

SECTION 02540

PUMP STATION

PART 1 – GENERAL

1.01 SCOPE OF WORK

The purpose of this Specification is to establish uniform MD-WASD requirements for the design and construction requirements for wastewater pumping stations. This Specification does not purport to cover all materials or installation procedures which may be required. However, it is intent of the MD-WASD to obtain a complete and working installation under this project, and any items of labor, equipment or materials which may reasonably be assumed as necessary to accomplish this end shall be supplied whether or not they are specifically shown on the Plans or stated herein.

1.02 QUALITY ASSURANCE

All material and installation shall be in accordance with the MD-WASD's Design and Construction Standard Specifications and Details.

1.03 DEFINITIONS

See Section 01005, "Defined Terms"

1.04 PROJECT APPROVAL

The approval of the MD-WASD and the local governing agencies shall be secured, prior to any construction related activity.

1.05 SPECIAL CONDITIONS

The work shall proceed in accordance with the following specification sections, found herein:

- A. Section 01011 - Site Conditions
- B. Section 01016 - Safety Requirements and Protection of Property
- C. Section 01031 - Grades, Lines and Levels
- D. Section 01100 - Special Project Procedures
- E. Section 01720 - Project Record Documents
- F. Section 01725 - Project As-Builts
- G. Section 01730 - Operating and Maintenance Instructions
- H. Section 01740 - Permits
- I. Section 01750 - Maintenance of Traffic and Public Streets
- J. Section 16051 – Pump Station Electrical Materials
- K. Section 16268 – Low Voltage Variable Frequency Drive
- L. Section 16420 - Stationary Engine-Generator Sets
- M. Section 16510 – Interior Lighting
- N. Section 16780 – S.C.A.D.A. System RTU Installation
- O. Section 16940 – Pump Station Control Panel

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1.06 PERMITS, INSPECTIONS AND FEES

- A. The Contractor shall obtain and pay for all permits and fees in accordance with Section 01740, "Permits".
- B. Inspection by MD-WASD personnel is required in addition to, not in lieu of, municipal and County department inspections. No facility will be accepted until it has passed all inspections, including pavement installation or replacement.

1.07 PRECONSTRUCTION CONFERENCE

- A. Prior to commencement of the work, the Contractor shall attend a Preconstruction Conference.

1.08 SUBMITTALS

- A. The Contractor shall furnish "As-Builts" in accordance with Section 01725. The Contractor shall submit operating and maintenance instructions and all other submittals in accordance with Section 01730.
- B. Where the Specifications require test certification or certification that certain products or material furnished are as specified, the Contractor shall deliver such certification to the MD-WASD. No material or equipment shall be approved for use in the work until individual certification has been received.

1.09 DESIGN REQUIREMENTS

A. GENERAL

- 1. Pumping stations shall be designed in accordance with the State of Florida Department of Environmental Protection (DEP) Rules, Chapter 62-604 for Wastewater Facilities, with OSHA requirements and with the "Florida State Board Health Sewage Guide" and the recommendations of Chapter 12 of the ASCE Manual No. 37, "Sewer Design and Construction", except as otherwise provided herein. Wet wells shall be classified as hazardous areas, Class 1, Division 2, Group C.
- 2. In addition, pump stations shall be designed in accordance with the MD-WASD's "Supplemental Design Guidelines for Lift Stations and Force Mains" found in Appendix B. The MD-WASD's "Standard Pump Station Drawings", bound herein, are provided solely as an aid and shall not be considered as completed construction drawings.
- 3. Pump station shall be designed to serve no more than one quarter section. Also design shall incorporate corrosion inhibiting measures, practices and or products as found in the "Basic Guide to Corrosion Protection for Miami-Dade Water and Sewer Department Projects", found in Appendix D.

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4. All applicable drawings of the MD-WASD's "Standard Details", found in PART IV herein, shall apply. Water service at pump stations shall be installed as shown in M-DWASD's Standard Pump Station Drawings.

