

**ROGERS WATER UTILITIES SYSTEM
ROGERS, ARKANSAS**

**SPECIFICATIONS FOR
SANITARY SEWER LIFT STATION FACILITIES
AUGUST 2017**



1. SCOPE

- A. This specification governs the construction of publically operated wastewater lift stations and provides a set of design and construction criteria to ensure a level of quality and standardization for wastewater lift station construction within the City of Rogers.

2. GENERAL REQUIREMENTS

- A. The construction of sanitary sewer lift stations shall only be considered if no feasible gravity flow alternative exists. Prior to beginning detailed design work, the engineer shall obtain written approval of Rogers Water Utilities for a lift station to serve the subject development.
- B. Lift station design and construction shall conform with the latest edition of the “Recommended Standards for Wastewater Facilities” as reported by the Wastewater Committee of the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (10 States Standards).
- C. Lift stations shall be designed to accommodate sanitary sewage flows from all proposed upstream drainage basins.
- D. Buoyancy of the wastewater pumping station structures shall be considered and, if necessary, adequate provisions shall be made for protection.
- E. Lift station site and access drive shall be deeded to the City of Rogers.
- F. All sanitary sewer lift stations shall consist of a circular wet well, duplex submersible pumps, and above-ground electrical controls housed in a climate-

controlled environment. Any alternative configuration requires prior approval from RWU.

- G. Multiple pumps shall be provided. Where only two units are provided, they shall be of the same size. Units shall have capacity such that, with any unit out of service, the remaining units will have capacity to handle the design peak hourly flow. All pumps should be warranted by the manufacturer.
- H. Electrical service to the lift station shall be 277/480 Volt, 3 phase, 4-wire WYE. Confirmation of service availability shall be required prior to construction.
- I. Emergency backup power shall be provided for all lift stations. Backup power generation shall be capable of operating (2) pumps for a period not less than 12 hours.
- J. Communications and SCADA control system shall be provided for all lift stations.

3. Hydraulic Capacity

- A. A hydraulic study shall be provided for the basis of design of wastewater lift stations. At a minimum, the report shall include:

- 1) Narrative of the methodology used in determination of wastewater flows
- 2) Maps showing the extent of drainage basins including topographic contour data, existing land use, potential areas of redevelopment, and comprehensive growth zones.
- 3) Population projections of the proposed service area assuming 2.5 persons per living unit.
- 4) Design average flow of the sewer collection system
- 5) Peaking Factor shall be calculated by the following equation, where P is the total population served:

$$PF = \frac{Q \text{ peak hourly}}{Q \text{ design average}} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}} \text{ or } 1.5, \text{ whichever is greater}$$

- 6) The design fill time and minimum pump cycle time shall be considered in sizing the wet well. The effective volume of the wet well shall be based on the design average flow with a filling time not to exceed 30 minutes. The pump manufacturer's duty cycle recommendations shall be utilized in selecting the minimum cycle time.
 - 7) Hydraulic calculations showing all head loss in the discharge pipe, fittings, and force main.
 - 8) Pump Curves for all proposed pumps
- B. The sizing of wastewater facilities receiving flows from new wastewater collection systems shall be based on an average daily flow of 100 gallons per capita plus wastewater flow from industrial plants and major institutional and commercial facilities unless water use data, wastewater flow monitoring data, or

- other justification upon which to better estimate flow is provided.
- C. The 100 gal/cap/d value shall be used in conjunction with a peaking factor to cover normal infiltration for systems built with modern construction techniques. However, an additional allowance should be made where conditions are unfavorable.
 - D. If the new collection system is to serve existing development the likelihood of I/I contributions from existing service lines and non-wastewater connections to those service lines shall be evaluated and wastewater facilities designed accordingly.
 - E. Projections shall be made from actual flow data to the extent possible.
 - F. The probable degree of accuracy of data and projections for all critical design flow conditions shall be evaluated. This reliability estimation should include an evaluation of the accuracy of existing data, and an evaluation of the reliability of estimates of flow anticipated due to infiltration/inflow (I/I), or flow due to elimination of sewer bypasses and backups or hydraulic restrictions.
 - G. Critical data and methodology used shall be included in all reports.

