

RESOLUTION NO. 2021-03

**BRIGHTON TOWNSHIP SEWAGE AUTHORITY
BEAVER COUNTY, PENNSYLVANIA**

**A RESOLUTION TO ADOPT RULES AND REGULATIONS SETTING FORTH
MINIMUM CONSTRUCTION STANDARDS AND DETAILS FOR PUMP
STATIONS**

WHEREAS, the Board of Directors desires to establish standards, specifications and details for construction and maintenance of Pump Stations within Brighton Township Sewage Authority service areas; and

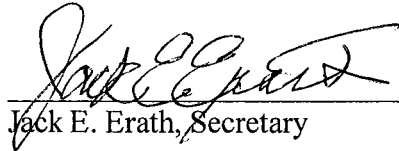
WHEREAS, Brighton Township desires to compile the standards, specifications and details into a comprehensive document.

NOW, THEREFORE, BE IT RESOLVED, by the Board of Directors of the Brighton Township Sewage Authority, Beaver County, Pennsylvania that they hereby adopt the Brighton Township Sewage Authority Pump Station Design Standards, a copy of which is attached hereto; and

BE IT FURTHER RESOLVED that the Brighton Township Sewage Authority Pump Station Design Standards may be revised and updated from time to time by Resolution of the Board of Directors.

RESOLVED AND ADOPTED by the Board of Directors of the Brighton Township Sewage Authority, Beaver County, Pennsylvania, in public meeting this 19th day of July, 2021.

ATTEST:



Jack E. Erath, Secretary

BRIGHTON TOWNSHIP
SEWAGE AUTHORITY



Gordon Sheffer, Chairman

BRIGHTON TOWNSHIP SEWAGE AUTHORITY
PUMP STATION DESIGN STANDARDS

SECTION 1 - GENERAL

1.1 FLOODING

Wastewater pumping station structures and electrical and mechanical equipment shall be protected from physical damage by the 100-year flood. Wastewater pumping stations should remain fully operational and accessible during the 25-year flood. Regulations of state and federal agencies regarding flood plain obstructions shall be considered.

1.2 ACCESSIBILITY AND SECURITY

The pumping station shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traffic way of streets and alleys. It is recommended that security fencing, doors and/or access hatches with locks be provided.

1.3 GRIT

Where it is necessary to pump wastewater prior to grit removal, the design of the wet well and pump station piping shall receive special consideration to avoid operational problems from the accumulation of grit.

1.4 SAFETY

Adequate provision shall be made to effectively protect maintenance personnel from hazards. Equipment for confined space entry in accordance with OSHA and regulatory agency requirements shall be provided for all wastewater pumping stations.

1.5 MODIFICATIONS

When an existing pumping station is to be modified, the specifications shall include provisions for adequate pumping capacity during the construction period.

SECTION 2 - DESIGN

The following items shall be given consideration in the design of wastewater pumping stations:

2.1 TYPE

Wastewater pumping stations shall be of a wet well/dry well configuration.

2.2 STRUCTURES

A. Separation

Dry wells, including their superstructure, shall be completely separated from the wet well. Common walls shall be gas tight. A dehumidifier is recommended for moisture control.

B. Equipment Removal

Provisions shall be made to facilitate removing pumps, motors, and other mechanical and electrical equipment. Individual pump and motor removal shall not interfere with the continued operation of remaining pumps.

C. Access and Safety Landings

1. Access

Suitable and safe means of access for persons wearing self-contained breathing apparatus shall be provided for both dry wells and wet wells.

2. Safety Landings

For built-in-place pump stations, a stairway to the dry well shall be provided with rest landings at vertical intervals not to exceed 12 feet (3.7 m). For factory-built pump stations over 15 feet (4.6 m) deep, a rigidly fixed landing shall be provided at vertical intervals not to exceed 10 feet (3 m). Where a landing is used, a suitable and rigidly fixed barrier shall be provided to prevent individuals from falling past the intermediate landing to a lower level. A manlift or elevator may be used in lieu of landings in a factory-built station, provided emergency access is included in the design.

D. Buoyancy

Where high groundwater conditions are anticipated, buoyancy of the wastewater pumping station structures shall be considered and, if necessary, adequate provisions shall be made for protection.

E. Construction Materials

1. Corrosion Protection

Materials shall be selected that are appropriate under conditions of exposure to hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in wastewater. This is particularly important in the selection of metals and paints. Contact between dissimilar metals should be avoided or other provisions made to minimize galvanic action.

2. Exterior

The building exterior shall be designed using block and brick materials that conform to the Brighton Township Building Code zoning district requirements.

