SECTION UC-600

PUMP STATION ELECTRICAL MATERIALS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install all electrical materials specified herein and required for a complete installation.

1.02 RELATED SECTIONS

A. Section UC-610 - Pump Station Control Panel
B. Section UC-615 - Pump Controller
B. Section 01031 - Grades, Lines and Levels
C. Section 01720 - Project Record Documents
D. Section 01725 - Project As-Builts

1.03 QUALITY ASSURANCE

A. All electrical materials and equipment shall be new, of recent domestic manufacture, and approved by the Underwriters' Laboratories, Inc. Material or equipment damaged in the course of installation or test shall be replaced or repaired to the satisfaction and the approval of the Engineer of Record.

B. All electrical materials and installation shall comply with the following codes and standards:

1. National Electrical Code (NEC)
2. Florida Building Code (FBC)
3. National Fire Protection Association (NFPA)
4. Insulated Power Cable Engineers Association (IPCEA)
5. National Electrical Manufacturers Association (NEMA)
6. Institute of Electrical and Electronic Engineers (IEEE)
7. American Society for Testing and Materials (ASTM)
8. American National Standards Institute (ANSI)
9. Underwriters Laboratories (UL)

1.04 SUBMITTALS

A. Before any material or equipment is purchased, the Contractor shall submit complete shop drawings to the MD-WASD for approval, including a complete list in quintuplicate of electrical materials, fixtures and equipment to be incorporated in the work. The list shall include catalog number, diagrams, drawings, and such other descriptive data as may be required by the Engineer of Record. Approval of material will be based on the manufacturer's compliance with the Specifications, published ratings, or on test results, where specified.

B. In addition, the Contractor shall furnish to the MD-WASD, in booklet form, four copies of; complete installation drawings, instruction books, operating and maintenance manuals,

parts lists for each major item of electrical equipment, and similar data on minor items of equipment, together with; dimensional drawings, wiring diagrams and schematics for each major piece of electrical equipment.

PART 2 - PRODUCTS

2.01 GENERAL

A. All equipment shall be new, complete and in operating condition unless otherwise specified. All components shall, whenever possible, be standard stock articles of well known domestic manufacturers, who have been regularly engaged in the manufacture of such material and equipment for at least five years.

B. Fusible equipment shall be equipped with fuses, and 100 percent of spare fuses of each type shall be supplied.

2.02 MOUNTING CHANNELS

A. All wall mounted electrical equipment, wiring troughs, junction boxes and groups of two or more conduits, shall be mounted on a system of extruded aluminum channels 1 5/8 inches wide, which shall be attached to the wall with stainless steel machine bolts and expansion shields. The channels shall be 12-gauge aluminum, P-1000 series with compatible hardware and fittings, as manufactured by Unistrut Mfg. Co., Van Huffel Tube Corp., or approved equal. Conduit clamps shall be stainless steel "Uniclips".

2.03 SURGE PROTECTION

A. Line-to-line and line-to-ground protection shall exceed the requirements of ANSI/IEEE Standard C62.1 Sections 8.6.1 and 8.7.3 by a factor of at least 300%. Voltage clamping time shall be less than five nanoseconds with a maximum surge current of 30,000 RMS at a clamping voltage under 600 VAC. One arrester, complete with circuit breaker disconnect is to be supplied on the incoming line to the control system. Arresters shall be Ingram Products, Joslyn or approved equal.

2.04 PHASE MONITOR

A. Phase Monitor shall be a three phase monitor and supplied on the incoming line. The phase monitor shall prevent motors starting on the following conditions: overvoltage, undervoltage, phase reversal, phase imbalance and loss of phase. The phase monitor shall have integral fault light and dry contact for alarm indication. Phase monitor shall be Timemark, Potter-Brunfield, ATC Diversified Electronics or approved equal, fused on line side and disconnect only for 3 phase equipment.

2.05 GROUND RODS

A. Ground Rods shall be copper clad steel rods, 5/8-inch diameter by 10 feet long, approved for that use.

2.06 CABLE AND WIRE

A. Cable and Wire shall be plainly marked with the manufacturer's name, year of manufacture, and type of cable. All conductors shall be copper unless otherwise specified.

B. All cable shall be manufactured in strict accordance with the specifications and the applicable IPCEA, NEMA, IEEE, UL, and ANSI standards, by a manufacturer with at least 5 years experience in cables of this type.

