

GRAVITY SEWERS. Item 501

Section 501.1. Description. All gravity sewers constructed in the Clermont County Sewer District that are to be dedicated, operated by, or otherwise made a part of the Sewer District, shall be installed in accordance with the materials and methods specified herein and as shown on the Standard Drawings.

Gravity sewers shall include sewer mains, sewer laterals and sewer service connections.

Materials of construction are specified as follows:

- Sec. 501.2. Reinforced Concrete Sewer Pipe
- Sec. 501.3. Ductile Iron Gravity Sewer Pipe.
- Sec. 501.4. PVC Sewer Pipe

Methods of construction for sewer mains, sewer lateral connections and sewer service connections are specified as follows unless otherwise noted:

- Sec. 501.5. Initial Bedding and Backfill
- Sec. 501.6. Laying Pipe

Sections 501.7 and 501.8 specify Lateral Connections and Sewer Service connections.

Earthwork including excavation and final backfilling shall be in accordance with Section 200 - Earthwork.

Surface and site restoration shall be in accordance with Section 300 - Restoration.

Sec. 501.2. Reinforced Concrete Sewer Pipe. All concrete pipe and fittings, including 12 inch diameter upwards through 42 inch diameter, shall be circular reinforced concrete pipe conforming to the requirements of ASTM Specification C-76, Wall C. These pipes shall have a net laying length of not less than six feet.

NO CONCRETE PIPE SHALL BE MOVED FROM THE CASTING YARD BEFORE SUCH PIPE HAS BEEN CURED A MINIMUM OF SEVEN DAYS.

The interior of the pipe shall conform to the internal size specified, of a true section and shall be free from fins, bulges, ridges, offsets, projections, defects, or roughness of any kind.

Concrete pipe joints for sanitary sewers shall conform to the requirements of ASTM Specification C-361, as pertains to bell and spigot joints. All joints shall consist of a confined "O" ring rubber gasket placed in a groove in the spigot of the pipe such that the gasket will be enclosed on all four sides of when the pipe is laid and the joint is completed. All rubber gaskets used in sanitary sewers shall conform to the requirements of ASTM Specification C-361.

Concrete pipe shall be tested in accordance with Item 505 - Testing.

Sec. 501.3. Ductile Iron Gravity Sewer Pipe. All Ductile Iron gravity sewer pipe shall be in accordance with AWWA C151 and shall be in 18 to 20 foot lengths with single rubber gaskets (push-on) joints (similar to Tyton® or Fastite®) in accordance with AWWA C111. All Ductile Iron Gravity Sewer Pipe will be a minimum Class 50 in accordance with AWWA C150.

Ductile Iron Gravity Sewer Pipe shall be tested in accordance with Item 505 - Testing

Sec. 501.4. PVC Sewer Pipe. This section of the Specifications covers materials and installation of PVC solid wall sewer pipe and fittings including 8" inch diameter through 27 inch diameter.

The PVC sewer pipe standard dimension ratios (SDR) shall be used in accordance with the following Schedule:

<u>PVC Solid Wall Sewer Main Pipe Schedule</u>		
<u>Pipe Diameter</u> <u>(inches)</u>	<u>SDR-</u> <u>Schedule</u>	<u>Maximum</u> <u>Depth of Cover</u> <u>(feet)</u>
8 thru 27	35	0-15<
	26	≤15-28<
	17	≤28-46

Materials. The PVC sewer pipe and fittings designated as SDR-35 and SDR-26 & 17 shall conform to ASTM Specification D-3034.

PVC pipe and fittings shall be made of PVC plastic conforming to the requirements of ASTM Specification D-1784 and D-1785 for a minimum cell classification of 12454B.

Elastomeric gasket joints shall conform to ASTM Specification D-3212. Seals shall conform to ASTM Specification F-477.

Installation. All joints shall be of the bell and spigot type conforming to ASTM Specification D-3212 using flexible elastomeric seals.

All PVC pipe and fittings shall be installed in accordance with ASTM Specification D-2321.

All bedding and initial backfill shall meet the requirements of ODOT Item 703.11-Type 2, with the following exceptions: In no case shall sand be used for bedding or backfill material; if the trench foundation is wet and/or the depth of cover exceeds 15 feet, then Class I Material (as defined in ASTM Specification D-2321) one inch aggregate shall be required for bedding and initial backfill.

Testing. The Contractor shall test the PVC sewer pipe in accordance with Item 505 - Testing and as defined in ASTM

Sec. 501.5. Pipe Bedding and Initial Backfill. The pipe shall be bedded in compacted granular material, as specified herein, placed on a flat trench bottom carefully graded to the proper slope and elevation to receive the pipe. The thickness of the bedding shall be as shown in the typical trench detail of the Standard Drawings. Bell holes shall be carefully excavated at proper intervals so that no part of the load is supported on the pipe bells.

The initial backfill shall be made of the same granular material used in the pipe bedding and shall be carefully compacted and extend from the top of the bedding, around the sides of the pipe barrel to a minimum one (1) foot over the top of the pipe. The initial backfill material shall be carefully placed in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously so as not to disturb or damage the pipe, in 6 inch maximum thick lifts. The granular material shall be sliced under the "haunches" of the pipe with a hand shovel or other tool to fill any voids in this area. Initial backfill shall be placed as soon as possible to maintain proper alignment and to protect the pipe.

The granular material to be used for pipe bedding and initial backfill shall be well-graded durable gravel meeting the requirements of ODOT Item 703.11-Type 2, with the following exceptions: In no case shall sand be used for bedding or backfill material; if the trench foundation is wet and/or the depth of cover exceeds 15 feet, then Class I Material (as defined in ASTM Specification D-2321) one inch aggregate shall be required for bedding and initial backfill. Adequate compaction of the pipe bedding and initial backfill must be demonstrated to the owner's satisfaction. Contractor may be required to perform testing to verify compaction to the pipe manufacturer's specification.

Sec. 501.6. Laying Pipe. 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.

Where necessary with bell and pipe, suitable bell-holes shall be excavated for the bell of each pipe so that the weight of the pipe will be supported along the entire length of the pipe barrel and the bell. The pipe joint mating surfaces shall be carefully cleaned before pipes are connected. Gaskets not already factory installed, shall be installed and lubricated in accordance with the gasket manufacturer's recommendations.

Pipe shall be adjusted so as to have a minimum open space on the

outside of the pipe between adjacent lengths. In addition to the rubber gaskets required for all pipe joints, the inside of the joints in concrete pipes 27 inches in diameter and larger, shall be completely filled with a 1 to 2 Portland cement mortar troweled smooth and flush with the inside of the pipe.

The mortar joint shall be painted, when and as directed with two coats of an approved asphalt soap emulsion. The use of clay emulsion will not be permitted.

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, water-tight stopper with adequate precautions taken to overcome possible uplift.

Sec. 501.7. Lateral Connections. 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.

Materials of construction shall be PVC with 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 501.4. The depth shall be determined by the depth of the lateral at the connection to the sewer main.

Wyes for house connections shall be either factory made in-line fittings, strap-on saddle type fittings, or Inserta Tee® type fittings. **No glue-on saddles permitted.** The strap-on saddle fittings shall be installed using a pre-approved Ductile Iron Saddle with rubber gasket over a pre-cut opening in the side of the sewer main pipe and restraining it with stainless steel bands. The spigot end of the pipe shall not project beyond the inside face of the sewer main.

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.

The Contractor shall make all house connections as soon as possible. In no case shall this work be more than 500 ft. behind the installation of the main sewer.

Wye branches shall be located where shown on the plans or where ordered by the District and shall be standard fittings of the same strength classification of the adjacent line.

Wherever possible, sanitary sewer laterals shall be brought to a depth not to exceed twelve (12) feet of final grade during construction of the sanitary sewer main. Please note this does not ensure any liability to the Sewer District as this request is to ease the service connections by future installers.

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 District. Also where curb exists, sanitary sewer laterals shall be so marked by markings in the curb.

Lateral connections shall be installed in accordance with Sections 501.5 and 501.6, and tested in accordance with Item 505 - Testing.

Sec. 501.8. Sewer Service Connections. Sewer service connections shall include that portion of sewer built on private property between the building being serviced and the property or easement limiting line.

Materials of construction shall be PVC Schedule-40 solid wall sewer pipe.

Commercial sewer service connections shall be constructed of 6 inch minimum diameter sewer pipe and in accordance with Sec. 501.5 and 501.6, and tested in accordance with Item 505 - Testing.

Residential sewer service connections shall be constructed of 4 inch minimum diameter sewer pipe and in accordance with Sec. 501.5 and 501.6, and tested in accordance with Item 505 - Testing.

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.

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) Inside the connecting structure or within (8) eight feet from the outside wall of said structure.
- e) Cleanout caps to be PVC 35 approved cap unless in non-grassy areas where cap is to be installed with Neenah R-1976 or approved equal cap. When brought to grade, the cleanout cap shall be encircled with an 8" radius Class C concrete pad, 8" thick.
- f) On residential lots, cleanouts will not be located within the driveway. All cleanouts must be located in grassy areas.

MANHOLES. Item 502

Section 502-1. Description. The Contractor shall furnish all materials for 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.

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.

Sec. 502.2. Materials. Cast-in-place concrete shall meet the requirements of Section 499 and 511 of the State of Ohio, Department of Transportation (ODOT), Construction and Material Specifications for Class "C" and Class "F".

The proportioning is based on developing strength at 28 days of 4000 psi for Class C and 2000 psi for Class F concrete.

Steel reinforcement bars shall conform to the requirements of ODOT 509. All joints, pipe connections, frames, risers, etc. shall be installed with a non-shrinking, pliable grout as approved by the Sewer District.

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.

Sec. 502.3. 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.

