

Texas Commission on Environmental Quality
Lift Stations and Force Mains
General Construction Notes

1. This lift station and/or force main must be designed and constructed in accordance with the Texas Commission on Environmental Quality's (TCEQ) Edwards Aquifer Rules 30 Texas Administrative Code (TAC) §213.5(c), the Design Criteria for Sewerage Systems 30 TAC Chapter 317, and the City of _____ Standard Specifications.
2. Any modification to the activities described in the referenced Lift Station/Force Main application following the date of approval may require the submittal of a Lift Station/Force Main application to modify this approval, including the payment of appropriate fees and all information necessary for its review and approval.
3. Prior to commencing any regulated activity, the applicant or his agent must notify the Austin Regional Office, in writing, of the date on which the regulated activity will begin.
4. Upon completion of the wet well excavation, a geologist must certify that the excavation was inspected for the presence of sensitive features and the certification must be submitted to the appropriate regional office. Further activities may not proceed until the executive director has reviewed and approved the methods proposed to protect any sensitive feature and the Edwards Aquifer from potentially adverse impacts to water quality from the lift station. Construction may continue if the geologist certifies that no sensitive feature or features are present.
5. If any sensitive features are discovered during the wastewater line trenching activities, all regulated activities near the sensitive feature must be suspended immediately. The owner must notify the appropriate regional office of the Texas Commission on Environmental Quality in writing within two working days of the feature discovery. The regulated activities near the sensitive feature may not proceed until the executive director has reviewed and approved the methods proposed to protect the sensitive feature and the Edwards Aquifer from any potentially adverse impacts to water quality while maintaining the structural integrity of the line.
6. Lift stations shall be protected from the 100-year flood and shall be accessible during a 25-year flood. All lift stations shall be accessible during a 25-year flood. All lift stations shall be intruder-resistant with a controlled access.
7. Dry well sump pumps:
 - a) Two separate sump pumps should be provided for removal of leakage or water from the dry well floor.
 - b) The discharge pipe level from the sump pumps shall be above the maximum liquid level of the wet well. A check valve should be installed on the discharge side of each sump pump.
 - c) All floor and walkway surfaces shall have an adequate slope to a point of drainage with sufficient measures taken to maximize traction and safety.
 - d) Motors to drive sump pumps shall be located above the height of the maximum liquid level in the wet well. As an alternate, sump pumps may be of the submersible type.
8. All lift stations shall have automatically operated pump control mechanisms. Pump control mechanisms shall be located so that they will not be affected by flow currents in the wet well. Provisions shall be made to prevent grease and other floating materials and rags in the wet well from interfering with the operation of the controls. When a float tube is located in the dry well, its height shall be such as to prevent overflow of the sewage into the dry well. Pump control mechanisms

which depend on a bubbler in the wet well shall be equipped with a backup air supply system. All connections to level controls in the wet well shall be accessible at all times. The circuit breakers, indicator lights, pump control switches, and other electrical equipment should be located on a control panel at least three feet above ground surface elevation. If controls are located in a dry well, the dry well shall be protected from flooding.

9. Wet wells

- a) Wet wells and dry wells shall be separated by at least a watertight and gastight wall with separate lockable entrances provided to each.
- b) Based on design flow, wet well capacity should provide a pump cycle time of not less than six minutes for those lift stations using submersible pumps and not less than 10 minutes for other non-submersible pump lift stations.
- c) All influent gravity lines into a wet well shall be located where the invert is above the "off" setting liquid level of the pumps, and preferably should be located above the lead pump "on" setting.
- d) The bottom of wet wells shall have a minimum slope of 10 percent to the pump intakes and shall have a smooth finish.

10. Stairways with non-slip steps shall be provided in all underground dry wells. Removable ladders may be provided in small stations where it is impractical to install stairways.

11. Ventilation shall be provided for lift stations, including both wet and dry wells.

12. Hoisting equipment or access by hoisting equipment for the removal of pumps, motors, valves, etc., shall be incorporated in the station design.

13. Drains from dry wells or valve vaults to the wet well shall be equipped with suitable devices to prevent entry of potentially hazardous gases.

14. Pumps.

- a) All raw sewage pumps shall be a non-clog design, capable of passing 2 ½ inch diameter spheres, and shall have no less than 3-inch diameter suction and discharge openings. Inspection and cleanout plates, located both on the suction and discharge sides of each pumping unit, are suggested for all non-submersible pumps so as to facilitate locating and removing blockage causing materials. Where such openings are not provided on the pumps, a hand hole in the first fitting connected to the suction of each pump shall be provided. All pumps shall be securely supported so as to prevent movement during operation. For submersible pumps, rail-type pump support systems incorporating manufacturer approved mechanisms designed to allow the operator to remove and replace any single pump without first entering or dewatering the wet well should be provided.
- b) The firm pumping capacity of all lift stations shall be such that the expected peak flow can be pumped to its desired destination. Firm pumping capacity is defined as total station maximum pumping capacity with the largest pumping unit out of service.
- c) Lift stations or transfer pumping facilities at a wastewater treatment plant or those discharging directly to the treatment plant where the plant's permitted daily average flow is equal to or greater than 100,000 gallons per day shall be provided with three or more pumps or with duplex automatically controlled variable capacity pumps or other automatic flow control devices. The pumps or other devices shall be adjusted for actual flow conditions and controlled to operate so as to minimize surges in the treatment units. No single pumping unit shall have a capacity greater than the design peak flow of the wastewater treatment plant unless flow splitting/equalization is provided.