2.3 PUMPS

A. Multiple Units

Multiple pumps shall be provided. Where only two units are provided, they shall be of the same size. Each shall be capable of handling peak instantaneous flows. Where three or more units are provided, they should be designed to fit actual flow conditions and must be of such capacity that with any one unit out of service, the remaining units will have capacity to handle peak instantaneous flows. A minimum of three pumps shall be provided for stations designed to handle maximum monthly average flow of greater than one million gallon per day. All pumps should be tested by the manufacturer. These tests should include a hydrostatic test and an operating test.

B. Protection Against Clogging

Pumps handling separate sanitary or combined wastewater shall be preceded by one or more of the screening devices such as a manually cleaned bar screen, mechanically cleaned bar screen, comminutor, or coarse bar rack to protect the pumps from clogging or damage. Where a manually and/or mechanically cleaned bar screen is used, refer to Section 51.131 of the Pennsylvania Department of Environmental Protection Domestic Wastewater Facilities Manual for appropriate bar spacing. Where a manually cleaned bar screen or coarse bar rack is provided, convenient facilities must be provided for handling screenings.

C. Pump Openings

Except where grinder pumps are used, pumps handling raw wastewater shall be capable of passing solid spheres of at least 3 inches (80 mm) in diameter. Pump suction and discharge openings shall be at least 4 inches (100 mm) in diameter. An exception to the requirement for passing solid spheres of at least 3 inches (80 mm) in diameter may be made on a case by case basis when the design includes equivalent protection from clogging or damage (i.e., grinder pumps, etc.).

D. Priming

The pump shall be so placed that under normal operating conditions it will operate under a positive suction head.

E. Electrical Equipment

Electrical systems and components (e.g., motors, lights, cables, conduits, switch boxes, control circuits, etc.) in raw wastewater wet wells, or 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. Equipment located in the wet well shall be suitable for use under

corrosive conditions. Each flexible cable shall be provided with a watertight seal and separate strain relief. A fused disconnect switch 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. Lightning and surge protection systems should be considered. Lift station control panels located outdoors shall be provided with a 110 volt power receptacle inside the control panel to facilitate maintenance. Ground Fault Circuit Interruption (GFCI) protection shall be provided for all outdoor outlets.

F. Intake

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. Intake piping should be straight and short as possible.

G. Dry Well Dewatering

A sump pump equipped with dual check valves shall be provided in the dry well to remove leakage or drainage with discharge above the maximum high water level of the wet well. Water ejectors connected to a potable water supply will not be approved. All floor and walkway surfaces should have an adequate slope to a point of drainage. Pump seal leakage shall be piped directly to the sump. The sump pump shall be sized to remove the maximum pump seal water discharge that could occur in the event of a pump seal failure.

H. Pumping Rates

The pumps and controls of main pumping stations, especially pumping stations operated as part of treatment facilities, should be selected to operate at varying delivery rates. Such stations should be designed to deliver as uniform a flow as practicable in order to minimize hydraulic surges. The station design capacity shall be based on the design peak hourly flow and should be adequate to maintain a minimum velocity of 2 feet per second (0.6 m/s) in the force main. Refer to Paragraph 6.1.

2.4 CONTROLS

A. Type

Control systems shall be of the air bubbler type, the encapsulated float type, the sonic detector type, FOGRod™, or the flow measuring type. Float tube control systems on existing stations being upgraded may be approved, provided that related electrical equipment complies with the National Electrical Code requirements for Class I, Division 1, Group D locations.

B. Location

The control system shall be located away from the turbulence of incoming flow and pump suction. Float tubes in dry wells shall extend high enough to prevent overflow. Provisions should be made to automatically alternate the pumps in use.

2.5 VALVES

A. General

All Shutoff valves shall be rising stem type valves.

B. Suctions Line

Suitable shutoff valves shall be placed on the suction line of dry pit pumps.

C. Discharge Line

Suitable shutoff and check valves shall be placed on the discharge line of each pump (except on screw pumps). The check valve shall be located between the shutoff valve and the pump. Check valves shall be suitable for the material being handled and shall be placed on the horizontal portion of discharge piping. Check valves shall not be placed on the vertical portion of discharge piping except that check valves may be approved on vertical risers when plans and specifications require a specific valve which is designed and is advertised by the manufacturer as suitable for raw wastewater on a vertical riser (e.g. ball check valves). Valves shall be capable of withstanding normal pressures and water hammer. Motorized slow closing plug valves are acceptable.

All shutoff and check valves shall be operable from floor level and accessible for maintenance. Outside levers are recommended on swing check valves.

