DESIGN GUIDELINES AND STANDARD SPECIFICATIONS AND DETAILS FOR SEWAGE PUMP STATIONS

1.1 SCOPE

This document provides design guidelines and standard specifications and details for sewage pump stations between 20,000 and 1.0 million gallons per day average daily flow that are to be accepted for ownership, operation, and maintenance by the City of Richland.

Pump stations serving private developments will not be maintained or owned by the City. At the option of the City, the pump station may be located in public right-of-way and dedicated to the City for ownership, operation, and maintenance.

Any of these requirements may change without notice, and the City may grant variances from individual requirements on a case-by-case basis. Project approval by the City is independent of any other agency approval, and it is the responsibility of the Owner to secure approvals and permits from all other regulatory agencies.

1.2 DESIGN GUIDELINES

1.2.1 Submittals to City for Review and Approval

Submittal for Design Review and Approval

Despite the specific information provided herein, the drawings, specifications and details ("Designs") only show minimum requirements, should be considered conceptual in nature, and may require revision and/or modification to conform to project conditions and applicable laws, codes, ordinances, standards and other current requirements and/or best practices. Designs shall be checked, completed and stamped by a Washington State Professional Engineer and Registered Electrical Engineer.

All deviations from City standards shall be clearly identified in a written transmittal attached to preliminary, design, construction, and record “as-built” drawings or plans.

Four (4) copies of the following shall be submitted to the City for design review and approval:

- Full or half size design drawings showing similar views and details of the pump station site and components as shown on the attached City Standard Drawings for Sewage Pump Stations
- Construction specifications

- Design calculations showing the following:
  - Existing and design influent flow estimates
  - System curves superimposed on pump curves
  - Pump(s) and wet well sizing including stops/starts per hour
  - Storage capacity during projected peak hourly flows from high water alarm elevation to overflow conditions through collection lines at the nearest manhole or dwelling sewer stub
  - Design assumptions
  - Analysis showing impact of discharge on City's existing collection system
  - Factor of safety against buoyancy

Submittal for Final Acceptance

Prior to final acceptance of the pump station, the applicant must submit the following:

- Testing: Provide results of testing, inspections, and certification by the Engineer of Record that the system passed the specified tests.

- Record "As-Built" Drawings: Submit final record drawings of the completed facility. Prepare record drawings in AutoCAD format and provide electronic files on CD. Provide one (1) reproducible full-size and reduced (11"x17") hard copy. Also provide one (1) PDF copy. Provide submittal within thirty (30) calendar days of completion of the project and prior to City final acceptance. All wires shall be tagged and all programs shall be submitted to the City on CD. Record drawings shall also be placed in Operation and Maintenance Manuals.

- Easements: Right-of-ways and/or easements for construction, operation and maintenance of the system shall be recorded with the County Assessor's Office and copies placed in the Operation and Maintenance Manuals.

- City Costs: Verify that all user equity fees and City administration, inspection, and other costs have been paid in full.

- O&M Manuals: Submit three (3) paper copies of the Operation and Maintenance Manuals approved by the City per Section 1.3.1.1.2. Also provide one (1) electronic PDF copy.

1.2.2 General Design Guidelines

Design Criteria

Pump station design shall be in conformance with the latest versions of the City of Richland's Comprehensive Sewer Plan, City of Richland's Standard Specifications and Details, and Washington Department of Ecology's Criteria for Sewage Works Design. The requirements in this standard specification are intended to supplement and supersede the criteria in these documents if they conflict.

Configuration

The pump station shall utilize a duplex submersible pump and wet well configuration with a separate valve vault. The pump station shall include the appurtenances and generally conform to the layout and configuration depicted in the attached standard drawings modified as necessary for each individual site requirements.

The station shall be designed with provisions for lifting the submersible pumps out of the wet well without disassembling fittings or the pump station structure and without entering the wet well.

Design Flows

Current and design flows including minimum daily, average daily, maximum daily, minimum hourly, peak hourly, and any other important flow conditions for the pump station shall be calculated for sizing the pumps and verifying the operating characteristics of the pump station. A design life of 20 years minimum shall be used unless otherwise approved by the City.

1.2.3 Pumps

Number and Size of Pumps

The station design shall include a minimum of two (2) pumps (i.e. duplex) each capable of handling, at a minimum, the design peak hourly flow. If the 20-year projected peak flow hourly exceeds 500 gpm, three (3) pumps (i.e. triplex) shall be provided with the ability to handle, at a minimum, the design peak hourly flow with the largest pump out of service. In addition to the two (2) pumps for use, a third pump (rebuild kit of full pump) shall be provided the City of Richland Sewer Operations as a spare.

If the flow from the ultimate service area exceeds the needs of the particular area under consideration, the City may require pump station capacities greater than the size required for the 20-year design period. The City may participate in the project to the extent of the incremental cost of materials for oversizing the pump station.

Operational Criteria

The pumps and wet well should be sized to limit the number of starts per hour to less than or equal four (4) per pump. In addition, the pumps and wet well should be sized to limit the maximum cycle time to less than 30 minutes to avoid septic conditions.

Pump Type

Pumps shall be submersible sewage pumps capable of passing spheres of at least 3 inches in diameter. Pump suction and discharge openings shall be at least 4 inches in diameter. All sewage pumps shall be rated explosion-proof and meet National Electrical Code (NEC) requirements.

Pump Manufacturer

Pumps shall be manufactured by ITT Flygt.

1.2.4 Wet Well and Valve Vault

Size

The wet well shall be adequately sized to accommodate the pumps and any other required equipment and piping. If additional pumps are planned to be added in the future to serve the ultimate flow projections, the wet well shall be upsized appropriately. The storage capacity in the wet well shall be sized to provide 30 minutes minimum response time during design peak hourly flows between the high water alarm elevation and overflow conditions at the nearest manhole or dwelling sewer stub. The wet well shall be a minimum of 72 inches in diameter.

The valve vault shall be sized to provide adequate space for access to and maintenance of appurtenances.

Access Hatches

The wet well and valve vault access hatches shall be sized to encompass and fully expose the entire interior to the atmosphere when opened (the corners of lid opening shall touch the inside diameter of wetwell) Access Hatch channels shall have pre drilled holes at 24” spacing to prevent water accumulation. Each hatch door shall have a fall protection cable to be connected to adjacent hatch during confined space entry.

Wet Well Liner

All interior surfaces of the wet well shall be lined with a non-corrodible lining system.

Confined Space Entry System

The wet well design shall provide for confined space entry by including a pre-cast concrete structure with core mount sleeve base with sleeve cap. The components shall be incorporated into the design and installed per the manufacturer's instructions.

Miscellaneous Design Details

The valve vault shall drain back into the wet well. A check valve or flapper shall be provided on the drain line.

All P-traps to be filled with water.

The wetwell and vault shall be designed to be watertight and for AASHTO H-20 traffic loads.

The corners of the wetwell bottom shall be filleted to minimize solids accumulation at the pump intakes at the bottom of the wet well.

The gravity sewer pipe entering the wet well shall be designed to discharge as far away as possible from the pumps to avoid cavitating the pumps.

Pipe inverts entering and exiting the structures, top slabs, and base elevations shall be shown on design drawings.

All materials shall be corrosion resistant. All nuts, washers, bolts and other steel hardware inside the structures shall be stainless steel.

Only rigid, ductile iron piping (Class 52) shall be used within and between the wetwell and valve vault. Where possible, interior fittings shall be flanged fittings with manufacturer-approved gaskets for sewage applications. Ductile iron piping and fittings shall have an interior and exterior epoxy coating. A dual flexible coupling system shall be provided between the valve vault and the wetwell to accommodate differential settlement between the two structures.

Stainless pipe supports shall be provided for the piping and valves inside the valve vault.

1.2.5 Sun Shelter

A sun shelter shall be provided to shield the electrical, control, and telemetry panels from the prevailing winds and southwestern sun.

1.2.6 Electrical

The electrical system shall include, but shall not be limited to, electrical service, service equipment, power distribution equipment, motor control equipment, as well as control, instrumentation and telemetry equipment. The standard design shall include a permanent, on-site generator and automatic transfer switch connected to the station.

The electrical system shall be constructed with two enclosures. The Power Panel shall contain a main circuit breaker, transfer switch, power distribution blocks, branch circuit breakers, combination stepdown transformer/panelboard, and motor starters. The Control Panel shall contain the control, instrumentation and telemetry equipment. These enclosures shall be NEMA 3R construction and shall be freestanding enclosures mounted adjacent to each other on a concrete pad.

The electrical installation shall meet NEC and other applicable codes in effect at the station location.

Electrical service shall be from the serving utility at the location of the station. Utility service requirements shall be adhered to.

Specific requirement for the electrical system are found in Section 1.3.5 of these specifications.

1.2.7 Controls

Controls for the lift station shall be provided to cause the pumps to cycle on and off based on wet well level. Motor starters shall be across the line starters or solid state soft starters, depending on motor size and City preference. Controls shall be provided for redundant means of starting and stopping pumps. One means shall be a level controller with programmable start and stop levels for lead and lag pumps. The second means shall be a high level float switch and timers to start both pumps and operate them for a time period after the float switch return to normal.

Wet well level shall be monitored by a level transducer mounted in the wet well and connected to the level controller.

1.2.8 Telemetry

The Contractor shall provide and/or install telemetry equipment to permit the City to monitor the lift station over the existing telemetry system. Telemetry equipment shall be as described in Section 1.3.6.

1.2.9 Standby Power

Standby power will be via a permanent generator set. The Contractor shall include an automatic transfer switch and generator to permit operation of the station on standby power when utility power fails. The on-site generator shall be connected to natural gas if readily available to lift station location.

1.2.10 Site Layout

Easements

The pump station shall be on dedicated right-of-way or easement with easy all-weather access. Written copies of all easements and right-of-way shall be provided to the City, shown on all drawings, and recorded with the County Assessor's Office.

Access and Drainage

Access and drainage shall be clearly shown on design drawings. The pump station access road/driveway shall be paved in conformance to City Street Standards and provide direct truck vehicle access to the gate. Access location(s) shall be designed using the City of Richland Vac Truck design template in Appendix A and approved by City and authorized maintenance operator(s). Unpaved finish grade surfaces inside the pump station fence shall be finished with a 4-inch layer of crushed surfacing top course over subgrade all compacted to 95% maximum density. Drainage facilities shall be constructed so that the access road, pump station, and surrounding properties are not subject to flooding from stormwater runoff. A 6-foot chain link fence shall enclose the lift station site with a minimum 12-foot vehicle slide gate and a 4-foot swing gate. Gate locations shall be installed as shown on construction plans.

Lighting shall be installed to provide adequate light for the entire site. Lights shall follow the current City of Richland Standard Detail found on the City of Richland's website. Lighting shall include a 15-foot steel pole with a Hubbell ASL1-160L-100-4K7-4W-UNV-ASQU-DBT light attached. No mast arm shall be required. The light shall have a switch installed.

1.2.11 Force Main

Size

Force mains should be not less than 4 inches in diameter. At design peak pumping capacity (with one pump running), a minimum self-scouring velocity of 3.5 feet per second (fps) should be maintained. Alternatively, with City approval, this velocity may be provided by automatically cycling two pumps simultaneously according to a programmable schedule. Design velocity should not exceed 5 fps.

Alignment and Grade

Uniform grade and straight alignment between high and low points, fittings, and appurtenances shall be maintained in new force mains. The force main shall be installed at a positive grade so that it can be drained and emptied if necessary. A combination air valve, Apco or approved equivalent, shall be placed at all high points in the force main to release trapped air and relieve air/vacuums during filling/draining.

Materials

Force main piping shall be constructed of C-900 and C-905 PVC water pipe, although epoxy-lined ductile iron may be allowed on a case-by-case basis. Fittings shall be epoxy-lined ductile iron. Materials and construction of piping and fittings shall meet City of Richland's Standard Special Provisions Section 7-17 for pressure pipe. All nuts, washers, bolts and other steel hardware shall be stainless steel.

1.2.12 Other Considerations

These standards generally apply to typical residential pump stations, although the City reserves the right to impose other requirements as necessary. Also, additional requirements may apply to pump stations receiving commercial or industrial sewage.

The following is a list of additional items that may be considered on a case-by-case basis:

- Screening
- Grinding
- Grit handling/removal
- Grease handling/removal
- Odor control
- Noise control
- Hydrogen sulfide corrosion control

1.3 STANDARD SPECIFICATIONS

1.3.1 Submittals

General

This section describes the requirements for construction and operation and maintenance (O&M) submittals and the review procedures.

1.3.1.1.1 Construction Submittals

Submittals not following these procedures or requirements will be returned to the Contractor without being reviewed.

Provide a Submittal Control Document showing the project submittals required by the Special Provisions, Project Plans, and Specifications. Submit this log to the Engineer as a spreadsheet in EXCEL® format within fifteen (15) working days after the effective date of the Notice to Proceed.

Number the submittals as shown in the Submittal Control Document. Specific items submitted under a general item shall be given a dashed number suffix. For example, under a general item “Valves” (Submittal No. 6), product data for gate valves would be submitted with a dashed number suffix such as Submittal No. 6-01. Resubmittals of the same item shall be given the original number with an alphabetic suffix. For example, the first resubmittal of the product data for the gate valve would be designated Submittal No. 6-01a.

Transmit each submittal with a submittal form identifying the Project Name, Contractor, Subcontractor or supplier, corresponding plans sheet or specification section, submittal name, and number.

Provide a Contractor's stamp or cover letter, signed or initialed, certifying that the submittal has been reviewed by the Contractor and is in accordance with the requirements of the Work and Contract Documents. SUBMITTAL WILL BE RETURNED IF NOT CERTIFIED.

Schedule submittals to expedite the Project, and deliver to the City Engineer at 625 Swift Blvd., Richland, Washington. Coordinate submission of related items.

The Contractor shall coordinate submittals with the work so that work will not be delayed. The Contractor shall coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. The Contractor shall not proceed with work related to a submittal until the submittal process is complete.

Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with Contract Documents.

The Contractor shall submit a copy of the technical specification with each subsection clearly marked for conformance or nonconformance with the subsection. Where the proposed equipment deviates from the specification, all necessary information and supporting calculations to evaluate the deviation shall be attached. The City retains its right to reject without justification the proposed deviation in favor of the specification, as written. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work. Identify requests for "or equal" "or equivalent" items. Justify the said deviation or "substitution" in detail in a separate letter immediately following transmittal sheet (written requests through Contractor only):

- If the justification is not given, shop drawing can be rejected and returned without further action.
- If justification is not given, deviation is not approved even if shop drawing is approved.

In making request for "or equal" "or equivalent" item, Contractor represents:

- He has personally investigated proposed item, has determined that it is adequate or superior in all respects to that specified, and that it will perform the function for which it is intended.
- He will provide same guarantee for "or equal" "or equivalent" item as for item specified.
- He will coordinate installation of accepted "or equal" "or equivalent" into work, to include building modifications if necessary, making such changes as may be required for work to be complete in all respects.
- He waives all claims for additional costs and/or time related to "or equal" "or equivalent" which subsequently arise.

(Note: This section does not address substitutions for major equipment during the bidding period.)

Provide space for Contractor and Engineer review stamps.

Unless noted otherwise, submit the number of copies which the Contractor requires to be returned, plus three (3) copies which will be retained by the Engineer. Special operation and maintenance submittal requirements are discussed below.

The Contractor shall be responsible for submitting complete and accurate information in accordance with the Contract Documents. All submittals requiring a third review by the Engineer shall be considered unresponsive and the Owner will charge the Contractor on a time and materials basis for all subsequent reviews and all related administrative costs.

Distribute copies of reviewed submittals to affected parties. Instruct parties to promptly report any inability to comply with provisions.

1.3.1.1.2 O&M Submittals

O&M Information shall be provided for all major equipment items as required by the Drawings and Specifications and indicated in the Submittal Control Document including but not limited to:

- All piping, fittings and valves.
- Pumps and motors.
- Electrical and control equipment.

IMPORTANT: Prior to startup, submit and bind together all O&M information in one complete manual binder that includes all of the O&M information for the entire booster station including mechanical and electrical. Only submittals provided in this format and as described below will be reviewed for acceptance. The manual binders shall be the heavy-duty, three-ring type. If O&M information does not fit in a single binder, multiple binders labeled "Volume 1", "Volume 2", etc. may be submitted. Each binder shall be labeled on the front and on the binder spine as follows: "[*project name*] Sewage Pump Station O&M Information (Volume _)".

Provide one (1) complete electronic copy in portable document format (PDF) and three (3) paper copies of the specified O&M manuals, which will be retained by the Owner. For ease of identification, each manufacturer's brochure and manual shall be appropriately labeled with the equipment name and equipment number as it appears in the project drawings and specifications. The manuals shall be indexed and reference the discrete equipment number on all manuals, data sheets and drawings. The manuals shall be provided with a table of contents and tab sheets to permit easy location of desired information.

If manufacturers' standard brochures and manuals are used to describe O&M procedures, such brochures and manuals shall be modified to reflect only the model or series of equipment used on this project. Extraneous material shall be crossed out neatly or otherwise annotated or eliminated.

Submit operation and maintenance information printed on 8½ in. x 11 in. size heavy quality paper (20 lb. or heavier). Reduce drawings or diagrams bound in manual to 8½ in. x 11 in. or 11 in. x 17 in. size.

Following the acceptable installation and operation of an equipment item, the item's instructions and procedures shall be modified and supplemented by the Contractor to reflect any field changes or information requiring field data.

Include manufacturer contact data, operating instructions, preventive and corrective maintenance requirements, warranty information, parts lists, and any other applicable information.

Operation and Maintenance Manuals shall contain operation and maintenance instructions, repair data, parts lists, manufacturer's warranty, record drawings, permits, easements, photo graphs, test results, schematics for mechanical, electrical, and civil design components, and other pertinent information.

1.3.1.1.3 Review Procedure

Unless otherwise specified, within thirty (30) days after receipt of the submittal, the Engineer will review the submittal. The returned submittal will indicate one of the following actions:

- If the review indicates that the material, equipment or work method is in general conformance with the contract drawings/specifications, the submittal copies shall be marked "Reviewed". In this event the Contractor may begin to incorporate the material/ equipment/work method covered in the submittal, subject to the full requirements of the Contract Documents.

- If the review indicates that the submittal is insufficient or that limited corrections are required, the submittal copies shall be marked "Furnish as Corrected". The Contractor may begin to implement the work methods or incorporate materials/equipment covered in the submittal, in accordance with the corrections/comments noted. Where submittal information is to be incorporated in O&M data, a corrected copy shall be provided; otherwise no further action is required.

- If the review reveals that the submittal is insufficient or contains incorrect data and that the comments require revision and resubmittal, the submittal copies shall be marked "Revise and Resubmit". (In this case, except at its own risk, the Contractor shall not undertake work covered by this submittal until the attached comments have been confirmed by a separate written communication of the submittal that has been revised, resubmitted, and returned to the Contractor).

- If the review indicates that the material, equipment, or work method is not in general conformance with the design concept or in compliance with the contract drawings/specifications, or if the submittal is incomplete, the submittal copies shall be marked "Rejected". Submittals containing deviations from contract drawings/specifications that have not been clearly identified and that have not been noted previously in correspondence also shall be considered rejected, even if the Engineer fails to note the deviation. No deviation will be accepted unless clearly marked on the submittal. (In this

case, except at its own risk, the Contractor shall not undertake work covered by this submittal until the attached comments have been confirmed by a separate written communication or the submittal has been revised, resubmitted, and returned to the Contractor).

1.3.1.1.4 Effect of Review of Contractor's Submittals

Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of its responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer on behalf of the City, or by any officer or employee of the City, and the Contractor shall have no claim under the Contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed.

Payment

All labor, material, and equipment required to provide submittals shall be considered incidental and included in other bid prices.

1.3.2 Pumps and Motors

General

This section covers the wastewater submersible pumps and accessories.

1.3.2.1.1 Pump Performance Requirements

The pump shall meet the following performance requirements:

- Design Duty Point: _____ gpm at _____ feet total dynamic head (TDH)
- Design Static Head Lift: _____ feet
- Minimum Shutoff Head: _____ feet
- Minimum Efficiency: _____
-

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged.

The drawings and specifications for this project are based on the following pump and motor:

- Wastewater Submersible Pump: ITT FLYGT (w/N-Impeller) Model _____
- Motor: _____

1.3.2.1.2 Submittals

Submit the following under provisions of Section 1.3.1:

- Manufacturer's Certificate: Certify that products meet or exceed specified requirements, and are suitable for the use intended.

- Pump and motor performance data.

- Shop drawings showing pump dimensions, detailed drawings for installation requirements, pump connections and sizes, rail system and connections, and access hatch requirements.

- Anchor bolts for the discharge elbows shall be of adequate size and embedment into the wet well floor slab to support the pumps. Contractor shall provide structural design calculations sealed by a Professional Structural Engineer licensed in the State of Washington.

- Pump curves with both one and two pumps operating and superimposed system duty points showing performance requirements are satisfied.

- Operation and maintenance manuals and information.

1.3.2.1.3 Quality Assurance

Install and operate pumps and motors in accordance with the manufacturer's recommendations.

1.3.2.1.4 Warranty

Include coverage of all pumps, motors, bearings, seals, wear plates, and accessories, for a minimum of five (5) years from the date of shipment. Pro-rate the warranty after the first 18 months of operation.

Materials

1.3.2.1.5 General Requirements

Included under this section will be the pump, motor, discharge elbow, guide bar brackets and related and required accessories.

The pump supplier shall also supply compatible motor, discharge elbow, mechanical seals, guide bar brackets and related and required accessories.

The pumps shall be suitable for pumping raw unscreened wastewater comprised of domestic, commercial, and industrial waste and be easily removed for inspection and service requiring removal of no bolts, nuts, or other fastenings and not requiring personnel to enter the wet well.

All components and materials inside the wetwell shall be constructed of stainless steel or other non-corrodible materials.

Only ITT Flygt Corporation submersible raw sewage pumps and motors shall be allowed. No substitutes will be allowed. Pumps and motors shall meet applicable ITT Flygt Performance Specifications and the requirements of this specification:

1.3.2.1.6 Scope of Work

Furnish and install two submersible non-clog wastewater pump(s). In addition to the installation of the two pumps, furnish and deliver to the City of Richland Sewer Department Shop a spare impeller and re-build kit.

Each pump shall be equipped with a submersible electric motor with ____ feet length of submersible cable (SUBCAB) suitable for submersible pump applications. The pump shall be supplied with a mating cast iron ____inch minimum discharge connection and be capable of meeting the performance requirements given in this specification.

Each pump shall be fitted with stainless steel lifting chain and synthetic cord for use with the Grip-Eye lifting device. The working load of the lifting system shall be 50% greater than the pump unit weight.

1.3.2.1.7 Pump Design

The pump(s) shall be automatically and firmly connected to the discharge connection. There shall be no need for personnel to enter the wet-well. No portion of the pump shall bear directly on the sump floor. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact.

1.3.2.1.8 Pump Construction

Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump. Lifting bails shall be stainless steel.

1.3.2.1.9 Cooling System

Each unit shall be provided with an integral motor cooling system. The cooling system shall provide for continuous pump operation in liquid temperature of up to 104 Degrees F or in free air. Restrictions below this temperature are not acceptable.

1.3.2.1.10 Cable Entry Seal

The cable entry seal design shall ensure a watertight and submersible seal.

1.3.2.1.11 Motor

The motor shall be totally enclosed for submersible service, explosion proof, and suited for operation on 480 volt, 3-phase, 60 hertz power.

The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class H insulation rated for 180 C (356 F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor and pump shall be designed and assembled by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for continuous operation up to 40 C (104 F) ambient and have a NEMA Class B maximum operating temperature rise of 80 degrees C. A motor performance chart shall be provided, upon request, showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be terminated with Meltric DS60 series plug. Matching Meltric receptacles shall be housed in a stanchion disconnect stand (Romtec or approved equal). The power cables shall be of sufficient length to reach the stand without the need of any splices and shall run through an open cable channel with an H-20 rated cover.

1.3.2.1.12 Bearings

The pump shaft shall rotate on two permanently grease lubricated bearings.

1.3.2.1.13 Mechanical Seal

Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The

lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary tungsten-carbide seal ring and one positively driven rotating tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The seal system shall not rely upon the pumped media for lubrication. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

Seal lubricant shall be FDA Approved, nontoxic.

1.3.2.1.14 Pump Shaft

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be AISI Type 431 or ASTM A479 S43100-T stainless steel.

1.3.2.1.15 Impeller

The impellers shall be of N-impeller design and manufactured of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

1.3.2.1.16 Volute

The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The

volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of (ASTM A-48, Class 35B gray iron or ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

1.3.2.1.17 Protection

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125 C (260 F) the thermal switches shall open, stop the motor and activate an alarm. A leakage sensor shall be included to detect water in the stator chamber. The Float Leakage Sensor(FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS shall stop the motor and send an alarm both local and/or remote. USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125 C (260 F) SHALL NOT BE ALLOWED. The thermal switches and FLS shall be connected to the pump level controller and monitoring unit (See section 1.3.5.1.16 for the pump level controller and monitoring unit specifications).

Guide bars and brackets shall be stainless steel:

- Two continuous guide bars per pump used for raising and lowering the pump. Type 304 stainless steel.
- Lower guide bar holders to be integral with discharge elbow.
- Guide pump unit on guide bars utilizing guide brackets. Type 304 stainless steel.
- Use intermediate supports on guide bars as needed.
- Guide cables are not acceptable.
- Guide bars shall not support any portion of the weight of the pump.
- Guide bar shall have a stainless cable and hook able to clip to hatch frame for ease of reaching guide bar assembly

Workmanship

1.3.2.1.18 Examination

Verify all pumps, motors, and materials are present and meet the requirements of these Specifications.

1.3.2.1.19 Installation

Install pumps and motors in accordance with shop drawings and manufacturer's recommendations.

Interface with suction and discharge piping to provide a complete waterproof seal.

Install electrical and pump controls in accordance with the manufacturer's recommendations and the electrical division of these Technical Specifications.

Center pump bowls and discharge column.

Furnish and deliver one (1) spare pump, spare impeller and re-build kit to the City Sewer Department Shop.

1.3.2.1.20 Acceptance Testing

Prior to acceptance, test lift station with representatives of the City Engineer present to verify proper operation. Coordinate and schedule acceptance testing with the City a minimum of five (5) working days before.

Conduct drawdown test with one and with both pumps in operation measuring drawdown and time to verify the flowrates and that the pumps are pumping at their rated capacity.

Simulate alarm and control conditions. Operate pumps through complete fill and pump cycles. Field adjust level float and controller level settings to achieve optimum performance.

1.3.2.1.21 Start-Up Services

Provide a factory-trained representative for four (4) hours minimum to oversee, inspect and to certify the installation of each type of pump. Prior to operator training, demonstrate to the Engineer that the equipment is ready for operation. Coordinate and schedule operator training with the Engineer a minimum of five (5) working days before.

Provide required Equipment Operation and Maintenance (O&M) Manuals to the Owner as per the requirements of Section 1.3.1.1.2.

Payment

Payment shall be made at the unit price or lump sum bid price as stated in the Contractor's bid proposal. Payment shall be considered full compensation for all labor, material, and equipment to install the pump and motors, complete and operational.

1.3.3 Precast Wetwell and Valve Vault

General

1.3.3.1.1 Scope

This work shall consist of constructing the pump station wetwell and valve vault in accordance with these specifications, as shown on the plans, and as staked by the Engineer.

In addition to the requirements of this specification, the wetwell and valve vault shall also comply, where appropriate, with the requirements of the City of Richland's Standard Special Provision's Section 7-05, Manholes, Inlets, Catch Basins and Drywells.