4. SITE REQUIREMENTS

- A. All site work shall conform to the City of Rogers Code of Ordinances regarding the development of lands.
- B. A paved access drive shall be provided to service the lift station. The drive shall have a minimum width of 12', maximum cross slope of no more than 3%, maximum longitudinal slope of no more than 10%. An unobstructed access to the lift station shall be provided and maintained. Base material, compaction, and pavement recommendations shall be provided by a qualified geotechnical engineer.
- C. The site shall be designed with ample maneuvering room for a vacuum excavation truck to service the lift station and turn around so as not to back out of the site or onto an adjacent street. Pavement grades in maneuvering areas shall be a minimum of 1% and a maximum of 5%.
- D. Wet wells shall be a minimum of 6" above the surrounding pavement and a minimum of 2 feet above the 100-year flood hazard elevation.
- E. A 6' high chain link fence (or alternate materials as approved by RWU) with posts set 1' inside the asphalt with a 14' roll back gate is required. The roll back gate shall have solid rubber tires. All areas inside of the fence shall be paved or otherwise maintenance-free. If a wooden fence is provided, the HOA or other controlling entity will be required to execute a maintenance agreement assuming full responsibility for the repair and maintenance of the fence.
- F. A potable water supply shall be provided for wash down. The water supply shall consist of a meter service with a frost free yard hydrant equipped with a vacuum breaker.
- G. Site lighting shall be provided and shall adequately illuminate the wet well area during night time hours.
- H. A weatherproof, insulated and air-conditioned building shall be provided for the station control panel. The building shall consist of traditional stud wall framing

or masonry. The inside of stud wall framed buildings shall be covered with plywood. Floor sills and roof overhangs shall be weatherproof. Doors shall be of sufficient size to provide ample room for installation and removal of all electrical cabinets and components. The Building shall be of sufficient size to such that workspace dimensions comply with NEC 110.26 and OSHA 29 CFR 1910.333. The building shall have a light and switch with 120 volt spare receptacle.

- I. Steel pipe bollards (per RWU Standard Detail WD-1 / 24) shall be provided for protection of the building, generator, vault, transformer, and other above-ground features in or adjacent to traffic areas.

5. WET WELL REQUIREMENTS

- A. The lift station will be constructed of min. 3,500psi concrete with reinforcement material per ACI 350 and ACI 315 (Latest Edition).
- B. The wet well shall be lined with an epoxy coating per RWU Specification 03-11.
- C. All plumbing entering or leaving the wet well shall have a water stop and grouted to prevent infiltration per RWU Specification 03-05 and 03-11.
- D. The wet well shall be vented. Venting systems shall be appropriately sized, corrosion resistant, and protected from weather and rodents.
- E. Wet wells shall be circular with a minimum diameter of 8 feet.
- F. Wet well shall be cast-in-place. No precast structures will be allowed.
- G. Access covers and safety grates shall be of aluminium construction and designed for access to submersible pumps. Covers shall be equipped with a guide bar bracket, safety chain hook, electric cable support, and a hasp for a padlock. Covers shall be of a size compatible with the pumps. Wet well hatch shall open toward the control panel and safety hatch towards the sides of the wet well and hold a live-load of at minimum 300 pounds per square foot. Door shall open to 90°, lock automatically in position; have closed position lock hasp and retractable grip for opening and closing with one hand.
- H. All lift station mounting rails, guide rails, support brackets, cross bracing, anchors, bolts, nuts, washers and other hardware shall be stainless steel type 304 or 316 and of domestic manufacture.
- I. Stainless steel chains, hooks and cord grip shall be provided for all pumps cables in wet well.
- J. Each pump shall have an individual intake. Wet well and intake design should be such as to avoid turbulence near the intake and to prevent vortex formation.
- K. Pumps weighing greater than 500 lbs. or wet wells with more than 2 pumps will require a monorail type overhead hoist system.

