WASTEWATER LIFT STATION

DESIGN STANDARDS

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SECTION I GENERAL

A. Introduction

This lift station design manual outlines the design requirements for public and private sanitary wastewater lift stations. Upgrades or modifications to existing wastewater lift stations must meet these standards to the extent practical. These standards are not applicable to a single residential structure with four or fewer independent residences or commercial/industrial buildings with projected wastewater flow less than or equal to 4 equivalent dwelling units.

The wastewater lift station design standards include design criteria and Standard Drawings. The design standards generally apply to wastewater lift stations pumping up to 5.0 million gallons per day (MGD). Design of wastewater lift stations with greater than 5.0 MGD capacity will be considered on case-by-case basis, with special requirements as determined by the City of Reno.

These standards are intended to guide the engineer in the design of wastewater lift stations. The City of Reno reserves the right to modify or waive any design standard for a particular application. Any deviations from these design standards will require justification to and the approval of the City of Reno prior to construction.

When a development project requires a wastewater lift station, a pre-design conference must be held with the design engineer and the City of Reno to determine the design parameters, including tributary area and design period. The pre-design conference is described in detail in Section III.

In order to improve communication between the City and the design engineer during the design and construction of wastewater lift stations, “City of Reno” and “City” as used in this document means the City of Reno Development Services Department. Unless otherwise directed, all correspondence and requests for information must be made through this office. The Development Services Department shall route submittals and requests for information to the Public Works Director, Utility Services Director, Sewer Maintenance Supervisor or others as appropriate.

B. List of Abbreviations

CC&Rs	Covenants, Codes and Restrictions
CFR	Code of Federal Regulations
DIPRA	Ductile Iron Pipe Research Assn.
gpm	Gallons per Minute
HDPE	High Density Polyethylene
HI	Hydraulic Institute

IEEE	Institute of Electrical and Electronics Engineers
LPI	Lightning Protection Institute
MGD	Million Gallons per Day
NEC	National Electric Code
NPSHA	Net Positive Suction Head Available
NPSHR, NPSH3	Net Positive Suction Head Required at 3% Flow Reduction
NPT	National Pipe Thread
OSHA	Occupational Safety and Health Administration
PVC	Polyvinyl Chloride
RF	Radio Frequency
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
WEF	Water Environment Federation
WTS	Water Technical Sheets

C. Applicable Regulations and References

Wastewater lift stations must satisfy the regulations of agencies having jurisdiction.

Wastewater lift stations, at a minimum, must conform to this document and the Guidance Document WTS 14 for Wastewater Lift Station Design as prepared by the Nevada Division of Environmental Protection. Other regulations governing facilities and construction shall be adhered to, including regulations published by the Occupational Safety and Health Administration, the National Fire Protection Association (NFPA), National Electric Code (NEC), and others as applicable. Reference documents for guidance include the Design of Wastewater and Storm Water Pumping Station, Manual of Practice FD-4 as published by WEF, PVC Pipe Design manual published by Uni-Bell, Ductile Iron Pipe Design manual published by DIPRA, Hydraulic Institute Standards and the Recommended Standards for Wastewater Facilities, latest edition.

SECTION II DESIGN CRITERIA

A. Flow

Wastewater lift stations must be designed to accommodate the projected peak hour flow rate. The design flow rate for the wastewater lift stations shall consider current and projected peak flow rates and wastewater composition. Peak design flow rates

shall be per the City of Reno Public Works Design Manual Sanitary Sewers latest edition.

1. Planning Period/Growth Rate

   Wastewater lift stations must, at minimum, be designed to accommodate a 30-year planning period for the major components including the wet well, pump station layout (must be appropriately sized for pumps and piping necessary for the 30 year planning period), and force main.

2. Existing and Projected Flow rates

   Wastewater lift stations must be designed to pump the flow for existing and future developments. In developed areas, population shall be determined by house count and non-domestic user inventory with allowances made for remaining undeveloped tributary areas. Flow monitoring can be used as existing flow value in lieu of house count with City approval. In undeveloped areas population densities and per capita flows must be as established in agreement with the City of Reno Development Services Department. The drainage basin shall be the hydrographic basin for the area and may include areas outside the City limits. Flow contributions outside the City limits shall be determined by using the appropriate governing authority's population densities in combination with the City of Reno's occupancy rates and wastewater flow rates as specified in Sanitary Sewers latest edition.

3. Composition

   Wastewater composition can vary widely depending upon the proportion of design flow generated by non-domestic users. Non-domestic user wastewater composition shall be investigated. Adequate consideration and necessary provisions shall be taken to ensure that wastewater lift station equipment and materials are suitable for the anticipated composition of wastewater.

B. Downstream Impacts

1. Sanitary Sewers

   Contributing pumped flows from the proposed lift station must be included in the required sewerage analysis as defined in the Sanitary Sewers design manual. The contributing design flows must include an investigation of the projected flow rates throughout the planning period and with the growth rates projected.

2. Trunk or Interceptor Reduction

Trunk or interceptor peak reduction factors as specified in Sanitary Sewers design manual are not allowed when determining flow rates downstream from a wastewater lift station. Actual wastewater lift station peak discharge flow rates must be utilized

3. Impacts on Downstream Lift Stations

The Preliminary Design Report shall include a detailed analysis of the impacts on any downstream wastewater lift station caused by the increased flow rates generated by the proposed wastewater lift station. The potential need for downstream improvements will be identified at the pre-design conference. The flow rates investigated must be for the 30 year planning period. The cost for required modifications or upgrades to any downstream lift stations shall be borne by the development generating the increased flows.

C. Siting

Wastewater lift station site selection is dependent on a number of factors, including topography, access, availability of power supply, floodplain, site drainage, land use, aesthetic and odor concerns, overflow potential and impact to the environment. All of these factors shall be considered when selecting the lift station site.

1. Topography

Sewers tributary to wastewater lift stations commonly dominate site selection. Adjacent drainage areas potentially served by the wastewater lift station must also be considered. Wastewater lift station site selection must also be compatible with suitable site access, and soil capability with respect to land grading in conjunction with site development.

2. Access

All wastewater lift stations must be sited to allow access by all-weather surface roads capable of accommodating a WB-50 design vehicle. The wet well shall be located so that it is directly accessible to a 35’ vacuum truck with the nose of the vehicle over the wet well. Whenever possible, provisions shall be made for entry into traffic nose first. Site slopes or grades must be adequate to accommodate low-hanging hose reels on vacuum trucks.

3. Floodplain

Wastewater lift stations must be sited to remain operational and permit access during a 100-year return frequency flood. Lift station top slab, wet well rims

and related vault lid elevations must conform to the City of Reno Flood Hazard Ordinance.

4. Land Use

   Lift station sites must conform to land use regulations for which the property is zoned and adhere to setbacks required under such zoning. Approved variances may be required for situations not adhering to the City of Reno Zoning Ordinance.

5. Aesthetics and Noise

   Natural screening and remoteness of the site should be a primary element of site selection wherever possible. Where pump stations are sited in proximity to developed areas, predominant wind direction for potential odor dispersion and building aspects such as generator exhaust and noise and ventilation fan noises must be considered and minimized. Similarly, building setbacks must be considered to provide minimal impact to neighboring properties. Landscape screening may be required as directed by the City of Reno.

6. Odors

   The Engineer must assess the effect of odor on adjacent land use and workers at the facility. Every effort shall be made in site selection to reduce potential odor pollution. Wind direction, duration and intensity are all important considerations that must be evaluated.

7. Protection from Vehicle Impact

   Sanitary wastewater lift stations, when located adjacent to high speed roads, heavily traveled roads or in areas otherwise susceptible to vehicular impact must be designed with impact mitigation devices to protect the lift station equipment from errant vehicles. In addition, turnouts to allow maintenance vehicles to safely access the site may be required.

8. Overhead Clearance

   Adequate overhead clearance must be provided over the entire wastewater lift station site so that maintenance equipment does not interfere with overhead utilities or structures. In general wastewater lift stations should not be sited where existing overhead interferences exist.

9. Ownership

Wastewater lift stations, regardless of ownership, must be constructed to the City of Reno's standards. The wastewater lift station site shall be large enough in size to accommodate the required features specified in these design standards as well as future upgrades. Land requirements for future improvements, if justified, will be specified on a case by case basis by the City of Reno.

Wastewater lift stations shall be offered for dedication to the City. The City is not obligated to accept any offer of dedication, but if accepted, the offer must include ownership of the parcel for the lift station site.

D. Site Improvements

Wastewater lift stations must be designed and constructed with the necessary improvements to ensure adequate and reasonable access, security, drainage and maintainability.

1. Access Road

Wastewater lift stations must be constructed with adequate access for maintenance vehicles including Vactor trucks with low-hanging hose reels. Road slopes and structural sections shall be designed in accordance with Streets of the Public Works Design Manual.

All paved surfaces at the lift station site must be designed for the expected vehicular and equipment loadings but shall not have a structural section of less than 4 inches of asphalt and 6 inches of base as specified in Streets of the Public Works Design Manual.

2. Perimeter Fence and Gates

All wastewater lift stations must have a minimum 6 foot high perimeter fence surrounding the lift station site designed to discourage unauthorized access. Fencing shall be 9 gauge galvanized steel chain link with barbed wire if zoning allows, unless approved otherwise. Fencing materials shall be approved by the Development Services Department and must be designed for high winds. A 3 foot wide man-gate as well as double 8 foot wide (16 foot total) swinging gates must be provided for access to the site. A 16 foot sliding gate with hardened wheels may be allowed in lieu of the swinging gates if circumstances warrant. All gates must be capable of achieving full open position, including sliding gates. All posts shall be steel set in concrete. Fencing design and construction must be in accordance with the latest adopted

edition of the Standard Specifications for Public Works Construction, latest edition.

3. Potable Water

   A potable water yard hydrant shall be installed at the lift station site inside the fence near the wet well. The hydrant shall have a threaded spigot for a standard garden hose. The water service shall also supply any landscape irrigation requirements. The potable water service shall be equipped with a service line and a Reduced Pressure Backflow Preventer (RP) in accordance with Truckee Meadows Water Authority details, or other authority if appropriate. The RP must be installed in a heated "hot box' located outside the lift station fencing.

4. Site Surfacing

   The area within the fence must be paved or finished with concrete. With approval, the surface may be protected with ¾" minus drain rock or alternate surface as approved.

5. Grading

   Wastewater lift station site grading must be designed to prevent local ponding and to provide positive drainage away from structures. The site must be graded so as to not create a low-point in relation to the adjoining properties. On-site cross slopes should be limited to no greater than 4 percent away from the structures. Storm runoff from the lift station site shall be designed in compliance with Storm Drainage of the Public Works Design Manual.

6. Landscaping

   All wastewater station sites must be screened as appropriate for the surrounding development. Landscape design and materials must meet the same requirements for landscaping as required by the conditions of approval for the project or minimum standards in zoning code when not subject to entitlement conditions. Landscaping shall not be installed within the fenced portion of the site but shall surround the perimeter of the site or as required by Development Services Department. Variations to the minimum requirements may be allowed with the approval of the Development Services Department. All irrigation controls and the reduced pressure backflow preventer must be located outside the lift station fence unless otherwise approved.

7. Lighting

   Exterior lights must be provided to adequately light the equipment area. The lights must be appropriately shielded to prevent "spillage" on to neighboring

properties in accordance with the Land Development Code. Exterior lift station lighting shall be fitted with manual on-off switches with the photocell sensor operational in the Auto mode.

Work lighting shall be installed in all cabinets and over the wet well and shall operate on manual on-off switches. All lighting must be Light Emitting Diode (LED) type due to lower power usage and longer life, resulting in lower maintenance costs for the project site. LED light shall be 5000k or 6000k brightness.

Pole lighting must be mounted on concrete bases with grounding and access handholes. Duplex receptacles with ground fault interrupt capability shall be installed where shown on the drawings. Weatherproof receptacle may be mounted in the outdoor light poles.

E. Hydraulics

Wastewater lift stations must be designed to satisfy the hydraulic conditions of the planned facility. The friction head must be determined as accurately as possible taking into account all pipe and minor losses. Pump/system curves must be shown for individual and combined simultaneous pump operation. The pump/system curve calculation may be performed utilizing any accepted hydraulic equation or software. The design calculations must be submitted in the preliminary design report along with all design assumptions, limitations and restrictions. The Engineer must include in the calculations the net positive suction head available (NPSHA) as well as the net positive suction head required (NPSHR) to assure cavitation will not occur. NPSH margin requirements must comply with HI 9.6.1 standards, which require a minimum margin of 4.9 feet over the allowable operating range.

F. Force Main

1. Size and Velocity

The force main must be sized to produce a fluid velocity of no less than three (3) feet per second and no more than six (6) feet per second with one pump operating, for stations with two pumps installed (one duty and one standby). For stations with three pumps installed (two duty and one standby), the force main must be designed such that a minimum of three (3) feet per second is provided by a single pump, and velocities no higher than six (6) feet per second occur with two pumps operating. Potential for expansion of the lift station through the planning horizon must be considered when sizing the force main.

2. Horizontal Location

Force mains must be located within the public rights-of-way or in appropriate easements. Appropriate clearances between other utilities must be provided for as specified by the governing agencies. The horizontal location of the force main shall be identified with buried tracer wire and locator tape marked "SEWER". The location of all angle points and valve locations must be submitted to the City of Reno in Nevada State Plane (ground) coordinates.

Typical force main trench detail is shown in the Standard Drawings.

3. Materials

All pipe utilized for force mains must be pressure rated pipe. The material shall be High Density Polyethylene, DR 11 minimum or approved equal. Ductile iron may be used for short piping runs and fittings within the lift station site, and must be provided with ozone-resistant gaskets. PVC is not acceptable without specific written approval, and if used, must be provided with ozone-resistant gaskets. All ductile iron pipe and fittings shall be wrapped in green polyethylene plastic per AWWA C105 marked "SEWER".

4. Profile

Force mains shall have a minimum depth of cover of 4 feet as measured from the proposed finish grade to the top of pipe. A continuous upward slope from the lift station to the discharge point is required if possible. In the event that a high point cannot be avoided, and as allowed by the City, a wastewater air and vacuum release valve must be installed in a vault. All vaults must have adequate clearance around the valve to allow maintenance. At major low-points a manually controlled drain valve must be installed in a manhole to allow for cleaning or draining.

5. Separation Distance

Clearance between sanitary sewer force mains and water lines must comply with NAC 445A.6715 through 445A.6718. Sanitary sewer force mains paralleling water mains that are less than eighteen inches below the water main must have a minimum of 10 feet of horizontal clearance from the water main. At perpendicular crossings the force main must be placed below the water main a minimum of 18" vertically. For purposes of determining pipe separation, the distance indicated must be the smallest outside diameter-to-outside diameter distance. Smaller separation distances may be allowable on a case by case basis as listed in the NAC requirements.

6. Appurtenances

a. Air Release and Air/Vacuum Release Valves

The Engineer must provide an economic analysis comparing the installation of air release and air/vacuum release valves against the installation of deeper force main piping. The economic analysis shall take into account the installation and maintenance costs associated with the air release and air/vacuum release valves. Air release and air/vacuum release valves must be specifically designed for wastewater service and be sized per the manufacturer's recommendations. Air release and air/vacuum release valves must be manufactured of stainless steel and/or HDPE plastic. Air release and air/vacuum release valves shall be required at the following locations:

- Profile highpoints (when allowed)
- Other locations as required per the hydraulic analysis report

The air and vacuum release valves will be contained in a vault and vented above ground. A manually controlled stainless steel isolation valve must be installed between the force main and the air release or air/vacuum release valves. The valve shall be installed on a two-inch saddle or pipe tap and equipped with stainless steel nipples and a stainless steel ball valve. All piping to and from the air valve must be stainless steel. The vault shall be sized to provide a minimum of twelve-inches clearance above the valve, and two feet clearance on all sides. If necessary, the force main depth shall be increased to provide adequate clearance. All vaults must be insulated to prevent freezing of the valve. Locations of air and vacuum valves shall be reviewed by the City for any odor concerns.

b. Drain Valves

When required by the City the design engineer shall include at least one force main dewatering connection at the lift station and dewatering connections at other major force main low points. Drains shall generally include a plug valve installed on a tee and drain piping to an existing sewer manhole or to a separate manhole that can then be pumped by City personnel.

c. Additional Appurtenances as Required

The City may require additional appurtenances at sanitary sewer lift stations and force mains on a case-by-case basis.

7. Water Hammer

A water hammer (surge) analysis studying the force main and the related wastewater lift station must be performed and submitted to the City for review and approval. Water hammer must be evaluated for the normal operation of the pump station as well as for a power outage while the pump(s) are running. The modulus of elasticity of the pipe material and pipe wall thickness must be considered when evaluating water hammer effects and cyclic loadings. At a minimum the following should be addressed in the surge analysis:

1) Maximum and minimum transient pressures due to water hammer and the effect of these pressures on the entire system.
2) Cyclic loading of the force main.
3) Investigation of the pipeline profile to determine the possibility of water column separation.
4) Reverse rotation characteristics of the pumps.
5) Shut-off characteristics of all proposed pump control valves (if allowed), including check valves.
6) Substantiation for the use of surge control valves, surge tanks, or other surge protection devices, when necessary, listing recommended size and computed discharge pressures.

The potential impact of water hammer must be evaluated with special consideration given to cyclic loadings that are inherent in wastewater force mains. All elements of the piping system must be designed to withstand the maximum water hammer in addition to the static head and cyclic loading. A safety factor of 1.5 shall be used when determining the adequacy of all piping system components with regard to withstanding system pressure.

The City of Reno may allow the use of a surge control device in lieu of strengthening piping system components. The decision to allow such a device must be based on a life-cycle cost comparison.

Water column separation in the force main under surge events is not acceptable and must be prevented using surge control devices or other approved methods. Minimum pressure in the line shall be limited to 0.5 atmosphere, or 6.3 PSIA, in order to provide a safety factor against column separation.

8. Force Main Termination

Exposed walls of a structure required at the junction of force mains and gravity sewers (termination manhole) must be constructed or protected with

acid resistant materials. This applies to all surfaces exposed to the atmosphere above the wastewater. The flow transition from the force main to the gravity sewer shall be smooth and non-turbulent.

G. Wet Well

Wet wells shall be considered a hazardous environment, as defined in NFPA820, and shall be classified as NEC Class 1, Division 1, Group D for explosive gases. Wet wells must be designed and constructed to be as hazard free as possible, and corrosion-resistant materials shall be used throughout. All materials and equipment used in wet wells must meet NEC Class 1, Division 1, Group D standards. No junction boxes shall be installed in the wet well.

Float cables and pump cables shall be placed in the cable tray that shall extend from the motor connection cabinet to the wet well. Wet well conduit terminal panel installation must be in accordance with the Standard Details.

Wet well configuration must be designed in accordance with HI 9.8 standards.

1. Structure

Wastewater lift station wet wells shall be constructed of polymer resin composite (Armorock or equal) and shall be circular. Precast concrete wet wells can be used if approved by the Utility Services Director or appointee and must be coated with interior linings as listed below. The wet wells that are installed below the groundwater table must be adequately designed or equipped with ballast to prevent flotation under projected maximum groundwater levels without the use of hydrostatic pressure relief valves. The exterior of wet wells installed below the 100-year high groundwater level must be waterproofed as described herein. Wet well size and depth shall be as required to accommodate the influent sewer, provide for adequate pump suction pipe or pump submergence as recommended by the pump manufacturer, at minimum, or operator preference, and to provide adequate volume to prevent the excessive cycling of pumps. Partitioning the wet well to help accommodate future growth requirements is allowed, however, the design of any partition must be approved by the City of Reno.

a. Wet Well Volume

The required wet well working volume must be calculated to optimize pump operation to meet both peak hour flow and minimum hour flow. The design engineer must consider the diurnal nature of wastewater flow as well as the pump manufacturer's recommendations regarding pump start frequency when determining the wet well volume. Every effort must be made to prevent wastewater in the wet well from becoming septic. The wet well must contain adequate vertical room for level sensing adjustments above and below the design levels. The minimum active operating range for the lead pump,

between “ON” and “OFF” level settings, must be 1.5 minutes of the pump capacity in normal operation. Wet well must be sized such that pump starts (regardless of alternation) do not occur more frequently than ten starts per hour under any flow conditions.

b. “OFF” Levels

Lowest “OFF” level for the pumps shall be at the top of the pump, excluding the lifting eye, or manufacturer’s minimum operating level, whichever is higher.

c. Wet Well Size

Minimum inside width must be 6 feet, however, retention time, pump configuration and access may require a larger structure.

d. Alarm Floats

In addition to the primary level sensing element, two high water alarm floats shall be provided. For drop inlet stations, the primary “HIGH” water alarm float shall be set to wet well influent invert. A redundant “HIGH HIGH” water alarm float shall be installed six inches above the primary high water alarm. For ramped-style inlets, the “HIGH” alarm shall be set at the crown of the ramp pipe at the entrance manhole, and the “HIGH HIGH” level set six inches higher. Activation of the “HIGH HIGH” alarm float shall activate the backup pump control sequence.

e. Minimum Level Separation

Minimum elevation difference between control elevations shall be six inches.

2. Interior Linings and Waterproofing

Wet well interior walls and ceiling must be lined with a material that is suitable for immersion wastewater service. Unless specifically approved by the City, coating must be Raven 405 or Sauereisen 210 or approved equal. Coating must only be installed by factory authorized and certified installers. The lining must be completely resistant to hydrogen sulfide and sulfuric acid. The liner must be easily cleanable and sufficiently durable that it can be washed with a high pressure water hose. The liner must be light in color. Materials used for interior liners must be subject to the approval of the City of Reno prior to installation. Liner is subject to spark testing as required by the City of Reno. The spark tester used must provide a minimum 12,000 volts for 125 mil thickness coatings.

Wet wells that are anticipated to be partly below the groundwater table must also have a waterproofing system installed on the exterior of the wet well. Waterproofing system must consist of an application of a self-adhesive rubber/bitumen backed HDPE liner such as Bituthene 2000 or equal. Liner must extend above anticipated 100 year high water level. Waterproof concrete admixture can be approved upon request. Any conduit or pipe penetrations within the 100 year flood level must be sealed with compression seals.

Regardless of the elevation of the water table, all joints in the concrete and all penetrations through the concrete must be grouted with non-shrink grout on both sides of the joint or penetration.

3. Access and Hatches

Wet well access must be through a top slab opening with aluminum hatch cover and frame. All hatches must be rated for incidental H-20 loading at minimum. All hardware for the hatch, including hinges, springs, latch, and cable hooks, must be stainless steel. The top slab access hatch must be sufficiently large to remove all equipment from the wet well with a minimum of two inches clear on all sides, but in no case smaller than 36 by 36 inches. All access hatches must be torsion or spring assisted and all components must be non-corrosive. Removable safety railings or chains must be provided around the access hatch in accordance with OSHA regulations. Channel drains from the hatch frame must be equipped with a stainless steel pipe draining back to the wet well.

4. Influent Manhole Sump

Each wet well shall be equipped with an independent 60" diameter manhole located just upstream of the wet well containing a sump to help assist in trapping large items to prevent them from entering the pumps and/or piping and to provide a dedicated area for cleaning. The sump must be a minimum of 2 feet wide and 12 inches deep. On a case by case basis, the City may allow the sump to be located in the wet well rather than in the influent manhole.

5. Floor Slopes

Wet wells must have sloping sides to form a hopper at the bottom of the wet well in all areas outside of the dedicated sump. Slopes shall be approximately 1 horizontal to 1 vertical. Square corners should be avoided. The flat portion of the wet well floor must be minimized. Sump configuration must be in accordance with manufacturer's recommendations and HI standards.

6. Level Control System

Wet well liquid levels shall be controlled by a level sensing system equipped with two additional redundant backup float switches for high water alarms. These systems within the wet well must be located to minimize the turbulent influences of flow into the wet well on the control of liquid level.

The primary level sensing system shall utilize a radar or laser level sensor providing a 4-20mA level signal to the control system as described in Appendix A. Pressure transducers may be acceptable on a case by case basis with approval of the City. Ultrasonic or bubbler systems are not acceptable.

7. Odor Control

It should be assumed that a collection system upstream of the pump station with a greater than two-hour detention time and/or greater than 2 hour force main detention time will require some form of odor prevention/mitigation measures. An odor analysis shall be prepared considering the average and maximum detention time in the wet well. Analysis must be submitted to the City of Reno for approval. Proposed odor control measures will be evaluated on a case by case basis. Acceptable chemical treatments for odor control include Bioxide® and SulFade™ Commander, or equal upon approval.

H. Approach Manhole

A 60-inch diameter approach manhole containing a sump shall be constructed upstream of all wet wells. The approach manhole shall be located within the site fencing of the lift station and shall serve as a common point of connection for all sanitary sewer pipes tributary to the pump station. A single pipe shall extend from the approach manhole to the wet well. The approach manhole must have a 36-inch diameter cover with a removable 24-inch diameter insert cover.

I. Wet Well Inlet Configuration

The inlet configuration to the wet well may be either an oversized ramped inlet or a drop inlet as discussed below.

1. Ramped Inlet Configuration

Ramped inlets must be designed in accordance with HI Standard 9.8 Appendix C, latest revision. Unless approved otherwise, hydraulic design must be based upon a Manning's n factor of 0.010 and a pipe slope of 2%. The ramped inlet pipe must be configured such that the normal "OFF" point and "ON" points for the lead pump are both contained within the ramped

section, and a hydraulic jump must occur within the ramped section. No manholes or fittings are allowed within the ramped section of pipe. See Standard Details for additional information.

