equipment support pads, shall be constructed of precast concrete units. Precast concrete units include the wet well, bar screen manhole, and valve chamber, and shall be constructed in accordance with Section 3200, Gravity Sewer Manhole and the Standard Detail Drawings.

2.3 PRECAST BOX SECTIONS

Where precast box sections are required on the drawings, they shall conform to the requirements of ASTM C-789, except as modified herein.

Precast box sections shall be designed to withstand a total lateral earth pressure and hydrostatic pressure (psf)=80 pcf x feet of depth, using a minimum factor of safety of 1.7.

The walls shall have a minimum thickness of 8 inches and all joints between riser sections shall be sealed with a flexible watertight butyl rubber sealant equal to Conseal, Type CS-102. Openings for pipes shall be cored in the precast units after the various structures have been constructed.

Flat slab tops shall have a minimum thickness of 12 inches and be reinforced for highway loading. The flat slab shall be precast with recessed lifting lugs and the access hatches, wall pipe and embedded electrical accessories in place.

2.4 ACCESS HATCHES

Access hatches for lift station structures shall have ¼" thick diamond plated aluminum covers with aluminum channel frames and stainless steel hinges and hardware. Hatches shall be capable of supporting a minimum live load of 300 psf. Covers shall be easily controlled throughout the entire arc of opening and closing, include a hold-open mechanism, and have a hasp locking device.

Wet well hatches shall include fall protection grating meeting all applicable OSHA fall protection requirements. Fall protection grating shall be constructed of all aluminum and stainless steel parts and include a hold-open mechanism.

Hatches and fall protection systems shall be supplied in the sizes and door orientations noted in the project documents and meet the minimum absolute clear space opening required for the provided submersible pumps and other devices provided. Acceptable hatch manufactures include Bilco, Halliday, or approved equal.

2.5 EXPOSED PIPING - DUCTILE IRON PIPE

In general, all pipe not buried in the ground or pipe encased in concrete shall be Class 53 Ductile Iron flanged mechanical joint pipe in accordance with ANSI A21.15, AWWA C-115. Flanges shall be Class 125 drilled in accordance with American National Standard B16.1. Rubber gaskets (1/8" thick) of "Rainbow"

or other approved quality shall be used in all flanged joints. All flanged joint gaskets shall be full faced type.

All ductile iron pipes, fittings and sleeves shall have a thin bituminous coated cement lining in accordance with ANSI A21.4 (AWWA C-104).

Bolts and nuts for flanged piping within the wet well, valve vault or any other corrosive environment, as determined by the Owner's Representative, shall be Type 304 stainless steel. All heads and nuts shall be hexagonal, trimmed and chamfered. All heads, nuts and threads shall be of the United States standard sizes. Where flanged joints are buried in the ground, and where specifically shown on the drawings, bolts, nuts and washers shall be Type 304 stainless steel and shall not be painted. All stainless steel nuts and bolts shall be coated with an approved nut-lock compound to prevent loosening and to allow disassembly. Where stainless steel bolts and nuts are used, electrical isolation sleeves shall be installed in all bolt holes to separate dissimilar metals.

2.6 PAINTING – DUCTILE IRON PIPE AND FITTINGS & IRON AND CARBON STEEL EQUIPMENT

All exposed ductile iron pipe and fittings, and all other exposed iron and carbon steel equipment surfaces, shall receive an outside shop primer of polyamide epoxy (2 mil) equal to Porter: MCR-43 Epoxy Primer 4300. Piping within the valve vault and wet well shall receive two (2) finish coats of coal tar epoxy (8 mil) equal to Porter: Tarset C-200. All other exposed piping (vent line) shall receive a finish coat of polyamide epoxy (4 mil) equal to Porter: MCR-43 Hi-Build and a final finish coat of aliphatic urethane (2 mil) equal to Porter: Hythane.

All buried or concrete encased ductile iron pipe and fittings shall have an outside shop coating of bituminous paint in accordance with AWWA C-110.

2.7 BURIED PIPING - PVC PIPE

In general, all buried piping used for the pump station shall be Polyvinyl Chloride (PVC) pressure pipe conforming to the requirements of Specification 3310 – PVC Sewer Force Mains.

2.8 EXPANSION COUPLINGS

Expansion couplings shall be installed where indicated on the Standard Drawings and shall be Style No. 138 as manufactured by Dresser, Type 411 by Smith-Blair, Inc., or approved equal.

2.9 PIPE HANGERS AND SUPPORTS

Pipe supports shall be constructed of Type 304 Stainless Steel in standard structural steel shapes or special supports as manufactured by Elcen, ITT Grinnell, or approved equal. Pipe supports fastened to floor or wall concrete shall be anchored with Type 316 stainless steel stud type expansion anchors. Pipe

supports fastened to ceiling concrete shall be anchored with flush setting, corrosion resistant, expansion type threaded shields. Stud type anchors shall be all Type 316 stainless steel, including studs, wedges, washers and nuts.

2.10 PIPE SEALS

All pipes that pass through walls and slabs shall be sealed to fill the annular space between the pipe and the cored hole through which the pipe passes. All metal parts of the seal shall be 300 series stainless steel, all links shall be EPDM rubber, and pressure plates shall be Delrin. All seals shall be watertight to 40 feet of head. Pipe seals shall be Link-Seal, service designation S (corrosive service), as manufactured by Thunderline Corporation, or approved equal.

2.11 PLUG VALVES

Plug valves shall be of the non-lubricating, rising stem, eccentric type with resilient faced plugs and ANSI 125 lb. flanged ends. Bodies shall be semi-steel or cast iron with raised seats and shall be of the bolted bonnet design, suitable for 150 psig pressure. Bearings shall be noncorrosive and permanently lubricated. Valve seats shall be nickel, or nickel-coated stainless steel or bronze. Valve packing shall be Nitrile- Butadiene (Buna (VEE)). The valves shall provide drip-tight shut-off in either direction approved equal.

Each plug valve shall be furnished with a handwheel and gear actuator. Gear actuators shall be of the totally enclosed wormgear type, oil or grease lubricated and sealed for watertightness, with self- lubricating bronze or stainless steel sleeve bearings, thrust bearings, built-in adjustable opening and closing stops and valve position indicators. Each actuator shall be sized to require not more than 300 inch pounds of torque in the input shaft to seat and unseat the valve plugs at the pressure drops specified herein. Valves shall open with a counterclockwise turn and shall provide drip-tight shut-off in either direction up to 150 psig.

The gear actuators shall be totally enclosed wormgear type, oil or grease lubricated and sealed for watertightness, with self-lubricating bronze or stainless steel sleeve bearings, thrust bearings, built-in adjustable opening and closing stops and valve position indicators. Each actuator shall be sized to require not more than 300 inch pounds of torque in the input shaft to seat and unseat the valve plugs at the pressure drops specified herein.

Plug valves shall be DeZurik Series 100, Homestead Ballcentric Figure 37L, Pratt Eccentric, Clow F-5410, Dresser X-Centric or approved equal.

2.12 CHECK VALVES

All check valves shall be iron body, bronze mount, with outside lever and spring, stainless steel hinge pin, 150 psi working pressure and 300 psi test pressure. Check valves shall be Mueller Company No. A-2600-6-02, Clow F-5340 or F-5381, or approved equal.

2.13 SUBMERSIBLE SEWAGE PUMPS

Each pump shall be a submersible sewage type designed to pump raw, unscreened sewage containing 3 inch diameter solids without damage during operation and shall be rated for continuous, 24-hour per day service.

Submersible pumps shall be capable of running at shut-off head without damage to seals, shafts and bearing and shall be non-overloading at any point on the pump curve. Major pump components shall be of gray cast-iron with smooth surfaces void of blow holes and other irregularities. All mating sections shall be gasketed watertight. All exposed nuts, bolts and washers shall be stainless steel.

All electrical equipment within the wet well, including pumps, motors, controls and control wiring, lights, power wiring, wiring devices and other accessories, shall comply with Article 501 of the National Electric Code for Class I, Division I locations (explosion proof).

Pump manufacturers shall be Flygt Corporation, Hydromatic/Markley Pump Company, EBARA (ADD), Gorman Rupp, Inc., or approved equal.

Impellers - Impellers shall be cast-iron, dynamically balanced, double shrouded, with long thrulet with no acute turns, and with a heavy-duty stainless or bronze wear ring. The impellers shall be designed to handle solids, sludge and fibrous materials.

Shafts and Seals - Pumps shafts shall be stainless steel and shall be supported by permanently lubricated inboard and outboard bearings using 400 series. Seals shall be tandem double mechanical type running in an oil bath and shall not require a pressure differential to effect sealing. Each pump shall be equipped with a moisture sensing device to detect water leakage past the seals and to provide an alarm contact output to the pump control circuit as shown on the drawings.

Motors - Pump motors shall be NEMA Design B, 1.0 (minimum) service factor, 460 volts, 3 phase, 60 hertz, Class F insulation rated 155°C (311°F), with three thermal devices (one per phase), embedded in the windings and connected so as to shut the pump down and provide an alarm contact output in the event of excessive motor temperatures.

Power and Control Cables - Pump power and control cables shall be “SO” type and enter the pump through heavy-duty entry assemblies which shall include elastomer grommets to protect against leakage. Cable strain relief assemblies shall be included.

Discharge Coupling - Each pump shall be furnished with a discharge coupling and mating base elbow. The elbow shall be complete with stainless steel anchor bolts and shall mate with the flanged discharge piping. Seal of the pump discharge coupling to the base elbow flange shall be accomplished by a simple downward linear motion of the pump with the entire weight of the pump being guided by two guide bars to press tightly against the discharge elbow forming a leakproof connection. Metal to metal connections shall not be permitted. No part of the pump shall bear directly on the sump floor and no rotary motion of the pump shall be required for sealing.

Guide Bars – Each pump shall be furnished with two guide bars to permit rising and lowering the pumps. The bars shall be of adequate length to extend from the lower guide holder on the pump discharge connection to the upper guide bracket at the access cover. Guide bars shall be 2-inch schedule 40 stainless steel pipe. Intermediate guide bar supports shall be provided for each pair of guide bars. Each set of guides shall also include stainless steel cable holders and stainless steel lifting chains with hooks.

2.14 LIQUID LEVEL SENSORS

The Contractor shall furnish and install a submersible level transmitter for pump control and level alarms within the pump station wet well and non-floating type level sensor for local high water alarm in the wet well and in the bar screen manhole.

The submersible level transmitter shall consist of a piezoresistive sensing element, encased in a 316 SS housing. The sensing element shall have a 0-10 psi range and an accuracy of at least ±0.25%. Acceptable products include Mercoid #PBLT2-10-60 or approved equal.

The non-floating type level sensors shall consist of a mercury switch in a smooth pear shaped chemical resistant polypropylene casing suspended on its own cable. The units shall be suitable for use in liquids with a specific gravity range of .65 to 1.5 and a temperature range of 32° to 140°F. Acceptable products include Flygt ENM-10 or approved equal.

Each unit cable shall be protected with a synthetic jacket and consist of 19 AWG wire. Sensor cables shall be furnished having minimum of 30 feet length.

2.15 GUARD POSTS

The Contractor shall furnish and install the steel guard posts as specified and as shown on the Standard Drawings. Steel posts shall be 6 inch diameter, schedule 40, steel pipe, 6 feet long, shall be installed in 3 foot deep augered holes, and anchored and filled with Class "F" Concrete as specified herein.

Steel pipe may be hot dip galvanized or mild steel pipe power wire brush cleaned and given an outside shop primer of polyamide epoxy (2 mil) equal to Porter: MCR-43 epoxy primer 4300, a finish coat of polyamide epoxy (4 mil) equal to Porter: MCR-43 Hi-Build and a final finish coat of aliphatic urethane (2 mil) equal to Porter: Hythane.