C. All cable and wire shall be suitable for wet locations.

D. 600 volt class cable shall be Class B, heat and moisture resistant thermoplastic type THW rated 75° C, maximum conductor temperature in wet or dry locations, with copper conductors. No. 10 and smaller may be single strand, No. 8 through No. 2 shall be 7 strand and No. 1 through 4/0 shall be 19 strand and 250 MCM through 500 MCM shall be 37 Strand.

2.07 LUGS

A. All power cables of any voltage class shall be terminated with tinned copper indentation-type lugs. The lugs shall be Bundy type YA, T & B, or equal, long barreled, with double indentations in the larger sizes. Two hole lugs shall be used where possible. The Contractor shall be responsible for compatibility between hole size and spacing on the lugs and on the equipment furnished.

2.08 PULLING COMPOUND

A. Pulling Compound, if used, shall conform to the recommendations of the wire manufacturer.

2.09 CONDUIT, FITTINGS AND WIREWAY

A. General: Conduits, fittings and wireway shall be sized in accordance with the National Electrical Code, where sizes are not shown on the Plans. Conduit smaller than 3/4-inch shall not be used. If protected from mechanical damage, PVC conduits with factory made elbows can be installed exposed inside the dry well

B. Metallic conduits shall be heavy walled, threaded and rigid. Galvanized steel conduit shall be used where it is embedded in concrete and/underground runs, and aluminum conduit shall be used for exposed runs.

1. Galvanized Steel Conduit shall be hot-dip galvanized, inside and outside, after threading, and shall conform to Federal Specification WW-C581. Buried conduit shall be coated with two coats of Carboline Bitumastic 50, or equal.

2. Aluminum Conduit shall contain less than 0.1 percent copper, and shall conform to Federal Specification WW-C-540C. It shall be as manufactured by Kaiser Aluminum and Chemical Corporation, Triangle, or approved equal. Alcoa thread lubricant shall be used on all aluminum threads.

C. Flexible Conduit shall be "Sealtite" flexible, liquid tight conduit, as manufactured by the American Brass Company, Bridgeport, Connecticut, the equivalent by 0-Z/Gedney, or equal.

D. PVC Conduit shall be Type 40, heavy-walled rigid, rated for 90 degree C cables as manufactured by Carlon or approved equal.

E. Conduit Fittings and Device Boxes embedded in concrete shall be galvanized cast "Feraloy" FD series, by Crouse-Hinds. Device boxes, condulets, clamps, and other fittings in aluminum conduit runs shall be copper-free, cast aluminum. Condulets shall be oversize, and device boxes shall be FD series cast aluminum with die cast aluminum covers, by Crouse Hinds, Appleton, or equal.

F. Wall Sleeves for Conduit shall be O.Z., positive, watertight through wall entrance fittings, FSK Series, Crouse-Hinds, or equal.

G. Entrance Seals shall be O.Z. type CSBG, Crouse-Hinds, or equal.

H. Rigid Conduit Straps and Clamp Backs of cast aluminum such as EFCOR 233 AL, Appleton, or equal, shall be used in attaching conduit to concrete surfaces where channels and clamps are not used.

I. Conduit Bushings shall be insulated metallic bushings by T & B, O.Z., or approved equal, except where grounding bushings are required.

J. Conduit Sealing Fittings shall be Crouse-Hinds, type GUAB, with sealing covers, or approved equal.

K. Wireways shall be of the size required plus no less than 50% of spare capacity, made of 12 gauge aluminum with hinged spring-latched covers, and painted to protect against corrosion. The Contractor shall furnish all necessary bends, couplings and connectors. Interior parts shall be smooth, free of sharp edges and burrs. Use grounding type locknut and copper bond wire to make wireway and attached conduits electrically continuous. Slip-fasteners are not acceptable for this purpose. Wireways shall be type HW as manufactured by General Metals, Inc., Square D, or approved equal.

2.10 SWITCHES AND COVERS

A. Light Switches shall be rated 20 amp, 120/277 volt AC, for tungsten or inductive load, Hubbell 1221 and 1223, Leviton, or approved equal.

B. Weather proof Switch Covers shall be Crouse-Hinds DS185-SA, Appleton, or approved equal, copper-free aluminum.

C. Explosion-Proof Switches shall be rated 20 amp, 125 volts AC with front operating handle, Appleton Cat. No. EFS175-FL, Crouse-Hinds, or approved equal.

D. Safe-Run Switches shall be 2 position, double pole, single throw, maintained contact, selector switch in NEMA-4 enclosure, General Electric AJ201C or approved equal.