Where limited pump backspin will not damage the pump and low discharge head conditions exist, short individual force mains for each pump may be considered in lieu of discharge valves.

Valves shall not be located in the wet well.

2.6 WET WELLS

A. Divided Wet Wells

Where continuity of pumping station operation is critical, consideration should be given to dividing the wet well into two interconnected sections to facilitate repairs and cleaning.

B. Size

The wet well size and control setting shall be appropriate to avoid heat buildup in the pump motor due to frequent starting and to avoid septic conditions due to excessive detention time. The effective capacity (e.g., capacity between working levels) of the wet well shall generally provide a holding period not to exceed 15 minutes for the maximum monthly average flow. Where tributary flow distance is short, a holding period not to exceed 30 minutes for the maximum monthly average flow should be considered.

C. Floor Shape

The wet well floor shall have a minimum slope of 1 to 1 to the hopper bottom. The horizontal area of the hopper bottom shall be no greater than necessary for proper installation and function of the inlet.

D. Air Displacement

Covered wet wells shall have provisions for air displacement to the atmosphere, such as an inverted "j" tube or other means.

2.7 SAFETY VENTILATION

A. General

Adequate ventilation shall be provided for all pump stations. Mechanical ventilation shall be provided for dry wells that are located below the ground surface. If screens or mechanical equipment requiring maintenance or inspection are located in the wet well, permanently installed ventilation is required. There shall be no interconnection between the wet well and dry well ventilation systems.

B. Air Inlets and Outlets

In dry wells over 15 feet (4.6 m) deep, multiple inlets and outlets are desirable. Dampers should not be used on exhaust or fresh air ducts. Fine screens or other obstructions in air ducts should be avoided to prevent clogging.

C. Electrical Controls

Switches for operation of ventilation equipment should be clearly marked and conveniently located. All intermittently operated ventilation equipment shall be interconnected with the respective pit lighting system. Consideration should be given to automatic controls where intermittent operation is used. The manual lighting/ventilation switch shall override the automatic controls. For a two speed ventilation system with automatic switch over where gas detection equipment is installed, consideration should be given to increasing the ventilation rate automatically in response to the detection of hazardous concentrations of gases or vapors.

D. Fans, Heating, and Dehumidification

The fan wheel shall be fabricated from non-sparking material. Automatic heating and dehumidification equipment shall be provided in all dry wells. The electrical equipment and components shall meet the requirements in Paragraph 2.3E.

E. Wet Wells

Wet well ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least 12 complete air changes per hour; if intermittent, at least 30 complete air changes per hour. Air shall be forced into the wet well by mechanical means rather than solely exhausted from the wet well. The air change requirements shall be based on 100 percent fresh air.

F. Dry Wells

Dry well ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least 6 complete air changes per hour; if intermittent, at least 30 complete air changes per hour. A system of two speed ventilation with an initial ventilation rate of 30 changes per hour for 10 minutes and automatic switch over to 6 changes per hour may be used to conserve heat. The air change requirements shall be based on 100 percent fresh air.

2.8 FLOW MEASUREMENT

Suitable devices for measuring wastewater flow shall be provided at all pumping stations. Indicating, totalizing, and recording flow measurement shall be provided at pumping stations with a 350 gpm (22 L/s) or greater design peak hourly flow, or pumping stations with variable frequency drives or screw pumps. Elapsed time meters, used in conjunction with annual pumping rate tests, may be acceptable for pump stations with constant output pumps and a design peak hourly flow up to 350 gpm (22 L/s), provided sufficient metering is configured to measure the duration of individual and simultaneous pump operation.

2.9 WATER SUPPLY

There shall be no physical connection between any potable water supply and wastewater piping at the pumping station which, under any conditions might cause contamination of the potable water supply.

A separate potable water supply shall be brought to the station for routine cleaning and maintenance activities. A separate potable water spigot and water hose system shall be provided at one or more locations, as directed by the Authority.

SECTION 3 - ALARM SYSTEMS

Alarm systems with a backup power source shall be provided for pumping stations. The alarm shall be activated in cases of power failure, dry well sump and wet well high water levels, wet well low water levels, pump failure, unauthorized entry, or any other cause of pump station malfunction. Pumping station alarm systems shall transmit and identify alarm conditions. The alarm shall be transmitted to municipal offices during normal working hours and to the home of the responsible person(s) in charge of the lift station during off-duty hours.