2.16 CHAIN LINK FENCE AND GATES

The Contractor shall furnish and erect chain link fencing and gates where shown on the Detail and Standard Drawings. In general, the fence will be 7 feet above grade (including 3 strands of barbed wire occupying the top 1 foot) with green privacy strips installed on entire fence. Gate(s) shall be supplied with a lift bar type lock post and a heavy duty padlock keyed to the Water Resources Department master.

Fence Fabric - shall be No. 9 gauge high quality, medium carbon steel woven in 2 inch mesh and aluminum coated in conformance with ASTM-A491 requirements. Fabric shall be fastened to line posts

with fabric bands spaced approximately 14” apart, and to the top rail with tie wires, spaced approximately 24” apart. Connection to terminal posts shall be with ¼” x ¾” galvanized steel tension bars and 7/8” bands at 14” intervals.

Posts – Line posts shall be 2.25” x 1.7” H-Beams, 4.1 lbs/ft, or 2.5” O.D. Standard Weight Pipe, 3.65 lbs/ft. End, Corner and Pull Posts shall be 3” O.D. Standard Weight Pipe, 5.79 lbs/ft. All posts shall be hot dipped galvanized (2.0 oz/sq. ft. average) after fabrication. All intermediate posts shall be fitted with hot dip galvanized extension arms of pressed steel. End, gate and corner posts to be fitted with heavy malleable iron arms. Each arm to carry three (3) barb wires securely fastened thereto. Topmost barbed wire to be 12” above the fabric and 12” out from the fence line at an angle of 45 degrees.

Top Rail - Shall be hot dip galvanized pipe 1-5/8” O.D. or "H" section, weight 2.27 lbs. per lineal foot; provided with couplings approximately every 20 feet. Couplings to be outside sleeve type and at least 7“ long; one coupling in every five to have a heavy spring to take up expansion and contraction of top rail. Top rail to pass through base of line post tops and from a continuous brace from end to end of each stretch of fence. Top rail to be securely fastened to terminal post by pressed steel connections.

Braces - Shall be hot dip galvanized and of the same material as the top rail. Braces to be spaced midway between top rail and ground and to extend from terminal post to first adjacent line post. All braces shall be securely fastened to posts by suitable pressed steel connections, then trusses from line post back to terminal post with a 3/8” round rod.

Barbed Wire - Shall consist of three (3) lines of 4-point pattern, each composes of two strands of No. 12-1/2 gauge galvanized wire.

Gate - Furnish and install the gate as shown on the Standard Drawings. Gate shall be full 7 foot height with clear opening dimensions as shown. Gate shall be braced and topped with barbed wire and brackets similar to the fence. Gate frames shall be constructed of 2” O.D. Standard Weight Pipe, 2.72 lbs./ft. with welded, malleable or heavy pressed steel corners. Frames shall have fabric matching the fence and shall have 3/8” diameter adjustable truss rods to prevent sag or twist. Gate posts shall be 3” O.D. Standard Weight Pipe, 5.79 lbs./ft. for gates 5 feet wide, or less, 4 feet in width, and 4” O.D. Standard Weight Pipe, 9.11 lbs./ft. for gates 10 feet to 20 feet in width, and 4” O.D. pipe 10.62 lbs./ft. for gates 20 feet to 28 feet in width. Gate shall be supplied with a lift bar type lock post and a heavy duty padlock keyed to the District master.

The gate shall be furnished with heavy duty galvanized hinges which afford minimum 180° swing. Double gate shall have a center rest and hold-open chains. Latch shall accommodate padlock fastening from either side.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of all pumps, liquid level sensors, and hoists to be used. Submit to the Owner's Representative for review and approval prior to ordering.

Pump submittals shall include the following:

Shop Tests – Provide certified data from similar pump on performance tests.

Pump Tests – Provide certified data from performance tests of each pump to be provided. The tests to be performed shall certify the hydraulic performance of the pump. Where applicable, the tests shall be in accordance with the Hydraulic Institute Standards. Certified curves and data sheets shall be provided to the Owner's Representative for approval prior to shipment.

Field Tests – Demonstrate that pumps can operate as specified, installed and as submitted. All field tests to be performed by, and all test reports to be prepared by, an authorized factory representative.

Following installation and prior to final acceptance, Pump Operation and Maintenance Manuals shall be furnished to the Owner's Representative for review and approval. Operation and Maintenance Manuals to include a detailed parts list, repair data, manufacturing data for couplings, bushings and pump seal assemblies, electrical diagrams, mechanical diagrams, troubleshooting data, test data, repair parts and maintenance materials, and warranty data.

3.2 SPARE PARTS

The following spare parts are required to be submitted prior to final acceptance:

Pump Spare Parts: One (1) set of seals and o-rings
One (1) full set of bearings
One (1) wear ring
One (1) impeller

PART 4 – EXECUTION

4.1 GENERAL

The Contractor shall furnish all necessary labor, material, tools, and equipment required in the installation of the Sanitary Sewer Pump Station, except as identified in Section 3301 – Sanitary Sewer Pump Station, Electrical. This work includes removal of structures and obstructions, earthwork, concrete, reinforcing steel, pump station structures, expansion joints, access hatches, buried and exposed piping, pipe couplings, pipe hangers and supports, pipe seals, valves, submersible pumps, access drives, guard posts, chain link fence and gates, site clearing and restoration. All work shall be completed as specified, as shown on the Contract Drawings and as directed by the Owner's Representative.

The surface elevation of all equipment pads, the wet well, bar screen manhole, and valve chamber shall be installed at the same elevation, to provide a level site upon final grading and backfill. The entire fenced site, other than area designated to be paved, will have a 2 mil plastic vapor barrier placed 1' past the fence line and covered with 6" of compacted #4 stone.

The Contractor is responsible to repair or replace all pavement and roadway surface disturbed by the contractor, as a result of the sewer pump station installation, to the satisfaction of the governing entity of said pavement or roadway surface.

Flow in existing sewers shall not be disrupted due to construction related to this project. Existing flow (including that caused by rain events) shall be maintained by pumping (or some other approved method) around the construction area. Adequate sizing of the temporary pumps required to convey the existing flow is the responsibility of the contractor. Any temporary pumping required for satisfactory construction of this project shall come at no additional expense to the Owner.

4.2 CONCRETE

Where required, installation of reinforcing steel shall conform to the requirements of ODOT 509, except as modified herein. All top bars in slabs shall be furnished with a standard hook at discontinuous edges; however, base slabs shall have hooks on the bottom bars.

Where the underneath side of the concrete slabs will be exposed, the reinforcing shall be supported with a non-corrosive and non-staining type chair, bolster or support.

Suitable moldings or bevels shall be placed in the concrete forms to bevel the corners and edges of the concrete to provide a continuous chamfer unless otherwise directed by the Owner's Representative.

Precast concrete structures may have 1 ¼" holes for handling cast in the risers. These holes shall be plugged once the structure is in place.

4.3 PIPING

In general, all pipe not buried in the ground or pipe encased in concrete shall be Class 53 Ductile Iron flanged mechanical joint pipe in accordance with ANSI A21.15, AWWA C-115 and all buried piping used for the pump station shall be Polyvinyl Chloride (PVC) pressure pipe conforming to the requirements of Specification 3310 – PVC Sewer Force Mains.

Cutting Pipe – Whenever a length of pipe requires cutting to make a closure in the line, the work shall be done in a satisfactory manner so as to leave a smooth end at right angles to the axis of the pipe. For ductile iron pipe, cut ends shall be coated with bitumastic or primer as required to match shop coat.

Drilling or tapping – All drilling and tapping for threaded pipe connections, shown on the Standard Drawings or required by the Owner's Representative, shall be done in such a manner that the pipe, when screwed tightly into the tapped hole, will not project into the pipe or fittings.

Pipe Hangers and Supports – The Contractor shall furnish and install all pipe supports as shown and located on the Standard Drawings. Where pipe supports are not shown on the Standard Drawings, the Contractor shall locate and select the supports as approved by the Owner's Representative.

4.4 VALVES

Plug Valves - Where possible, all plug valves shall be installed with shafts horizontal and plugs opening to the top of the valve. Seat ends of plug valves shall be located such that when closed, the line pressure will hold the plug against the seat, unless specifically noted otherwise on the drawings.

4.5 PAINTING

All metal surfaces, other than stainless steel, shall have non-machined surfaces painted in accordance with Section 2.6 of this specification.

4.6 LIQUID LEVEL SENSORS

Level Sensors shall terminate in the junction box mounted on the wet well slab. All liquid level sensors shall be readily accessible from the hatch opening. Liquid level sensors shall be provided as scheduled below (reference CCWRD standard details S5.1.1 and S5.1.2) and installed as shown on CCWRD standard detail S5.1.4:

Liquid Level Sensor Type	Installation Elevation
Submersible Level Transmitter	Below Elev. "F"
Non-Floating Type Level Sensors	Elev. "J"

4.7 GUARD POSTS AND FENCE POSTS

All guard posts and fence posts shall be installed 3' deep and embedded in class "F" concrete. Post hole diameters shall be a minimum of 9 inches for line posts and 12 inches for all other posts. Concrete tops shall be crowned to shed water. Guard Posts shall be painted safety yellow.

4.8 ACCESS DRIVEWAY – ASHPALT CONCRETE ON AGGREGATE BASE

Where indicated on the drawings, the pump station access driveway shall consist of the following:

Aggregate Base - Two (2) 6" courses of compacted crushed aggregate meeting the material requirements of ODOT 304

Asphalt Surface Course – One (1) 2" compacted courses of asphalt surface meeting the material requirements of ODOT 448

PART 5 – TESTING

5.1 GENERAL

The Contractor is responsible to provide all tools, materials, gauges, and water that are necessary to complete the testing as specified herein. All testing must be witnessed and approved by the Owner's Representative.

5.2 PIPING

All piping shall be tested in accordance with Section 3310, PVC Sewer Force Main. Testing to be performed after all couplers have been installed. Contractor to provide, at no additional cost to the Owner, all bulkheads required to complete the testing.

5.3 MANUFACTURER'S REPRESENTATIVE

The Contractor shall secure the services of a technical representative of the various equipment manufacturers to supervise, adjust, align and check the installation of said equipment and to instruct the Water Resources Department operating personnel in the operation, care and maintenance of the equipment. All equipment shall be given a running test to demonstrate to the Water Resources Department its readiness for continuous operation.

5.4 WET WELL, BAR SCREEN MANHOLE, AND VALVE CHAMBER

The wet well, bar screen manhole and valve chamber shall all be vacuum tested in conformance with Section 3200, Gravity Sewer Manhole. If it is determined to be impractical, and authorized by the Owner's Representative, a hydrostatic test may be performed in lieu of vacuum testing. If a hydrostatic test is the approved testing method, it shall be conducted in accordance with AWWA D110-04, Section 5.13 'Watertightness' testing.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the lump sum unit price bid for Item 3300 – Sanitary Sewer Pump Station, General. Any additional materials required by the pump manufacturer, but not shown on these drawings, to allow these pumps to function in the required manner and in accordance with the pump warranty, shall be furnished and installed as part of this item. All electrical equipment furnished under this section shall meet all requirements of Section 3301-Sanitary Sewer Pump Station, Electrical.

All wiring from the pumps to the pump junction boxes, as shown on the drawings, shall be furnished under Item 3300. All electrical connections shall be performed as part of Section 3301 – Sanitary Sewer Pump Station, Electrical.