The foundations for manholes without precast concrete bottoms shall be cast in place with Class "C" concrete conforming to the requirements of ODOT Item 499 and 511; and shall conform in all respects, to the dimensions shown on the Drawings. Manholes with

precast base sections shall be placed on a 6 inch compacted layer of granular material equal to that specified in Section 501.5 for pipe bedding and initial backfill.

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:

<u>Inside Diameter (feet)</u>	<u>Minimum Wall Thickness (inches)</u>
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, mechanically retained "O" rings, or mechanically expandable seals. The above seals shall be equal to those manufactured by Dura-Crete, Inc., Price Brothers Company or Thunderline Corporation.

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.

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

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 Section 501.5 for pipe bedding and initial backfill.

Sec. 502.4. 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 inside drop pipes as shown on the Standard Drawings. Inside drop connections, when approved by the District, 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.

Sec. 502.5. Manhold Castings. 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.

Manhole Frames and Lids. Standard manhole frames shall be equal to Neenah R1765 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.

Solid lids shall be furnished with Neenah Type J - "T" handle lock or equal and/or machined to receive self-sealing gasket. The Contractor shall supply the District one (1) "T" handle for every five (5) locking lids installed.

Four (4) bolt holes shall be furnished in the frame flange for anchoring the frame to the manhole. Four (4) - 3/4" 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.

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.

Sec. 502.6. Testing. The manholes will be tested, under District supervision, after installation is complete to show they are watertight. In general, testing will comply with Section 505.8- Testing of Manholes.

SEWAGE FORCE MAINS. Item 503

Section 503.1. Description. All sewage force mains constructed in the Clermont County Sewer District that are to be dedicated, operated by or otherwise made a part of the Sewer District, shall be installed in accordance with the materials and methods specified herein and as shown on the Standard Drawings.

Earthwork including excavation and final backfilling shall be in accordance with Section 200 - Earthwork.

Surface and site restoration shall be in accordance with Section 300 Restoration.

Sewage force mains shall be constructed of Polyvinyl Chloride (PVC) pipe as specified herein. No substitute materials shall be allowed.

Sewage force mains installations shall include access and drain manholes, where required; combination sewage air release valves and blocking.

Force mains will be tested in accordance with Item 505-Testing-Sewer.

Sec. 503.2. Polyvinyl Chloride (PVC) Pipe and Fittings. All Polyvinyl Chloride (PVC) pipe under this Item shall be in accordance with AWWA C900, DR-14.

For all sewage force main installations, unless a higher class is required by laying conditions or pressure in accordance with the Clermont County requirements, the minimum thickness class shall be as follows:

<u>Nominal Size</u>	<u>Thickness Class</u>	<u>Pressure Class</u>
All sizes (Min. 6" Force Main)	DR-14	200

All fittings, wall pipes and specials shall be of Polyvinyl Chloride (PVC) in accordance with (AWWA C-900)

Sec. 503.3. Sewage Force Main Manholes. Sewage force main access manholes shall be installed at all force main summits (high points) and at 600 foot maximum spacing unless approved otherwise by the District. Sewage force main drain manholes shall be installed at all force main depressions (low points) unless approved otherwise by the District.

Manhole construction, materials, and testing shall be in accordance with Item 501 - Manholes and as shown in the Standard Drawings.

Access and Drain manholes shall have 2 inch deep sumps constructed of Class "C" concrete as shown on the Standard Drawings. Precast concrete flat slab tops used in force main manhole construction shall be reinforced for highway loadings.

Access Manholes. Access manholes shall contain a removable section of pipe secured in place with expansion type pipe couplings at each end. Couplings shall be Dresser Style 138 or District approved equal.

Access manholes installed at force main summits shall contain a combination sewage air release and vacuum release assembly as specified in Section 503.4. - Valves.

Drain Manholes. Drain manholes shall contain a 4 inch plug valve and a flanged adapter coupling allowing for force main maintenance and access. Flanged coupling adapters shall be Dresser Style 128 or District approved equal. Plug valves shall be as specified in Section 503.4. - Valves.

Sec. 503.4. Valves. Force main installations shall incorporate plug and sewage combination air valves at force main depression and summit points, respectively.

Combination Sewage Air Valves. Combination sewage air valves shall be provided in force main summit manholes. Air release valves shall be sufficiently long 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. Materials of construction shall be as follows:

Body & Cover -----	Plastic or Stainless Steel
Internal Linkage -----	Delrin
Float & Internals -----	300 Series Stainless Steel
Needle & Seat -----	Buna N
Plug -----	Bronze

Sewage combination air valves shall be equal to A.R.I. D-020 or D-025, and sized according to the valve manufacturer's design recommendations.

Combination sewage air valves shall be furnished with a 2 inch long pipe nipple and vertical bronze lift check valve on the discharge to prevent automatic vacuum relief. Bronze lift check valves shall be equal in size to the air release valve discharge diameter and be Figure 584 as manufactured by the Powell Valve Company or District approved equal.

Sewage air valves shall be installed using a tee and reducing

flange (reduces to 2"). Saddles will not be permitted.

Plug Valves. Plug valves shall be of the non-lubricating, eccentric type with resilient faced plugs and ANSI 125 lb. flanged ends as described in fittings on section 504-5. 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.

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.

Sec. 503.5. Excavation and Pipe Laying. The proposed location of the pipe lines and connections shall be as shown on the construction drawings approved by the District. If, during the course of the work, unforeseen conditions arise that necessitate a change in horizontal alignment, no change shall be made until such time as the District has been notified of the change and has given its approval.

Unless approved otherwise, the force main shall be installed with a minimum cover of 4.0 feet from the finished ground elevation and the finished curb grade to the top of the force main. In any areas where the force main is to be installed in an embankment area, the embankment shall be placed and compacted prior to the force main trench being excavated.

The excavation and preparation of the trench shall be performed in accordance with Item 201 of these Specifications.

Concrete blocking, supports and/or buttresses shall be provided at all 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.

During any construction where the outside temperature is below 40°F

all rubber gaskets and lubricants shall be kept in a heated area at least 40°F until needed. No gasket or lubricant shall be out of the heated area more than 5 minutes before being placed in the bell or on the spigot of the pipe. All joints shall be lubricated according to the manufacturer's recommendations.

The Contractor shall notify the District and appropriate utility companies and perform the work around underground utilities in accordance with Sec. 201.11.

The Contractor shall be held responsible for any and all repairs necessary to underground utilities when broken or otherwise damaged by the construction operations.

As soon as possible after the force main trench has been excavated, the service lines shall be repaired as follows: The section of pipe removed shall be put back in place and connections with "Ford" or other approved couplings. The Contractor shall provide the couplings required and where pipe has been damaged in uncovering, a new section of pipe shall be provided by the Contractor.

All drain pipe crossing the trench shall be adequately supported to prevent sag.

The Contractor shall keep the District and other utility companies informed of his expected progress well in advance of excavating operations.

Prior to backfilling, the District shall be informed so that their representative may inspect the work that is to be covered. Testing will take place after backfilling and shall be done in accordance with Item 505-Testing-Sewer.

During backfilling, magnetic marking / locator tape shall be installed approximately 12" over the pipe.

Sec. 503.6. Backfilling. Backfilling, cleaning up and maintaining of surfaces shall be done in accordance with the provisions of AWWA Specification C-600, except as specified otherwise in Section 202 - Final Backfilling or herein.

All granular material for bedding and initial backfilling shall be durable gravel meeting grading requirements of ODOT 703.11 for No. 67 stone or sand. No limestone or crushed stone shall be included in this material.

All trenches shall be initially backfilled by hand, from the bottom of the trench to 12 inches above the top of the pipe, with granular bedding material, and compacted. At a location 12 inches over the pipe, magnetic marking / locator tape shall be installed the entire length of the pipe. Bedding material shall be deposited in the trench for its full width of each side of the pipe, fittings and appurtenances simultaneously.

For final backfilling from 12 inches above the top of the pipe to finished grade or subgrade, see Item 202 of these Specifications.

SEWAGE PUMP STATIONS. Item 504

Section 504.1 Description. The Contractor shall furnish all materials, equipment and labor necessary to install a pump station complete in place and ready for use as shown on the Standard Drawings and as specified herein.

The pump station shall consist of the following structures: a wet well, valve vault, bar screen manhole, a chemical feed tank, and equipment support pads. The principle items of equipment shall include duplex motor driven submersible sewage pumps, internal piping, valves and emergency standby pumping.

The work shall include but shall not be limited to the following:

- Sec. 504.2. Removal of Structures and Obstructions
- Sec. 504.3. Earthwork
- Sec. 504.4. Concrete
- Sec. 504.5. Reinforcing Steel
- Sec. 504.6. Pump Station Structures
- Sec. 504.7. Expansion Joints
- Sec. 504.8. Access Hatches
- Sec. 504.9. Ductile Iron Pipe
- Sec. 504.10. Pipe Coupling
- Sec. 504.11. Pipe Hangers and Supports
- Sec. 504.12. Pipe Seals
- Sec. 504.13. Valves
- Sec. 504.14. Submersible Sewage Pumps
- Sec. 504.15. Roadways
- Sec. 504.16. Guard Posts
- Sec. 504.17. Chain Link Fence and Gates
- Sec. 504.18. Clearing Site and Restoring Damaged Surfaces
- Sec. 504.19. Electrical Work
- Sec. 504.20. Additional Required Items

Sec. 504.2. Removal of Structures and Obstructions. The Contractor shall remove all existing pavement and fence required for the construction of the pump station and access driveway, in conformance with Section 202 of the ODOT Construction and Material Specifications, within the limits as required to install the pump station and access driveway.

Sec. 504.3. Earthwork. The Contractor shall perform all earthwork necessary for the construction of the Pump Station.

Earthwork including excavation and final backfilling shall be in accordance with Section 200 - Earthwork.

Sec. 504.4. Concrete. The Contractor shall furnish all materials, equipment and labor necessary therefore, and shall place all cast-in-place concrete required in the construction of the pump station.