1.3.3.1.2 Submittals

Submit shop drawings for the lift station wetwell and valve vault. Shop drawings shall be complete and shall show overall layout, unit locations, fabrication details, reinforcement, connection details, hatch orientation and opening direction, location of uni-sleeve, support items, dimensions, and relations to adjacent materials.

Submit concrete mix design, concrete materials, accessories, epoxy adhesive and concrete test results.

Manufacturer shall provide structural design calculations for the wet well and valve vault, sealed by a Professional Structural Engineer licensed in the State of Washington.

Materials

1.3.3.1.3 Precast Concrete

All cast-in-place and structural concrete for this project shall meet the requirements of Class 4000. Contractor to submit concrete mix design, concrete materials, accessories, epoxy adhesive and concrete test results. Manhole joints shall be sealed with continuous rubber manhole gasket. Grout joints inside and out.

Design the wet well and vault for AASHTO H-20 loadings.

1.3.3.1.4 Wet Well

The lift station wet well shall conform to ASTM C-478, Standard Specification for Precast Reinforced Concrete Manhole Sections. The valve vault shall be a precast concrete vault sized as shown on the drawings. Cast hatches and/or frame and covers in the top slabs (coordinate opening location and size with pump manufacturer). Design the wet well and vault for H-20 loadings.

All interior surfaces of the lift station precast wet well shall be lined with non-corrodible lining systems.

A. The wet well walls, floor (including the fillet taper), and roof slab surfaces shall be lined with a protective epoxy, polyamine, fiber reinforced coating. Coating shall be a 100% solids and spray applied. Minimum thickness shall be 100 mills.
B. The lining shall be Series 436 Perma Shield FR Epoxy Coating as manufactured by Tnemec, or approved equivalent.
C. Filler-resurfacer shall be Series 64-1500, 218, 219 or 434 as manufactured by Tnemec, or approved equivalent.
D. Installation of the lining shall be done in accordance with the recommendations of the liner manufacturer.
E. Joints between the lining/coating and other lift station components shall be sealed with butyl rubber sealant material.

1.3.3.1.5 Valve Vault

The valve vault shall be a pre-cast concrete vault sized as shown on the drawings. Provide solid plastic access steps where shown on the plans.

Check valves for the pump station discharge line shall be Lever and spring check valve with rubber faced clapper, M&H 259-02.

1.3.3.1.6 Top Slabs

Cast access hatch frames into the top slabs.

Design the wet well and vault for AASHTO H-20 traffic loads.

Produce a smooth, troweled finish on the surfaces of all slabs including the station area slab. Slab shall be level and flat. All finished concrete and hatches shall be at same elevation.

1.3.3.1.7 Access Hatches

The access hatches shall be double-leaf aluminum with stainless steel hardware. Hatches shall be rated for AASHTO H-20 traffic loads unless this load rating is not available in the required size. Then hatches may be rated for a reduced traffic loading rating of 16,000 pounds over a 20 inch x 20 inch area. Provide a recessed, lockable hasp covered with a hinged lid flush with the surface. Provide a stainless steel safety chain for a safety barrier between the door leafs when open. The hatch on the wet well shall be gasketed for odor control. The hatch drain coupling on the wet well shall be capped. Route the hatch drain on the valve vault to discharge near the vault floor. Hatches shall be Bilco JD-AL-H20 or approved equivalent. Hatches

shall open in the orientation as shown on the plans. The hatch dimensions for the wetwell shall be 72" by 72" for the wet well and 60" by 60" for the valve vault.

1.3.3.1.8 Non-Shrink Grout

Non-shrink grout shall be premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2,400 psi (17 MPa) in 48 hours and 7,000 psi (48 MPa) in 28 days, Gifford-Hill "Supreme," L&W "Crystex," or UPCO "Upcon High Flow".

1.3.3.1.9 Joint Filler Material

Install 1/2-inch joint filler material between the wetwell and concrete slab and where called for on Drawings. Joint filler material shall be asphalt impregnated fiberboard or felt, tongue and groove profile, set 1/8-inch below floor slab elevation, meeting the requirements of ASTM D-1751.

1.3.3.1.10 Exterior Coatings

The below ground level exterior surfaces of lift station precast wetwell and valve vault sections shall be coated with Asphalt for Waterproofing (ASTM D312, Type 4) in accordance with Section 6-08 of the WSDOT Standard Specifications.

1.3.3.1.11 Confined Space Entry System

A confined space entry system shall be furnished with the lift station. The system shall be Miller DuraHoist ™ and shall consist of the following primary components:

A. Core Mount Sleeve Base, Model No. DH-9SS, and Sleeve Cap, Model No. DH-10SS, install per drawings and manufacturer's recommendations on the wet well and valve vault;

1.3.3.1.12 Sewer Pipe and Fittings

The sewer pipe materials, as indicated on the plans within the wet well and valve vault and to the gate valve downstream of the valve vault, shall be Ductile Iron conforming to ANSI/AWWA C515/A21.51 minimum Class 52 and as specified in the Standard Special Provisions. Fittings shall be as specified in the Standard Special Provisions. Flanged fittings shall have manufacturer-approved gaskets for sewage applications. All piping and fittings inside wet well and valve vault shall have an interior epoxy lining and an asphaltic exterior coating. All piping and fittings underground shall have an interior epoxy lining and an asphaltic exterior coating.

1.3.3.1.13 Drain Pipe and Fittings

The materials, as indicated on the plans for the drain pipe, shall be "Polyvinyl Chloride Pipe" (PVC) ASTM D3034, SDR 35 as specified in Section 7-04 of the City of Richlands Standard Special Provisions. Fittings shall be the same material as the pipe, molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, end caps, and other configurations required.

Workmanship

Do not place backfill for at least 24 to 48 hours after application of exterior coating. Place backfill in a manner that will not rupture or damage the film or cause the coating to be displaced on the wall.

A minimum of one compaction test shall be taken at each structure location as follows: foundation subgrade, base under floor slab, midpoint of the backfill, and finished subgrade elevation.

Payment

Payment shall be at the unit price or lump sum price as stated in the Contractor's bid schedule. Payment shall be considered full compensation for all labor, materials, equipment, excavation, and backfill to complete installation of the wet well, valve vault, coating, frame and cover, top slabs, hatches, steps, confined space entry system, piping, fittings, valves, concrete pad, and site surfacing, and all items necessary to furnish and install the lift station, complete and operational.

1.3.4 Force Main Sewer

General

In addition to the requirements of this specification, the force main sewer shall also comply, where appropriate, with the requirements of the City of Richland's Standard Special Provisions.

Materials

The sewer main line materials, as indicated on the plans for the sanitary sewer force main, shall be "Polyvinyl Chloride Pipe" (PVC) C-900 as specified in Section 7-17 of the City of Richland's Standard Special Provisions. Fittings for the force main shall be also as specified in the Standard Special Provisions. Ductile iron pipe conforming to ANSI/AWWA C151/A21.51 Class 50 as specified in the Standard Special Provisions, is a pre-approved substitute, but ductile iron pipe shall be epoxy lined. Cement mortar lining will not be allowed.

Tracer wire shall be insulated 12 gauge copper.

Valves and valve boxes for the sanitary sewer force main shall meet the requirements of Section 7-12 of the City's Standard Special Provisions. All valve box lids shall be marked with the letter "S".

Workmanship

The sewer force main shall be laid at a uniform grade as called for or as shown on the plans and as required to not create high or low points in the line.

Tracer wire for the sanitary sewer force main, valves and valve boxes shall be installed in accordance with the detail in the plans.

The Contractor shall hydrostatic test the sanitary sewer force main in accordance with Section 7-09 of the City's Standard Special Provisions.

Payment

Payment for fitting shall be at the contract unit price as stated in the bid schedule for each type and size fitting.

Payment shall be at the contract unit price as stated in the bid schedule for "Force Main Sanitary Sewer Pipe _____ In. Diam." The contract unit price shall be considered full compensations for all labor, materials and equipment to include trench excavation and backfill, pipe installation, and testing.

A separate payment will not be made for testing the sanitary sewer force main. All costs to perform the test shall be inclusive to the contract unit price for the sanitary sewer force main.

1.3.5 Electrical System

General

1.3.5.1.1 Scope

The Contractor shall provide a complete electrical system for the project site including: electrical service (in conjunction with the local electric utility), service equipment, distribution equipment, motor control equipment, telemetry equipment, instrumentation equipment, conduit, conductors, fittings, hangers, and associated devices/equipment required for a complete and operational system.

This section is intended to delineate the minimum requirements of the system, but in no way do they relieve the Contractor from providing all hardware and programming necessary to accomplish the functional tasks indicated by the system specifications.

The control panel (CP) shall be furnished by a single supplier, and that supplier shall supervise the construction, installation and testing of the telemetry and control system. The supplier shall also coordinate with the City representative to ensure the correct interface of the telemetry equipment with the City's existing man-machine interface software program. The supplier shall be a firm which can demonstrate significant experience in the design and installation of computerized radio telemetry instrumentation and control systems associated with the wastewater industry, with a minimum of five projects during the last five years in performing such work.

The system shall be complete with any incidental items necessary to provide proper and reasonable operation of the component parts. This may include, but shall not be limited to: power supplies, filters, isolation transformers, delay or suppression devices, interconnecting devices, or any items which are ordinarily furnished as a part of a system, or which are necessary to successful operation of the system and/or equipment.

1.3.5.1.2 Submittals

All submittal information shall be submitted to the City representative by the Contractor, in accordance with Section 1.3.1. Extraneous or non-applicable material and information shall be omitted, or clearly denoted as inapplicable when such omission is impractical.

Shop drawings, where required, shall be accurately drawn to a scale or scales appropriate to show overall arrangement, pertinent features, details, and methods of connection or joining. Figure dimensions shall be used, as opposed to scaled dimensions.

For the following specific equipment items, shop, catalog, and other appropriate drawings, along with pertinent descriptive information shall be submitted to the City for review prior to fabrication:

- Telemetry and Control Panel
- Antenna and antenna cable
- Motor Controllers
- Power Panel and enclosed components
- Level Controller and Transducer
- Engine Generator

A single complete package shall be submitted including all of the above referenced equipment items. Submit the number of copies specified in Section 1.3.1.

1.3.5.1.2.1 Telemetry/Control Panel Information Submittal

The submittal shall contain a detailed diagram showing the proposed hardware and interconnections to be used for the Telemetry/Control Panel. The diagram shall contain references to discrete supplementary submittal information on each supplied component. The supplemental information shall contain, but not be limited to, physical and functional attributes of the hardware including manufacturer's name, specific model numbers and series numbers of proposed equipment, accessory items, cut sheets, and operating/maintenance instructions for each equipment item. Where more than one type or item exists on a single page, the item proposed shall be clearly indicated. Information on accessory items such as power supplies, fuses, batteries, relays, signal converters, and enclosures shall also be included.

A dimensioned outline drawing of the control panel enclosure, inner door, and backplate showing device locations within the enclosure and conduit connection locations shall be submitted, along with an elementary wiring diagram showing connections of all devices and equipment contained within the panel and clearly showing connection of all field located devices.

1.3.5.1.2.2 Antennas, Support Structures, And Associated Devices

The submittal shall contain complete information on antennas and antenna support equipment, including antenna cable, cable connectors, masts, brackets, and mounting hardware.

1.3.5.1.2.3 Motor Controllers

The submittal shall contain complete information on motor controller, including ratings, dimensions, features, options, and operation and maintenance manuals.

1.3.5.1.2.4 Power Panel

The submittal shall contain information on the Power Panel enclosure along with dimensioned interior and exterior elevations showing locations of all contained equipment/devices. In addition, it shall contain information on devices contained within the enclosure such as transfer switches, motor starters, transformers, panelboards/loadcenters, fuses, relays, and similar items, including wiring and/or connection diagrams.

Mounting details shall be submitted, including information on mounting relative to the utility service meter.

1.3.5.1.2.5 Support Structure for Power Panel and Control Panel

The submittal shall contain a dimensioned layout, schedule of materials of construction, and anchoring hardware for the support structure for the Power Panel and the Control Panel. Supporting calculations demonstrating the adequacy of the proposed anchoring method, including concrete pad dimensions and seismic considerations, shall be submitted for the designed location.

1.3.5.1.2.6 Instrumentation Devices

The submittal shall contain information on the level controller and transducer including model numbers, features, ratings, and dimensions, along with all manufacturer's installation, operation, and maintenance manuals. Submit a configuration sheet showing proposed parameters for operation of the controller specific to this application.

1.3.5.1.2.7 Operations & Maintenance Information

The Contractor shall provide the number of copies of Operation and Maintenance Manuals specified in Section 1.3.1. The following operations and maintenance information shall be furnished for all installed equipment specified in the contract documentation:

- Complete identification, including model and serial numbers.
- Installation and initial start-up instructions.
- Complete instructions regarding operation and maintenance requirements, including procedures and recommended intervals.
- Identification of any special materials, software, or tools required for maintenance.
- Record wiring diagrams
- Parts lists.
- Warranty information, including the name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.

Operation and maintenance information shall be comprehensive and detailed, specific for the items of equipment installed on the project. Material not directly applicable shall be removed, omitted, or clearly marked as inapplicable.

It is the responsibility of the Contractor to ensure that all operation and maintenance materials are obtained and formally transmitted to the City. Material submitted must meet the requirements of Section 1.3.1 and the approval of the City prior to project acceptance.

1.3.5.1.3 Record Information

The Contractor shall be furnished one full set of plans to be used as record drawings. During construction, the Contractor shall maintain an accurate and complete record of all changes in red ink on this set of record drawings. All dimensions shall be field-verified and clearly shown on the drawings. The red-marked set shall be submitted to the City prior to project closeout and approval of final payment.

Three copies of complete record wiring diagrams for all equipment and electrical circuits shall be submitted to the City when the as-built installation differs from that shown on previously submitted drawings or on the plans. Record diagrams shall be clearly marked indicating all such differences, and shall be coordinated with the plat record drawings.

The Contractor shall also maintain records of the hardware and firmware versions, settings, and configurations for the equipment provided. These records shall be updated as necessary during testing and start-up of the system to indicate the final configuration at closeout of the project. These records must be submitted prior to final contract closeout.

The record drawings shall be checked by the Contractor and bear his approval prior to submittal to the City.

1.3.5.1.4 Substitutions

It is the intent of this set of specifications that equipment be provided as specified for uniformity with the existing radio telemetry system. The City will consider proposals for substitution of certain materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and other information required by the City to evaluate the proposals.

Substitution requests will not be considered for telemetry equipment (RTU's and radio), pump level controller and monitoring unit, or motor starter equipment.

To obtain acceptance of items for substitution, the Contractor shall submit requests not later than seven days after the start of Contract execution.

Submission of a substitution proposal shall not relieve the Contractor from the requirement to provide equipment as specified. Substitution proposals will be reviewed by the City for conformance with the functional requirements and intent of these specifications. It is the Contractor's responsibility to demonstrate that the proposed substitute equipment will meet the requirements and the intent of these specifications. The City retains the exclusive right to approve or disapprove all proposed substitutions; all decisions by the City regarding these matters are final. Therefore, the Contractor is responsible for abiding by any decision made by the City regarding proposed substitutions for any equipment and/or system component.

A shop test of the power panel and control panel shall be conducted prior to shipment of the equipment to the job site. The shop test shall be conducted by the panel fabricator and witnessed by the City's representative. Drawings of the panels shall be provided at the shop test. The City representative will compare the drawings to the actual panels. Drawings and actual panel fabrication must match prior to panels being shipped to the job site.

1.3.5.1.5 Tests/Inspection

The shop test shall demonstrate proper operation of the power panel and control panel. Controls shall be operated in each state (for example, hand, off, and automatic for HOA switches); inputs shall be tested by shorting across inputs or actuating devices connected as inputs; and outputs shall be tested by measuring resistance across terminals or contacts. Analog inputs shall be tested at not less than three points, nominally near zero, mid-range, and full range. Test result shall be documented in writing by the panel fabricator. The City representative may choose to bring a laptop computer to the test and monitor I/O on the RTU by connecting the laptop to the RTU. Deficiencies identified as a result of the shop test shall be corrected and retested prior to shipment of the panels to the job site.

The system shall be field tested after installation. Equipment at the site shall be checked for proper operation and functionality. This functional test shall be performed in the presence of a City representative to demonstrate that the entire system is in proper working order and that it will perform the functions for which it was designed. Since the control system will be operating using an existing telemetry system, the field test must be coordinated with the City with at least 10 working days' notice to ensure that the testing does not negatively impact operation of the existing wastewater telemetry system.

The Contractor shall obtain and pay fees for applicable permits and inspections required by any authority having jurisdiction.

Materials

1.3.5.1.6 Basic Materials and Methods

Provide new materials and equipment approved and labeled for the purpose for which they are to be used by a nationally-recognized electrical testing laboratory. Similar items of equipment shall be of the same manufacturer and quality. The equipment and materials shall meet applicable NEMA, IEEE, and ANSI standards.

Furnish materials, devices, equipment, or supplies of materials that are inherently non-corrosive, or are coated or covered in a manner acceptable to the City which renders them non-corrosive. Do not install materials in a manner, location, or

construction that produces galvanic action or any other materials which have the potential to facilitate corroding or eroding action.

Equipment or devices fabricated in the field shall be equal in every respect to manufactured items used for the same purpose. Where cutting, drilling, grinding, etc., is done to galvanized or painted metal, it shall be re-galvanized or painted to match original finish.

1.3.5.1.7 Raceways

Rigid steel conduit shall be hot-dipped, galvanized, or sherardized steel conduit meeting ANSI C80.1. Couplings shall be unsplit, NPT-threaded, steel cylinders with galvanizing equal to conduit. Threadless couplings are not permitted. Nipples shall be factory-made through 8-inch length. Running threads are not permitted. Intermediate steel conduit is not permitted.

Liquid-tight flexible metal conduit shall be flexible, galvanized steel convolutions covered by a liquid-tight PVC layer with manufacturer's marking at 3-foot or less intervals. Connectors shall be UL approved for grounding and employ a ferrule which covers the end of the conduit inside and out. Conduit shall be Electri-Flex Type LA or American Sealtite, Type UA.

Flexible metal conduit shall be flexible galvanized steel convolutions forming a continuous raceway. Connectors shall be galvanized screw-in type, approved by UL for grounding. Flexible aluminum or light-wall steel conduit is not acceptable.

Rigid plastic conduit shall be Schedule 40 or Schedule 80 PVC rigid conduit suitable for underground installation without concrete encasement, and shall meet NEMA TC-2 standards for plastic conduit. Manufacturers are Carlon, Johns-Manville, or equal.

Raceway supports shall be stainless steel, galvanized steel, or aluminum structural shapes, and cast hardware.

1.3.5.1.8 Conductors

Power wiring for service, feeder, and motor circuits shall be Class B stranded copper conductor, with Type RHH-RHW-USE insulation.

Branch circuit conductors shall be Class B solid copper conductor, THHN-THWN insulated in sizes No. 10 and No. 12 AWG. Minimum conductor size for all power wiring shall be No. 12 AWG.

Control wiring shall be Class C stranded copper conductor with Type MTW insulation. Minimum conductor size shall be No. 14 AWG, except conductors which connect to the RTU or radio terminals or connectors shall be sized and fused to match the terminals

or connectors (20 gauge nominal). DC circuits shall be color coded, red for positive and black for negative.

Low-voltage instrument wire shall be multi-conductor cable with overall neoprene or PVC jacket. Individual conductors shall be PVC or polyethylene/nylon insulated. Unshielded instrument cable shall be Beldon 9486 (#18 AWG), Beldon 9488 (#14 AWG), or equal. Shielded single pair instrument wire (2/C#18) shall be Belden 9341 or equal.

Ground rods shall be copper-clad steel, 3/4 inch round, 10-feet long. Grounding clamps shall be equal to T&B 3900 UB Series. Grounding wire and cable shall be solid copper for No. 4 and smaller diameter.

Connectors for splicing copper conductors shall be: "Scotchlok" insulated spring connectors for No. 18 through No. 6 AWG solid conductors; insulated, solid-barrel, crimp-type, plated copper alloy connectors for No. 18 through No. 6 AWG stranded conductors.

Connectors for terminating copper conductors shall be insulated, solid-barrel, crimp-type, spade tongue-plated copper alloy terminal for No. 18 through No. 10 AWG.

Insulating materials for splices shall be "Scotchfill", or equal, for filling bolted or irregular areas before taping with Scotch No. 88, 33 plus or equal 7-millimeter vinyl plastic tape.

Wire markers shall be slip-on sleeve, shrink to fit style. Brady, or approved equal.

1.3.5.1.9 Fittings

Fittings shall be galvanized, cast iron alloy with threaded hubs, neoprene gasket and galvanized cast iron alloy cover. Miscellaneous fittings shall be as follows:

- Clamp backs shall be galvanized cast iron alloy, one-hole style.
- Locknuts shall be extra-heavy, hot-dip galvanized steel through 2 inches trade size and hot-dip galvanized malleable iron above that size.
- Bushing shall be hot-dip galvanized iron with insulating thermosetting collar. Provide grounding connector on bushing where terminating at enclosures.
- Seals shall be provided in conduit runs where runs exit or enter from outdoor areas. Seal shall be EYA or EYS type; sealant shall be clear or colorless RTV silicone or equal.

1.3.5.1.10 Anchors, Supports, and Attachments

Attachments to building surface and structural shapes or members shall be as follows:

- Wood: Lag screws, Type A tapping screws.
- Masonry: Rawl hollow-set drop-in expansion anchor.
- Hollow Partitions: Molly or toggle bolts.
- Concrete: Rawl Lok-Bolt expansion anchors.
- Structural Shapes or Members: Clamps or U-bolts.
- Other Steel: Machine screw-in tapped hole.

Attachments shall be stainless steel or hot-dipped galvanized.

1.3.5.1.11 Motor Controller

Motor Controller shall be Square D/Schneider Electric LC1 Series with LRD Series electronic overload with remote reset. Starter shall include HMCP short circuit protection, and auxiliary run contacts.

1.3.5.1.12 Main Circuit Breaker

Main circuit breaker shall meet NEMA Standard AB-1. The unit shall be a molded case circuit breaker with thermal magnetic trip. The circuit breaker shall have a short circuit withstand rating as required for the available short circuit current at the point of connection to the Electric Utility.

1.3.5.1.13 Enclosures for Power Panel and Control Panel

Power Panel shall be NEMA 3R double door enclosure nominally 60”W x 72” H. Control Panel shall be NEMA 3R single door enclosure nominally 36”W x 72”H. Depth of the enclosures shall be equal and as required for the devices and/or enclosures contained therein, but not less than 20”. The enclosures shall be provided with a pad-lockable, three-point latching system and handle, and panel backplates and mounting hardware as required for the installation. The control panel shall have an internal swing door for mounting of pilot devices and the level controller.

The enclosure shall be manufactured of stretcher leveled steel of 12 or 14 gauge thickness welded into a self-supporting rigid structure. Doors shall be piano hinged with stainless steel hinge pins. Reinforcement shall be provided around areas of the enclosure weakened by openings or mounting of heavy equipment/components. The panel subplate shall be sized to fit within the enclosure and shall be mounted on collar studs for easy installation and/or removal. Print pockets shall be provided on the door.

Panels shall be descaled, cleaned, and primed in preparation for painting. Painting shall consist of one coat of flat white enamel in the interior and two coats of hard finish exterior enamel, gray in color. Paint shall be suitable for field touch-up. Spare paint (one pint) shall be provided for exterior touch-up purposes.

1.3.5.1.14 Intrusion Sensing

Proximity switches shall be provided for use as intrusion sensing devices at the Valve Vault, electrical and control enclosures, and at the wet well. Only one proximity sensor is needed at the valve vault and wet well if an overlapping lid style is used.

Proximity sensors shall be Turck Bi15-Q20-Y1X-H1141 2-wire NAMUR proximity sensor, 5-30 VDC, 4-pin M12 quick disconnect, Turck RK 4T-10 cable, 10 meter, 4-wire with M12 quick disconnect. (Note -- Modify Part number to meet actual cable length required for continuous run of cable from Proximity Sensor to Seal-off at Electrical Vault.) Sensor isolating switch amplifier shall be IM1-22EX-R, or approved equal.

1.3.5.1.15 Power Center

The power center shall be Cutler Hammer “Mini Power Center”, or approved equal.

1.3.5.1.16 Pump Level Control and Monitoring Unit

The Pump Level Control and Monitoring Unit shall be a Flygt MultiSmart, consisting of a base controller unit with Pump Control I/O Board, CPU board, DSP board, and Energy Monitoring and Pump Protection board. The unit and all boards and other required accessories shall be supplied with the pumps.

1.3.5.1.17 Fuses

Fuses shall be as follows: Power fuses, Class RK-5 silver element. Control fuses, Bussman FNQ or equal.

1.3.5.1.18 Current Sensor

Current transformers shall be furnished to allow monitoring of pump operation by the pump level control and monitoring unit. CTs shall be 50:5A ratio and shall be provided for each phase of each motor.

1.3.5.1.19 Panel Heater

Panel Heater shall be 120 volt, single phase with built-in thermostat, fan, and aluminum enclosure. Hoffman D-AH2001A, or equal.

1.3.5.1.20 Transfer Switch

Transfer switch shall be UL listed and approved, with NEMA 3R, 4, or 4X enclosure. The switch shall:

- Be capable of transferring the connected load from “Utility” to “Generator” power, and retransferring back to “Utility”

- Have a selectable commit to transfer function – when the transfer switch senses the loss of normal power, once the sequence of transfer has begun, the transfer switch shall transfer to standby power even if normal power is restored during the transfer sequence.
- Selectable "Y-Y Primary Failure Detection": this algorithm shall function to inhibit retransfer until a dedicated timer expires, the alternative source fails, or measurable evidence permits a reasonable presumption of a truly restored preferred source.
- Electrically operated by a single solenoid or motor mechanism and mechanically held.
- High current-breaking capacity with silver-surfaced contracts equipped with arc barriers and magnetic blow-out coils.
- Contacts rated in accordance with UL 1008 for current carrying and switching capabilities.
- Suitable for repetitive load transfer switching.
- Floating solid neutral connection (ungrounded)
- Interlocked to prevent supplying the load for more than one source at a time.
- "NEUTRAL DELAY" to allow motors to stop on transfer.
- Adjustable close differential voltage monitoring relays provided on all three phases to sense voltage on the "Utility" and "Generator"
- Dry contact output (ratings coordinated with generator) to signal generator to start and run.
- Adjustable time delays for:
    - Call for generator to start and run (minimum of 0-30 seconds). The transfer switch manufacturer shall provide an alternative power source in the transfer switch as necessary to permit the transfer switch to operate without normal power being available during the full time delay.
    - Transfer to standby source (minimum of 0-30 seconds)
    - Neutral delay time (minimum of 0-30 seconds)
    - Transfer to utility source (minimum of 0-30 minutes)
    - Generator Cool Down (minimum of 0-30 seconds)
- Adjustable voltage set points for:
    - Utility source acceptable (70-100% of nominal)
    - Utility source unacceptable (70-100% nominal)
    - Standby source acceptable (70-100% nominal)
    - Standby source unacceptable (70-100% nominal)
- Auxiliary contacts
    - One set form C (normally open and normally closed) for each position "Utility" and "Generator" which operate in parallel with the main transfer contracts to indicate switch position.
    - Two sets from C (normally open and normally closed) for "Utility Available" and "Generator Available" to be used for louver control and

shall be suitably rated for 120 VAC circuits. If required provide an additional relay to provide these contacts.
    - One set from C with each set of voltage relays to indicate when these relays are signaling the switch that voltage is adequate or inadequate (90% and 70%, respectively)
    - Auxiliary contacts are isolate, dry contacts suitable for 120V, 10A inductive loads, NEMA B10 rated. Wired to terminals in the switch low voltage control area.
- Adjustable features for exercising generator set (coordinate provision of this feature with actual generator set).