B. STRUCTURE AND TYPE

1. Stations may be either precast or cast-in-place, installed by Caisson Method.
2. Stations shall be of reinforced concrete, and may be of the wet well-dry well type or submersible pumping station type, with depths no greater than 24 feet. The dry well shall maintain the cross-sectional area of the floor, up to ground level and shall be provided with an intermediate removable deck. Dry wells with entrance tubes shall not be approved.
3. Dry wells shall be close to square, in shape, with a minimum area of:
64 sq. ft. - for stations of 50 horsepower per pump and below,
100 sq. ft. - for stations of 60 to 75 horsepower per unit.
In all cases, dimensions of dry well shall also be based on the size of the pumping equipment and appurtenances approved for installation therein.
4. Structural design shall conform with the requirements of the Florida Building Code and the American Concrete Institute "Building Code Requirements for Reinforced Concrete", ACI 318, latest edition. In order to provide strength, stability, and serviceability for sanitary structure under special loading conditions, the recommendations of ACI Committee 350 Report entitled "Concrete Sanitary Engineering Structures" (ACI 350) shall be used as a guide.
5. Wet-Well/Dry-well configuration shall be used when the station requires installation of pumps weighing more than 1,500 pounds.
6. Wet-wells may be constructed as an integral part of the dry-well or as a separate structure. Piping between separate wet-well and dry-well structures shall be provided with a flexible joint at the structure wall. There shall be at least four feet of separation between such structures. Wet-well operating capacity determination shall be based on pump cycling, not on a fixed determined wet-well effective volume. The method of determination shall be as specified in Section 3.4.3 of "Supplemental Design Guidelines for Pump Stations and Force Mains".

C. ACCESS

1. Wet-well/dry-well pumping station: shall have separate outward opening access hatches for the-wet well and dry-well sized for the pump. Hatches shall be provided in accordance with Section 05540. Wet-well hatches shall have a minimum clear opening of 30 inches by 30 inches and shall be located directly above the influent pipe and the operating control tubing. Dry-well hatches shall have a minimum clear opening of 48-inches by 72-inches centered above the pumps. In no case shall dry-well opening be less than as recommended by pump manufacturer.

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2. Submersible pumping station: shall have hatches designed for an H-20 live load and sized according to pump manufacturer's recommendations. [See Section 05540 and Plans entitled; "Typical Submersible Sewage Pumping Station].

D. PUMPING EQUIPMENT

1. For wet well-dry well stations furnish and install vertical, centrifugal sewage pumps, in accordance with Section 11210.
2. For submersible stations furnish and install submersible sewage pumps in accordance with Section 11205.
3. Each pumping unit shall be designed to pump the peak flow at the required head.

E. PIPING

1. Each pump suction line shall be sized for a maximum velocity of 5 feet per second at the rated peak flow. Provide a 90 degree flared elbow in the wet well and an isolation plug valve in the dry well, of a wet well-dry well type station. The plug valve shall be the same size as the suction piping. Provide a plug valve per pump in the valve vault of a submersible type station together with a further isolation plug valve just outside of the valve vault on the force main.
2. Discharge lines shall be provided with horizontally mounted check valves of the outside-lever and weight type and full size isolation plug valve. Discharge piping shall be sized for a maximum velocity of 6 feet per second at rated peak flow or a minimum of 6-inches in diameter, whichever is greater. Each pump discharge line shall be equipped with a petcock and pressure gage. The combined discharge line shall be equipped with a bronze tapping saddle with 1-inch plugged tap for installation of SCADA by MD-WASD.
3. All pipes and fittings furnished and installed shall be in accordance with Section 15060, "Pipe and Fittings".
4. Piping within the pumping station shall be flanged ductile iron pipe. Piping passing through concrete walls shall be provided with wall pipe or sleeves.
5. Fresh water and seal water pressure piping shall be copper. Seal water suction, drain and overflow piping shall be PVC. Small piping (including conduits), passing through concrete walls shall be provided with wall sleeves.
6. Valves 6-inches and larger shall be plug valves of the non-lubricated eccentric type with resilient faced plugs. Valves 2-inches and smaller shall be gate valves.

F. EMERGENCY PUMP CONNECTION

1. A connection to the discharge piping shall be provided for emergency pump-out of the wet well. It shall consist of necessary fittings, isolation plug valve, a ductile

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iron or brass quick-connect male fitting and a dust cap with an air release petcock. A petcock for gage at discharge of force main shall be provided.