All references to ODOT Specifications shall refer to the "Construction and Materials Specifications", Ohio Department of Transportation, latest Edition, except as modified herein.

Cement. Cement shall meet the requirements of ODOT Item 701.01.

Fine Aggregate. Fine aggregates shall meet the requirements for fine aggregates of ODOT Item 703.02.

Coarse Aggregate. Coarse aggregates shall meet the requirements for coarse aggregates of ODOT Item 703.02.

Water. Water used in mixing concrete shall be free of sewage, oil, acid, strong alkalies, vegetable matter, clay or loam.

Proportions. The materials shall be mixed in the proportions required according to ODOT Item 499.03, using Class C.

The proportioning is based on developing strength at 28 days of 4,000 pounds per square inch for Class C.

Slump shall not be greater than 4 inches.

Construction Methods. The construction methods shall meet the requirements of ODOT Item 511.

Suitable moldings or bevells shall be placed in the forms to bevel the corners and edges of the concrete to provide a continuous chamfer unless otherwise ordered by the District.

Interior and exterior surfaces exposed to view, other than floors, tops of slabs and walkways, shall be cleaned and finished in accordance with ODOT 511.15, Grout Cleaning.

Sec. 504.5. Reinforcing Steel. The Contractor shall furnish and place all concrete reinforcing steel required for the construction of any cast in place pump station structures or equipment support pads as specified herein.

Steel reinforcement bars shall meet the requirements of the "Standard Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcement", ASTM A615, Grade 60.

Installation of reinforcing steel shall conform to ODOT 509, except as specified 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.

Sec. 504.6. Pump Station Structures. All pump station structures, except for equipment support pads, shall be constructed of precast concrete units. Precast concrete units shall be circular manhole sections conforming to the requirements of Item 502 - Manholes, and/or box sections as specified herein.

Precast Box Sections. The precast box sections shall be of reinforced concrete and shall conform to the requirements of "Specifications for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers", ASTM Designation: C-789, except as modified herein.

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

The construction under this Item shall conform to the dimensions and types shown on the Drawings and be placed at the locations and elevations shown or ordered.

The foundations for structures without precast concrete bottoms shall be cast in place with Class "C" concrete as specified in the Concrete section of this Item and shall conform in all respects, to the dimensions shown on the Drawings. Reinforcing steel shall conform to ASTM 615 for Grade 60.

Minimum wall thickness shall be 8 inches.

Openings for pipes shall be cored in the precast units after construction of the various structures.

Joints between precast riser sections shall be sealed with flexible watertight butyl rubber sealants meeting the requirements of Federal Specification SS-S-00210 (210A).

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

Flat slab tops shall be a minimum 12 inches thick 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.

In general, the structures shall be constructed so the top of the structure is at the elevation of the proposed ground surface or as ordered at the discretion of the District.

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

Sec. 504.7. Expansion Joints. The Contractor shall furnish and place preformed filler expansion joints, conforming to the requirements of ODOT 705.03, where pump station structures, pads and/or roadways abut.

Sec. 504.8. Access Hatches. The Contractor shall furnish all labor and materials required to install the construction castings for the valve vault and bar screen manhole as shown on the Standard Drawings.

Manhole lid and frames for valve vault and bar screen manhole shall be equal to diamond plated aluminum type R-6662-RH with hold open device; with type G lift handles as manufactured by Neenah Foundry.

Sec. 504.9. Ductile Iron Pipe. The Contractor shall furnish and install all the materials for and properly connect in place all ductile pipe and fittings, as shown on the Standard Drawings and as required to complete the work for the pump station in accordance with the requirements stated under this Item.

In general and except where otherwise shown, all pipe not buried in the ground or encased shall be flanged joint with ductile iron flanges; and all pipe buried in the ground (yard piping) shall be push-on joint PVC, as specified.

Standards.

Pipe:

Materials: All ductile iron pipe shall be of the ductile, centrifugally cast type in accordance with ANSI 21.51 (AWWA C-151) or ANSI A21.15 (AWWA C-115).

Thickness Class: (Unless otherwise called for).

A. Inside Structures (and outside not buried):

All pipe shall be Class 53 Ductile Iron in accordance with ANSI A21.15 (AWWA C-115).

B. In Ground:

All buried pipe used for the lift station shall be Polyvinyl chloride (PVC) pressure pip conforming to AWWA C900. PVC pipe shall have ductile iron outside diameter, elastomeric-gasket type joints and shall have a minimum working pressure rating of 200 psi.

Fittings:

All fittings, wall pipes and specials shall be of ductile iron in accordance with ANSI A21.10 (AWWA C-110).

Joints. Flanged pipes and fittings shall be Class 125 drilled in accordance with American National Standard B16.1. Mechanical joints and "push-on" joints shall conform with the requirements of American National Standard Specification for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings", ANSI A21.11 (AWWA C-111). All joints shall have the same pressure rating as the pipe or fitting of which they are a part.

All piping shown on the Standard Drawings as mechanical joint piping shall be mechanical joint piping except underground piping will be PVC, C900 with push-on type joints.

Installation. The pipe installation shall be made only by workmen of sufficient experience and skill in the work to properly and satisfactorily perform it in the manner prescribed in these Specifications.

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. Cut ends shall be coated with bitumastic or primer as required to match shop coat.

Drilling and Tapping. All drilling and tapping for threaded pipe connections, shown on the Standard Drawings or ordered, shall be done in such a manner that the pipe, when screwed tightly into the tapped holes, will not project into the pipe or fittings.

Placing. Proper tools and appliances for the safe and convenient handling and placing of the pipe and fittings shall be used. Care shall be taken to prevent the pipe coating from being damaged, particularly on the inside of the pipe and fittings and any such damage shall be remedied as directed. All pipe and fittings shall be carefully examined by the Contractor for defects just before placing. No pipe or fitting shall be placed which is known to be defective.

If any defective pipe is discovered after having been installed, it shall be removed and replaced with a sound pipe or fitting in a satisfactory manner, by the Contractor at his own expense. All pipes and fittings shall be thoroughly cleaned before they are used, shall be kept clean until they are used in the completed work and when installed, shall conform to the lines and grade as ordered by the District. Open ends of pipe shall be kept plugged with a bulkhead during construction.

Pipe laid in trench shall be laid to a firm and even bearing for its full length. Precautions shall be taken against floating. The laying specifications of the AWWA shall be followed.

Supports. The Contractor shall furnish all supports and backing necessary to support the pipe and fittings in a firm, substantial

manner to the lines and grades shown or ordered. The Contractor shall supply all concrete supports and blocking, all stirrups, rods, beam clamps, hangers, structural shapes and pipe columns used for pipe supports, as shown or ordered, necessary to complete the work in a satisfactory manner.

Built-in Place and Fittings. Where shown on the Standard Drawings, or where directed, pipe and fittings shall be carefully built into or supported on concrete, stone or brick masonry.

Jointing. All flanged joints shall be thoroughly bolted with through stud, or tap bolts of required size as may be directed. Where tap or stud bolts are required, flanges shall be tapped. Rubber gaskets (1/8 inch thick) of "Rainbow" or other approved quality shall be used in all flanged joints. The bolts and nuts shall be of the best quality hot galvanized or cadmium plated steel with good, sound, well fitting threads. The nuts shall be cold pressed. Cadmium plating, if used, shall be of an approved process and shall be from 0.0003 to 0.0005 inch thick. All heads and nuts shall be hexagonal, the nuts to be 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 otherwise specifically shown on the Standard Drawings, bolts, nuts and washers shall be 304 stainless steel and shall not be painted. They shall, however, be coated with an approved nut-lock compound to prevent loosening. This compound shall allow disassembly. All flanged joint gaskets shall be full faced type.

Cleaning. The Contractor shall thoroughly clean all pipe lines to meet the approval of the District.

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

Painting. All piping buried in the ground or cast in concrete shall have an outside shop coating of bituminous paint in accordance with AWWA C-110. All other exposed piping (vent line) shall receive 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. All other piping in the wet well and valve vault shall receive an outside shop primer of polyamide epoxy as previously described and two (2) finish coats of coal tar epoxy (8 mil) equal to Porter: Tarsel C-200.

Finish painting will not be required for piping which is to be embedded in the ground or in concrete except where the shop coating has become damaged, in which case it shall be retouched to the satisfaction of the District.

Marking. All pipe and fittings shall be appropriately marked in accordance with American National Standard and AWWA Specifications.

Inspection. Makers of all pipe, fittings and specials used in the work, shall furnish a sworn certificate of inspection and testing in accordance with the requirements of the above mentioned specifications. All pipe, fittings and specials shall be subject to inspection and approval by the District after delivery; and no broken, cracked, misshaped, imperfectly coated, or otherwise damaged or unsatisfactory pipe shall be used.

Testing. All pipe lines shall be tested for tightness after erection. Where pipe lines are laid in excavation, or are bedded in concrete, testing shall be done prior to backfilling or placing of the concrete covering. The necessary tight bulkheads shall be provided as required.

All piping shall be tested under hydrostatic pressure of 150 pounds per square inch, gauge, or less, as the District shall direct. They shall be conducted as specified in the Standard AWWA Specifications C-600, Section 4 and as modified under this section.

Pipe shall be subjected to a manufacturer's test in accordance with ASTM Designation E23-72, Notched Charpy Test with the exceptions as described in ANSI A21.51.

The chemical constituents shall meet the Physical Property recommendations of ASTM A536 to insure that the iron is suitable for satisfactory drilling and cutting.

All tools, material, labor and appliances, including pumps, bulkheads and calibrated gauges, shall be furnished by the Contractor at his own expense.

Valves, pipe couplings, pipe accessories and other pipe appurtenances associated with a given section of pipeline shall be tested with, and at the same pressure as, that section of pipeline. Pressure relief valves shall be closed during the test.