Transfer switch shall operate as follows:

- Transfers from "Utility" to "Generator" when normal voltage falls to set percent of rated value (typically 70-90 percent) and standby voltage is at set percent of rated value (typically 90-95 percent).
- Re-transfers to Utility when normal voltage returns to set percent of rating (typically 90-95 percent) unless commit to transfer function is activated. If commit to transfer function is active, the re-transfer to Utility will occur after the timeframe set in the commit to transfer function.
- Two separately adjustable time delays prevent transfer to Generator and re-transfer to Utility on voltage dips. Retransfer delay to Utility is overridden if connected source is below set percent of rating (typically 90-95 percent).
- Immediately retransfer to Utility power if the Generator power fails.

1.3.5.1.21 Engine Generator

Provide a __kW (nominal rating) standby engine generator as manufactured by Cummins. Engine generator set shall have the following features and accessories unless otherwise noted:

- Air-intake filter silencer
- Battery charger
- Starting battery
- Block heater
- One output circuit breaker with lugs capable of accepting quantity of conductors as shown on the one line diagram.
- Set-mounted Control Panel
- Muffler
- Subbase fuel tank *if natural gas is not available
- Sound Attenuated Weatherproof Enclosure
- Enclosure shall have Pad lock capability

System Description:

- Unit shall be rated on 0.8 power factor and 277Y / 480 volts, 3 phase, 60 Hz while operating at sea level to 500 feet in an ambient temperature range of 0 degrees F. to 104 degrees F.
- Starting capability suitable for each of the following conditions with a voltage dip resulting in a supplied voltage of not less than eighty percent of nominal, or the voltage required by the control equipment supplied by the Contractor, whichever is higher:
    - One __ HP motor across the line with 3 KVA of miscellaneous load on before starting
    - One __ HP motor across the line with one __ HP motor and 3 kVA of miscellaneous load on before starting.

Engine:

- Four-stroke cycle natural gas-powered engine of either vertical in-line or V-type. Turbocharged diesel if natural gas is not available,suitable for operation on #2 diesel fuel.
- Maximum continuous power output capacity of the engine shall not be less than 1.5 bhp/kW or generator set rating at 1800 (synchronous) rpm, at the job site altitude and with all accessory loads or losses as operating at the job site deducted from the rating, including alternator, water pump, exhaust system, etc.
- Engine speed governed by a full hydraulic or isochronous electric governor
    - Maintain governed speed within 1.8 cycles of 60 cycles per second from no-load to full-load generator output
    - Maintain frequency at any constant load, including no-load, within a steady-state band width of plus or minus 0.25 percent of rated frequency.
    - Frequency modulation (defined as the number of times that the frequency varies from the average frequency in cyclic manner) does not exceed one cycle per second.
- Oil pump: gear-type lubricating oil pump for supplying oil under pressure to main bearings, crankpin bearings, pistons, piston pins, timing gears, camshaft bearings, and valve rocker mechanism.
- Oil filters: Full flow oil filters conveniently located for servicing, and equipped with a spring-loaded bypass valve to insure oil circulation if filters are clogged.
- Cylinder Liners: removable, wet or dry type cylinder liners of close-grained alloy iron.
- Air Cleaner: one or more dry type air cleaners.
- Electric starter sufficient to start the engine within ten seconds of call to start
- Cooling System: sufficient to cool the engine when the generator set is delivering full-rated load in an ambient temperature of 104 degrees Fahrenheit.
- Engine-driven, centrifugal-type water circulating pump

- Thermostatic valve
- Heat exchanger (radiator)
- Block Heater: engine-mounted, thermostatically controlled immersion-type engine coolant heater to ensure a minimum coolant temperature of 120 degrees Fahrenheit at ambient room temperature of 32 degrees Fahrenheit.
- The block heater shall be suitable for being supplied at 120 VAC, single phase, or 240 VAC, single phase. The Contractor shall change or modify the branch circuit and circuit breaker serving the block heater as required to coordinate with the block heater actually provided.
- Batteries: 12 volt DC lead acid batteries of sufficient capacity for cranking the engine a minimum of four times for at least 30 seconds at firing speed without recharging. Batteries shall be mounted in an earthquake proof rack on the skid or set frame or approved separate locations with connections provided. Provide terminals to connect power from batteries to automatic transfer switches.
- Battery charger: Silicone rectifier static type, self-regulated with high current and full float operation with a filtered output. Ten ampere DC high current charging rate when the battery voltage is below the "float voltage setpoint". Full floating charging when voltage is above the setpoint. Battery charger operates from 120 VAC. The charger is complete with voltmeter, ammeter, charging rheostat, automatic equalizing timer and low battery voltage alarm. Battery charger shall be mounted on the engine generator.

Generator

- Four-pole, revolving field generator
    - Enclosure is of drip-proof construction.
    - Insulation Class H
    - 2/3 pitch windings.
    - Wiring is 12-lead, re-connectable, for 3-phase, 4 wire, 480Y/277V, 60 Hz operation.
- Voltage regulator: solid state, maximum regulation ±2 percent - NO LOAD TO FULL LOAD.

Generator Set Control Panel: Contains the following features, functions, devices:

- Control panel is of the dead front type, vibration mounted on the housing.
- Operates at 12 volts direct current from the generator/battery electrical system.
- Automatic starting system:
    - Provides four cranking and three reset periods
    - Operation is automatically initiated by the closing of contacts in the automatic transfer control circuit.
    - Alarm and dry contact output which is energized if the engine has not started by the end of the final cranking cycle.
- Indicating and alarm lights for:

  - RUN
  - LOW COOLANT LEVEL
  - HIGH ENGINE TEMP
  - LOW OIL PRESSURE
  - OVERSPEED
  - OVERCRANK.
  - LOW BATTERY VOLTAGE
  - BATTERY CHARGER MALFUNCTION
  - LOW COOLANT TEMPERATURE
  - NOT IN AUTO

  *If natural gas is not available:
  - LOW FUEL LEVEL
  - FUEL LEAK - FUEL TANK
  - FUEL LEAK - FUEL TRANSFER SUMP
  - LOAD CIRCUIT BREAKER OPEN
- AC voltmeter and switch (Phase 1-2, 2-3, 3-1, and OFF).
- AC ammeter and switch (Phase 1, 2, 3, and OFF).
- Frequency meter (55-65 Hz).
- Engine "AUTO-OFF-MANUAL" control selector switch.
- Lube oil pressure gauge.
- Coolant temperature gauge.
- Running time meter.
- Generator field protection circuit breaker.
- Emergency shutdown button/switch.
- Automatic exercise and cycle timer. (This unit function may be included in the transfer switch specified in 1.3.5.1.19. “Transfer Switches”.)
- Time-delay-relay to permit operation at "NO-LOAD" after re-transfer of load to normal source. (This unit function may be included in the transfer switch specified in 1.3.5.1.19“Transfer Switches”.)
- Automatic safety controls which shut down the engine on:
  - high engine or jacket water temperature
  - low coolant level
  - low lubricating oil pressure
  - engine overspeed
- Separate contacts for transmission of signals to remote location.
  - 2 separate dry contacts for generator run: one N/O and one N/C.
  - 2 separate dry contacts for generator alarm: one N/O and one N/C.

  For Diesel Options:
  - 2 separate dry contacts for generator fuel low level: one N/O and one N/C.
  - 2 separate dry contacts for generator fuel leak: one N/O and one N/C.

- Provide capabilities in generator control panel to monitor inputs from fuel leak detection devices (minimum three inputs).

Accessories

- Sub-base: fabricated steel sub-base for mounting the engine generator unit on a concrete foundation.
  - include seismically certified vibration isolators between the unit and the concrete foundation.
  - Vibration isolation efficiency 90 percent at 1800 rpm.
- Exhaust Silencer: critical rated, welded steel exhaust silencer
  - Finish complying with operating temperature to 1000 degrees F.
  - Sufficiently sized to ensure against loss of power due to excessive back pressure in accordance with engine manufacturers recommendations, including tailpipe sizing verification. Include a drain plug and drip leg in exhaust piping to protect engine.
- Exhaust connection: stainless steel flexible exhaust connection at least two feet long with an exhaust water condensate trap. Provide flapper rain cap on end of exhaust stack.
-

*If natural gas is not available:

- Sub base fuel tank: suitable for #2 diesel fuel.
  - Capacity for 24 hours of full load operation.
  - Overflow basin.
  - Vent piping to enclosure exterior.
  - Fuel fill connection on tank.
  - Level Indicator.
  - Low fuel level float and contacts.

  Fuel leak detection system fortransmission of low fuel and fuel leak alarms to set control panel and/or remote annunciator.
- Weatherproof, sound-attenuated, Level 1 enclosure

Finish

- The entire standby generator set and accessories shall be factory painted with heat-resistant enamel paint and primer. Gen-set manufacturer shall provide appropriate epoxy/polyurethane coating system for high heat conditions.
- Metal shall be cleaned, primed, and finish painted with a minimum of two coats of manufacturer's standard color.

Factory Test: Test assembled sets at the factory prior to shipment to the job site.

- Perform manufacturer’s standard factory tests.
- A shop test shall be performed for the control panel

- Test for a minimum of four hours at full load.
- Record voltage, frequency, amperage, engine temperature, generator temperature, lube oil pressure etc., during the test

Workmanship

1.3.5.1.22 Clean-Up

Vacuum equipment clean after installation; remove metal cuttings with a magnet or suitable means before assembling equipment; wipe insulating supports, bushings, etc. with a clean lint-free cloth; clean debris, shavings, etc. from equipment and enclosures before startup.

1.3.5.1.23 Raceways

Rigid steel conduit shall be used for all work except as noted in this item of the Specifications.

An open channel raceway with H-20 approved cover shall be used for pump and float cables to connect to Romtec (or approved equal) enclosure.

Rigid plastic conduit may be used as follows:

- Between the valve vault and the control enclosure, and
- For utility service circuits as permitted by the serving utility.

Where rigid plastic conduit is used, transition to rigid steel PVC coated conduit at stub-ups and locations where the conduit changes from buried to encased in concrete or exposed. Do not extend plastic conduit above grade, or into equipment.

Flexible conduit shall be provided for connections to equipment which is subject to vibration in normal service. Runs shall be kept as short as practical and shall not be used in place of elbows, offsets, or fittings to attach to fixed equipment. Flexible conduit shall not be strapped to structures or other equipment.

Circuits shall run in individual raceways unless specific combinations in one raceway are shown. Raceways shall not be ganged into wireways, pull boxes, junction boxes, etc., without specific approval.

Conduit connections to enclosures shall be made at the nearest practicable point of entry to the enclosure area where the devices are located, to which the circuits contained in the conduit will connect.

Where raceway exits from grade or concrete, provide the following: For runs exiting from grade, slabs or encasement, provide a rigid steel elbow and adapter. In "wet" areas, elbow shall be 20 mil PVC coated.

Direct-buried rigid steel conduit shall be installed where underground runs are shown. Rigid steel conduit, underground or encased in concrete, shall have a half lapped wrap of Scotchrap No. 51 plastic tape or a coat of Koppers Bitumastic No. 505 or factory PVC coating, 20 mils minimum thickness.

Install raceway as a complete, continuous system without wires, mechanically secure and electrically connected to all metal boxes, fittings, and equipment. Blank off all unused openings, using factory-made knockout seals. Keep conduits clean and dry until conductors are installed using caps, bushings, and "penny" or other suitable means.

Provide double locknuts and insulating bushings at all conduit connections to boxes and cabinets. Bushings shall be grounding type where connecting to concentric or eccentric knockouts. In "wet" areas, locknuts shall be sealing type or Myers hubs shall be used.

Use approved split or union type couplings only where permitted by the Engineer.

Cut ends of conduit square with hand or power saw or approved pipe cutter. Ream cut ends to remove burrs or sharp ends. Thread cuts on conduit in the field shall have same effective length and thread dimensions and taper as specified for factory-cut threads. Transitions from plastic to steel shall be made with a plastic threaded male adapter to a steel conduit coupling.

Provide anchors, hangers, supports, clamps, etc. to support the raceways from the structures in or on which they are installed. Provide sufficient clearance to allow conduit to be added to racks, hangers, etc. in the future.

Conduit couplings, fittings, and boxes where threaded male to female connections are made shall be waterproofed and rustproofed by application of a watertight, conductive thread compound. Clean threads of cutting oil before applying thread compound and making up joint.

1.3.5.1.24 Conductors

Insulated conductors and cables shall be installed in raceway systems after the system is complete. Damage due to missing bushings, burrs on conduit ends, etc. shall be cause to require removal and replacement of conductors. Damaged ends shall be considered sufficient indication of damaged insulation to require replacement. Cable lubricants, pulling sleeves, pullboxes, etc. shall be used to keep pulling tensions within allowable limits. Pulling compounds shall be Ideal Yellow 77 or equal. Pulls shall be by hand using cable grips or wrapping extra conductor around to form an eye. Cable and conductor ends shall be cut off after pulling and all compound cleaned from conductors before terminating.

Power circuits shall be continuous without splices from equipment terminal to equipment terminal. Instrumentation and control circuits shall be continuous except for termination on terminal strips in control panels or at terminal cabinets. Branch circuits may be spliced at taps.

Do not use white or green color for any conductor not intended for neutral or grounding purposes. This limitation applies to power, lighting, and control wiring, except smaller gauge (No. 18 or less), low voltage control circuits.

Use wire with the insulation of required color for conductors No. 8 AWG or smaller. DC circuits shall be color coded red for positive and black for negative.

Control wiring must be of colors different from power wiring or be supplied with a trace of color in addition to the basic color of the insulation. In general, use same color throughout a given system for any signal or control wires performing the same function.

Install wire neatly in all enclosures. Bend or form wires in neat runs from conduits to terminals. Arrange wires so that they may be grouped by conduit or by function in the enclosure. Install cable ties and straps to support and bundle wiring in enclosures. Arrange wires to allow wire tags and numbers to be easily read without bending or flexing wiring.

Terminate wiring with connectors made especially for the wire size and terminal size on which they are installed.

1.3.5.1.25 Anchors, Supports and Attachments

Install attachments to structures or surfaces in a manner which does not damage the structure or surface. Trim all excess length of studs, rods or bolts.

Provide stainless steel or galvanized fasteners in all outdoor, wet, or below grade locations, and any location exposed to the process. Support each raceway or device independently.

Do not drill, tap, punch or shoot structural metal or pre-stressed concrete structures; use clamping devices only to metal and expansion shields or inserts on concrete.

1.3.5.1.26 Power Panel

Power panel shall be assembled with open style devices, except for Mini Power center. Wiring shall be routed open or in plastic wireways. Distribution blocks, and other devices with open terminals shall have plastic, or similar material, guards to

cover the terminals and prevent accidental contact. The assembled panel shall bear the label of an approved Electrical Testing Laboratory.

1.3.5.1.27 Transfer Switch

Acceptance Testing: After installing transfer switches and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

- Provide services of a qualified independent testing agency to perform specified testing for transfer switches.
- Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.22.3 for transfer switches. Certify compliance with test parameters.
- Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

Start-up and Training: Provide the services of the manufacturer's factory authorized representative for startup of transfer switches and training of the Owner's personnel for operation and maintenance of the transfer switches.

- Inspect the installation of each transfer switch for conformance with the manufacturer's recommended installation practices.
- Program and/or configure each transfer switch to properly operate with the generator to which it is connected. Set programming parameters such as adjustable time delays and voltage setpoints.
- Program the transfer switch with engine generator exercising timeframes in cooperation with the Owner. The exercising timeframe shall be discussed with the Owner prior to programming and shall be set prior to final acceptance of the transfer switch by the Owner.
- Test the operation of each transfer switch after programming/ configuring the transfer switch. The testing shall include single phasing the normal power source under load in cooperation with the serving Utility. Contractor shall make arrangements & schedule testing with Utility and pay any associated costs for the testing. The Utility shall single phase each phase leg of the service one phase leg at a time and the Contractor shall verify that the transfer switch properly transfers the load to the generator and retransfers back to the Utility.
    - The Contractor shall make adjustments to the transfer switch as required for successful operation for of the transfer switch during open leg (single phase) events in coordination with the Owner and Engineer.
    - During this test, the Contractor shall obtain the services of an independent testing agency to monitor and record voltages during the test. The independent testing agency shall provide a written report describing the test results including the methods, locations of measurements and sequence of events.

- Reprogram and/or reconfigure and then retest as required to obtain proper operation of each transfer switch. Document the final configuration and programming parameters after successful startup and provide copies of the documentation to the Owner. Documentation shall be provided in hard copy and electronic form.
- Provide a minimum of four hours training to the Owner, at the Owner's facility, prior to start-up of the transfer switches. Training shall cover installation, maintenance, operation, and problem troubleshooting for each type of transfer switch provided.
- Provide a minimum of four hours additional training, program revisions, and maintenance at the Owner's facility approximately one to three months after completion of the project.

Transfer Switch Parameters:

- Adjust configuration settings, time delays and similar settings in transfer switches to obtain satisfactory operation of the switch in coordination with operation of downstream process equipment.
- The following table represents the typical parameters available with an automatic transfer switch and provides a basis for the settings. Adjust and record the parameters of switch actually provided accordingly.

Table 1 Voltage and Frequency Settings

Description	Settings	Default Setting (for reference)	Initial Setting
Normal Source Voltage	Dropout	85%	85%
	Pickup	90%	90%
	Over Voltage Trip	Off	107%
	Unbalance Enable	No	Yes
	Unbalance Dropout	20%	5%
	Unbalance Pickup	10%	3%
Emergency (Generator) Source Voltage	Dropout	75%	85%
	Pickup	90%	90%
	Over Voltage Trip	Off	Off
	Unbalance Enable	No	No
	Unbalance Dropout	20%	10%
	Unbalance Pickup	10%	5%
Normal Source Frequency	Dropout	90%	90%
	Pickup	95%	95%
	Over Frequency Trip	Off	Off
Emergency (Generator)	Dropout	90%	90%
	Pickup	95%	95%
	Over Frequency Trip	Off	Off

Table 2 Feature Time Delay Settings

Feature Code	Time Delay	Default Setting (for reference)	Initial Setting
1C	override momentary Normal source outages	1 second	6 seconds
1F	override momentary Emergency source outages	0 seconds	0 seconds
2B	transfer to Emergency	0 minutes	10 seconds
2E	unloaded running (engine cooldown)	5 minutes	10 minutes
3A	retransfer to Normal (if Normal fails)	30 minutes	15 minutes
	retransfer to Normal (if just a test)	30 seconds	30 seconds
7ADTS/B	delay transition time	0 seconds	30 seconds

Table 3 Feature Settings

Feature	Default Setting (for reference)	Initial Setting
Commit to transfer	No	Yes
Shed load direction	From E	From E
Shed load in phase	No	No
Shed load in phase time delay	1.5 Seconds	1.5 Seconds
Shed load isolate load on source failure	Yes	Yes
Shed load isolate load on test 17	No	No
Phase rotation monitor enable	No	Yes
Phase rotation monitor reference	ABC	ABC
Inphase monitor enable	no	no
Inphase monitor time delay	1.5 second	1.5 second
Y–Y primary failure detection enable	no	no
Y–Y primary failure sensing time delay	1.0 second	1.0 second
Y–Y primary failure retransfer time delay	1.0 hour	1.0 hour

Table 4 General Settings

Parameter	Default Setting (For Reference)	Initial Setting
Language	ENGLISH	ENGLISH

Serial communications baud rate	19.2k	Mbus19.2k
Serial communications address	1	1
Event log enable	No	Yes
Print enable	No	No
Clear log	No	No
Password	1111	1111

Table 5 Engine Exerciser Settings

	Parameter	**Default Setting (For Reference)**	**Initial Setting**
	Month	JAN	Set to current time and date
	Day	1	
	Year	1	
	Hour	1	
	Minute	1	
P1	Engine exercise enable	No	Yes
	Engine exerciser transfer load	No	Yes
	Engine exerciser start hour	0	10
	Engine exerciser start minute	0	15
	Engine exerciser run week	All	Fifth
	Engine exerciser run day	SUN	MON
	Engine exerciser run duration hours	0 hours	0 hours
	Engine exerciser duration minutes	0 minutes	45 minutes
P2	Engine exercise enable	No	Yes
	Engine exerciser transfer load	No	No
	Engine exerciser start hour	0	11
	Engine exerciser start minute	0	15
	Engine exerciser run week	All	Alternative
	Engine exerciser run day	SUN	MON
	Engine exerciser run duration hours	0 hours	0 hours
	Engine exerciser duration minutes	0 minutes	30 minutes
P3..P7	Engine exercise enable	No	
	Engine exerciser transfer load	No	
	Engine exerciser start hour	0	
	Engine exerciser start minute	0	
	Engine exerciser run week	All	
	Engine exerciser run day	SUN	
	Engine exerciser run duration hours	0 hours	0 hours
	Engine exerciser duration minutes	0 minutes	30 minutes

1.3.5.1.28 Engine Generator

- Install the complete set per the manufacturer's installation instructions.
- Anchor the set to concrete housekeeping base or pad.
- Install accessories, including exhaust silencer, flexible exhaust connections, batteries, battery charger.
- Make electrical connections between accessory items which are not factory wired.
- Maintain minimum workspace around unit and components per manufacturer's installation shop drawings and NFPA 70 National Electrical Code.
- Provide a complete fill of lubricating oil.
- Provide a complete fill of anti-freeze (ethylene-glycol) and water to protect the engine and heat exchanger cooling system to minus 25 degrees Fahrenheit.
- If available to lift station location, natural gas shall be connected to power generator.
    - If natural gas is not available, provide a complete fill of diesel fuel oil including topping up after testing i.e. leave tank full when all testing is complete and accepted by Owner.
- Provide services of a factory-authorized service representative to supervise installation and connection of unit and to report results in writing.
- Supervised Adjusting and Pretesting: Under supervision of a factory-authorized service representative, pretest all system functions, operations, and protective features. Provide all instruments and equipment required for tests. Adjust to ensure operation is according to Specifications
- Perform Field testing of installed unit with temporary load bank.
    - System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
    - Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent steploads increases and decreases and verify that performance is as specified.
- Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- Adjust voltage and frequency output of set to nominal ratings.
- Adjust time response of control system to meet performance requirements.
- On completion of installation, inspect engine generator set. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

Payment

Payment shall be made at the unit price or lump sum bid price as stated in the Contractor's bid proposal. Payment shall be considered full compensation for all labor, material, and equipment to install the electrical system, complete and operational.

1.3.6 Telemetry and Control System

General

1.3.6.1.1 System Capabilities

The existing wastewater telemetry system communicates via radio. The City will furnish the radio to the Contractor for mounting in the Control Panel (CP). The City will configure the radio so that communications may be established with the existing telemetry controller.

The existing controller for the wastewater telemetry system, together with the control computer, provides for recording all analog variables and status inputs and maintaining a database of values for reports. Programming of the control computer man-machine interface shall not be the responsibility of the Contractor, but shall be performed by the City.

Materials

1.3.6.1.2 Enclosure

The telemetry equipment shall be contained in the control panel enclosure specified under 1.3.5.1.13 above.

A spare, single 2" PVC electrical conduit shall be installed from the enclosure to outside the perimeter fence, capped, and stubbed up into an enclosed temporary vault for future use of fiber communications. The location of the stub shall be detailed on the record drawings provided by the contractor.

1.3.6.1.3 Conductors

Conductors shall be as specified in 1.3.5.2 above.

1.3.6.1.4 Protection, Control, and Instrumentation Devices

Miscellaneous protection and control devices shall be as follows:

- Power fuses, Class RK-5 silver element. Control fuses, Bussman FNQ or equal.
- Lightning arresters shall be General Electric Company Catalog No. 9L15BBC008, Joslyn, Phoenix Control-Trabtech, or equal.
- Control relays shall have contacts rated 10A - 120VAC, unless higher ratings are required for the circuit being serviced. Coils shall be rated for the voltage of the coil circuit. Relays shall be Schneider Electric RUM or equal mounted in RUZ DIN rail mounted sockets. Relays shall have LED indicators of coil state. Provide surge suppressers and hold down springs.
- Time delay relays shall be Schneider Electric RUW101MW in combination with RUM relays and RUZ base units.
- Pilot devices (selector switches) shall be heavy duty, oil-tight type per NEMA ICS-1. Allen-Bradley, or equal.
- Phase monitoring relay shall be SSAC Model PLMU11.
- Float switches shall be Gems Sensors and Controls (Warrick Controls) Series M mechanical tilt float switches, form C narrow angle. (Part Number MBLUxxW, xx representing the cable length – to be determined by Contractor) with weight (Part # 7762381)

1.3.6.1.5 Remote Telemetry Units

The City will furnish the RTU to the Contractor for mounting in the Control Panel (CP). The telemetry equipment (RTU) shall be a Zetron model 1716 unit for conformity with the existing radio telemetry system.

1.3.6.1.6 Power Supply and Surge Protection

Provide a 120 Volt AC input, 12 VDC output power supply, Sola SPD3-15-100T. Provide a 7 Amp-hour battery backup system.

1.3.6.1.7 Level Controller

The pump level control and monitoring unit shall be a Flygt MultiSmart, consisting of a base controller unit with Pump Control I/O Board, CPU board, DSP board, and Energy Monitoring and Pump Protection board, and panel mount HMI display. The unit and all boards and other required accessories shall be supplied with the pumps. The unit shall be installed in the Control Panel, but shall be programmed, configured, and started up by the Pump representative in conjunction with the startup off the Control Panel. The controller will monitor a submersible level sensor and control the pump based on the measured level. The submersible level sensor shall be a PMC model VL2113 with a 0-10 ft range, 0.25% accuracy and 50’ cable. The sensor shall be intrinsically safe with a PR Electronics IS Barrier model 9106B. The sensor shall include a MP-11 moisture protection assembly and SW2000 sink weight. Backup of the pump level control and monitoring unit shall be accomplished by a single level float and time delay off relay, which will run both pumps when the float is activated. The

level sensors shall be independent from each other/not using parallel contacts (refer to electrical plans for installation)

Float switches shall be Warrick Controls part # MBLU40W (gung with weight attached for tether method – NOT tethered to float switch mast).

Timer shall be Schneider Electric / Telemecanique:
Base RUZ3M – 11 Pin Base
Relay RUMC3AB2F7 – 11 Pin 120vac Relay
Timer Module RUW101MW – Multi Function Timer

1.3.6.1.8 Radio Transceiver

The City will furnish the radio transceiver to the Contractor for mounting in the Control Panel (CP).

1.3.6.1.9 Antenna Systems

A YAGI directional antenna shall be provided for the telemetry system. The antenna shall be a commercial antenna: Andrew DB-499K, or Kathrein SCALA TY-900. Antennas shall be provided with manufacturer's standard stainless steel or galvanized steel mounting hardware for mounting antennas on up to 2.375" diameter standards or poles.

The Contractor shall be responsible for providing all equipment necessary for installation. This includes provision of all incidental items necessary for proper installation and operation, which may include, but shall not be limited to, structural supports, masts, anchoring hardware, supporting members, connection cables, cable connectors. Antenna mast bell reducers, if utilized, shall be drilled and tapped (1/4" minimum) in four locations and stainless-steel bolts installed to prevent turning on the mast.

1.3.6.1.10 Antenna Cable

All antenna coax shall be premium quality.
The cable shall be Times LMR-400. Tessco #59520.