SECTION 4 - EMERGENCY OPERATION

Pumping stations and collection systems shall be designed to prevent or minimize bypassing of raw wastewater. For use during possible periods of extensive power outages, mandatory power reductions or storm events, consideration should be given to providing a controlled, high-level wet well overflow to supplement alarm systems and emergency power generation in order to prevent backup of wastewater into basements, or other discharges which may cause severe adverse impacts on public interests, including public health and property damage.

4.1 EQUIPMENT REQUIREMENTS

A. General

The following general requirements shall apply to all internal combustion engines used to drive electrical generating equipment.

1. Engine Protection

The engine shall be protected from operating conditions that would result in damage to equipment. Unless continuous manual supervision is planned, protective equipment shall be capable of shutting down the engine and activating an alarm. Protective equipment shall monitor for conditions of low oil pressure and overheating. Oil pressure monitoring will not be required for engines with splash lubrication.

2. Size

The engine shall have adequate rated power to start and continuously operate under all connected loads.

3. Fuel Type

Reliability and ease of starting, especially during cold weather conditions, should be considered in the selection of the type of fuel.

4. Fuel Storage

The generator shall have an integral, above ground fuel storage tank, in the case of a liquid-fueled equipment.

5. Engine Ventilation

The engine shall be located above grade and shall be provided with adequate ventilation of fuel vapors and exhaust gases.

6. Routine Start-up

All emergency equipment shall be provided with instructions indicating the need for regular starting and running of such units at full loads.

7. Protection of Equipment

Emergency equipment shall be protected from damage at the restoration of regular electrical power. Equipment shall operate under emergency power for a minimum of a five minute period of clean outside power source before returning to normal operation.

8. Air Quality

Regulations of state and federal agencies regarding air quality shall be considered.

9. Silencer

Noise control should be considered.

B. Engine-Driven Generating Equipment

In addition to the general requirements, the following requirements shall apply to permanently installed or portable engine driven generating equipment:

1. Generating Capacity

- a. Generating unit size shall be adequate to provide power for pump motor starting current and for lighting, ventilation, and other auxiliary equipment necessary for safety and the proper operation of the lift station.
- b. The operation of all pumps operating simultaneously during periods of auxiliary power supply shall be justified. Such justification may be made on the basis of the design peak hourly flows, the anticipated length of power outages, and the storage capacity.
- c. The generating equipment shall have the capacity to start all pumps simultaneously with auxiliary equipment operating.

2. Operation

Provisions shall be made for automatic and manual start-up and load transfer unless only manual start-up and operation is justified. The generator shall be protected from operating conditions that could result in damage to equipment. Provisions should be considered to allow the engine to start and stabilize at operating speed before assuming the load. Where manual start-up and transfer is justified, the storage capacity and the alarm system shall meet the requirements of Section 3 and Section 4.

SECTION 5 - INSTRUCTIONS AND EQUIPMENT

Wastewater pumping stations and portable equipment shall be supplied with a complete set of operational instructions, including emergency procedures and maintenance schedules. Tools and spare parts shall be supplied as necessary.

SECTION 6 - FORCE MAINS

6.1 VELOCITY AND DIAMETER

At design pumping rates, a cleansing velocity of at least 2 feet per second (0.6 m/s) should be maintained. A maximum velocity of 8 feet per second (2.4 m/s) is recommended to avoid high head loss and protect valves. The minimum force main diameter for raw wastewater shall not be less than 4 inches (100 mm).

6.2 AIR AND VACUUM RELIEF VALVE

Air relief valves shall be placed at high points in the force main to prevent air locking. Vacuum relief valves may be necessary to relieve negative pressures on force mains. The force main configuration and head conditions should be evaluated as to the need for and placement of vacuum relief valves.

6.3 TERMINATION

The force main shall enter the receiving manhole with a smooth flow transition to the gravity sewer system at a point not more than 2 feet (0.6 m) above the flow line.

6.4 PIPE AND DESIGN PRESSURE

Pipe and joints shall be equal to water main strength materials suitable for design conditions. The force main, reaction blocking, and station piping shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater lift stations. The use of surge valves, surge tanks or other suitable means to protect the force main against severe pressure changes shall be evaluated.

Where forcemains are designed using High Density Polypropylene (HDPE) the minimum wall thickness shall meet the requirements of DR 11 rated at 160 pounds per square inch. Use of HDPE pipe shall be equipped with Protecto 401 Lined Pipe and Fittings as manufactured by U.S. Pipe, or approved equal.

6.5 SPECIAL CONSIDERATIONS

Force main construction near streams shall meet applicable requirements of Section 27 of the Pennsylvania Department of Environmental Protection Domestic Wastewater Facilities Manual.