The Contractor also has the option to bid both the General work and Electrical work (Sections 3300 and 3301). Bid options are as follows:

Item	Unit	Description
3300	Lump Sum (LS)	Sanitary Sewer Pump Station, General
3300 / 3301	Lump Sum (LS)	Sanitary Sewer Pump Station, Complete

END OF SECTION

SECTION 3301 – SANITARY SEWER PUMP STATION, ELECTRICAL

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary for furnishing and installing a sanitary sewer pump station as indicated on the Standard Drawings, except as identified in Section 3300-Sanitary Sewer Pump Station, General, and as specified herein.

1.2 GENERAL

This work shall consist of providing all labor, materials, and equipment necessary to construct, install and place in satisfactory service, the complete electrical systems and all electrical work as specified herein and as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

The electrical work shall include the following:

a) Conduit, conductors, circuits, switches, connections, etc. for all electrically operated equipment furnished for the Pump Station. All wiring, conduit, circuit breakers, fuses, switches, motor starters, transformers, pilot devices, control circuits, wiring connections and any electrical device necessary for the completion of the Pump Station, shall be furnished and installed.

   It shall be the responsibility of the Contractor to check and coordinate all of the electrical work required for the Pump Station; to provide the correct electrical service to each piece of electrical equipment furnished and installed; and to check and coordinate the required electrical service and controls with the actual utilization equipment provided.

b) Service Entrance, 480 volts, 3 phase, 60 cycle, A.C. from Service Entrance drop provided by Duke Energy to the Pump Control Panel.

c) Distribution System for Power, complete, including Pump Control Panel, Emergency Standby Electric Generator, feeders, circuit breakers, fuses, switches, motor starters, control equipment and connections to utilization equipment at 460 volts, 3 phase, 60 Hz A.C.

d) Distribution Systems for Single Phase power, complete including feeders, control power transformers, circuit breakers, branch circuits, switches, receptacles, connections to utilization equipment and all other appurtenances at 120 volts, 1 phase, 60 Hz A.C.

e) Grounding Systems.

f) Service of a competent field engineer from the staff of the equipment manufacturer to check out and approve the installation of the major units of electrical equipment.

Equipment specified by means of a manufacturer's designation does not limit the equipment to that manufacturer but is for the purpose of establishing standards. Equipment furnished shall meet the detail requirements of these specifications and shall be the products of General Electric, Siemens or Square D (listed alphabetically) or approved equal by others, with a NEMA rating.

g) Supervisory Control and Data Acquisition (SCADA) System components.

1.3 RELATED WORK

A. Section 3300 Sanitary Sewer Pump Station, General

PART 2 – PRODUCTS

2.1 GENERAL

All materials used shall be new and shall bear the inspection labels of Underwriters' Laboratories if material is a class inspected by said laboratory.

All work and appliances shall conform to the requirements of the National Electrical Code, to the requirements of the Ohio Board of Building Standards, to the regulations of Clermont County, to the additional requirements of these Specifications, and is subject to the approval of the Electrical Inspector assigned by the Division of Factory and Building Inspection. The Contractor shall obtain all necessary permits required to perform the work required for the Pump Station.

Where discrepancies arise between codes, the most restrictive regulation shall apply. The Specifications are intended to reinforce and strengthen the above regulations and codes and add additional requirements to the regulations and codes. It is not intended that these Specifications be in conflict with any applicable regulations and codes but to only supplement the regulations and codes.

Workmanship shall be first class in every respect and the Contractor's attention is called to the fact that neat and workmanlike appearance in the finished work is required.

2.2 WIRING

All conductors shall be annealed copper, stranded insulated wire. All wires shall be run in aluminum rigid metal conduits unless otherwise specified herein. The sizes of the conductors shall conform to the requirements of the National Electrical Code with the additional requirements for minimum sizes specified herein.

True three phase required/no open delta on all motors 15HP and larger.

No wire smaller than No. 12 AWG shall be used except that remote control circuits for motor starters and electronic equipment power feeds may be No. 14 AWG stranded wire if the circuits require less than 10 amperes. Insulation for all low voltage wires shall be 600 volt rated Type THHN/THWN unless specified otherwise herein.

All underground wiring should be type XHHW-2 for power and Class 1 control circuits, rated 600v insulation. Belden 8760 or equivalent for all 4/20 MA control wiring, rated 300V.

Metering signal wires shall be No. 18 (16x30) or No. 16 (19x29), 2 conductor twisted pair shielded cable. The shield shall be 100 percent coverage aluminum-polyester tape with tinned-copper drain wire. Ground shield at load location only and as recommended by instrument manufacturer. Shield and drain wire shall be kept isolated from raceway and all metal parts of system. *The cable shall be Belden No. 8760, 8719 or equal by others.*

All electrical connections shall comply with the requirements of the National Electrical Code. All stranded conductor connections of No. 12 AWG and smaller shall utilize ferrule type crimp connectors to regain the integrity of solid core wire. All electrical connections No. 8 AWG and larger shall be made by a pressure plate or wire clamp type connection. All connectors shall be properly sized to match the wire and terminals size.

Where more than three power or lighting wires are installed in one conduit, they shall be derated in accordance with the National Electrical Code. All wire sizes specified herein, are based on not more than three (3) power or lighting wires in a conduit.

2.3 CONDUIT

All conduit installed for the Pump Station shall be aluminum rigid conduit unless specified otherwise.

Conduits run concealed shall be 1-inch size minimum. All other conduit shall be a minimum of 3/4 inch. All conduit sizes shall be one size larger than required by the National Electrical Code for the number and size of conductors installed.

All underground electrical conduits to be Schedule 80 PVC, concrete encased, red dye, with detectible marking tape buried 12" above concrete encasement. Transition to Aluminum Rigid Conduit (ARC) at 6" below grade, ARC to be coated with bitumastic material where in direct contact with earth. All threaded ARC joints to be coated with Moalox Anti-Oxidant Compound.

Conduit fittings shall be of the threaded type with aluminum metal bodies, and rust or corrosion resistant protective coating. All covers shall be aluminum and shall have gaskets of a type approved

by the Owner. All conduit hubs shall be Myers Hub type or equivalent, shall be cast aluminum, have tapered threads, and all joints shall be watertight.

Expansion fittings shall be OZ Type "AX" with Type "BJ" bonding jumper, Crouse Hinds Type "XJ" with bonding jumper, or equal.

All conduit and equipment installed shall conform to the requirements for installation in the designated hazardous area as described in Article 500, 501 and 502 of the National Electrical Code. *Seal fitting shall be Series EYS by Appleton Electric Company, Series EYS by Crouse Hinds Company or equal by others.*

Conduit racks shall be stainless steel channel framing type by Unistrut, Globe Strut or equal. The basic member minimum size shall be the 1-5/8 inch x 1-5/8 inch x 12 Ga. channel with accessories as required. Support channels, bolts and nuts, and all accessories shall be stainless steel. Anchors to concrete shall be 304 stainless steel expansion type.

2.4 OUTLET BOXES, JUNCTION BOXES, PULL BOXES AND FITTINGS

All outlet boxes, junction boxes and pull boxes are to be 300 series stainless.

All boxes installed in concrete or masonry shall be deep type with a total minimum box depth of 3-1/2 inches, so concealed conduits entering sides of boxes can clear steel reinforcing rods.

All boxes shall be sized for at least the maximum number of wires which are allowed by these specifications in the conduits leading up to these junction boxes. All boxes shall have removable gasketed covers and shall be watertight. **ALL COVER FASTENING SCREWS SHALL BE STAINLESS STEEL.** All conduit entrances shall be sealed watertight and link sealed if penetrating a structure below grade.

All outlet boxes shall be at least 2-1/2 inches deep, single gang or multigang type and of a size to accommodate the devices required. *Surface mounted outlet boxes in non-hazardous locations shall have exterior mounting feet, shall use only single gang covers, and shall be Crouse Hinds No. FD01, FD02, FD03, Adalet FD0, FD2, FD3 or equal.* All cover plates shall be single gang type, even on multigang boxes, and shall be stainless steel metal covers with neoprene gaskets and stainless steel fastening screws. All boxes, fittings and supports shall also meet the requirements for Conduit. All exposed metal items such as nuts, bolts, supports, must be made of approved stainless steel material.

The Contractor shall furnish and install, at the pump station wet well, one (1) junction box as detailed on CCWRD standard detail S5.1.4. The junction box shall have minimum 100 amp terminals for motor terminations and minimum 25 amp terminals for thermal and moisture detection *100 ampere terminals shall be equal to Allen Bradley 1492-CD2. 25 ampere terminals shall be equal to Allen Bradley 1492-F1.*

2.5 GROUNDING

Main grounding conductors, grounding electrode conductors and main bonding jumpers shall be no smaller than #3/0 stranded insulated copper cable, annealed, with no less than nineteen (19) strands in the cable. Connections to equipment shall be made with approved extra heavy copper solderless connectors.

2.6 STATION GROUNDS

Ground rods shall be ¾ inch diameter by 10 feet long. They shall have a heavy exterior layer of non-porous, pure copper, inseparably molten welded to a high carbon steel core. They shall have a rolled scar-resisting surface. Both ends of the rod shall receive the same heavy coating of copper as the body of the rod. The driving end of the rod shall be chamfered and the point shall be machined smooth, to aid in driving.

2.7 120 VOLT SWITCHES, RECEPTACLES AND COVER PLATES

Switches for lighting circuits shall be rated at 20 amps, 120 volts, and shall be by General Electric or Hubbell as listed below or equal.

Service	General Electric No.	Hubbell No.
Single Pole	GE5951-2	1221-I
Three Way	GE5953-2	1223-I
Four Way	GE5954-2	1224-I

Cover plates for switches installed only in flush mounted boxes, where a weatherproof cover plate is not required, shall be stainless steel flush mounting Type No. 93071 through 93076 by General Electric, Hubbell or equal by others, as required. Cover plates for switches installed in all surface mounted boxes and flush mounted where a weatherproof cover plate is required, shall be cast metal single gang type with gaskets for a NEMA 4 Type installation, Crouse Hinds No. DS-185 or Adalet No. WSL or equal by others.

All lighting circuit receptacles shall have NEMA 5-2OR configurations. *Receptacles installed in all flush mounted boxes where a weatherproof cover plate is not required shall be duplex, grounded, 20 ampere, 125 volt receptacles General Electric GE0526-C, Hubbell No. 53CM62 or equal by others, with stainless steel cover plates, General Electric 93101, Hubbell No. 93101 or equal by others. Receptacles installed in all flush mounted boxes where a weatherproof receptacle is required and in all surface mounted boxes, shall be the same as above with single gang type cast metal self closing spring door cover plates and gaskets meeting OSHA, NEC and UL standards for use in wet locations, Course Hinds No. WLRD-1 or equal by others.*

Ground fault circuit interrupter (GFCI) duplex receptacles shall have NEMA 5-15R configurations. The receptacles shall conform to UL Standard 943 for Safety, Class A. *The receptacles shall be Arrow-Hart No. 1591, Hubbell No. GF-5262 or equal by others, with stainless steel cover plates, Arrow-Hart No.97061, Hubbell No. S-26 or equal by others.*

2.8 CIRCUIT BREAKERS

Electrical circuits shall be protected by molded case circuit breakers. Each pole of these breakers shall provide inverse time delay overload protection and instantaneous short-circuit protection by means of a thermal-magnetic element. Magnetic only, molded case circuit breakers, may be used only in three phase combination motor controllers. The minimum interruption ratings of the circuit breakers shall be at least equal to the available short circuit at the line terminals.

The breakers shall be operated by a toggle type handle and shall have a Quick-made, Quick-break overcenter switching mechanism that is mechanically trip free from the handle. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position mid-way between the manual ON and OFF positions.

Breakers must be completely enclosed in a molded case. Terminals shall be listed with Underwriter Laboratories suitable for use with copper cable. Circuit breakers shall be listed with Underwriters' Laboratories, Inc., and conform to the requirements of NEMA Standard Publication No. AB1-1975 and meet the appropriate classifications of Federal Specifications W-C-375b.