Provide two male Type "N" connectors for the main antenna cable that are LMR-400 N-Connector Male. Tessco #576809. Provide two connector weatherproof kits for connections at the antenna.

Provide 24-inch radio jumper cable with two male "N" connectors to connect between radio and antenna cable lightning arrester. Jumper cable shall be Cablewave S-FLC12 or equal. LMR 400 Tessco #374049.

Provide a coax cable grounding kit for each site to ground the antenna cable to the mast. Ground kit shall be Tessco #310778 GK-S400TT.

Provide an antenna lightning arrester for each site. Antenna lightning arrester shall be Polyphasor IS-50NX-C2 Tessco #20573.

Provide a coax cable grounding kit for each site to ground the antenna cable to the mast. Ground kit shall be Cablewave #916383, or equal. Tessco #300380 GK-S600TT

Provide an antenna lightning arrester for each site. Antenna lightning arrester shall be Polyphasor #S-50NX-C2.

Execution

1.3.6.1.11 Control Panel

The telemetry equipment remote unit, radio, battery, relays, and associated wiring and components at the site shall be provided in the control panel. The assembled panel shall bear the label of an approved Electrical Testing Laboratory. This section of the specifications applies to the control panel.

1.3.6.1.12 Component Installation

Components mounted in the interior shall be fastened to an interior subpanel using machine screws plus adhesive to insure vibration-free attachment. No fastening devices shall project through the outer surfaces of the cabinet. Interior component mounting and wiring shall be grouped as much as possible by function and then by component type. Interiors shall be so arranged that control relays, terminal blocks, fuses, etc. can be replaced or added without disturbing adjacent components. Spare mounting space equal to at least 20 percent of each type of component shall be provided for all components in the system. This provision applies primarily to relays, gutter space, internal selector switches, fuses, and similar components.

Devices, including fuses, power supplies, relays and terminal blocks, installed on the panel subplate, shall be provided with a minimum spacing between the component and the wire duct of 1 inch. Minimum spacing between adjacent components shall be 1 inch. A minimum of 2 inches shall be provided between terminal strips and wireways or between terminal strips. DC fuses shall be mounted completely separate from AC fuses and not in the same horizontal plane.

Panel wireways shall be provided between each row of components, and adjacent to each terminal strip. Wireways shall be a minimum of 1 inch wide and 2 inches deep with removable snap-on covers and perforated walls for easy wire entrance. Wireways shall be constructed of non-metallic materials with a voltage insulation in

excess of the maximum voltage carried therein. Wiring duct shall be Panduit "E" Type LG, Panel Channel, or equal.

Terminals shall be provided for the termination of external power, control, and instrument wiring. Where terminal blocks are used for low energy resistance, current, or voltage circuits, they shall be physically separated from line voltage circuit or current transformer secondary circuits. Where multiple terminals are required for a given wire number, additional terminals shall be provided and jumpered as necessary to provide terminal spaces for each individual outgoing wire. Terminal numbers shall correspond to those shown on the elementary wiring diagram. Provide space for a minimum of 10 percent additional terminals distributed at each group of terminals.

Power terminals shall have brass screws with straps suitable for No. 12 through No. 18 AWG wire. They shall be Buchanan, General Electric, Marathon, or Siemens. Control and instrument terminals shall be modular, rail mounted units, Phoenix, Entrelec, or equal.

Control power fuses shall be FRN for ratings above 10 amperes or FNQ for 10 amperes and below. FRN fuses shall be mounted in phenolic blocks and a fuse puller mounted adjacent to them. FNQ fuses shall be mounted in a buss HPC fuseholder. Label all fuseholders with fuse identification number and fuse size and type. Provide 3 spare fuses of each type and size in each panel. Provide box or fuse clip mounted on panel interior marked "SPARE FUSES" to hold the spares.

1.3.6.1.13 Wiring

Panel wiring shall comply with National Electrical Code.

Panel wiring terminating on device or terminal block screw terminals shall be terminated using slip-on spade tongue insulated crimp (compression) terminators. Run wiring within the panel in wiring duct neatly tied and bundled with tie wraps or similar materials.

All wires to internal components shall be connected to the "inside" or panel side of the terminal strip. All wires to external components shall be connected to the "outside" or field side of the terminal strip. No more than two wires shall be connected to any one control terminal point.

Wiring inside the panel shall be arranged to separate low voltage control signals of the milliamp-millivolt or other low energy type from inductive power circuits, and all panel wiring shall be effectively shielded and grounded to a panel common which will be grounded by the electrical contractor in the field.

Shielding of instrumentation circuits shall be connected to insulated terminals provided adjacent to the circuit terminals, i.e. three terminals for 0-5VDC, 4-20 mA, or similar analog circuits. In general, analog circuits shall be run directly from instrument to instrument without termination. Loop wiring connections to devices shall be made by joining two runs of cable to the device, terminating one conductor of each cable on the device and splicing the other conductors.

1.3.6.1.14 Marking and Identification

Wiring which is an internal part of a device and is not connected to external terminal blocks may be wired using the manufacturer's standard wire designations. Wire which connects to external circuits, to terminal blocks, or other devices which are connected to external circuits shall be identified by the numbers shown on the elementary wiring diagrams. Every wire termination, including all jumpers, shall be identified with wire markers. Wire markers shall be installed over wire terminators or directly adjacent to them. Markers shall be arranged to permit reading of identification without the flexing or twisting of wires.

Nameplates shall be rigid phenolic plastic laminate with engraved lettering or engraved metal plate with filled lettering. Background shall be black. Lettering shall be white. Edges shall be beveled showing a white border. Abbreviations are not permitted unless approved by the Engineer or specifically shown on the nameplates, schedules, or drawings. The engraving shall be as shown on the plans for the identification of each panel.

Nameplates shall be installed plumb and parallel to the lines of doors or structures to which they are attached. Nameplates shall be attached to the sheet metal structure by a thin coat of adhesive and sheet metal screws. Adhesive and screw application shall be made in a manner to avoid buckling or distorting nameplates due to use of excessive adhesive or over tightening of screws.

A nameplate shall be provided for each panel. It shall be 2"×10" minimum size with ½" minimum engraved letters. Nameplates shall be provided for all relays, timers, transformers, fuses, terminal blocks, switches mounted internally, and other components which are mounted to the internal mounting panel. These nameplates shall be sized to the scale of the device to which they refer. Lettering shall be white. Backgrounds shall be black. The engraving shall be as shown for the device on the elementary wiring diagrams.

1.3.6.1.15 System Integration

The telemetry and control system installation shall be performed by an installer who has been trained in system design, installation, operation, and maintenance of the RTU equipment.

The Contractor shall assume full responsibility for the proper installation, maintenance, and operation of all equipment provided under this contract, prior to acceptance. The operation of the man-machine interface, insofar as the program written for the City's Radio Telemetry System, shall not be the responsibility of the Contractor.

1.3.6.1.16 Radio System

The radio shall be installed in the control panel. The City shall install the cables and make connections of the antenna to the antenna cable, the antenna cable to lightning arrester, lightning arrester to antenna jumper cable, and antenna jumper cable to radio using connectors. The City will adjust the radio for proper transmission and reception of radio signals. The Contractor shall be prepared to assist the City in coordinating the work of this Contract with the work of the City, including, but not limited to, adjusting the RTU transmit and receive gain settings, adjusting antenna mounting height and directional orientation. This assistance shall include one additional callback of at least four hours for re-adjustment of the system within the first three months of operation.

1.3.6.1.17 Field Calibration And Startup

After equipment has been installed at the site, the Contractor shall test the telemetry system as described in 1.3.5.1. All analog inputs shall be verified with external devices providing signals of 4.0, 12.0 and 20.0 mA. All discrete inputs shall be verified by simulating contact closure and opening.

Payment

Payment shall be made at the unit price or lump sum bid price as stated in the Contractor's bid proposal. Payment shall be considered full compensation for all labor, material, and equipment to install the telemetry and control system, complete and operational.

1.4 EXAMPLE DRAWINGS

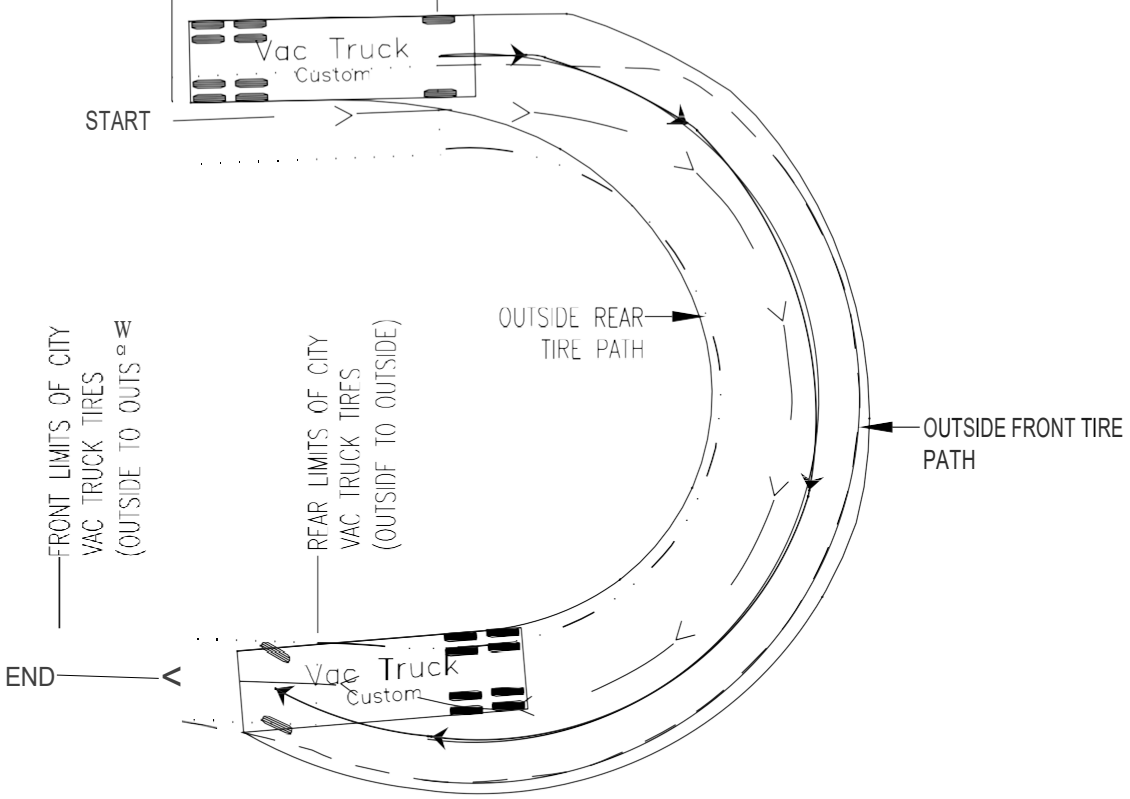
Despite the specific information provided herein, the drawings, specifications and details ("Designs") only show minimum requirements, should be considered conceptual in nature, and may require revision and/or modification to conform to project conditions and applicable laws, codes, ordinances, standards and other current requirements and/or best practices. Designs shall be checked, completed and stamped by a Washington State Professional Engineer and Registered Electrical Engineer.

The following example drawing sheets are taken from previous sewer lift station projects and are attached in Appendix B

- SP-1 Waterfront Lift Station Mechanical Details
- SP-2 Waterfront Lift Station Mechanical Section
- SP-3 Waterfront Lift Station Mechanical Plan and Notes
- SP-4 Waterfront Lift Station Electrical Symbol Schedules and Details
- SP-5 Waterfront Lift Station Electrical Plan and Details
- SP-6 Waterfront Lift Station One Line Diagrams
- SP-7 Waterfront Lift Station Elementary Wiring Diagram
- SP-8 Sienna Hills Lift Station Drawing List
- SP-9 Sienna Hills Lift Station Control Panel Layout Diagram
- SP-10 Sienna Hills Lift Station Control Panel Nameplate Layout
- SP-11 Sienna Hills Lift Station Control Panel Power Distribution Diagram
- SP-12 Sienna Hills Control Panel Auxiliary WiringSP-13 Sienna Hills Lift Station Pump Controller Wiring
- SP-14 Sienna Hills Lift Station Control Panel RTU Wiring
- SP-15 Sienna Hills Lift Station Power Panel Layout Diagram
- SP-16 Sienna Hills Lift Station Power Panel Distribution Diagram
- SP-17 Sienna Hills Lift Station Pump Disconnect Panel Layout Diagram
- SP-18 Sienna Hills Lift Station Pump Disconnect Control Wiring Diagram

APPENDIX A – Vac Truck Autoturn Analysis

CITY OF RICHLAND
VAC TRUCK WHEEL
PATH(FIELD SURVEYED
MAY 27TH **2014**



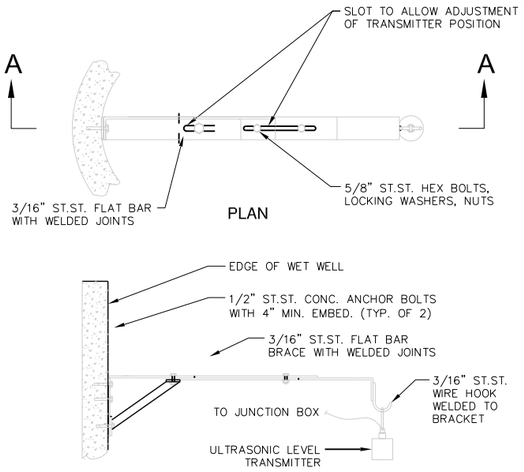
Richland
Washington

DATD D6-23-20
DRAWN BY: JC
SCALD I" = 2D'
CAD DWG:

20 0 20 40

SCALE IN FEET

APPENDIX B – Example Drawings

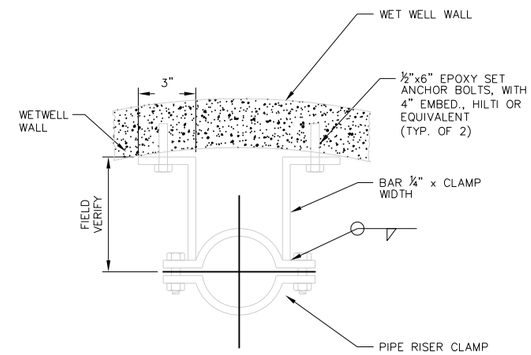


NOTES:

1. SEE PUMP STATION MECHANICAL PLAN FOR PROPER ORIENTATION.
2. FIELD ADJUST TO AVOID CONFLICTS WITH PUMP REMOVAL AND TO OPTIMIZE TRANSMITTER PERFORMANCE.
3. PROVIDE DIMENSIONED SHOP DRAWING SUBMITTAL.

ULTRASONIC LEVEL TRANSMITTER AND BRACKET DETAIL

SCALE: NONE

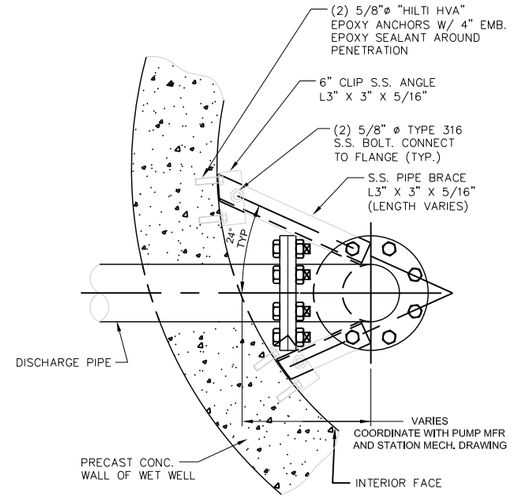


NOTES:

1. ALL HARDWARE AND BRACE MATERIALS TO BE STAINLESS STEEL
2. MINIMUM SIZING SHOWN. ACTUAL SIZE TO BE AS REQUIRED FOR DESIGN PIPE SIZE AND CONDITIONS.

PIPE BRACE DETAIL

SCALE: NONE



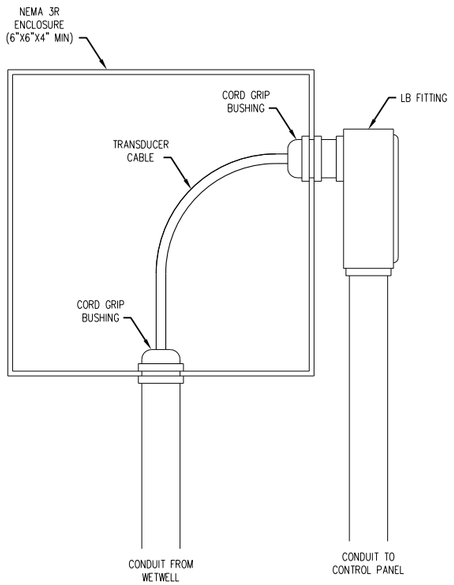
PLAN VIEW

NOTES:

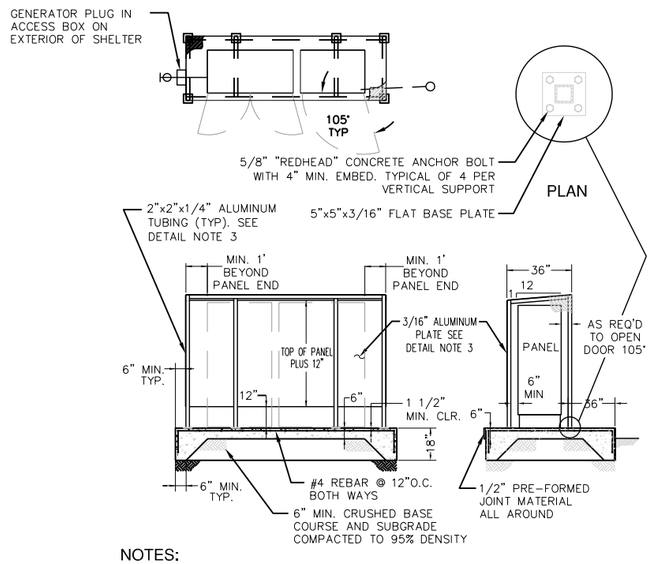
1. ALL HARDWARE AND BRACE MATERIALS TO BE STAINLESS STEEL
2. MINIMUM SIZING SHOWN. ACTUAL SIZE TO BE AS REQUIRED FOR DESIGN THRUST RESTRAINT.

THRUST RESTRAINT PIPE SUPPORT DETAIL

SCALE: NONE



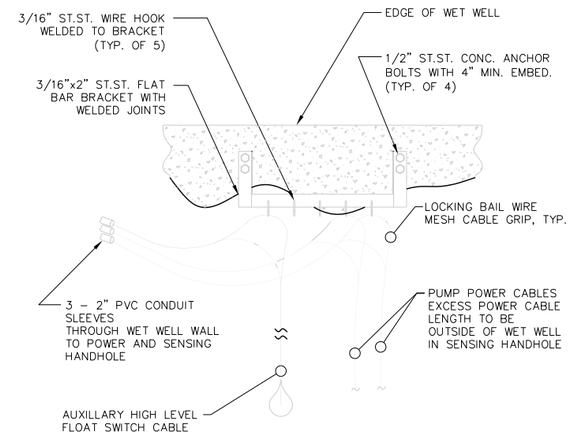
TRANSDUCER CABLE



NOTES:

1. ALL PANELS SHOP FABRICATED AND ANODIZED AFTER FABRICATION.
2. DOORS TO FACE NORTH OR EAST (±)
3. ALUMINUM MAY BE SUBSTITUTED WITH HOT-DIPPED GALVANIZED STEEL.
4. PROVIDE DIMENSIONED SHOP DRAWING SUBMITTAL.
5. MINIMUM TUBING AND BOLT SIZING SHOWN. ACTUAL SIZING TO BE AS REQUIRED FOR STRUCTURE SIZING AND LOCATION.

PUMP STATION SUN



NOTES:

1. SEE LIFT STATION MECHANICAL PLAN FOR PROPER ORIENTATION.
2. FIELD ADJUST TO AVOID CONFLICTS WITH PUMP REMOVAL AND TO OPTIMIZE FLOAT SWITCH PERFORMANCE.
3. PROVIDE DIMENSIONED SHOP DRAWING SUBMITTAL.

CABLE SUPPORT

Richland Washington

DRAFT

CITY OF RICHLAND
PUBLIC WORKS DEPARTMENT

NO.	DESCRIPTION	BY	APR. DATE
	REVISION		

LIFT STATION STANDARDS
CITY OF RICHLAND

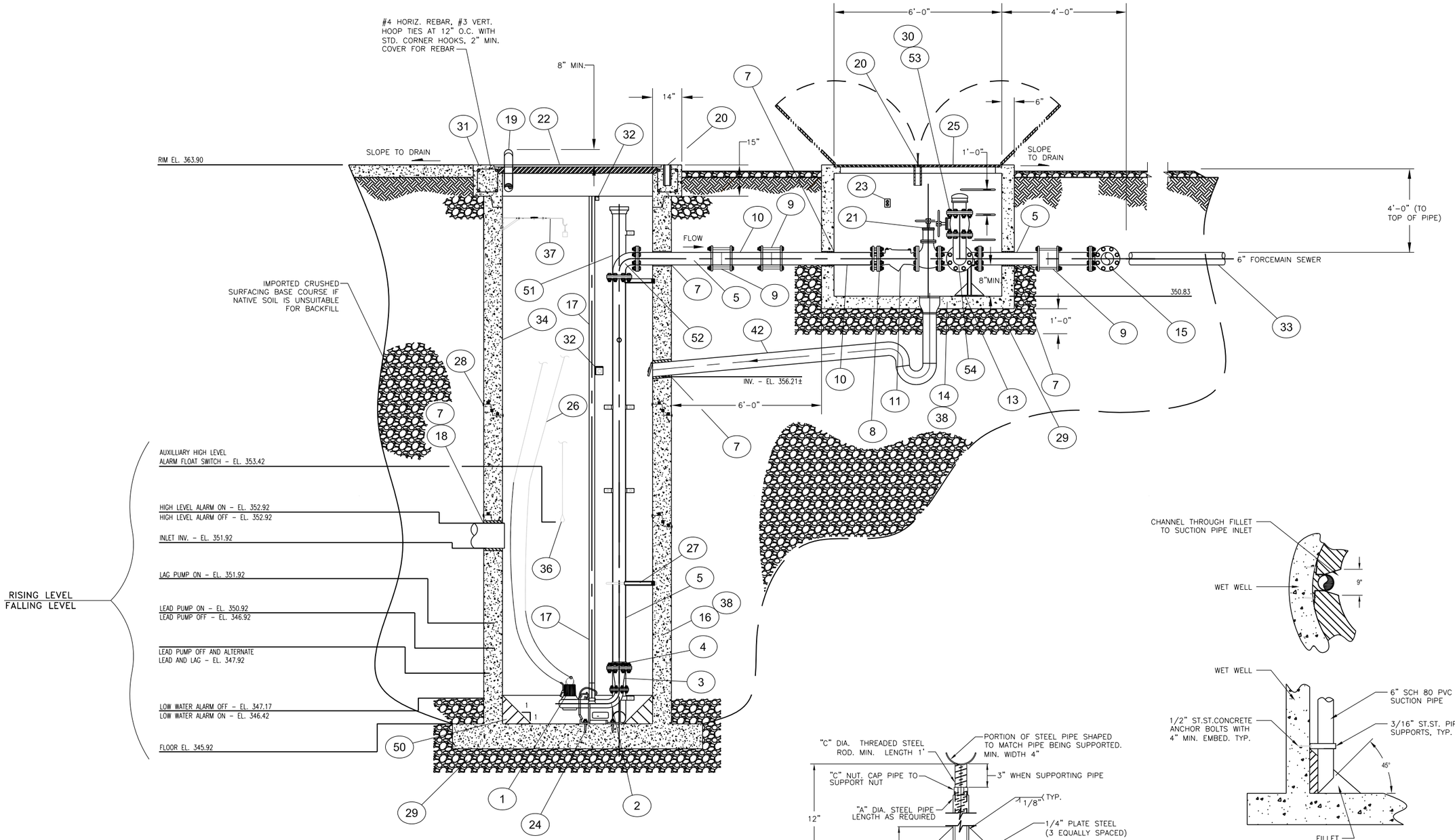
SEWER LIFT STATION MECHANICAL DETAILS

ONE INCH

AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

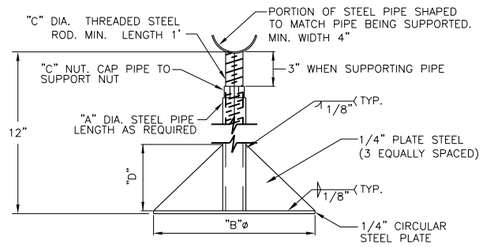
CAD DWG: std drawings	
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 1 OF 18



MECHANICAL SECTION A-A

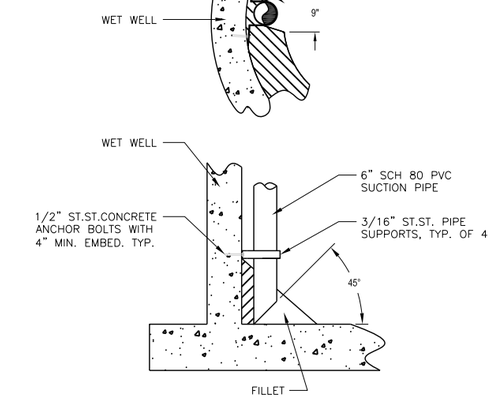
SCALE: NONE
(FROM SHEET 16)
(VARIES IN PLACES)



A	B	C	D
2"	1'-0"	1-1/2"	0'-6"

TYP. STEEL PIPE SUPPORT DETAIL

SCALE: NONE



VACTOR SUCTION PIPE DETAIL

SCALE: NONE

EXAMPLE DRAWINGS FROM WATERFRONT LIFT STATION. NOT FOR CONSTRUCTION

Richland Washington

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CITY OF RICHLAND
PUBLIC WORKS DEPARTMENT
REVISION

NO.	DESCRIPTION	BY	APR.	DATE

LIFT STATION STANDARDS
CITY OF RICHLAND

SEWER LIFT STATION MECHANICAL SECTION

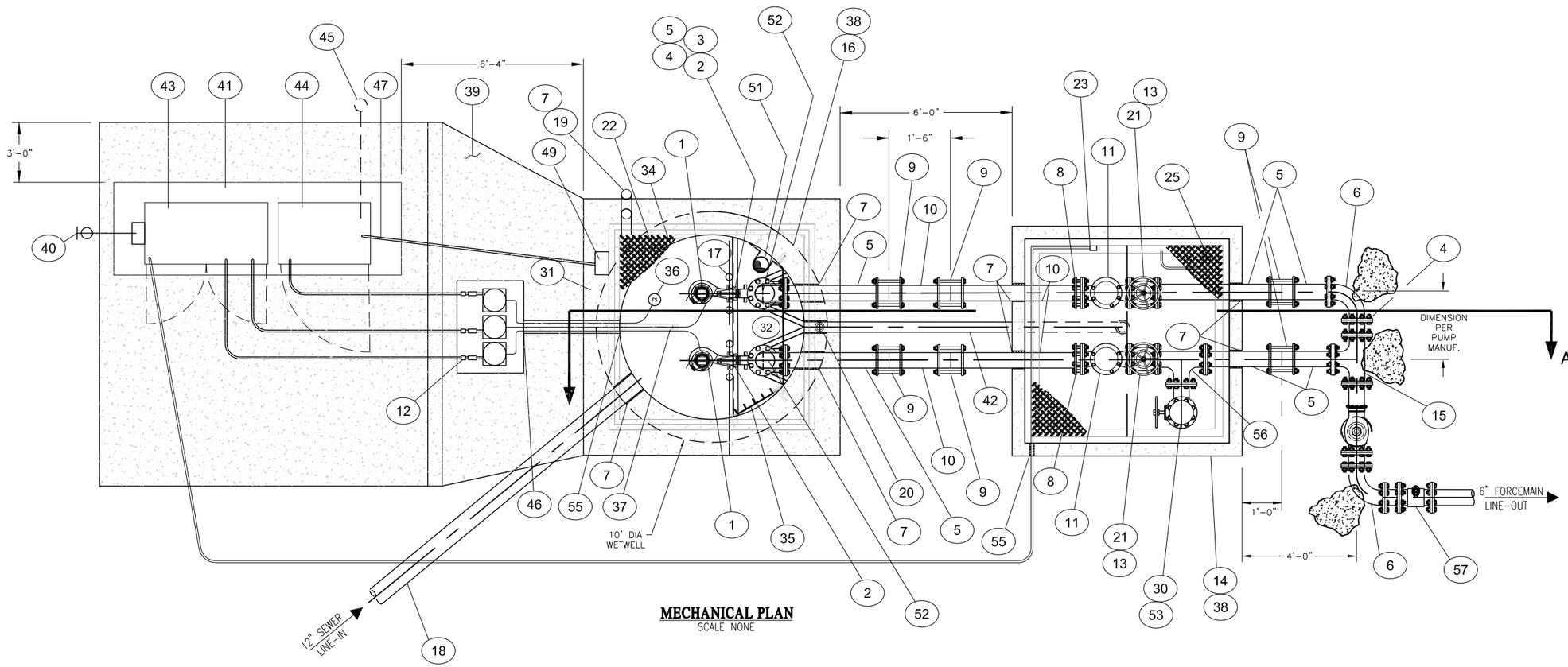
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG: std drawings
CONTRACT NO:
DATE: 08-12-2022
DRAWN BY: MTL
DESIGN BY:
RECORD DWG:

SHEET 2 OF 18

NOTE:
SEE STANDARD DETAILS FOR KEYED AND CONSTRUCTION NOTES.