E. Safety Disconnect Switches shall be heavy duty Type A, quick-make, quick-break, horsepower rated, with external operating handle interlocked to prevent opening of the cover unless it is in the "off" and "open door" position. Switch shall be manufactured by Square D, Westinghouse, or approved equal.

F. Float Switch shall have be plastic material resistant to inorganic salt solutions, alkalis, and mineral acids. The electrical cable shall be two conductors with neoprene jacket and shall run unspliced to the Control Cabinet. Switch shall be Anchor Scientific Inc. or approved equal.

G. Limit Switch shall be heavy duty Square D Class 9007 or approved equal with 2 N.O. and 2 N.C. contacts.

2.11 RECEPTACLES AND COVERS

A. Outlets shall be 125 volt, 20 amp, grounding type, duplex receptacle specification grade, Hubbell 5362, Leviton, or approved equal.

B. Weatherproof Switch Covers shall be Crouse-Hinds DS185-SA, equivalent by Appleton, or approved equal, copper-free aluminum, gasketed cover.

C. Receptacle for Emergency Power shall be 4 wire, 4 pole with angle adapter and screw cover, Russell Stoll, Catalog numbers as indicated below for the different services, or approved equal:

JRSA 2034 DR45 for 240 volts
JRSA 2034 HR45 for 480 volts

D. Ground Fault Protected Receptacles shall be Class A, 120 Volt, duplex 20/20A NEMA 5-20R, Square D Catalog GDFR-120BC or approved equal.

2.12 LIGHTING FIXTURES

A. The Contractor shall provide lighting fixtures equipped with lamps and where size is not specified, use the largest lamp for which the fixture is rated. The Contractor shall supply a minimum of 100 percent extra bulbs for the entire Project.

1. High Pressure Sodium Fixtures shall be wall mounted with cast aluminum housing, Lexan refractors, and reactor type ballasts. The Contractor shall provide each fixture with a photoelectric control, by General Electric, Type C583N510, Halophane LED or approved equal.

1. Fluorescent Fixtures shall be vapor and dust-tight, fiberglass-reinforced polyester housing with prismatic acrylic lens, and stainless steel latches and exterior hardware. They shall be fitted with two F32T8 lamps and electronic ballast, shall be 120 volt rapid start. The fixtures shall be Crouse-Hinds Catalog No. NFL-4232/120, or approved equal.

2.13 PANELBOARD

A. The Contractor shall provide panel board with the voltage, phases and amperage required, with main and branch breakers ambient-compensated. It shall provide for a minimum of 20%

spare space. Panels shall have neutral and equipment grounding bus and shall be Square D, Westinghouse or approved equal.

2.14 PUMPS MOTOR CONNECTION BOX

A. Pump motor connection box shall only be used in submersible pump wet well applications. The Contractor shall furnish and install 24" x 18" x 8" NEMA 4X stainless steel enclosure with hinged bolt-on cover and all necessary appurtenances for a complete installation. Connection box assembly shall include 3' x 3' x 6" concrete slab and 1-5/8 x 1-5/8 unistrut support. The following shall also be included:

1. Six-Pole power insulated terminal block panel mount shall be Allen Bradley Bulletin 1492, sized as required.
2. Six-Circuit control insulated terminal block panel mount shall be Allen Bradley Bulletin 1492
3. Gland nut and neoprene bushing shall be Crouse-Hinds CGFP, or approved equal, sized as required for cable outer diameter.
4. Conduit Seal, also 1/4" drain and ventilation holes.

2.15 TRANSFORMER

A. Transformer shall be 480 volt to 120/240 volt, single phase, 60 hertz, 3KVA for submersible stations and 7-1/2 KVA, minimum, for dry well/wet well stations. It shall be high efficiency Square "D" Model 9070E01D1, or approved equal, with two 5% taps below normal, weatherproof for indoor or outdoor service.

2.16 PULL BOX

A. Pull box shall be welded aluminum, 12 gauge, with hinged cover, minimum dimensions of 12 inch x 12 inch x 6 inch, without knockouts, anodized and painted, as manufactured by General Metals, Inc., Hoffman, or approved equal.

2.17 LIGHTNING ARRESTER

A. Lightning arrester shall be 3-pole, 650 volt, thyrite secondary arrester, General Electric type 9L15BCC008, Westinghouse 634A217AO1, or approved equal.