The circuit breakers shall be the General Electric or Westinghouse Types listed below, or equal by others.

West. Type	G.E. Type	Max. Amps.	Type Trips	Interrupting Rating Sym.RMS Amps		
				120 V	208/240V	480V
BAB	THQB	100	N	10,000	10,000	-
QBGF	THQB-GFCI	30	N	10,000	-	-
EB	TEB	100	N	10,000	10,000	-
FDB	TED	150	N	-	18,000	14,000
FD	THED	150	N	-	65,000	25,000
JD	TFK	225	IA	-	25,000	22,000
HMCP*	TEC/TFC/TJC	600	NA	-	25,000	25,000

(I) Interchangeable Trips
(N) Non-interchangeable Trip
(A) Adjustable Magnetic Trips
* Magnetic only for individual Motor Circuits only.

2.9 THREE PHASE MOTOR CONTROLLERS

Three phase motor controllers shall be magnetic coil operated, horsepower rated equipped with 3 overload elements and a fused pilot control transformer for 120V pilot control. All controllers shall be combination type controllers with circuit breakers used in combination type controllers conforming to Section 2.8, Circuit Breakers, of these specifications. All combinations of motor size, fuse size, circuit breaker size, overload size and contractor size shall conform to the National Electrical Code.

Control power transformers shall be provided in accordance with section 2.11.

Overload relays shall be manually reset from outside the enclosure by means of an insulated bar or button. The relays shall be of the temperature compensating type and have heaters sized to coordinate with the actual motors being controlled.

The three phase motor controllers shall be Siemens NEMA rated not IEC, or equal by others. For all motors over 15 HP shall be equipped with soft start/stop starters.

2.10 PILOT CONTROL DEVICES

Pilot control devices shall be furnished and installed in the pump control panel of Section 2.11 of these specifications for the proper functioning of each piece of utilization equipment.

Pushbuttons, selector switches and pilot lights shall be heavy duty, oil tight Allen Bradley Bulletin 800T, General Electric Type CR2940, Square D Type K, Westinghouse ElectricType PB2 or equal by others. Pilot lights shall be push-to-test transformer type (120 VAC x 6 VAC) LED lights, color as described in section 2.11. All pilot control devices shall have screw terminals for wire connections. All pushbuttons, selector switches and indicator lights shall have custom lettered, jumbo size legend plates with black engraved lettering on a white background.

Relays shall be sized for the load conditions. *Light duty relays shall be general purpose plug in type mounted on heavy duty octal sockets, Finder Type 46 Series or equal by others.* Heavy duty relays shall be used for motor control circuits and similar duty. *Heavy duty relays shall have 10 amperes rated 300 volt A.C. convertible contacts and shall be Allen Bradley Bulletin 700 Type N, Square D Class 8501 Type GO-40, or equal by others.* All relays shall have 120 VAC coils.

2.11 PUMP CONTROL PANEL

The Contractor shall furnish and install a pump control panel for pump and equipment control. The enclosure shall be constructed in accordance with JIC Electrical Standards for Mass Production Equipment, except as modified herein.

1. The pump control panel shall be manufactured by a UL panel builder and the assembly shall bear a serialized UL label for "**Enclosed Industrial Control Panels**". Listing for open style industrial control panels or an assembly of listed or recognized components shall not be acceptable.

A. Enclosure

The custom made enclosure shall be of formed type construction with welded seams and corners throughout. All exposed metal shall be hand selected for finish and to be level. The enclosure shall be constructed of 12 gauge, or heavier, NEMA 4X 300 series stainless steel, powder coated White, Ivory, or an approved lighter color and shall have a No. 6 finish. All welds shall be ground smooth and finished to give a uniform appearance to the entire enclosure.

The enclosure shall have two uniquely gasketed, overlapping doors which eliminate the need for a center post. The door gaskets shall be oil resistant, attached with an oil resistant adhesive and held in place with retaining strips. The doors shall be supported with heavy duty full length piano type hinges and shall have an oil tight pad lockable handle with three point latching mechanism.

All hardware on the enclosure, hinges, pins, clamps, nuts, bolts, washers, screws, etc., shall be stainless steel. All components inside the enclosure shall be mounted on panels which are bolted to the enclosure with collar studs. All interior panels shall be painted a high gloss white. The enlosure shall be provided with a corrosion-resistant drawing pocket on the door interior.

The Contractor shall furnish a control panel of the size required to house the manufacturer's equipment supplied and all other electrical components installed in the enclosure as approved by the Owner's Representative.

The control panel shall be designed so that all conduit enters and leaves through the bottom or lower rear of the unit unless otherwise noted. All holes for installation of conduit shall be sealed watertight after equipment installation.

All electrical equipment and controls for the pump station shall be mounted inside the pump control panel enclosure. There shall be no equipment mounted on the external faces of the enclosure with the exception of the control power transformers, unless approved otherwise. All access to equipment shall require the opening of the enclosure doors. The equipment mounted inside the enclosure shall include the emergency and normal source circuit breakers, the generator remote monitor, the transfer switch contactor and intelligent section, surge protection, a GFCI receptacle and the circuit breaker type combination starters for the pump station pumps.

The pump control panel shall include the following controls for duplex pump installations mounted on a two part, fully hinged, ¼ turn closure inner door: A Hand-Off-Automatic selector switch, a green running indicator light and a red pump seal failure indicator light for each pump and a red flashing LED high wet well level alarm indicator light mounted on top of the panel;.

For triplex (three pump) pump stations the pump control panel shall include all the controls as for duplex pump stations, plus the following additional controls: A three (3) position selector switch to select which pumps are the lead and lag pumps and

The enclosure shall have a ground bus for connection of all ground wires. All relays, timers, pushbuttons, selector switches and pilot lights shall conform to the requirements of Section 2.10 of these specifications. All legend plates shall be custom lettered as approved by the Owner's Representative.

B. Wiring

Panel wiring shall be general purpose open type with all connections clearly identified and with all connections external to the panel connected to terminal strips mounted on a subpanel at the lower rear of the enclosure. All wires shall be numbered and labeled at each termination and at each junction of the wire. Wiring shall be single conductor, stranded copper, rated 600 volts at 75°C,

Type XHHW. Wire size shall be No. 14 AWG minimum or larger if load requirements so dictate. All dc signal wiring shall be two-conductor shielded cable, size no. 16 AWG, equal to Belden No. 8719. Separate ac wiring from dc wiring. All wiring terminations shall be by means of insulated solderless pressure type connectors equal to T&B Sta-Kon, Vaco, or Ideal terminals.

All wires shall terminate at terminal strips. The terminal strips shall be screw terminal type with barriers between the screws and shall be rated for use at 600 volts. The ac terminals shall be separated from the dc terminals. Twenty percent spare terminals shall be provided for both ac and dc terminals. All terminals shall have a terminal labeling surface and all terminals shall be labeled with the appropriate wire number. The terminals shall be Allen Bradley Catalog Number 1492-CD8, G.E. CR151A3, or equal by others. Soldered type connections are not acceptable.

All components in the enclosure shall be completely wired to the terminal strips within the enclosure, before being delivered to site. Field work shall consist of setting the enclosure in place and making field wiring connections to the terminal strips.

All wiring shall be run along vertical or horizontal routes and bundled together to present a high quality design and neat appearance. Angled runs are not acceptable. All parallel runs of wire shall be grouped together and installed in vinyl plastic lay-in wiring ducts or tied together in bundles with nylon cable ties where wiring ducts cannot be used. Wiring to equipment mounted on doors or where movement of the equipment will take place shall be installed in nylon spiral wrapping sheaths equal to Panduit Type T or Voltrex Type HWN. All wiring ducts and cable ties shall be solidly bolted or screwed into place where they are secured to the panel. Adhesive type mountings are not permitted. Lay-in wiring ducts shall have snap-on covers and slots in the duct sidewall for easy wire insertion and shall be equal to Panduit Type E and Voltrex Type WDS.

C. Control Transformers

The pump control panel shall have two (2) control power transformers, one (1) for pump control circuits and one (1) for miscellaneous 120 volt power loads. Transformers shall be mounted outside of the pump station control panel in NEMA 3R enclosures unless otherwise noted. The transformer for pump control shall have a fusible switch, equal to Allen Bradley 1492 H6, in each primary leg, one secondary leg fused and the other secondary leg grounded. The transformer for miscellaneous loads shall have circuit breaker protection in both the primary and secondary. Circuit breakers shall also be included to protect the circuits for the GFCI receptacle, the engine block heater, the battery charger, the enclosure heater and one spare circuit.

D. Variable Frequency Drives

Where required by the Owner, provide a variable frequency drive (VFD) for each pump. VFD shall be used for conversion of single phase power to 3 phase power.

E. Surge Arrestor

Provide a surge arrestor on incoming single –phase and 3-phase power.

F. Climate Control

The enclosure shall have a forced air type space heater, 120-volt with thermostat to control condensation in control panel. The enclosure temperature shall be maintained at 40 degrees Fahrenheit (° F.) in ambient temperatures as low as -10° F. Thermostat controlled panel ventilation shall also be supplied. Ventilation shall consist of the following components, size and quantity to be determined by enclosure requirements. No less than (1) 120v 6" Axial fan, (1) 120vac din mount thermostat, (1) ea. inlet and outlet filter with fan shroud.

G. Power Monitor

Provide a power-monitoring relay in control panel for phase-failure protection. Include the following items:

1) 3-Phase Line Voltage Phase Monitor: SymCom Motorsaver Model 460
2) 1-Phase Line Voltage Phase Monitor: Finder 46.52.8.120.0040

2.12 SCADA SYSTEM

It shall be the responsibility of the Contractor to furnish and install supervisory control and data acquisition (SCADA) equipment compatible with the receiving equipment operated by the Owner.

All wiring and conduits required to connect the SCADA equipment with the alarm contacts or switches shall be furnished and installed by the Contractor as specified herein and in accordance with the Water Resources Department's existing SCADA system.

SCADA equipment required at each pump station installation shall include, but not be limited to, the following items and all associated wiring and connections:

Quantity	Description	Manufacturer	Model	Part #
1	PLC	Allen Bradley	Micrologix 1400	1766-L32BWAA
1	Verizon Network Enabled SCADA Radio	Sierra Wireless	GX400	1202182
1	Antenna	Digital Antenna	Powermax	295-PW
1	Antenna Surge Protector	Times Microwave Systems		LP-STRL-NFF
1	12VDC Power Supply	Array Electronic Co.		SP-12AS

2.14 ODOR CONTROL CHEMICAL FEED SYSTEM

Contractor shall supply and install one (1) odor control chemical feed system at each lift station site. The system must be sized accordingly with the capabilities of injecting the odor control chemical directly in the force main or in the lift station wet well. Each system shall have a minimum tank size of 1,000 gallons and include one (1) full tank at start-up.

2.15 EMERGENCY STANDBY GENERATOR

The Contractor shall furnish and install a diesel powered emergency standby generator capable of continuous service at rated output for the duration of any utility power failure. It shall be the responsibility of the Contractor to check and coordinate all appurtenances required by this system, to provide all such appurtenances whether or not shown and specified, and to check and coordinate all construction required to complete the system. The fuel tank will be sized with a MINIMUM 36 hour operating capacity. Transfer switches are to be mounted in a separate, minimum NEMA 3R rated, enclosure. The diesel powered emergency standby generator shall be manufactured by Kohler or approved equal.

The diesel powered emergency standby generator shall include a five (5) year full parts and labor warranty, including travel. Spare parts shall include spare filters and block heater.