Valves shall be tested at the scheduled pressure only for body rating. Drip tight shut-off valves shall only be tested to line working pressure. Where valves will not hold drip tight at test pressure, they shall not be used to isolate a section of line. Blind flanges shall be used in such a case.

Sec. 504.10. Pipe Couplings. The Contractor shall furnish, install, test and paint the expansion type pipe couplings where shown on the Standard Drawings and as specified herein.

Expansion Type. The expansion type couplings shall be of a gasketed sleeve-type, with diameter to properly fit the pipe. Each coupling shall consist of one (1) steel middle ring, two (2) steel followers, two (2) rubber compounded wedge section gaskets and sufficient track-head steel bolts to properly compress the gaskets. Field joints shall be made with this type of coupling.

The couplings shall be assembled on the job in a manner to insure permanently tight joints under all conditions of expansion, contraction, shifting and settlement, variations in gradient, etc. Unless otherwise shown, the coupling shall be Style No. 138 as manufactured by Dresser, Type 411 by Smith-Blair Inc., or equal.

Each coupling shall be sized for the type of pipe line in which it will be installed and for the pressure to be used.

The expansion couplings shall be carefully assembled and erected in accordance with the instructions of the manufacturer. The bolts shall be tightened sufficiently to prevent leakage but not too tightly to prevent expansion and contraction of the pipe. Space shall be left between the ends of the pipe at the couplings to provide for expansion. Expansion couplings shall be installed wherever a pipe crosses a structural expansion joint and elsewhere as shown on the Drawings or as ordered by the District.

Testing. All couplings shall be tested after erection with the piping to which they are attached.

Painting. The bolts and nuts shall be of the best quality, grade 8, hot galvanized or cadmium plated steel with good, sound, well fitting threads. The nuts shall be cold pressed. Cadmium plating, if used, shall be of an approved process and shall be from 0.0003 to 0.0005 inch thick.

Under this Item, all iron and steel parts of couplings shall receive one shop coat and one field coat of bituminous paint.

Sec. 504.11. Pipe Hangers and Supports. The Contractor shall furnish and install the various pipe supports including structural members as specified herein and as approved by the District or shown on the Standard Drawings.

Where pipe supports are shown and located on the Standard Drawings, they shall be 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 District.

Types. In general, the pipe supports shall be standard structural steel shapes of A36 steel or shall be special supports as manufactured by Elcen, ITT Grinnell, or equal. All anchors, shields, anchor bolts, bolts, nuts, washers and accessories shall be a part of this Item.

Design. Pipe supports shall be designed and located to adequately and rigidly support the piping, brace against thrusts, anchor the piping between expansion couplings, brace against uplift, and maintain the piping in proper alignment and to proper grade.

In the design of pipe supports, all piping shall be assumed to be full of water. All design shall conform to the requirements of "Pipe Hangers and Supports - Materials and Design", SP-58, Manufacturers Standardization Society of the Valve and Fittings Industry.

Anchors, Bolts, Painting and Galvanizing. Pipe supports fastened to floor or wall concrete shall be anchored with 300 series 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 300 series stainless steel, including studs, wedges, washers and nuts.

All non-anchor bolts required for installation of the pipe supports shall be steel. All other metal parts of pipe supports shall be galvanized.

Sec. 504.12. Pipe Seals. The Contractor shall furnish and install mechanically expandable link type rubber seals where shown on the Standard Drawings and as called for herein. All pipe lines which pass through walls and slabs shall be sealed. Such seals shall fill the annular space between the pipe and the cored hole through which the pipe passes. In general, one (1) 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 or floor opening. Seals shall be watertight to 40 feet of head.

Pipe seals shall be Link-Seal, service designation S (corrosive service), by Thunderline Corporation, or equal.

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

Sec. 504.13. Valves. The Contractor shall furnish, install, test and place into operation at the locations shown on the Standard Drawings or where ordered, all valves, and accessories as specified herein and shown on the Standard Drawings.

Also included under this Item shall be all operators, bolts and nuts, operating nuts and wrenches for a complete valve installation.

General. Those manufacturers referred to are listed to establish recognized standards. The valves used shall be of the types, sizes, and styles listed as manufactured by the companies named or equal.

All parts of each valve installation, so far as possible, shall be furnished by one manufacturer.

All valves shall open with a counterclockwise turn and shall be operated as specified and as shown on the Standard Drawings.

Plug Valves. The Contractor shall furnish, install, test and shop paint the various plug valves, operators, wrenches and accessories, complete and ready for continuous operation as shown on the Standard Drawings and as specified herein.

Plug valves shall be of the non-lubricating, rising stem, eccentric type with resilient faced plugs and ANSI 125 lb. flanged ends as described in fittings on section 504-5. 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.

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.

The valves shall provide drip-tight shut-off in either direction up to 150 psig.

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

Operators, Wrenches and Accessories: Each plug valve shall be provided with the operating accessories shown on the Standard Drawings. All accessories shall be manufacturers standard except as modified herein.

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.

Installation. 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 tends to hold the plug against the seat, unless specifically noted otherwise on the Standard Drawings.

Manual operator handwheel shafts shall be installed horizontal.

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

Painting. All equipment furnished under this Item not made of stainless steel, shall have non-machined surfaces painted with coal tar epoxy as specified in Section 504.9, Ductile and Cast Iron Pipe of this Item.

Testing. All piping, equipment and accessories provided under this Item shall be tested for tightness after erection. Any leaks shall be repaired.

Sec. 504.14. Submersible Sewage Pumps. The Contractor shall furnish, install and place in successful operation a minimum of two (2) submersible sewage pumps, one (1) operation and one (1) standby.

All pump installations shall be complete and shall include all drives, rails and all accessories and appurtenances such as small piping, assembly and anchor bolts and shims as required, as shown on the Standard Drawings and as specified herein. All anchor bolts shall be stainless steel.

Submersible Pumps. Each pump shall be a submersible sewage type designed to pump raw, unscreened sewage containing 3 inch diameter solids without damage during operation as manufactured by Flygt Corp., Hydromatic/Markley Pump Co., EBARA (ADD) or Gorman Rupp, Inc.

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.

Construction. 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.

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.

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.

Pumps shall be rated for continuous, 24 hour per day service.

Pump Spare Parts

- 1-set - Seals & O-Rings
- 1-full set - Bearings
- 1-Wear Ring
- 1-Impeller

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).

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.

The pump power and control cables shall be "SO" type. The cables shall enter the pump through heavy-duty entry assemblies which shall include elastomer grommets to protect against leakage. Cable strain relief assemblies shall be included.

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.

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. No part of the pump shall bear directly on the sump floor and no rotary motion of the pump shall be required for sealing.

Access Frame and Guides. Each pump shall be furnished with an individual aluminum access frame and cover and two guide bars where shown on the Drawings. The frames shall be complete with anchor straps, shall be sized for the removal of the installed pumps, shall be coated with a protective coating where the metal would come in contact with concrete, and shall be cast into the precast concrete slab where shown. Each frame shall be complete with cover door having skid-proof design, hinges and flush locking mechanism. The covers shall be designed for 300 psf. All hinges and other hardware and accessories shall be stainless steel.

Each frame shall also include upper guide brackets, stainless steel

cable holders and stainless steel lifting chains with hooks.

Guide bars (two per pump) shall be furnished to permit raising and lowering the pump. 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.

Portable Hoist. One (1) portable hoist shall be provided. The hoist shall be capable of lifting the heaviest submersible pump furnished under this Item. The hoist shall weigh not more than 100 pounds, shall have a lift of at least 30 feet and shall have a reach of at least 24 inches. The hoist shall consist of wall socket mounted vertical pipe with side boom, winch, load pulley, lifting hook (safety type) and cable. The hoist shall be designed to rotate about the vertical pipe axis. Hoist is to be constructed of stainless steel.

Wall type or platform type sockets shall be permanently installed at each submersible pump installation as shown on the Drawings. The sockets shall be anchored with stainless steel expansion anchors of the size, length and quantity as recommended by the pump hoist manufacturer.

Controls. All wiring from the pumps to the pump junction boxes, as shown on the Drawings, shall be furnished under this Section. All electrical connections shall be performed as part of the Electrical Section of this Item.

Any additional materials required by the manufacturers of these pumps, but not shown on the Drawings, to allow these pumps to function in the required manner, shall be furnished and installed as part of this Item. All electrical equipment furnished under this Section shall meet all requirements of the Electrical Section of this Item.

Liquid Level Sensors. As part of this Section, the Contractor shall furnish and install liquid level sensors for pump control and level alarms.

Each level sensor shall be a non-floating type level sensor consisting of a mercury switch in a smooth pear shaped chemical resistant polypropylene casing suspended on its own cable. Each unit shall be suitable for use in liquids with a specific gravity range of .65 to 1.5 and a temperature range of 32°140°F. Each unit cable shall be a synthetic three conductor cable consisting of 19 AWG wire. The mercury switch shall have a maximum voltage rating of 250 volts and a maximum amperage rating of 8 amperes AC. Floats or bubblers will not be considered an approved equal. The liquid level sensors shall be equal to Flygt Model ENH-10. Sensor cables shall be furnished having minimum of 30 feet length.

The level sensors shall be mounted from the junction box cast into the Wet Well slab. The electrical connections and all wiring from the

mounting junction box to the pump starters will be performed under the Electrical Section of this Item.

Liquid level sensors shall be provided as scheduled below:

Liquid Level Sensor Schedule

Pumps off	- Elev. "F"
Start Lead Pump	- Elev. "G"
Start Lag Pump	- Elev. "H"
High Level Alarm	- Elev. "J"

Manufacturers 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 District operating personnel in the operation, care and maintenance of the equipment.

Electrical. All electrical apparatus furnished under this Section shall meet all requirements of the Electrical Section of this Item.

Tests. After installation, all above specified equipment shall be given a running test to demonstrate to the District its readiness for continuous operation.

Drawings and Manuals. Shop drawings shall be submitted for District approval for all pumps, liquid level sensors and hoists furnished under this Item.

