CONTROL PANEL AND

GENERAL

PART 1

- 1.01
- 1.01 Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to the following:

  A. Control Panel Equipment:
  1. BBC Pump Equipment (FCWRD design)
  2. Pre-approved equal
  3. Products of other manufactures assembled to provide all specified functions, including reliability equal to or exceeding that of the manufacturers listed above

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ote lift station

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Alarm Signal must be initiated by level control system, backup high signal or power failure relay.
 Motor temperature shutdown as previously discussed in these Specifications. Report failure on pump control panel.
 Seal failure shutdown. Report failure on OmniSite & pump control
 Provide horn and light per FCRWD Standards.
 Contractor must meet FCRWD standards, including remote lift stat

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- General Requirements: A. Control Panels shall be manufactures in accordance with ISO 9000-2001 specifications and shall be so constructed for the application of a UL Listing Label by an approved UL Control Panel Assembly Facility.
- œ All electrical connections shall be properly inspected and torque in complian with ISO specifications. External connections to the control panel shall be by way of numbered terminal blocks.
- C. rol Panels shall be properly checked and load tested with povrol panel test log shall be supplied with the control panel. rer applied. A

All starters must be NEMA rated for the next larger horsep Solid state reduced voltage soft-start motor starters.

Current ramp duration adjustable two (2) to thirty (30) secon Current trip adjustable from fifty (50) to four hundred (400) End of limit signal to sequence start of motors.

Allen Bradley SMC3 or equal.

- Ð. Control Panels shall be supplied from a UL approved control panel assembly facility with all of the required labels properly attached. Control Panel Enclosure rating shall be specified in accordance with the project requirements and contract drawings as NEMA 4X (Stainless Steel).
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The control center shall include a micro-processor base pump controller manufactured by Digital Control Corp. model 11928-5 (Without Exceptions) to control the pumps and to maintain the level in the wet well. The controller shall also receive a signal from the back-up floats and automatically switch to back-up the 4-20ma signal is lost. All necessary components for above controller to opers shall be included.

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The motor starters must be wired to autom:

 Power is restored after an outage.
 The controls are in the "ON" position.
 Or
 The controls are in the "Auto" position a control of the control of the control of the second of th

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- The control system must incorporate all wiring, controls, relays and components necessary to meet or exceed FCRWD Standards.
   All Control Panels shall have 25% free space on back plate.
   The control panel must be supplied with 277/480 volt, three (3) phase, four (4) wire, sixty (60) cycle power.
   A lightning arrestor (transient surge protector) must be supplied in the control panel and must be connected to each line of the incoming side of the control panel and must be connected to each line of the incoming side of the control panel must be connection, tee connections, and terminating esistors.
   Integral within the control panel must be an open network device control bus with back to back trunk cable connection, tee connections, and terminating esistors.
   Integral within the control panel must be an open network device control bus with back to back trunk cable connection.
   All enclosures of the control panel must be weather proof NEMA Type 4X fabricated of 14 gauge 304 stainless steel mounted adjacent to the wet well. The sections must be joined to form a free standing completely enclosed assembly.
   The dead-front panel must be of stainless steel with a piano hinge and a latching device for HSE padlocks (purchased from HSE).

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- .9 <u>.</u>8 Interior control panel must be painted steel, laser cut sized to cover wiring and components mounted on back of panel; with Allen Bradley push buttons, hand-off-automatic ("H/O/A") switches and LED compatible control function lights, and instrumentation as specified.
- Back panel must be 12-gauge removable steel panel sized to mount starters, control equipment and instrumentation.
   Stainless steel, continuous vertical hinge to provide one hundred sixty-five

Control Circuit Breakers shall be in accordance with section UL 489 with minimum interrupting capacity of 10,000 amperes.
 Control Voltage Transformer Fuses: Rated one tenth (1/10) to six hundred (600) amperes, six hundred (600) volts AC or less must be UL listed on Class RK1, current-limiting time delay with 200,000 amperes RMS interrupting rating as manufactures by Buss model MDA or equal. Primary side fuses must be Little Fuse, model KLDR, Gould Showmut: Amp-Trap 11, or equal. All fuse sizes greater than sixty (60) amperes to be silver link.
 Control Power Transformers required to provide control system and accessory power shall be machine tool type control transformers with epoxy encapsulated coils or resin impregnated coils, high quality silicon steel laminations, scoper magnet wire, moulded-in-terminals and 55°C rise (Class 10 insulation system).
 Voltage/Phase Monitor:

