

PART 1 - GENERAL

- 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 manufacturers assembled to provide all specified functions, including reliability equal to or exceeding that of the manufacturers listed above.
- 1.02 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.
- B. All electrical connections shall be properly inspected and torque in compliance with ISO specifications. External connections to the control panel shall be by way of numbered terminal blocks.
- C. Control Panels shall be properly checked and load tested with power applied. A control panel test log shall be supplied with the control panel.
- D. Control Panels shall be supplied from a UL approved control panel assembly facility with all of the required labels properly attached.
- E. Control Panel Enclosure rating shall be specified in accordance with the project requirements and contract drawings as NEMA 4X (Stainless Steel).
- 1.03 Electrical Equipment
- A. Standards
1. The control system must incorporate all wiring, controls, relays and components necessary to meet or exceed FCWRD Standards.
2. All Control Panels shall have 25% free space on back plate.
3. The control panel must be supplied with 120/240 volt three (3) phase, four (4) wire, sixty (60) cycle power.
4. 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 power input terminals.
5. Integral within the control panel must be an open network device control bus with back to back trunk cable connection, tee connections, and terminating resistors.
6. Lift stations must include starter sized for the next larger horsepower voltage motor and built-in electronic overload protection.
7. 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.
8. The dead-front panel must be of stainless steel with a piano hinge and a latching device for HSE padlocks (purchased from HSE).
9. 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.
10. Back panel must be 12-gauge removable steel panel sized to mount starters, control equipment and instrumentation.
11. Stainless steel, continuous vertical hinge to provide one hundred sixty-five (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 sealed with removable non-collapsing putty like material. (3M product or better)
- B. Cabinet Heater
1. 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
- C. Electrical Transient (Surge) Protection:
1. All electrical and electronic components of the Control Panel shall be protected against damage due to electrical transients induced in interconnecting lines from lightning discharges and surges in nearby electrical systems.
2. The transient surge protector shall be rated for 25kA per phase or larger.
3. All devices shall be provided with protection per device manufacturer's requirements.
- D. Telemetry
1. Contractor must provide an OmniSite dialer system per current FCWRD Standards. The dialer system must provide for remote shut-down of the pump station through telephone systems via FCWRD cellular systems.
2. The unit must be supplied with an external lightning/surge protection package.
- E. Instrumentation
1. Pilot Lights: Run - green; Call - amber; Fail - red supplied w/ LED bulb, push-to-test type.
2. 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.
3. 2-H/O/A, three (3) position switches manufactured by Allen Bradley.
- F. 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 as manufactured by:
- a. Arrow-Hart
- b. Bryant
- c. General Electric
- d. Or Engineer approved equal.
- G. Grounding
1. Entire installation to be grounded in accordance with requirements of NEC.
2. Equipment grounding must be provided for, but not limited to, the following items: panel enclosure, motor frames, receptacles, lighting.
3. Ground must be insulated wire conductors, green color coded, sized according to code.
4. 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.
5. 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.
- H. Battery Backup
1. Twelve (12) volt DC lithium ion battery with automatic volt charging system.
2. Must provide eight (8) hour continuous operation of alarm light.
3. Must be mounted inside control panel.