6. PUMP REQUIREMENTS

- A. Submersible pumps and motors shall be designed specifically for raw wastewater use, including totally submerged operation during a portion of each pumping cycle, and shall meet the requirements of the National Electrical Code

- for such units.
- B. All pumps shall have a minimum horsepower rating of 5hp and rated for a 277/480V, 3 phase, 4-wire WYE service. Pumps not meeting this criteria shall require prior approval from Rogers Water Utilities.
 - C. An effective method to detect shaft seal failure or potential seal failure shall be provided.
 - D. Submersible pumps shall be readily removable and replaceable without the necessity of personnel entering or dewatering the wet well or disconnecting any piping in the wet well. All lift stations require rail mounted submersible pumps as manufactured by Flygt (N-Series), or equivalent and interchangeable without alteration to the piping or electrical system. Proposed pumps other than Flygt shall require prior approval from Rogers Water Utilities.
 - E. Pump motor power cords shall be designed for flexibility and serviceability under conditions of hard usage and shall meet the requirements of the National Electrical Code standards for flexible cords in wastewater pump stations. Ground fault interruption protection shall be used to de-energize the circuit in the event of any failure in the electrical integrity of the cable. Power cord terminal fittings shall be corrosion-resistant and constructed in a manner to prevent the entry of moisture into the cable, shall be provided with strain relief appurtenances, and shall be designed to facilitate field connecting.
 - F. All pumps will meet or exceed the minimum requirements to pump the anticipated flow for the known number of houses, units, or number of persons. The pumps will meet or exceed required head values based on design.

7. DISCHARGE PIPING / DESIGN

- A. The “Discharge Pipe” is defined as all pipe and fittings required from the pump discharge to the check valve connection at the valve vault.
- B. Discharge pipes shall be designed and constructed such that normal velocities are between 2 ft. /s and 8 ft. /s.
- C. Head loss shall be calculated using Hazen-Williams with C=100 for stainless steel and C=120 for DIP, epoxy-lined sewer pipe, as well as appropriate “K” factors for minor losses in fittings.
- D. All lift station piping 2” diameter or less shall be stainless steel. All piping 3” diameter or greater shall be DIP, epoxy lined pressure sewer pipe.
- E. Pumps shall be mounted on stainless steel slide rails and use watertight pump connector as recommended by the pump manufacturer.

8. VALVES & VALVE VAULT

- A. Valves shall be located in a vault separate from the wet well.
- B. Provisions shall be made to drain accumulated water from the valve chamber to the wet well through a 2” stainless steel drain line with a 2” stainless steel check valve.
- C. Maximum vault depth shall be 6’ from access hatch to base.
- D. Discharge pipes 3” and larger shall be equipped with a swing check valve (per

- RWU Specification 03-07). A plug valve (per RWU Specification 03-06) located downstream of the check valve.
- E. Discharge pipes smaller than 3" shall be equipped with a stainless steel swing check valve and stainless steel ball valve.
 - F.
 - G. Access shall be provided for the valve vault. Access covers shall be aluminum construction, designed for access to valves. Covers shall be of a size compatible with the valves, and shall be located such that valve nuts can be operated from the surface without the need for personnel to enter the vault. Wet well hatch shall be rated for a live-load of at minimum 300 pounds per square foot. Door shall open to 90°, lock automatically in position; have closed position lock hasp and retractable grip for opening and closing with one hand.
 - H. The base of all piping shall be mounted a minimum of 24" above the floor of the vault with steel support stands.
 - I. All valves must be provided with 2" operating nuts so that valves can be operated without entering the valve vault.

9. ELECTRICAL

- A. All electrical components shall be installed by a licensed electrician and comply with all applicable building and electrical codes. All equipment shall be UL listed.
- B. Electrical systems shall comply with Arc Flash requirements per NEC 240.87 and NFPA 70E.
- C. Electrical systems and components (e.g., motors, lights, cables, conduits, switch boxes, control circuits, etc.) in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class I, Division 1, Group D locations. No electrical equipment shall be located inside the wet well with the exception of pump cable and level sensing equipment. Each flexible cable shall be provided with a watertight seal and separate strain relief. A breaker type disconnect located above ground shall be provided for the main power feed for all pumping stations. When such equipment is exposed to weather, it shall meet the requirements of weatherproof equipment NEMA 3R or 4, at a minimum.
- D. Lightning and surge protection systems should be incorporated in the electrical design on all wiring entering or leaving the panels, including incoming power and Ethernet.
- E. Ground Fault Circuit Interruption (GFCI) protection shall be provided for any outdoor outlets.
- F. An automatic transfer switch shall be incorporated for any backup power source.
- G. All conduit entries and exits shall be galvanized to 5' outside structure. All conduit elbows shall be long sweep elbows. Conduits and conductors between transformers and main disconnect to be sized in accordance with NEC standards. Conduits to be minimum 18" depth. All conduits inside wet well