CONCRETE SLAB OVER WET WELL AND DOUBLE-LEAF ACCESS HATCHES NOT COMPLETELY SHOWN FOR CLARITY



MECHANICAL PLAN
SCALE NONE

CONSTRUCTION NOTES:

1. CONSTRUCT ALL WORK IN ACCORDANCE WITH CITY OF RICHLAND STANDARD SPECIFICATIONS.
2. ALL BOLTS, NUTS, WASHERS, FASTENERS, ETC. WITHIN WETWELL SHALL BE STAINLESS STEEL.
3. FIELD ADJUST LEVEL SETTINGS TO OBTAIN OPTIMAL PERFORMANCE.
4. ALL PIPING AND FITTINGS TO VALVE DOWNSTREAM OF VALVE VAULT SHALL BE D.I.P. CL-52. ALL PIPING AND FITTINGS INSIDE WET WELL AND VAULT SHALL HAVE AN INTERIOR AND EXTERIOR EPOXY COATING. ALL PIPING AND FITTINGS UNDERGROUND SHALL HAVE AN INTERIOR EPOXY COATING AND AN ASPHALTIC EXTERIOR COATING.

KEYED NOTES FOR MECHANICAL PLAN AND SECTION:

1. SUBMERSIBLE PUMP.
2. QUICK DISCONNECT ELBOW AND MOUNTING SYSTEM PUMP DISCHARGE ELBOW AND MOUNTING BASE.
3. REDUCER, FLGxFLG
4. UNI-FLANGE
5. PIPE SPOOL (FLGxPE)
6. 90° ELBOW, (FLGxFLG) WITH THRUST BLOCK
7. WATERTIGHT WALL PENETRATION, MANHOLE ADAPTER "A-LOK PREMIUM", "KOR-N-SEAL" OR EQUIVALENT
8. FLANGE COUPLING ADAPTER
9. FLEXIBLE SLEEVE-TYPE PIPE COUPLING, ROMAC 501 OR EQUAL.
10. PIPE SPOOL (PExPE)
11. RUBBER FLAPPER SWING CHECK VALVE
12. THREE PIECE EXPLOSION PROOF COUPLING
13. STAINLESS STEEL VALVE/PIPE SUPPORT.
14. PRE-CAST CONCRETE VALVE VAULT (6'X6'). PROVIDE OPENINGS AS REQ'D TO ACCOMMODATE PIPING AND ACCESS HATCH AS SHOWN.
15. TEE, FLG WITH THRUST BLOCK
16. PRECAST MANHOLE WITH MONOLITHIC BASE. EXTEND AND SIZE BASE AS REQUIRED FOR BUOYANCY RESISTANCE WHEN GROUNDWATER IS PRESENT.
17. STAINLESS STEEL PUMP REMOVAL SYSTEM, COMPLETE WITH MOUNTING BRACKETS AND INTERMEDIATE SUPPORT BRACES.
18. INLET PIPE
19. 4" STAINLESS STEEL, SCH. 40, SCREENED VENT
20. CONFINED SPACE ENTRY SYSTEM-LIFTING SUPPORT PEDESTAL FLUSH MOUNT STAINLESS STEEL SLEEVE AND CAP. LOCATION TBD IN FIELD BY ENGINEER.
21. RESILIENT WEDGE GATE VALVE (FLGxFLG) WITH 12" HAND WHEEL
22. DOUBLE-LEAF, ACCESS HATCH. (FIELD FIT WITH WET WELL VAULT)
23. ELECTRICAL OUTLET
24. EPOXY-SET STAINLESS STEEL ANCHOR BOLTS
25. DOUBLE-LEAF ACCESS HATCH. (FIELD FIT WITH VALVE PIT)
26. STAINLESS STEEL LIFTING CABLE WITH S.S. CLEVIS FITTING AT EACH END.
27. DISCHARGE PIPE SUPPORT.
28. MANHOLE JOINT WITH EXTRUDED BUTYL RUBBER SEAL. GROUT JOINT INSIDE AND OUT, TYPICAL.
29. CRUSHED SURFACING BASE COURSE COMPACTED TO 95%
30. CAM-LOCK FITTING WITH PRESSURE CAP.
31. CONCRETE CURB FOR SUPPORT OF HATCH PER HATCH MANUFACTURER RECOMMENDATIONS. SEE SECTION DETAIL FOR REINFORCEMENT DETAILS.
32. BOLT UPPER GUIDE RAIL SPACER TO FABRICATED SUPPORT BRACKET AS RECOMMENDED BY MANUFACTURER. POSITION SPACER AS REQUIRED TO LOCATE GUIDE RAIL PIPES IN TRUE VERTICAL POSITION. MOUNTING HARDWARE AND BRACKET TO BE S.S. AND TO INCLUDE 1/4" S.S. BAR STOCK HOOK FOR HANGING LIFTING CABLE.
33. FORCE MAIN
34. INTERIOR LINING SYSTEM
35. CABLE SUPPORT BRACKET.
36. AUXILIARY HIGH LEVEL ALARM FLOAT SWITCH WITH NO/NC CONTACTS
37. ULTRASONIC LEVEL TRANSMITTER AND BRACKET.
38. EXTERIOR ASPHALTIC COATING
39. 6" CONCRETE PAD ON 6" CRUSHED SURFACING BASE COURSE AND SUBGRADE COMPACTED TO 95%.
40. ELECTRICAL SERVICE CIRCUT. COORDINATE CONNECTION WITH UTILITY
41. SUN SHELTER, SEE DETAIL.
42. CAST IRON FLOOR DRAIN 4" SDR 35 PVC DRAIN PIPE WITH P-TRAP INSTALLED AT 2% SLOPE TO WETWELL. INSTALL FLAP GATE ON OUTLET IN WETWELL.
43. POWER PANEL
44. CONTROL PANEL
45. ANTENNA AND POLE
46. POWER AND SENSING HANDHOLE
47. GALVANIZED STEEL RIGID CONDUIT FOR POWER AND CONTROL CABLES
48. GATE VALVE W/VALVE BOX (FLGxMJ) WITH MEGALUG JOINT RESTRAINT
49. ULTRASONIC LEVEL TRANSDUCER JUNCTION BOX
50. CONSTRUCT CONCRETE FILLET (TYPICAL) APPLY WELDO-CRETE® OR APPROVED EQUIVALENT BONDING AGENT. APPLY IN CONFORMANCE WITH MANUFACTURERS RECOMMENDATION.
51. 6" SCH 80 PVC VACTOR SUCTION PIPE PER DETAIL. DRILL TWO 1" HOLES IN PIPE 7' BELOW TOP OF SLAB. PROVIDE ST.ST. PIPE SUPPORTS AND FEMALE CAMLOCK FITTING W/ CAMLOCK CAP.
52. 90° ELBOW, (FLGxFLG) W/ THRUST RESTRAINT, PIPE SUPPORT.
53. 6" RES WEDGE GATE VALVE (FLGxFLG) WITH 12" HAND WHEEL.
54. 90° ELBOW, (FLGxFLG)
55. ELECTRICAL CONDUIT WALL PENETRATION, "LINK-SEAL, MODEL S-316" OR EQUIVALENT.
56. TEE, (FLGxFLGxFLG)
57. 6" MAGNETIC FLOW METER.

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CITY OF RICHLAND
PUBLIC WORKS DEPARTMENT
REVISION

NO.	DESCRIPTION	BY	APR.	DATE

LIFT STATION STANDARDS
CITY OF RICHLAND

SEWER LIFT STATION MECHANICAL PLAN

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG: not drawings	
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 3 OF 18

GENERAL ELECTRICAL ACRONYMS AND ABBREVIATIONS

A	AMPERE
AC	ALTERNATING CURRENT
AFC	AVAILABLE FAULT CURRENT
AI	ANALOG INPUT
AL	ALUMINUM
AO	ANALOG OUTPUT
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DI	DISCRETE INPUT
DO	DISCRETE OUTPUT
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSURE
ENT	ELECTRICAL NONMETALLIC TUBING
EWD	ELEMENTARY WIRING DIAGRAM
FMC	FLEXIBLE METAL CONDUIT
FU	FUSE
FVNR	FULL VOLTAGE NON REVERSING
FVR	FULL VOLTAGE REVERSING
G	GROUNDING CONDUCTOR
GFP	GROUND FAULT PROTECTOR
GND	GROUND
HMI	HUMAN MACHINE INTERFACE
HP	HORSEPOWER
IC	INTERRUPTING CAPACITY
KA	KILO AMPERES
KAIC	KILO AMPERES INTERRUPTING CAPACITY
KCMIL	THOUSAND CIRCULAR MILLS
KV	KILOVOLT
KVA	KILOVOLT-AMPERE
KVAR	KILOVAR (REACTIVE KILOVOLT AMPERE)
KW	KILOWATT
KWH	KILOWATT-HOUR
LCP	LIGHTING CONTROL PANEL
LDP	LOAD REACTOR
LFMC	LIQUIDTIGHT FLEXIBLE METAL CONDUIT
LPU	LINE PROTECTION UNIT
LNR	LINE REACTOR
M	MAGNETIC CONTACTOR
mA	MILLIAMPERES
MCP	MOTOR CURRENT PROTECTOR - MAGNETIC ONLY CIRCUIT BREAKER
MEG	MEGOHM
MLO	MAIN LUGS ONLY
MTS	MANUAL TRANSFER SWITCH
mV	MILLIVOLT
MW	MEGAWATT
N	NEUTRAL CONDUCTOR
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION.
NESC	NATIONAL ELECTRICAL SAFETY CODE
OCP	OVERCURRENT PROTECTOR
ODP	OPEN DRIP PROOF
OI	OPERATOR INTERFACE
OL	OVERLOAD
P	POLE
PF	POWER FACTOR
PH	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PRMC	PVC COATED RIGID METALLIC (STEEL) CONDUIT
PS	POWER SUPPLY
PVC	POLYVINYL CHLORIDE
RMC	RIGID METAL (STEEL) CONDUIT
RNC	RIGID NON-METALLIC CONDUIT
RPM	REVOLUTIONS PER MINUTE
RS485	SERIAL RS485 CABLE
RTRC	REINFORCED THERMOSETTING RESIN CONDUIT
SCS	SHIELDED CAT 5e CABLE
SEC	SECOND
SHLD	SHIELDED
SPD	SURGE PROTECTIVE DEVICE
STP	SHIELDED TWISTED PAIR
SUSE	SUITABLE FOR USE AS SERVICE ENTRANCE
TB	TERMINAL BLOCK
TEFC	TOTALLY ENCLOSED FAN COOLED
TENV	TOTALLY ENCLOSED NON-VENTILATED
UCS	UNSHIELDED CAT 5e CABLE
UC6	UNSHIELDED CAT 6 CABLE
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR
V	VOLT
VA	VOLT AMPERE
VFD	VARIABLE FREQUENCY DRIVE
VR	VOLTAGE MONITORING RELAY
W	WATT
WH	WATT HOUR
WP	WEATHER PROOF
XFMR	POWER TRANSFORMER

ELEMENTARY WIRING DIAGRAMS SYMBOL SCHEDULE

SYMBOL	DESCRIPTION
	PANEL OR DEVICE WIRING
	FIELD WIRING
	EQUIPMENT/DEVICE ENCLOSURE
	WIRING CONNECTED
	WIRING NOT CONNECTED
	DEVICE OR EQUIPMENT TERMINAL
⊘	CONTROL PANEL TERMINAL
	FUSE
	GROUND
	ARC SUPPRESSOR (METAL OXIDE VARISTOR)
	DIODE

CONTACTBLOCK OPERATORS

N.O. N.C.	PUSHBUTTON (1PB,2PB,ETC.)
"HAND OFF AUTO" A1-1SS	SELECTOR SWITCH (1SS,2SS,ETC.) "X" = CLOSED IN THIS POSITION
"OFF — ON" XX-1SS	OFF-ON SELECTOR SWITCH (1SS,2SS,ETC.) "X" = CLOSED IN THIS POSITION ARROW POSITION DENOTES OPEN/CLOSED STATUS (SHOWN IN "OPEN" POSITION)

CONTACTS

N.O. N.C.	SINGLE BREAK CONTACTS
	DOUBLE BREAK CONTACTS (CONTACT BLOCKS

RELAY CONTACTS

N.O. N.C. XXCR XXCR	INSTANTANEOUS CONTACT OF RELAY (1CR, 2CR, ETC.)
XXTR XXTR	TIMED DELAY CONTACT OF RELAY (DELAY ON ENERGIZATION-ON DELAY) (1TR, 2TR, ETC.)
XXTR XXTR	TIMED DELAY CONTACT OF RELAY (DELAY ON DE-ENERGIZATION-OFF DELAY) (1TR, 2TR, ETC.)
X=OL X=OL	OVERLOAD RELAY (1OL, 2OL, ETC.)

MECHANICALLY ACTUATED SWITCHES

N.O. N.C. XXFS XXFS	FLOAT SWITCHES (1FS, 2FS, ETC.)

ABBREVIATIONS
N.O. = NORMALLY OPEN
N.C. = NORMALLY CLOSED

MAGNETIC COILS

XX XXCR	CONTROL RELAY (1CR, 2CR, ETC.)
XX XXTR	TIMED DELAY RELAY (1CR, 2CR, ETC.)
XX M	MAGNETIC MOTOR STARTER (1M, 2M, ETC.)
	SOLENOID (1SV, 2SV, ETC.) (FOR VALVE UNLESS OTHERWISE NOTED)

PILOT LIGHTS

G OR-1LT	INCANDESCENT "PUSH-TO-TEST" (CONNECT TEST CIRCUIT TO LINE) (1LT, 2LT, ETC.)

LENS COLOR CODE
A = AMBER
G = GREEN
R = RED

INDICATING INSTRUMENTS

HM	HOUR METER (ELAPSED TIME METER)

ELECTRICAL PLAN DRAWINGS SYMBOL SCHEDULE

SYMBOL	DESCRIPTION
POWER DISTRIBUTION AND CONTROL	
	DISTRIBUTION/CONTROL EQUIPMENT - FLOOR MOUNTED
SPECIAL PURPOSE CONNECTIONS	
⊕4	SPECIAL PURPOSE EQUIPMENT CONNECTION
MECHANICALLY ACTUATED SWITCHES	
FS	FLOAT SWITCH
LT	LEVEL TRANSDUCER
LS	LIMIT SWITCH
GENERAL WIRING SYMBOLS	
J	JUNCTION BOX
	WIRING RUN EXPOSED ON BUILDING OR STRUCTURE UNLESS OTHERWISE NOTED ON DRAWINGS
	WIRING RUN CONCEALED UNDER SLAB OR BELOW GRADE UNLESS OTHERWISE NOTED ON DRAWINGS
G #10	INDICATES WIRE SIZE IF OTHER THAN #12AWG LINE OR PHASE CONDUCTOR — CROSSMARKS INDICATE NEUTRAL CONDUCTOR — QUANTITY AND USE GROUNDING CONDUCTOR — OF CONDUCTORS
2 #12AWG	ARROWHEAD INDICATES HOMERUN TO EQUIPMENT/DEVICE NOTED AT END OF ARROWHEAD. NUMBER (WHERE NOTED) INDICATES CIRCUIT WITHIN EQUIPMENT/DEVICE NOTED.
	CONDUIT TURN UP
	CONDUIT TURN DOWN
OTHER ELECTRICAL DEVICES	
	MOTOR

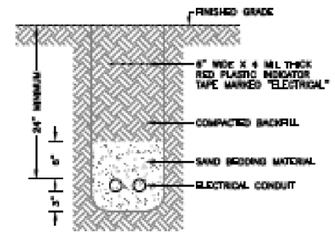
PANEL ELEVATION DRAWINGS SYMBOL SCHEDULE

OFF	LEGEND PLATE PUSH BUTTON
ON R	LEGEND PLATE INDICATOR LIGHT
OFF HAND AUTO	LEGEND PLATE CONTROL STATION
SETPOINT P1	LEGEND PLATE POTENTIOMETER
LRS-1HM	HOUR METER (DIGITAL)
NP1	ENGRAVED NAMEPLATE

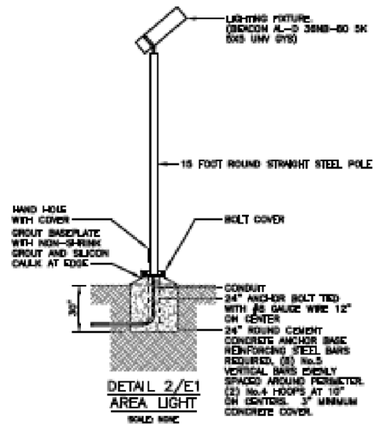
DESIGNATIONS:
1,2,3,ETC. ARE THE ITEMS IN NAMEPLATE SCHEDULE

ONE LINE DIAGRAMS SYMBOL SCHEDULE

SYMBOL	DESCRIPTION
	DEVICE OR EQUIPMENT TERMINAL
	WIRING CONNECTED
	BUS
	WIRING
	EQUIPMENT/DEVICE ENCLOSURE
	PLUG-IN CONNECTION
	THERMAL MAGNETIC CIRCUIT BREAKER
	MAGNETIC ONLY CIRCUIT BREAKER (MOTOR CIRCUIT PROTECTOR)
	CONTACTOR
	THERMAL OVERLOAD
	FUSE
	POWER TRANSFORMER
	CONTROL POWER TRANSFORMER
	CURRENT TRANSFORMER
	GROUND CONNECTION
	TRANSFER SWITCH
WH	WATTHOUR METER (REVENUE METERING)
VR	VOLTAGE RELAY
S/N	SOLID NEUTRAL
	MOTOR
FS	FLOAT SWITCH



DETAIL 1/E1
TRENCH FOR ELECTRICAL CIRCUITS
SECONDARY POWER OR SIGNAL CIRCUITS
SCALE: 1"=1'-0"



DETAIL 2/E1
AREA LIGHT
SCALE NONE

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LIFT STATION STANDARDS
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ELECTRICAL SYMBOL SCHEDULES AND DETAILS

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:
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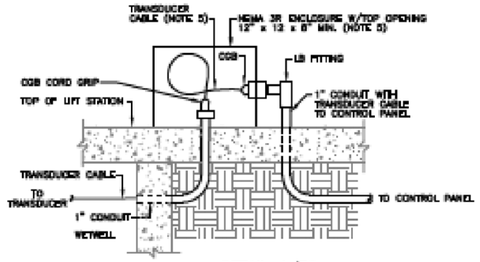
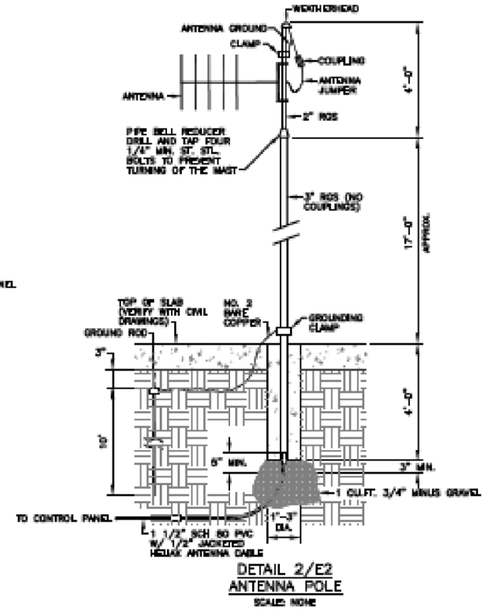
RECORD DWG:

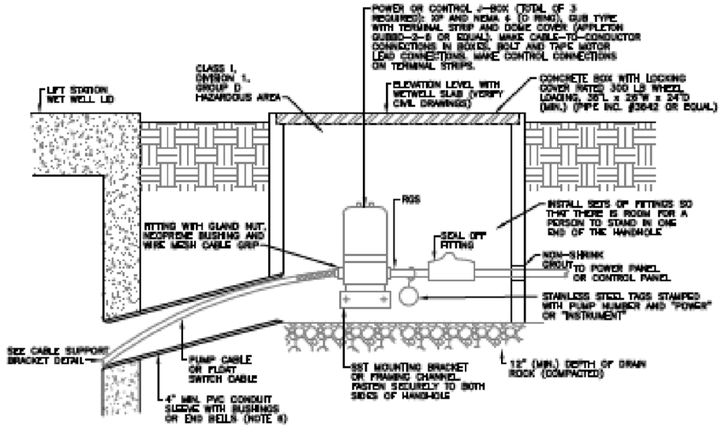
SHEET 4 OF 18



DETAIL 1/E2
TRANSDUCER J-BOX INSTALLATION
SCALE: NONE



DETAIL 2/E2
ANTENNA POLE
SCALE: NONE



DETAIL 3/E2
HANDHOLE ELEVATION
SCALE: NONE

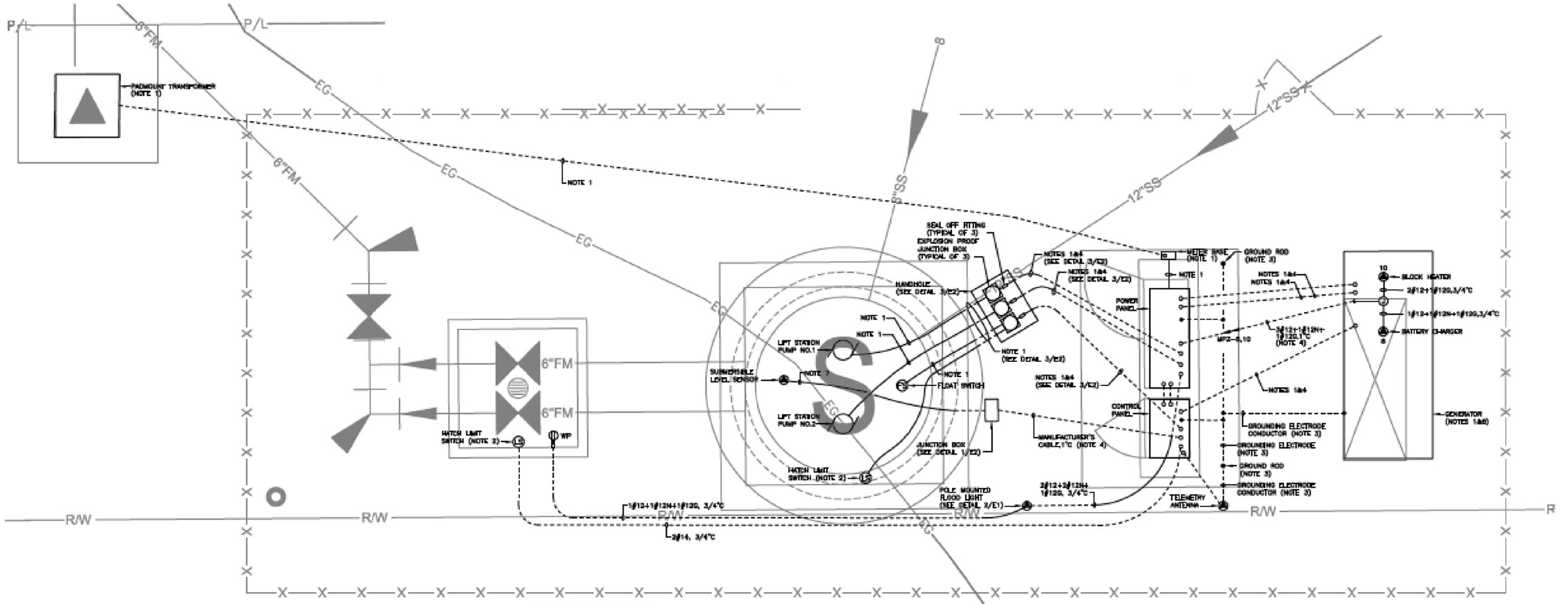
NOTES:

1. SEE ONE LINE DIAGRAM SHEET E3 FOR CIRCUIT AND EQUIPMENT INFORMATION.
2. MOUNT LIMIT SWITCH ON VAULT WALL OR LID COLLAR. ADJUST LIMIT SWITCH SO THAT SWITCH DEACTIVATES (OPENS) WHEN LID IS OPENED. MOUNT SWITCH ON SIDE OPENING FIRST. IF LID CAN OPEN EITHER SIDE FIRST, PROVIDE TWO LIMIT SWITCHES (ONE ON EACH SIDE) WIRED IN SERIES.
3. PROVIDE #2 BARE COPPER GROUNDING ELECTRODE IN SLAB BETWEEN GROUND RODS. PROVIDE GROUNDING ELECTRODE CONDUCTORS FROM GROUNDING ELECTRODE TO THE FOLLOWING:

CONTROL PANEL	#8
POWER PANEL	#8
TRANSFORMER "T-MP2"	#8
ANTENNA MAST	#8
GENERATOR	#8

EXOTHERMICALLY WELD ALL CONNECTIONS.

4. SEE DETAIL 1/E1 FOR TRENCHING INFORMATION.
5. CO-ORDINATE JUNCTION BOX SIZE AND CONDUIT PLACEMENT WITH BEND RADIUS LIMITATIONS OF TRANSDUCER CABLE.
6. INSTALL THE CONDUIT SLEEVE TO DRAIN INTO THE WETWELL. INSTALL THE PIPE INVERT OF THE CONDUIT SLEEVE AT THE JUNCTION BOX EVEN WITH THE FLOOR OF THE JUNCTION BOX. INSTALL THE PIPE INVERT IN THE WET WELL AT ELEVATION AT LEAST 2" LOWER.
7. INSTALL LEVEL SENSOR CABLE SUCH THAT IT IS SEPARATE FROM (NOT TIED TO) OTHER CABLES IN THE WET WELL.
8. COORDINATE GENERATOR STUB-UP LOCATIONS WITH GENERATOR MANUFACTURER'S CONDUIT LOCATION INFORMATION PRIOR TO CONDUIT INSTALLATION.