 The voltage-phase monitor shall continuously measure the voltage of each of the three phase motors, as well as sensitive electronics, etc. The phase monitor shall sense the following conditions: under-and over-voltage unbalance, phase loss and phase reversal.
 Control Relays:

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- 11.Stainless steel, contir (165) degree swing.
- 12. Contractor must make all appropriate modifications, with written approval from Engineer, to ensure the control panel is suitable for operation with the pumping equipment.
  13. All panel penetrations are to be seated with removable non-collapsing putty like material. (3M product or better)

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Control relays shall be squ schematic).

boss type, 120VAC or 12VDC (based on design

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Control relays shall be 4PDT (4 Pole, Double Throw) open contacts rated at 120 VAC, 5 amps minimum.
 Control relays shall include an integrated test buttor indicator.

an integrated test button and relay

ed flag

- Electrical Trans Sized as required by cabinet dimensions to allow for a minimum interior temperature of sixty (60) degrees Fahrenheit when the exterior ambient temperature is minus thirty (-30) degrees Fahrenheit. Basis of Design: Hoffman ient (Surge) Prote
- All electrical and electronic components of the Control Panel shall be protected against damage due to electrical transients induced in interconnecting lines from lighting discharges and surges in nearby electrical systems.
- The transient surge protector shall be rated for 25kA per phase or larger. All devices shall be provided with protection per device manufacturer's requirements.
- D Telemetry 1. Contract ώŅ
- Contractor must provide an OmniSite dialer system per current FCRWD Standards. The dialer system must provide for remote shut-down of the pump station through telephone systems via FCRWD cellular systems.
   The unit must be supplied with an external lightning/surge protection package.
- 1 Itation un - green; Call nber; Fail - red supp ied w/ LED bulb,
- . Pilot Lights: Run { push-to-test type.
- Elapsed time meters must be wired to each motor starter to indicate total running time in hours and tenths of hours and be six (6) digit non-resettable
   2-H/O/A, three (3) position switches manufactured by Allen Bradley.

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Conductors sizes #8 or smaller, to include co splices and wire joints:

· type ter

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Main and feeder cables must be wire tagged in all pull boxes, wire ways and wi gutters of panels. Tags must identify wire or cable number and/or equipment served on shown on the Construction Plans. Tags must be of flame resisting adhesive material, T & B type WSL or equal. ble Terminals and connectors (for Copper Conductors Only)

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- GFCI Convenience Receptacle:
  1. There shall be a 120VAC, 20 Amp GFCI rated convenience receptacle mounted on the dead front swing door of the control panel. Receptacle circuit shall be protected by a thermal magnetic circuit breaker.
  2. Ground Fault Circuit Interrupting ("GFCI") specification grade receptacle manufactured by:
- Arrow-Hart

- General Electric Or Engineer appr
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- Entire installation to be grounded in accordance with requirements of NEC.
   Equipment grounding must be provided for, but not limited to, the following items: panel enclosure, motor frames, receptacles, lighting.
   Ground must be insulated wire conductors, green color coded, sized according to code.
   Control Panel enclosure shall be properly grounded in accordance with the National Electrical Code and local code requirements and have a local three point grounding rod configuration.
   Each analog signal loop shall only have its shield wire connected to ground at a single point for the loop. Shields shall be grounded at control panels where signals are input to the receiving device and not at the source of the transmitting device.

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For compression connections sizes #8 and larger, to include, to include one hole lugs, two lugs, butt splices, H-tops, C-tops and anti-oxidizing compound: Thomas & Betts; Burndy Hydent; Penn Union, or equal.
 A double-slide breaker must be provided on the control panel that will allow the connection of a standby power generator.

a. For mechanical or set-screw type con Hydent; Penn Union EZ; or equal.
b. For split-bolt type connectors: Thoma equal.

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or: The

as & Betts, Lugil; Bui

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lok; Ideal Wing-Nut; or equal. I set screw, or split bolt type

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- I vith
- Battery Backup
  Twelve (12) volt DC lithium io
  Must provide eight (8) hour o
  Must be mounted inside cont volt lt charging syste 1 light.