Following installation and prior to final acceptance, Pump Operation and Maintenance Manuals shall be furnished to the District.

Painting. All iron and carbon steel surfaces of equipment furnished under this Item shall receive as a minimum a 2 mil thick shop coating of polyamide epoxy equal to Porter: MCR-43 epoxy primer 4300 and two (2) finish coatings, 8 mil thick each, of coal tar epoxy equal to Porter: Tarsel C-200.

Sec. 504.15. Roadways. Under this Item the Contractor shall furnish all materials, equipment and labor necessary therefore, and shall construct a pump station access driveway pavement in conformity with the lines, grades and dimensions as shown on the Drawings or ordered by the District; all in accordance with these Specifications.

The work shall include re-excavation and disposal of temporary surfacing materials.

Asphalt Concrete on Aggregate Base. This pavement shall consist of two (2) courses of 6 inch depth each, compacted crushed aggregate base courses meeting the requirements of Item 304 of the State of Ohio, Department of Transportation, Construction and Material Specifications; a bituminous prime coat meeting the requirements of Item 408 of said Department of Transportation Specifications, the

bituminous material being RT-3 or RT-4 of ODOT Item 702.09 applied at a rate of 0.40 gallons per square yard; an asphalt concrete leveling course meeting the requirements of ODOT Item 402 with 85-100 penetration, the compacted thickness being 1-1/2 inches; and an asphalt concrete surface course meeting the requirements of ODOT Item 404 with 85-100 penetration, the compacted thickness being 1-1/2 inches.

Maintenance. Any settlement in areas paved by the Contractor taking place within the specified maintenance period shall be repaired by the Contractor, at his own expense, to a condition satisfactory to the District.

Sec. 504.16. 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.

Sec. 504.17. Chain Link Fence and Gates. The Contractor shall furnish and erect chain link fencing and gates where shown on the Standard Drawings and as specified herein. Green privacy strips shall be installed on entire fence.

The height of the fence after installation shall be standard 7 feet above grade (including 3 strands of barbed wire occupying the top 1 foot).

The fabric shall be No. 6 gauge high quality, medium carbon steel woven in 2 inch mesh and aluminum coated in conformance with the requirements of ASTM-A491. The top selvage shall be twisted and barbed.

Line posts shall be 2.25 inch x 1.7 inch H-Beams, 4.1 lbs./ft., or 2-1/2 inch O.D. Standard Weight Pipe, 3.65 lbs./ft.

End, corner and pull posts shall be 3 inch O.D. Standard Weight Pipe, 5.79 lbs./ft.

All posts shall be hot dipped galvanized (2.0 oz./sq. ft. avg.) after fabrication. Posts in ground shall be embedded in 3 feet of Class "F" concrete with a maximum spacing of 10 feet on centers. Post hole diameter 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.

Top rail shall be hot-dip galvanized pipe 1-5/8 inch 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 inches 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 3/8 inch round rod.

Fabric shall be fastened to line posts with fabric bands spaced approximately 14 inches apart, and to the top rail with tie wires, spaced approximately 24 inches apart. Connection to terminal posts shall be with 1/4 inch x 3/4 inch galvanized steel tension bars and 7/8 inch bands at 14 inch intervals.

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 inches above the fabric and 12 inches out from the fence line at an angle of 45 degrees.

All fittings shall be of hot-dip galvanized castings, wrought iron or pressed steel.

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. The Contractor shall also 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 inch 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 inch diameter adjustable truss rods to prevent sag or twist. Gate posts shall be 3 inch O.D. Standard Weight Pipe, 5.79 lbs./ft. for gates 5 feet wide, or less, 4 feet in width, and 4 inch O.D. Standard Weight Pipe, 9.11 lbs./ft. for gates 10 feet to 20 feet in width, and 4 inch 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.

Sec. 504.18. Clearing Site and Restoring Damaged Surfaces. Clearing of the site and restoring all damaged surfaces resulting from and installation of the pump station shall be in accordance with Section 300 Restoration.

Sec. 504.19. Electrical Work. The Contractor shall furnish all electrical work required for the Pump Station.

Sec. 504.19.1. Description. The Contractor shall furnish all labor, materials, equipment, services and incidentals required to construct, install and place in satisfactory service, the complete electrical systems and all electrical work as specified herein.

The electrical work shall include the following:

1. 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, control 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.

2. Service Entrance, 460 volts, 3 phase, 60 cycle, A.C. from Service Entrance drop provided by Cincinnati Gas and Electric Company to the Pump Control Panel.
3. 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 440 volts, 3 phase, 60 Hz A.C.
4. 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.
5. Grounding Systems.
6. Capacitors for power factor correction on large motors.
(See Section 504-20-12)

7. 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, Square D or Furnas (listed alphabetically) or approved equal by others, with a NEMA rating.

8. Telemetering System.

Sec. 504.19.2. Materials and Workmanship. 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 Article 20 of OBBC (Chapter 4101:2-20 of the Ohio Administrative Code), to the regulations of Clermont County, to the additional requirements of these Specifications, and is subject to the approval of the District 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.

Sec. 504.19.3. Drawings. Before beginning the electrical work, the Contractor shall submit to the District, 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.
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.

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 District prior to the final estimate for distribution to permanent record files. 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. One copy of the final installation drawings shall be a reproduceable copy on mylar.

Sec. 504.19.4. Wiring. All conductors shall be annealed copper, stranded insulated wire. All wires shall be run in rigid metal conduits unless otherwise specified herein. All wire shall comply with the requirements of the National Electrical Code and shall be approved by the Underwriters' Laboratories. 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.

Power supply wires for electronic equipment between the disconnect and the equipment shall be No. 14 THHN/THWN stranded, or No. 16 THHN/THWN stranded if the equipment takes less than 6 amperes.

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 one 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 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.

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 conditions shall be replaced with a new cable for the full length. Test instruments are to be provided by the Contractor.

All electrical connections shall comply with the requirements of the National Electrical Code. All stranded conductor connections shall be made by means of pressure type connectors which shall be T&B Stakon pressure type, or Ideal solderless terminals, or equal unless the terminal has 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.

Sec. 504.19.5. Conduit. All conduit installed for the Pump Station shall be full weight rigid galvanized steel unless specified otherwise. The steel conduit shall be heavily coated with zinc on both the interior and exterior surfaces by a hot dipping process or by sherardization.

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 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. "All" conduit threads shall be coated immediately after they are cut and cleaned off, with a cold zinc galvanizing system, "SpraGalv" as manufactured by Thermacote Company, "Z.R.C." by Z.R.C. Chemical Products Co., Quincy, Mass. or equal by others.

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 Subsection 504.20.7 for ground wire size.

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 and shall have gaskets of a type approved by the District. Hubs shall have tapered threads and all joints shall be watertight.

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 than 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. The expansion fittings shall be OZ Type "AX" with Type "BJ" bonding jumper, Crouse Hinds Type "XJ" with bonding jumper, or equal.

All wiring installed underground shall be installed in rigid metal conduit and the conduit encased all around in 4 inches of concrete. All underground conduit shall be at least 24 inches below the surface. A red, 6 inch wide plastic underground warning tape shall be installed 12 inches above the concrete encasement of all underground conduits. 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 Subsection 504.20.7 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 Schedule 40 steel pipe with waterstop collar and hot dip galvanized after fabrication, unless shown or specified otherwise. Watertight seals shall be mechanical type seals meeting the requirements of Sec. 504.13.

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 conduit and equipment installed in Pump Station Wet Well 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.

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.

All conduits shall be substantially supported by pipe straps or suitable clamps or hangers attached to the elements of the building structure to provide rigid installation. Conduit racks shall be metal channel framing type by Unistruct, Globe-Struct 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 and all accessories shall be hot dipped galvanized. Bolts and nuts shall be stainless steel. Anchors to concrete shall be 304 stainless steel expansion type. Field cuts and all damaged areas shall be touched up with a cold zinc galvanizing compound equal to "SpraGalv" by Thermacote Company, immediately after being cut or damaged.

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.

Sec. 504.19.6. 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 requirements of Subsection 504.20.5 Conduit.

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 removeable gasketed covers and shall be watertight. **ALL COVER FASTENING SCREWS SHALL BE STAINLESS STEEL.** All conduit entrances shall be sealed watertight.

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 cast metal covers with neoprene gaskets and stainless steel fastening screws.

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. **ALL MOUNTING ANCHORS, SCREWS, NUTS, ETC. SHALL BE STAINLESS STEEL.**

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 District. Hubs shall have tapered threads and all joints shall be tight. **ALL COVER FASTENING SCREWS SHALL BE STAINLESS STEEL.**

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.

The Contractor shall furnish and install at the Pump Station Wet Well, at least one (1) pump junction box and one (1) level control junction box. The pump junction box shall have 100 amp terminals for motor terminations and 25 amp terminals for thermal and moisture detection, if required, terminations. The level control junction box shall have 25 amp terminals for control and alarm float sensors. 100 ampere terminals shall be equal to Allen Bradley 1492-CD2. 25 ampere terminals shall be equal to Allen Bradley 1492-F1. 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 Subsection 504.20.14 to the pump and level control junction boxes shall be sealed with conduit seal fittings at the junction boxes.

Sec. 504.19.7. 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.

Main grounding conductors, grounding electrode conductors and main bonding jumpers shall be no smaller than #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.

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, staps 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 multicircuited 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.

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 described herein. 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.

Ground rods shall be 1 inch diameter by 20 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. Two (2) 10 foot long rods coupled together may be used to make up a 20 foot long rod. Connectors for fastening grounding cables to rods shall be equal to **CADWELD** exothermic type welded connections.

The Contractor shall test, in the presence of the District, 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.

Sec. 504.19.8 120 Volt 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 Subsection 504.20.6, Outlet Boxes, Junction Boxes, Pull Boxes and Fittings.

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.