- shall be type 304 or 316 stainless steel.
- H. Electrical supply, control, and alarm circuits shall be designed to provide strain relief and to allow disconnection from outside the wet well. Terminals and connectors shall be protected from corrosion by location outside the wet well and through use of watertight seals.
 - I. Control Panel (277/480V 3-phase)
 - 1) All pumps rated at 7.5 HP and smaller shall be installed with one “across the line” magnetic contactor or “soft start” per pump sized to HP and NEMA standards shall be provided and installed with overload protection sized to motor specifications.
 - 2) Lift stations requiring greater than 7.5-HP pumps shall be operated by variable frequency drives as manufactured by Schneider or approved equal. VFDs shall be sized in accordance with pump motor specifications.
 - 3) All operator controls, overload resets, circuit breakers, etc., shall be accessible without removing the dead-front panel.
 - 4) A disconnect for the High Voltage panel shall be provided to disconnect power before the panel can be opened.
 - 5) One combination circuit breaker/overload disconnect unit with magnetic trip elements sized for individual protection shall be provided for each pump.
 - 6) Each pump will have separate Terminals (Busman or equivalent) provided for each pump and mounted a minimum of 4” above the bottom of the control panel.
 - J. 3-phase power monitor must be installed to protect pump from low voltage, single phasing and phase reversal. (Motor Saver Model 460)
 - K. A 120 Volt Surge arrester (Mission Critical Guard MA035) shall be used for control circuit protection.
 - L. Surge protection shall be installed between the modem and the PLC to protect from lightning.
 - M. A backup float system shall operate a timer that allows both pumps to run without the need of a PLC. The float cord shall be of sufficient length to reach the lowest inlet.
 - N. 480/120VAC control transformer protected by combination circuit breaker/overload shall provide protection on both the primary and secondary control circuit. Neutral and ground wires shall be bonded inside the transformer.
 - O. All terminals coming from the wet well shall be manufactured by Busman or equivalent and must be mounted a minimum of 4” above the bottom of the control panel.
 - P. All terminal connections must be a minimum of 4” above the bottom of the control panel.
 - Q. All pumps shall be protected by seal fail and hi temp relays.
 - R. Building air conditioning shall be relay-controlled by the PLC.
 - S. One 120 volt receptacle will be provided for the modem. The modem shall be

- powered by a relay that will sense power fail and switch to battery power.
- T. Station service panel shall operate on 220 Volts AC with a minimum of eight breakers.
- U. A lightning arrester shall be installed for pumps protection and mounted below and outside of the control panel.
- V. A fuse shall be added for the phase monitor with 1/16 amp fuses on each leg.
- W. High level alarms are required. A red warning light with flasher and audible alarm shall be installed at a height visible from the adjacent roadway.
- X. The power company shall be contacted prior to design to determine type of electrical service and transformer requirements. Three-phase 277/480V power must be used. No single phase power will be accepted on duplex stations.