- connector
  Spare Parts
  Furnish one (1) lot spare parts as recommender or manufacturers.
  At a minimum, spare parts to include the following.
  Two (2) sets of upper and two (2) sets of lower pump seals
  Wear rings.
  Two (2) sets of 0-rings and gaskets.
  One (1) spare impeller for current operation conditions. Fusize of fuse used in installation.
  Future impellers (as specified on the Lift Station Plan), and
  Other items defined as expendable by manufactures.

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ELECTRICAL EQUIPMENT SPECIFICATIONS

2.01 ART 2 - EXECUT

- Electrical and Te
- grounding type receptacles are to have grounding slot connected to outlet box. vice entrance neutral must be grounded in accordance with Article 250-94 NEC. unding system is to be 3 5/8" x 10' copper ground rods installed in a triangular 10' tern beyond overdig area. Cad welded to earth. ordination with utility Coordination with utility and verify the limits of responsibility with respect to metering, terminations and the like.

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The automatic transfer requirements of:

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- N Insections, community on the invest-In such cases that these Specifications do not con requirements, the latter must govern the Project đ utility's

Starters
 The motor controller shall be a NEMA rated, full voltage, non-reversing, across the line contactor and overload relay combination.
 The motor overload relay shall be an ambient compensated type with inverse-time-current characteristic and shall be provided with heaters or sensors in each phase matched to nameplate full load current of the specific motor to which it connects.

- ά ά ά Provide circuit breakers at proper sizes for loads served. Do not install two (2) poles in single module. Install multiple pole breakers with single operating handle mechanical ties between single pole breakers.
- 8 install ext
- Conduit system to be electrically continuous and must be grounded in accordance with NEC. Provide grounding conductors in all new raceways sized in accordance with NEC Table 250-95 (1993 edition) and FCRWD Standards.
   All conduit terminations to be equipped with lock nuts and bushings. Conduits one and one quarter (1.25) inch and longer must have insulating bushing and have lock nuts inside and outside enclosure.
   Conduits supported by pile straps must have supports spaced not more than four (4) feet apart on center. Secure support by means of toggle bolts, inserts or expansion bolts. 2
- Conduit (4) feet : expansio Protect its during co plugs or caps.
- 9 P P all wire of the same circuit in same conduit. wire can be pulled until conduit installation is finalized. no thermoplastic wire at ambient temperatures lower more Fahrenheit.
- I no thermoplastic grees Fahrenheit. peratures lower than thirty-three (33)
- approved pull-in com ng of wire. nd (sir ilar to Wire-Lube or Y-Er-Ease) to facilitate
- and connect wires only in readily accessible boxes and seal off entry from wet
- 6. If indicated on the Construction Plans, run all in conducable in three (3) inch sand envelope. Conduit and dirthirty (30) inches below finished grade.
   7. Provide cord cap assembly per 10.04.E. in FCRWD Stat.
   4. Wire and Cable Identification
   1. Identify control wires at termination with schematics Plans, run all in conduit. Otherwise, run direct bury slope. Conduit and direct bury cable must be at least

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- 1 4 lace wiring ins ide eq Num t per FCRWD. tie wraps for
- ω all spare wires in cabinets or panate with insulation tape and tag ctions and Devices Q, 먹 for
- N roughly clean wires before installing lugs and connectors so that joint will carry capacity of conductors without perceptible rise in temperature. lugs or connectors of approved size for conductor. Lugs or connectors must be alled as per manufacture's recommendations.

ART 3 -01 PUMP CONTRO

COPE OF WORK . This project inc following: Ŧ station

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- New PLC and HMI with con New Submersible level sen
- New Submersible lev New wetwell floats. Miscellaneous status
- us status m and alar
- 1 5 Innentation & Control General Descriptions he instrumentation and control system shall nd control process for each of the process el therwise noted.
- all work necessary to monitor noted above in 3.01.A, unless
- shall be a PLC with programming to control submersible pump operation with ontrol based on setpoints via a submersible level sensor. shall be a backup float system designed so that upon PLC or submersible failure, float mode is automatically put into operation. Float mode shall also ctable via a selector switch on the front of control panel to allow for PLC inance or programming revisions.
- Pro 1 **Control Descriptions**

P. Wire and Cable (Up to six hundred (600) volts)
1. Except where otherwise noted in these Specifications, insulation must be color coded thermosetting or thermoplastic type rated six hundred (600) volts as approved by Engineer.
2. Conductors must be soft drawn copper, each strand individually tinned or coated with approved alloy.
3. Conductors #10 and smaller:

a. Use stranded conductors for final connections to motors and all locations where vibration or movement is present.
b. Use solid conductors for all other locations.