<u>Service</u>	<u>General Electric No.</u>	<u>Hubbell No.</u>
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 one 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 5-20R 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, Crouse 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.

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.

ALL COVER PLATE FASTENING SCREWS SHALL BE STAINLESS STEEL.

Sec. 504.19.9 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		
				120V	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) Noninterchangeable Trip
- (A) Adjustable Magnetic Trips

* Magnetic only for individual Motor Circuits only.

Sec. 504.19.10. 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 Subsection 504.20.9 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 sized for connected auxiliary relays, timers and accessories, with a minimum capacity of 100 VA. The control power transformers shall have the two (2) primary legs fused, one (1) secondary leg fused and the one (1) secondary leg grounded for each controller.

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.

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 Subsection 504.20.11.

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 galvanized 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.

The three phase motor controllers shall be Furnas NEMA rated not IEC, or equal by others.

For all motors over 15 HP shall be equipped with soft start/stop starters.

Sec. 504.19.11 Pilot Control Devices. Pilot control devices shall be furnished and installed in the pump control panel of Subsection 504.20.14 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 Electric Type PB2 or equal by others. Pilot lights shall be push-to-test transformer type (120 VAC x 6 VAC) with low voltage (6 volt No. 755) incandescent lamps with appropriate faceted glass color cap. 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.

Relays shall be sized for the load conditions. Light duty relays shall be general purpose plug in type mounted on heavy duty octal sockets, Potter Brumfield Type KRPl1AN, Eagle Signal Type 22AP2C10 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.

Timers and timing relays shall be field adjustable, on or off delay, with ranges of 0-60 seconds. Timers and timing relays shall be solid state, totally enclosed units and shall have contact ratings compatible with current of devices simultaneously operated by contact. Timers and timing relays shall be plug-in type mounted on heavy duty octal sockets with barrier protected screw terminals and shall be manufactured by Automatic Timing and Controls Company (ATC), Eagle Signal, or equal by others.

Alternating relays used for alternating control of pumps shall be all solid state. The alternators shall be completely self-contained in a dust-proof relay case and shall require only a 120 VAC source to operate the circuit and one side of the same AC source for a control line to initiate the alternating action.

Sec. 504.19.12. Power Capacitors. The Contractor shall furnish and install power factor correcting capacitors on all motors of 15 HP or more furnished for the Pump Station.

All capacitors shall be sized according to the motor manufacturer's recommendation and as approved by the District and shall raise the motor power factor up to between 90 percent and 100 percent under all operating conditions. The capacitors shall be installed in the pump control panel of Subsection 504.20.14 and wired to the respective motor contractor terminals. The Contractor shall test to prove the power factor of the motors after installation if requested.

All capacitors shall be for outdoor weatherproof service, shall be UL listed where listing is available and shall be General Electric Type OFW, EWT or HWT, Sprague Unipak or Univar, Westinghouse Type Dri-Var or equal by others.

All capacitor mounting hardware shall be stainless steel.

Sec. 504.19.13. 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 Cincinnati Gas and Electric Company. It shall be the responsibility of the Contractor to contact the electric company and to coordinate the work involved in the service entrance installation.

Note: the electrical meter and equipment shall be mounted on galvanized or stainless poles. Treated lumber stands or supports will not be acceptable. The only exception to this is meters mounted directly to service poles.

Sec. 504.19.14. 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.

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, NEMA3R or 4x 300 series stainless steel 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 cast iron 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. The enclosure shall be rated NEMA 3R construction.

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 enclosure shall be provided with print pocket.

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 Clermont County Sewer District.

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, 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 of Subsection 504.20.15, the transfer switch contactor and intelligent section of Subsection 504.20.15, surge protection, power factor correction capacitors, a GFCI receptacle and the circuit breaker type combination starters for the pump station pumps.

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. 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 of Subsection 504.20.15, the battery charger of Subsection 504.20.15, the enclosure heater and one spare circuit.

The pump control panel shall include the following controls for duplex pump installations: A Hand-Off-Automatic selector switch, an elapsed time meter, a green running indicator light and a red pump overload indicator light for each pump; a red moisture alarm indicator light, if applicable, for each pump; a red high wet well level alarm indicator light; time delay on starting for each pump; and, an automatic alternator to alternate the lead and lag pump operation at each operating cycle. 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.

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 a 0-15 minutes adjustable on delay timer. The operation of a triplex pump station shall be the same as for a duplex pump station except as follows: Upon reaching the high level alarm condition, the 0-15 minutes timer shall be energized. If the pump station level remains at the high level condition for the length of time set on the timer, the third pump shall start. 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 metal tagged. All panel components shall be clearly labeled and identified on shop drawings.

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, thermoplastic insulated, rated 600 volts at 75°C, Type THHN/THWN. 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 wire numbers shall be clearly shown on shop drawings and sufficiently explained on shop drawing legends.

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. First class workmanship shall be expected in the completed installation.

The enclosure shall have a 120 volt thermostatically controlled strip heater mounted in the bottom of the enclosure to keep the enclosure free of moisture condensation.

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 Subsection 504.20.11. All legend plates shall be custom lettered as approved by the District.

Sec. 504.19.15. Emergency Standby Pumping
(Self Priming Centrifugal Pumps)

Description

Scope: CONTRACTOR furnish all labor, materials, equipment, and incidentals required for self priming centrifugal pumps. Pumps shall be complete and operational with all equipment and meet the specifications described herein. The principal items of equipment shall include pump, oil level sight gauge, pressure relief valve, desired elbows and strainers, etc.

Coordination: Review installation procedures under other Sections and coordinate the work that must be installed with or attached to the self priming centrifugal pumps.

Shop Drawings:

1. Comply with all Clermont County Sewer District requirements.
2. Submit manufacturer's literature, illustrations, specifications and engineering data including (highlighted to show):
 - a. Dimensions.
 - b. Materials.
 - c. Size.
 - d. Weight.
 - e. Performance data and curves showing overall pump efficiencies, flow rate, head, brake horsepower, motor speed and shut-off head.
3. Submit Shop Drawings showing fabrication, assembly, installation

- wiring diagrams.
4. Submit Operation and Maintenance Manuals including complete installation, operation and maintenance data including copies of all reviewed Shop Drawings.
 5. Complete parts and recommend spare parts lists.
 6. Names and location of two nearest authorized service representative.

Self Priming Centrifugal Pumps

Service Conditions:

1. Non-clog, self priming centrifugal pump with diesel engine drive.
2. Design, construct and install for the service intended.
3. Comply with design conditions listed in this Schedule.

Pump Control Compatibility:

1. To insure compatibility, pumps, motors and associated starters, controls and panels shall be furnished by the pump supplier.

Construction Details:

1. Materials:
 - a. Volute casing, wear plate, cover plate, intermediate bracket, seal plate and flanges: Gray Iron No. 30.
 - b. Impeller: Ductile Iron.
 - c. Impeller Shaft: Alloy Steel No. 4140.
 - d. Shaft Sleeve: Alloy Steel No. 4130.
 - e. Wear Plate: Steel No. 1020.
2. Bearings:
 - a. Radial: Single ball or tapered roller type, heavy duty, oil lubricated.
 - b. Thrust; Double ball or tapered roller type, heavy duty, oil lubricated.
3. Impeller:
 - a. Type: Open type, two vanes, non-clog, one piece.
 - b. Sphere diameter: Three inch minimum.
4. Check Valve:
 - a. Internal: Moulded one-piece tapered suction valve.
5. Seal:
 - a. Pump Shaft: Balanced mechanical seal, double floating, self-aligning and oil lubricated. Rotating and stationary faces of tungsten-titanium carbide. Viton elastomers and stainless steel cage and spring.
6. Drive Unit:
 - a. Provide diesel engine drive unit.
7. Valves and Piping
 - a. Air Release Valve: Automatic, release air during priming cycle, close to prevent recirculation of cycle and, visible indication at closure, function on discharge pressure only and no connection to suction line.
 - b. Valve Materials: Cast iron, stainless steel or similar corrosion resistant materials as approved by Clermont County Sewer District. Diaphragms of fabric-reinforced neoprene or similiar inert material as approved by Clermont County Sewer District.
 - c. Maintenance and Operation: Cleanout port for inspection, cleaning and servicing. Field adjustable for verifying discharge heads.
8. Gauges:
 - a. Compound Gauge: Glycerin-filled, graduated from -34 to 34 feet water column, accuracy to 1% full scale, minimum

- 4 inches in diameter.
- b. Pressure Gauge: Glycerin-filled, graduated from 0 to 140 feet water column, accuracy to 1% full scale, minimum 4 inches in diameter.
 - c. Mounting: Resilient panel and frame assembly, complete installation with all hose and fittings and shutoff valves in each line of pipe connection point.

9. Spare parts Kit:

- a. Minimum Required: One pump mechanical seal (complete) and all gaskets, seals, sleeves, o-rings and packing. One set of impeller clearance adjustment shims. One gallon of seal lubricant.

10. Unit Base:

- a. Composed of structural steel members with base flange drilled for mounting to concrete pad. Base shall be capable of being lifted during shipping and installation. Base to be anchor bolted to floor after installation.

Product and Manufacturer:

1. Gorman-Rupp Company, Model T6A3-F4L.
2. Or equal.

Painting

- A. Paint pumps, motors, drives, frames, baseplates, appurtenances, etc. prior to shipment.
- B. Coat machined, polished, and non-ferrous surfaces with corrosion prevention compound.

Installation

- A. Comply with manufacturer's instructions and recommendations:
- B. Install check valve, air release valve, and shut-off valve in discharge and suction piping for each pump.
- C. Support discharge and suction piping independent of pump coupling.

Start-Up and Test

- A. Verify that structures, pipes and equipment are compatible.
- B. Adjust system to provide proper operating conditions.
- C. Manufacturer's Representative:
 1. Check and approve the installation before operation.
 2. Test operate the system in the presence of the owner and verify that the pumps comply with requirements.
 3. Instruct plant personnel on care and maintenance of the equipment.
 4. Revisit the job site as often as necessary until all trouble is corrected and the installation is entirely satisfactory.