2. Drop Inlet Configuration

Drop inlets must be provided with a bowl or tee-type inlet that allows clear access to the drop pipe from above. The drop inlet must be located below the wet well access hatch or a manhole lid such that the inlet can be accessed without entering the wet well. The drop section of the pipe must be equipped with a 45° elbow and extend below the lead pump "OFF" level. The drop pipe must be a "Reliner" drop bowl as manufactured by Duran Inc., or equal. Minimum size of the drop pipe must be the same diameter as the inlet pipe. The drop pipe must be anchored to the wet well wall using stainless steel brackets and stainless steel anchors at no more than five foot spacing on center, with one bracket at the top and one bracket at the bottom of the pipe section.

J. Pump Selection

The type of wastewater pump required by the City shall be determined by the required pump motor horsepower. Wastewater lift stations may be either custom built-in-place or engineered package systems with submersible or self-priming centrifugal pumps.

Wastewater pumps must be centrifugal non-clog solids handling pumps designed specifically for handling raw, unscreened domestic sanitary wastewater. All wastewater pumps must rotate clockwise as viewed from the motor end. Pump motors must operate on 460 volt, 3 phase, 60 Hertz electrical service and at a speed no higher than 1780 rpm. For pumps ten horsepower and less, if 460 volt service is not readily available, 208 volt 3-phase power may be acceptable on a case by case basis with City approval. The pump motor horsepower selected must be sufficient to prevent motor overload over the entire range of the pump performance curve without encroaching into the service factor. Wastewater pumps and motors must be suitable for continuous duty.

Proper pump selection is critical and applications where pumps must operate near their shutoff head or run-out conditions must be avoided. Design of pumps expected to operate outside of the manufacturer's Allowable Operating Region is prohibited. Pumps should be selected to operate most frequently within the Preferred Operating Region.

1. Submersible Pumps

Submersible style pumps are contained in a wet well and are the preferred design for City pump stations smaller than five million gallons per day.

Generally, submersible pumps will be allowed when the required individual pump horsepower does not exceed 100 HP under buildout conditions. Lift stations that are proposed with submersible pumps with motors larger than 100 HP must be reviewed and approved by the City of Reno on a case by case basis. Submersible wastewater pumps contained in wet wells must be equipped with stainless steel guide rails and cast iron or ductile iron pump discharge elbow assemblies installed in the wetwell. All pump manufactures must be compatible with a Flygt base. Pump outlet to discharge must be metal to metal connection unless otherwise approved. All anchor bolts must be stainless steel.

Pumps must be designed for pumping raw wastewater that may contain stringy solids and must be capable of passing a minimum 3-inch diameter sphere. Pumps must be minimum of 5 HP unless approved otherwise. Pump volute, and motor housing must be of cast iron construction, impeller must be of hardened cast iron construction. The pump volute casing and impeller must be fitted with replaceable wear rings to maintain sealing efficiency between the pump volute and impeller. Submersible wastewater pumps must be fitted with leakage sensors for detecting the presence of water in the oil and/or stator housing. Pump supplier or manufacturer must provide the required seal fail/over temperature relay and it must be installed by the motor control system supplier/manufacturer. Submersible wastewater pumps must feature stainless steel guide rails and an automatic cast iron discharge connection elbow system permanently installed in the wet well. The motor shaft must be a single piece heat-treated high strength alloy steel or high strength stainless steel having a tapered end to receive the impeller. All nuts, bolts and screws must be stainless steel.

The motor must be Class H insulated (minimum) and sealed from the pump by independent double mechanical seals. The motor and pump must be explosion proof for Class 1 Division 1 Group D applications. The upper and lower mechanical seal must run in an oil chamber. The upper seal must be a stationary tungsten-carbide seal or Silicone Carbide seal with rotating carbon ring. The lower seal must be one stationary and one positively driven rotating tungsten-carbide ring. All mating surfaces where watertight sealing is required must be machined and fitted with a rubber O-ring. All motor starters must incorporate thermal switches in series to monitor the temperature of each phase winding and must be wired to the motor controller. The machining of mating surfaces must provide metal to metal bearing on sealing surfaces without crushing the O-ring.

Pumps shall be a Flygt “N-series”, Homa “A-Series” or equal with approval of the City on a case by case basis.

2. Self-Priming Engine Driven Centrifugal Pump

This type of wastewater pump can be provided in lieu of providing one hour of emergency storage as required in section N paragraph 2. All lift stations over 1,000 GPM or as deemed necessary by the City requires a self-priming engine driven centrifugal pump.

a. General

The engine driven pump must consist of an integrated standby pumping system for operation during an electrical equipment or power failure. The standby pumping system must consist of a packaged unit, self-priming, horizontal, end-suction, non-clog, diesel-engine driven, centrifugal pump in an outdoor enclosure, suitable for pumping liquids containing municipal wastewater solids. The pump must be capable of self-priming as installed with a minimum of a five foot safety factor, and must not rely on vacuum pumps for priming.

b. Components

The pumping system must be packaged with pump, diesel engine, throttle control, control panel, fuel tank, discharge check valve, battery system, sound attenuating enclosure, and all appurtenances to provide a complete, integrated pumping unit. The pumping unit must be designed and rated for the elevation above sea level of the lift station.

c. Control system

The pumping system must be furnished with an integrated control system to allow programming the automatically controlled startup/shutdown, speed control, and the control of liquid levels during operation of the standby pumping system.

The engine driven pump must incorporate an independent level sensing system and control system that will start the pump and operate the pump based on the water level in the supply to the pump from the suction manhole or wet well.

d. Engine

The pump must be supplied with a compression ignition, diesel fueled, engine. The motor must be rated to continuously meet all pump power requirements at the speed required to achieve the specified head and capacity. The engine must be selected to be non-overloading throughout the pump's head capacity curve at the rated speed. Pump engine must

comply with the latest Northern Nevada Public Health Air Quality Management requirements.

e. Capacity

Minimum capacity of the engine-driven pump must be equal to the design capacity of the lift station.

f. Enclosure

The engine driven pump must be equipped with a weatherproof, lockable, sound attenuating enclosure, critical muffler, and fuel tank with sufficient capacity to operate the pump at full capacity for twenty-four hours.

g. Manufacturer

Engine pump package shall be as manufactured by Godwin, Gorman-Rupp, or equal.

3. Other Pumps

In special circumstances due to extraordinary wastewater composition, rehabilitation of an existing installation or other reasons, the City shall be consulted to determine the acceptability of other pump types before the wastewater lift station design commences. No prefabricated steel stations consisting of steel structures with dry pits and exterior wet wells will be allowed, and no pumps requiring the use of seal water systems will be acceptable. All pumps must be filterless.

K. Wastewater Lift Station

Standard Drawings for Wastewater Lift Stations are shown in the supplemental drawings available from the City of Reno. These reference drawings in conjunction with the Public Works Design Manual provide the design engineer with the minimum requirements for construction drawing preparation and submittal to the City of Reno.

Wastewater lift station structures, equipment systems, piping, controls, force main and accessory systems must be engineered according to these guidelines. To fulfill the intent of these guidelines, the Engineer must exercise judgment to use the special knowledge relating to project site characteristics and conditions of service (e.g. head, flow, force main length) particular to the wastewater lift station design under development.

All wastewater lift stations must have multiple pumps, with a minimum of one standby pump. Wastewater lift stations must be capable of delivering the design flow rate with

the largest pump out of service. Wastewater lift station design must permit individual pump maintenance while maintaining the station in operation. Suction and discharge piping must be supported rigidly at or near the pump connections. Supports must be stainless steel and designed and placed to avoid vibration.

Wastewater lift stations must be designed to provide suitable environments for operating and maintaining pumping equipment and piping systems. Configuration of pump components must promote safe access and adequate space for equipment and valve maintenance.

1. Submersible Lift Station

   a. Pump Removal

      The wastewater lift station must be designed so that the pumps and related equipment can be removed while the other pumps remain in service. Lift station needs to be designed as to allow a crane truck to remove the pumps.

      All wet wells must be located on the site to provide access to the wet well for a Vactor-type truck for cleaning of the wet well.

   b. Net Positive Suction Head

      The Engineer must perform a net positive suction head available (NPSHA) analysis and include this information in the pre-design report. The NPSHA must be calculated for the expected design flows and must exceed the pump manufacturer's Net Positive Suction Head Required (NPSHR) requirements by an added margin of safety of not less than 4.9 feet as prescribed by HO 9.6.1. Calculations must be performed with the water level at the normal "OFF" point.

L. Piping Systems

1. Pump Station Piping

   Pump discharge piping must be sized to provide velocities in the range of 4 to 8 feet per second.

2. Valves

   Each wastewater pump must have isolation valves to permit the removal or maintenance of the pump and check valve without affecting the operation of remaining pumps. Isolation valves must be non-lubricated plug valves. Plug valves must be 100% port opening. 4 to 6 inch plug valves must be quarter turn to open. Larger plug valves must have geared operators with hand wheels,

or nut if buried. Plug valves must be positioned so that when closed, the valve body is isolated from the actively flowing portion of the piping system. Plug valves if installed horizontally must be positioned so that when the valve is opened, the valve plug must be at the top of the body.

Each pump must have a high quality swing check valve with an internal flexible disc with non-slam closing action; disc material must be compatible with pumped fluids. Check valves must include a field-installable backflow actuator. Check valves must be Val-Matic Swing Flex®, Milliken Flex Check, or City approved alternate. Check valves must be installed horizontally.

3. Bypass Pumping

Wastewater lift stations must have additional pipe, valves, fittings and couplings as necessary to permit bypassing of the lift station, including both the wet well and pumps. The provisions must include the approach manhole and bypass piping with an isolation valve and blind flange enabling the temporary pump to pump directly into the existing force main. A typical bypass pumping schematic is shown in the Standard Drawings.

4. Wet Well Mixers

Every lift station shall be provided with a submersible sewage mixer. Mixers must be designed to keep the contents of the wet well mixed to avoid grease or solids accumulation. Wet wells eight feet and larger in diameter must be equipped with a Flygt Model 4630 mixer or equal, and wet wells smaller than eight feet in diameter must be equipped with a Flygt Model 4610 mixer, or equal. Mixers must be mounted on stainless steel slide rails and be located to allow removal without taking out the sewage pumps.

5. Flow Metering

All wastewater lift stations shall be provided with a dedicated magnetic type flow meter that includes instantaneous rate of flow and flow totalization. Flow metering shall be included in the SCADA system. Installation of the meter must be as recommended by the meter manufacturer, including the provision of grounding rings or electrodes. Meter output must be 4-20 mA unless noted otherwise. Provide testing and calibration by the meter manufacturer's authorized representative at startup.

6. Pressure Gauges

Provide a minimum of one pressure sensing ring and pressure gauge on the discharge of each lift station, near the flow meter. Gauge and ring assembly must be oil filled and equipped with a 2-1/2" stainless steel pressure gauge

rated 0 to 100 PSI, unless approved otherwise. Gauge and assembly shall be a Red Valve Model 40, Onyx PSR, or equal. Pressure sensor elastomeric material must be as recommended for use with ozone-containing wastewater. The location and orientation of all pressure gauges must be approved by the City prior to construction.

M. Vaults

Precast concrete vaults and manholes containing exposed wastewater must have an interior coating designed to protect against corrosion from hydrogen sulfide gas. When high groundwater is anticipated exterior waterproofing system must be installed and the vault designed to resist buoyancy. Vaults shall extend 6 inches above grade and shall have aluminum hatches with spring-doors to access the vaults. All hatches and lids must be rated for incidental H-20 loading.

All vaults must be equipped with a drain back to the wet well. Sump drain line must be 4-inch minimum diameter, cannot contain a P-trap, must slope continuously to the wet well at a minimum slope of 2%, and be equipped with a duckbill-type check valve on the discharge in the wet well.

Sump pumps may be allowed on a case by case basis with City approval. If allowed, sump pumps must be a float-controlled submersible sump pump located in a sump. The sump pump must have capacity to handle anticipated maximum system flow from seepage and infiltration and routine piping and pump maintenance and must discharge into the wet well. The discharge line must be 2-inch diameter minimum, cannot contain a P-trap, and must be equipped with a duckbill-type check valve on the discharge in the wet well. Discharge check valve shall be low-opening pressure type, Red Valve Tideflex Series 35 or equal. All pump vaults with sump pumps must be provided with a float switch emergency alarm system to protect the vault from flooding in the event of sump pump failure. Each sump pump must have dual check valves installed on the discharge piping to protect the pump vault from backflow from the wetwell.

N. Emergency Station Operation

To ensure that utility power or equipment failures do not cause sewer system overflows, provisions to maintain wastewater pump station including standby power and emergency storage must be made.

1. Standby Power Equipment

A diesel engine driven standby electric generator with non-proprietary control panel must be provided for all wastewater lift stations. GenSets must be derated for actual elevation of the lift station.

The unit must be sized to allow simultaneous starts and operation of all pumps in addition to the auxiliary loads. The system must start lag pumps while the lead pump is running with a maximum voltage dip of 15%.

Diesel engine must be adequately sized to operate the generator within the voltage dip criteria listed above, and be equipped with an electronic governor and emission controls in compliance with local air pollution regulations. Engine must be equipped with an electric engine block heater sized per manufacturer recommendations. Exhaust silencer must be a hospital grade, EGSA Class 7 minimum. Engine must comply with all current air pollution regulations.

An automatic transfer switch must be provided to switch to standby power on a power failure or a drop in any phase voltage to 70 percent of line voltage.

Diesel engine powered generators must be provided with a fully automatic 3-phase resistance element load bank rated at 50% of the generator KW rating. The load bank requires a second circuit breaker and is located next to the radiator. The load bank must be energized when the generator load is less than 50% load and de-energized when the load is above 50%.

An aboveground, skid mounted, double wall containment fuel tank per UL 142 must be provided for diesel fuel. Tank must be equipped with low level alarm, and equipped with fill connections and venting in accord with NFPA fuel storage regulations. The fuel tank must be sized to provide a minimum of 24-hour fuel supply at full load for the generator provided.

The generator must be housed in an outdoor weatherproof sound attenuating enclosure that is painted in an earth tone. The generator must meet the City of Reno sound requirements as delineated in Title 8 of the Reno Municipal Code.

The system shall be monitored and controlled by the SCADA system as well as local manual and automatic control. An external emergency stop must be provided by the manufacturer in an NEMA-4X control station on the exterior of the generator enclosure. A shunt trip must be provided if required by the local fire agency.

Generator shall be Gillette, Blue Star, Baldor or approved equal. Transfer switch shall be ABB, Thomson, Eaton or approved equal

2. Emergency Storage

Emergency storage capacity must be provided to hold a minimum of 1 hour of peak hour design flow. In lieu of the providing the emergency storage, an engine driven pump may be provided as described elsewhere herein.

The wet well, collection system and emergency storage containment can all serve as the emergency storage provided that the 1 hour requirement is met without a spill occurring. Additional storage time may be required by the City based on the potential for environmental contamination or other factors.

In addition to new stations, the emergency storage requirement may be required on upgrades to existing wastewater lift stations as directed by the City.

The emergency storage must be available above the "HIGH" water alarm elevation in the wet well and must be continuously available without the need for an operator to switch valves or diversions. If a dedicated overflow storage tank is provided, it must be concrete and lined with Raven 405, Sauereisen 210, or equal. Alternate materials such as PVC or HDPE may be approved on a case by case basis. Dual pipes must be in place to allow flow to travel to and from the wet well and the emergency storage basin. The return pipe from the emergency storage basin to the wet well must include a plug valve that is located near the bottom of the emergency storage basin, and must be equipped with a duckbill-type check valve (Red Valve Tideflex Model 35, or equal) on the discharge in the wet well. The emergency storage basin must have a smooth floor sloped to the drainpipe with a minimum slope of 1%. The emergency storage tank must have a minimum of 2 manholes to provide access from the surface. The manholes must be a minimum of 36-inches in diameter with a removable 24- inch diameter insert.

O. Electrical

1. Power Requirement

The electric service must be 480 volt, 3 Phase, 60 Hertz, unless approved otherwise. The service must be sized to allow all station fixtures, equipment and all pumps to operate simultaneously.

All electrical service distribution systems must have a complete Power Systems Study completed to meet the intent of NFPA requirements and other sections within this standards document.

All electrical service distribution systems must have an Arc Flash Hazard Analysis completed to meet the current NFPA requirements. The Analysis must be provided in the form of a Power System Study report for City review and approval.

At a minimum, the Power System Study report shall contain the following:

- A complete short circuit study with findings and recommendations.
- A coordination study providing recommended protective device

settings for all equipment.

- An arc flash hazard analysis providing energy levels at each bus node for worst case scenario.
- Arc flash labels meeting NFPA current standards must be installed on equipment for each:
    - Service Entrance Section
    - Switchgear
    - Switchboard
    - Motor Control Center
    - Panelboard
    - Disconnect
    - Motor Control Panel
    - Process Control Panel

Arc Flash labeling of equipment is required prior to energizing equipment.

Variable Frequency Drives (VFD's) are required on all pump controller installations. VFD's must be sized at a minimum one size larger than the minimum required for the pump horsepower. All panels containing VFD's must be provided with panel mounted air conditioning units to prevent overheating of the panel. VFD's shall be Schneider Altivar series, Rockwell Automation, Allen Bradley, or equal.

Provide VFD mini cas from the VFD to the wet well terminal box as shown in the Standard Details.

The raceway with VFD cable must have a seal off after the cable is either landed on a terminal strip or provided with a cable connector system. The pump motor cable must be routed into the terminal box and either landed on the terminal strip or provided with a cable connector to mate with the VFD cable.

The raceway from the terminal box to the wet well must be provided with removable material to block the gas from the wet well. The pump control cables must be treated the same as the power cables that are to be routed to the VFD cabinet.

Some manufacturers provide VFD power cable with control conductors in the same cable, to avoid a separate raceway from the terminal box to the VFD cabinet. This is a similar wiring method that some pump manufacturers

provide from the pump/motor monitoring devices that are routed in the same cable as the pump motor power conductors.

2. Lift Station Power and Control Panels

   The Power and Control Panels must be enclosed in powdered coated white steel NEMA 3R enclosure panels located outdoors and must include adequate space for mounting instrumentation as required.

   Panels for small lift stations (less than 500 GPM) shall be mounted on stainless steel racks mounted on concrete bases.

   Larger lift stations must have powdered coated white NEMA 3R cabinets mounted on a concrete slab and shall have an over-cabinet canopy with outdoor LED lights mounted under the canopy.

   All switches, breakers and wires must be clearly marked or labeled. Standard control panel layout for two or more pumps must be provided with the following section of panels:

   - Power company metering and main breakers
   - Automatic transfer switch
   - Circuit breakers and starters for unit heaters, sump pumps, main wastewater pumps, fans, compressors, engine block heaters for generator and engine pump (if provided), etc., station power transformer and 240/120 voltage 1 phase panelboard.
   - City SCADA system to control pump motor controllers via City designated telemetry system.
   - No OEM station controller is allowed.

3. Convenience Receptacles

   Provide a minimum of two GFCI outdoor weatherproof convenience duplex outlets. Provide 120 volt, 1 phase receptacles within the pump station buildings or cabinet enclosures.

4. Standby or Portable Generator Systems

   If required, pump stations shall have an exterior mounted panel with provisions for Hubble 4100 portable generator connection. Power from a portable generator must be delivered to an automatic transfer switch generator connection lugs for pump stations.

5. Energy Conservation

Energy efficient motors must be provided for all pumps. All lighting must be Light Emitting Diode (LED).

6. Lightning and Surge Protection

Transient voltage surge suppression devices rated at 80 kA minimum must be provided. At the service entrance, installation must be in accordance with the current National Electrical Code (NEC) Article 285. Where lightning system devices are installed, they must be connected to the site grounding system with the cable routed above ground in PVC Schedule 80 raceways, for protection and to avoid weather deterioration.

P. Telemetry

1. Remote Terminal Units (RTU)

a. General

Remote terminal units must be as specified for lift stations when directed by the City of Reno and provided for by the developer or contractor. See Appendix B for specifications.

The City will provide the design engineer with information on how the existing master control system screen displays are to be updated and the reports that need to be updated from the lift station RTU.

The City will provide current manufacturers and model numbers of the required equipment and provide information on the existing software in use by the City. All equipment and software must be compatible with the City's existing SCADA system.

The construction of the lift station must include necessary funding to have the necessary programming changes made to the City's master control system. These changes must be performed by a City-selected contractor.

b. Battery Backup

The telemetry system must have a battery backup with 2 hours reserve.

2. SCADA Telemetry

The lift station shall be provided with cellphone-based SCADA telemetry compatible with the City of Reno Standards as described in the attached

Appendix B. If not connected to the City of Reno system, the high level alarm must be transmitted to a private security monitoring firm that is manned on a 24 hour per day basis.

3. RTU Equipment

The Contractor must purchase the required RTU equipment as specified in Appendix B and install the equipment in accordance with the specifications. Prior to purchase, the equipment must be submitted to the City for review and approval by the City's SCADA consultant.

Q. Minimum Architectural Standards

Above grade structures may be required to meet minimum architectural standards as specified in the CC&Rs, Land Development Code or as directed by the Development Services Department.

R. Security Systems

Security systems must be included in the electrical design for future installations at the wastewater lift station. The security systems must include intrusion, fire and environmental hazard systems at the site or as directed by Utility Services Director and Maintenance and Operations Director.

S. Confined Space Considerations

It is the desire of the City of Reno to eliminate confined space entries whenever possible. If a confined space cannot be avoided, the design of the lift station must incorporate features to minimize the dangers of the confined space.

The City of Reno must review and approve design drawings and specifications for any confined space prior to construction. No canned dry pit/wet pit installations are acceptable.

T. Miscellaneous

1. Coatings and Painting

All exposed construction materials and equipment, except that constructed from stainless steel, aluminum and PVC, must be field painted or have some other form of field-applied protective coating. Factory finished items do not require field painting if the factory finish conforms to the specified paint system and color. Painting unfinished materials must be in accordance with the specification. Paint and other coatings must be utilized as necessary to prevent corrosion, extend wear or promote easy to clean surfaces. Paint and

coating systems used at wastewater lift stations must exhibit superior durability. All paint and coating systems must be reviewed and approved by the City. All piping, valves, and pipe supports within vaults must be painted. Stainless steel items do not need to be painted.

2. Fall Protection

   Temporary and permanent fall protection for all floor and wall openings in the lift station must be in accordance with the requirements of the latest edition of OSHA 29 CFR, Chapter XVII. Fall protection includes, but is not limited to railings, toe-boards, screens, covers, hatches, grills, slats and fences. A socket must be provided and mounted to an appropriate engineered base for the use of a City provided "uni-hoist".

3. Signage

   A facility sign must be provided at the facility that includes the facility name, address and 24 hour emergency telephone number. The sign must be baked aluminum with a green finish and white reflective letters approximately 18 inches x 24 inches.

SECTION III DESIGN, CONTRACT DOCUMENTS AND CONSTRUCTION

A. Predesign Conference

Prior to submission of the preliminary design report a predesign conference must be held. The predesign conference can be scheduled through the Development Services department and must include the Utility Services department and the project engineer.

During this meeting, ownership, flow rates, design exceptions and any other necessary information will be discussed.

B. Preliminary Design Report

The preliminary engineering report will include, at a minimum, the description of design criteria to be utilized, preliminary flow computations, design calculations, calculated system curves, water hammer (surge) protection analysis/recommendation, identification of right-of-way requirements, number of property owners involved, listing of permit requirements, geotechnical investigation and cost estimate based on unit costs for major elements of work. In addition, the following design criteria shall be developed:

- Site Development
- Structural Design
- Architectural Design
- Hydraulic Analysis
- Mechanical Design
- Electrical Design
- Instrumentation and Process Control
- Corrosion Control
- Odor Control
- Noise Control
- Arc Flash Analysis
- Power System Study Report

The hydraulic analysis must include calculation of the system curve. The system curve must be plotted on the pump curve with the operating point identified. Two system curves must be calculated, one for the maximum expected operating head and one for the minimum expected operating head. The minimum head curve must be calculated with new clean pipe and the wet well water surface at the lead pump "ON" point. The maximum head curve must be calculated for dirty pipe and the wet well at the "OFF" point, representing the condition after the pipe has been in service for an extended period of time. Every effort shall be made to select a pump that operates at its best efficiency point for both system curves. Peak and average flows must be considered

when selecting the appropriate pump. Pump manufacturer data sheets must also be included in the preliminary design report submission.

If the pump station is being designed with built-in expansion capability, an economic analysis must be submitted that identifies the life cycle cost of:

1. Adding a third, equal sized pump to operate in parallel
2. Upgrading the existing pumps with larger impellers and motors
3. Replacing the two existing pumps with two new pumps

The analysis must consider capital costs as well as the operational costs of the lift station. Design assumptions (e.g. cost of electricity, cost of money) must be determined in consultation with the City of Reno.

The Preliminary Design Report must be submitted to the City for review and approval.

C. Design Conference

After submission of the preliminary design report a design conference will be held. The conference shall include:

1. The City of Reno:
   - Operation and Maintenance,
   - Utility Service, and
   - Development Services
2. The design engineer
3. The property owner/developer
4. The construction contractor, if one has been selected.

Representatives from the City of Sparks or Washoe County may also be present if the lift station could potentially serve property in those jurisdictions.

During this meeting the preliminary design report will be discussed and comments will be provided. The meeting will confirm pumping flow rates, discuss any additional design exceptions and review any project specific concerns/needs.

D. Final Design Documents

The final design may be completed after the design conference, incorporating any comments received. The final design documents will include construction drawings on 22 inch x 34 inch paper and technical specifications for the equipment. All design drawings must be drawn to a scale found on a common engineer's or architect's scale. Multiples of 10 and one-tenth for the engineering scales (e.g. 4 and 400 scale) are also acceptable.

The final design documents must contain the design criteria including the different combinations of pump flow rates and total dynamic head and must be submitted to the City of Reno Development Services as a permit for approval.

E. Pre-Construction Conference

A pre-construction conference shall be held prior to the commencement of any construction on the wastewater lift station. At a minimum, the design engineer, the general contractor, construction inspector (as required by the permit), City of Reno Utility Services, and City of Reno Operation and Maintenance shall be present at the pre-construction conference.