- d) The engineering design report accompanying the plans shall include system curves, pump curves and head calculations. Calculations and pump curves at both minimum and maximum static heads and for a C value of both 100 and 140 must be provided for each pump and for the combination of pumps (modification pump curves). Where a suction lift is required, the report shall include a calculation of the available new positive suction head (NPSH) and a comparison of that value to the required NPSH for the pump as furnished by the pump manufacturer.
- e) Only self-priming or pumps with acceptable priming systems, as demonstrated by a reliable record of satisfactory operation, shall be used where the suction head is negative. All self-priming pumps shall include a means for venting the air back to the wet well when the pump is priming.
- f) All raw sewage pumps, other than submersible pumps without "no suction" piping and self-priming units capable of satisfactory operation under any negative suction heads anticipated for the lift station under consideration, shall be positioned such that the pumps always experience, during their normal on-off cycling, a positive static suction head.

15. Piping

- a) Each pump shall have a separate suction pipe. Cavitation may be avoided by using eccentric reducers in lieu of typical reducers in order to prevent air pockets from forming in the suction line.
- b) Full closing valves shall be installed on the discharge piping of each pump and on the suction of all dry pit pumps. A check valve shall be installed on the discharge side of each pump, preceding the full closing valve. Check valves should be of a swing check type with external levers. Rubberball check valves may be used for grinder pump installations in lieu of the swing check type. Butterfly valves, tilting disc check valves, or other valves with a pivoted disc in the flow line are not allowed. The design shall consider surge effects and provide protection where necessary. Surge relief shall be contained in the system.
- c) Gate valves should be rising-stem valves. If other than rising-stem gate valves and check valves with external levers are used, the valves shall include a position indicator to show their open and closed positions.
- d) Flanged pipe and fitting or welded pipe shall be used for exposed piping inside of lift stations. A flexible or flanged connection shall be installed in the piping to each pump so that the pump may be removed easily for repairs. Provisions shall be made in the design to permit flexure where pipes pass through walls of the station. Piping should normally be sized so that the maximum suction velocity does not exceed five feet per second and the maximum discharge velocity does not exceed eight feet per second.
- e) Force mains shall be a minimum of four inches in diameter, unless justified, as with the use of grinder pumps. In no case shall the velocity be less than two feet per second with only the smallest pump operating, unless special facilities are provided for cleaning the line at specified intervals or it can be shown that a flushing velocity of five feet per second or greater will occur one or more times per day. Pipe specified for force mains shall be of a type having an expected life at least as long as that of the lift station and shall be suitable for the material being pumped and the operating pressures to which it will be subjected. All pipe shall be identified in the technical specifications with appropriate ASTM, ANSI or AWWA specification numbers for both quality control and installation. All pipe and fittings shall have a minimum working pressure rating of 150 pounds per square inch.
- f) Final plans and specifications shall describe and require pressure testing for all force mains following construction. Minimum test pressure shall be 1.5 times the maximum design pressure.
- g) Air release valves or combination air release/vacuum valves suitable for sewage service shall be provided at all peaks in elevation. The final engineering drawings must depict all proposed force mains in both plan and profile.

16. Lift stations shall be designed such that there is not a substantial hazard of stream pollution from overflow or surcharge onto public or private property with sewage from the lift station. Options for a reliable power source may include:
- a) The commission will determine the reliability of the existing commercial power service. Such determinations shall be based on power outage records obtained from the appropriate power company and presented to the commission. When requesting outage records for submittal to the commission, it is important to note that the records be in writing, bear the signature of an authorized utility employee, identify the location of the wastewater facilities being served, list the total recorded outage. The facility will be deemed reliable if the demonstrated wastewater retention capacity, in the station's wet well, spill retention facility, and incoming gravity sewer lines, is sufficient to insure that no discharge of untreated wastewater will occur for a length of time equal to the longest electrical outage recorded in the past 24 months.
 - b) If the existing power supply is found to be unreliable, an emergency power supply or detention facility shall be provided. Options include:
 - i) Electrical service from two separate commercial power companies, provided automatic switch over capabilities are in effect;
 - ii) Electrical service from two independent feeder lines or substations of the same electric utility, provided automatic switch over capabilities are in effect;
 - iii) On-site automatic starting electrical generators;
 - iv) Proposals for the utilization of portable units shall be accompanied by a detailed report showing conclusively the ability of such a system to function satisfactorily. Portable units will be approved only in those cases where the station is equipped with an auto-dialer, telemetry device or other acceptable operator notification device, operators knowledgeable in acquisition and startup of the portable units are on 24-hour call, the station is accessible in all weather conditions, reasonable assurances exist as to the timely availability and accessibility of the proper portable equipment, and the station is equipped with properly designed and tested quick connection facilities.
 - c) Provisions should be made to restore the lift station to service within four hours of outage.
 - d) A spill containment structure should be considered together with in-system retention in determining a total wastewater retention time. Because separate spill retention facilities are not suitable for all locations, engineers should check with the commission prior to designing such structures. The design shall provide:
 - i) a minimum storage volume of average design flow from the contributing area and the longest power outage during the most recent consecutive 24-month period or, if power records are not available, an assumed 24-hour outage;
 - ii) an impermeable liner (20 mil thickness) and should have an energy dissipator at the point of overflow from the lift station to prevent scour;
 - iii) a fence with a controlled access; and
 - iv) a plan for routine cleaning and inspection.
 - e) An audio-visual alarm system (red flashing light and horn) shall be provided for all lift stations. These alarm systems should be telemetered to a facility where 24 hour attendance is available. The alarm system shall be activated in case of power outage, pump failure or a specified high water level.
17. The discharge pipe level from the sump pumps shall be above the maximum liquid level of the wet well. A check valve should be installed on the discharge side of each sump pump.

THESE LIFT STATION AND FORCE MAINS CONSTRUCTION NOTES MUST BE INCLUDED ON THE CONSTRUCTION PLANS PROVIDED TO THE CONTRACTOR AND ALL SUBCONTRACTORS.