6.6 DESIGN AND FRICTION LOSSES

A. Friction Coefficient

Friction losses through force mains shall be based on the Hazen-Williams formula or other acceptable methods. When the Hazen-Williams formula is used, the following values for "C" shall be used for design:

Unlined iron or steel: 100 PVC: 130-150 All other materials: 120

B. Max Power Requirements

When initially installed, force mains will have a significantly higher "C" factor. The effect of the higher "C" factor should be considered when calculating maximum power requirements and duty cycle time to prevent damage to the motor. The effects of higher discharge rates on selected pumps and downstream facilities should also be considered.

6.7 SEPARATION

There shall be at least a 10 foot (3 m) horizontal separation between water mains and sewer force mains. Force mains crossing water mains shall be laid to provide a minimum vertical distance of 18 inches (0.5 m) between the outside of the force main and the outside of the water main. This shall be the case where the water main is either above or below the force main. At crossings, if possible, one full length of water pipe shall be located so both joints will be as far from the force main as possible.

6.8 IDENTIFICATION

Where force mains are constructed of a material that might cause the force main to be confused with potable water mains, the force main shall be appropriately identified.

6.9 LEAKAGE TESTING

Leakage tests shall be specified including testing methods and leakage limits.

6.10 MAINTENANCE CONSIDERATIONS

Isolation valves should be considered where force mains connect into a common force main. Cleanouts at low points and chambers for pig launching and catching should be considered for any force main to facilitate maintenance.

6.11 COVER

Force mains shall be covered with sufficient earth or other insulation to prevent freezing.

SECTION 7 - ADDITIONAL REQUIREMENTS

7.1 ODOR/CORROSION CONTROL SYSTEM

Low influent flow conditions and the resulting extended periods between pump operation cycles will increase the forcemain residence time for raw sewage. Increased forcemain residence time can lead to the production of corrosive and odor-causing by-products of raw sewage.

A non-hazardous treatment system to reduce the corrosive and odor-causing effects of increased by-products production of the raw sewage shall be installed at the pump station.

The odor / corrosion control system shall consist of a storage tank, metering, and injection system that utilizes BIOXIDE® Calcium Nitrate Solution or an approved equal.

7.2 MINIMUM DRIVEWAY REQUIREMENTS

A minimum 15ft wide driveway shall be provided to pump station from the nearest township or state-owned street. This driveway shall be paved in accordance with the most current Township of Brighton, Minimum Construction Standards and Details for a Local Commercial Street.

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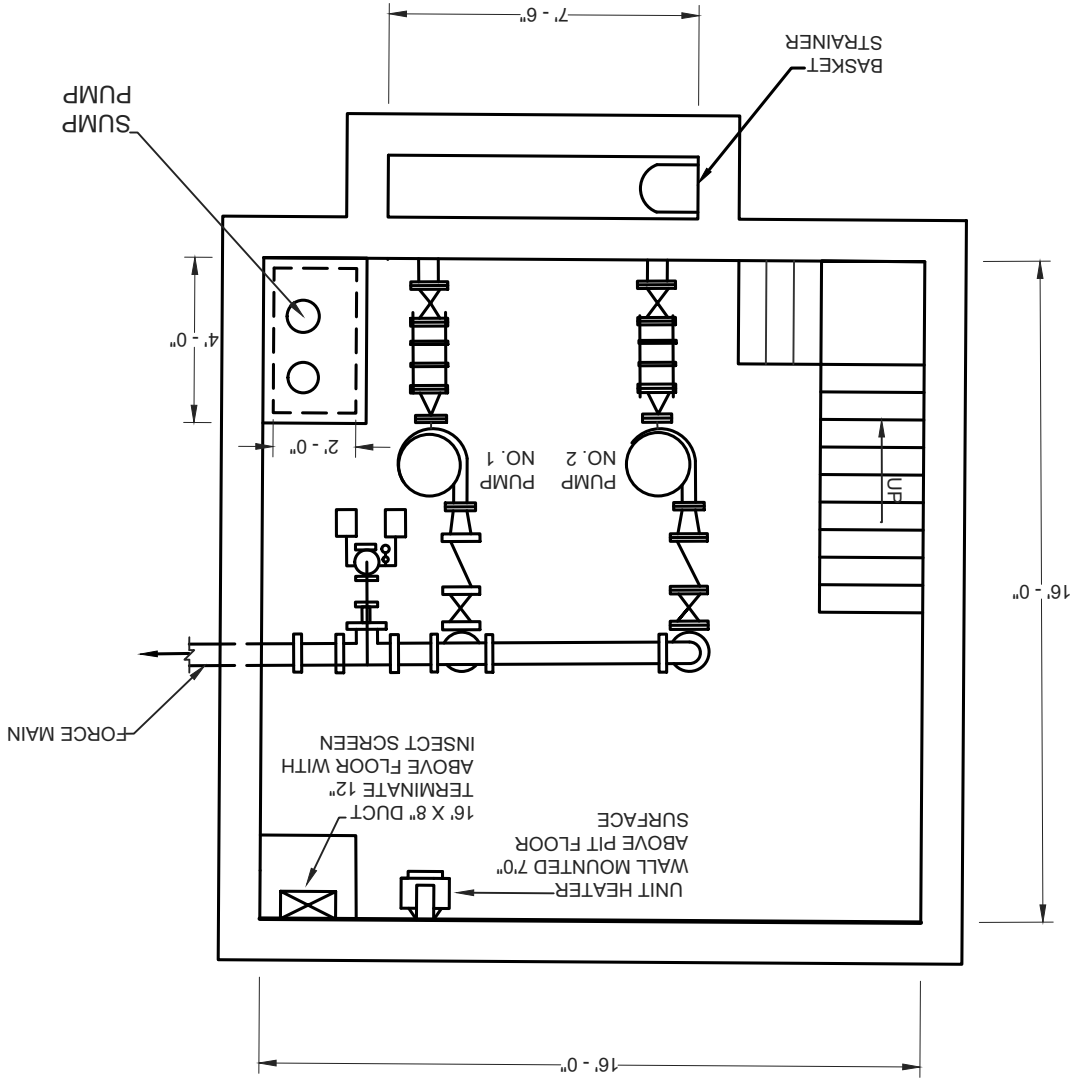
REFERENCES