G. ELECTRICAL SERVICE

1. Coordinate with the power company early during the design stage. No booster or set-up transformer shall be permitted. Service shall be 3 phase, 208 or 480 volt, and adequate for the load served, but never smaller than the sizes indicated below:

SERVICE SIZE				
<u>Voltage</u>	<u>Pump Motor H.P.</u>	<u>AMP</u>	<u>THW Cu</u>	<u>Conduit</u>
208	5 thru 10	110	# 3	1-1/2"
208	15 thru 25	200	# 3/0	2-1/2"
480	5 thru 15	70	# 3	1-1/2"
480	20 thru 50	200	# 3/0	2-1/2"
480	60 thru 75	250	250 MC	3"

2. Neutral and grounding conductors to be sized according to NEC and FBC.

H. STANDBY POWER

1. As shown on the Plans titled, "Typical Submersible Pumping Station (WASD Design Standard Update 2005)", the MD-WASD will require, as a minimum, construction of a generator building, fuel tank pad and all interconnecting piping and conduits. MD-WASD may require actual provision and installation of the diesel generator, fuel tank and associated items dependent upon the criteria provided below in this subsection.
2. Stations Above 350 GPM Capacity: Stations that will a peak flow above 350 GPM shall require approval and installation of an emergency generator and fuel tank (Section 16420).
3. Stations at/or Below 350 GPM Capacity: May require stationary generator based on the area's need for uninterrupted service (i.e. hospitals, government centers, correctional institutions and similar facilities).
4. Unusually High Horsepower Motors: Which cannot be operated by portable generators shall require a stationary generator.
5. Special Cases:
 - a) The MD-WASD may, at its discretion, require portable generators at stations having unusual characteristics, or when an existing pump stations being upgraded above 350 GPM, or when an institution as described in Article 1.09-H.2, above, is added and no space exist for a permanent generator.

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- b) If the project will contribute less than 350 GPM, but the pump station is being designed to handle more than 350 GPM (PEAK) for the entire service area, no installation of emergency generator and fuel tank is required.
- c) A pump station serving only one development and designed for peak flows of 150 GPM or more shall require installation of an emergency generator and fuel tank.

I. FIRE EXTINGUISHER

1. General: One fire extinguisher shall be wall mounted in the dry well on suitable brackets furnished by the manufacturer, bearing the mark of approval of Underwriter's Laboratory, Inc., and ratings conforming to NFPA No. 10, but not less than 3-A; 20-B:C. Fire extinguishers shall be of steel construction with red enamel finish, except the valves which shall be stainless steel or chromium-plated.
2. Dry Chemical Extinguishers: shall be rated for Class A, B and C fires, shall be ten (10) pound capacity, nitrogen operated and shall be steel with red enamel finish except valves which shall be stainless steel or chromium plated. Dry type extinguishers shall be Allenco, Badger-Powhatan, Larsen or approved equal.
3. Carbon Dioxide Extinguishers: shall be steel with red enamel finish, except valve and operator which shall be stainless steel or chromium-plated, Allenco Model 7400-10, Badgern-Powhatan or approved equal. Hose diffuser horns shall be non-metallic.

J. PANELBOARD & TRANSFORMER

A 100 amp single phase 120/240V breaker panelboard shall be provided to power all miscellaneous loads such as lights, seal water pump, air compressors, fans, sump pumps, dehumidifier, etc. If required, a dry type 480V-120/240V transformer wall mounted at the intermediate deck level shall be provided to feed all these loads. The transformer shall be sized to supply all of the connected load plus 30% of spare capacity.

K. STUCCO

Only the outside wall surfaces of the above-grade structure (to six inches below grade) shall be stuccoed. Materials shall conform to the Florida Building Code (latest edition).

L. LIGHTING

1. Provide LED indoor lighting with a minimum of 10 foot-candle power at the intermediate deck and at the lower level.
2. Where outdoor lighting is required provide LED wall-mounted fixture with photoelectric control.

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3. Lighting fixtures shall be in accordance Section 16510.

M. ALARM SYSTEM

Provide an alarm system to give audible and visual alarms of pump station malfunction, in accordance with Section 16051.

N. AIR MOVING EQUIPMENT

All air moving equipment shall be in accordance with Section 15860.

O. INTERMEDIATE DECK

Provide an intermediate deck at an elevation with at least one-half foot clearance above the top of the motor, but never less than 7-foot clearance from floor slab. The deck shall be constructed of removable galvanized steel grating supported on galvanized steel channels. Grating shall be anchored to support frame channels. The channels shall be located such, that clear access is provided to the motors from the hatch opening when the grating is removed. Design in accordance with FBC and OSHA requirements.

P. LADDER

Provide a galvanized steel ladder from the hatch to the intermediate deck. It shall have extension rails which can be pulled up when the hatch is open. A second galvanized steel ladder shall be provided from the intermediate deck to the bottom floor. Ladders shall be in accordance with the requirements of the FBC and OSHA. A safety railing and stainless-steel chain shall also be provided around the opening in the intermediate deck for the bottom ladder.

Q. SURFACE PROTECTION - PAINTING

1. The inside walls of the dry well and all piping and equipment shall be properly primed and painted.
2. Paint material and specification requirements are shown in Section 09900.