ELECTRICAL SITE PLAN
SCALE: 3/8" = 1'-0"

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ELECTRICAL PLAN AND DETAILS

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:	std drawings
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DATE:	08-12-2022
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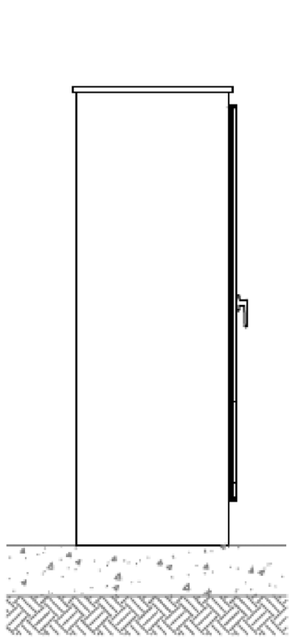
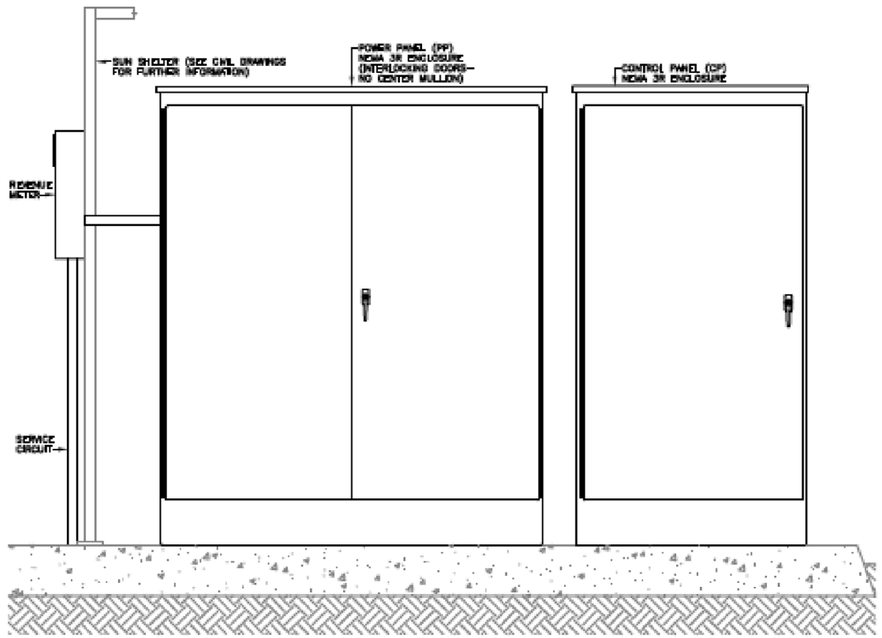
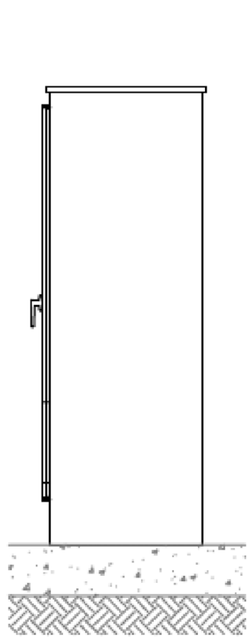
SHEET 5 OF 18



LEFT EXTERIOR ELEVATION
POWER PANEL (PP)
SCALE: 1"=1'-0"



FRONT EXTERIOR ELEVATION
POWER PANEL (PP) AND CONTROL PANEL (CP)
SCALE: 1"=1'-0"

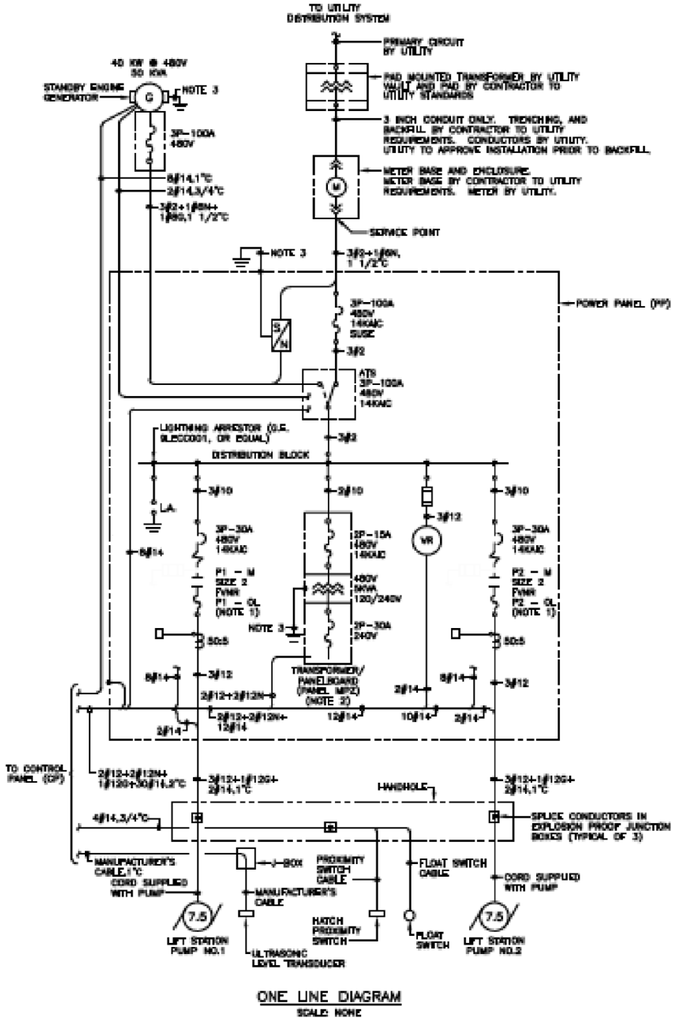


RIGHT EXTERIOR ELEVATION
CONTROL PANEL (CP)
SCALE: 1"=1'-0"

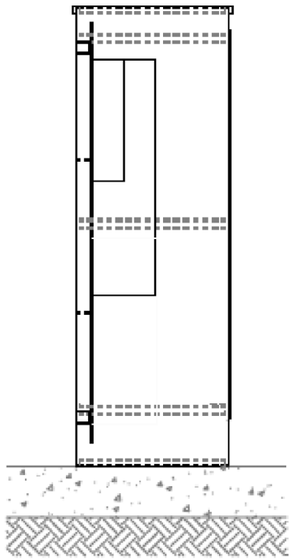
PANELBOARD
CIRCUIT SCHEDULE
PANEL MPZ

SECTION 1 OF 1

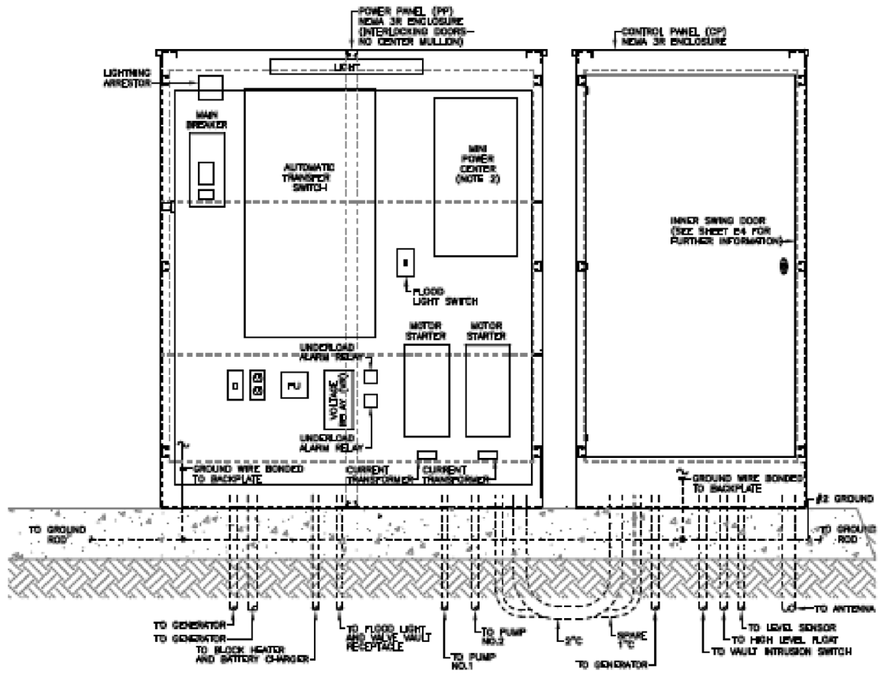
CKT. #	LOAD DESCRIPTION	BREAKER TYPE	POLES		BREAKER TYPE	LOAD DESCRIPTION	CKT. #
1	CONTROL PANEL LIGHT & HEATER VALVE VAULT	1P-20A	1	2	1P-20A	PUMP NO.1 CONTROLS	2
3		1P-20A	3	4	1P-20A	PUMP NO.2 CONTROLS	4
5	RECEPTACLE POWER PANEL	1P-20A	5	6	1P-20A	SPARE	6
7		1P-20A	7	8	1P-20A	BATTERY CHARGER	8
9	RECEPTACLE POWER PANEL LIGHTING	1P-20A	9	10	3P-60A	BLOCK HEATER	10
11	SPARE	1P-20A	11	12			



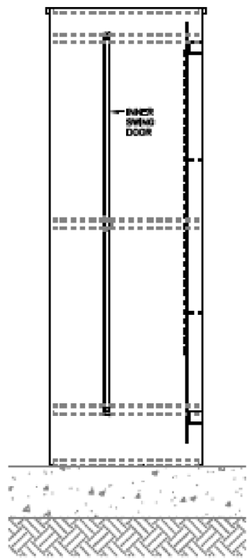
ONE LINE DIAGRAM
SCALE: NONE



LEFT INTERIOR ELEVATION
POWER PANEL (PP)
SCALE: 1"=1'-0"



FRONT INTERIOR ELEVATION
POWER PANEL (PP) AND CONTROL PANEL (CP)
SCALE: 1"=1'-0"



RIGHT INTERIOR ELEVATION
CONTROL PANEL (CP)
SCALE: 1"=1'-0"

NOTES:

1. SIZE/ADJUST OVERLOAD HEATERS TO PROTECT ACTUAL MOTOR PROVIDED.
2. SEE PANELBOARD CIRCUIT SCHEDULE THIS SHEET FOR BRANCH CIRCUIT INFORMATION.
3. SEE GROUNDING ON SHEET E2 FOR ADDITIONAL INFORMATION.

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LIFT STATION STANDARDS
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ONE LINE DIAGRAMS

ONE INCH

AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:	see drawings
CONTRACT NO:	
DATE:	08-12-2022
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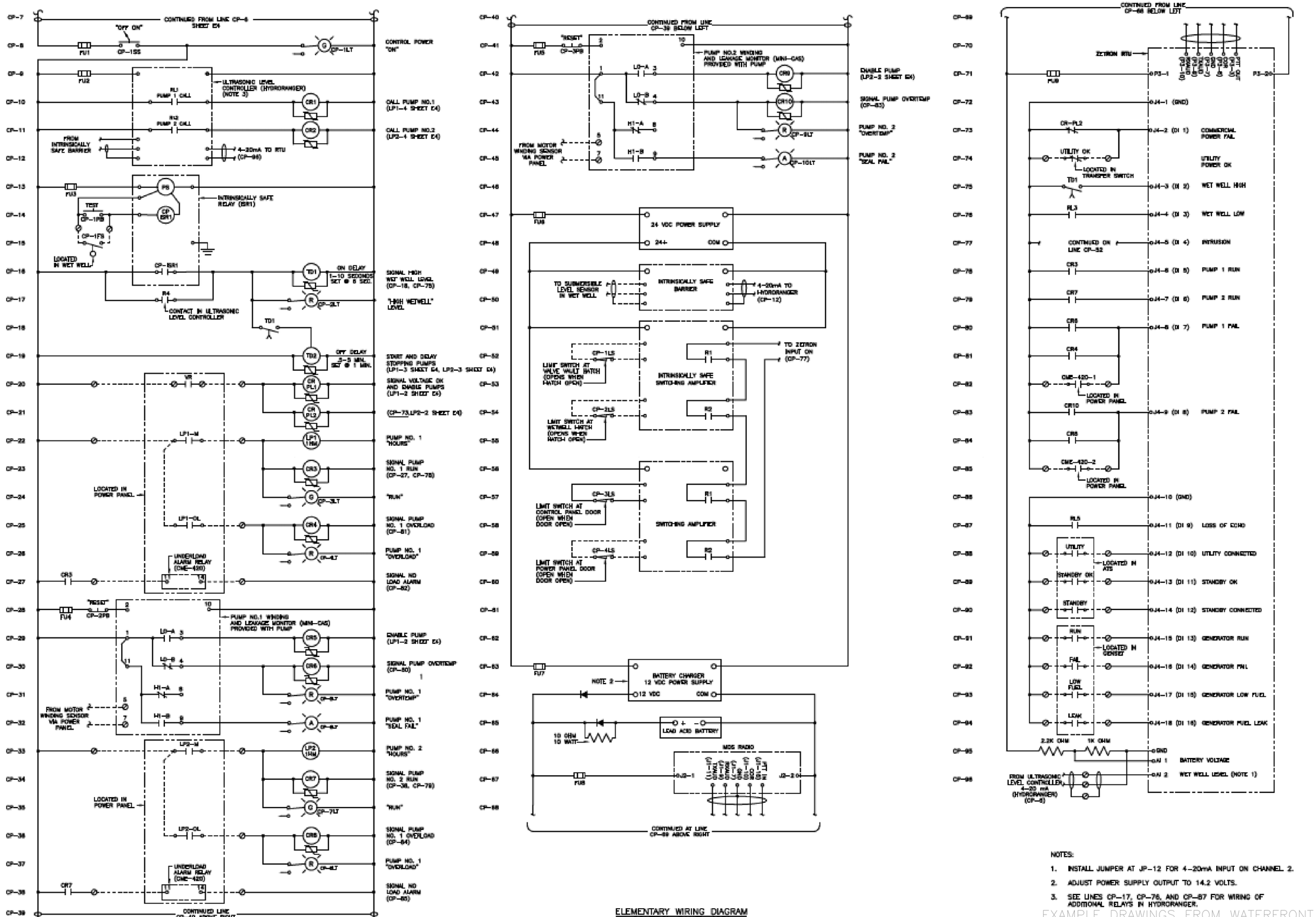
DESIGN BY:	
RECORD DWG:	

SHEET 6 OF 18



ELEMENTARY WIRING DIAGRAM
CONTROL PANEL (CP)

NOTES:

1. INSTALL JUMPER AT JP-12 FOR 4-20mA INPUT ON CHANNEL 2.
2. ADJUST POWER SUPPLY OUTPUT TO 14.2 VOLTS.
3. SEE LINES CP-17, CP-76, AND CP-87 FOR WIRING OF ADDITIONAL RELAYS IN HYDRORANGER.

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ELEMENTARY WIRING DIAGRAMS

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG: std drawings	
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 7 OF 18

DRAWING NAME	DESCRIPTION	DRAWING TYPE
P-00	CONTROL PANEL	PANEL LAYOUT DIAGRAM
P-01	CONTROL PANEL	NAMEPLATE LAYOUT
C-00	CONTROL PANEL	POWER DISTRIBUTION DIAGRAM
C-01	CONTROL PANEL AUXILIARY WIRING	CONTROL WIRING DIAGRAM
C-02	PUMP CONTROLLER WIRING	CONTROL WIRING DIAGRAM
C-03	CONTROL PANEL RTU WIRING	CONTROL WIRING DIAGRAM
P-10	POWER PANEL	PANEL LAYOUT DIAGRAM
C-10	POWER PANEL	POWER DISTRIBUTION DIAGRAM
P-20	PUMP DISCONNECT PANEL	PANEL LAYOUT DIAGRAM
C-20	PUMP DISCONNECT PANEL	CONTROL WIRING DIAGRAM

WIRING SPECIFICATIONS

(MAIN SUPPLY SOURCE)

VAC POWER	STRANDED COPPER, MTW, BLACK W/ PHASES COLORED
VAC CONTROL	STRANDED COPPER, MTW, RED
VAC NEUTRAL	STRANDED COPPER, MTW, WHITE
GROUND	STRANDED COPPER, MTW, GREEN
VDC CONTROL	STRANDED COPPER, MTW, BLUE
VDC COMMON	STRANDED COPPER, MTW, WHITE W/ BLUE STRIPE
VDC ANALOG	TWISTED SHIELDED PAIR, BLACK AND CLEAR

(EXTERNAL SUPPLY SOURCE, ENERGIZED WITH MAIN DISCONNECT OFF)

FOREIGN CONTROL	STRANDED COPPER, MTW, YELLOW
FOREIGN GROUNDED NEG.	STRANDED COPPER, MTW, WHITE W/ YELLOW STRIPE

WIRE SIZED AT MINIMUM PER UL508A, TABLES 28.1 AND 38.1
FIELD WIRING SHALL BE COPPER WIRE WITH MINIMUM 60 DEG. C INSULATION RATING UNDER 100 AMPS, 75 DEG. C INSULATION RATING 100 AMPS OR MORE
TORQUE SCREWS AT FIELD WIRING AND FUSED TERMINAL BLOCKS TO 7 LB. IN., TORQUE SCREWS AT CIRCUIT BREAKERS TO 21 LB. IN., OR TORQUE AS INDICATED ON LABEL NEAR TERMINALS.

CONTROL PANEL LABELS

THE FOLLOWING LABELS WILL BE PLACED WITHIN THE CONTROL PANEL IF LISTED IN THE CONTROL PANEL LAYOUT (P) DRAWING

1. QCC NAMEPLATE (FRONT DOOR)
2. MAIN POWER NAMEPLATE (INTERIOR)
3. FIELD WIRING SPECIFICATION (INTERIOR)
4. NON-UL COMPONENT (NEAR NON-UL ITEM)
5. MULTIPLE POWER SOURCES (FRONT DOOR)
6. INSTANTANEOUS TRIP CIRCUIT BREAKER (2 LABELS NEAR DEVICE)
7. HIGH FAULT SCCR BRANCH CIRCUIT TRIP (NEAR CB)
8. INTRINSICALLY SAFE FIELD WIRING (NEAR I.S. FIELD TERMINALS)
9. INTERFACE TO HAZARDOUS LOCATIONS (2 LABELS ON FRONT DOOR)
10. 208, 240, OR 480 VAC LABEL (FRONT DOOR)
11. UPS POWER (FRONT DOOR)
12. NON-UL LOW VOLTAGE COMPONENT, EXTERNALLY POWERED (NEAR FUSE)

LEGEND

- (00) BILL OF MATERIALS ITEM NO.
- – — — – WIRING BY OTHERS
- ▲ EQUIPMENT BY OTHERS
- (1) MAIN DISCONNECT AND BRANCH CIRCUIT PROTECTION PROVIDED IN THE FIELD BY OTHERS
- (2) INSTALL IN ACCORDANCE WITH ARTICLE 504 OF THE N.E.C. CABLE LENGTH SHALL NOT EXCEED 1,000 FT.

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DRAWING LIST

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG: std drawings
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DATE: 08-12-2022
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DESIGN BY:
RECORD DWG:

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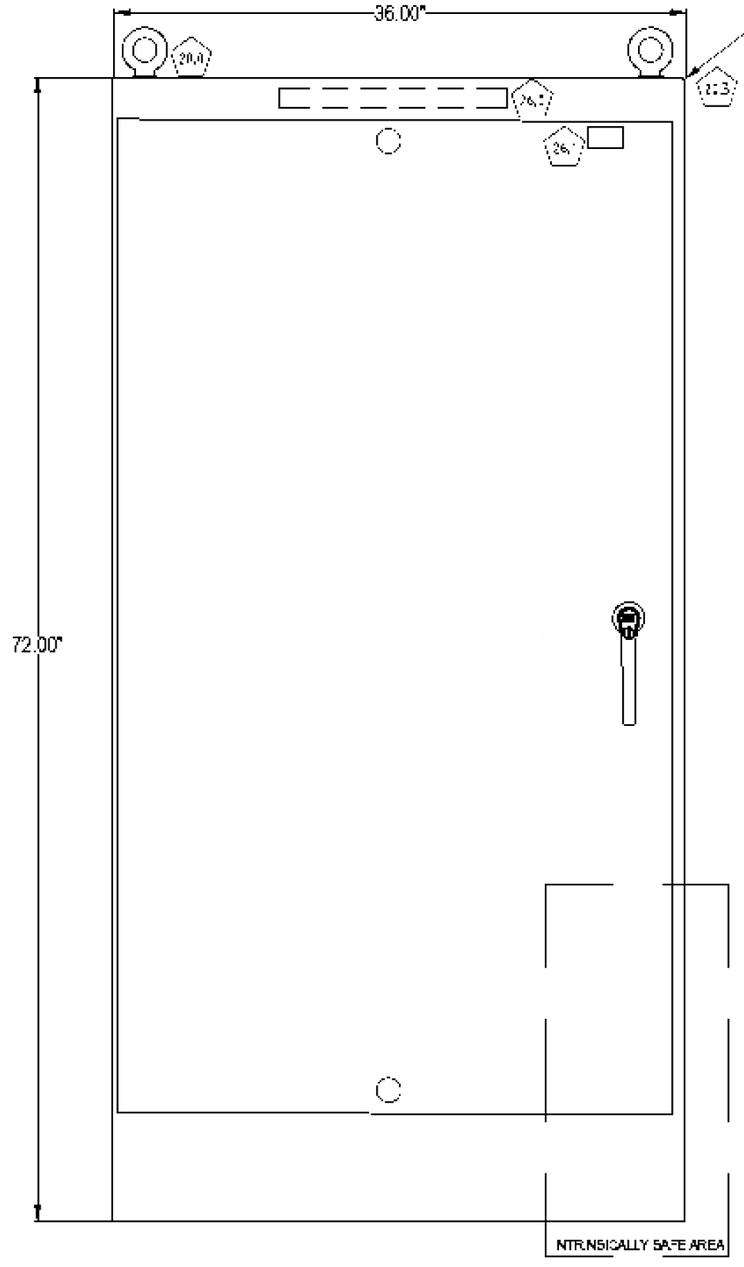
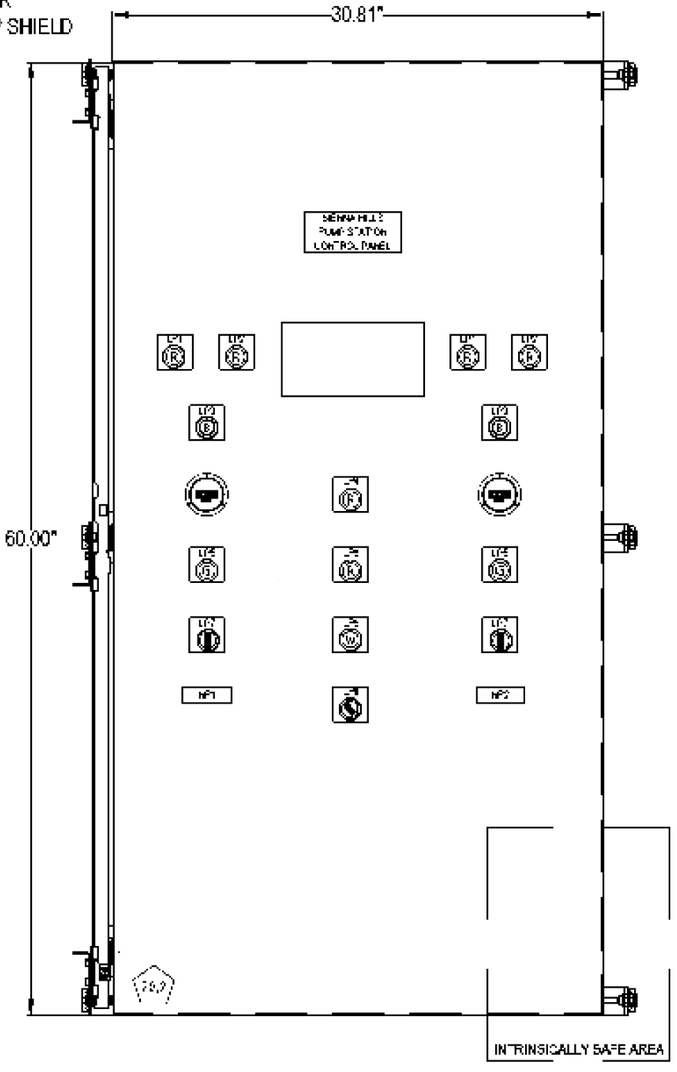
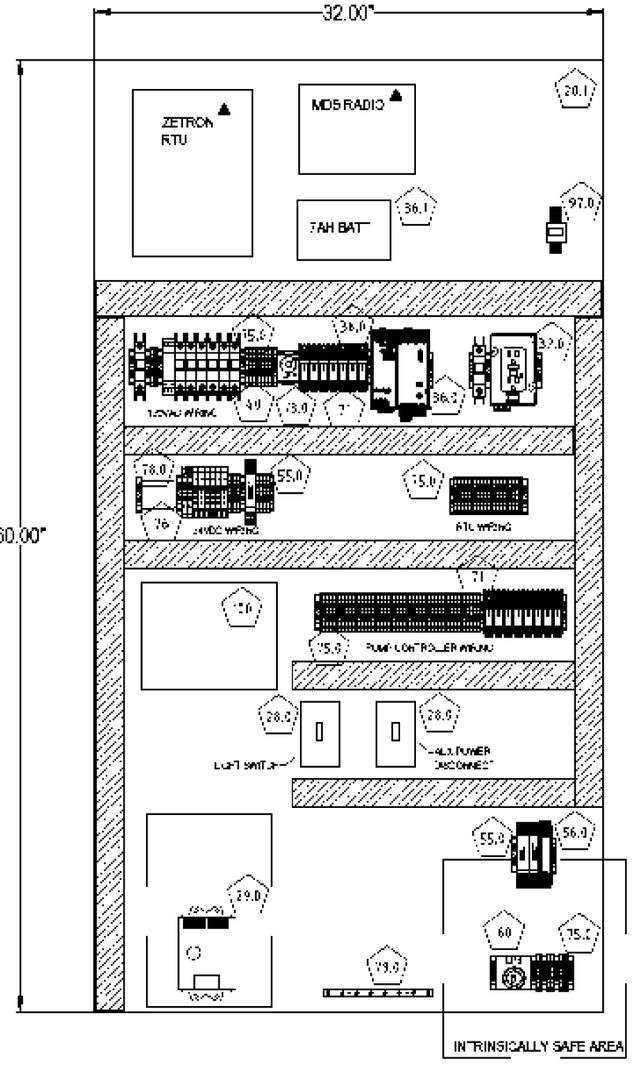




INTERIOR SWING PANEL LAYOUT



BACK PANEL LAYOUT

LABELS: ① ② ③ ⑤ ⑧ ⑨

ENVIRONMENTAL TYPE 3R, USE TYPE 3R CONDUIT HUBS & FITTINGS TO MAINTAIN RATING.