Brighton Township Sewage Authority
Pump Station Design Standards

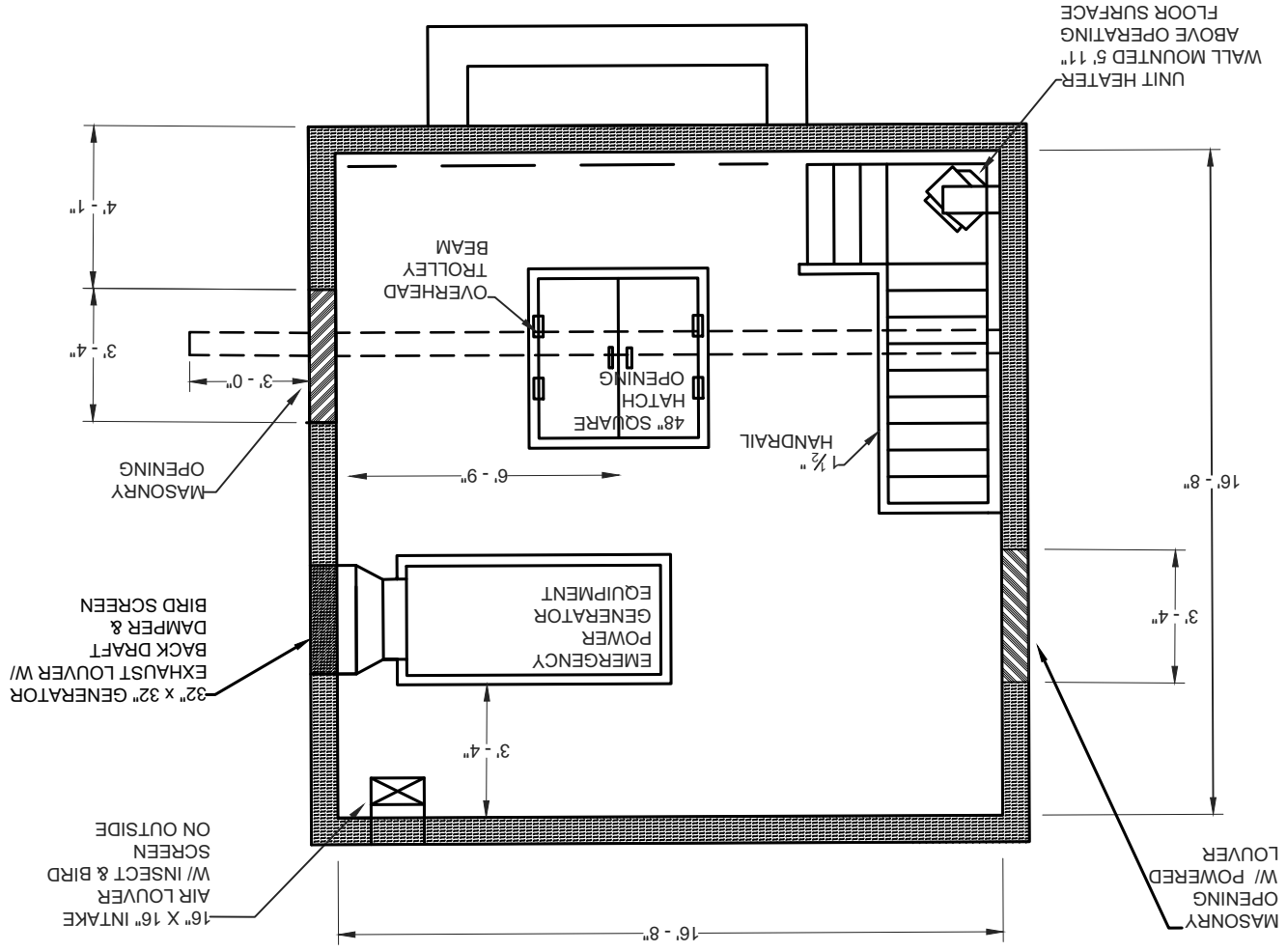
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LOWER PUMP FLOOR PLAN VIEW