R. SITE & LOCATION REQUIREMENTS

1. Stations shall be located on property of adequate size and said property shall be conveyed to the MD-WASD by fee simple title.
2. Location of pump stations shall be in accordance with local codes or governing authority having jurisdiction at the proposed site. In any case, a 25-foot long by 12-foot wide paved driveway, which shall provide access to all structures, wet well, dry well, valve pit, emergency generator and fuel tank, if required. Typical pump station site plans shall have a 45-foot by 65-foot format. A minimum separation of 5-foot shall be maintained between any proposed structure and a water or sewer main, and between two sewer

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mains (edge to edge). Proposed rim elevations and final grade elevations shall be in compliance with DERM requirements.

3. Direct access shall be provided, without entering or crossing private property, by a paved driveway alongside the drywell and the wet-well for parking of maintenance trucks. The driveway shall be direct and clear from the roadway to the dry well / wet well. Control panels and emergency pump-out shall be located to permit clear access through driveway
4. Provide a chain link fence, in accordance with Section 02822, that will enclose the pump station property. The fence shall be 6-feet high minimum, with a 12-foot wide, minimum, double-leaf gate for the paved driveway. Barbed wire and extension arms may also be required in some locations.
5. Other types of property enclosures, such as block walls, may be substituted but shall require the prior approval of the MD-WASD.
6. Unpaved areas shall be completely sodded after construction is complete. Additional landscaping as required shall be incorporated in the Plans as set forth in Section 02900.

1.10 COMPLETED AS-BUILTS

- A. The as-builts shall be completed and submitted to the Department at the time of system testing. Testing will not be considered complete until as-built record documents are submitted and approved by the Department. Completed finalized as-built package are required by the Department within 10-days upon the successful testing of all mains, equipment and appurtenances.
- B. Complete topographic and boundary survey for the pump station shall be signed and sealed by the Florida Licensed Professional Surveyor and Mapper as part of the as-built plans. All information required of a boundary survey shall be contained on the as-built plans to include the legal description of pump station site, easements and right-of-ways abutting the pump station site and location of all surface facilities recorded by a PSM. All utilities within pump station property shall be properly shown, along with their associated elevation and clearance.
- C. The mechanical, structural and electrical information on as-builts for Pump Stations and Plant work shall be reviewed and signed and sealed by a Florida Registered Professional Engineer when designated as the responsible party for the corresponding portion of the as-builts. The Engineer shall verify that all mechanical, structural and electrical information on the as-built the work was constructed as designed on the Design Plans. Any deviation shall be noted and approved by the Department.

PART 2 - PRODUCTS

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2.01 GENERAL

- A. All material for use in the Project shall be new and of recent domestic manufacture and shall be the products of reliable manufacturers or suppliers who, unless otherwise specified, have been regularly engaged in the manufacture of such materials and equipment for at least five (5) years.
- B. All fittings and components shall, wherever possible, be standard stock articles of well known manufacturers.
- C. Where the Specifications designate the products of a particular manufacturer, the product specified has been found suitable for the intended use, but, unless otherwise provided, articles or products of similar characteristics may be offered for the approval of the MD-WASD, after prior approval by the Engineer.
- D. Copies of complete descriptive data shall be furnished regarding all material, consisting of dimension drawings, catalog references and other information necessary to clearly identify and evaluate each article.
- E. Unless otherwise specified, all fabricated items, steel bolts, nuts washers and all other miscellaneous ferrous metal items (except cast iron and stainless steel) shall be hot-dip galvanized in accordance with ASTM A123, "Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products" and ASTM A153, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware". Where the word "galvanized" or its abbreviation is used on the Plans or in these Specifications, it shall mean hot-dip galvanized. Fabricated items shall be hot-dip galvanized after fabrication. Internal threads shall be tapped or re-tapped after galvanizing. All threaded fasteners together with their associated components, such as washers, located in the wet well shall be type 316 stainless steel.
- F. Pumps, motors, electrical items and other station equipment shall be shipped, handled, stored and protected in accordance with Section 01600, "Materials and Equipment Shipping, Handling, Storage and Protection"
- G. Any salvageable pipe, fitting, or other miscellaneous material or equipment, removed from the MD-WASD-owned mains during construction and not reused in the work shall be cleaned, hauled to and stored where directed by, and shall remain the property of the MD-WASD. All other material and equipment shall be disposed of by the Contractor at his expense.
- H. To insure satisfactory and successful final painting of materials and equipment to be furnished, it is essential that the paints applied in the shop and in the field be mutually compatible. To this end, require that the shop paints applied to materials and equipment be compatible with the paints proposed for use in the field, or determine what shop paints have been used and select field paints compatible therewith, all as approved by the MD-WASD.