F. Commissioning and Acceptance of Public Lift Stations

1. Startup Checklist and Procedure

Prior to wastewater lift station acceptance by the City of Reno a thorough inspection and operational check of the station is required. The design engineer shall submit a proposed start-up checklist to the City prior to the completion of construction. The start-up shall include:

1. Confirm static and dynamic pressures
2. Confirm all alarms, remote control capability and reporting functions
3. Calibration of instruments including flow meter and level controls
4. Confirm operation of lift station under the standby power system
5. All equipment must be calibrated
6. Provide schooling on systems operations

2. Startup

Once the start-up procedure is finalized, the start-up will be scheduled. The following are required to be present at the start-up:

- The engineer in responsible charge of the lift station design
- The electrical and instrumentation engineer
- The mechanical engineer
- The general contractor superintendent
- A representative from the electrical contractor
- A representative from the instrumentation contractor
- A representative from the mechanical contractor
- The pump manufacturer's representative
- A representative from the City of Reno Operation and Maintenance Section
- A representative from the City of Reno Utility Services Section

The installation of mechanical and electrical equipment in accordance with these design standards requires, upon completion and prior to final inspection, testing to ensure the standards are met and to maintain quality control.

Pump testing must include pumping rate and pressure for each pump and combination thereof, and electrical testing procedures that apply to all electrical equipment. Load bank testing procedures that apply to standby generators must be provided.

The wastewater lift station will not be approved by the City of Reno until all components are tested individually and as a complete system. If one component fails it must be repaired or replaced and re-tested. Once the individual component is operating properly the entire system must be re-tested to assure the system as a whole is operating properly.

Flow tests shall be conducted that allow each pump to cycle a minimum of 10 times. The test shall be run so that the pumps cycle continuously as if in permanent operation. While conducting the test, flow rates must be recorded through the use of the flow meter and through measuring of levels in the wet well. The discharge pressures from each pump must also be recorded during the test. The contractor will be required to supply test water if onsite water or sewage is not available.

Tests must be non-destructive, and procedures used must be approved by the City. Generally testing must comply with the procedures outlined in International Electrical Testing Association (NETA) Acceptance Testing Specification for Electrical Power Equipment and Systems: ANSI/NETA-ATS.

3. Lift Station Electrical Equipment

Testing and protective device settings must be performed and confirmed by a NETA Certified Test Firm, in addition to the testing by the contractor.

Ground resistance testing must be performed for grounding systems using the fall of potential method. Ground resistance test services must be provided by a fully trained and equipped testing company such as Electro-Test Inc., General Electric, Cutler Hammer – Eaton Corporation, or equal.

The test must be complete enough to be conclusive and to insure proper operation. This must be certified in test reports submitted to the Engineer.

G. Documentation for Private or Public Lift Stations

Prior to acceptance of the lift station the contractor shall deliver to the City copies of the following:

- Record drawings for all components of the lift station, including electronic CAD files and PDF files.
- As-built control schematics
- As-built wiring diagrams
- Pump specifications, test data and manufacturer's O&M manuals

- Generator equipment data and manuals
- Mechanical and electrical component lists
- Keys or entry tools for all vaults and equipment enclosures (City owned only)
- Contact Information for all warranties (City owned only)
- Stamped & Signed letter from Engineer of Record (as defined in the latest edition of the City of Reno Public Works Design Manual) certifying the lift station was constructed per plan and specifications

H. Warranty

All sanitary sewer lift stations must include a one-year warranty against defects in workmanship and materials. The one-year time frame must begin once the City has made final acceptance. Items that require repair under the one-year warranty period must be covered under an additional one-year warranty after the repair is made.

Any warranty claim must be acknowledged by the responsible party and a course of action determined with one week of the initial notification.

I. Instruction of City Personnel

City personnel shall receive operation and maintenance training from factory authorized representatives of the major equipment to include, but not necessarily be limited to, the pumps, pump controls, standby generator, engine pump, VFD motor controllers, RTU equipment, and SCADA supervisory control and data acquisition. The training shall be performed prior to acceptance of the lift station by the City.

SECTION IV TYPICAL LIFT STATION DIAGRAMS

The following drawings are intended to illustrate the requirements delineated in the design standards. They are not to scale, do not show all lift station components and should be taken to be conceptual. Each lift station will require an independent site analysis to identify the best configuration for the required components.

The pre-design conference will address the general site layout and required deviations from these conceptual configurations will be determined at that time for the specific project under consideration.

This pre-design conference will include Utility Services, as well as City of Reno Operation and Maintenance personnel.

A. ATTACHED DIAGRAMS:

R-240 Flow Schematic

R-241 Sump- Detail

R-242 Submersible Pumping Station

R-243 Below Grade Self Priming Pumping Station

R-244 Above Grade Self Priming Pumping Station

R-245 Bypass Pumping Valves & Connection

R-246 Force Main Trench

R-247 Test Station

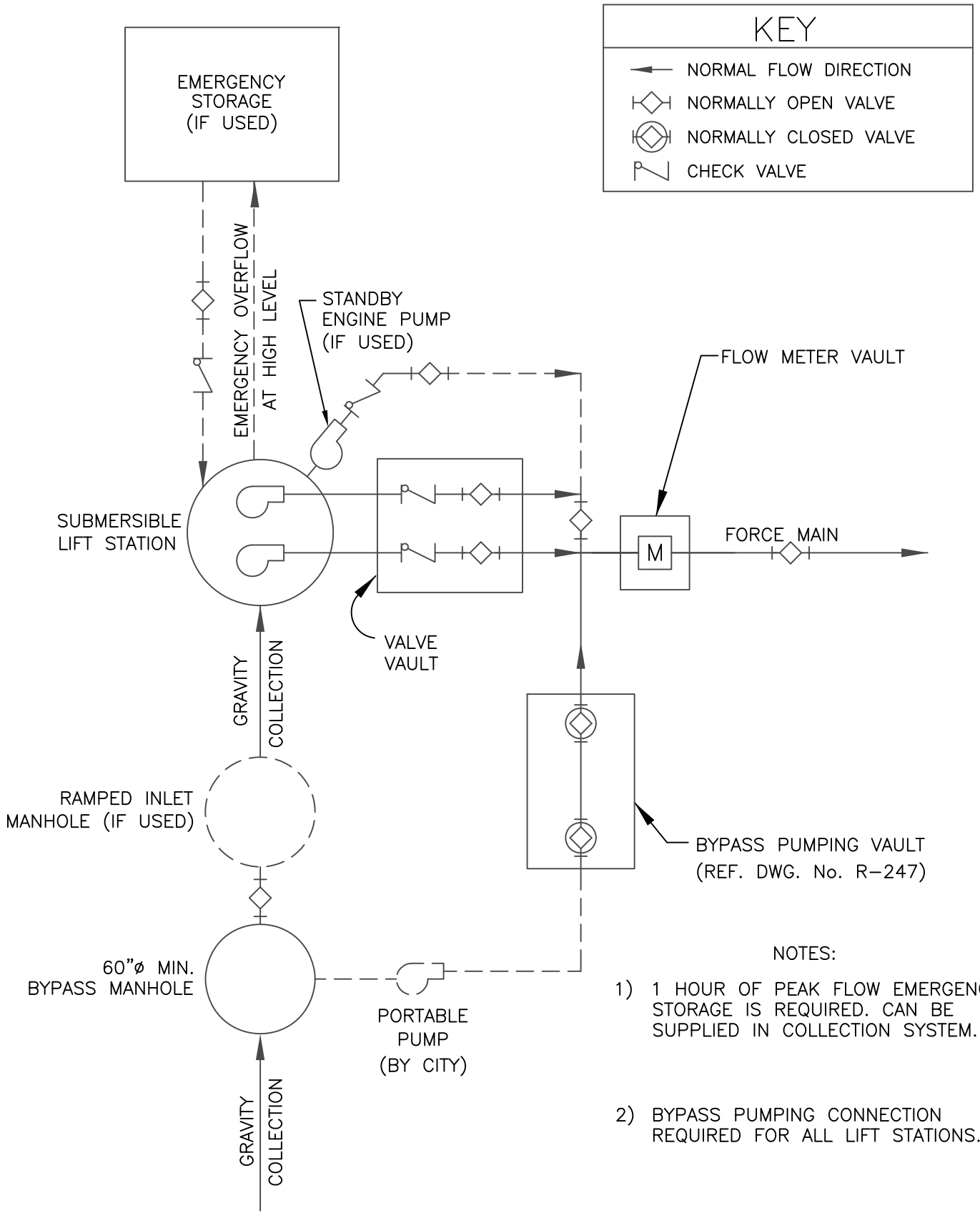
R-248 Odor Control Chemical Injection

R-249 Cable Tray

R-250 Standby Diesel Engine Driven Pump

R-251 Ramped Inlet Pumping Station

R-252 Drop Bowl

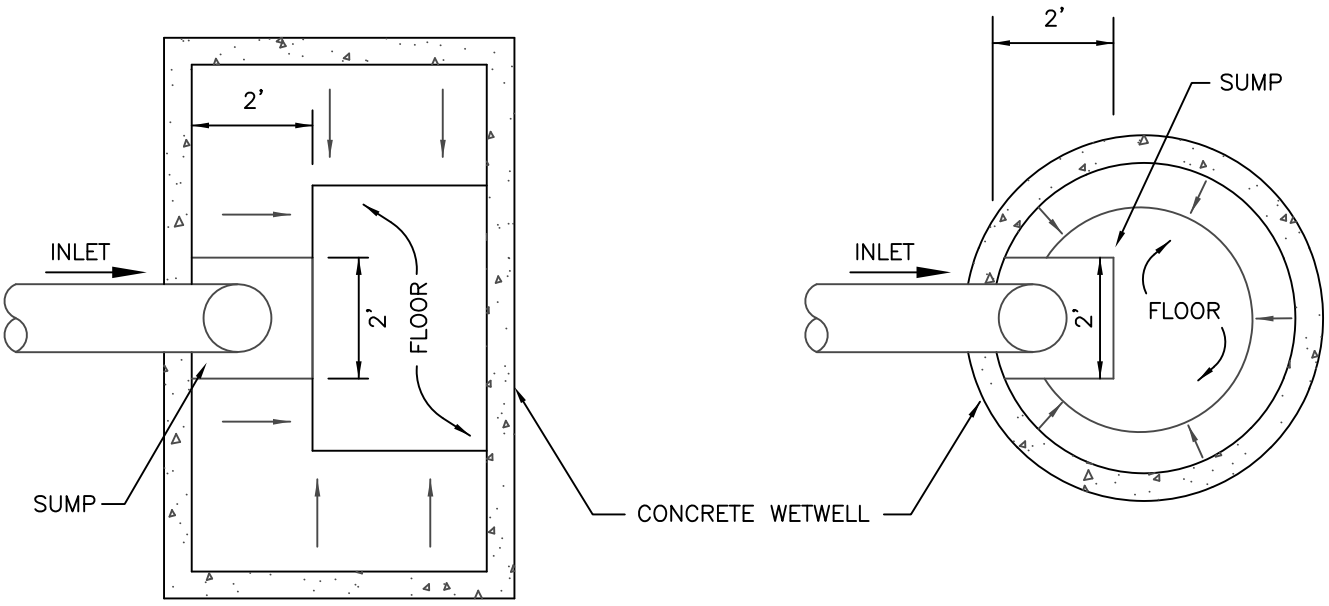


NOTES:

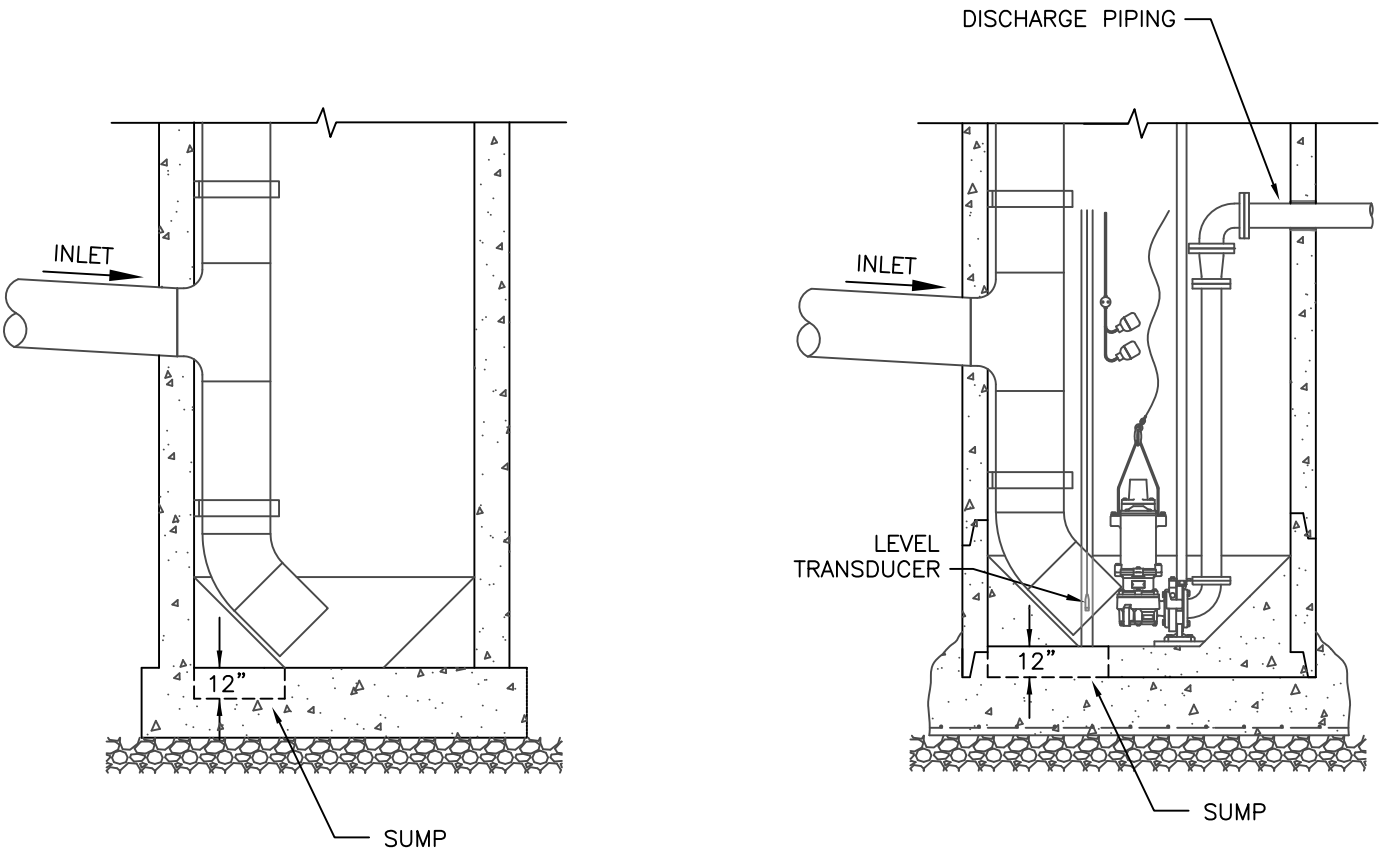
1) 1 HOUR OF PEAK FLOW EMERGENCY STORAGE IS REQUIRED. CAN BE SUPPLIED IN COLLECTION SYSTEM.

2) BYPASS PUMPING CONNECTION REQUIRED FOR ALL LIFT STATIONS.

	STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
RENO	FLOW SCHEMATIC	DETAIL #R-240
		APPROVED BY: KK | DATE: 6/2024

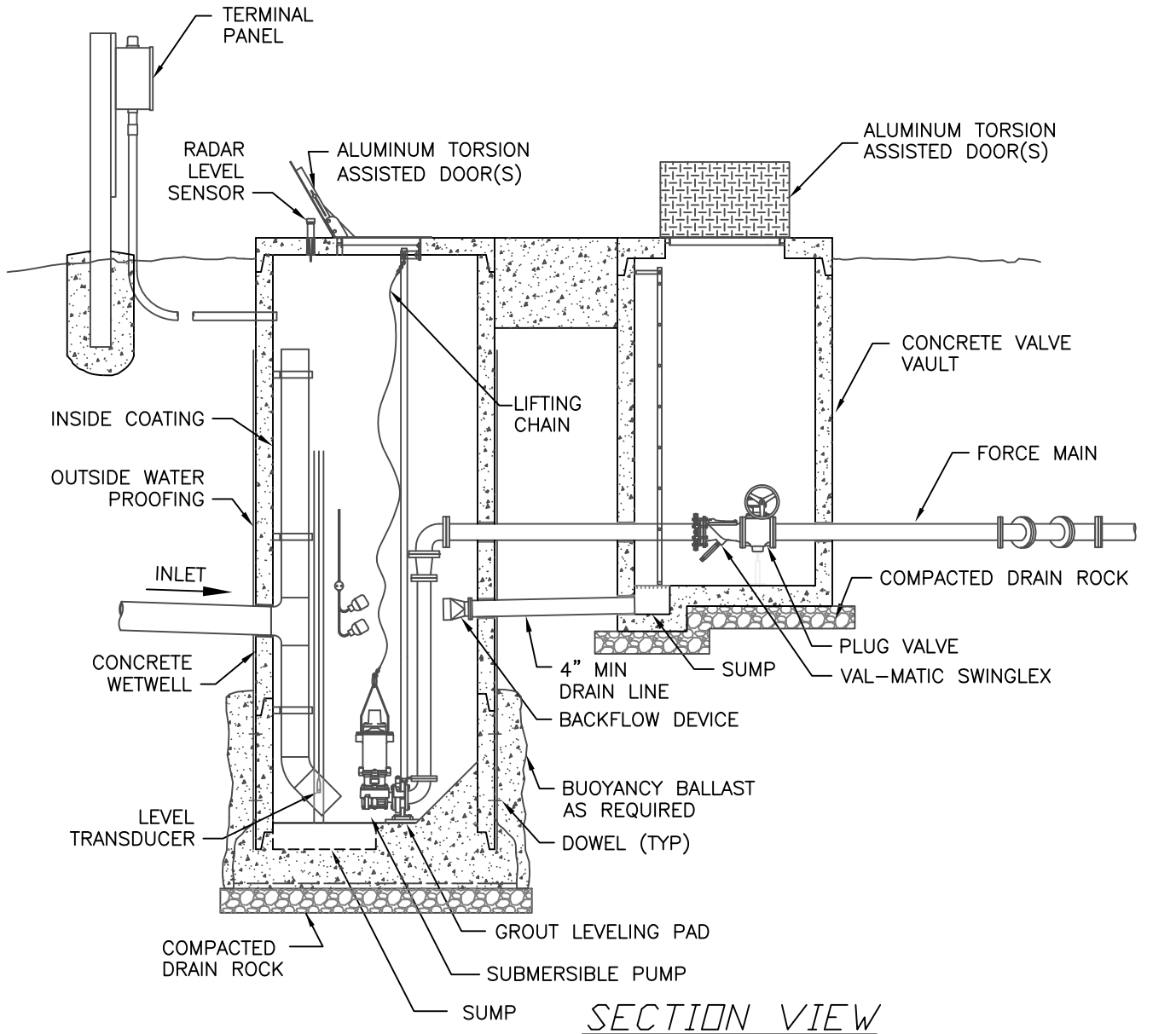


PLAN VIEWS

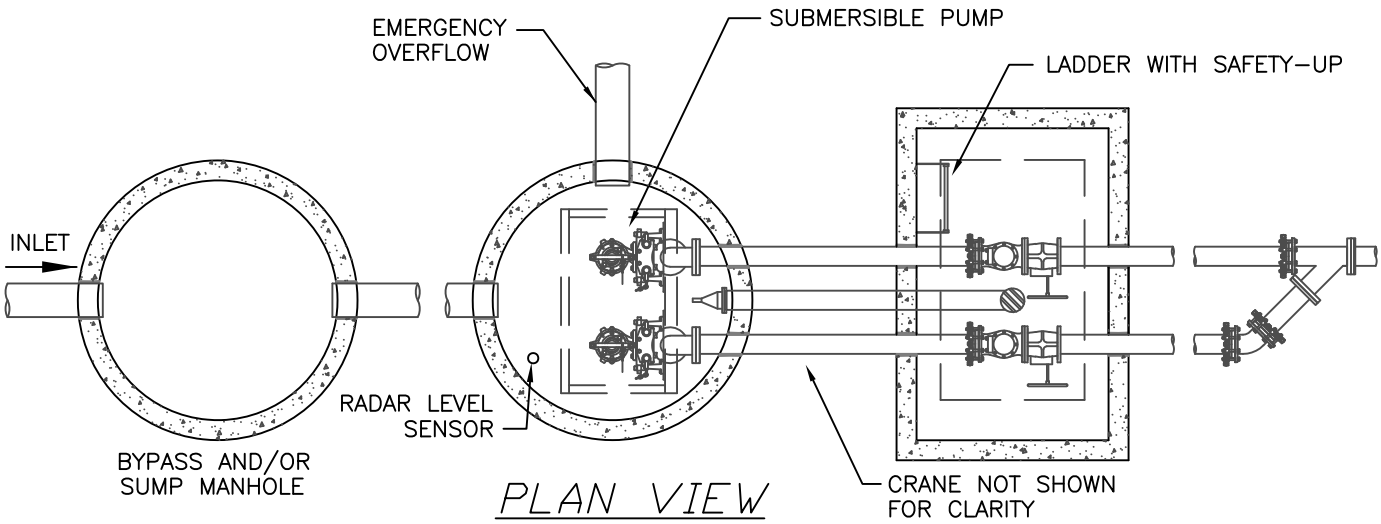


SECTION VIEWS

STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
SUMP DETAIL	DETAIL #R-241
	APPROVED BY: KK | DATE: 6/2024

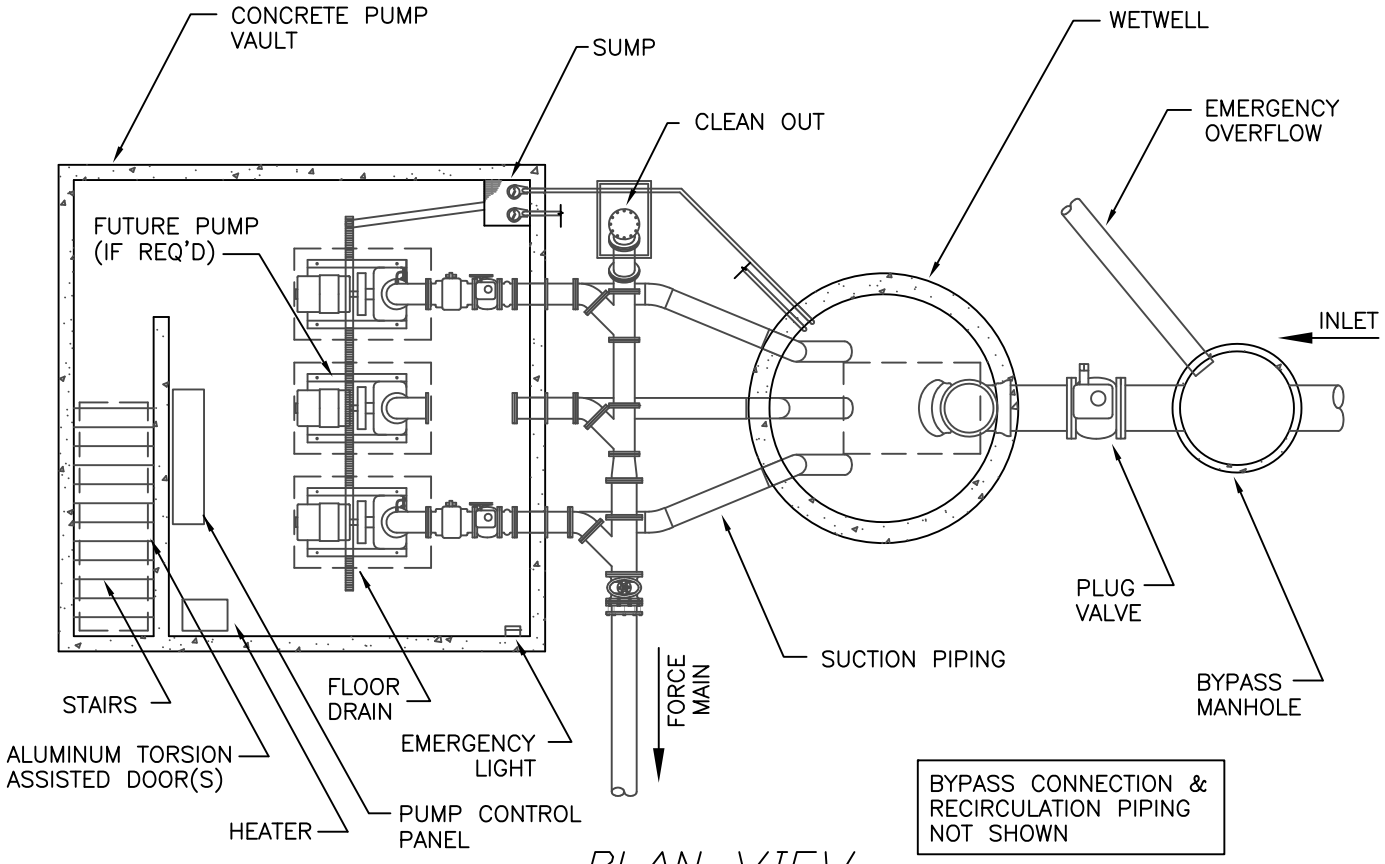


SECTION VIEW

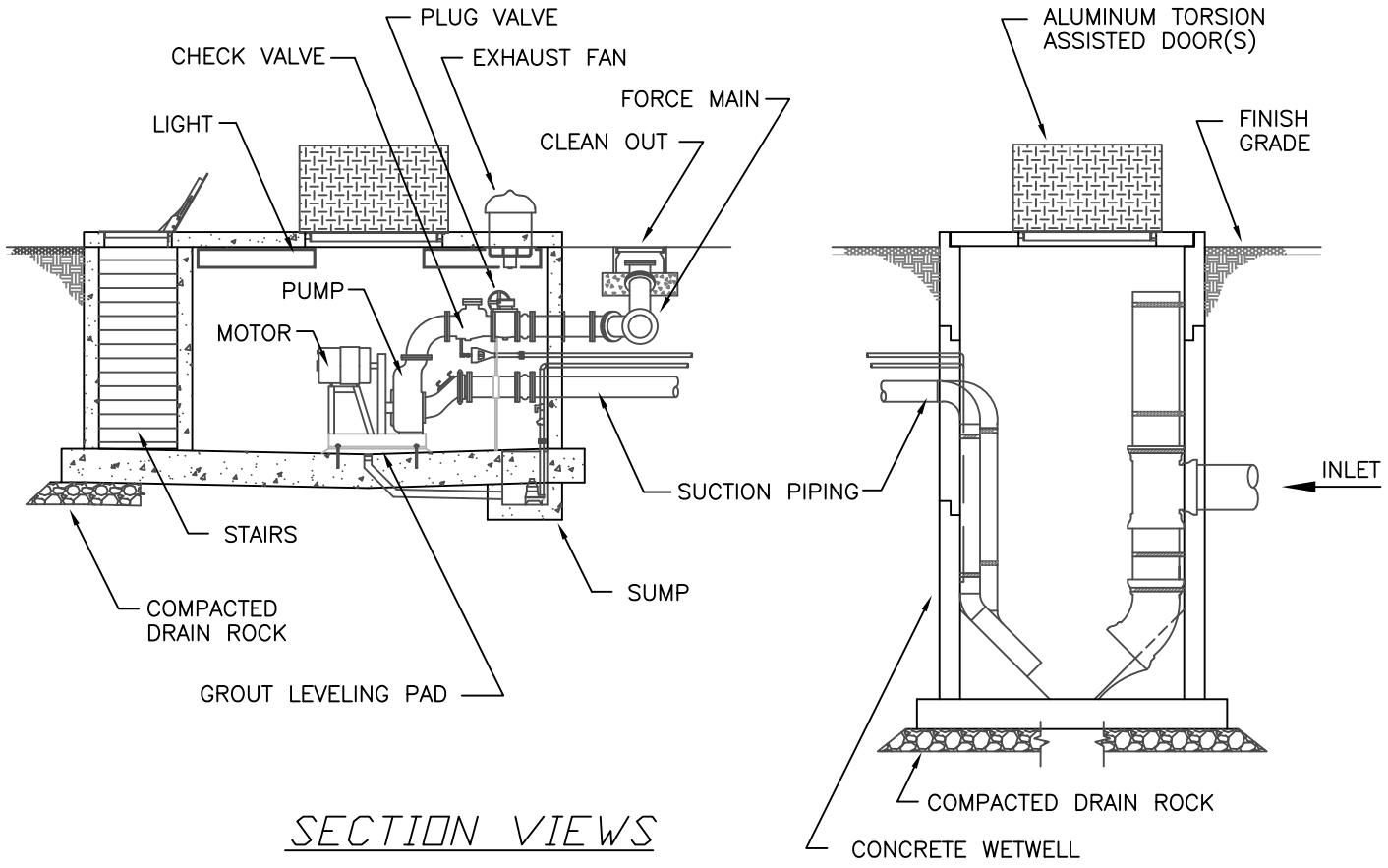


PLAN VIEW

STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
SUBMERSIBLE PUMPING STATION	DETAIL #R-242
	APPROVED BY: KK | DATE: 6/2024