4. Use double braid, stranded conductors #8 and larger.
5. Minimum Wire Size: General - #12; over one hundred (100) feet - #10; over one hundred fifty (150) feet - #8; Control - #14; Signal - #18 or as required by equipment manufacturer.

tinned or coated

- The lift station shall have two pumps which will be operated in lead/lag scenario. Program the PLC to call the lead pump on when a lead setpoint is reached at elevation 831.50 (fully adjustable). If level continues to rise, call the lag pump on when lag setpoint is reached at 832.00(fully adjustable). All setpoints shall be enterable from the HMI.
- N ol panel shall have backup float relay logic that ble level sensor or PLC fails.

- Provide pump alternation so that lead pump is changed once every 24 hours.
   Provide alarming for high level when high level setpoint is reached at elevation 833.77 (fully adjustable).
   Program the PLC so that each pump will have a 'soft' H-O-A within programming to allow the operator to place the pump in 'Manual' mode and force a pump on/off.
   Program the PLC so that pump runtimes are calculated and display on the HMI.
   Lift station pumps shall stop when low level setpoint is reached at elevation 828.50 (fully adjustable).
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a. For terminals (rings, forks, disconnects): Thomas & Betts; Stakon; Burndy Hydent; Buchanan Press-Sure; or equal.
b. For splices (butt-type): Thomas & Betts; Stakon; Burndy Hydent; Buchanan Press-Sure; or equal.
c. For wire joints (twist-on): Thomas & Betts; Scothlok; Ideal Wing-Nut; or equal.
Conductor sizes larger than #8 to include mechanical set screw, or split bolt type connectors:

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- e following shall be monitored on local HMI: Pump start/stop status for each pump. Pump run status for each pump. VFD fail status for each pump. Lift station high level alarm. Pump high temp status for each pump. VFD speed set and speed feedback.

CEPTABLE MANUFACTURERS

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switches

shall be ASCO 300 Series or app

oved

ENCLOSURE

4.04

- P Automatic transfer switches located outdoors shall be furnished as specified on drawings or otherwise in a NEMA 4X, stainless steel enclosure, including a strip heater with thermostat. Indoor units shall be furnished in a NEMA 1 steel enclosure unless otherwise shown on the plans. Controller shall have a flush-mounted display with LED indicators for switch position and source availability. It shall also include test and time delay bypass switches.
- .B
- VULIAGE AND FREQ ENCY SENSING
- Þ oltage of each phase of the normal table from 90% to 95% of nominal to 95% of nominal p setting for open transition operat I source shall be monitored, with pickup and dropout adjustable from 70% to 90% of tion.
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- ?
- P Single-phase voltage sensing of the emergency source shall be provided, with pickup voltage set at 90% of nominal and independent frequency sensing with pickup set at 95% of nominal for open transition operation. Repetitive accuracy of all settings shall be within +/- 2% over an operating temperatu range of -20 deg. C. to 70 deg. C. Voltage and frequency settings shall be field adjustable without the use of tools, meters or power supplies. Actual settings shall be clearly defined in the operator's manual.
- Pro ed trai and retr and
- TIME DELAYS
- B .> A time-delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals; adjustable for either 1 or 3 seconds. A time-delay shall be provided on retransfer to normal, adjustable from 1 second to 30 minutes. Time-delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
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- ime-delay shall be provided for shutdown control of the engine generator, to allo engine cool down, without load, and shall be set at 5 minutes. adjustable time delays shall be fully adjustable without the use of tools.

5.1 SUMMARY

PART 4

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PART 5- GENERAT

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SCOPE OF WORK A. Furnish and install automatic transfer and bypass-isolation switch with number of poles, amperage, voltage, withstand, and current ratings as shown on the plans. Each automatic transfer switch shall consist of a double throw power transfer switch mechanism, and a micro-processor controller to provide automatic operation, closed transition type, with manual bypass and isolation switch.

to the

UL1008 - Standard for Automatic Transfer Switches
 NFPA 70 - National Electrical Code
 NFPA 99 - Essential Electrical Systems for Health Care Facili
 NFPA 110 - Emergency and Standby Power Systems
 IEEE Standard 446 - IEEE Recommended Practice for Emerg Systems for Commercial and Industrial Applications
 NEMA Standard ICS10 (formerly ICS2-447) - AC Automatic T

accessor set in pla

5.2 DIESEL-ENG

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