UPPER CONTROL FLOOR PLAN VIEW



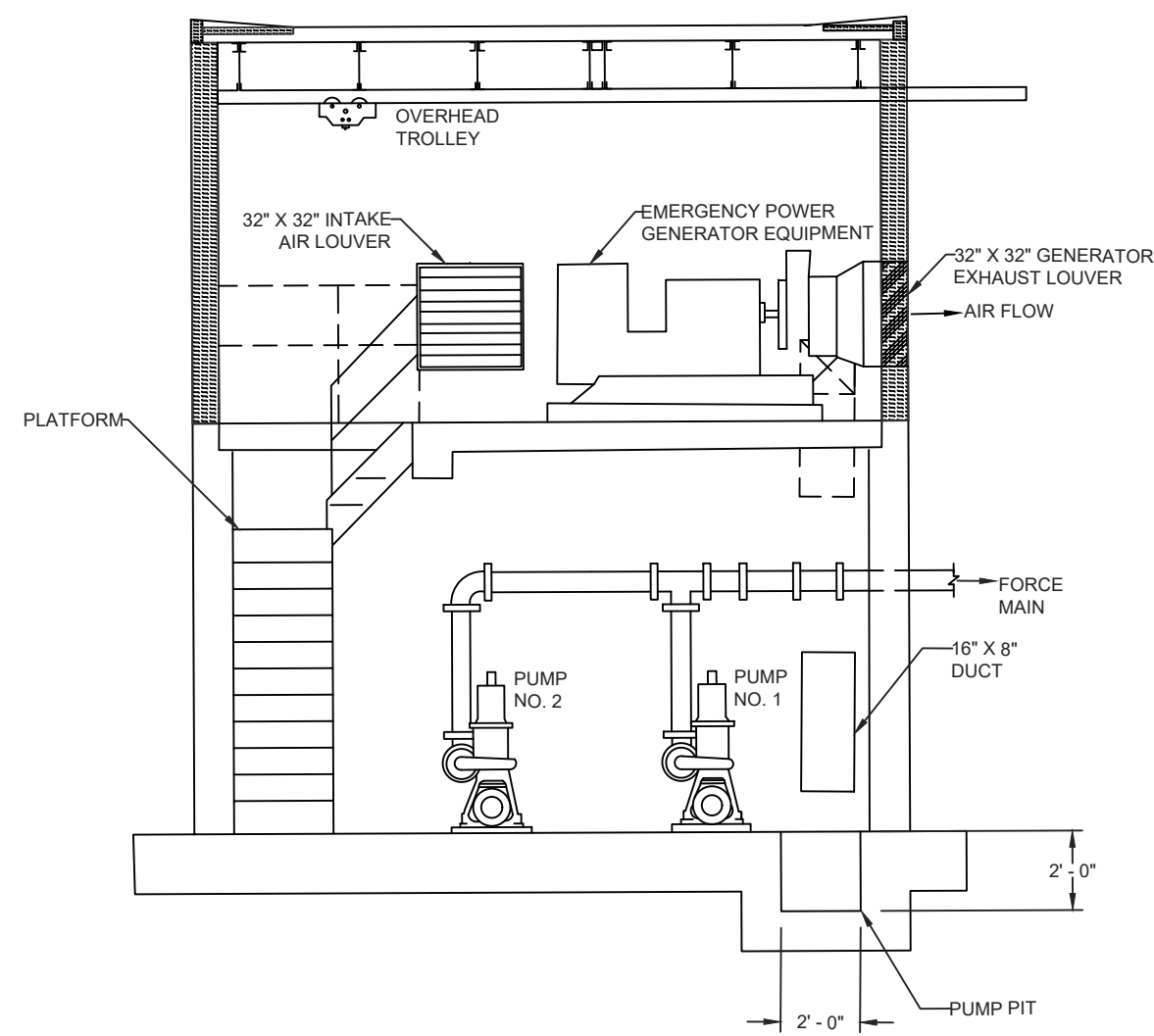
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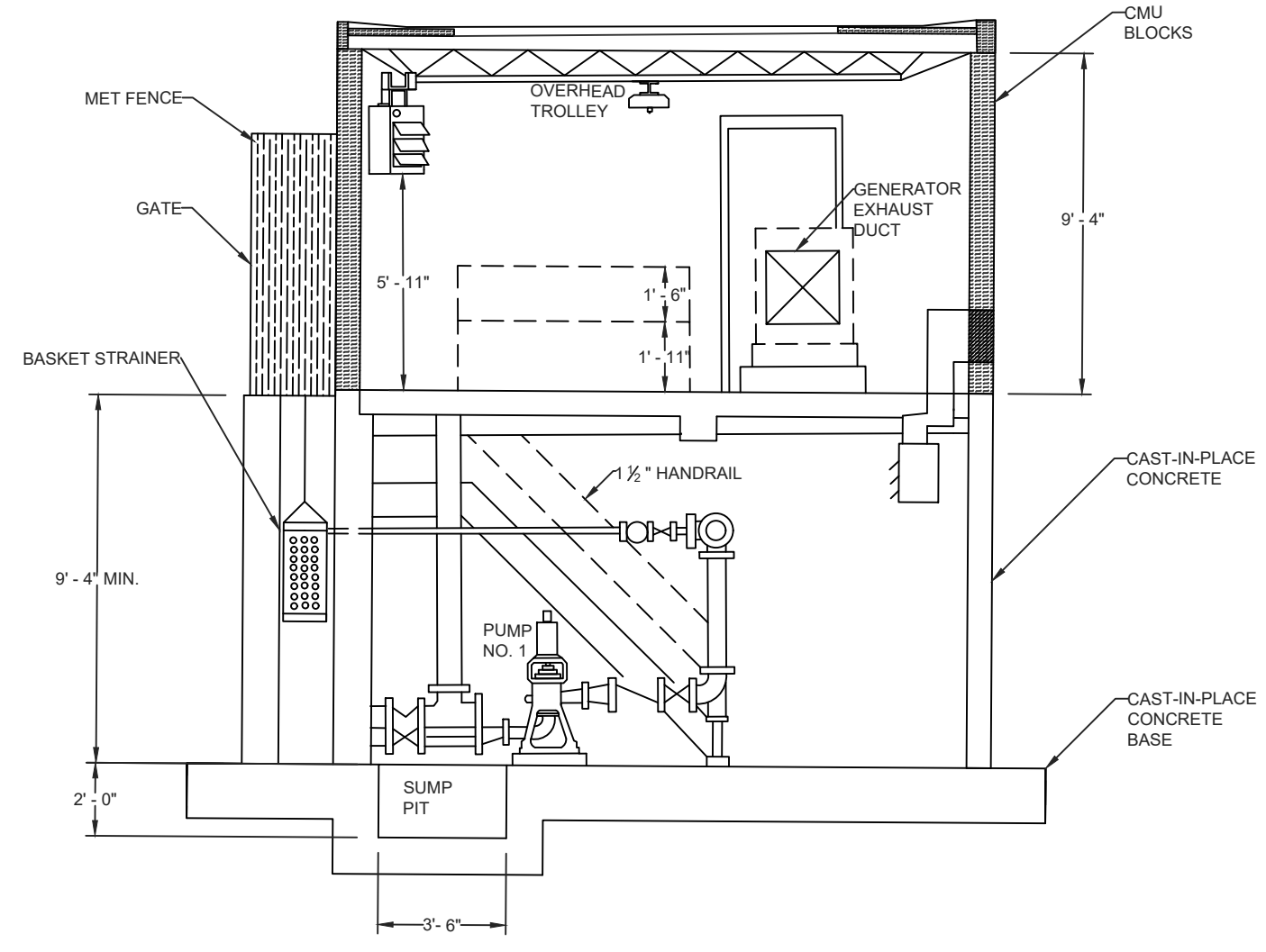
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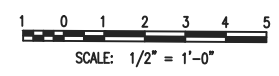
ISSUE / REVISIONS



SECTION A - A



SECTION B - B



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