PLAN VIEW



SECTION VIEWS

STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION

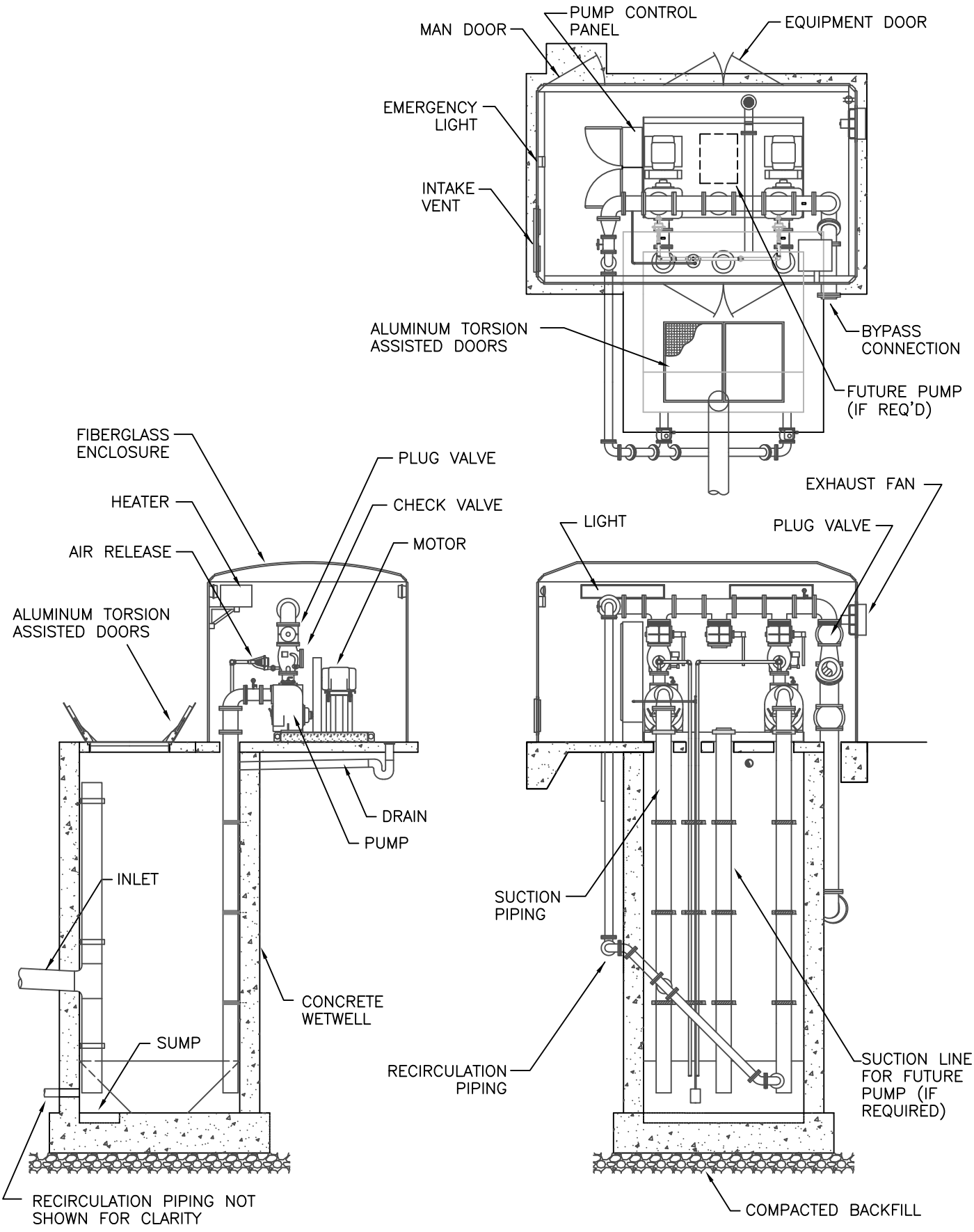
DRAWING No.

BELOW GRADE SELF PRIMING PUMPING STATION

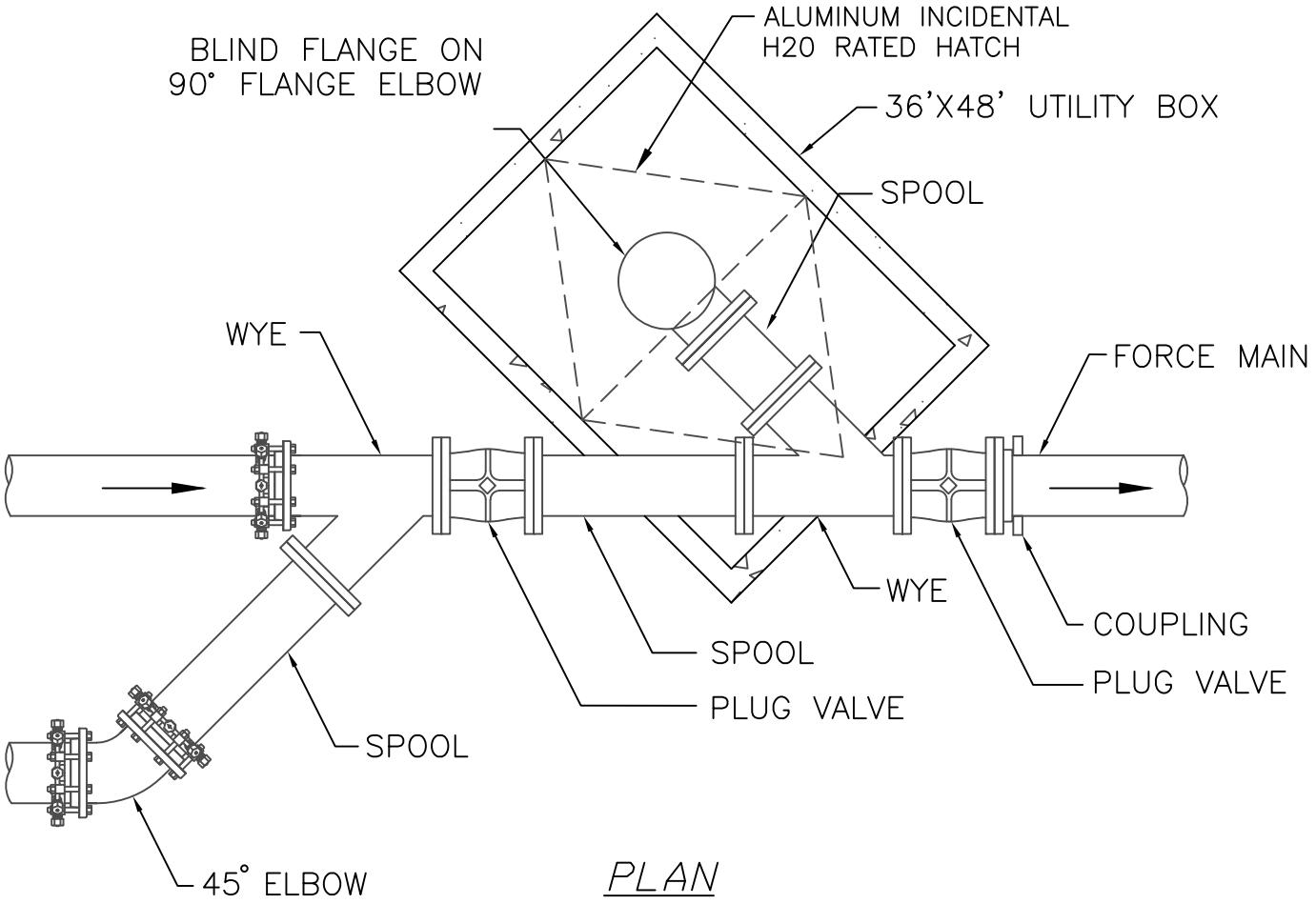
DETAIL #R-243

APPROVED BY: KK

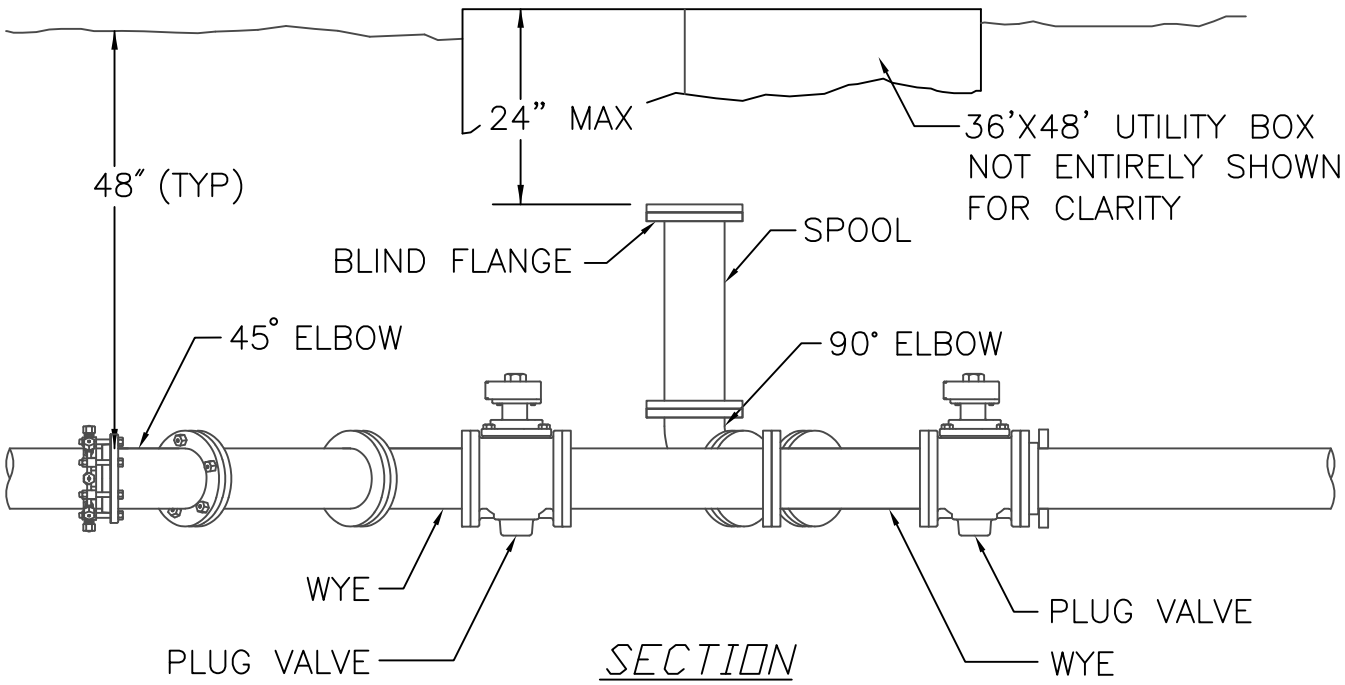
DATE: 6/2024



RENO	STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
	ABOVE GRADE SELF PRIMING PUMPING STATION	DETAIL #R-244
		APPROVED BY: KK | DATE: 6/2024



PLAN



SECTION

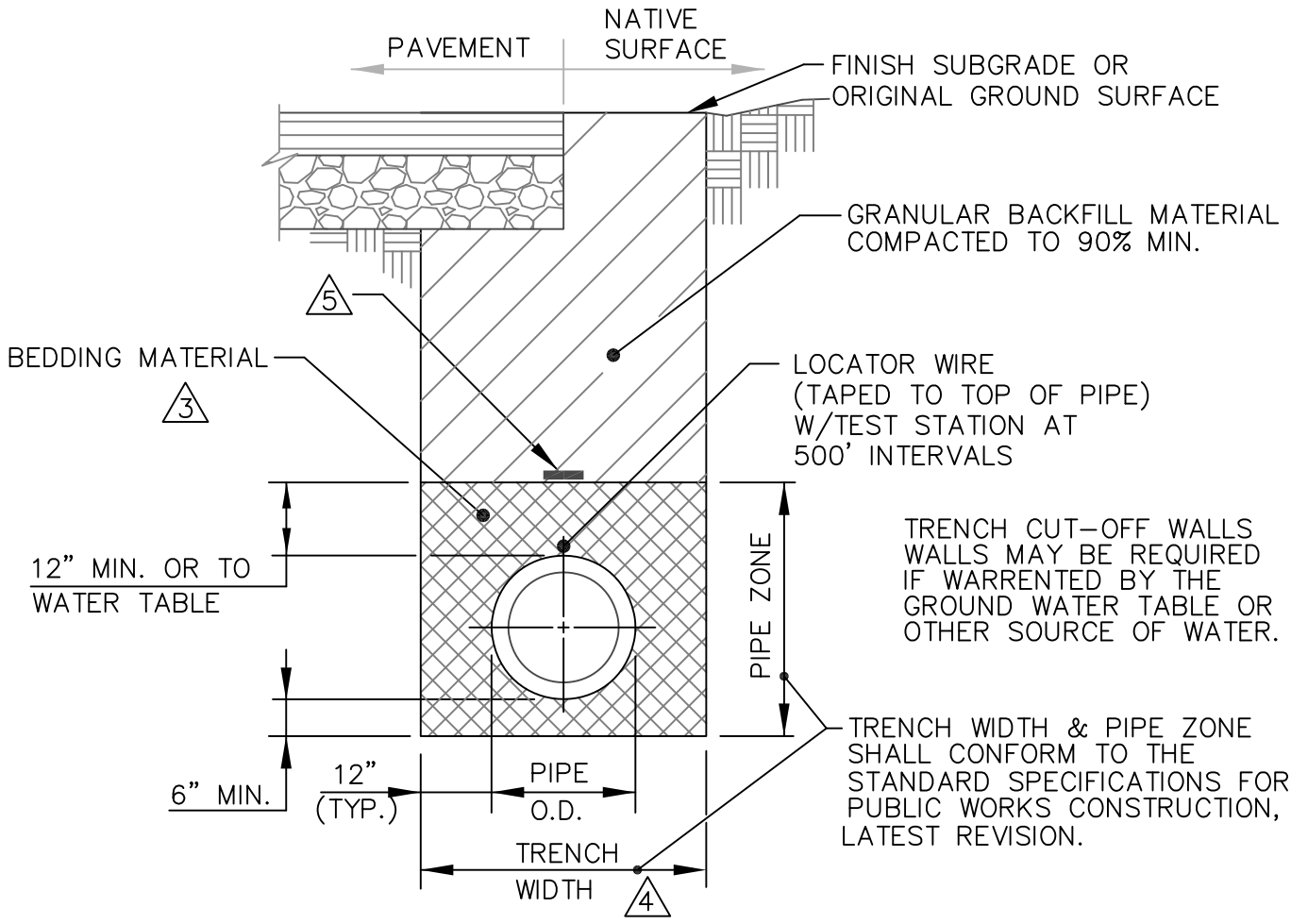
STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION

DRAWING No.

BYPASS PUMPING VALVES AND CONNECTION

DETAIL #R-245

APPROVED BY: KK | DATE: 6/2024



NOTES:

1. A PERMIT MUST BE OBTAINED FROM THE CITY ENGINEER PRIOR TO CUTTING ANY PUBLIC RIGHT-OF-WAY. 24 HOURS PRIOR TO TRENCH EXCAVATION, THE PERMITTEE MUST NOTIFY THE CITY EXCAVATION PERMIT INSPECTOR OR APPLICABLE ENGINEER OF RECORD. SEE RELATED STANDARD DETAIL DRAWING NOS. R-103 (141), R-204 (306), R-119 (312), R-120 (305,320) AND R-121 (305,320).

2. ALL MATERIALS AND INSTALLATION PROCEDURES SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, LATEST REVISION.

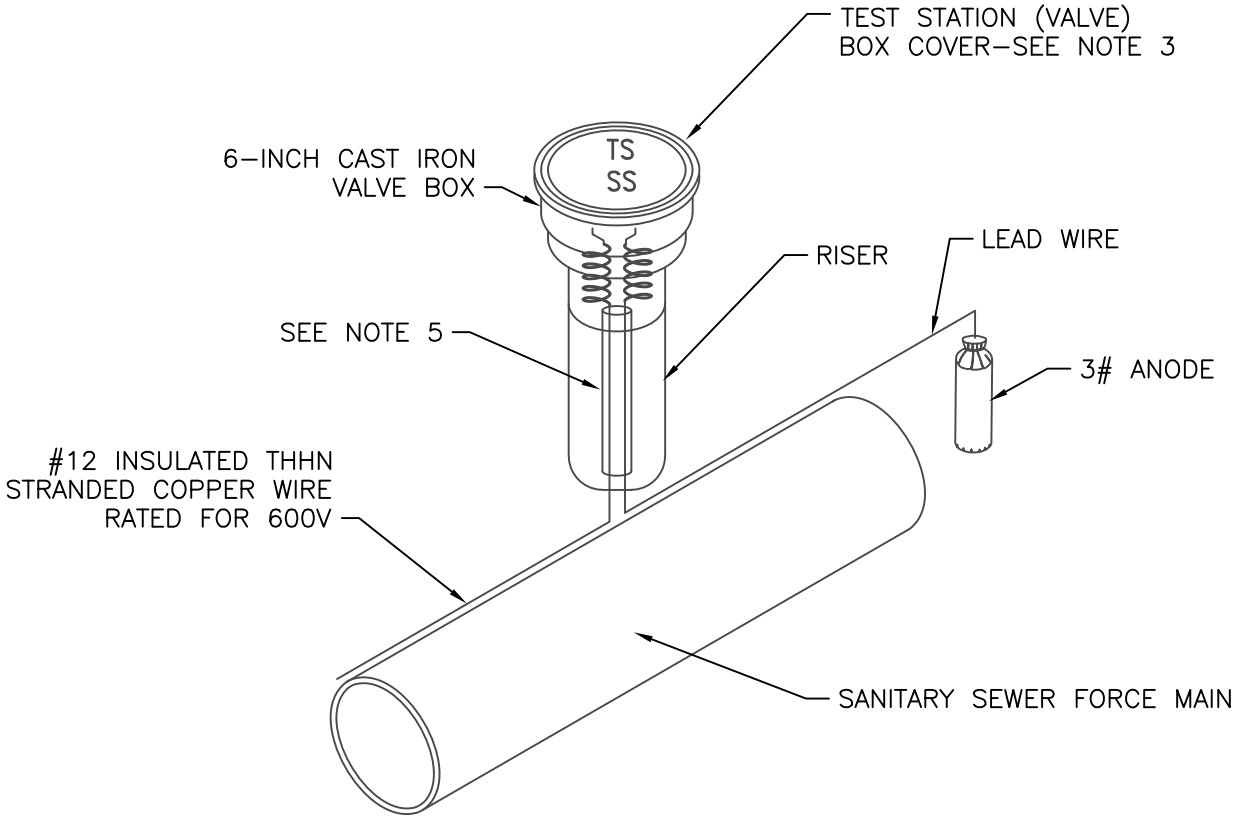
3. FORCE MAIN BEDDING MATERIAL SHALL BE CLASS "A", "B", OR "C", COMPACTED TO 90% MINIMUM. BACKFILL SHALL BE GRANULAR MATERIAL COMPACTED TO 90% MIN.

4. ALL EXCAVATIONS SHALL CONFORM TO THE LATEST O.S.H.A. REQUIREMENTS. SHORING OR SLOPED CUT MAY BE NECESSARY, BUT THERE WILL BE NO PAYMENT FOR ADDITIONAL EXCAVATION, BEDDING, BACKFILL, OR SHORING.

5. INSTALL GREEN IDENTIFICATION TAPE MARKED "SEWER FORCE MAIN"

6. FORCE MAIN SHALL HAVE A MINIMUM OF 4' OF COVER MEASURED FROM PROPOSED FINISH GRADE TO TOP OF PIPE

	STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
RENO	# FORCE MAIN TRENCH	DETAIL #R-246
		APPROVED BY: KK | DATE: 6/2024



NOTES:

1. TEST STATIONS SHALL BE INSTALLED AT ALL ANGLE POINTS AND, AT A MAXIMUM, 1000–FOOT INTERVALS.

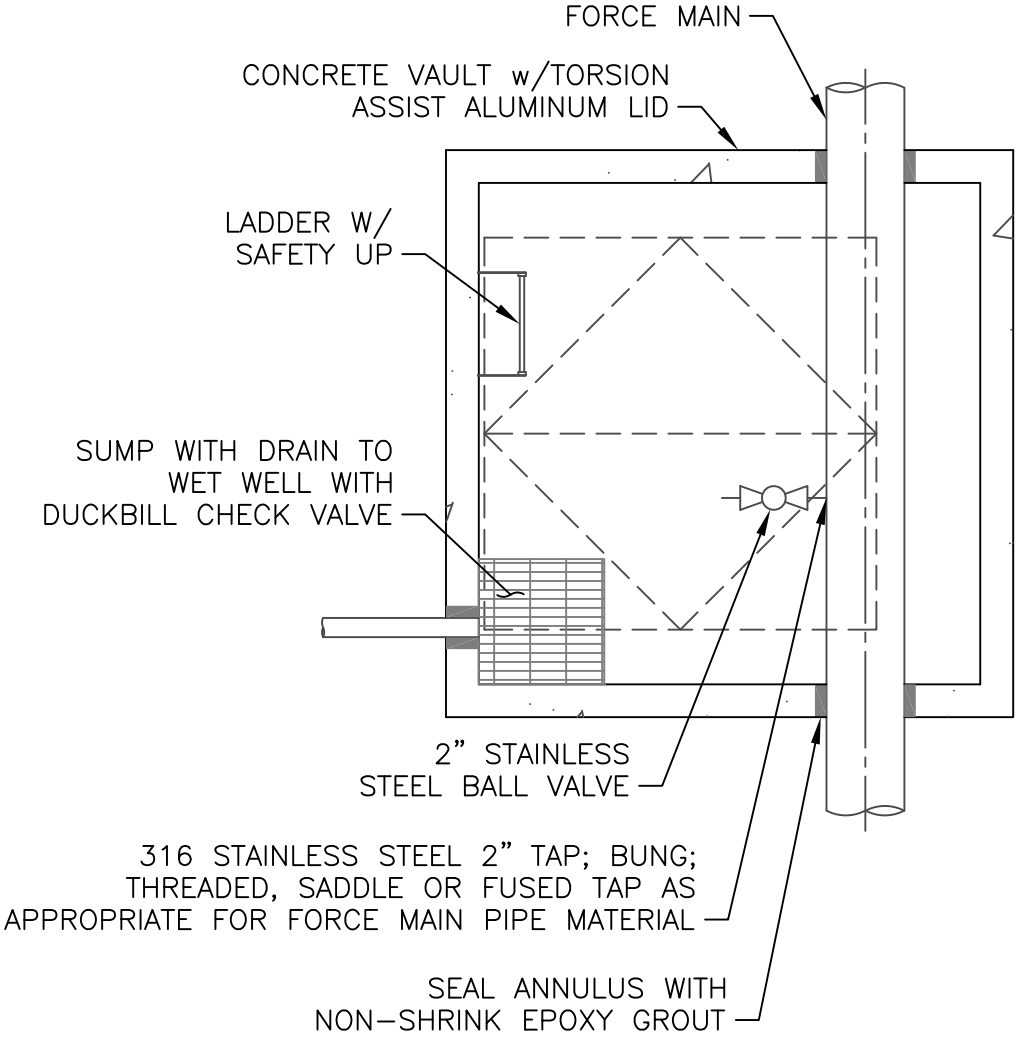
2. A 3# ANODE WILL BE ATTACHED ON THE TRACER WIRE.