2.02 PUMPS

- A. Submersible Pumps – See Section 11205 Submersible Pumps

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- B. Dry Well Centrifugal Sewage Pumps – See Section 11210 Vertical (Dry Pit) Centrifugal Pumps
- C. Pump Warranty
 - 1. Submersible Pumps: The pump manufacturer shall warrant the units supplied to the owner against defects in workmanship and materials for a period of 5 years or 10,000 hours of operation, in normal use, operation and service. The warranty shall be in printed form and shall apply to all similar units. A copy of the warranty shall be supplied with each pump. The warranty shall consist of the following: From 0 18 months or 0 - 3,000 hours, 100% warranty, From 19 39 months or 3,001 6,500 hours, 50% warranty, From 40 60 months or 6,501 10,000 hours, 25% warranty.
 - 2. Centrifugal over 60 HP and under: Same as for submersible pumps.
 - 3. Centrifugal over 60 HP: One year Warranty minimum. Project specific as required by the Engineer.

2.03 WET WELL

- A. See Section 02536 Precast Manholes.
- B. Concrete Protective Coatings: See WASD Pre-Approved Product List Sheet 10.7 Wet Well Coating.
- C. Crystalline Waterproofing: Pump Station Wet Wells shall have Xypex/BASF Crystalline Waterproofing Admixture or approved equal, applied at 2 to 3% of the weight of portland cement in the wet well by volume. The Crystalline Waterproofing Admixture shall be used in lieu of painting the exterior of the structure with Bitumastic Coal-Tar Epoxy. The precast concrete structure with the Crystalline Waterproofing Admixture is required to cure for 28 days prior to application of the concrete protective coating.
- D. Water Cement Ratio: 0.34 for Pump Station Wet Wells
- E. Reinforcement of Grade 60 bars. (Pump Station Wet Wells require rebars not wire mesh reinforcing).
- F. Waterstops: Ribbed PVC Waterstop with centerbulb.
- G. No construction joints will be allowed below an elevation of four feet above mean sea level. Construction joints will be allowed above elevation+4.0, if adequate keyways and waterstops, approved by the Department (Ribbed PVC waterstop with centerbulb), are provided. The Department may approve an alternate joint method in cases of excessively deeper and heavy structures.

2.04 CASTINGS

- A. GENERAL

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1. Material used in the manufacture of the castings shall conform to ASTM A48, "Gray Iron Castings", for Class 35B. Proof Loading: AASHTO M306 Loading
2. Castings shall be in compliance with Standard Details and Section 05550, "Castings".

B. MANHOLE FRAMES AND COVERS

Manhole covers and frames shall be MD-WASD Type "A" with roadway cover, U.S.F. Fabrication No. 310, or approved equal. The covers shall be cast labeled "SANITARY SEWER".

C. VALVE BOXES AND COVERS

Valve Boxes and Covers shall be MD-WASD No. 52 or No. 53 in accordance with the Standard Details appended hereto. Valve box covers shall be cast labeled with the letter "S".

2.05 BRICK

- A. Concrete brick shall conform to ASTM Standard C55-01 "Concrete Building Brick". Clay brick shall be used in manhole construction. Clay brick shall conform to ASTM Standard C62-00, "Building Brick (Solid Masonry Units Made from Clay or Shale)".
- B. Bricks shall have true edges and sharp corners and shall have been cured for at least 14 days before being placed.

2.05 CONCRETE, MORTAR AND GROUT

See Sections 03300, 04060 and 03600, respectively.

2.06 CONCRETE BLOCK

Unit masonry shall conform with Section 04220.

- A. Standard units of concrete block shall conform to ASTM C90, "Hollow Load-Bearing Concrete Masonry Units", Normal Weight, Grade N-1, except that the maximum moisture content shall not exceed 50 percent of the total absorption.
- B. Louvered concrete ventilator block shall conform to the FBC for materials and quality control. Louvered blocks shall be considered non-load bearing units requiring a reinforced concrete lintel above, when placed in standard concrete block construction. Size and reinforcement of the lintel shall be as required by the FBC, however, the lintel shall bear not less than 8 inches on the masonry at each end.
- C. Louvered ventilator blocks shall be furnished in modular units 16 inches square nominal (15-1/2 inches by 15-1/2 inches actual), and each unit shall have four louvers.