- I. Alarm Apertunences
1. Alarm Signal must be initiated by level control system, backup high level signal or power failure relay.
2. Motor temperature shutdown as previously discussed in these Specifications. Report failure on pump control panel.
3. Seal failure shutdown. Report failure on OmniSite & pump control panel.
4. Provide horn and light per FCWRD Standards.
5. Contractor must meet FCWRD standards, including remote lift station control.
- J. Starters
1. The motor controller shall be a NEMA rated, full voltage, non-reversing, across the line contactor and overload relay combination.
2. 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.
3. All starters must be NEMA rated for the next larger horsepower voltage motor.
4. Solid state reduced voltage soft-start motor starters.
5. Current ramp duration adjustable two (2) to thirty (30) seconds.
6. Current trip adjustable from fifty (50) to four hundred (400) percent.
7. End of limit signal to sequence start of motors.
8. Allen Bradley SMC3 or equal.
4. The motor starters must be wired to automatically re-energize the pumps when:
- a. Power is restored after an outage.
- b. The controls are in the "ON" position.
- Or
- c. The controls are in the "Auto" position and when transducer indicates the need.
- K. Micro-Processor
1. 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 if the 4-20ma signal is lost. All necessary components for above controller to operate shall be included.
- L. Circuit Breaker Usage (Unless otherwise specified or shown on Construction Plans)
- Minimum Type of Service I.C. Rating Amperes Minimum I.C. Rating
- 20/120 volt 15-100 10,000 RMS
1. Lighting and Power Circuit Breakers shall be thermal magnetic type designed for AC current with a minimum interrupting capacity of 15,000 amperes.
2. Control Circuit Breakers shall be in accordance with section UL 489 with minimum interrupting capacity of 10,000 amperes.
- L. 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 manufactured by Buss model MDA or equal. Primary side fuses must be Little Fuse, model KLDN, Gould Showmut, model ATQR Amp-Trap 2000 time delay class CC six hundred (600) volt, or equal, based on ability to withstand inrush and spike conditions. Bus: Low Peak; Gould Showmut; Amp-Trap 11, or equal. All fuse sizes greater than sixty (60) amperes to be silver link.
- M. Control Power Transformers:
1. 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, copper magnet wire, moulded-in-terminals and 55°C rise (Class 10 insulation system).
- N. Voltage/Phase Monitor:
1. The voltage-phase monitor shall continuously measure the voltage of each of the three phases of the incoming power to the equipment and provide protection for 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.
- O. Control Relays:
1. Control relays shall be square boss type, 120VAC or 12VDC (based on design schematic).
2. Control relays shall be 4PDT (4 Pole, Double Throw) with normally closed/normally open contacts rated at 120 VAC, 5 amps minimum.
3. Control relays shall include an integrated test button and relay energized flag indicator.
- 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.
6. Main and feeder cables must be wire tagged in all pull boxes, wire ways and wiring 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.
- Q. Cable Terminals and connectors (for Copper Conductors Only)
1. Conductors sizes #8 or smaller, to include compression/indenter type terminals, splices and wire joints:
- 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; ScotMok; Ideal Wing-Nut; or equal.
2. Conductor sizes larger than #8 to include mechanical set screw, or split bolt type connectors:
- a. For mechanical or set-screw type connector: Thomas & Betts, Lugli; Burndy Hydent; Penn Union EZ; or equal.
- b. For split-bolt type connectors: Thomas & Betts; Burndy Hydent; Penn Union, or equal.
3. For compression connections sizes #8 and larger, to include, to include one hole: lugs, two lugs, butt splices, H-taps, C-taps and anti-oxidizing compound: Thomas & Betts; Burndy Hydent; Penn Union, or equal.
- R. A double-slide breaker must be provided on the control panel that will allow the connection of a standby power generator.
- S. Spare Parts
1. Furnish one (1) lot spare parts as recommended by station and pump manufacturers.
2. At a minimum, spare parts to include the following.
- a. Two (2) sets of upper and two (2) sets of lower pump seals.
- b. Wear rings.
- c. Two (2) sets of O-rings and gaskets.
- d. One (1) spare impeller for current operation conditions. Fuses for each type and size of fuse used in installation.
- e. Future impellers (as specified on the Lift Station Plan), and
- f. Other items defined as expendable by manufactures.

PART 2 - EXECUTION

- 2.01 Electrical and Telemetry Installation
- A. All grounding type receptacles are to have grounding slot connected to outlet box.
- B. Service entrance neutral must be grounded in accordance with Article 250-94 NEC. Grounding system is to be 3 - 5/8" x 10' copper ground rods installed in a triangular 10' pattern beyond overdig area. Cad welded to earth.
- C. Coordination with utility
1. Coordination with utility and verify the limits of responsibility with respect to metering, terminations and the like.
2. In such cases that these Specifications do not conform to either utility's requirements, the latter must govern the Project.
- E. Circuit Breakers
1. Provide circuit breakers at proper sizes for loads served.
2. Do not install two (2) poles in single module.
3. Install multiple pole breakers with single operating handle. Do not install external mechanical ties between single pole breakers.
- F. Conduit Installation
1. 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 FCWRD Standards.
2. 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.
3. 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.
4. Protect conduits during construction with temporary plugs or caps.
- G. Wiring
1. Run all wire of the same circuit in same conduit.
2. No wire can be pulled until conduit installation is finalized.
3. Pull no thermoplastic wire at ambient temperatures lower than thirty-three (33) degrees Fahrenheit.
4. Use approved pull-in compound (similar to Wire-Lube or Y-Er-Ease) to facilitate pulling of wire.
5. Splice and connect wires only in readily accessible boxes and seal off entry from wet well.
6. If indicated on the Construction Plans, run all in conduit. Otherwise, run direct bury cable in three (3) inch sand envelope. Conduit and direct bury cable must be at least thirty (30) inches below finished grade.
7. Provide cord cap assembly per 10.04.E. in FCWRD standards.
- H. Wire and Cable Identification
1. Identify control wires at termination with schematics and number list per FCWRD.
2. Train and lace wiring inside equipment and panel boards with plastic tie wraps for a neat appearance.
3. Make all spare wires in cabinets or panelboards of adequate length for connection. Terminate with insulation tape and tag.
- I. Wire Connections and Devices
1. Thoroughly clean wires before installing lugs and connectors so that joint will carry full capacity of conductors without perceptible rise in temperature.
2. Use lugs or connectors of approved size for conductor. Lugs or connectors must be installed as per manufacture's recommendations.

CONTROL PANEL SPECIFICATIONS

NO SCALE

REVISIONS

DATE	DESCRIPTION	BY
3/23/18	FORWD REVIEW	EKZ

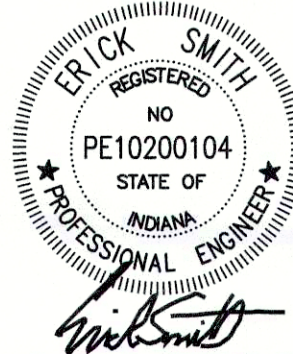


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MAPLE TRAILS  
SECTION 1

LIFT STATION  
ELECTRICAL SPECIFICATIONS



DRAWN BY EKZ	JOB NUMBER 2017-095-A
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SCALE AS SHOWN	
SHEET	

**C5.7**  
ELECTRICAL  
SPECIFICATIONS