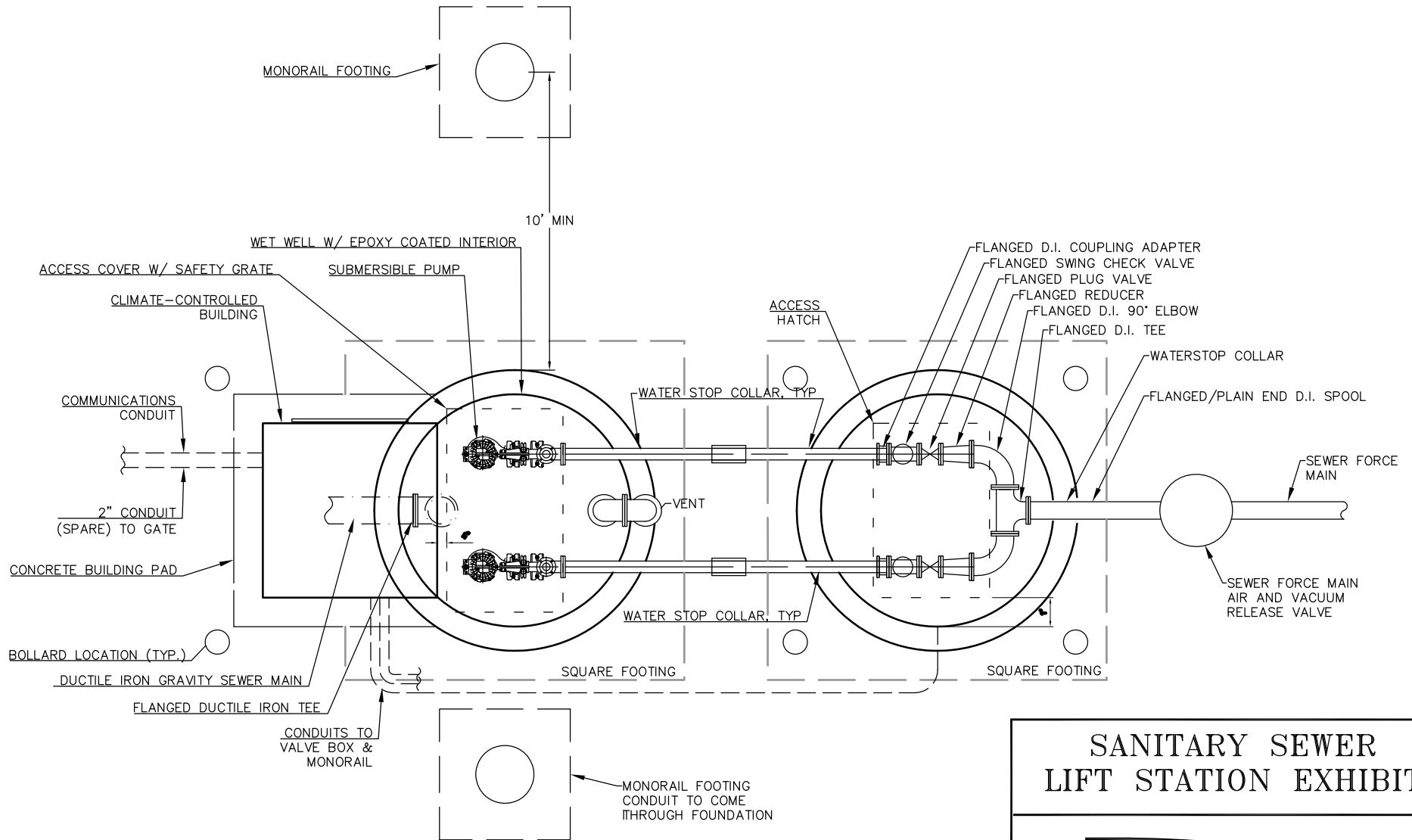
10. COMMUNICATIONS / SCADA

- A. NEMA 3R stainless steel enclosures with draw pull catch, provisions for padlocking and suitable for indoor or outdoor mounting shall be provided.
- B. The SCADA panel shall have an Ingram (Anti-Condensate Heater AHC-50W) or equivalent.
- C. The SCADA Control panel shall incorporate a hinged dead-front featuring the following features as a minimum:
 - 1) Individual selector switches to provide "hand-off-auto" control of each pump.
 - a) HAND POSITION - In this position, the pump controlled by the (HOA) switch will run regardless of the wet well level. The pumps will continue to run until the switch is turned "off" or in "auto" position
 - b) AUTO POSITION – Of the (HOA) switch shall operate the pumps and will be controlled automatically by the PLC and level sensors in the wet well. The control center will be designed to provide automatic operation, while maintaining motor protection.
 - 2) Pump HI TEMP pilot lights (red)
 - 3) Pump SEAL FAIL pilot lights (amber)
 - 4) Pump running pilot lights (green)
 - 5) Hour meters will be provided for each pump
 - 6) HMI (Scadapack Vision-60 or approved equal)
- D. The generator shall have an automatic transfer switch and be connected to the station SCADA system and generator alarms transmitted to the office Wonder Ware program.
- E. Communication between the generator and the PLC is to be fiber optic only. This reduces transient potential voltage.
- F. The Chase way coming through the wet well will be 6" PVC with a 6" PVC cap with cord grips.