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- D. A mortar groove shall be provided on the exterior of the frame, centered on the frame depth.
- E. Each modular unit shall be provided with an insect screen. Fabrication shall be extruded aluminum frames, corners mitered aluminum spline, and 16-18 mesh aluminum screen. Screens shall be fixed type, with aluminum clips and screens suitable anchored to the unit.

2.07 ELECTRICAL MATERIALS

- A. See Section 16051 "Pump Station Electrical Materials".
- B. See Section 16940 "Pump Station Control Panel".

2.08 TELEMETRY

- A. A telemetry panel provided by the MD-WASD shall be installed in the future. All appurtenances required by the telemetry system shall be provided, including antenna, concrete filled galvanized steel pipe, concrete base, mounting clamps and accessories.
- B. All lift stations shall be designed for fully automatic unattended pump control with local override capability. Lift stations shall also be designed for remote monitoring capability. Provisions for these installations shall be made by Engineer of Record. Remote monitoring will be installed by the MD-WASD.

2.09 FENCING MATERIAL

Fencing material shall be furnished and installed in accordance with Section 02822, "Chainlink Fences and Gate". Gates shall be positioned to allow for maintenance and direct truck access to the wet well.

2.10 PIPING AND FITTING MATERIAL

Piping, fittings and appurtenances shall be as specified in Section 15060, "Piping and Fittings". Sewage lined ductile iron pipe and fittings are required within the pump station.

2.11 LADDERS & GUARD CHAINS

- A. Galvanized steel ladders shall be fabricated with structural shapes in accordance with Section 05120, "Miscellaneous and Structural Steel", and shall be sized in accordance with the Plans. All welds shall be ground smooth and cleaned to remove welding marks. All screws and bolts appurtenant to the ladders shall be AISI Type 316 stainless steel.
- B. Guards chains shall be used where shown on the Plans. The chains shall be welded stainless steel close link hoist chain 3/8-inch by 1.2 inch X .540 inch links. One end of each chain shall be attached by a stainless steel shackle to a 3/8-inch round stainless steel eye bolt through the pipe stanchion and the other end of each chain shall be connected to a heavy stainless steel snap hook. A 3/8-inch stainless steel

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welded eye and concrete insert shall be provided in the wall for both chains. The eyes shall be installed just below the bottom of the top and intermediate rails. Stainless steel items shall be AISI Type 316.

- 2.12 All other material required for the satisfactory installation of the pump station, including valves, sewage pumps, sump pump, steel reinforcing, structural steel, waterstops, miscellaneous material and other products, shall be as specified elsewhere herein.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. The precast base shall be set level, with the walls plumb on the graded crushed rock bedding.
- B. Excavation shall extend to a level 12-inches below the level of the outside bottom of the base slab. If necessary, provide sheeting and shoring for the excavation. Sheeting and shoring may be required in order to control the excavation dimensions, protect the workmen, and prevent damage to the structure or other adjacent facilities. The resulting excavation shall be backfilled with drainfield limerock or specified pipe bedding material to a level to receive the structures at the proper elevation.
- C. Necessary sheeting and shoring shall be designed by a Registered Professional Engineer licensed to practice in the State of Florida. Signed, sealed, and dated drawings and design calculations shall be submitted to the Engineer for approval prior to construction.
- D. The excavation shall then be brought to the structure's bottom elevation by placing and compacting 6-inch layers of Oolitic limerock to 95% of maximum density as determined by AASHTO Specification No. T-180. Excess excavated material, suitable for the purpose, may be used later as backfill around the structure. The wet well, dry well and/or valve pit shall be painted prior to installation. Backfill around new structures up to the pavement base or surface of the ground shall be material not exceeding 6-inches in diameter and shall be compacted in layers not exceeding 9-inches. Each layer shall be compacted with a powered hand tamper or other approved method.
- E. For surfaces of structures exposed to view the Contractor shall fill all depressions and all air holes with mortar, dampen surfaces, and then spread slurry, consisting of one part cement and one and one-half parts sand, by damp loose volume, on the surface with clean burlap pads and sponge rubber floats. The Contractor shall remove any surplus by scraping and then rubbing with clean burlap. Finish surface shall be suitable to receive paint.