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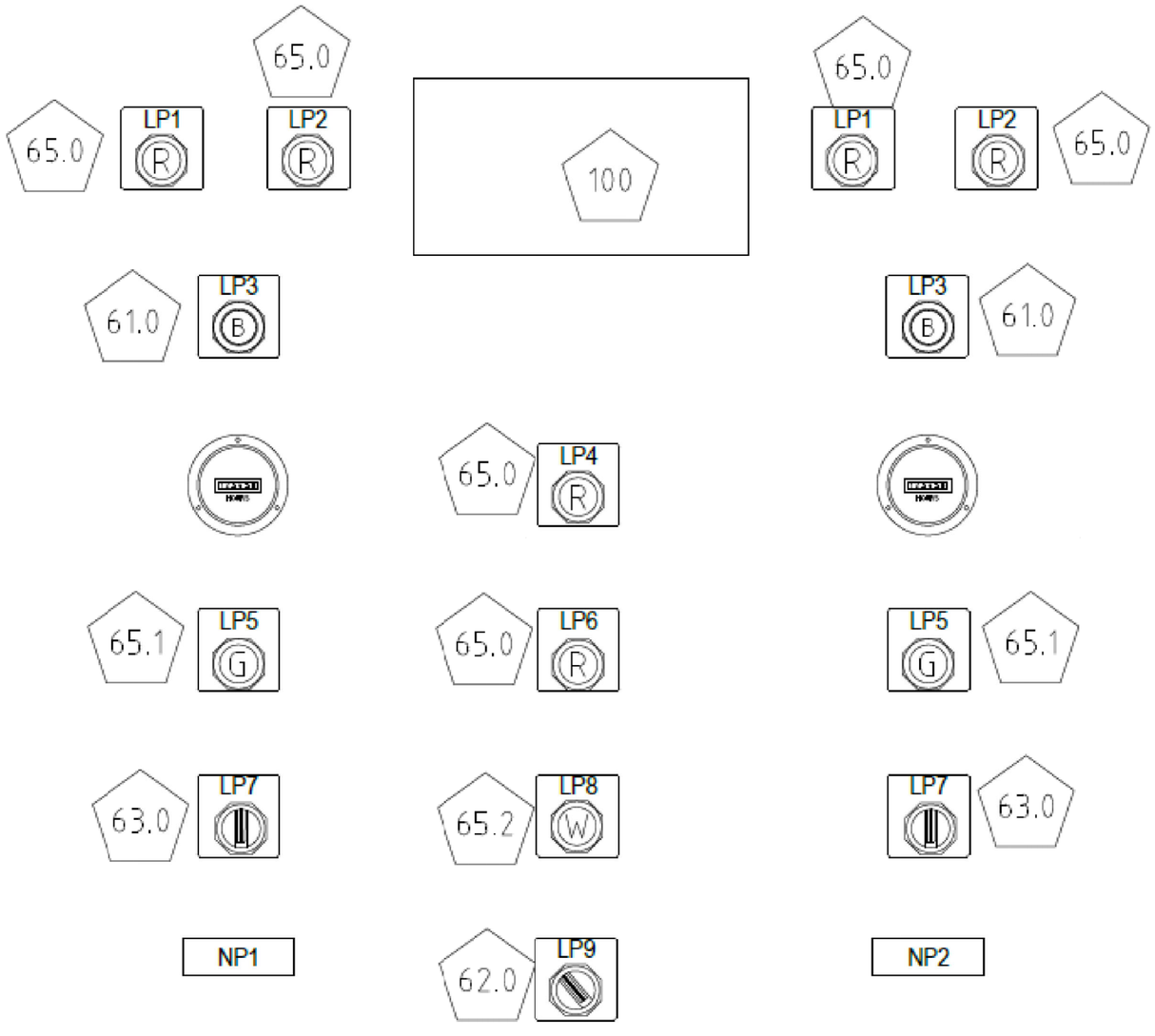
CONTROL PANEL LAYOUT DIAGRAM

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:	
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 9 OF 18



NP	DESCRIPTION
1	PUMP 1
2	PUMP 2

LP	DESCRIPTION
1	PUMP FAIL
2	OVERLOAD
3	RESET
4	AUX HIGH WETWELL
5	RUNNING
6	HIGH WETWELL
7	HAND / OFF / AUTO
8	CONTROL POWER ON
9	CONTROL POWER ON / OFF

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LIFT STATION STANDARDS
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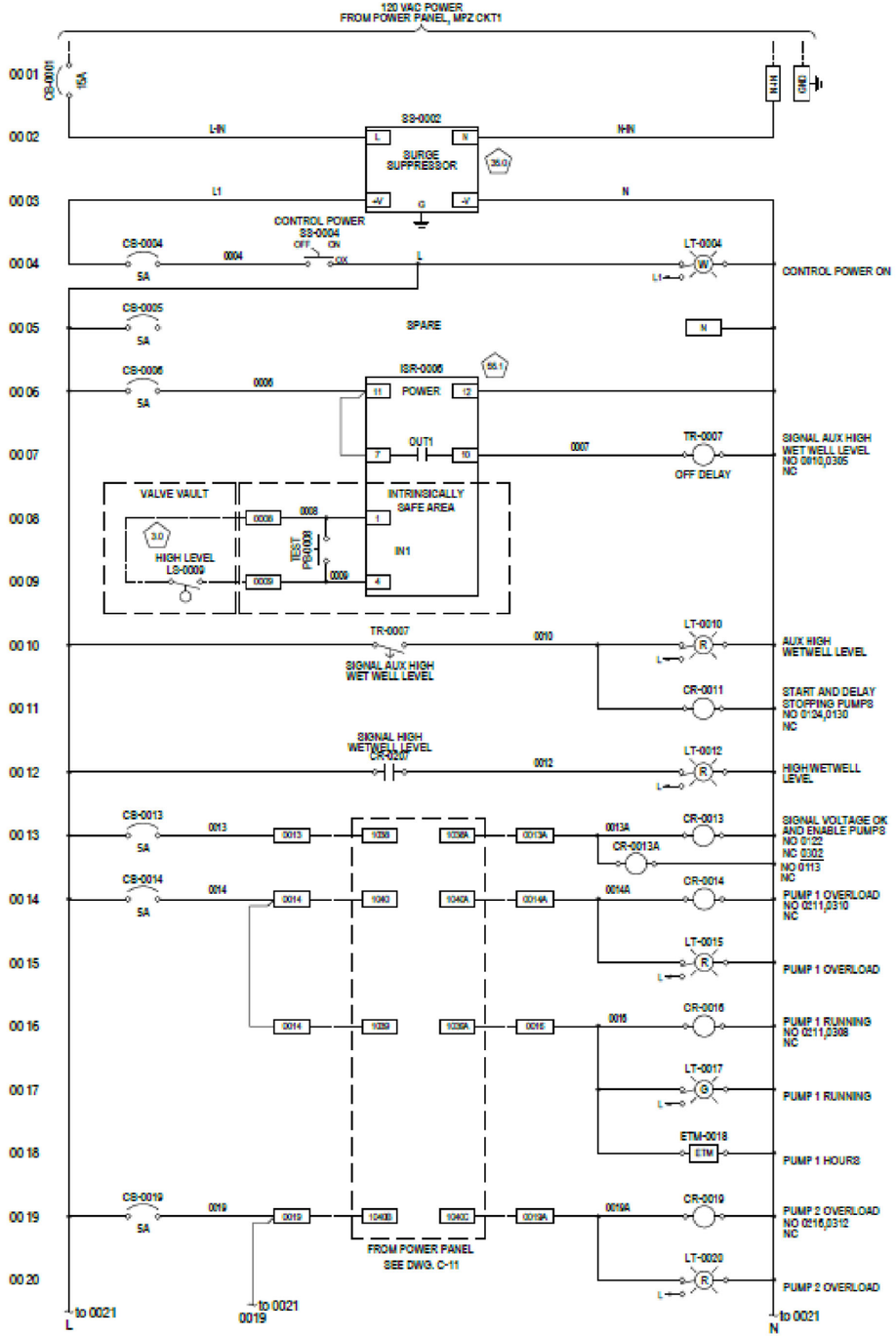
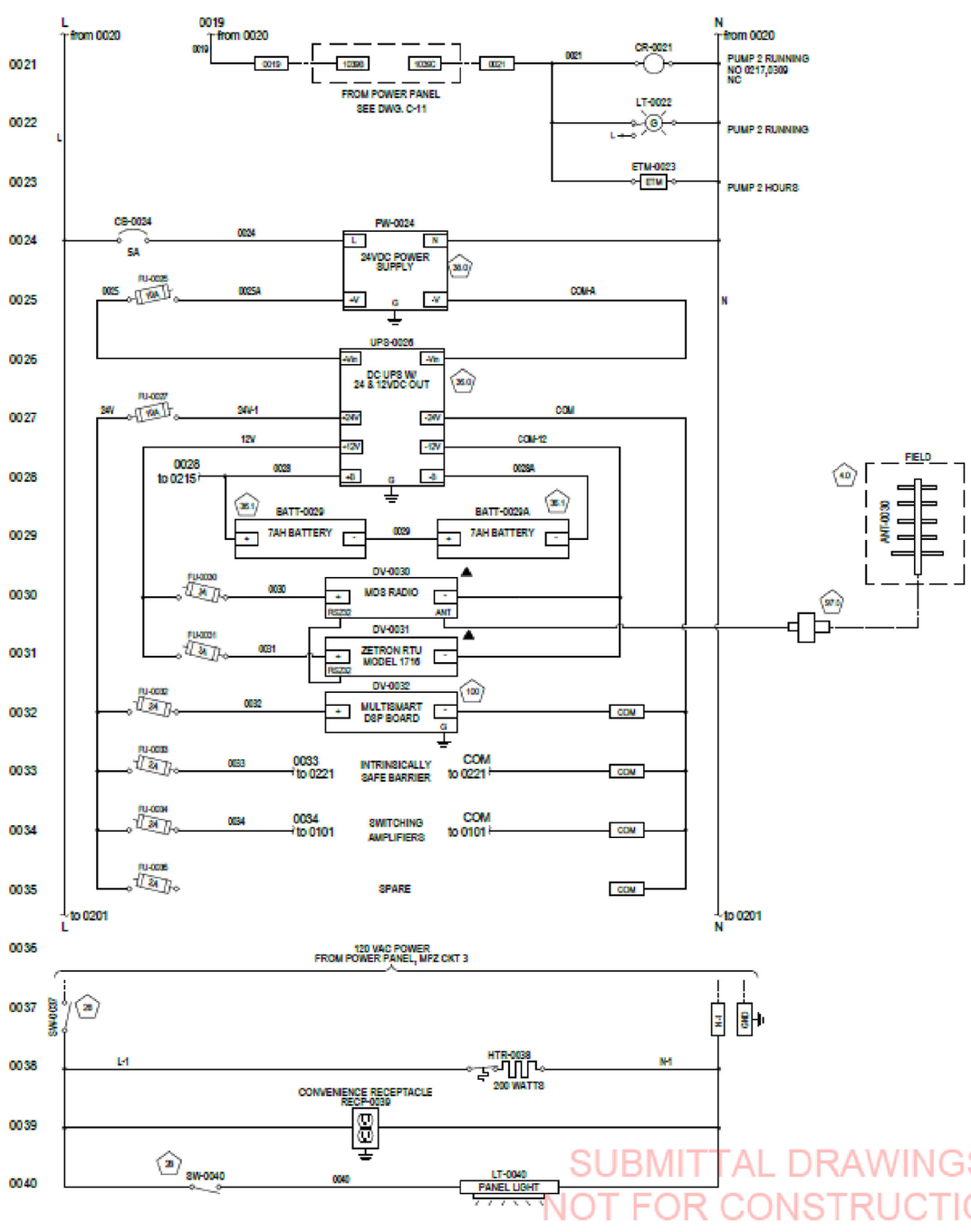
CONTROL PANEL NAMEPLATE LAYOUT

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:
CONTRACT NO:
DATE: 08-12-2022
DRAWN BY: MTL
DESIGN BY:
RECORD DWG:

SHEET 10 OF 18





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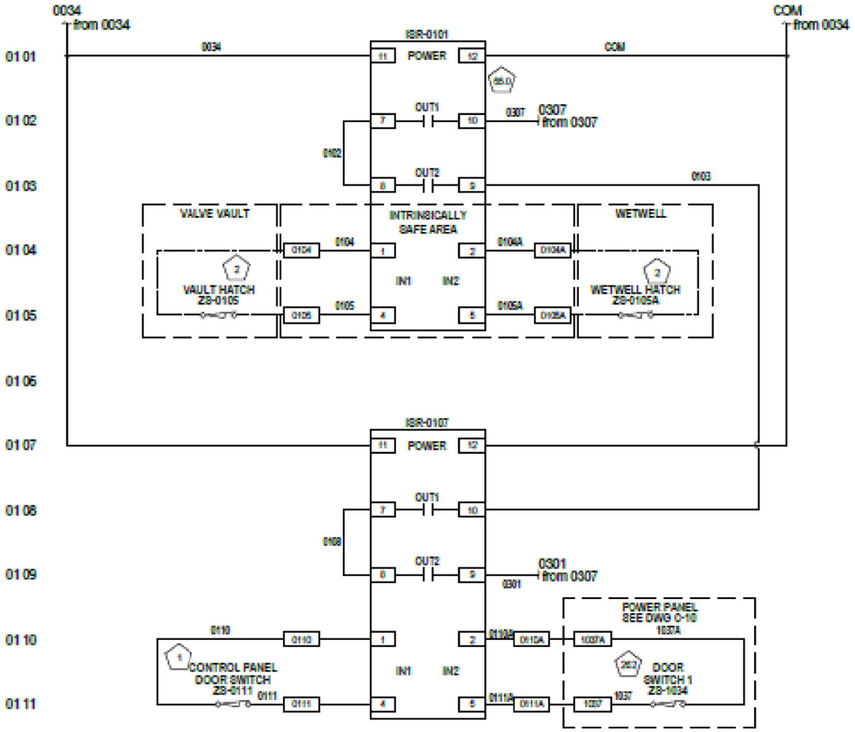
LIFT STATION STANDARDS
CITY OF RICHLAND

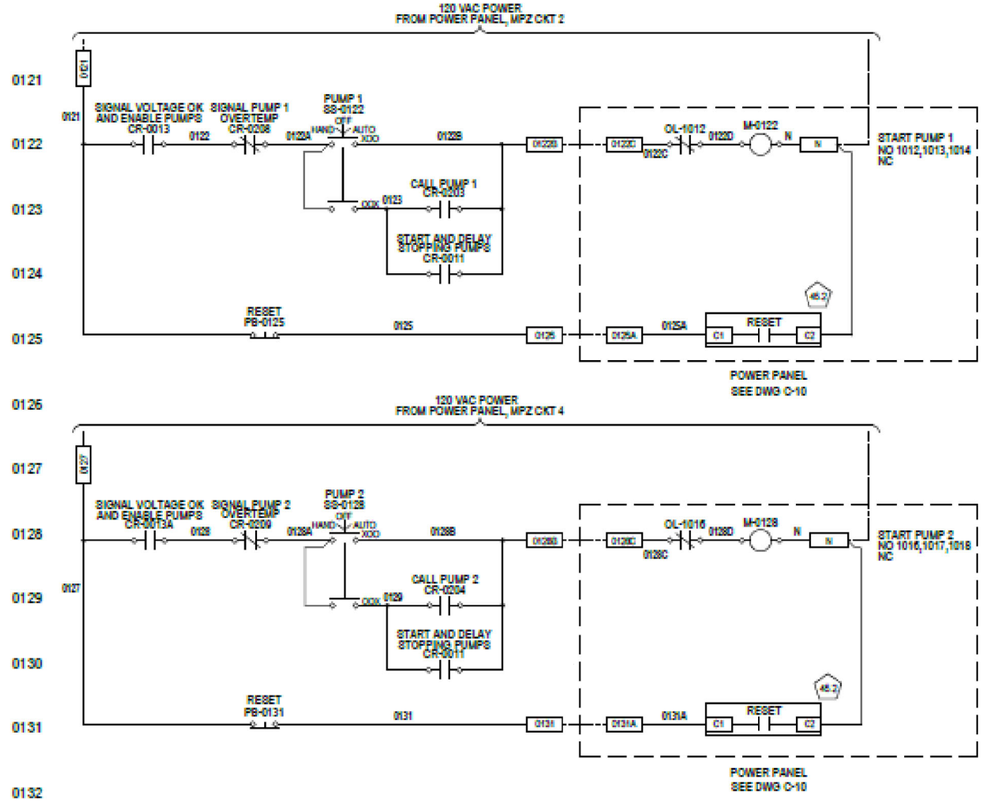
CONTROL PANEL POWER DISTRIBUTION DIAGRAM

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:	not drawings
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 11 OF 18





SUBMITTAL DRAWINGS
NOT FOR CONSTRUCTION

EXAMPLE DRAWINGS FROM SIENNA HILLS LIFT STATION. NOT FOR CONSTRUCTION

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LIFT STATION STANDARDS
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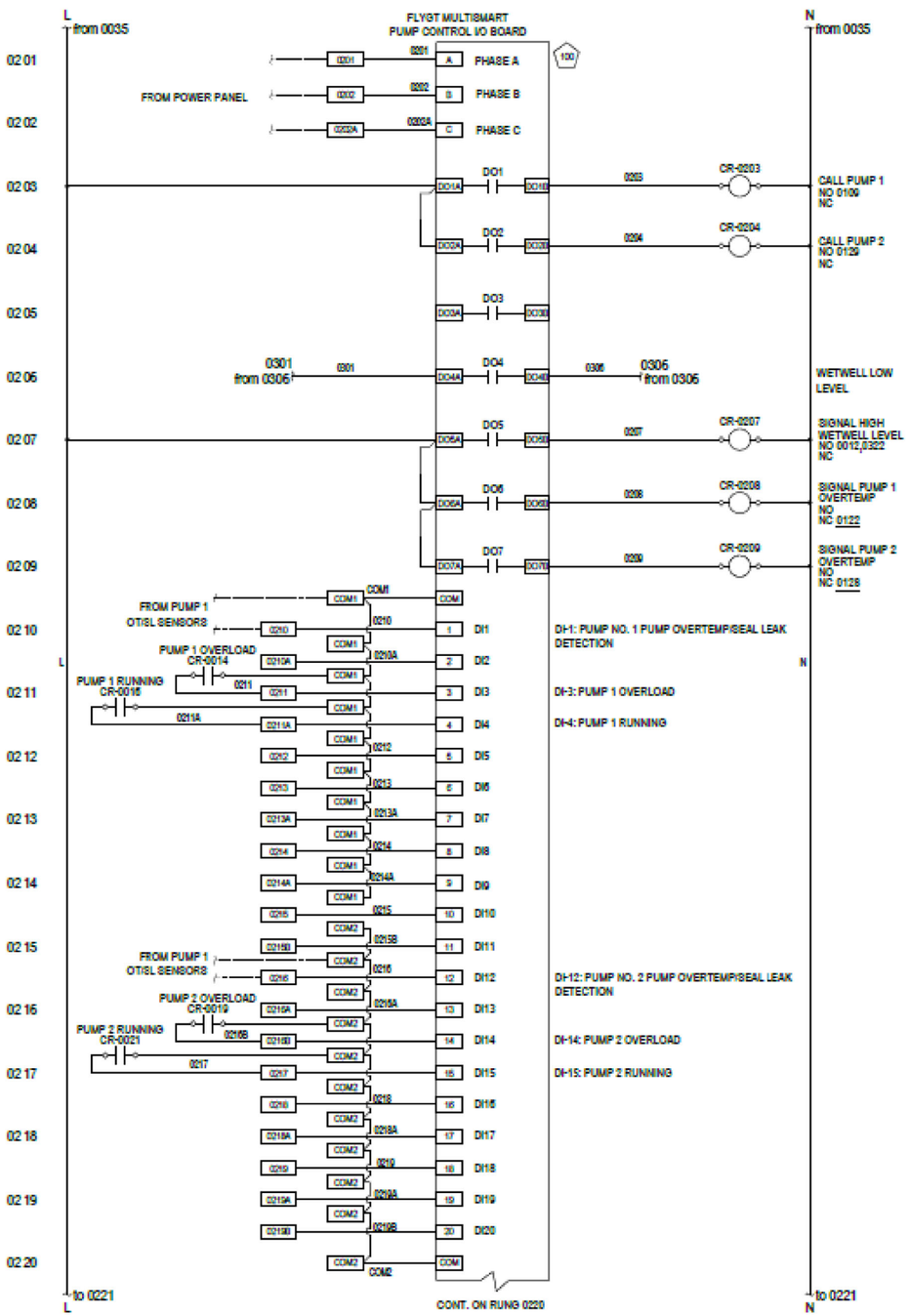
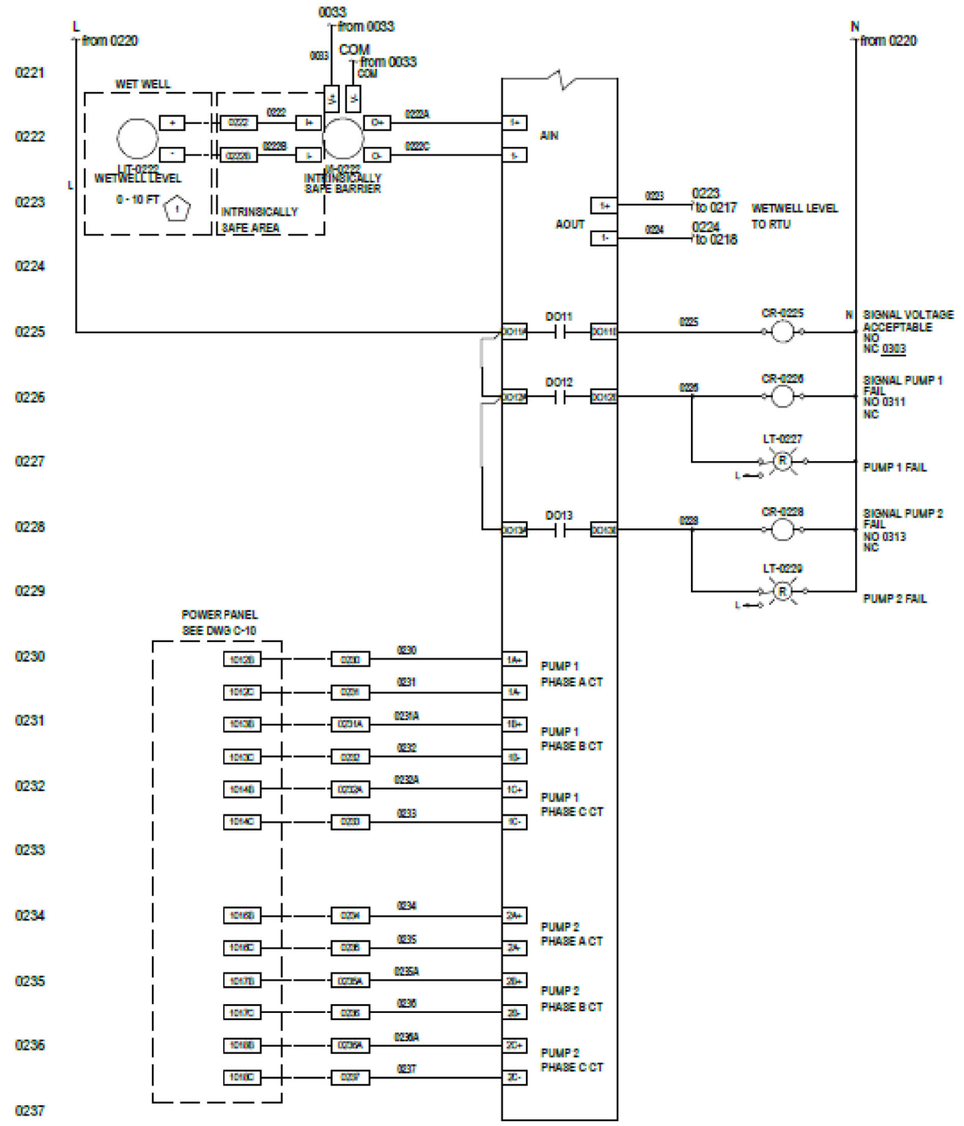
CONTROL PANEL AUXILIARY WIRING

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG: std drawings	
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 12 OF 18





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NO.	DESCRIPTION	BY	APP.	DATE
	REVISION			

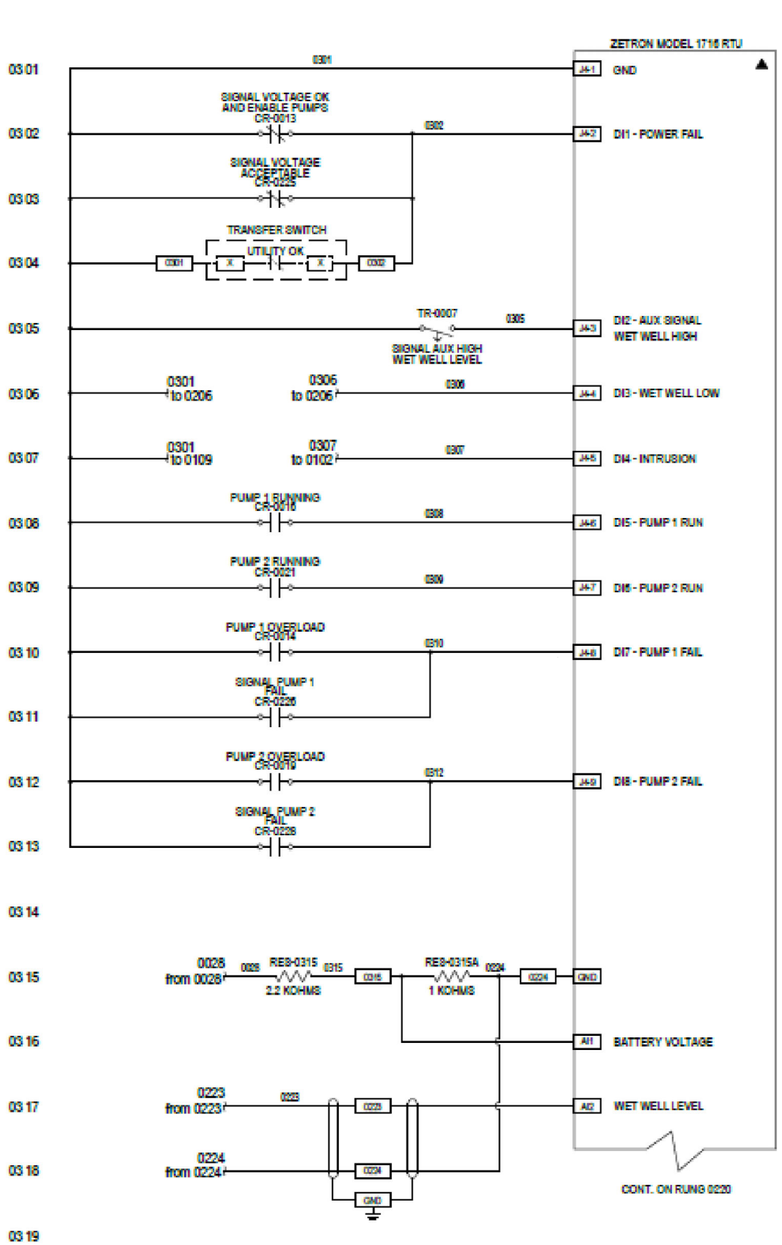
LIFT STATION STANDARDS
CITY OF RICHLAND

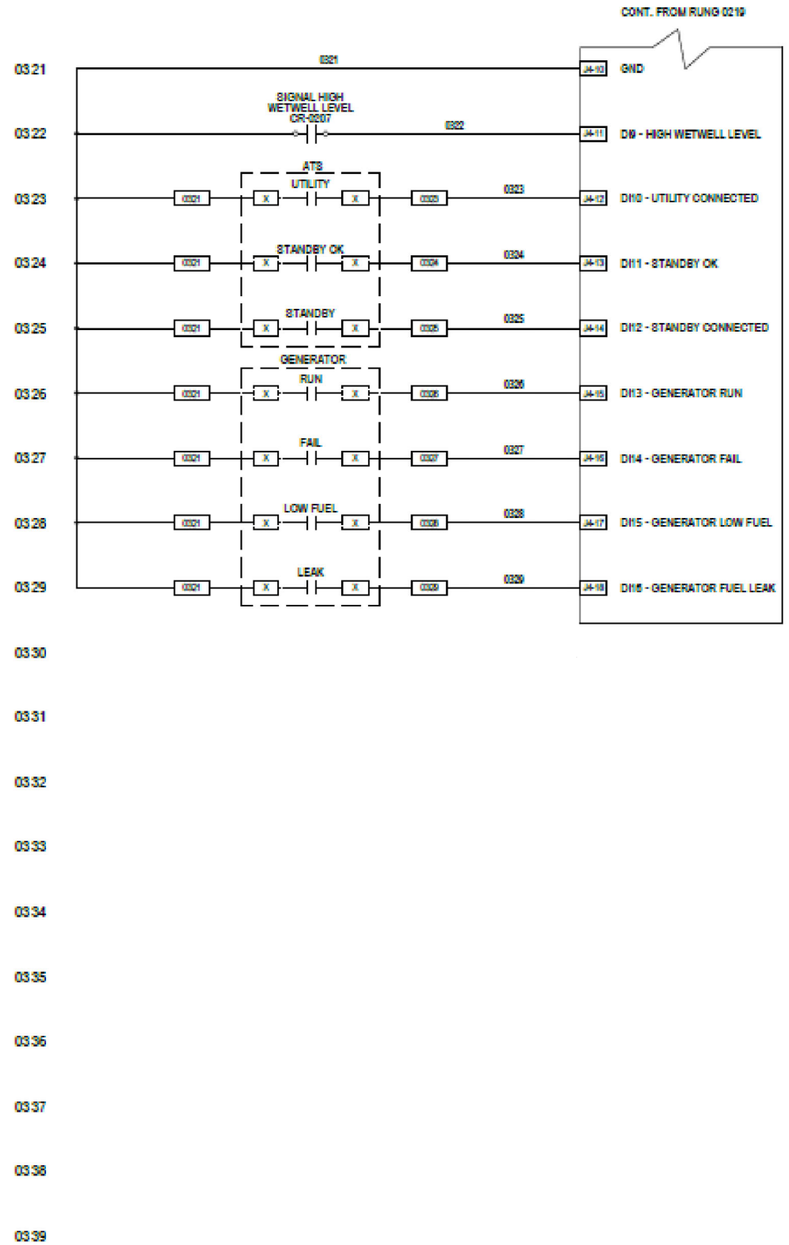
PUMP CONTROLLER WIRING

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG: std drawings
CONTRACT NO:
DATE: 08-12-2022
DRAWN BY: MTL
DESIGN BY:
RECORD DWG:

SHEET 13 OF 18





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PUBLIC WORKS DEPARTMENT
REVISION

NO.	DESCRIPTION	BY	APP.	DATE

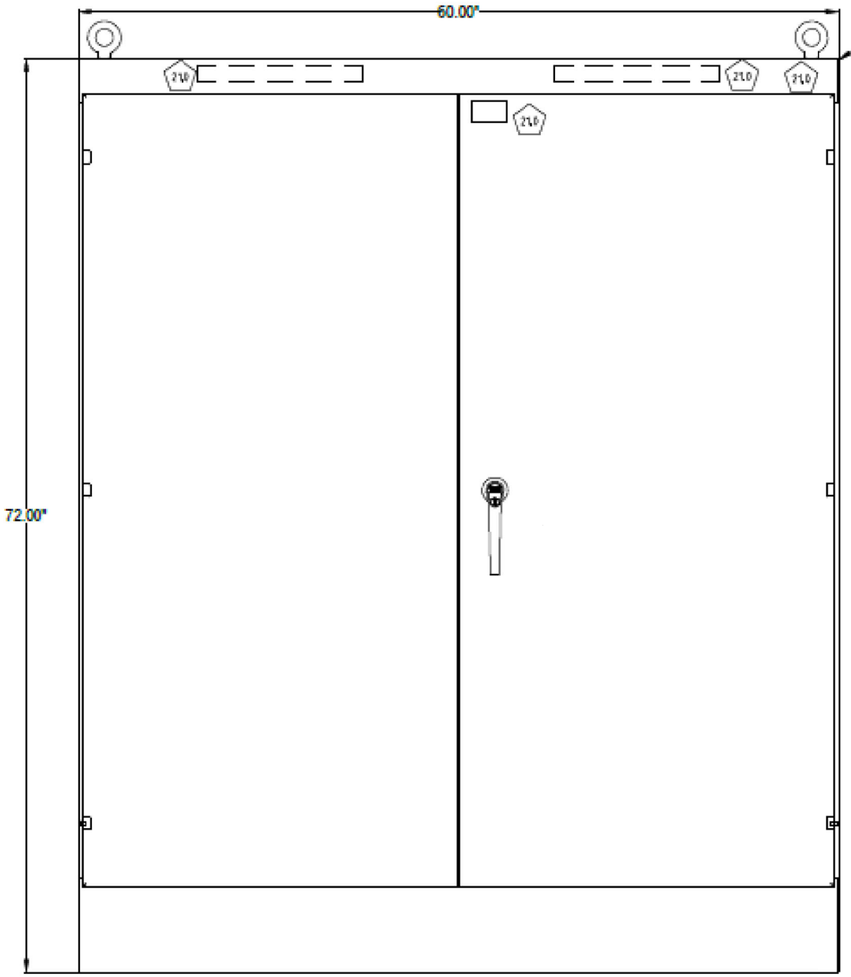
LIFT STATION STANDARDS
CITY OF RICHLAND

CONTROL PANEL RTU WIRING

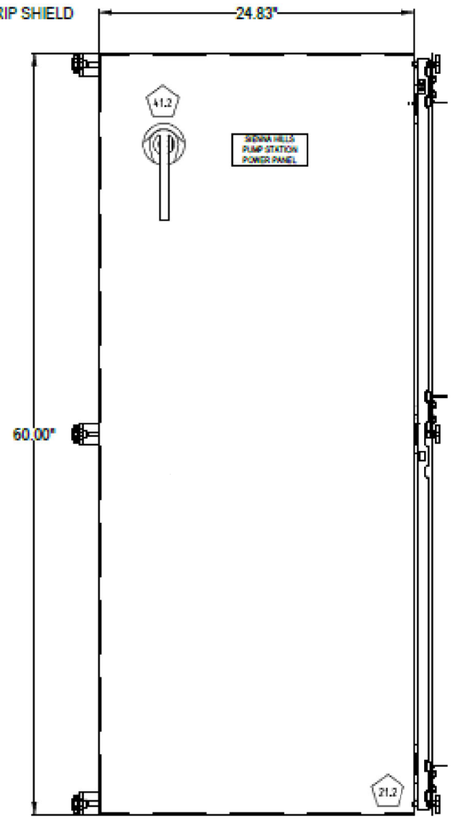
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:	
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

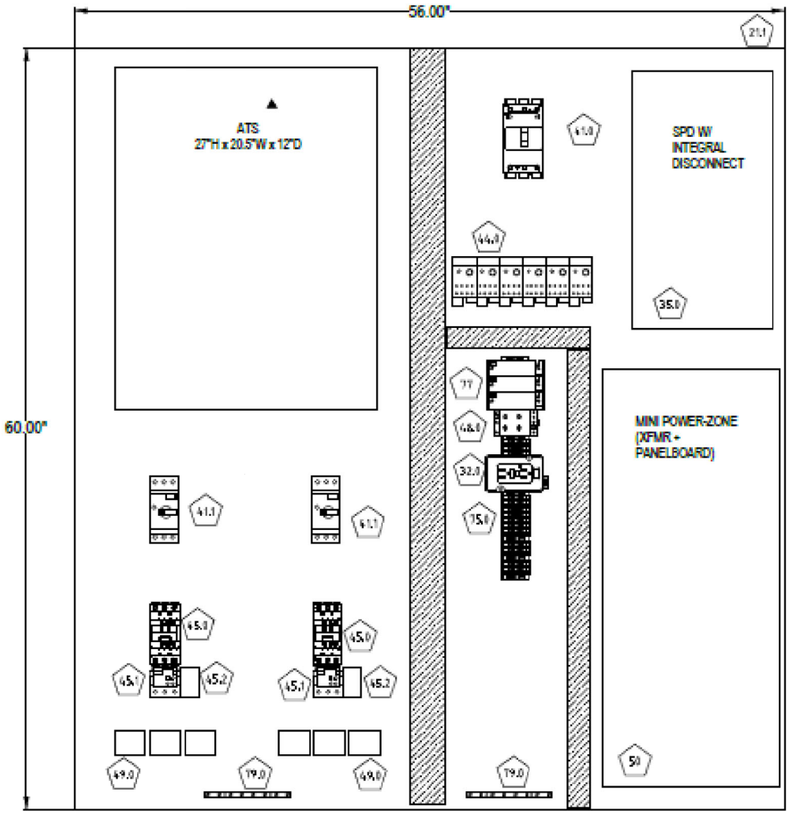
SHEET 14 OF 18



EXTERIOR PANEL



RIGHT SIDE SWING PANEL



BACK PANEL

LABELS: ① ② ③ ⑤ ⑦ ⑩

ENVIRONMENTAL TYPE 3R, USE TYPE 3R CONDUIT HUBS & FITTINGS TO MAINTAIN RATING.

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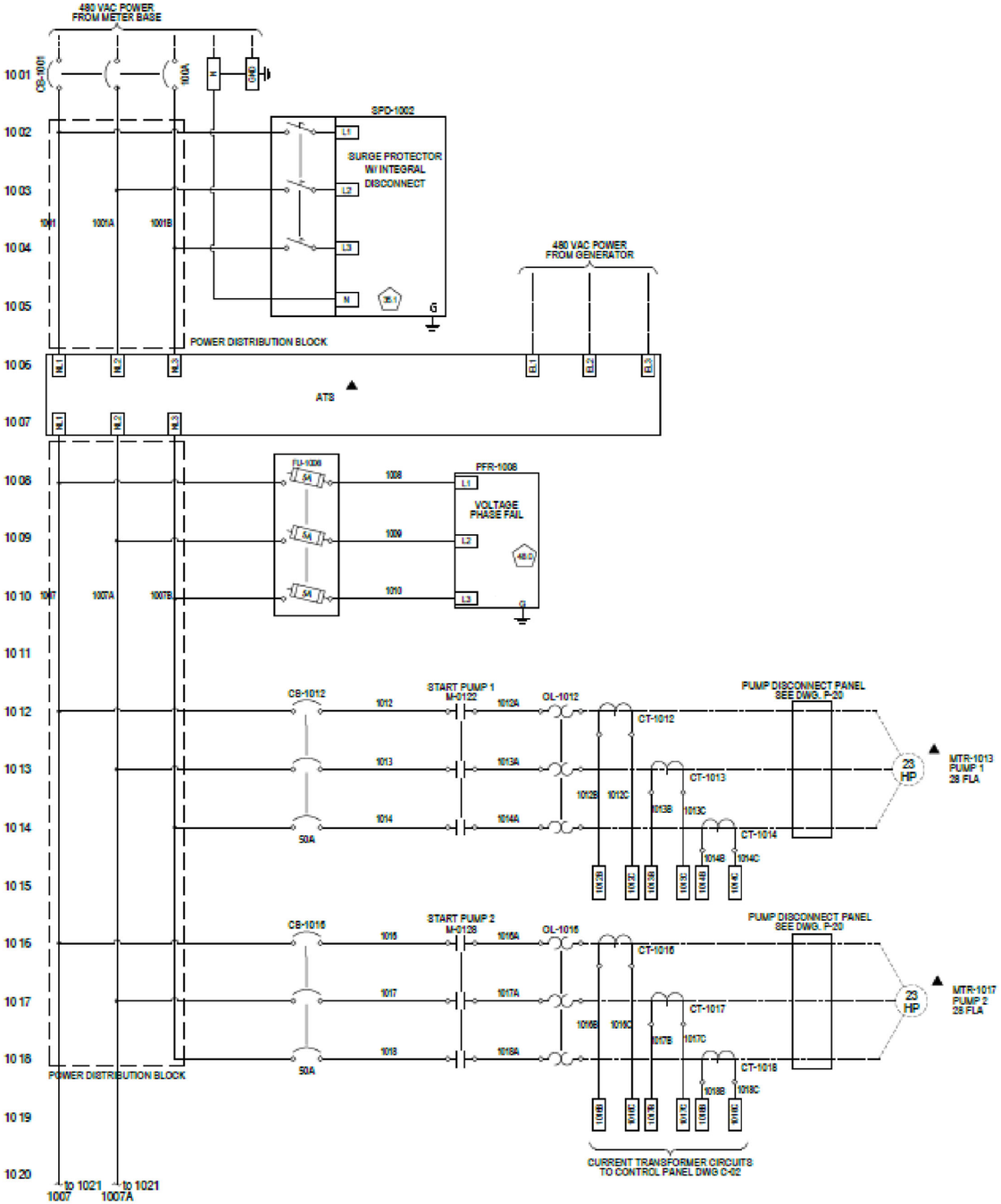
LIFT STATION STANDARDS
CITY OF RICHLAND

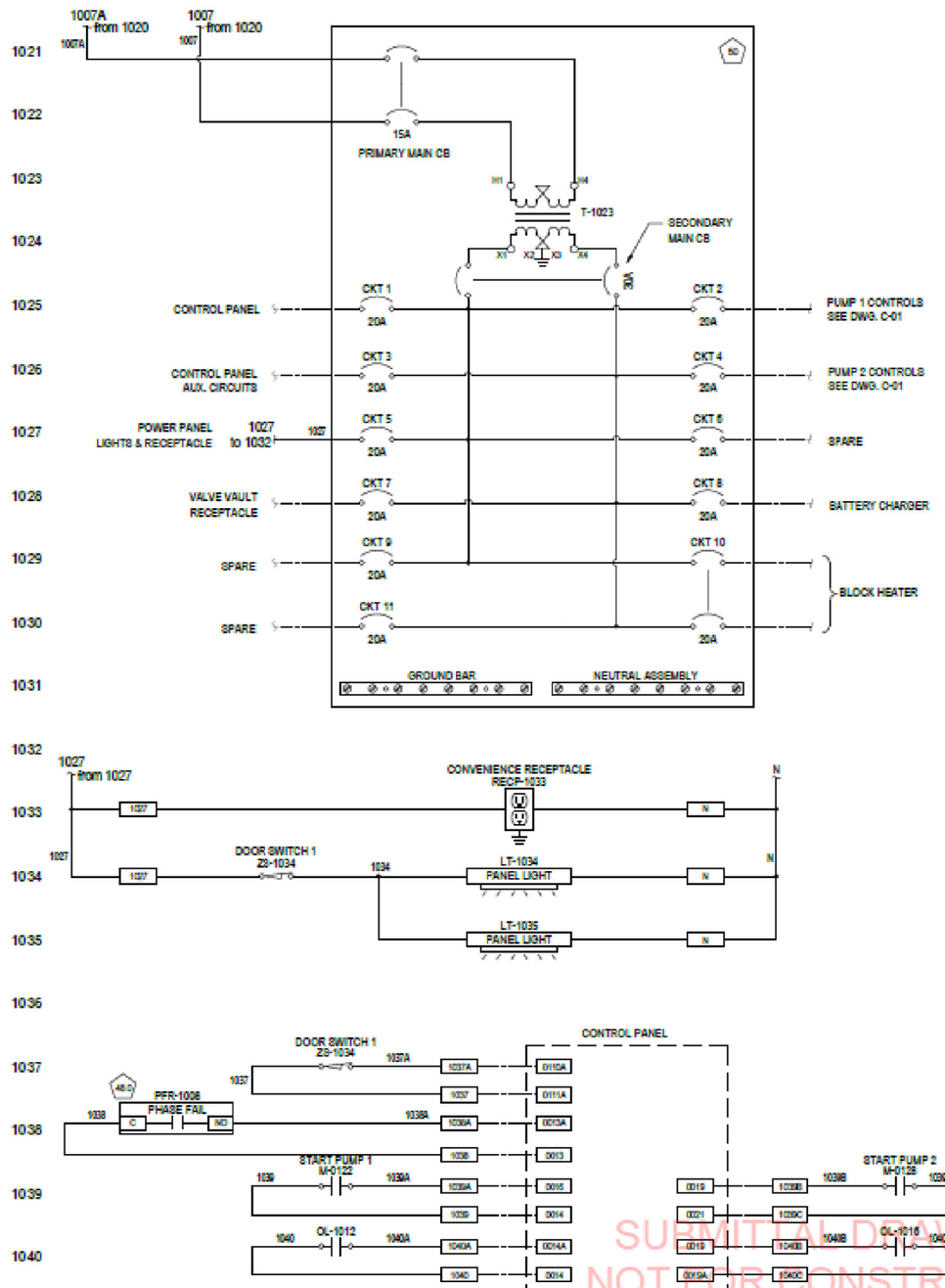
POWER PANEL LAYOUT DIAGRAM

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:	not drawings
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 15 OF 18





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NO.	DESCRIPTION	BY	APR.	DATE
	REVISION			

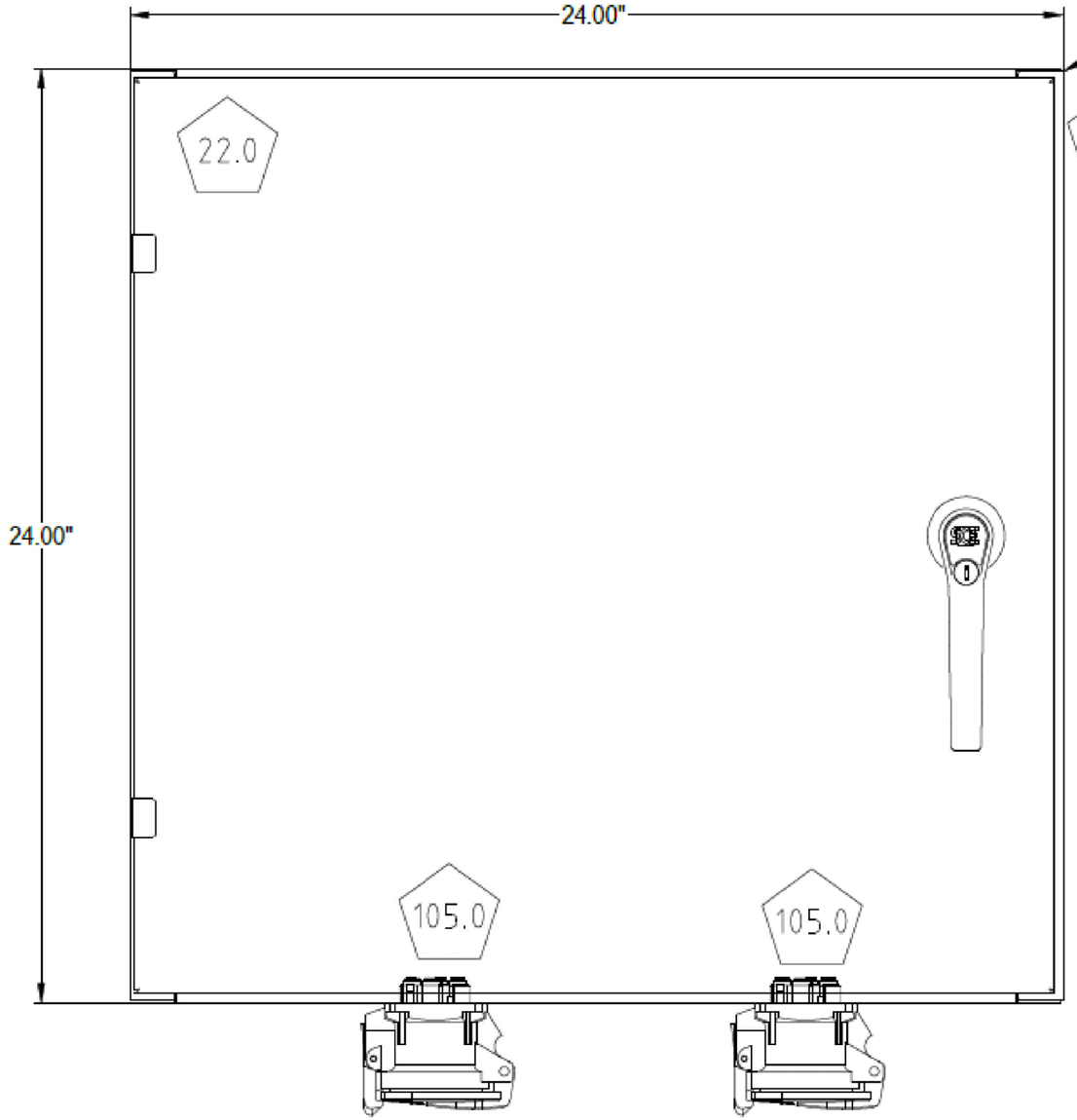
LIFT STATION STANDARDS
CITY OF RICHLAND

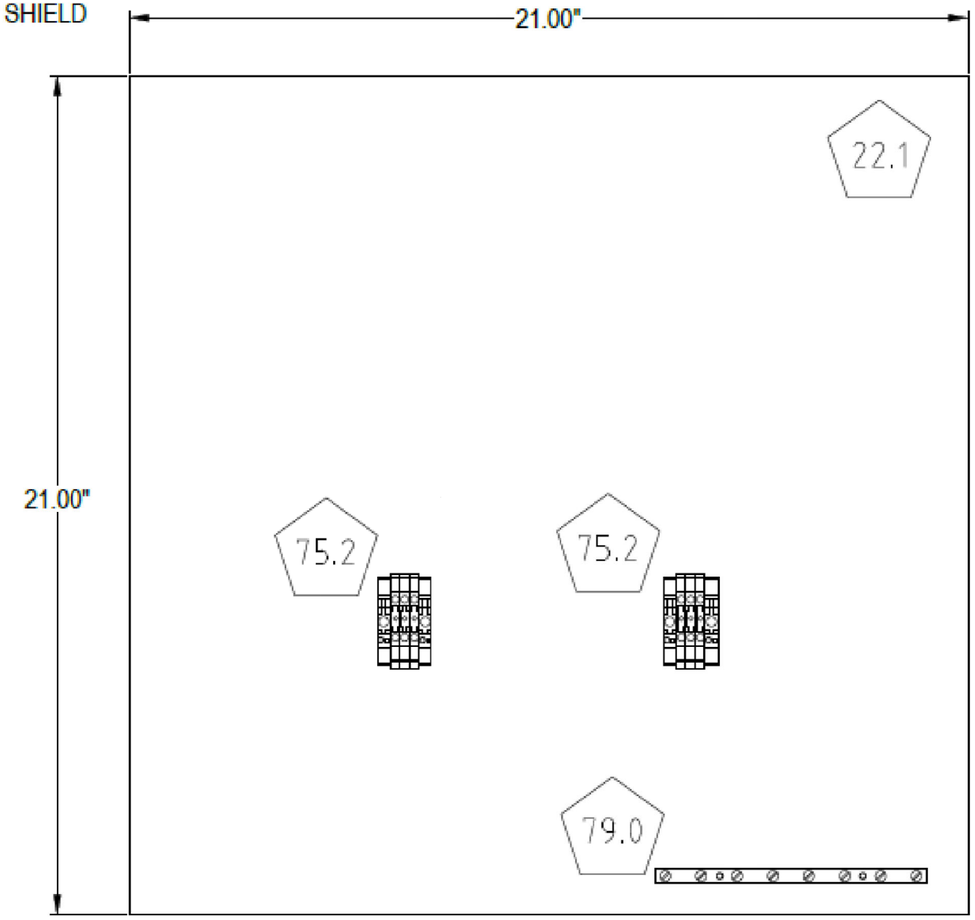
POWER PANEL DISTRIBUTION DIAGRAM

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:	std drawings
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 16 OF 18





LABELS: ① ② ③ ⑩

ENVIRONMENTAL TYPE 3R, USE TYPE 3R CONDUIT HUBS & FITTINGS TO MAINTAIN RATING.

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REVISION

NO.	DESCRIPTION	BY	APP.	DATE

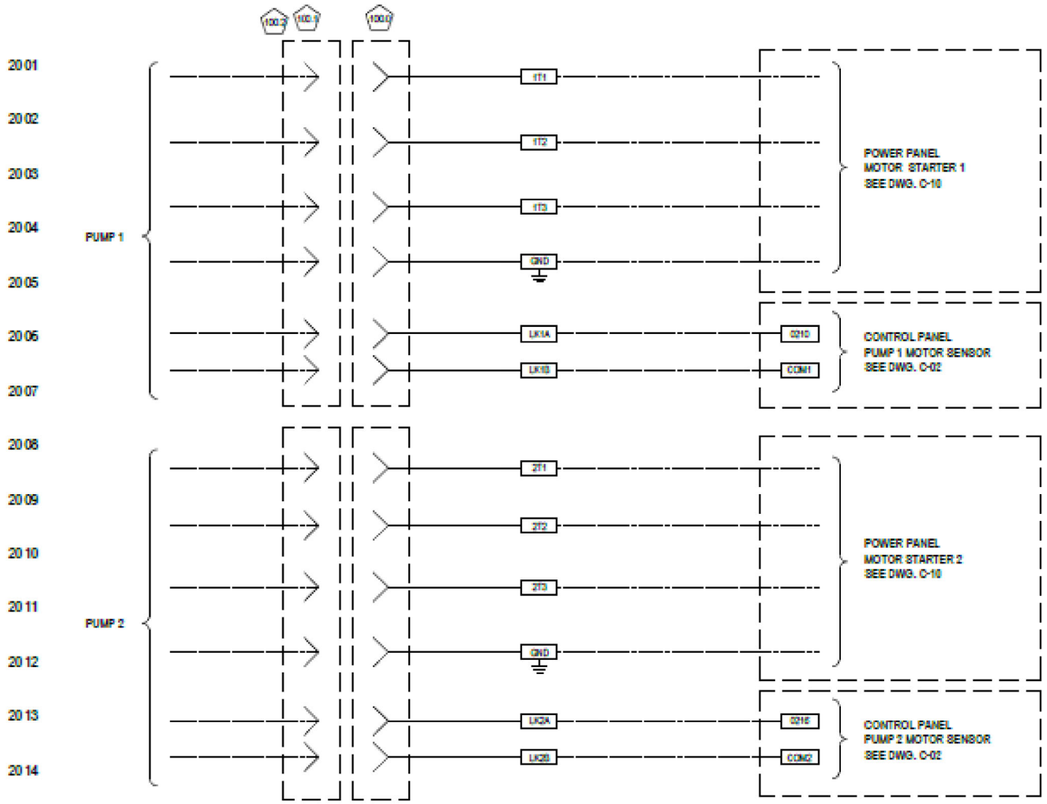
LIFT STATION STANDARDS
CITY OF RICHLAND

PUMP DISCONNECT PANEL LAYOUT DIAGRAM

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG:	not drawings
CONTRACT NO:	
DATE:	08-12-2022
DRAWN BY:	MTL
DESIGN BY:	
RECORD DWG:	

SHEET 17 OF 18



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REVISION

NO.	DESCRIPTION	BY	APR.	DATE

LIFT STATION STANDARDS
CITY OF RICHLAND

PUMP DISCONNECT CONTROL WIRING DIAGRAM

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

CAD DWG: std drawings
CONTRACT NO:
DATE: 08-12-2022
DRAWN BY: MTL
DESIGN BY:
RECORD DWG:

SHEET 18 OF 18