3. THE TEST STATION BOX COVER SHALL BE MARKED "TS SS" OR "TS SEWER" OR SIMILAR.

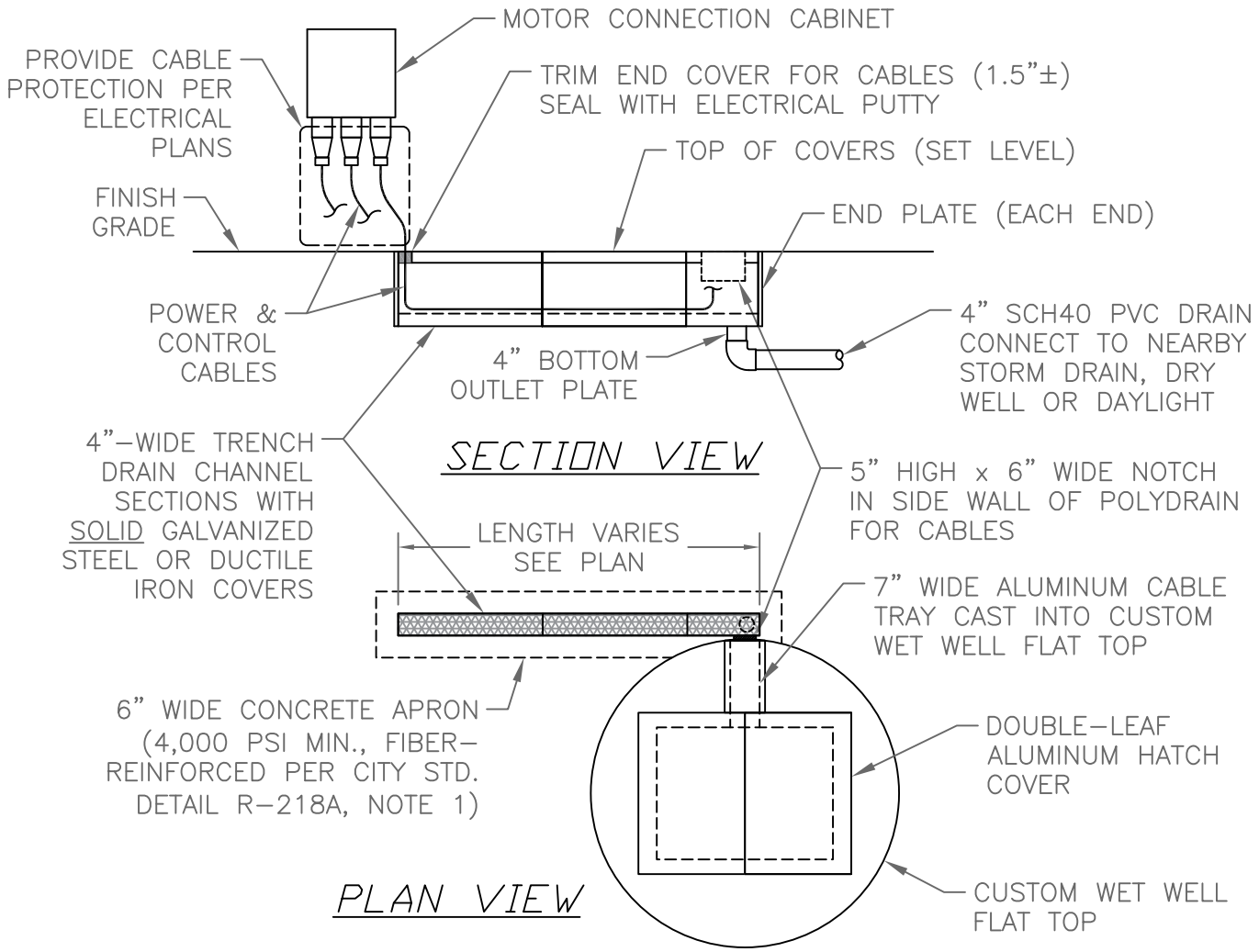
4. THE TEST LEAD WIRE SHALL BE LONG ENOUGH TO EXTEND FOUR (4) FEET ABOVE GROUND LEVEL AND SHALL TERMINATE IN A TEST STATION BOX.

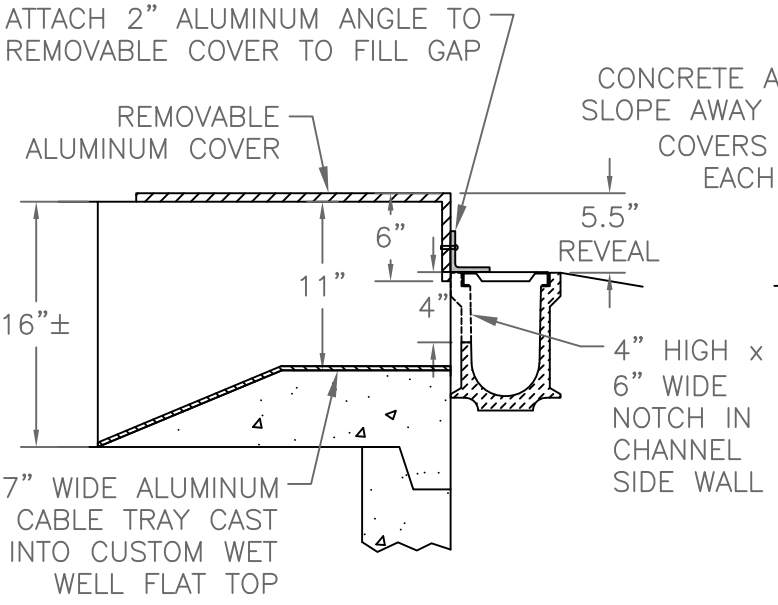
5. USE 3/4–INCH PVC OR PE PIPE AS A LEAD WIRE CONDUCTOR PIPE. PLACE APPROXIMATELY 6–INCHES ABOVE CARRIER PIPE AND INTO TEST STATION BOX.

	STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
RENO	TRACER WIRE TEST STATION	DETAIL #R-247
		APPROVED BY: KK | DATE: 6/2024

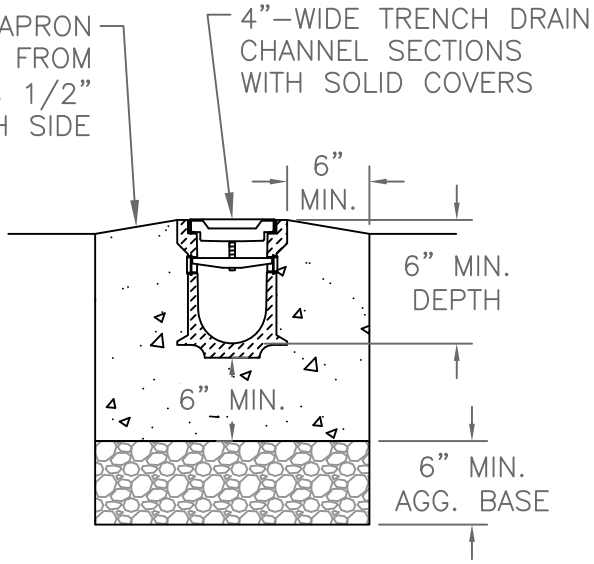


STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
ODOR CONTROL CHEMICAL INJECTION	DETAIL #R-248
	APPROVED BY: KK | DATE: 6/2024



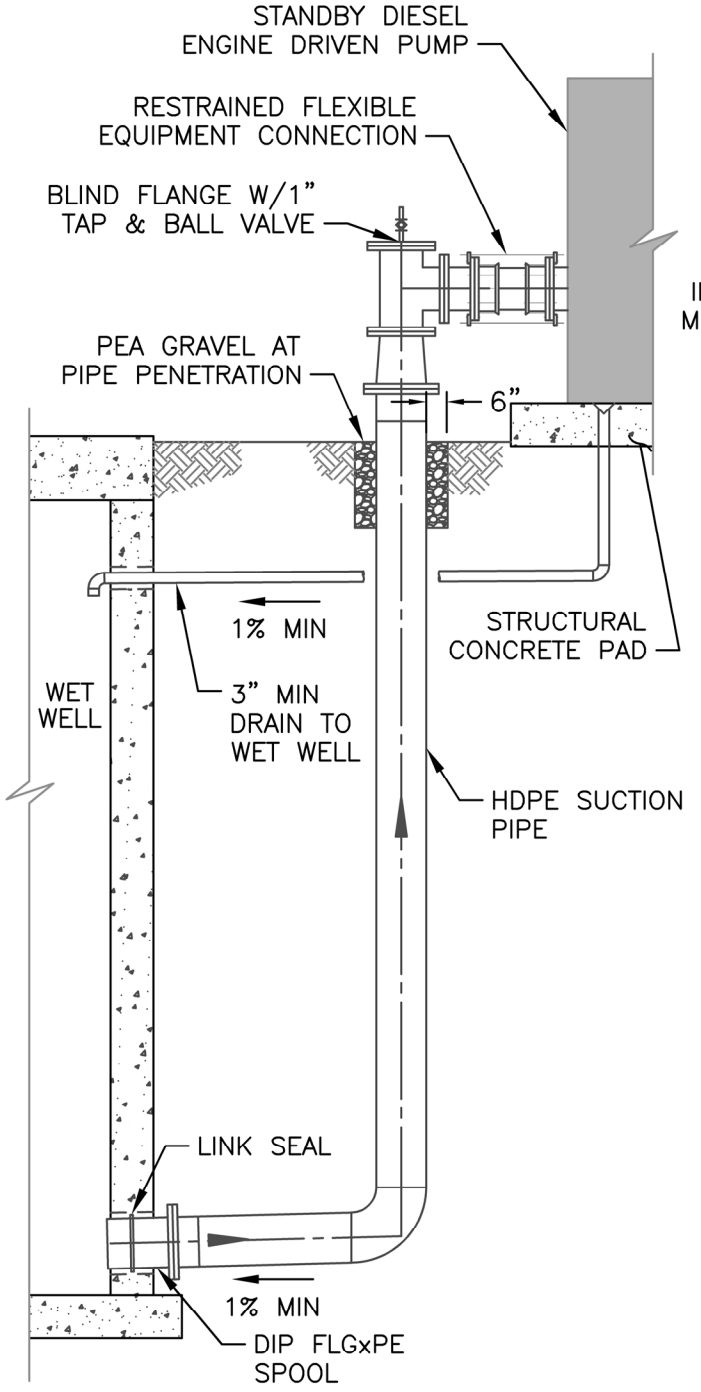


SECTION VIEW AT WET WELL

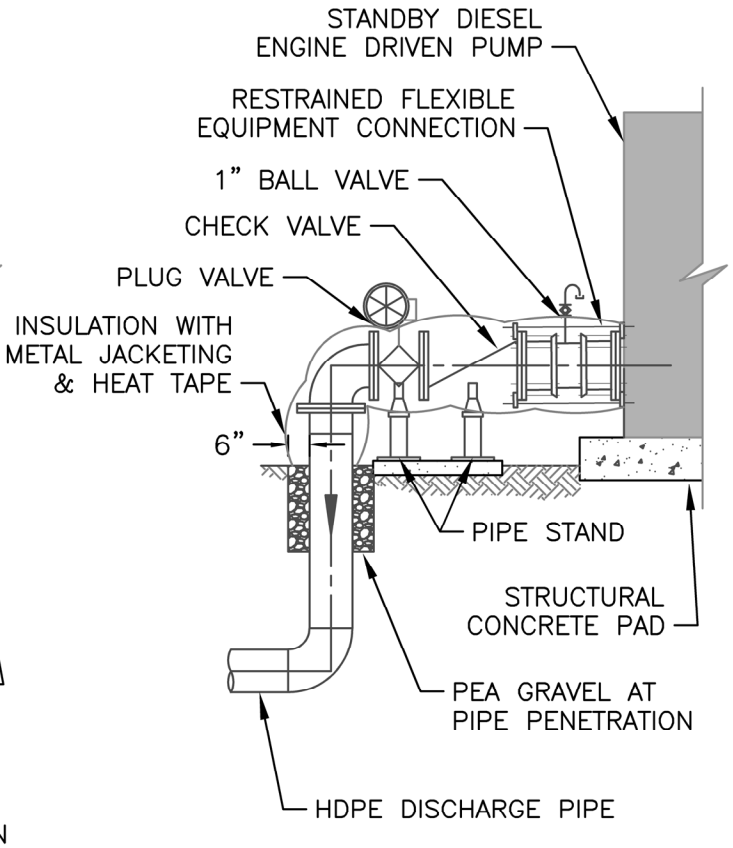


TYPICAL SECTION VIEW

RENO	STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
	CABLE TRAY	DETAIL #R-249
		APPROVED BY: KK | DATE: 6/2024

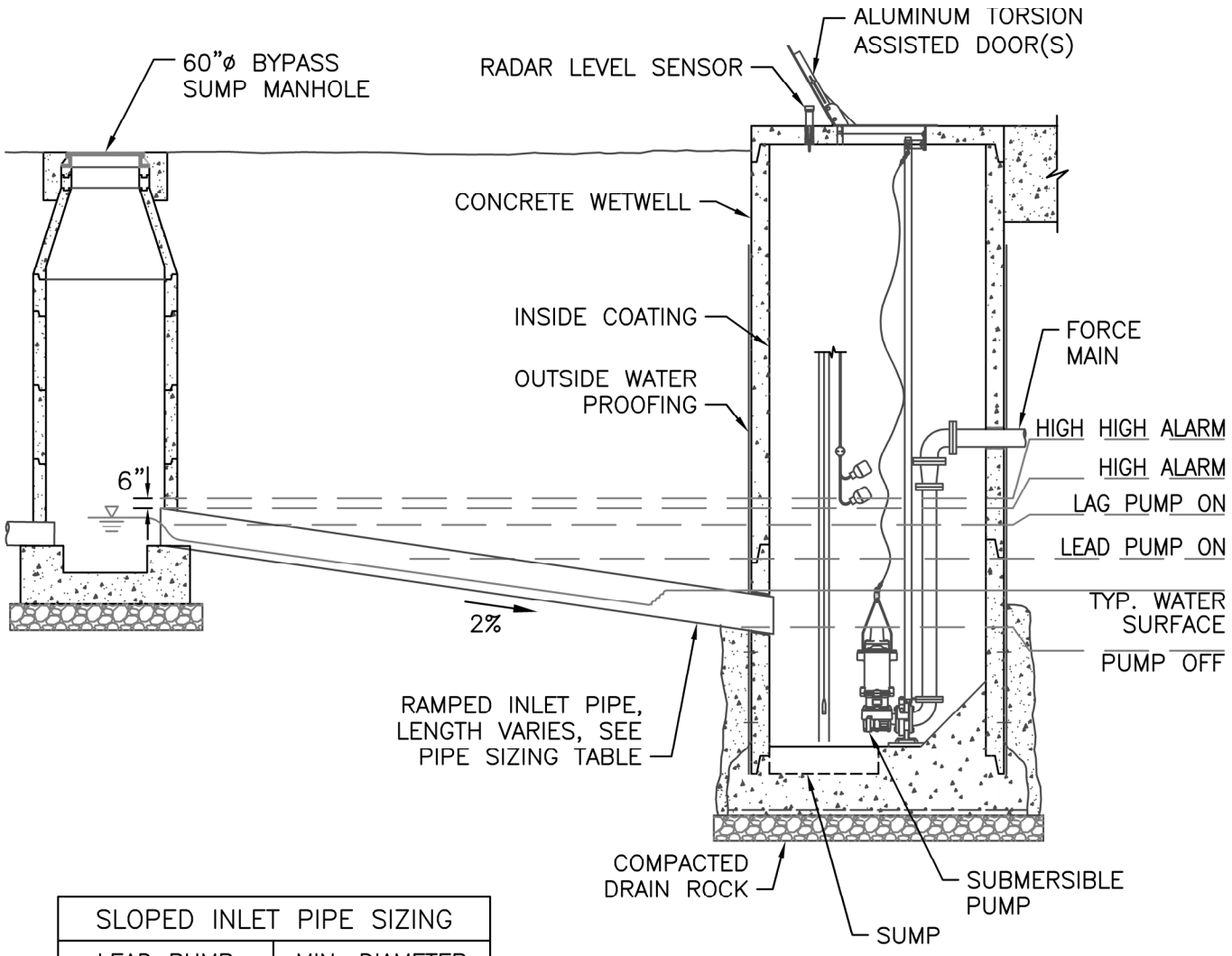


PUMP SUCTION SECTION



PUMP DISCHARGE SECTION

	STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
RENO	STANDBY DIESEL ENGINE DRIVEN PUMP	DETAIL #R-250
		APPROVED BY: KK | DATE: 6/2024



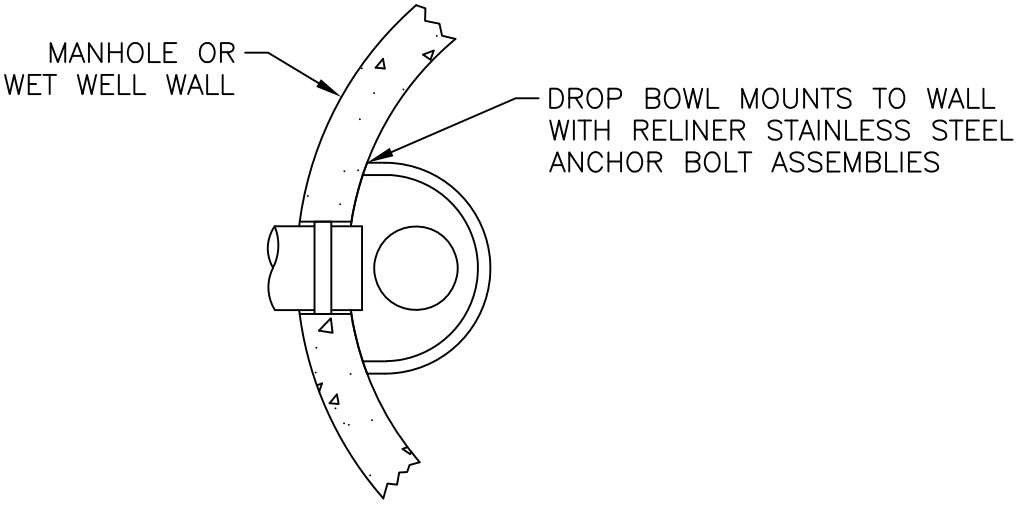
SLOPED INLET PIPE SIZING	
LEAD PUMP FLOW (GPM)	MIN. DIAMETER (IN)
300	10
500	12
600	15
1800	18
2500	24
3300	27

NOTE: RAMP DESIGN TO BE IN ACCORDANCE WITH HI STANDARD 9.8 APPENDIX C.

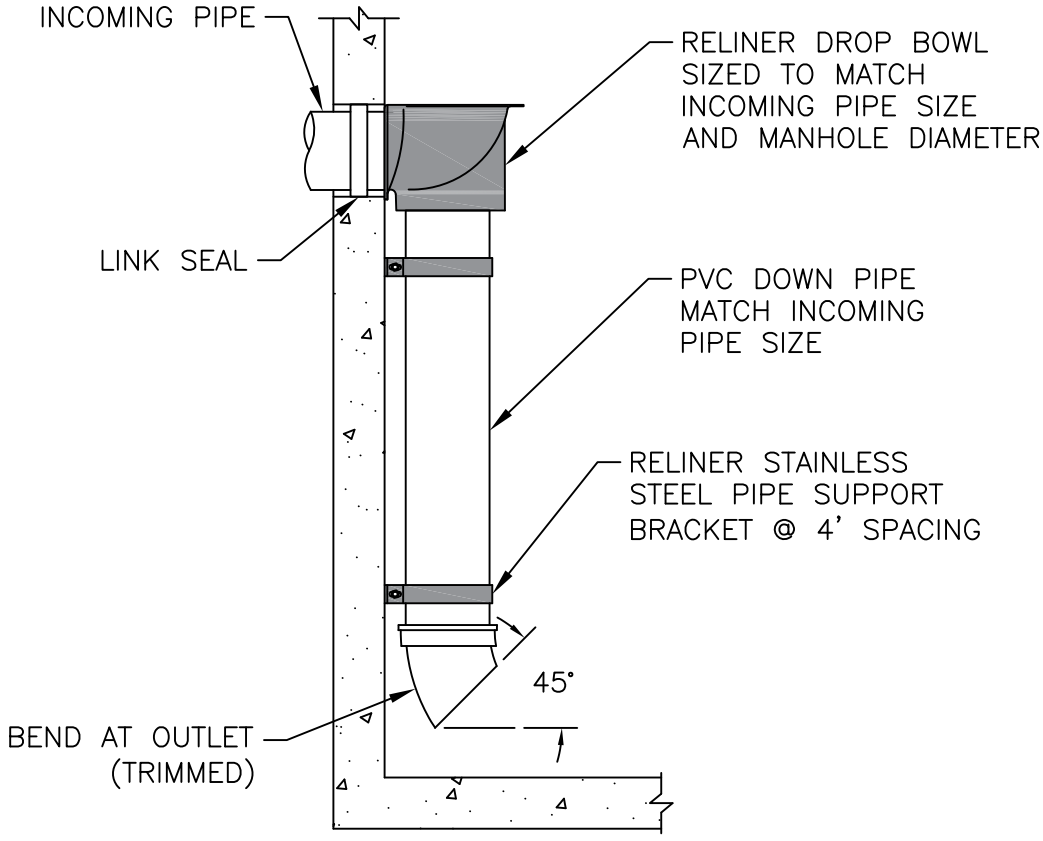
SECTION VIEW

SCALE: NONE

STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
RAMPED INLET PUMPING STATION	DETAIL #R-251
	APPROVED BY: KK | DATE: 6/2024



PLAN VIEW



SECTION VIEW

STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION	DRAWING No.
DROP BOWL	DETAIL #R-252
	APPROVED BY: KK | DATE: 6/2024

SECTION V APPENDICES

APPENDIX A – LEVEL SENSOR SPECIFICATIONS

APPENDIX B - TELEMETRY AND SCADA SYSTEM SPECIFICATIONS

APPENDIX A

LIFT STATION LEVEL SENSOR SPECIFICATIONS

LEVEL TRANSMITTERS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies requirements for lift station level transmitters and associated indication devices and accessories.

1.02 SUBMITTALS

A. Submittals must be provided to the City for review and must include the following:
   1. Marked Contract Document Mechanical and/or Electrical Plan drawings, sections, and details showing sensor installation locations and details.
   2. Marked product literature of all equipment and features to be provided.
   3. Installation drawings for specifically the transmitters, sensors, and mounting accessories to be provided.
   4. Electrical and signal connection drawings for specifically the transmitters and sensors to be provided.
   5. List of miscellaneous items, cables, spare parts, that will be provided.
   6. Marked product literature for surge protectors.

PART 2 PRODUCTS

2.01 GENERAL

A. Measuring elements and transmitters must comply with the following requirements:
   1. Measured parameter output indicators complying with paragraph 2.02 must be provided with any transmitter that does not include an integral indicator. Indicators, whether integral or separate, must be calibrated in process units, and engraved on the indicator scale plate.
   2. The two-wire type transmitters must have operating power derived from the signal transmission circuit.
   3. Transmitters must meet specified performance requirements with load variations within the range of 0 to 600 with the power supply at a nominal 24 volts DC with the default range of 0 to 100% corresponding to 4 to 20 mAdc.
   4. Transmitter output must increase with increasing measurement.
   5. Time constant shall be adjustable from 0.5 to 5.0 seconds.
   6. Transmitter output must be galvanically isolated via electro-mechanical or optical technology.

7. Transmitter enclosures must be rated NEMA 250, Type 4, unless otherwise specified.
8. Transmitters located outdoors must be provided with surge protectors:
   a. Signal: Emerson/Rosemount Model 470 D, Emerson/EDCO SS64-036-2, CCI SPN-42 FS28 Series, or accepted equal.
   b. AC Power: UL 1449, LED indicator, screw terminal connections, NEMA 4X. EDCO HSP121A or accepted equal.
9. Two-wire transmitter located in a facility area classified as hazardous per the NFPA and the NEC must be made safe by means of an intrinsic safety barrier as specified in paragraph 2.03.
10. Four-wire transmitters must be isolated from the process and power or provided with a loop-powered signal current isolator as specified in paragraph 2.04 connected in the output signal circuit.

2.02 PROCESS PARAMETER OUTPUT INDICATOR

A. Provide digital LED or LCD indicators that integral to the instrument housing where available from the manufacturer. Displays must be scaled in engineering units, over the calibrated range of the instrument. Calibrate the indicator scale in process units.

B. Analog output indicators must be 2.5-inch milliammeter with 90-degree movement enclosed in a NEMA 7/9 rated meter case. Provide indicators with accuracy within two percent of span. Provide a diode to maintain loop continuity for indicator removal.