- G. The developer / contactor will provide spare parts and software for any controls not commonly used by RWU Field operations.
- H. Alternator shall be provided in the PLC for duplex units.
- I. The level control system sensors shall be a Transducer 4 to 20 milliamps. (Chase Control Model 03271988-03042005) or equivalent.
- J. All duplex pump stations shall be controlled with a (SCADAPACK 32 PN/P4-100-01-1-1) and have circuit protection for disconnect. The PLC shall be powered by a SCADAPack 5103 power supply. The power supply and PLC shall have a battery as a backup (12 volt 26 amp hour battery). Inline fuse shall be installed between the battery and the SCADAPack 5103 power supply. Battery to be placed in bottom of SCADA panel.

11. FINAL ACCEPTANCE

- A. A spare pump, lifting chain, and mounting flange must be furnished with each sewer lift station and delivered to the Station Building prior to lift station final inspection and acceptance.
- B. The electric and water meters shall be installed before a final inspection is requested.
- C. A final lift station inspection shall be conducted at the developer's request once lift station construction has been completed, and pump start-up has been performed. A lift station startup report must be given to the Rogers Water Utilities Field Operations personnel. Field operation maintenance personnel must be present at the pump start up session.
- D. The lift station final inspection and development final inspections are separate inspections and will take place at separate appointments.
- E. The electric account shall be setup with Power Company by the contractor and after the final inspection shall be transferred to Rogers Water Utilities upon acceptance of the overall development and lift station.
- F. All panels, disconnects and breakers will be labeled. The correct voltage shall be displayed on all panels. All disconnects shall be Lock Out/Tag Out compatible, and locked in "ON" position.
- G. Warranty period will be 12 months to the Rogers Water Utilities after final acceptance.
- H. The auxiliary generator, if required, must be test run and load bank tested to ensure proper operation, and to insure the correct rotation of the pumps.
- I. The developer / contactor will provide 3 copies of operation & maintenance manuals, as well as one PDF digital copy. This manual shall include – Identification and contact information for all suppliers, installers, and programmers, hydraulic report, force main plans, station component cut sheets, valve vault components, electrical schematics, and electrical catalog, pump serial numbers, and pump curves. The books shall be submitted to the Rogers Water Utilities prior to final inspection.
- J. The Contractor shall provide a basic parts list to RWU for the Electrical and Communications Panel.



PLAN VIEW
SCALE: 1"=5'

NOTE:

LIFT STATION EXHIBITS ARE TO BE USED AS A DESIGN GUIDE AND TO SUPPLEMENT TO STANDARD SPECIFICATIONS. EXHIBITS ARE INTENDED TO SHOW THE DESIRED GENERAL LAYOUT OF FACILITIES AND ARE NOT TO BE USED AS CONSTRUCTION PLANS.