For stations specifically noted to not receive a standby generator, the Contractor shall furnish a double throw safety switch with cam lock connectors made by Cutler Hammer, or approved equal, in lieu of an automatic transfer switch.

PART 3 – SUBMITTALS

3.1 GENERAL

Before beginning the electrical work, the Contractor shall submit to the Owner's Representative, for approval, the following data:

1. Wiring diagrams and conduit layout drawings showing sizes, quantities and locations of all conduits, conductors and all other electrical equipment being installed. All panel components shall be clearly labeled and identified. All wire numbers shall be clearly shown and sufficiently explained on shop drawing legends.

2. Plans, specifications, drawings and full descriptions of all equipment to be furnished, with complete wiring diagram and equipment data. This includes all components inside the major items of equipment and shall include any and all drawings or instructions required by someone installing, adjusting and/or operating this equipment.

3. Shop drawings shall include name plates, circuit labels and wording for review and approval by the Owner's Representative.

Each piece of equipment shall have its required drawings approved prior to the manufacture of the equipment.

Final as-built wiring diagrams and conduit installation drawings shall be made by the Contractor in triplicate and given to the Owner's Representative prior to the final acceptance of the facility. These drawings shall accurately show the actual location of all conduits, boxes and other electrical equipment and the number and intended use of all wires.

3.2 SPARE PARTS

All spare parts recommended by the manufacturers of the various items of equipment in any of their literature shall be furnished by the Contractor and turned over to the Water Resources Department. In addition, all parts, equipment and/or supplies necessary to keep the equipment operating successfully for the first year of operation shall be furnished by the Contractor and turned over to the Water Resources Department. Spare parts supplied by the Contractor shall include the following:

1. One (1) spare fuse for each and every fuse in service up to a maximum of ten (10) for any one (1) size fuse.
2. One (1) spare pilot light bulb for each and every pilot light bulb in service.
3. One (1) spare unit for each ten (10) or less of each size and type of each of the following components furnished: Control transformers, pilot light assemblies, switch contact blocks, relay contact cartridges, selector switch assemblies and pushbutton assemblies.
4. One (1) spare starter. If the lift station includes Variable Frequency Drives (VFD's), a spare VFD shall be supplied.

3.3 OPERATION AND MAINTENANCE (O&M) MANUALS

Three (3) sets of complete bound instruction books for the Emergency Standby Pumping and all other Electrical Equipment shall be furnished to the Water Resources Department. Each book shall contain complete and detailed operating and maintenance instructions on all components of the equipment. Manuals which describe general information on the manufacturer's complete line of equipment will not be acceptable.

3.4 PERMITS

Unless already obtained by the Owner, the Contractor shall obtain all necessary permits required to perform the work required for the Lift Station. This includes local Building Permits and State Fire Marshall Permits for fuel storage tanks. Submit copies of all permits, applications, and approvals to the Owner's Representative. The Contractor shall coordinate all permit inspections necessary to comply with local, state, and federal regulations and shall be responsible for any re-inspection fees.

PART 4 – EXECUTION

4.1 GENERAL

The Contractor shall furnish all necessary labor, material, tools, and equipment required in the installation of the Sanitary Sewer Pump Station, except as identified in Section 3300 – Sanitary Sewer Pump Station, General. This work includes all labor, materials, equipment, services and incidentals required to construct, install and place into satisfactory service, the complete electrical

systems and all electrical works as specified. All work shall be completed as specified, as shown on the Contract Drawings and as directed by the Owner's Representative.

4.2 WIRING

All wires shall be run in aluminum rigid conduits, unless otherwise specified herein.

All conductors shall be identified by circuit number and phase at each end, at each termination and at each splice location by a permanent non-rotting band over the insulation.

Where possible, install cable continuous, without splice, from termination to termination. Where required, splice in junction box using terminal boards. Splices in conduits will not be allowed.

Install instrumentation cable conduits as far as possible from power cable conduits.

4.3 CONDUIT

All conduit joints shall be cut square, threaded, reamed smooth and drawn up tight. Bends or offsets shall be made with standard conduit ells, field bends made with an approved bender or hickey, or hub-type conduit fittings, all conforming to the requirements of the National Electrical Code Table 346-10 (a), for the minimum bend radius allowed.

The conduit shall be installed in straight runs so far as possible and in no case shall the Contractor install more bends than allowed by the National Electrical Code without providing a pull box or access fitting. The conduit shall be so installed that any water which may collect in the pipe will drain to the nearest pull box, if possible.

Conduits shall be continuous from outlet to outlet, from outlets to cabinets, pull or junction boxes and shall be secured to all boxes with locknuts, bushings and O-rings in such manner that each system shall be waterproof and electrically continuous throughout. Conduit ends shall be capped to prevent entrance of moisture and foreign materials during construction. All conduits shall have a ground wire installed in the conduit. See Section 4.5, Grounding, for ground wire size.

Connections to existing conduits and other places where it is impossible to make a threaded connection shall be by waterproof threadless connections. A bonding jumper wire shall be connected across this connection. The bonding jumper wire shall be fastened at each end with stainless steel hardware. *Under no condition will a set screw type of union be allowed.*

All rigid metal exposed conduits 1-1/2 inches and smaller shall be supported at 5 foot centers or less and all conduit larger that 1-1/2 inches shall be supported at 10 foot centers or less.

Conductors of different voltage levels shall be in separate conduits except where approved otherwise. 460 volt circuits, 230 volt circuits, 120 volt circuits, signal, telephone,

intercommunication, analog metering circuits, dc pulse circuits, and all other circuits shall each be in separate conduits unless approved otherwise.

Expansion fittings shall be installed in long runs of exposed conduits, in any condition where thermal expansion and contraction could cause misalignment of the conduit, and in a run of conduit, whether in concrete or surface mounted, where the conduits cross structural expansion joints. See Section 2.3 for approved expansion fittings and bonding jumper.

All wiring installed underground shall be installed in Schedule 80 PVC conduit and the conduit encased all around in 4 inches of concrete. All underground conduit shall be at least 24 inches below the surface. All underground electrical conduits to be Schedule 80 PVC, concrete encased, red dye, with detectible marking tape buried 12" above concrete encasement. The underground conduit encasement shall be doweled into the structural concrete with a minimum of four (4) #5 x 4 foot long reinforcement bars per conduit. Where underground conduits enter a structure, building or tank, a watertight flexible connection shall be provided and a pull box or fitting shall be mounted on the inside face of the wall. Water drainage out of pull boxes at underground conduit entry shall be provided. Wiring and terminals shall be placed away from water. An insulated ground wire shall be installed in all underground conduits. All metal parts of the underground conduit system and all equipment shall be grounded. See Section 4.5, Grounding, for ground wire size.

For individual exposed conduits passing through new walls or slabs, install sleeves, unless specified otherwise, in the wall or slab, and seal watertight between the conduit and sleeves after conduit installation. Wall sleeves shall be aluminum pipe with waterstop collar, unless shown or specified otherwise. Watertight seals shall be mechanical type seals. All pipes that pass through walls and slabs shall be sealed to fill the annular space between the pipe and the cored hole through which the pipe passes. All metal parts of the seal shall be 300 series stainless steel, all links shall be EPDM rubber, and pressure plates shall be Delrin. All seals shall be watertight to 40 feet of head. Pipe seals shall be Link-Seal, service designation S (corrosive service), as manufactured by Thunderline Corporation, or approved equal.

Concealed conduits in poured concrete walls or slabs shall be run in the center of the wall or slab for maximum concrete cover over the conduit. Concealed conduits shall be accurately measured for location prior to being covered and this location marked on record drawings for future reference.

All conduits shall run parallel to building lines when installed within buildings, or other concrete structures, and parallel to plant structures when installed outside of structures underground, unless approved otherwise. All conduits, boxes, fittings, equipment and other material shall be supported by pipe straps or suitable clamps or hangers attached to the elements of the building structure to provide rigid installation. All conduits, fittings and enclosures shall be spaced at least 1/4 inch away from walls and slabs. Spacers shall be stainless steel, PVC or nylon.

4.4 OUTLET BOXES, JUNCTION BOXES, PULL BOXES AND FITTINGS

The Contractor shall furnish and install all outlet boxes, junction boxes, pull boxes and fittings where specified herein, and/or where required. All boxes, fittings and supports shall also meet the Conduit requirements of this specification. ***All boxes, mounting anchors, cover plates, fastening screws, bolts, nuts, etc. shall be stainless steel.***

Junction boxes shall be securely mounted to the building structures with supporting facilities independent of the conduits entering or leaving the boxes. All surface mounted boxes installed against concrete or masonry shall be installed with a 1/4 inch space between the box and the mounting surface. Spacers shall be stainless steel, PVC or nylon.

Conduit fittings shall be of the threaded type with cast or malleable metal bodies and rust or corrosion-resistant protective coating. All covers shall be cast type and shall have gaskets of a type approved by the Owner. Hubs shall have tapered threads and all joints shall be tight.

Provide terminal blocks for cable termination in all junction boxes. All conduit and cable entrances in boxes shall include plastic insulating bushings for wire protection.

Pump removal for the Pump Station Wet Well shall only require pump cable disconnection at the pump junction box. All conduits running from the Pump Control Panel of Section 2.11 to the pump and level control junction boxes shall be sealed with conduit seal fittings at the junction boxes.

4.5 GROUNDING

Lighting system neutrals, neutral taps of all "Wye" connected transformers, and all non-current carrying parts of electrical equipment such as motor frames, conduits, cabinets, etc., shall be solidly grounded to the Station Ground System in accordance with Article 250 of the National Electrical Code.

All conduit systems shall be electrically continuous from the service equipment. All conduit leaving the service equipment shall be grounded to the service equipment.

All conduits shall have ground wires installed in the conduit. All metal parts of the raceway systems shall be connected to this ground wire with copper clamps, straps or ground bushings. The size of the ground wire shall be the same as the phase wires, unless shown otherwise, except not smaller than #12 for all 120/240 volt circuits or #10 for all higher voltage circuits. This size of the ground wire for multi-circuited conduits shall be not less than the total cross sectional area of the phase wires connected to the maximum circuited system phase, within the conduit, unless shown otherwise. For example, if there are 3-A phase wires and 2-B phase wires in a conduit, the ground wire size shall be three times the area of A phase wires, not five times the area of all phase wires.

Grounding electrode conductors, only, may be bare copper cable, but all other grounding conductors shall be insulated, of adequate size installed in conduit, unless approved otherwise. Install separate main conductors for all dc and instrumentation grounds.

4.6 STATION GROUNDS

In order to furnish an adequate station ground for the electrical and electronic equipment for the Pump Station, the Contractor shall install and connect the grounding system as required by these specifications. The Contractor shall install at least the number of ground rods to provide a resistance of less than 5 ohms between the station ground and earth. The grounding system shall be tested in accordance with the Testing section of these specifications.

4.7 SWITCHES, RECEPTACLES AND COVER PLATES

The Contractor shall furnish and install all switches and receptacles with cover plates as required. They shall be installed in boxes as called for under Sections 2.4 and 4.4, Outlet Boxes, Junction Boxes, Pull Boxes and Fittings.

Bonding jumpers shall be installed between the receptacle ground screws and outlet boxes on all receptacles. Install receptacles, except ground fault circuit interrupters, with ground pole in the down position.

4.8 THREE PHASE MOTOR CONTROLLERS

Individual layout sketches shall be supplied and unit wiring diagrams shall be posted inside each door. Auxiliary devices and contacts for motor space heaters, remote status signals and interlocks necessary for the proper functioning of each piece of utilization equipment shall be furnished complete and wired to the terminal blocks in each controller enclosure. All wiring and cable shall be tagged at all terminations. Pilot control devices shall conform to Section 2.10 of these specifications.