2.03 INTRINSIC SAFETY BARRIERS

A. Intrinsic safety barriers for two-wire transmitters must be of the active, isolating, loop powered type. Barrier shall be Stahl Series 9000 or accepted equal.

2.04 SIGNAL CURRENT ISOLATOR

A. Isolator must provide galvanic isolation of milliampere transmission signals from transmitters. Isolator must be housed in a NEMA 250, Type 4/7 conduit body and derive operating power from the signal input circuit.

B. Input and output signals must be 4 to 20 milliamperes, and error must not exceed 0.1 percent of span. Input resistance must not exceed 550 ohms with an output load of 250 ohms.

C. Isolator shall be Moore Industries SCX 4-20mAdc to 4-20mAdc / 5.5VPL / -RF, DIN rail mounted, or equal.

2.05 OPERATION AND MAINTENANCE MANUAL

A. Provide the following data:
   1. Operating and maintenance information for supplied equipment.

2.06 RADAR LEVEL SENSOR

A. General
   1. Instrument Identification: LRM
   2. Instrument Function: Wastewater Level Measurement
   3. Instrument Description: Radar Level Transmitter, Pulsed
   4. Power Supply: 24 Vdc two-wire, intrinsically safe
   5. Signal Input Process
   6. Signal Output: 4-20 mA DC, HART

B. Product Requirements:
   1. Signal Converter/Transmitter:
      a. Signal type: Pulsed radar, 6 GHz.
      b. Enclosure: NEMA 4X integral mount.
      c. Display: Multi-line digital LCD scaled in engineering units. HART standard data communication protocol.
      d. Measuring range: 0-66 ft.
      e. Accuracy: ±0.1 % of range.
      f. Ambient Temperature Range: -40 to +176°F.
      g. Pressure Range: 0 to 7 psig.
      h. Sensor: 6-inch cone
      i. Process Connection: 8-inch 150 lb. ANSI flange.
      j. Wetted Materials: 316L SS, Nitrile.
      k. FM approved for Class I Division 1
      l. Accessories:
      m. One HART programmer for all transmitters.
      n. Manufacturer: Krohne 7400 Optiwave or Accepted equal.

C. Execution:
   1. Installation:

a. Install in accordance with manufacturer's instructions. Manufacturer to provide sensor/transmitter and full-length cables

b. Coordinate size and type of specified process connection with submittals

2. Calibration:

a. Calibrate to meet requirements of set-points shown on Plans.

2.07 SUBMERGED PRESSURE TRANSDUCERS

A. General

1. Instrument Identification: LST
2. Instrument Function: Level Measurement
3. Instrument Description: Submerged Level Transmitter and Meter - Wastewater
4. Power Supply: 24 Vdc Loop Powered
5. Signal Output: 4 to 20 milliamperes into 0 to 550 ohms
6. Process Connection: Submerged, suspended
7. Scaling range: 10psi

B. Product Requirements:

1. Sensor/Transmitter:

a. Minimum 3” large diameter diaphragm with 316 Stainless Steel housing and separate suspension cable.

b. FM Approved for Class I Division 1 when used with approved barrier.

c. Accuracy of 0.25% of range and operating temperature from -25°F to 180°F.

d. Provide cable length to reach junction box without splicing.

2. Manufacturers:

a. Dwyer PBLTX

b. Accepted equal.

C. Execution:

1. Installation:
    a. Install in accordance with manufacturer's instructions. Manufacturer to provide sensor/transmitter and full-length cables
2. Calibration:
    a. Calibrate to meet requirements of set-points shown on Plans.

END OF SECTION

APPENDIX B

CITY OF RENO TELEMETRY STANDARD SPECIFICATIONS

1.1 CONTROL PANEL ENCLOSURES

A. Manufacturers:

1. Gaylord.
2. Tesco.
3. Saginaw.
4. Approved equal.

B. Enclosure Ratings:

1. NEMA 3R: Suitable for enclosures located outdoors and in damp areas.
2. NEMA 4X: Suitable for enclosures located outdoors in damp and corrosive areas.
3. All modifications to the panel enclosure including device penetrations must not compromise the enclosure rating.

C. Enclosure Accessories:

1. All enclosures must be provided with a corrosion inhibitor sized per manufacturer recommendations.
2. Each panel enclosure must be provided with a data pocket for storing wiring diagrams, operation manuals, and other documentation inside the enclosure.

D. General Enclosure Specification:

1. All enclosures for this project must be provided with top and front mounted integral sun shield if mounted as standalone panels and not integrated into an MCC or similar equipment lineup. Shield must have welded attachment brackets with rounded corners.
2. Each panel must be provided with steel backpan painted white.
3. Unless otherwise specified, enclosures exterior finishes must be white in all process areas.
4. Enclosures materials must be provided as shown on the contract drawings. In general, all enclosures must be 12 gauge galvanized painted steel. (Stainless Steel for NEMA 4X areas)
5. Provide panels with front access only. Doors must be key/pad lockable and fitted with 3-point heavy duty latching assemblies. Provide a continuous piano hinge on each door
6. Each enclosure must include a SPDT intrusion switch rated 15A @ 120 Vac. Switch must be provided with a defeater option, which is automatically reset

when the door is closed. Switch shall be Cutler Hammer 10316H2042 with Y2 mounting bracket option or approved equal.

E. Control Panel Components General Specifications:

1. PLC shall be Allen Bradley 5069-L320ER, no equal to meet the requirement of the existing City owned and operated SCADA System.

   a. Add-on Analog input modules shall be Allen Bradley 5069-IF8, no equal.

   b. Add-on Analog output module shall be Allen Bradley 5069-OF4, no equal.

   c. Add on Discrete input module shall be Allen Bradley 5069-IB16, no equal

2. Surge Protection Device (SPD)

   a. All instrument and control equipment mounted outside of protective structures must be equipped with suitable surge arresting devices to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharge or nearby electrical devices. Protective devices used on 120Vac inputs to field mounted equipment must be secondary valve surge protectors conforming to the requirement of ANSI C62.1.

   b. SPD shall be as manufactured by Ferraz Shawmut model ST1201PG or approved equal.

3. 24Vdc power supply and DC UPS system

   a. Input: 120Vac.

   b. Output: 24 Vdc, 2.5A.

   c. DIN Rail Mounted.

   d. Temperature Rating: -10 °C to +60 °C (without de-rating).

   e. Efficiency: >= 85%.

   f. Mount in Control Panels as per drawings, specifications, and manufacturer's recommendations.

   g. Relay Output: 120Vac, 2 A to indicated Power OK status.

   h. Approved Manufacturers: Sola Heavy-Duty SDN series or Engineer approved equal.

4. DC UPS must be of the same manufacturer as the DC power supply.
    a. Provide a microprocessor controlled UPS that provides protection from power interruptions and automatically recharges the battery module when the DC input power is returned.
    b. Nominal input voltage: 22.5~30Vdc and fuse protected for overload and short circuit protection.
    c. Nominal output voltage: 24Vdc @10Amps with a minimum 0.5A charging capacity.
    d. LED status indicators with dry relay contacts for remote monitoring of battery trouble and UPS on line.
    e. Operating range: -20 to +50 °C .
    f. DIN rail mount battery module must be provided with a capacity to power the RTU for duration of approximately 120 minutes. Backup calculations must be provided as part of the control panel submittal to indicate expected run time.
5. Level Indicator
    a. Level indicators shall be Precision Digital PD765 to match City standards
        1) Display must have sunlight viewable 0.56” high digits
        2) Must be 24Vdc powered
        3) Indicator must be connected in series with existing 4~20mA submersible or radar level transmitters.
        4) Indicator must be configured in the field by the Contractor according to City provided scaling information.
6. Wiring
    a. Control wiring to be a minimum of #14 AWG tinned stranded copper; insulation rated at 600V MTW type insulation
    b. Analog wiring to be a minimum of #16 single pair copper 600V CIC white/black cable with overall foil shield and the drain wire. The black wire must be positive and white wire must be negative. Drain wires must be clipped in the field and terminated on individual green/yellow terminal blocks in the control panel. The shield must be grounded at only one end in the control panel grounding terminals, and cut back and insulated at the instrument end.
7. Wire Management

a. All conductors must be contained in wiring channels with snap on covers with narrow fingers. Channel must be white in color and attached to the backpan with stainless steel truss head Philips type machine screws. Self-drilling drilling screws are not permitted.

b. Channel must be minimum size of 1" wide by 3" tall and be no more than 60% filled.

c. Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by plastic spiral wrap. The hinge loop must be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections.

8. Terminals:

a. Provide 6mm multi-level strap screw type terminal blocks rated for 600 volts.

b. Identify each terminal block with a unique machine printed terminal number as shown on the approved submittal drawings. Cabinet chassis grounding terminal blocks to be identified by the electrical ground symbol.

c. Terminals to be Entrelec, Weidmuller or Engineer approved equal.

9. Fuse Holders

a. Fuse holders must be of the same manufacture as the terminal blocks. Fuse holders must have screw terminals and provided with "blown fuse" indicators.

10. Relays

a. 24Vdc and 120Vac relays must be 6.2mm SPDT pin type, plug-in, rated 6A complete with operation indicator, and surge suppressor as manufactured by Finder 38 series or approved equal.

b. Time delay relays must be DPDT, plug-in, multifunction, 8A with octal base as manufactured by Finder 88 series or approved equal.

c. Where the contact ratings of the relays listed are insufficient for the application, or additional relay contacts are required, select an appropriate type from an approved manufacturer such as Finder 58 Series.

d. Provide relay plug-in sockets for DIN mounting, complete with stacked screw terminals.

e. Intrinsic safe relays (ISR) must provide intrinsically safe connection per NEC Article 504 of various dry contact field switches and provide binary signal transmission via dry relay output. Relay must be 24Vdc powered with LED's to show relay status. Input/output configuration must be programmed through DIP switches on the front panel of the ISR. ISR must be DIN rail mount. Each relay must be provided with DPDT dry contacts. Provide, pepperl-fuchs, Gems, or approved equal.

f. Intrinsic safe barrier (ISB) must provide intrinsically safe pass-through connection per NEC Article 504 of various 4~20mA signals. Barrier must be 24Vdc powered with LED's to show relay status. Input/output configuration must be programmed through DIP switches on the front panel of the ISR. ISR must be DIN rail mount. Provide, pepperl-fuchs, Gems, or approved equal.

11. Radio System

a. The radio system must consist of the following elements. Due to equipment availability and arrangements with local cellular data providers, the Cellular modem must be provided as listed, no equal. As manufacturer specifications tend to change, the supplier must certify in writing as part of the radio system submittal that all of the components provided will function together to provide the best possible performance.

b. Cellular broad band router must be Sixnet Red Lion DA50AO for use on the Verizon 4G LTE Cellular network as manufactured by Red Lion. SIM and Cellular data plan will be provided by the City. Router must be provided with a "brother" type label indicating the IP address as assigned by The City.

c. Provide specific features as follows:

1) Operate at 24Vdc with screw terminal connectors.

2) Single RJ45 Ethernet connector.

3) Din Rail mountable.

4) SMA antenna connector for both main and diversity antennas.

d. Lightning arrestor

1) Two arrestors are required per RTU, one for each antenna. Arrestors shall be Antenex, or equal with connectors to connect to the coax provided. Arrestors must be panel mount type.

e. Antenna Coax

1) Coax for field connection between arrestors and antenna must be LMR400 for cable length over 20', cables 20' and less must be antenna manufactures supplied cables. Cable must be provided with weather proof N/male connectors (or as required to connect to antenna). Center pins must be soldered, not crimped and gold plated. Cables must be of the correct length for each installation, coiling of extra cables is not allowed. Connectors must be installed by qualified personnel and vapor wrapped to protect from moisture intrusion where required

2) Antenna jumper coax for use inside the RTU must be factory manufactured to the correct length with SMA x N/Male connectors or as required to connect to the cables provided

f. Antenna

1) Antenna must be a Multiple-Input-Multiple Output (MIMO) type for use on the Verizon LTE/Cellular and AT&T Cellular network.

2) Two identical antenna elements must be contained inside a single antenna housing and operate at a frequency of 694~960MHz. antenna must have a gain of 3 dBi minimum.

3) Antennas must be provided with connecters to mate with LMR400 antenna coax if total coax length is greater than 20 feet. SMA for cables 20 feet and less.

4) Antenna shall be MobileMark LTM302 Series or approved equal.

1.2 GROUNDING

F. Copper ground buses must be provided in all electrical enclosures. Ground bus must be sized to accommodate expected ground wires plus 20%. The ground bus must be properly sized per NEC and allow for the connection of all grounding conductors. "Double lugging" of grounding conductors is not allowed.

G. Mounting support or bracing bolts must not be used as an attachment point for ground conductors.

H. All raceway systems, supports, enclosures, panels, and equipment housings must be permanently and effectively grounded.

I. Ground/Bond Wires

1. Manufacturer:

a. Southwire

b. Approved equal

2. Ground and Bond wires must be AWG bare copper sized as shown on Contract Drawings or in accordance with NEC Table 250-66, whichever is greater.

1.3 PLC PROGRAMMING/SCADA INTEGRATION

The responsibility for PLC programming and the requirements for SCADA Graphics/integration and system alarming is dependent on who will be the responding/responsible party of the completed Sewage Lift Station once it goes into normal operation as follows:

A. Owner/Developer:

The owner/developer will be responsible for the programming and alarming of the completed system.

1. PLC programming and any local operator interface terminal that may be included as part of the project must be the sole responsibility of the owner/developer.
2. An alarming system that notifies a responsible party must be provided and maintained by the owner/developer. At a minimum, the following alarm notifications shall be provided:
   a. High High wetwell level (from floats)
   b. High wetwell level (Based on adjustable wetwell level setpoints)
   c. Power failure
   d. Pump failure
3. The PLC control system must be provided with the equipment and IO layout as discussed in the project specification and City of Reno Standard Lift Station Control Panel Drawings.
4. The Cellular modem is not required for owner/developer-maintained system but provision must be available for the installation of the modem in the future (i.e. spare 24vdc power distribution and available RJ-45 Ethernet port).

B. City of Reno

The City of Reno will be responsible for the programming and alarming of the completed system except as noted below.

1. Any local operator interface terminal configuration that may be included as part of the project must be the sole responsibility of the owner/developer and will NOT be provided by the City of Reno.

2. PLC Programming and SCADA Graphics/Integration will be provided by the City of Reno. The City will provide configuration, SIM and Data plan for the cellular modem provided and installed by the contractor.
3. PLC control system must be provided with the equipment and IO layout as discussed in the project specification and City of Reno Standard Lift Station Control Panel Drawings.
4. The contractor must coordinate with the City for startup and testing activities that shall include:
    a. Witnessed factory testing of the contractor provided control panel by City SCADA staff or their designated representative.
    b. Field testing including all PLC connected IO and coordination of instrument ranges with City SCADA staff or their designated representative.

3.1 INSTALLATION

A. General:

3. System:
    a. Install all products per manufacturer's recommendations and the Contract Drawings.
    b. Keep a copy of the manufacturer's installation instructions on the jobsite and available for review at all times prior to and during the installation of the associated equipment.
4. Panels and Enclosures:
    a. Install panels and enclosures as shown on the Contract Drawings.
    b. Install panels and enclosures plumb and level.
    c. Seal all enclosure openings to prevent entrance of insects and rodents.
    d. Install watertight hubs for all conduits entering outdoor panels and enclosures. Hubs must be located on sides or bottom only; top entry is not allowed.
    e. Clearance about electrical equipment must conform to the latest Authority Having Jurisdiction (AHJ) approved version of the National Electric Code (NEC).
5. Conduits and Ducts: Install all conduits and ducts per Division 16 and Contract Drawings.
6. Wiring, Grounding, and Shielding:

a. Wiring inside and outside equipment must be installed per Division 16 and Contract Drawings.

7. Cutting and Patching:

   a. Perform all cutting and patching required to install work.

   b. Obtain permission from Engineer before drilling or cutting structural members

   c. Cutting and patching must be performed only by skilled labor of the respective trades.

   d. Restore surfaces neatly to original condition upon completion of cutting and patching.

8. Cleaning and Touch up: At the completion of the work, Contractor must clean and touch up all parts of the installation, including all equipment, exposed conduit, and fittings.

END OF SECTION

STANDARD SCADA AND TELEMETRY DRAWINGS

ATTACHED DIAGRAMS:

I01 Symbols and General Notes

I02 Reserved

I03 RTU Enclosure Detail

I04 RTU Backpan Layout

I05 RTU Material List

I06 RTU Control Power Wiring

I07 RTU Panel Network Diagram

I08 RTU Panel Discrete Input Slot 1

I09 RTU Panel Discrete Input Slot 2

I10 RTU Panel Discrete Input Slot 3

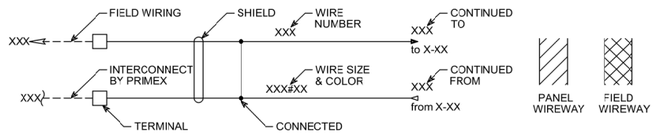
I11 RTU Panel Analog Input Slot 4

I12 RTU Panel Analog Output Slot 5

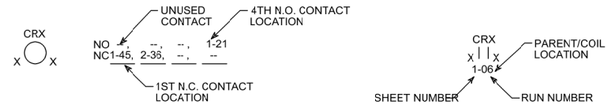
ELECTRICAL SYMBOLS

CBX	CIRCUIT BREAKER OR MOTOR CIRCUIT PROTECTOR	CLX	OVERLOAD RELAY
FUX-XX	FUSE & RATING	MX	MOTOR STARTER COIL
DSX	DISCONNECT SWITCH	MX	MOTOR STARTER OPEN CONTACT
SSX	OPERATOR CONTACT NORMALLY CLOSED	PBX	MUSHROOM HEAD PUSHBUTTON
SSX	OPERATOR CONTACT NORMALLY OPEN	PBX	PUSH BUTTON NORMALLY OPEN
SSX OX	SELECTOR SWITCH	TGX	TOGGLE SWITCH
CRX	NORMALLY OPEN RELAY CONTACT	CRX	CONTROL RELAY COIL
CRX	NORMALLY CLOSED RELAY CONTACT	SOLX	SOLENOID
TDX	NORMALLY OPEN TIME DELAY ON DE-ENERGIZE	TDX	TIMER COIL
TDX	NORMALLY CLOSED TIME DELAY ON DE-ENERGIZE	CTX	CURRENT TRANSFORMER
TDX	NORMALLY OPEN TIME DELAY ON ENERGIZE	FSX	NORMALLY OPEN SWITCH CLOSES ON RISING FLOW
TDX	NORMALLY CLOSED TIME DELAY ON ENERGIZE	FSX	NORMALLY CLOSED SWITCH OPENS ON RISING FLOW
LSX	NORMALLY OPEN SWITCH CLOSES ON RISING LEVEL	PSX	NORMALLY OPEN SWITCH CLOSES ON RISING PRESS
LSX	NORMALLY CLOSED SWITCH OPENS ON RISING LEVEL	PSX	NORMALLY CLOSED SWITCH OPENS ON RISING PRESS
TSX	NORMALLY OPEN SWITCH CLOSES ON RISING TEMP	ZSX	NORMALLY OPEN SWITCH CLOSES ON LIMIT/POSITION
TSX	NORMALLY CLOSED SWITCH OPENS ON RISING TEMP	ZSX	NORMALLY CLOSED SWITCH OPENS ON LIMIT/POSITION
BATX	MULTIPLE CELL BATTERY	ETMX	ELAPSED TIME METER
XXX TBX	FEED-THROUGH TERMINAL BLOCK	XA FUX	FUSED TERMINAL BLOCK
XXX PTBX	PULL-A-PART TERMINAL BLOCK	XXX DTBX	DISCONNECT TERMINAL BLOCK
XXX GTBX	GROUND TERMINAL BLOCK		GROUNDING STUD
	EARTH GROUND	PDBX	POWER DISTRIBUTION BLOCK
FANX	COOLING FAN	HTRX	HEATING ELEMENT
ALX	ALARM LIGHT	AHX	ALARM HORN
LTX	PUSH TO TEST INDICATOR LIGHT	LTX	INDICATOR LIGHT
RECPTX	GFCI RECEPTACLE	RECPTX	STANDARD RECEPTACLE
H H XFX	VOLTAGE TRANSFORMER	SPDX	SURGE PROTECTIVE DEVICE

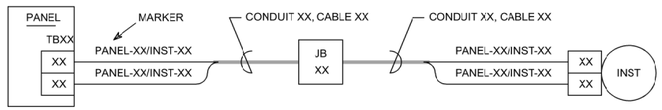
PANEL WIRING



CROSS REFERENCING



INTERCONNECT WIRING



GENERAL NOTES

1. PANEL WIRING: 600V STRANDED COPPER, TYPE MTW.
2. 120VAC POWER AND CONTROL WIRING: 16 AWG MINIMUM.
3. 24VDC POWER AND CONTRCL WIRING: 16 AWG MINIMUM.
4. ANALOG SIGNAL WIRING: TSP, 18 AWG MIN, BELDEN 8719.
5. USE WIRING LUGS WITH ALL NON-CAGED TERMINATIONS.
6. WIRE MARKERS: HEATSHRINK, WHITE W/ BLACK LETTERING.
7. SHRINK WIRE MARKERS LOCSELY TO ALLOW FOR ROTATION.
8. UNLESS OTHERWISE NOTED, NUMBER WIRING AS TERMINALS.
9. MOUNTING PAN COMPONENTS IDENTIFIED W/ KROY LABELS.
10. BOND ENCLOSURES, DOORS, & PANS WITH 12 AWG WIRING.
11. ALL FIELD WIRING SHALL USE CLASS 1 CONDUCTORS.
12. XX
13. XX
14. XX
15. XX
16. XX
17. XX
18. XX
19. XX
20. XX
21. XX

UL 508A LISTED INDUSTRIAL CONTROL PANEL

WIRING COLORS

480/277 VAC POWER, PHASE A	BRN
480/277 VAC POWER, PHASE B	ORN
480/277 VAC POWER, PHASE C	YEL
480/277 VAC NEUTRAL	GRY
240/120 VAC POWER, LINE 1	BLK
240/120 VAC POWER, LINE 2	RED
208/120 VAC POWER, PHASE A	BLK
208/120 VAC POWER, PHASE B	RED
208/120 VAC POWER, PHASE C	BLU
120 VAC UPS POWER	ORN
120 VAC UPS NEUTRAL	WHT/ORN
120 VAC NEUTRAL	WHT
120 VAC CONTROL	RED
120 VAC DIGITAL INPUTS	RED
120 VAC DIGITAL OUTPUTS	RED
25 VAC CONTROL	RED/BLK
25 VAC NEUTRAL	GRY
12 VDC POWER	BLU
12 VDC COMMON	WHT/BLU
24 VDC POWER	BLU
24 VDC CONTROL	BLU
24 VDC DIGITAL INPUTS	BLU
24 VDC DIGITAL OUTPUTS	BLU
24 VDC COMMON	WHT/BLU
4-20mA CONTROL, POSITIVE	CLR
4-20mA CONTROL, NEGATIVE	BLK
UNSPECIFIED FOREIGN	YEL
CHASSIS GROUND	GRN
INTRINSIC CIRCUITS	LBL

Sheet No.	DWG No.	Title
1	I01	SYMBOLS AND GENERAL NOTES
2	I02	RESERVED
3	I03	RTU ENCLOSURE DETAIL
4	I04	RTU BACKPAN LAYOUT
5	I05	RTU MATERIAL LIST
6	I06	CONTROL PANEL WIRING
7	I07	RTU PANEL NETWORK DIAGRAM
8	I08	RTU PANEL DIGITIAL INPUT SLOT 1
9	I09	RTU PANEL DIGITIAL INPUT SLOT 2
10	I10	RTU PANEL DIGITIAL OUTPUT SLOT 3
11	I11	RTU PANEL ANALOG INPUT SLOT 4
12	I12	RTU PANEL ANALOG OUTPUT SLOT 5

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MILESTONE

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CITY OF RENO
LIFT STATION STANDARD RTU UPGRADE
CONTRACT #:

SYMBOLS AND GENERAL NOTES

PROJ. No.:
DESIGN BY: MB
DRAWN BY: KB
CHECK BY: JP
SCALE: HORZ: AS SHOWN
VERT: AS SHOWN

DRAWING
I01

SHEET 1 OF 12

GENERAL NOTES

A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

RESERVED

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VERT:	AS SHOWN

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I02

SHEET 2 OF 12

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SHEET NOTES

1. FLOW TRANSMITTER WHEN SHOWN ON P&ID.

FUSE CHART

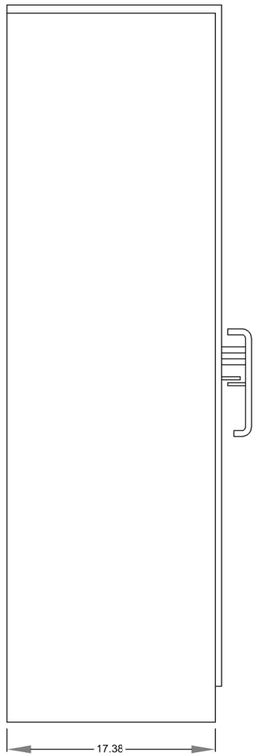
NO. / RANGE	AMP	VOLTS
F14, F15	1A	120VAC
F24, F25	1A	120VAC
FD1, FD7	3A	24VDC
FD2, FD3	2A	24VDC
FD4	1A	24VDC
FD500	1/4A	24VDC

NAMEPLATE NOTES

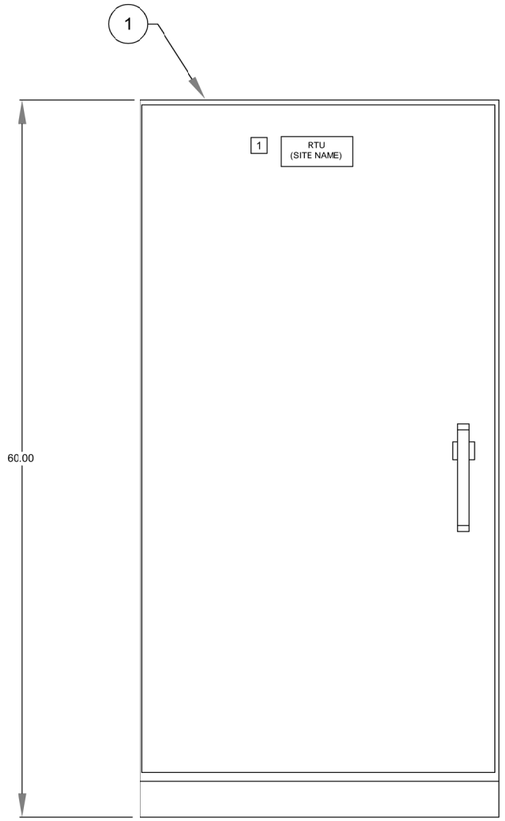
NOTE	DESCRIPTION
A	LAYOUT ALL INSCRIPTION ENGRAVING AS SHOWN.
B	CENTER ENGRAVING HORIZONTALLY AND VERTICALLY.
C	NAMEPLATE MATERIAL: PHENOLIC, BLACK WITH WHITE CORE.
D	NAMEPLATE MATERIAL: PHENOLIC, RED WITH WHITE CORE.
E	NAMEPLATE MATERIAL: PHENOLIC, WHITE WITH BLACK CORE.
F	NAMEPLATE MATERIAL: PHENOLIC, GRAY WITH BLACK CORE.
G	NAMEPLATE MATERIAL: PHENOLIC, YELLOW WITH BLACK CORE.
H	NAMEPLATE TO BE ATTACHED WITH ADHESIVE STRIPS.
J	NAMEPLATE TO BE ATTACHED WITH SILICONE ADHESIVE.
K	NAMEPLATE TO BE ATTACHED WITH STAINLESS STEEL SCREWS.
L	LEGEND PLATE BY MANUFACTURER.
M	LEGEND PLATE TO BE ATTACHED WITH OPERATOR BEZEL.