PUMP DRIVES

PART 1 - GENERAL

Description

- A. Scope: Contractor shall furnish all labor, materials, equipment, and incidentals required for pump drives. Drive units shall be complete and operational with all equipment and meet the specifications described herein. The principal items of equipment shall include a four cylinder, four cycle, air cooled diesel engine, mechanical governor, twelve volt electric starter, fuel tank, safety switches, skid, battery, control equipment, and accessories as shown and specified.

Submittals

Shop Drawings:

1. Submit manufacturer's literature, illustrations, specifications, and engineering data includings: (Highlighted to Show):
 - a. Dimensions.
 - b. Materials.
 - c. Size.
 - d. Weight.
 - e. Displacement, brake horsepower, speed and performance data.

Operation and Maintenance Manuals:

1. Submit Operation and Maintenance Manuals including complete installation, operation, and maintenance data including copies of all reviewed Shop Drawings.
2. Complete parts and recommended spare parts' lists.
3. Name and location of two nearest authorized service representative.

Diesel Engine Pump Drive:

Service Conditions:

1. Drive to power a self priming centrifugal pump.
2. Drive to function in an unheated building.
3. Horsepower: As required to satisfy the conditions per each lift station or pump station.

Construction Details:

1. Engine: Diesel powered, four cylinder and air cooled.
2. Equipment: Sufficient controls and components to permit manual or automatic operation with either engine controls or DC level control system.
 - a) 12 volt DC electrical system including starter and alternator with 189 amp-hr. storage battery.
 - b) Sensors for engine temperature, oil pressure, overspeed, and overcrank.
 - c) Muffler and exhaust designed for residential area.
 - d) Manual operation switch and controls.
 - e) Alternator ammeter, engine speed tachometer, and oil

pressure gauge.

3. Minimum Performance Standards:
 - a. Engine speed governor controlled over operating range to insure adequate cooling and prevent excessive speed. Performance curves to be submitted for review.
 - b. Must develop 95% of published performance.
 - c. Performance derated for continuous operation in environment with ambient temperature of 100°F.
 - d. Brake horsepower requirements not to exceed 70% of calculated engine horsepower after all derating allowances.
4. Drive Transmission: Shall be a Dyna-flex coupling between engine and pump.
5. Finish: All metal surfaces of pumps, exposed steel framework and drive assembly shall be cleaned and primed with zinc base synthetic primer.

Drive and Pump Control Compatibility:

1. To insure compatibility between pumps, drives, and control systems proposed, all items and associated controls shall be furnished by the pump supplier.

Accessories:

1. Drive unit shall power a 2 KW generator to provide power in case of power outages.
2. Drive unit shall contain programmable exercise controls.
 - a. Manually adjustable 7-day timer shall be used to establish exercise periods.
 - b. Exercise shall simulate loss of utility power and "lock out" main pumps to prevent simultaneous operation of main pump and standby pump.
 - c. Exercise period shall be 15 minutes or multiple thereof repeated every 7 days.

Products and Manufacturer:

1. Gorman-Rupp Company.
2. Or equal.

Certified Performance:

1. Documentation shall be submitted prior to shipment and ENGINEER shall witness test the drive, pumping unit, and controls for performance compliance.

Installation

- A. Comply with manufacturer's instructions and recommendations.
- B. Install diesel engine on frame and connect to pump.
- C. Provide and install all accessory equipment as shown and specified.

Start-Up and Test

- A. Verify that engine, pump, and equipment are compatible.
- B. Adjust system to provide proper operating conditions.
- C. Manufacturer's Representative:

1. Check and approve the installation before operation.
2. Test operate the system in the presence of the Owner and verify that the engine pumps comply with requirements.
3. Instruct plant personnel on care and maintenance of the equipment.
4. Revisit the job site as often as necessary until all trouble is corrected and the installation is entirely satisfactory.

Sec. 504.19.16. 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 District.

Required pump station information to be transmitted shall include the following conditions:

- | | |
|-------------------------------|----------------------|
| 1. High wet well level alarm. | 6. Trip Reset |
| 2. Power On | 7. System Test |
| 3. Power Off | 8. Blower Surge |
| 4. General Alarm | 9. Generator "on" or |
| 5. General Alarm | Power Failure Alarm. |

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 Sewer District's existing SCADA system.

SCADA equipment required at each pump station installation shall include, but not be limited to, the following items:

- 1 - PLC Control Panel (Micrologix 1500)
- 1 - Radio (Microwave Data Systems, Inc. - iNet 900)
- 1 - Yagi Directional Antenna (MDS Clearwave or equal) (path study must be performed to verify communication)

Sec. 504.19.17. Scheduling of Electrical Work. It shall be the responsibility of the Contractor to coordinate the installation of electrical equipment and wiring with respect to the construction of the Pump Station.

In general, electrical work shall be scheduled to coincide with the other construction work of the Pump Station in order to provide electrical service to each piece of new equipment as its installation is completed.

As each phase of construction is completed, it is expected that the electrical portion of the work associated with that phase will have been completed including either temporary or permanent wiring. At the completion of the project, all electrical equipment and wiring shall be permanently installed.

Sec. 504.19.18. 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.

Sec. 504.19.19. Spare Parts. All parts recommended by the manufacturers of the various items of equipment in any of their literature to the spare parts, shall be furnished by the Contractor and turned over to the District. 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 District.

These spares shall at least include the following items:

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 overload heater for each and every size in service up to a maximum of six (6) for any one size overload heater.
4. One (1) spare unit for each ten (10) or less of each size and type of each of the following components furnished: Elapsed time meters, control transformers, pilot light assemblies, switch contact blocks, relay contact cartridges, selector switch assemblies and pushbutton assemblies.
5. One (1) spare starter.

Sec. 504.19.20 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 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 District.

Sec. 504.19.21. Painting. All interior and exterior surfaces of equipment enclosures, except stainless steel enclosures and hardware, shall be thoroughly cleaned after fabrication, completely bonderized and finished painted at the factory. All interiors shall be white. Touch-up painting shall be done after installation.

Sec. 504.19.22. Instruction Books. Complete bound instruction books for the Emergency Standby Pumping and all other Electrical Equipment shall be furnished to the District. 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.

Sec. 504.19.23. Additional Required Items

1. Bioxide feed system at each site. The system must be sized accordingly with the capabilities of injecting the Bioxide directly in the force main and or in the well. Each system shall be sized with a minimum tank size of 1,000 gallons.
2. Generators:

- a. Kohler Preferred
 - b. Five year full parts and labor warranty including travel
 - c. Fuel tank with a minimum 36 hour operating capacity
 - d. Transfer switches are to be mounted in the MCC and not mounted on the generator
 - e. Spare filters and block heater to be supplied in spare parts.
3. Flow Monitor-Each station is to be equipped with a flow monitor including a flow totalizer. The flow monitor shall be a Greyline Model AVFM or approved equal.

Item 505 - TESTING-SEWER

- 505.1 - 505.7 - Gravity Sewer Testing
- 505.8 - Sewer Manhole Testing
- 505.9 - Sewer Force Main Testing

Section 505.1. Description. Generally, 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 District and may include infiltration, exfiltration or air testing.

Television inspection and individual joint testing may be ordered by the District for sewers having "live" connections.

Prior to testing, the lines shall be flushed and swabbed. Swabbing shall be a rubber inflated ball or other approved method.

All testing shall be conducted under the supervision of the District, 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 to prior to acceptance of testing and final inspection.

Sec. 505.2. Infiltration Testing. The District may order the Contractor to make infiltration (leakage) tests of as many sections of the sanitary sewers, as, in the District's 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 District 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.

Sec. 505.3. Exfiltration Testing. The District 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.

Sec. 505.4. 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.

Sec. 505.5. 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 Sewer District. Unless otherwise directed by the Sewer District, the sewer will be tested at 5 pounds of pressure for 5 minutes with no loss of pressure.

Sec. 505.6. Television Inspection. The District may order the Contractor to inspect, by closed circuit television, and test joints of sections of sewers with "live" service connections. The testing method shall be subject to the approval of the District. Joints that fail the joint test shall be sealed with a District approved chemical grout or excavated for repairs and retested until the joints pass the joint test.

Sec. 505.7 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 composite wall sewer pipe not meeting the deflection test shall be approved by the District.

Section 505.8 Testing of Manholes

- 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:

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 seconds	1 minute and 5 seconds	1 minute and 20 seconds
15.01 to 30 feet	1 minute and 20 seconds	1 minute and 45 seconds	2 minutes and 10 seconds

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.

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):

Allowable Leakage Per 1,000 Feet of Pipeline* - gph

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

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

Surge Tanks - Item 506

Section 506.1 Description. The Contractor shall furnish all materials, equipment and labor necessary to install a surge tank complete in place and ready for use as required and as specified herein.

Section 506.2. Earthwork. The Contractor shall perform all earthwork necessary for the construction of the surge tank.

Earthwork including excavation and final backfilling shall be in accordance with Section 200 - Earthwork.

Section 506.3. Concrete. The Contractor shall furnish all materials, equipment, and labor necessary therefore, and shall place all case-in-place concrete required in the construction of the surge tank.

All references to ODOT Specifications shall refer to the *Construction and Materials Specifications*, Ohio Department of Transportation, latest Edition, except as modified therein.

Section 506.4. General Requirements. The surge tanks shall be approved as a "temporary" system only. All approvals shall contain a standard condition in the permit to install stating as such:

The Clermont County Sewer District will be responsible for the operation and maintenance, of the surge tank, with the Developer posting a standard two year maintenance bond, as well as, pay all costs associated with said system until such time the system is abandoned. The developer will be responsible to eliminate said surge tank when such time it is possible to do so.

Section 506.5 Design Requirements.