3.02 INSTALLATION OF PRECAST PUMP STATION

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- A. Excavations for the cast-in-place or the precast structures shall be extended to a level 6-inches below the level of the outside bottom of the slab. Sheeting and shoring may be required in order to control the excavation dimensions, protect workmen, and prevent damage to the structure or adjacent facilities. The resulting excavation shall be backfilled with drainfield limerock or specified pipe bedding material to a level to receive the structures at the proper elevation. Pump station exteriors shall be painted prior to installation.
- B. Sheeting and shoring for the pump station shall be designed by a Registered Professional Engineer licensed to practice in the State of Florida. Signed, sealed and dated drawings and design calculations shall be submitted to the MD-WASD for approval prior to construction.
- C. The pump station shall come with an anchor slab, precast to the dimensions shown on the Plans to be lowered in to the excavation separately, or as a complete unit. The structure, with anchor slab shall be securely seated.

3.03 INSTALLATION OF VALVE PIT STRUCTURES

- A. During all backfilling operations the backfill level shall be kept even on all sides of the structure and the Contractor shall exercise every precaution to prevent damage to, or unplanned loading of, the structure or its appurtenances.
- B. The valve pit structure shall be precast to the dimensions shown on the plans and carefully lowered into the excavation. The structure shall be seated securely to grade and to the approval of the MD-WASD, after which the Contractor shall complete the remainder of the installations.
- C. After satisfactory installation and testing, the valve pit interior shall be painted as specified.

3.04 MECHANICAL WORK

- A. The mechanical work shall be performed by personnel who have had previous experience installing similar pumping station equipment. All equipment shall be installed in complete accordance with the installation instructions pertaining to the various items of equipment as published by the equipment manufacturers and no piece of equipment shall be installed unless its installation instructions are on hand. Duplicate copies of these instructions shall be furnished to the Engineer of Record prior to installation. Before any installation work is started, the Contractor shall submit five copies of installation drawings to the MD-WASD for approval of all the proposed mechanical work. No work shall commence until approval of the installation drawings has been received.
- B. All pipe, tubing, and fittings shall be adequately supported with adjustable pipe saddle supports, by wall brackets, or by ceiling hangers, as indicated on the drawings. Except as otherwise indicated or specified, all piping passing through walls or floors shall be provided with pipe sleeves or wall pipe as indicated on the Plans. Sleeves shall be caulked to piping on both sides of wall with Dow-Corning

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790 joint sealant or approved equal. Sleeves and wall pipe shall be accurately set in the forms and blocked to prevent movement during pouring of concrete. Sleeves and wall pipe for piping 6 inches and larger shall be made of cast iron. Sleeves for piping smaller than 6 inches shall be cut from Schedule 40 galvanized steel pipe, reamed and set flush with both faces of wall or floor, or as shown on the Plans.

- C. All pipe shall be thoroughly cleaned internally to the satisfaction of the MD-WASD before installation.
- D. All pipe work under this Contract including handling of materials, excavation, laying, blocking, alignment and grade, jointing, setting valves and fittings, and anchoring, shall meet the applicable provisions of AWWA Specification C600, "Installation of Ductile-Iron Water Mains and Their Appurtenances", latest edition, as modified herein.
- E. The Contractor shall furnish all nuts, bolts, washers, gaskets, foundation bolts, and all other items necessary to install the equipment specified herein. Foundation bolts shall be of a size recommended by the manufacturer of the equipment. All nuts, bolts, foundation bolts, and washers shall be hot-dip galvanized steel or stainless steel, as specified herein, or shown on the Plans.
- F. Equipment shall be installed in a neat workmanlike manner in accordance with accepted practices. Alignment of pumping equipment shall be by a qualified millwright. Foundations and supports for equipment shall be poured to within one inch from finished elevation. The floor shall be thoroughly roughened by chipping where supports, foundations or bases are to be poured. Foundation bolts shall be located by templates which shall be left in place during the pouring of the concrete. The equipment shall be set and shimmed with steel wedges to the required finished elevation. The foundations shall be encircled by forms and the equipment grouted in, using epoxy grout, as specified herein. Rodding or other suitable means shall be used to assure that all voids have been filled. After the grout has set, the shims shall be removed and the resulting spaces filled with grout. After setting, this grout shall be trimmed to match the adjoining grouted surfaces. The matching surfaces of the grout and foundation on all pumps shall be rubbed with a carborundum brick to produce a smooth, even finish, satisfactory to the MD-WASD. Exposed corners shall be chamfered 1 inch.
- G. The pumps and motors shall be placed in position and shall be perfectly aligned in accordance with the recommendations of the pump manufacturer, and to the satisfaction of the MD-WASD. Bolts shall then be tightened, and the alignment shall be rechecked. Alignment and checking shall be done in the presence of a MD-WASD representative.