NAMEPLATE SCHEDULE

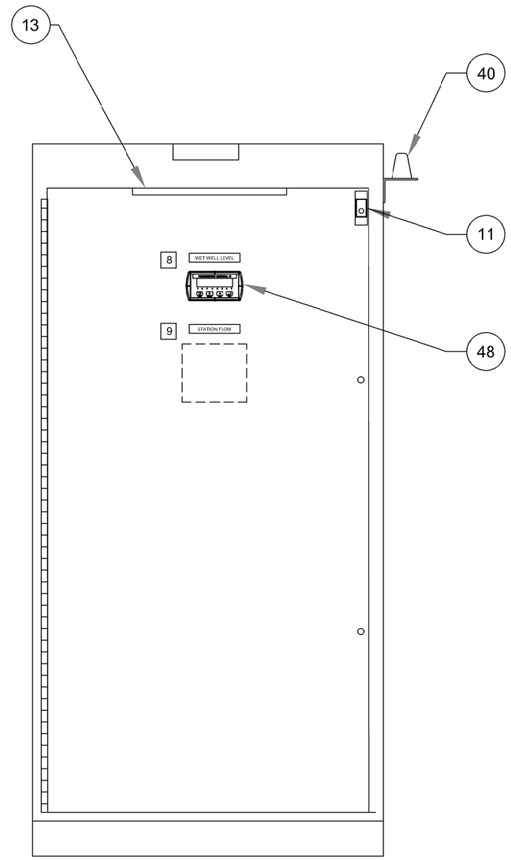
ITEM	DESCRIPTION	QTY	LTR SIZE	N/P SIZE	INSCRIPTION	NOTES
1	NAMEPLATE	1	3/8	2 X 5	RTU (SITE NAME)	A,B,C,J
2	--	-	-	-	NOT USED	-
3	NAMEPLATE	3	3/16	.75 X 3	CONVENIENCE RECEPTACLE	A,B,C,K
4	LABEL	1	N/A	1.25 X 4	WARNING: SUBSTITUION OF COMPONENTS MAY IMPAIR INSTRINSIC SAFETY IFS #1004523	N/A
5	LABEL	1	N/A	2.5 X 3.62	WARNING: EXPLOSION HAZARD, TO PREVENT IGNITION OF FLAMMABLE CR COMBUSTIBLE ATOMSPHERES, DISCONNECT POWER BEFORE SERVICING. PROVIDES INSTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN HAZARDOUS LOCATIONS WHEN CONNECTED PER PANEL CONTROL DRAWING.	N/A
6	LABEL	1	3/16	1.25 X 4	INTRINSICALLY SAFE FIELD WIRING TERMINALS	N/A
7	LABEL	1	3/16	1.5 X 1.38	INTRINSICALLY SAFE CIRCUITS	N/A
8	LABEL	1	3/16	1.25 X 4	WET WELL LEVEL	N/A
9	LABEL	1	3/16	1.25 X 4	STATION FLOW	N/A



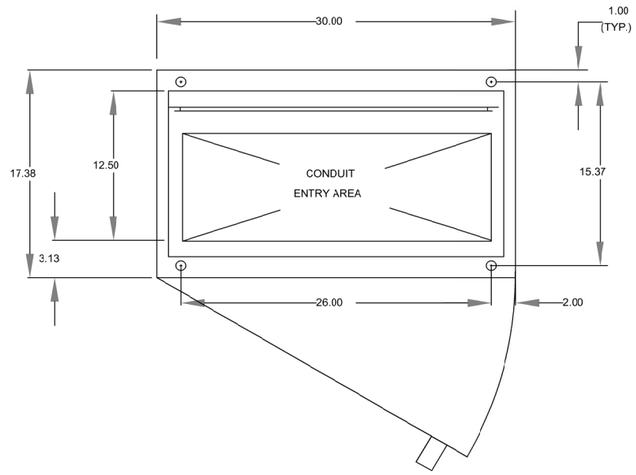
LEFT SIDE VIEW



FRONT ELEVATION
(NEMA 3R, WHITE)



FRONT ELEVATION
(EXTERIOR DOOR REMOVED
FOR CLARITY)



PLAN VIEW

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CONTRACT #:

RTU ENCLOSURE DETAIL

PROJ. No.:	
DESIGN BY:	MB
DRAWN BY:	KB
CHECK BY:	JP
SCALE: HORZ:	AS SHOWN
VERT:	AS SHOWN

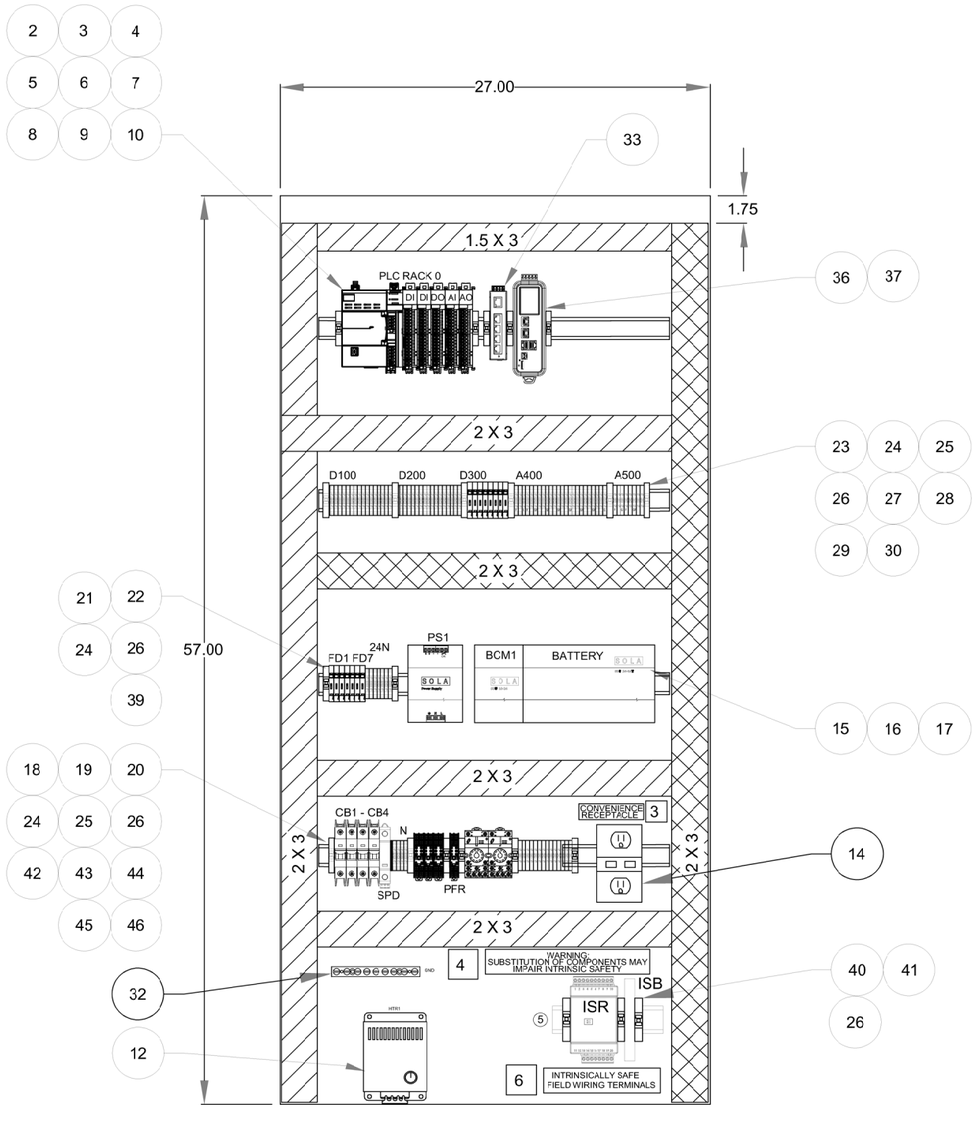
DRAWING
I03

GENERAL NOTES

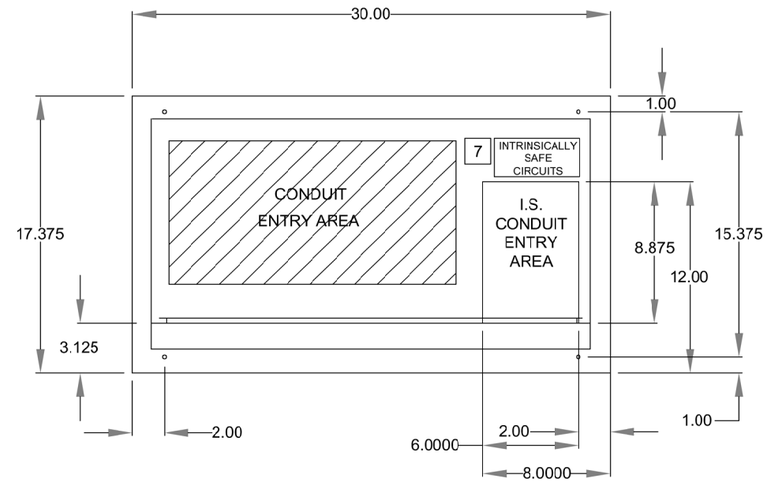
A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

1. PROVIDE 2" CLEARANCE AT TOP AND BOTTOM, 1" SIDES
2. PROVIDE 4" CLEARANCE AT TOP
3. PROVIDE 2.75" CLEARANCE AT TOP, 1" RIGHT AND LEFT SIDE
4. PROVIDE 0.75" CLEARANCE AT TOP AND SIDES, 1.5" AT BOTTOM
5. ADDITIONAL IS RELAYS MAY BE NECESSARY. REFERENCE PROJECT P&ID FOR REQUIREMENTS.



BACK PANEL LAYOUT



BASE DETAIL

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LIFT STATION STANDARD RTU UPGRADE
CONTRACT #:

RTU BACKPAN LAYOUT

PROJ. No.:	
DESIGN BY:	MB
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CHECK BY:	JP
SCALE:	HORZ: AS SHOWN
	VERT: AS SHOWN

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I04

SHEET 4 OF 12

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BILL OF MATERIALS

Item #	Description	Manufacturer / Model	Part No.	Tag No.
1	ENCLOSURE, NEMA 3R, POWDER COATED WHITE, 60"H X 30"W X 17.375"D, FACTORY INSTALLED TOP AND REAR SUN SHIELDS, INNER DOOR, AND BACKPANEL	MYERS	MEUG3A-3060L-M200-22K-MOD	SCP
2	5069 COMPACTLOGIX 5380 PROGRAMMABLE LOGIC CONTROLLER, 2MB, 16 I/O EXPANSION	ALLEN-BRADLEY	5069-L320ER	PLC CPU
3	5069 COMPACTLOGIX FIELD POTENTIAL DISTRIBUTOR	ALLEN-BRADLEY	5069-FPD	PLC POWER DIST.
4	5069 COMPACTLOGIX I/O 16 CHANNELS DC INPUT MODULES, 24VDC	ALLEN-BRADLEY	5069-IB16	PLC DISCRETE IN
5	5069 COMPACTLOGIX I/O 16 CHANNELS DC OUTPUT MODULE, 24VDC	ALLEN-BRADLEY	5069-OB16	PLC DISCRETE OUT
6	5069 COMPACTLLOGIX I/O 8 CHANNEL VOLTAGE/CURRENT ANALOG INPUT MODULE, 16 BIT RESOLUTION	ALLEN-BRADLEY	5069-IF8	PLC ANALOG IN
6A	5069 COMPACTLLOGIX I/O 4 CHANNEL VOLTAGE/CURRENT ANALOG OUTPUT MODULE, 16 BIT RESOLUTION	ALLEN-BRADLEY	5069-OF4	PLC ANALOG OUT
7	5069 COMPACTLOGIX RIGHT END CAP	ALLEN-BRADLEY	5069-ECR	PLC END CAP
8	5069 COMPACTLOGIX I/O POWER TERMINAL RTB KIT FOR 5069-AEN2TR CONTAINS BOTH 4 AND 6 PIN SCREW TYPE RTB	ALLEN-BRADLEY	5069-RTB64-SCREW	PLC POWER TB
9	5069 COMPACTLOGIX I/O 6 PIN SCREW TYPE RTB PACKED KIT	ALLEN-BRADLEY	5069-RTB6-SCREW	PLC POWER TB
10	5069 COMPACTLOGIX I/O 18 PINS SCREW TYPE TERMINAL BLOCK KIT	ALLEN-BRADLEY	5069-RTB18-SCREW	PLC I/O TB'S
11	INTRUSION SWITCH	HONEYWELL	1AC2	ZS-93A
12	HEATER, FORCED AIR, ADJUSTABLE THERMOSTAT, 100W, 115VAC	HOFFMAN	DAH1001A	HTR1,2
13	LED,BAR,90-260VAC,13.82" HOFFMAN	HOFFMAN	LEDA1S35	LT
14	OUTLET,DUPLX,120/15/GFI	PHOENIX CONTACT	5600462	RECPT
15	24VDC, 10A DC UPS POWER MODULE	SOLA HD	SDU 10-24	BCM1
16	24VDC DIN RAIL BATTERY MODULE, CABLE INCLUDED	SOLA HD	SDU 24-BAT	BATT1
17	24DC POWER SUPPLY	SOLA HD	SDN 10-24-100P	PS1
18	CIRCUIT BREAKER, MINIATURE, C CURVE, 1P, 2A, DIN RAIL MOUNT	SQUARE D	M9F42102	CB8
19	CIRCUIT BREAKER, MINIATURE, C CURVE, 1P, 10A, DIN RAIL MOUNT	SQUARE D	M9F42110	CB7,9-11
20	120VAC SPD	CITEL	DS240S-120/G	SPD
21	FUSED TERMINAL BLOCK, 24VDC 10A, WITH LED, 1/4X1-1/4"	PHOENIX CONTACT	3046414	FD1-7, FD400*
22	FAST ACTING FUSE, 1/4 X 1-1/4", 2AMP	BUSSMANN	ABC-2-R	FD2,3,7
23	INTERFACING RELAY, 24VDC CONTROL VOLTAGE, FORM C	SCHNEIDER ELECTRIC	RSL1PVBU	CR3-10
24	FEED THRU TERMINAL BLOCKS FOR PWR DISTRIBUTION	PHOENIX CONTACT	3044102	N, COM,1-4, D340-D342
25	TERMINAL BLCCK END COVER	PHOENIX CONTACT	3047028	
26	MOUNTING RAIL END CLAMP	PHOENIX CONTACT	3022218	
27	2 LEVEL TERMINAL BLOCKS FOR DI/DO	PHOENIX CONTACT	2770011	FOR DI/DO
28	END COVER FOR 2 LEVEL FEED THRU	PHOENIX CONTACT	2770024	
29	3 LEVEL TERMINAL BLOCKS FOR AI	PHOENIX CONTACT	3214259	FOR AI
30	END COVER FOR 3-LEVEL TB	PHOENIX CONTACT	3214314	
31	GROUND BAR, NUMBER OF TAPS, 8	ILSCO	D167-8	G-BAR
32	OIT, C-MORE EA9 SERIES	AUTOMATION DIRECT	EA9-T10CL	OIT
33	ETHERNET SWITCH, 5 PORT	PHOENIX CONTACT	2891001	ESW1
34	CABLE, ETHERNET, CAT6, YELLOW, 1'	CAT5CABLEGUY	C6-001 YELLOW	E1
35	CABLE, ETHERNET, CAT6, YELLOW, 5'	CAT5CABLEGUY	C6-005 YELLOW	E2, E3
36	FLEXEDGE DA50A NETWORK GATEWAY W/MODULE COMM	RED LION/SIXNET	DA50A0BNN0000010	CELL MODEM
37	DA SIERIES SLED FOR CELLULAR CAT 4 STANDALONE GPS FOR VERIZON. W/SLED HOLDER AND FACEPLATE	RED LION/SIXNET	DAS00CL9C4SVZ000 / 10909 / 10664-01	COMM MODULE
38	LTE MULTIBAND MIMO ANTENNA	4RF	APLB-ACEL-MTB-DM-B5-BK	ANT
39	FAST ACTING FUSE, 1/4 X 1-1/4", 3AMP	BUSSMANN	ABC-3-R	FD1
40	INTRINSICALLY SAFE RELAY 4 CHANNEL 102-132V AC & 10-125V DC, 5A SPST-NO	MACROMATIC	ISDUR4	ISR1
41	INTRINSICALLLY SAFE BARRIER, ANALOG, 4-20MA	TURCK	MZB87P	ISB1
42	MULTI FUNCTION TIME DELAY RELAY	SQUARE D	9050 JCK70 V14	TR1,2
43	MULTI FUNCTION TIME DELAY RELAY BASE	SQUARE D	8501 NR62	
44	RELAY 24VCD	SQUARE D	RJ2S-CLD24	CR1A,B,C
45	RELAY 120vac	SQUARE D	RJ2S-CLD120	PFR
46	RELAY BASE	SQUARE D	SJ2S-05	
47	KNIFE DISCONNECT TERMINAL BLOCK	PHOENIX CONTACT	3046139	
48	LEVEL DISPLAY	PRECISION DIGITAL	PD765-7X3-00	LI

GENERAL NOTES

A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

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CITY OF RENO
LIFT STATION STANDARD RTU UPGRADE
CONTRACT #:

RTU MATERIAL LIST

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SCALE: HORZ: AS SHOWN
VERT: AS SHOWN

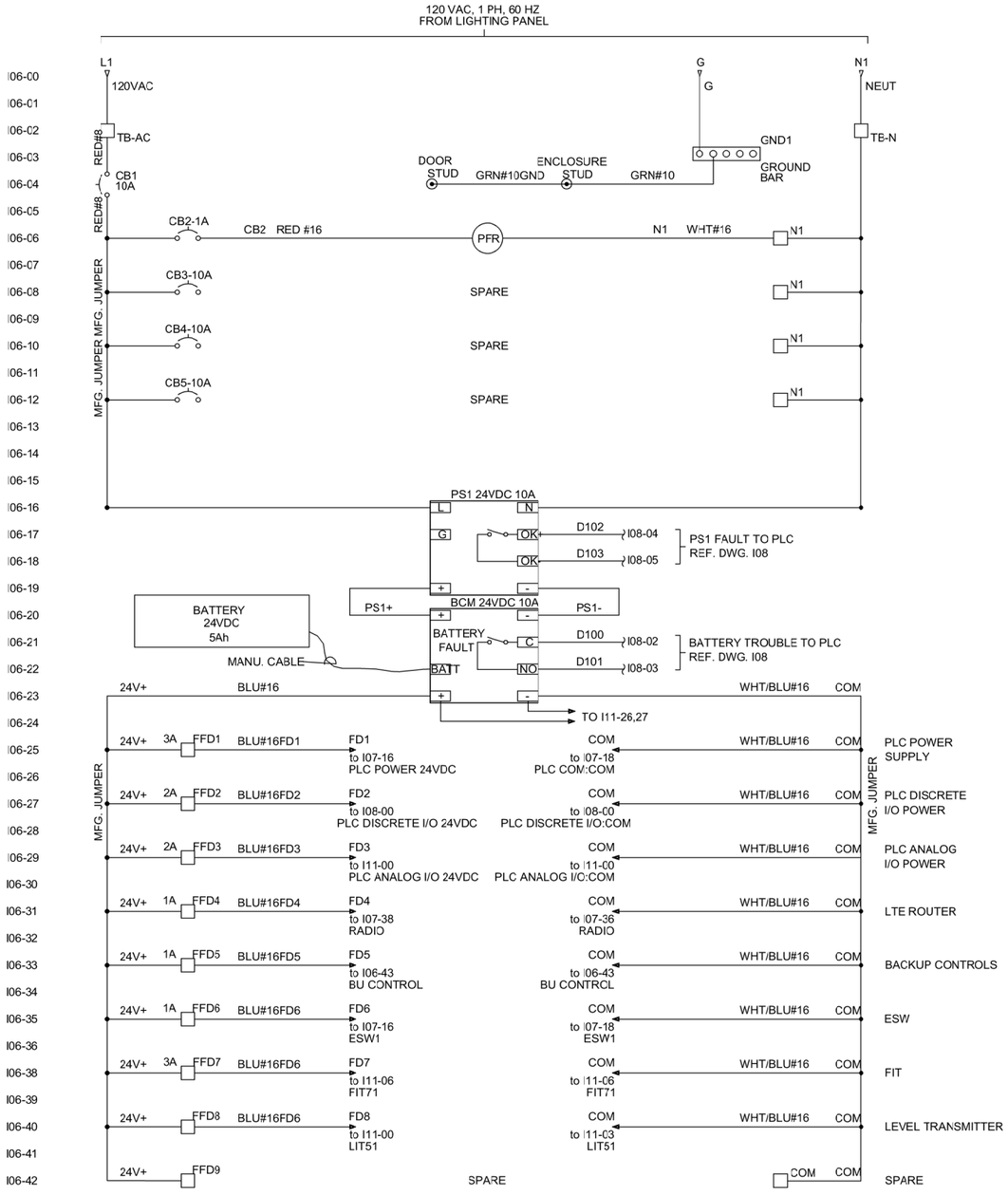
DRAWING
I05

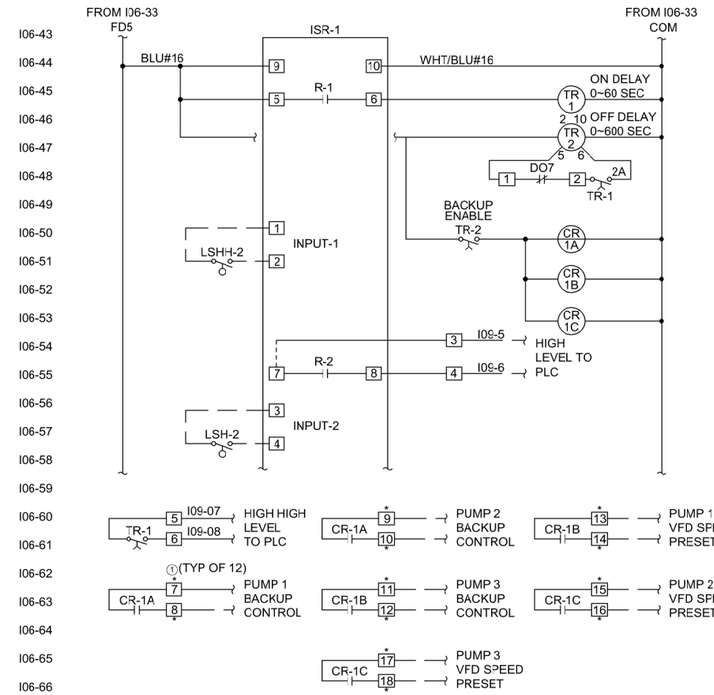
GENERAL NOTES

A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

1. DISCONNECT TYPE TERMINAL BLOCKS.





DETAIL A - TIMED BASED BACKUP CONTROLS

SCALE: NTS

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PHONE (775) 334-2548

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CONSTRUCTION

CITY OF RENO
LIFT STATION STANDARD RTU UPGRADE
CONTRACT #:

RTU CONTROL POWER WIRING

PROJ. No.:	
DESIGN BY:	MB
DRAWN BY:	KB
CHECK BY:	JP
SCALE:	HORZ: AS SHOWN
	VERT: AS SHOWN

DRAWING
I06

SHEET 6 OF 12

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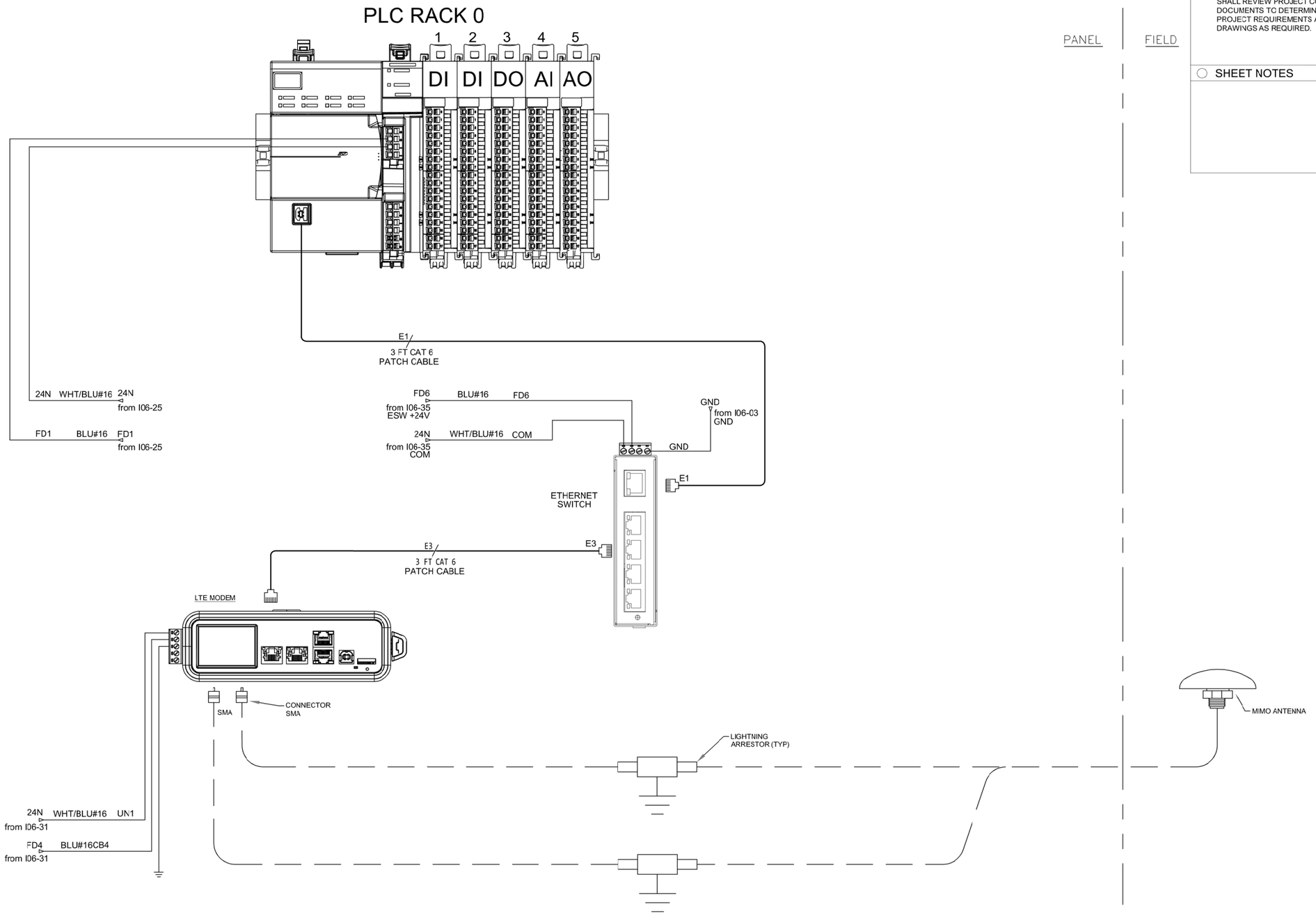
PANEL | FIELD



GENERAL NOTES

A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

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CONTRACT #:

RTU PANEL
NETWORK DIAGRAM

PROJ. No.:	
DESIGN BY:	MB
DRAWN BY:	KB
CHECK BY:	JP
SCALE:	HORZ: AS SHOWN
	VERT: AS SHOWN

DRAWING
I07

SHEET 7 OF 12

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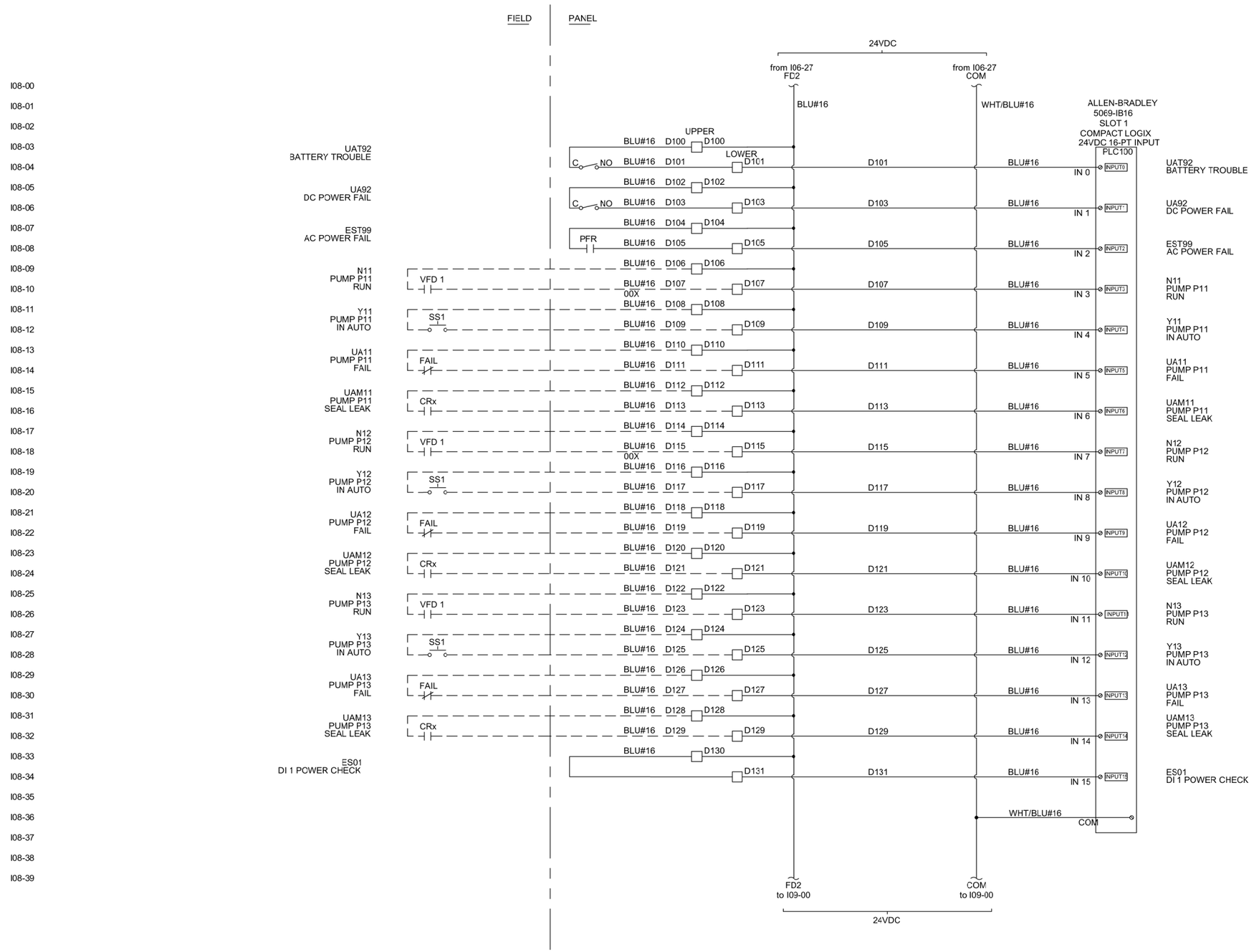
GENERAL NOTES

A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

1. DOUBLE LEVEL BLOCKS FOR DI/DO

   UPPER LEVEL = EVEN NUMBERS
   LOWER LEVEL = ODD NUMBERS



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CONTRACT #:

RTU PANEL
DISCRETE INPUT SLOT 1

PROJ. No.:	
DESIGN BY:	MB
DRAWN BY:	KB
CHECK BY:	JP
SCALE: HORZ:	AS SHOWN
VERT:	AS SHOWN

DRAWING
I08

SHEET 18 OF 12

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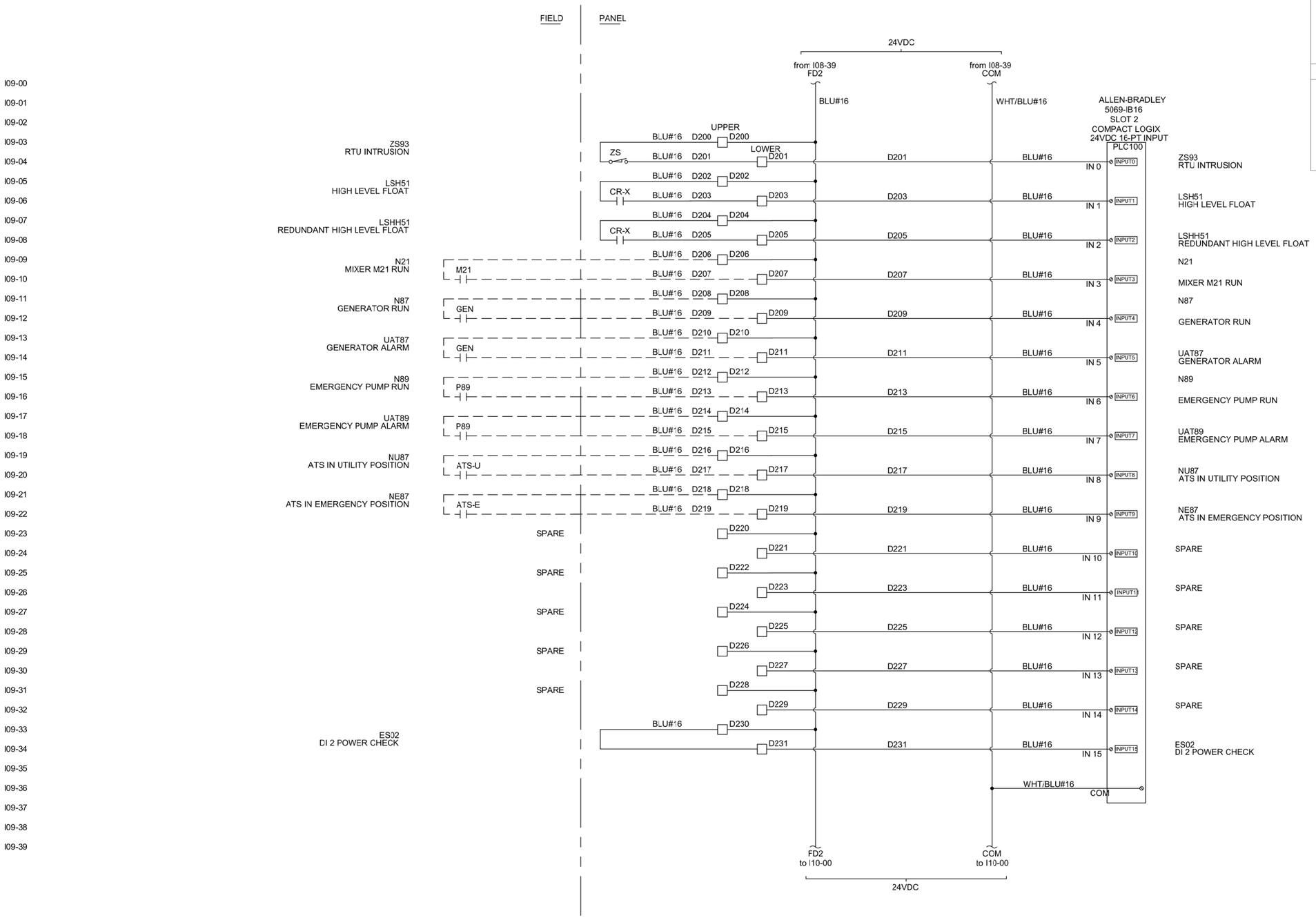
GENERAL NOTES

A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

1. DOUBLE LEVEL BLOCKS FOR DI/DO

   UPPER LEVEL = EVEN NUMBERS
   LOWER LEVEL = ODD NUMBERS



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CONTRACT #:

RTU PANEL
DISCRETE INPUT SLOT 2

PROJ. No.:	
DESIGN BY:	MB
DRAWN BY:	KB
CHECK BY:	JP
SCALE:	HORZ: AS SHOWN
	VERT: AS SHOWN

DRAWING
I09

SHEET 9 OF 12

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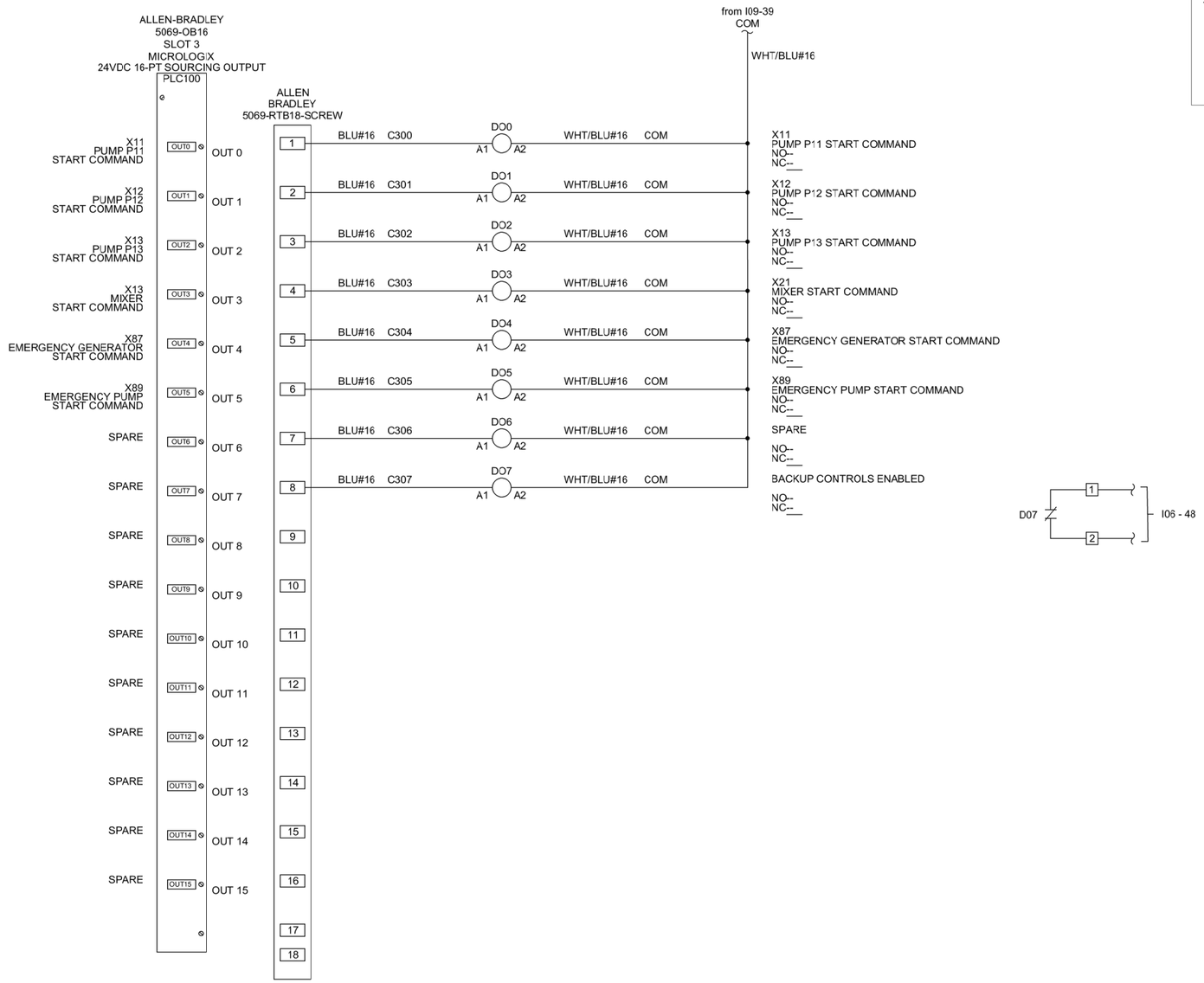

GENERAL NOTES

A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

1. DOUBLE LEVEL BLOCKS FOR DI/DO

   UPPER LEVEL = EVEN NUMBERS
   LOWER LEVEL = ODD NUMBERS

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CONTRACT #:

RTU PANEL
DISCRETE OUTPUT SLOT 3

PROJ. No.:	
DESIGN BY:	MB
DRAWN BY:	KB
CHECK BY:	JP
SCALE: HORZ:	AS SHOWN
VERT:	AS SHOWN

DRAWING
I10

SHEET 10 OF 12

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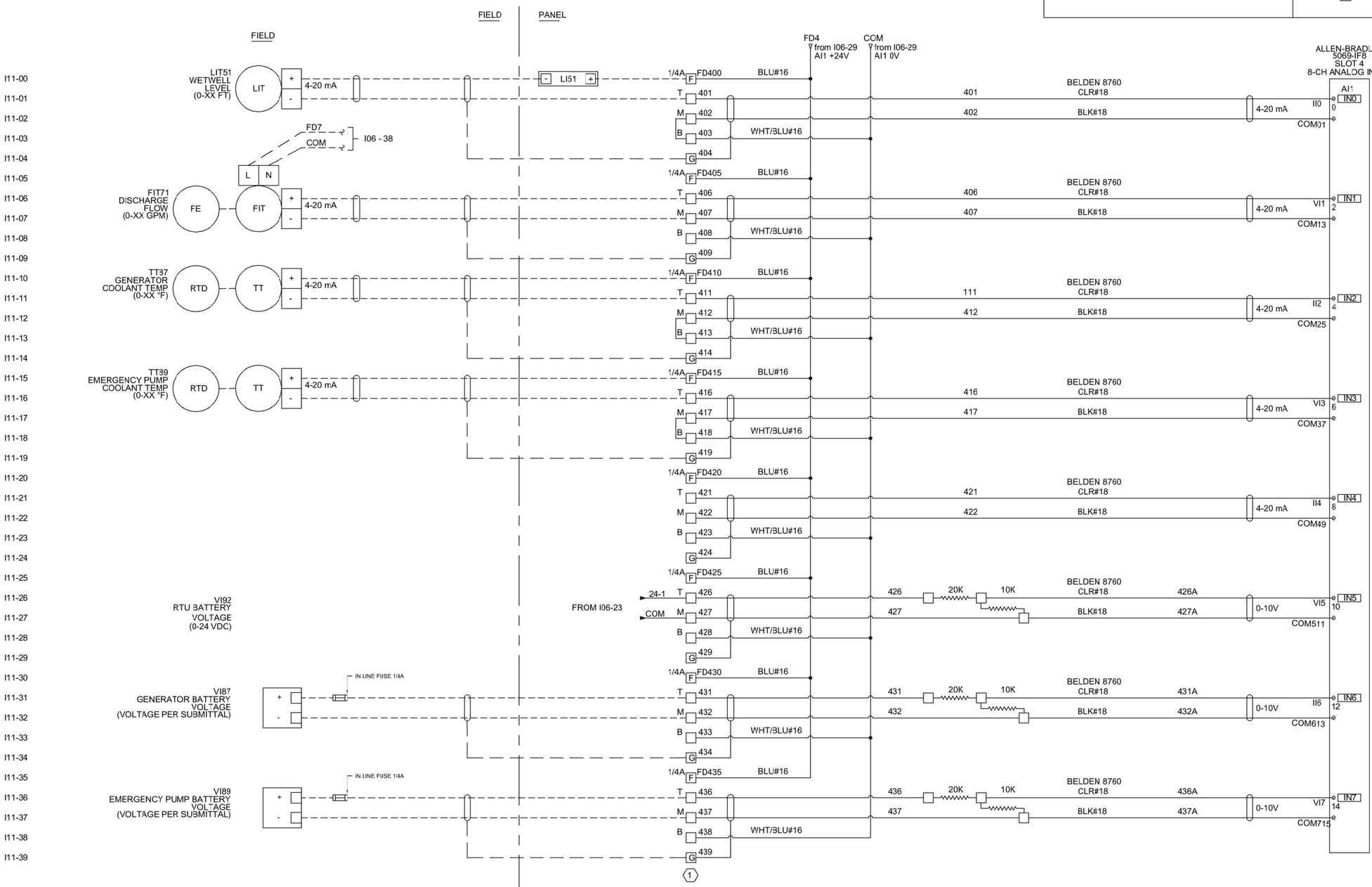
GENERAL NOTES	SHEET NOTES
A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.	1. ANALOG INPUT BLOCK LEGEND: 1/4A F FD400 — SEPARATE FUSED BLOCK (TYP.) T 401 M 402 B 403 3 LEVEL TERMINAL BLOCKS (TYP.) A401 = TOP LEVEL A402 = MIDDLE LEVEL A403 = BOTTOM LEVEL G 404 — SEPARATE GND BLOCK (TYP.)



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CONTRACT #:

RTU PANEL
ANALOG INPUT SLOT 4

PROJ. No.:	
DESIGN BY:	MB
DRAWN BY:	KB
CHECK BY:	JP
SCALE:	HORZ: AS SHOWN
	VERT: AS SHOWN

DRAWING
I11

SHEET 11 OF 12

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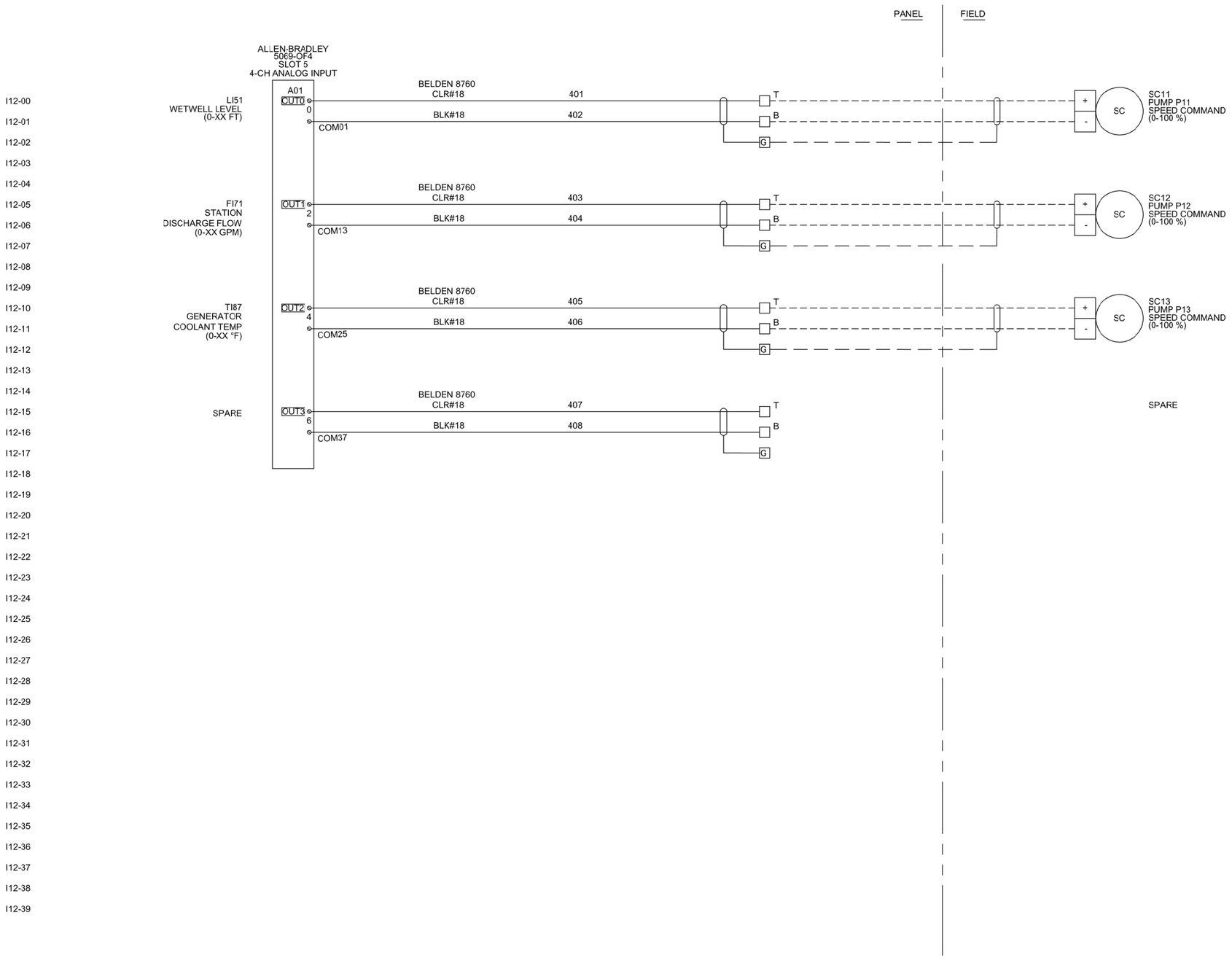

GENERAL NOTES

A. DRAWING DEPICTS A TYPICAL CONTROL PANEL DESIGN AND LAYOUT. CONTRACTOR SHALL REVIEW PROJECT CONTRACT DOCUMENTS TO DETERMINE SPECIFIC PROJECT REQUIREMENTS AND ADJUST THESE DRAWINGS AS REQUIRED.

SHEET NOTES

1. DOUBLE LEVEL TERMINAL BLOCKS FOR AO.
2. TOP LEVEL =ODD #
3. BOTTOM LEVEL= EVEN #

MILESTONE

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CONTRACT #:

RTU PANEL
RTU ANALOG OUTPUT SLOT 5

PROJ. No.:	
DESIGN BY:	MB
DRAWN BY:	KB
CHECK BY:	JP
SCALE:	HORZ: AS SHOWN
	VERT: AS SHOWN

DRAWING
I12

SHEET 12 OF 12

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