Isolation: Since no open tanks will be permitted, a minimum of 150 feet isolation distance should be maintained.

Aeration: Dual blowers shall be required. The normal air requirement of 2 cfm per 1000 gallons of storage shall be maintained. Blowers shall be housed.

Antiflotation: Pressure relief valves shall not be allowed. Antiflotation shall be achieved by alternate methods, such as providing perimeter drain tile system, etc.

Capacity: At least two days detention time shall be provided. This allows at least one day to service, repair, and/or replace the pumps, controls, or valves.

Pumps: Design requirements shall conform to standards for pump stations and shall be sized to completely pump tank contents over a designated time during low flow periods in the sewer (i.e. after midnight, early morning, etc.).

Controls and Alarms: These will conform to standards for pump stations and shall provide a 24 hour timer to prevent pumping during peak flow periods. Also, a visual "pump running" indicator should be provided.

Air intake/venting: A detail study with computations will be required concerning louvers, moisture, exhaust fans and the installations of Humistats for CCSD approval.

All requirements are completely under the control of the Clermont County Sewer District and said requirements, shop drawings, plans, specifications must be approved prior to installation.

Overflow: An emergency overflow line is optional. If it is provided, it shall be constructed to provide gravity flow to the nearest manhole. With two days storage capacity, it may not be absolutely necessary to provide an emergency overflow.

Standby Power: Not needed with two day storage capacity.

Access: A paved access road shall be provided. Also, a security fence or lockable covers and housing (if installed above ground) shall be provided.

506.6 Operations and Maintenance.

The air diffusers shall be of a removable type.

Water service shall be available for clean-up purposes. A sloped tank bottom towards the sump pump is required.

If the top of the tank is sealed, the air will be vented into the sewer through the inlet and emergency overflow (if needed) pipes.

Interceptors - Item 507

(A) General:

(1) Interceptors shall be provided, operated and maintained whenever liquid or liquid wastes are received by the plumbing system which may contain flammable, explosive, noxious toxic, gaseous, corrosive or other materials that may be hazardous to the building or its occupants, or that may be harmful to the building drainage system, the wastewater system, sewage treatment plant or its processes. Deleterious and detrimental materials include but are not limited to greases, oils, sugars, paraffins or other waxes, plastic wastes, paints and other coatings, sands, silts, clays and similar earthly materials will be intercepted and prevented from entering the wastewater system.

(1-B) Businesses operating within a permanent structure(s) which are licensed as Retail Food Establishment (RFE), Food Service Operation (FSO) or Temporary Food Service Operation (FSO) operating seven (7) consecutive days or greater than fifty two (52) days a year shall discharge through an interceptor before entering the public sewer system.

(2)Wastes from industrial processes, meat packing and food processing industries, and similar processing plants shall be handled in accordance with plans and specifications, approved by the Ohio Environmental Protection Agency, or the proper authority in charge of the sewage system into which the wastes are to be discharged. The plans and specifications submitted for approval shall include a full description of the wastes, their characteristics and volume. The system shall be approved by the proper authority before any work or construction is begun.

(3)Corrosive wastes shall be treated as provided in rule 4101:2-63-04 of the Adminstrative Code.

(4)Interceptors may be pre-built or engineered units, or they may be constructed or assembled at the site of the work and shall be designed and installed in accordance with the accepted engineering practice.

(5)Where pre-built units are used, they shall be sized and installed in accordance with the manufactures specifications, drawing and instruction for the intended service.

(6)All interceptors shall be of such capacity and volume as to retain the liquid for a sufficient length of time to permit the deleterious and detrimental materials to separate from the other wastes before they are discharged into the building drain or sewer. If necessary, strainers shall be installed to retain and collect solid materials one half inch or larger in any dimension.

(7)Interceptors shall be located so as to be readily accessible at all times. All materials removed shall be disposed of in a manner that will not permit them to enter the sewage system or wastewater treatment plant.

(8)Where flammable, toxic, noxious or gaseous wastes which may be hazardous to the building or its occupants are received by the interceptor, the cover shall be non-absorbant, be bolted and gasketed, so as to make it gas tight.

(9)Where nonhazardous wastes are received by the interceptor, a solid cover of sufficient weight to hold it in its frame or secured by suitable fasteners shall be used. If in an area that water may pond or in a parking or paved area the cover shall be non-absorbant, be bolted and gasketed so no liquids may enter the interceptor.

(10)Interceptors shall be constructed of suitable impervious materials not affected by the wastes received. The interceptor shall be designed to withstand the internal pressures and external forces to which it may be subjected in any part of the interceptor. All piping and metals shall resist corrosion to the same degree that soil and waste piping resist ordinary sewage waste.

(B)Oil Interceptors:

(1)Oil separators required. At repair garages; gasoline stations and oil service facilities with grease racks; car washing facilities; and at factories where oily and/or flammable liquid wastes are produced or used, separators shall be installed into which all oil-bearing, grease-bearing or flammable wastes shall be discharged before emptying into the building drainage system or other point of disposal. Wastes

from interceptors shall not be discharged into any street, alley or onto the surface of the ground.

(2) Separation of liquids. A mixture of treated or untreated light and heavy liquids with various specific gravities shall be separated in an approved receptacle.

(3) Oil Separator design. Oil separator shall be designed as follows:

General design requirements. Site-built oil interceptor conforming with the following prima-facia evidence of conforming to accepted engineering practice.

A. The interceptor shall be of sufficient size to retain the materials and volumes of liquids and separated materials.

B. The horizontal cross sectional area of the interceptor shall be at least twenty-four inches in diameter. There shall be at least twelve inches of ventilating space above the invert of the inlet.

C. The top of the outlet shall be at least twenty-four inches below the invert of the inlet. The outlet shall rise adjacent to and external to the interceptor to the outlet drain where a double tee or cross fitting with the run vertical shall connect to the outlet riser and the outlet drain line. The top of the cross and the back side of the cross shall extend upward to grade level where a clean-out plug of same size shall be installed.

D. The interceptor shall have a depth at least twelve inches below the invert of the outlet in the wall of the interceptor receiver and more if necessary to retain the intercepted materials between cleanings.

E. The outlet of the interceptor shall be at least four inches in diameter. The outlet drain shall be vented as per the Ohio Plumbing Code.

F. The venting space in the receiver shall be vented by at least a three inch vent extending up separate from all other vents through the roof. Wash sinks that are trapped in the service area may be permitted to discharge into the local vent from the interceptor.

(4) Sizing of interceptors. Sizing of interceptors shall be based on the liquid depth which is the effective volume.

A. Interceptors shall have a minimum capacity of five cubic feet for the first one hundred square feet of area to be drained, plus one cubic foot for each additional one hundred square feet of area to be drained into the separator.

B. Interceptors for mechanical car washing installations shall be designed on the basis of the volumes of water and wastes produced and the rates of flow thereof.

(C) Grease Interceptors:

(1) Grease interceptors for kitchen wastes shall be installed so that they will receive all grease bearing kitchen wastes. Clermont County Sewer regulations do not permit discharge of a garbage disposal into the sewer system. Grease interceptors shall be installed immediately outside the building where there is easy access for cleaning.

(2) The grease interceptor shall be cleaned frequently and cleaned as often as necessary to retain the grease wastes. The Sewer District having jurisdiction may require scavenger hauler tickets if grease is detected through discharge into the sewer system. The materials removed in cleaning shall be removed from the premises for disposal and not be deposited in the plumbing system. The use of enzymes for the cleaning of grease interceptors is not permitted.

(3) The grease interceptor shall have a minimum size of 250 gallons and be determined using the following formula:

$$\frac{(0.75 \times \text{fixture volume (gal.)})}{\text{drainage period (1 minute)}} \times \frac{2.25 \text{ pounds}}{56.5 \text{ \#/ft}^3} \times \frac{7.48 \text{ gal.}}{\text{ft}^3} = \text{volume (gallons)}$$

(4) Pre-built interceptors eight feet in length or longer must be equipped with openings at least twenty-four inches in diameter and located over the inlet and the outlet baffles.

A. The top of the outlet shall be at least twenty-four inches below the invert of the inlet. The outlet shall rise adjacent to and external to the interceptor to the outlet drain where a double tee or cross fitting with the run vertical shall connect to the outlet riser and the outlet drain line. The top of the cross and the back side of the cross shall extend upward to grade level where a clean-out plug of same size shall be installed. The outlet must be 12" above the tank bottom to allow for solids settling.

(5) At the discretion of the Sewer District, Grease interceptors may be installed adjacent to each fixture or piece of equipment capable of fifty gallons per minute flow or less and must conform to PDI G-101 Standards. This exception only applies to existing structures experiencing a change of use and is strictly at the discretion of the Sewer District.

(6) All valves and devices included in the design of the grease interceptors to prevent grease discharge from the interceptor shall be installed in accordance with the manufactures instructions.

(7) Grease interceptors are not required on apartments or kitchenette wastes.

(D) Sand Interceptors

(1) Discharge containing sand, dirt solids or semi solids harmful to a drainage system, shall discharge through a sand interceptor.

(2) Sand interceptors shall be a minimum twenty-four inches square with not less than two foot depth of sand storage below the discharge drain line.

(3) The inlet and outlet piping shall be a minimum three inches in diameter. The inverts shall be at the same level.

(4) Baffles or tees with a turndown tailpiece providing a four inch minimum water seal shall be installed. However, when the sand interceptor discharges through an oil interceptor such as in car

washes, the baffles or turndown tailpiece shall not be installed in the sand interceptor, but shall be installed in the oil interceptor at the inlet pipe.

(5)The top of the sand interceptor shall be covered with a removable open grating set flush with the finished floor and shall be designed in accordance with the floor loads requirements of the building code.

Special use interceptors:

(1)Bottling plant wastes shall be discharged into an interceptor capable of separating broken glass or other solids before discharging liquid wastes into the drainage system.