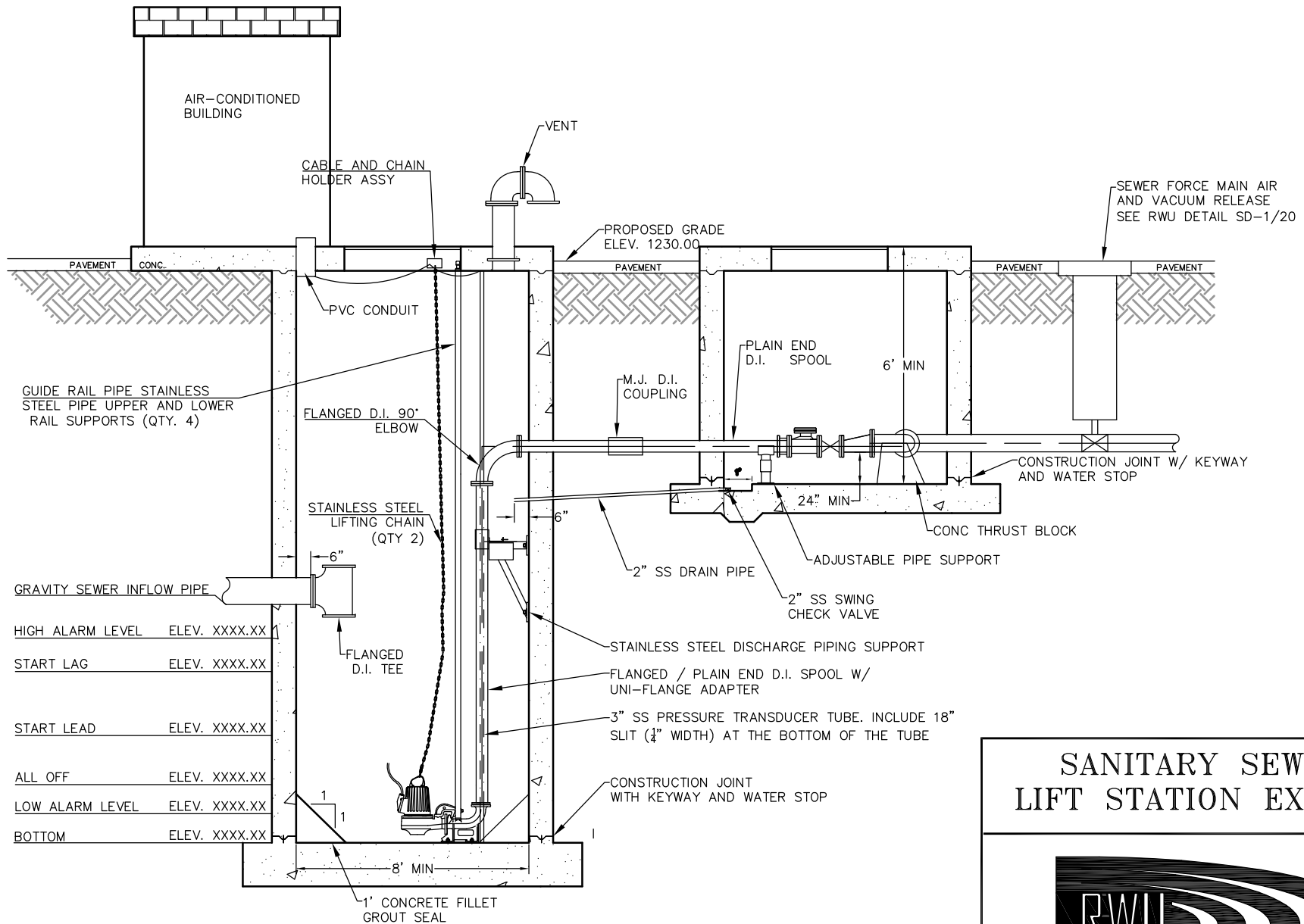
**SANITARY SEWER
LIFT STATION EXHIBIT**



P.O. DRAWER 338
OFFICE - 601 SOUTH 2ND ROGERS, ARKANSAS
72757-0338

DATE: 6/06/17

SHEET NO.
LS-1



GUIDE RAIL PIPE STAINLESS
STEEL PIPE UPPER AND LOWER
RAIL SUPPORTS (QTY. 4)

HIGH ALARM LEVEL	ELEV. XXXX.XX
START LAG	ELEV. XXXX.XX
START LEAD	ELEV. XXXX.XX
ALL OFF	ELEV. XXXX.XX
LOW ALARM LEVEL	ELEV. XXXX.XX
BOTTOM	ELEV. XXXX.XX

PROFILE VIEW
SCALE: 1"=5'

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SANITARY SEWER LIFT STATION EXHIBIT



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SHEET NO.
LS-2