3.05 STRUCTURAL WORK

- A. All concrete work shall be constructed in accordance with all applicable provisions of Section 03300.
- B. If, in performing the concrete work hereunder, the forms holding the concrete should fail, sag or get out of line in any way whatsoever, repair such damage to the

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complete satisfaction of the Engineer. All completed members shall be straight and true, and present a uniform appearance. The use of excavation walls as forms will not be approved.

- C. Concrete surfaces shall be inspected immediately after the forms are removed. Defective areas shall be chipped away to the depth of the imperfections but not less than one inch deep. These areas shall be kept wet for at least two hours before patching. Immediately thereafter, all the holes shall be brushed neat with cement grout. While the grout is still wet, the holes shall be filled with a barely moist grout consisting of one part Portland cement and three parts sand, which shall be driven tight with wooden caulking tools and finished off flush and smooth. The mortar patches shall be cured as specified.
- D. The dry well floor and valve pit floor shall slope one inch from the farthest point to the sump.
- E. Construct the foundations for the pumps and motors with non-shrink epoxy grout. The foundation shall include anchor bolts, nuts, washers, and sleeves as required for the equipment. Anchor bolts shall be in accordance with the equipment manufacturer's recommendations and as approved by the MD-WASD. The foundations shall be poured to heights of not less than one inch below the elevation required to bring the equipment to the correct elevation, leaving room for placing grout to maintain the equipment at the proper elevation. After the forms have been removed, the foundations above the floor line shall be rubbed smooth with a carborundum brick. Exposed corners shall be chamfered 1-inch. Anchor bolts, nuts, washers, and sleeves shall be hot dip galvanized.
- F. The Contractor shall construct concrete foundations for the check valves, including felt paper lining. Foundation and supports shall be allowed to cure for at least 7 days before setting any equipment. The floor shall be thoroughly roughened by chipping where supports are to be poured. After the forms have been removed, the foundations above the floor line shall be rubbed smooth with a carborundum brick. Exposed corners shall be chamfered 1 inch.

3.06 ACCEPTANCE TESTING

- A. The Contractor shall inform the MD-WASD in writing that the station is ready for operation, and shall, in the presence of the MD-WASD's representative, demonstrate the operability and correct adjustment of every device included in the Project. The Contractor shall furnish all gauges, testing devices, water to fill (and refill as required) the wet well, electric power, labor, and other necessities to demonstrate that the station is ready to be put into operation. All tests and/or demonstrations shall be conducted to the complete satisfaction of the MD-WASD.
- B. Testing of the different items of equipment shall be conducted as many times, and for as long as is necessary, to determine whether the various items meet Specifications. Discharge piping shall be tested for leaks under pump shut-off head condition. No leakage is allowed. All interior ductile iron piping except the pump-

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suction piping shall be tested and made "drop-tight" under a hydrostatic test pressure of at least 100 psi. Sections of discharge piping which cannot be isolated by valving for full pressure tests shall be tested at system pressure with no leakage allowed. Pump suction piping and valves shall be made "drop-tight" when the wet well is flooded to the invert level of the gravity line entering the wet well.

- C. The Pump Station shall be tested per pump manufacturer's recommendations, WASD Standards for Submersible/Centrifugal Pumps and in the manner described below:
1. Fill wet well with water.
 2. For pump number one:
 - Check winding resistance and record readings.
 - Place the operating mode selector switch in the manual position.
 - Record voltage and amperages.
 - Take pump down time and document it.
 3. For all subsequent pumps follow steps 1 and 2.
 4. With water level below lead pump starting point place all pumps selector switch to automatic position and continue adding water to wet well as necessary.
 5. Observe lead pump run.
 6. Increase water flow into wet well for lag pumps to run.
 7. Continue this process for all pumps.
 8. Stop pouring water into wet well and observe as all pumps shut off at the pre-selected levels.
 9. Return selector switch to the off position.
 10. Allow well to fill up to verify that High level alarm is functioning.
 11. Again, pump down well in manual operation until low alarm level is triggered but
 12. before pump loses prime.
 13. Disconnect Digital Level Controller and check that lead pump is turned "on" and "off" at the proper levels by Back-up controller operating with float switches.
 14. If the above parts of the test show that any component is not operating as intended, make necessary adjustments and/or repairs and repeat steps one through thirteen, until the entire system operates trouble free.
 15. Fill the wet well with water to the invert of the influent pipe. Leave it full of water for at least two hours. If the water level goes down, locate and repair the leak to the satisfaction of the Engineer. Repeat test to ensure absence of leaks.

END OF SECTION