The motor controllers for non-hazardous locations shall be installed in NEMA 4 stainless steel enclosures except those controllers installed in Motor Control Centers or pump control panels.

Securely fasten enclosure to wall or other mounting surfaces. Where local wall is not available, provide stainless steel supports to rigidly support equipment reasonably close to motor. Space at least 1/4-inch from wall with stainless steel, PVC or nylon spacers. Use stainless steel materials for miscellaneous and mounting hardware.

4.9 PUMP STATION SERVICE ENTRANCE

The Contractor shall furnish and install all appurtenances necessary to bring power from the power company overhead lines to the Pump Control panel, located at the Pump Station.

The Contractor shall furnish and install complete, a new service power pole with anchoring guywire to receive the overhead lines from the power company distribution system, and all cable, cable terminations, conduit and other appurtenances necessary to bring the power from the overhead lines down the pole and underground to the Pump Control panel. The Contractor shall also install the power company's metering socket. The power company will furnish the overhead lines from their distribution system to the new service power pole, the metering socket and the meter.

The complete installation of the service power pole and the service from the pole to the Pump Control panel shall meet all the requirements of the power company. It shall be the responsibility of the Contractor to contact the power company and to coordinate the work involved in the service entrance installation.

Note: the electrical meter and equipment shall be mounted on stainless poles. Treated lumber stands or supports will not be acceptable. The only exception to this is meters mounted directly to service poles.

4.10 PUMP CONTROL PANEL

The Contractor shall furnish and install a pump control panel for pump and equipment control. The enclosure shall be constructed in accordance with Section 2.11 of these specifications. All holes for installation of conduit shall be sealed watertight after equipment installation.

For Duplex Pump Stations, the pump station operation shall be as follows: As the level in the Pump Station Wet Well rises the lead pump will start after a time delay and will remain on until the level in the wet well falls to a set stop level. If the level in the wet well continues to rise, the lag pump will start after a time delay and both pumps will remain on until the wet well level falls to the set stop level. If the wet well level continues to rise a high level alarm indicator light shall become illuminated. Alternation of pump status as to lead or lag pump shall occur at the end of each operating cycle. High motor temperature or motor overload shall cause the respective pump to stop and illuminate its red overload indicator light.

The operation of a Triplex Pump Station shall operate as follows: As the level in the Pump Station Wet Well rises the lead pump will start after a time delay and will remain on until the level in the wet well falls to a set stop level. If the level in the wet well continues to rise, the lag pump will start after a time delay and both pumps will remain on until the wet well level falls to the set stop level. If the wet well level continues to rise, the lag-lag pump will start after a delay and all three pumps will remain on until the wet well level falls to the set stop level. If the wet well level continues to rise a high level alarm indicator light shall become illuminated. All three pumps shall remain on until the level falls to the set stop level. The selected lead and lag pumps shall alternate at this time.

All instruments and equipment inside the panel shall be permanently tagged. All panel components shall be clearly labeled and identified on shop drawings.

All wiring shall be run along vertical or horizontal routes and bundled together to present a high quality design and neat appearance. Angled runs are not acceptable. All parallel runs of wire shall be grouped together and installed in vinyl plastic lay-in wiring ducts or tied together in bundles with nylon cable ties where wiring ducts cannot be used. Wiring to equipment mounted on doors or where movement of the equipment will take place shall be installed in nylon spiral wrapping sheaths equal to Panduit Type T or Voltrex Type HWN. All wiring ducts and cable ties shall be solidly bolted or screwed into place where they are secured to the panel. Adhesive type mountings are not permitted. Lay-in wiring ducts shall have snap-on covers and slots in the duct sidewall for easy wire insertion and shall be equal to Panduit Type E and Voltrex Type WDS. First class workmanship shall be expected in the completed installation.

The enclosure shall have 120 volt thermostatically controlled heat and ventilation as described in section 2.11. The enclosure shall have a ground bus for connection of all ground wires.

All controls, pushbuttons, selector switches and pilot lights shall conform to the requirements of Section 2.10 of these specifications. All legend plates shall be custom lettered as approved by the Owner's Representative.

Upon completion of the control panel programming of the PLC will be completed by CCWRD.

4.11 SAFETY SIGNS

Self-sticking marking labels shall be furnished and installed on each piece of electrical equipment stating the maximum voltage level involved with that piece of equipment. The labels shall be at least 2" high and shall include the following: 120 VOLTS; 240 VOLTS; 480 VOLTS; 2300 VOLTS: 4160 VOLTS; 13,000 VOLTS.

4.12 ENGRAVED NAMEPLATES AND CIRCUIT LABELS

All electrical motor starters, disconnect switches, manual starter switches, pushbutton stations and similar equipment operating components shall be provided with permanently mounted, laminated engraved nameplates. The nameplates shall describe the motor or equipment function and give the circuit number. The nameplates shall be mounted by means of stainless steel machine screws into drilled and tapped holed to meet NEMA 4 standards.

All other electrical appurtenances, switches, outlets, pull boxes, etc., except conduit shall be labeled with the appropriate circuit number such as L-4 or P-5. These labels shall be permanently attached embossed type labels. All nameplates, circuit labels and wording on them shall be approved by the Owner's Representative.

4.13 PAINTING

All interior and exterior surfaces of equipment enclosures, except stainless steel enclosures and hardware, shall be thoroughly cleaned after fabrication, completely bonderized and finish painted at the factory. All interiors shall be white. Touch-up painting shall be done after installation.

PART 5 – TESTING

5.1 GENERAL

The Contractor is responsible to provide all tools, materials, gauges, and water that are necessary to complete the testing as specified herein. All testing must be witnessed and approved by the Owner's Representative.

5.2 WIRING

Test each electrical circuit after permanent cables are in place to demonstrate that the circuits and connected equipment perform satisfactorily and that they are free from improper grounds and short circuits. Any cable which fails the insulation tests or which fails when tested under full load condition shall be replaced with a new cable for the full length. Contractor to provide all test instruments.

5.3 STATION GROUNDS

The Contractor shall test, in the presence of the Owner's Representative, the resistance to ground with a "Meg" ground tester using two temporary reference grounds versus the permanent grounding cable. The reference grounds shall be a minimum of 50 feet and 100 feet, respectively, from the permanent ground rods.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the lump sum unit price bid for Item 3301 – Sanitary Sewer Pump Station, Electrical. Any additional materials required to construct, install and place in satisfactory service, the complete electrical systems, shall be furnished and installed as part of this item. All electrical equipment furnished under this section shall meet all requirements of Section 3301-Sanitary Sewer Pump Station, Electrical.

All wiring from the pumps to the pump junction boxes, as shown on the drawings, shall be furnished under Section 3300 – Sanitary Sewer Pump Station, General. All electrical connections shall be performed as part of Section 3301 – Sanitary Sewer Pump Station, Electrical.

The Contractor also has the option to bid both the General work and Electrical work (Sections 3300 and 3301). Bid options are as follows:

Item	Unit	Description

3301	Lump Sum (LS)	Sanitary Sewer Pump Station, Electrical
3300 / 3301	Lump Sum (LS)	Sanitary Sewer Pump Station, Complete

END OF SECTION

SECTION 3310 – PVC SEWER FORCE MAINS

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all Labor, Material, and Equipment necessary for furnishing and installing PVC force main pipe and ductile iron fittings as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

1.2 GENERAL

This work shall consist of providing all labor, materials, and equipment necessary for furnishing and installing PVC force main pipe and ductile iron fittings including all bends, reducers, tees, sleeves and special castings required for the installation of the valves, strapping, placement of concrete thrust blocks and all other work required for furnishing and installing force mains complete and ready for service as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

The force main and fittings shall be installed in accordance with the Contract Drawings, the American Water Works Association (AWWA) for potable water main and fittings installation and the Clermont County Water Resources Department Standard Specifications and Rules and Regulations.

PART 2 – PRODUCTS

2.1 PVC FORCE MAIN

PVC pressure pipe shall be manufactured in accordance with AWWA C-900. The outside diameters shall match ductile iron pipe outside diameters. The wall thickness shall meet the DR 14 requirement in AWWA C-900. Minimum diameter of force mains shall be 6".

2.2 DUCTILE IRON FITTINGS

All fittings, wall pipes and specials shall be of ductile iron or in accordance with ANSI A21.10 (AWWA C-153).

All fittings shall have a bituminous coated cement lining complying with AWWA C-104 and shall have an outside coating complying with AWWA C-153 or an epoxy coating complying with AWWA C-116.

All ductile iron fittings shall be provided with mechanical joint ends.

2.3 CONCRETE THRUST BLOCKING

Concrete thrust blocking, supports and/or buttresses shall be provided at all tees and bends and at any other locations required by the District. These concrete structures shall be built to the lines, grades and

dimensions shown on the Standard Drawings. Concrete used for blocking shall conform to Class C Concrete, having a compressive strength of 4,000 pounds per square inch.

All concrete shall be mixed by mechanical means prior to installation. The installation of dry concrete will not be permitted.

2.4 TRACER WIRE

The tracer wire system shall include THW size 10 AWG copper electrical wires. The boxes shall be equal to Bingham & Taylor 4930, 3" curb box, screw type, with extension(s) as necessary to allow the bottom section of the curb box to rest on the force main and the upper section to be level with the ground surface. Curb box covers shall include the word "SEWER" on the cover.

2.5 PIPE JOINT RESTRAINT

Pipe joint restraints shall be Field Lok Gasket, American Fast Grip, or approved equal as determined by Owner's Representative, except as modified herein.

2.6 MAGNETIC TRACING TAPE

Magnetic marking / locater tape shall be installed the entire length of the pipe at a location 12" over the pipe.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of the materials to be used for review & approval by the Owners Representative prior to ordering.

PART 4 – EXECUTION

4.1 GENERAL

The Contractor shall furnish all necessary labor, material, tools, and equipment required in the installation of the force main pipe and fittings. This work includes furnishing all materials, the proper storage of those materials, saw cutting, excavation, laying and joining the pipe, installation of concrete blocking and joint restrains, backfilling, installation of tracer wire and locator tape, repairing or replacing all drains, sewers, utilities, and any other structures that may be disturbed or damaged by the Contractor's operations including driveway culvert pipes, and restoration of all disturbed surfaces. Also included in this item is the disposition of all excavated materials. All work shall be completed as shown on the Contract Drawings and as directed by the Owner's Representative.

Pipe and fittings shall be handled so that the joints, coating and/or lining will not be damaged. If, however, any part of the jointing coating or lining is damaged, the repair or replacement of such

material shall be made by the Contractor at his own expense in a manner satisfactory to the Owner's Representative.

All pipe and fittings stored on the job site shall be placed on blocks and suitably chocked to eliminate any possibility of rolling or shifting. Blocks and chocks shall have a minimum thickness of 2 inches and shall be high enough to assure that the pipe and fittings will not be touched by surface drainage.

The Contractor is responsible to repair or replace all pavement and roadway surface disturbed by the contractor, as a result of the force main and fittings installation, to the satisfaction of the governing entity of said pavement or roadway surface.

4.2 INSTALLATION

The general proposed location of the force mains and connections to the existing sewer manholes are shown on the Plans. If, during the course of work, unforeseen conditions arise, the location of the pipeline may be changed as directed by the Owner's Representative to meet such conditions. Long radius curves or small angular changes in the pipeline can be formed by deflecting joints of straight pipe not more than 3 degrees to the axis of the pipe.

When cut all rough edges must be filed to provide a smooth, beveled edge.

The Contractor shall furnish, place, and maintain sheeting and bracing as may be required to securely support the sides and ends of the excavation and to prevent injury to the structure being built or to personal property or adjacent utilities.