2.18 SURGE CAPACITOR

A. Surge capacitor shall be a 3-pole, 650 volt, 1.0 mfd. capacitor. It shall be a General Electric Type 9L18ABB301, equivalent by Westinghouse, or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. All electrical work shall comply with the applicable rules of the National Electrical Code, the National Fire Protection Association, and the Florida Building Code, and shall be in accordance with the requirements of OSHA, and the best commercial and industrial practice.

Conduit and cable shall be sized as specified in the National Electrical Code, where sizes are not shown on the Plans.

B. All electrical wiring, regardless of voltage classes, shall be installed in rigid conduit, except where shown otherwise on the Plans. No conduit installed shall be smaller than 3/4 inch IPS and no wire smaller than AWG #12, except as otherwise shown on the Plans, specified herein, or authorized by the Engineer of Record with the MD-WASD's approval.

C. In some cases, the exact requirements must be determined from the shop drawings of the equipment furnished by the Contractor. Changes required by the Contractor for furnished equipment shall be the Contractor's responsibility. Materials or equipment damaged in the course of installation or test shall be replaced or repaired to the satisfaction of the MD-WASD.

3.02 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Electrical service shall be built to Florida Power & Light Standards.

3.03 MISCELLANEOUS INSTALLATION

A. The Contractor shall provide in dry well two GFCI receptacles and four switch-controlled lighting fixtures, two ceiling mounted and two wall mounted below grating. Fixtures shall be provided with two 32W lamps. Switch shall be accessible from hatch.

B. A sump pump and GFCI receptacle shall be installed in the valve pit and hard-wired to the control cabinet. Discharge from pump shall be conveyed to wet-well using 1-1/4-inch diameter PVC pipe.

3.04 CONDUIT INSTALLATION

A. The Plans are generally indicative of the work to be installed, but do not show all bends, fittings, boxes, and specialties which may be required or the exact location of all conduits. The Contractor shall carefully investigate the site and conditions affecting all of his work and arrange his work accordingly. Any changes from locations shown on the Plans must be approved by the MD-WASD.

B. Conduits shall be installed in such a manner that wires may be removed and replaced at a later date and to insure against collection of condensation or rainwater. Where bends are made, they shall be made with an approved conduit bending machine. Crushed or deformed conduit shall not be used.

C. All conduit ends shall be square cut and reamed to remove burrs. Running threads will NOT be permitted. Approved couplings shall be used. All conduit joints shall be made up wrench tight, using strap wrenches, and shall be made waterproof in such a manner as not to interrupt the electrical bonds.

D. As soon as installed, all open conduit ends, including those terminating in boxes, shall be plugged or capped and so maintained during construction to prevent the entrance of moisture and dirt. All conduit shall be carefully cleaned and dried inside before the installation of wire.

3.05 GROUNDING

A. All grounding shall comply with the requirements of the National Electrical Code and all local Codes having jurisdiction.

B. The ground system shall be composed of at least two 5/8" diameter x 10 feet long copper clad ground rods, spaced a minimum of 6 feet apart. Ground rods shall also be connected to rebar in slab. Make all connections with #6 bare copper wire.

C. Maximum ground resistance shall not exceed 25 ohms under normal dry conditions. Additional ground rods shall be driven if required to maintain this level.

D. All electrical equipment, structural steel, guard rails, and other metallic objects shall be connected to the above-mentioned ground system

E. Provide a warning ribbon installed at 12" depth in the ground above the ground loop conductor.

3.06 NEUTRALS

A. Each circuit which requires a neutral conductor shall have its own individual neutral conductor, contained in the same enclosure.

3.07 TESTING

A. All circuits and motors shall be megged, and the voltage and current load on each circuit shall be checked. Two copies of the results shall be furnished to the MD-WASD before acceptance of the work.

3.08 AS-BUILT/RECORD DRAWINGS

A. As the construction of the Project progresses, at no longer than monthly intervals, or shorter times if so ordered by the Engineer (ie Chief, Engineering Division, M-DWASD); the Contractor shall submit As-Built/Record drawings showing all work performed in the preceding time interval. The drawings shall be submitted for approval of the MD-WASD, and if not timely submitted and thereafter approved, the work of said time period will not be accepted. Drawings shall conform with the requirements of Sections 01031,”Grades, Lines and Levels”; 01720 “Project Record Documents”, and 01725 “Project As-Builts”. All electrical, control and communication equipment and underground electrical conduits and ducts shall be accurately located, sized, with cover or elevation shown, and identified.

END OF SECTION