Proper tools and facilities satisfactory to the Owner's Representative shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe, fittings, and valves shall be carefully lowered into the trench by means of derricks, ropes, or other suitable tools or equipment, in such a manner to prevent damage to the force main materials and protective coating and lining. Under no circumstances should force main or fitting material be dropped or dumped into the trench. Materials cracked, gouged, chipped, dented or otherwise damaged shall be rejected.

All pipe and fittings shall be brushed to remove all foreign matter and carefully examined for cracks and other defects while suspended above the trench immediately before installation. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed into the trench.

When pipe installation is not in progress, the open ends of the installed pipe shall be closed by a water tight plug or other means approved by the Owner's Representative.

If water is in the trench, the seal shall remain in place until the trench is pumped dry.

Ends of pipe shall be carefully wiped clean and dry before joining.

All PVC force mains shall include and shall be installed in bedding and initial backfill material as described in Item 1200-Granular Bedding and Initial Backfill Material.

Restraints shall be installed where called for on the contract drawings and as directed by the Owner's Representative.

Backfill and pavement replacement shall be installed as described in Item 1130-Concrete Pavement Replacement, Item 1140-Asphalt Pavement Replacement, Item 1210-Controlled Density Fill (CDF), and Item 1220-Granular Backfill.

The proposed PVC force main pipe and fittings shall be installed with a minimum 4 feet cover from finished ground elevation to the top of the force main, unless otherwise noted on the contract drawings or approved by the Owner's Representative.

4.3 TRACER WIRE

A complete tracer wire system shall be furnished and installed on all PVC pipe used underground. The wire shall be continuously wrapped around the entire length of the PVC pipe, shall be THW size 10 AWG copper electrical wire, and shall terminate and be looped through all manholes as installed as part of the forcemain. Sufficient wire shall be looped in the location boxes that the wire can extend to above the boxes. The boxes shall be equal to Mueller H-10365 roadway screw type valve boxes. In addition, locator tape properly installed 12" above the pipe is required with proper backfill.

PART 5 – TESTING

5.1 GENERAL

The contractor is responsible for all costs associated with hydraulic pressure testing (including water). Should the pipe line fail this test, the contractor shall be responsible to locate and repair the damaged section of pipe.

All testing of the force main shall be as specified in the AWWA specifications and shall be witnessed, inspected and approved in writing by the Clermont County Water Resources Department.

5.2 HYDROSTATIC TESTING

As a minimum, all sewer force mains shall be tested in accordance with the Hydrostatic Testing Requirements of AWWA C600.

A. All force mains shall be given a hydrostatic test of at least 1.5 times the shutoff head of the connected pumps or 150 psi, whichever is greater. Loss of water pressure during test shall not exceed 5 psi in a 2-hour period.
B. Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 1500 feet.

C. The pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the District. The pump, pipe connection, gauges, and all necessary apparatus shall be furnished by the Contractor. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.

D. Duration of test shall not be less than two hours.

E. The test pressure shall not exceed the rated pressure of the valves in the pipeline.

F. The Contractor will provide water for testing the force mains and the Contractor will be responsible for piping or hauling the water if necessary.

G. No pipe installation will be accepted if the leakage is greater than that determined by the formula:

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

in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge. Allowable leakage at various pressures and pipe sizes are shown in the Table below (from AWWA C600 - Table 6A):

Avg. Test Pressure Psi	**3”**	**4”**	**6”**	**8”**	**10”**	**12”**	**14”**	**16”**	**18”**	**20”**	**24”**	**30”**	**36”**	**42”**	**48”**	**54”**
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

Allowable Leakage Per 1,000 Feet of Pipeline* - gph

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Linear Feet (LF) price bid for Item 3310 – PVC SEWER FORCE MAIN. Progress payments will be made based on the measured quantities of Item 3310 completed. The Contractor shall review the submitted units completed and provide confirmation to the Owner's Representative of the measurements prior to payment for work under this specification.

SECTION 3320 – FORCE MAIN ACCESS MANHOLE

PART 1 – GENERAL

1.1 GENERAL

Provide all Labor, Material, and Equipment necessary for furnishing and installing new force main access manhole as located and detailed on the contract drawings, in accordance with these Specifications and Clermont County Standard Details, and as directed by the Owner's Representative.

1.2 RELATED WORK

A. Section 3200 – Gravity Sewer Manholes

PART 2 – PRODUCTS

2.1 MANHOLE

Force main access manholes shall meet all requirements of Section – 3200 Gravity Sewer Manholes except as modified herein.

2.2 COUPLING

Couplings shall be Dresser Style 138 or equal as determined by the Owner's Representative.

PART 3 – SUBMITTALS

Contractor shall submit literature and/or catalog cut sheets of the access manhole and coupling to Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Force main access manholes shall be installed every 600 feet.

Force main access manholes shall contain a removable section of pipe secured in place with an expansion type pipe coupling at each end.

Force main access manholes shall include a 2 foot x 2 foot x 2 inch sump pit constructed of 2000 psi concrete. The bottom of the manhole shall be sloped towards the sump pit and shall have a maximum thickness of 4 inches.

PART 5 – TESTING

Force main access manholes shall be tested in accordance with Section – 3200 Gravity Sewer Manholes

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
3320	Each (Ea.)	Force Main Access Manhole

END OF SECTION

SECTION 3330 – FORCE MAIN LOW POINT MANHOLE

PART 1 – GENERAL

1.1 GENERAL

Provide all Labor, Material, and Equipment necessary for furnishing and installing new force main low point manhole (also known as a Drain Manhole) as located and detailed on the contract drawings, in accordance with these Specifications and Clermont County Standard Details, and as directed by the Owner's Representative.

1.2 RELATED WORK

A. Section 3200 – Gravity Sewer Manholes
B. Section 3110 – PVC Sewer Force Mains

PART 2 – PRODUCTS

2.1 MANHOLE

Force main low point manholes shall meet all requirements of Section – 3200 Gravity Sewer Manholes except as modified herein.

2.2 FLANGE ADAPTER

Flange Adapter shall be Dresser Style 128 or equal as determined by the Owner's Representative.

2.3 FITTINGS

Force main low point manhole fittings shall be flanged ductile iron pipe meeting all requirements of Section 3310 - PVC Sewer Force Mains except as modified herein.

2.4 PLUG VALVE

Plug valves shall be of the non-lubricating, eccentric type with resilient faced plugs and ANSI 125 lb. flanged ends. Bodies shall be semi-steel or cast iron with raised seats and shall be of the bolted bonnet design, suitable for 150 psig pressure. Bearings shall be noncorrosive and permanently lubricated. Valve seats shall be nickel, or nickel-coated stainless steel or bronze. Valve packing shall be Nitrile-Butadiene (Buna (VEE)). The valves shall provide drip-tight shut-off in either direction up to 150 psig. The resilient face material of valves for sewage and sludge service shall be Neoprene or Hycar. All straightway valves shall be DeZurik Series 100, Clow F-5412, Homestead Ballcentric or District approved equal.

Each plug valve shall be furnished with a handwheel and gear actuator. Gear actuators shall be of the totally enclosed wormgear type, oil or grease lubricated and sealed for watertightness, with self-lubricating bronze or stainless steel sleeve bearings, thrust bearings, built-in adjustable opening and closing stops and valve position indicators. Each actuator shall be sized to require not more than 300 inch pounds of torque in the input shaft to seat and unseat the valve plugs at the pressure drops specified herein.

2.5 CONNECTION

Force main low point manhole connection shall be 4 inches in size and include a 4 inch blind flange, tapped for 4 inch diameter male NPT adapter with cap equal to OPW figures 633-F and 634-B.

PART 3 – SUBMITTALS

Contractor shall submit literature and/or catalog cut sheets of the force main low point manhole, adapter, fittings, and plug valve to Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Low point manholes shall include a 2 foot x 2 foot x 2 inch sump pit constructed of 2000 psi concrete. The bottom of the manhole shall be sloped towards the sump pit and shall have a maximum thickness of 4 inches.

Where possible, all plug valves shall be installed with shafts horizontal and plugs opening to the top of the valve. Seat ends of plug valves shall be located such that when closed, the line pressure will hold the plug against the seat, unless specifically noted otherwise on the Drawings.

PART 5 – TESTING

Force main access manholes shall be tested in accordance with Section – 3200 Gravity Sewer Manholes.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
3330	Each (Ea.)	Force Main Low Point Manhole

END OF SECTION

SECTION 3340 – FORCE MAIN AIR RELEASE VALVE AND MANHOLE

PART 1 – GENERAL

1.1 GENERAL

Provide all Labor, Material, and Equipment necessary for furnishing and installing new force main air release valve and manhole (also known as high point manhole) as located and detailed on the contract drawings, in accordance with these Specifications and Clermont County Standard Details, and as directed by the Owner's Representative.

1.2 RELATED WORK

A. Section 3200 – Gravity Sewer Manholes

PART 2 – PRODUCTS

2.1 MANHOLE

Force main air release valve and manholes shall meet all requirements of Section – 3200 Gravity Sewer Manholes except as modified herein.

The manhole base shall be constructed using a precast concrete footing ring with an open center.

2.2 AIR RELEASE VALVE

Air release valve shall be combination type sewage air valves, sufficiently long enough to maintain an air gap between the sewage media and the air release orifice. Each air release valve shall be fitted with one (1) gate valve (shut off); one (1) gate valve (blow off), one (1) 1/2 inch gate valve (back flush), with a quick disconnect coupling, a minimum of 10 feet of hose to permit back flushing after installation without dismantling the valve, and all associated pipe fittings. All body and interior parts shall be stainless steel.

Sewage combination air valves shall be A.R.I. D-020 or D-025 or approved equal as determined by the Owner's Representative.

2.3 FITTINGS

Force main air release manhole fittings shall be flanged ductile iron pipe meeting all requirements of Section – 3120 Ductile Iron Gravity Sewer Main except as modified herein.

PART 3 – SUBMITTALS

Contractor shall submit literature and/or catalog cut sheets of the air release manhole and coupling to Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Sewage air valves shall be installed using a tee and reducing flange (reduces to 2") where necessary. Saddles will not be permitted.

The center of the footing ring shall be filled with a minimum of 6" of aggregate base #57 stone.

PART 5 – TESTING

Air Release valve shall be tested in accordance with the manufacturer's recommendations.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
3340	Each (Ea.)	Force Main Air Release Valve and Manhole

END OF SECTION

SECTION 3350 – FORCE MAIN DISCHARGE MANHOLE

PART 1 – GENERAL

1.1 GENERAL

A. Provide all Labor, Material, and Equipment necessary for furnishing and installing new force main discharge manhole and connections to said manhole, as located and detailed on the contract drawings, in accordance with these Specifications and Clermont County Standard Details, and as directed by the Owner's Representative.

B. Provide all Labor, Material, and Equipment necessary to modify and convert existing sanitary manhole to force main discharge manhole, as located and detailed on the contract drawings, in accordance with these Specifications and Clermont County Standard Details, and as directed by the Owner's Representative.

1.2 RELATED WORK

A. Section 3200 – Gravity Sewer Manholes

PART 2 – PRODUCTS

2.1 MANHOLE

Force main discharge manholes shall meet all requirements of Section – 3200 Gravity Sewer Manholes except as modified herein.

2.2 MANHOLE LINING MATERIAL

Manhole lining material shall be Sauereisen SewerGard epoxy polymer or approved equal. Material shall be an impermeable, high strength, corrosion-resistant, fiber-filled or aggregate-filled epoxy material specifically designed to protect concrete surfaces of municipal wastewater treatment structures and collection systems from chemical attack and physical abuse. The material shall prohibit water infiltration and shall have proven resistance to a broad range of corrosive chemicals, including sulfuric acid created by hydrogen sulfide gas as well as other chemicals typically found in sanitary sewers. The material shall be suitable for application over damp or dry concrete surfaces without the use of a primer. The material shall have a non-sagging consistency to permit application on vertical and overhead surfaces

PART 3 – SUBMITTALS

Contractor shall submit literature and/or catalog cut sheets of the force main discharge manhole and lining material to Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

Where the discharge manhole is located at the end of a gravity sewer main, the crown of the force main shall be install at the same elevation as the crown of the gravity sewer main.

Where the discharge manhole is not located at the end of a gravity sewer line, the invert of the force main shall be installed not more than one foot above the sewer main flow line, no more than a 45 degree angle as measured from the flow line of the sewer main, and in the same general direction as the flow of the sewer main.

The manhole channel and bench shall be construction or modified to provide a smooth flow of sewage from the force main sewer to the gravity sewer and between the sewer influent and effluent.

All lining material shall be installed by manufacturer trained and certified installer. Copies of installer certificates shall be provide to Owner's Representative.

The force main discharge manhole shall be prepared, repaired, and lined per manufacturer's recommendations. The coatings shall be applied to the vertical and overhead surfaces of the concrete and masonry structures. The material may be trowel or spray applied as recommended by the manufacturer. The final material thickness shall be a minimum of 20 mils. Contractor shall provide a 5 year warranty on all lining material and labor.

The interior of the manhole frames and covers shall be coated with polymer or epoxy paint or another corrosion resistant product approved by the Owner's Representative. The frames and covers shall be prepared and lined/painted per manufacturer's recommendations.

PART 5 – TESTING

Force main discharge manholes shall be tested in accordance with Section – 3200 Gravity Sewer Manholes.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
3350	Each (Ea.)	Force Main Discharge Manhole

END OF SECTION

SECTION 3500 – SANITARY SEWER AERIAL CROSSING

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary for furnishing and installing sanitary sewer aerial crossing as shown on the Contract Drawings or as otherwise directed by the Owner's Representative.

PART 2 – PRODUCTS

2.1 STEEL CASING PIPE

Steel pipe used for casing shall be seamless, smooth steel with minimum yield strength of 35,000 psi. The inside diameter of the casing pipe shall be a minimum of four (4) inches larger than the largest outside diameter of the sewer line. Wall thickness, casing diameter, and the maximum span from pier to pier shall be based on the following schedule:

Pipe Size (inches)	Casing OD (inches)	Wall Thickness (inches)	Maximum Span (ft)
6 to 8	16	3/8	45
10	18	3/8	50
12	22	3/8	50
14 to 20	30	½	60
21 to 24	36	½	65
27 to 30	40	½	65

Larger diameter casing pipe may be substituted by the CONTRACTOR; however, there will be no extra cost to the OWNER for this substitution.

A UV resistant bituminous coating shall be applied to the casing to protect it from weathering

2.2 SPACERS AND END SEALS

Casing spacers shall be model CCS stainless steel casing spacers as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, IL (1-800-426-4301), Model BWM-SS as manufactured by BWM Company or approved equal. End seals shall be model CCES as manufactured by Cascade Waterworks, model BWM-PO as manufactured by BWM Company or approved equal.

PART 3 – SUBMITTALS

Submit literature and/or catalog cut sheets of the steel casing, spacers, straps, UV resistant bituminous coating and concrete to be used. Submit to the Owner's Representative for review and approval prior to ordering

PART 4 – EXECUTION

4.1 PIERS

Concrete shall be Class C with a minimum compressive strength of 4000 PSI. No more than two (2) inches of water shall be allowable in the drilled excavation, immediately prior to concrete placement. Dewatering of shaft to meet specification, if necessary, shall be included in the Unit Bid price for this paragraph.

Piers shall be excavated or drilled plumb. The depth of the piers shall be at least 4'-3" or determined by a geotechnical investigation of the site. The minimum pier width or diameter shall be outer diameter of the casing pipe plus 24".

A cradle will be formed at the top of each pier to accept the casing pipe that is a ¼" larger in diameter than the casing pipe.

All reinforcing steel shall conform to ASTM A 615 including Supplementary Requirements. All reinforcing steel shall be 60,000 psi yield strength. All reinforcement shall be cold bent, unless otherwise specifically permitted by the Owners Representative. Reinforcing bar layout to be as shown on plans.

No drilled piers shall be left open overnight.

4.2 STEEL CASING PIPE

Steel casing pipe shall be installed at the grade and elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth, non-obstructing joint inside. All joints shall be centered and supported on a pier, with each side of the joint secured, as specified below, to the pier.

Open area between pipe, piers, and creek bed must be large enough to allow unobstructed flow of 50 years storm runoff. Provide calculations to CCWRD for review.

A concrete collar shall be formed around the steel casing pipe 2' from each end of the casing as shown on the standard detail. Concrete shall be Class C with a minimum compressive strength of 4000 PSI and reinforced with #5 bars each way.

A ¼" neoprene pad shall be placed under the pipe at each pier cradle. The steel casing shall not come in contact with the concrete. ¼" thick and 3" wide stainless steel straps with ¼" neoprene pads shall snuggly secure the casing pipe to the piers. Stainless steel anchor bolts, ¾" diameter with minimum 6" embedment, shall be used to secure the casing to the piers.

4.3 SPACERS AND END SEALS

Casing spacers shall be model CCS stainless steel casing spacers as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, IL (1-800-426-4301), Model BWM-SS as manufactured by BWM Company or approved equal. End seals shall be model CCES as manufactured by Cascade Waterworks, model BWM-PO as manufactured by BWM Company or approved equal.

PART 5 – TESTING

All testing will be performed in conjunction with the gravity sewer main as stated in Sections 3110.

PART 6 – BASIS OF PAYMENT

6.1 SANITARY SEWER AERIAL CROSSING, COMPLETE

Payment for all labor, material, and equipment necessary to perform sanitary sewer aerial crossing, complete, including concrete piers, steel casing and anchors, shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
3500	LF	Sanitary Sewer Aerial Crossing

Item 3110 – PVC GRAVITY SEWER MAIN, will include the cost of pipe.

END OF SECTION

SECTION 3510 – CONNECTION TO EXISTING MANHOLE

PART 1 – GENERAL

1.1 GENERAL

Provide all Labor, Material, and Equipment necessary for the connection to existing manhole as called for on the contract drawings, in accordance with these Specifications and Clermont County Standard Details, and as directed by the Owner's Representative.

1.2 RELATED WORK

A. Section 3200 – Gravity Sewer Manholes

PART 2 – PRODUCTS

2.1 CONNECTION MATERIAL

Connection materials shall meet all requirements of Section – 3200 Gravity Sewer Manholes except as modified herein.

2.2 MANHOLE TO PIPE CONNECTORS

Connection materials to existing precast concrete manholes shall be mechanically retained "O" rings, Kor-N-Seal I, 106 Series, stainless steel for 6" to 18" sewer mains or Lok-N-Seal II, 206 Series, stainless steel for 18" and greater, as manufactured by NPC/Trelleborg or approved equal.

2.3 GROUT

Grout shall be non-shrink, non-metallic, non-staining, capable of developing a minimum compressive strength of 9,000 psi at 28 days when tested in accordance with ASTM-C-109. Grout shall be free of any metal, plastic, gypsum, and chemicals, and guaranteed not to shrink below its original placement volume at any time. Approved material is Five Star Grout by U.S. Grout Corporation, F-100 by Sauereisen Cement Company, and Masterflow 928 by Master Builders.

PART 3 – SUBMITTALS

Contractor shall submit literature and/or catalog cut sheets of the connection material to Owner's Representative for review and approval prior to ordering.

PART 4 – EXECUTION

For new sewer connections to existing manholes, the pipe openings shall be core drilled to accommodate the new pipe. The connection material shall be furnished and installed per manufacturer's recommendations. The sewer pipe shall be connected in such a manner to provide a water tight leak free connection. The opening around the connection material shall be grouted to the level of the existing bench. The existing manhole channel(s), flow line(s), apron(s), etc. shall be chipped out and re-grouted to accommodate the new piping. The new grout shall be installed and troweled in place to provide a smooth continuous even sloped surface from the influent sewer pipe through the manhole to the effluent sewer pipe.

All connections where the pipe is 2 feet or more feet above the invert of the manhole will require an inside drop. Where the difference is less than 2 feet, the manhole channel and bench shall be contoured and sloped to prevent solid deposits.

All openings and damage to manholes shall be repaired using non-shrink grout material as identified in paragraph 2.3. Temporary backing or forming may be required for the installation of the grout material. Grout shall be placed until flush with outside face of the manhole wall and troweled to provide a smooth surface. Grout shall be mixed and installed per manufacturer’s recommendations. All voids and spaces shall be filled, excess grout trimmed, and the surface finished to match adjoining surfaces or as directed by Owner’s Representative.

PART 5 – TESTING (Not Applicable)

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be based on the following bid items, units, and unit prices:

Item	Unit	Description
3510	Each (Ea.)	Connection to Existing Manhole

END OF SECTION

SECTION 3520 – DOGHOUSE STYLE MANHOLE

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, and equipment necessary to install the doghouse style manholes conforming to the specifications and of the types and sizes shown on the Standard Drawings and shall construct the same in accordance with these Specifications at the locations and to the lines and grades shown on the Drawings.

1.2 LOCATION OF MANHOLES

Manholes locations shall conform to Section 3200.

PART 2 – PRODUCTS

All products shall conform to Section 3200.

PART 3 – SUBMITTALS

3.1 GENERAL

Submit literature and/or catalog cut sheets of the materials to be used for review & approval by the Owners Representative prior to ordering.

PART 4 – EXECUTION

4.1 MANHOLE CONSTRUCTION

Manholes shall be watertight structures constructed with monolithic 4000 PSI concrete cast-in-place bases extending to undisturbed earth and/or a minimum of 18” below the invert of the existing sewer on which the doghouse manhole is being constructed, in combination with precast riser sections (field set over the existing sewer), cones and/or flat slab tops. The top of the existing sewer main will be neatly cut out and removed inside the manhole. Contractor to take appropriate measures to prevent foreign material from entering the sewer system.

Field pour the bottom channel; fill with 2000 PSI concrete. Shaping of manhole walls and bottoms is required to provide for pipe junctions, channels, etc.; such work shall be made with Class "F" concrete conforming to the requirements of ODOT Item 499 and 511.

The invert channel and manhole bench shall be constructed as shown in the Standard Drawings. In general, the invert channel shall be a smooth continuation of the pipe and U-shaped. The bench shall provide good footing for workmen and have a 1 inch batter towards the invert channel.

Minimum wall thickness of circular precast manhole bases, risers and cones shall be as scheduled below:

Inside Diameter (feet)	Minimum Wall Thickness (inches)
4	5
5	6
6	7
6.5	7.5
8	9

Openings for the inlet and outlet sewer pipes shall be cast in the precast units.

All pipe entering manholes at precast openings and along all barrel sections shall be sealed by means of imbedded flexible rubber gaskets.

Flexible grout to be utilized on the inside of all manholes at all joints, steps, and pipe as directed by the Water Resources Department.

Manholes planned within any pavement will have the rim match the profile and section of the existing roadway.

PART 5 – TESTING

The doghouse style manholes will be tested and inspected in accordance with Section 3200.

PART 6 – BASIS OF PAYMENT

Payment for all labor, materials, and equipment necessary to complete the work described above shall be at the Each (EA) price bid for Item 3520 – X' DIAMETER DOGHOUSE STYLE MANHOLES.

Item	Unit	Description
3520	Each (EA)	X' DIAMETER DOGHOUSE STYLE MANHOLES

Progress payments will be made based on the manholes actually installed, as measured by the OWNER'S REPRESENTATIVE. The Contractor shall review the submitted units completed and provide confirmation to the Owner's Representative of the measurements prior to payment for work under this specification.