



**METROPOLITAN  
SEWER DISTRICT**  
OF GREATER CINCINNATI

**LOW PRESSURE SEWER SYSTEM (LPSS)**

**DESIGN STANDARD**

April 29, 2024

## Record of Revision

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Wastewater Engineering

Departmental Approval:



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## ADMINISTRATION

### 100 INTRODUCTION

100.1 This *Low Pressure Sewer System (LPSS) Design Standard* is to be followed where a gravity sanitary sewer system is not feasible as determined by the Director in accordance with Sections 501 and 613 of the latest version of the MSD Rules and Regulations.

When, in the opinion of the Engineer of Record, it is not practical or prudent to incorporate any of the following requirements, the Engineer of Record is required to identify Design Exceptions on the Title Page of the Construction Drawings.

### 101 DEFINITIONS

The following terms are used throughout this standard:

- 101.1 Low Pressure Sewer System (LPSS): The collective term used to describe all the interconnected Pressure Sewer Mains and Pressure Service Laterals within a development. Within an LPSS, all conduits are pressurized exclusively by grinder pumps that are located on each property being served. Inside an LPSS, no conduit that transports flow will operate exclusively by gravity flow, so driving pressure head is essential for the system to function. For the purposes of this standard, an LPSS will begin at the exterior faces of foundation for all the buildings being served and will end at the single discharge point into the local (gravity) sewer. Internal building plumbing is not considered to be part of an LPSS, so that piping design will be governed by the applicable building and plumbing codes. Within the sewer industry, an LPSS is sometimes referred to by other names such as a “Low Pressure System,” or a “Grinder Pump System.”
- 101.2 Pressure Sewer Mains (PSMs): The publicly owned conduits that collect and transport sanitary flows from all properties served. These conduits typically reside in the public right of way and/or a dedicated easement. The pressure needed to push flows within these conduits is provided by grinder pumps. All PSMs in the LPSS will combine and ultimately lead to the point of system discharge. Pressure Sewer Mains have various alternative names within the sewer industry, sometimes being known as “Low-Pressure Force Mains” or “Common Force Mains.” In this manual, the term will often be shortened to simply “mains” or abbreviated as “PSMs.”
- 101.3 Pressure Service Laterals (PSLs): These are privately owned conduits that deliver the sanitary flows from a single property to a connection at the Pressure Sewer Main. These conduits mostly reside on private property outside of the public right of way and/or dedicated easements, however, a small portion of each PSL will need to be inside the public right of way and/or dedicated easement to make the actual connection to the main. There is typically a grinder pump housed inside a wet well tank located somewhere along the privately owned portion of a PSL. These conduits are the LPSS equivalent of a common sewer lateral found in a traditional gravity sewer, except the flow is pressurized to run uphill. Within the sewer industry, PSL’s are sometimes referred to as “Individual Force Mains,” “Service Lines,” or simply “Laterals.”

- 101.4 Grinder Pumps: These pumps are a privately-owned component of an LPSS and typically reside at the bottom of the wet well that serves each benefitted property. Grinder Pumps are a special type of electrically driven submersible sewage pump that features impellers capable of grinding suspended solids into small, easily transportable fragments. The numerous grinder pumps within any given LPSS are designed to operate together as a group to provide the necessary hydraulic pressures to transport sewage from each property and into the PSMs until those flows reach the discharge point into a gravity sewer.
- 101.5 Local Sewer: Sewers outside the LPSS network that operate by traditional gravity flow. A local sewer is synonymous with the term “gravity sewer.” Local Sewers ultimately receive all flows exiting an LPSS at a location referred to as the “discharge point.”
- 101.6 System Designer: The person or company responsible for the technical design of the LPSS and also the author of the System Design Report.

## **102 GRAVITY SEWERS PREFERRED**

- 102.1 The installation of an LPSS will create ongoing Operations and Maintenance (O&M) expenses for not only the property owner(s), but also for the Metropolitan Sewer District of Greater Cincinnati (hereafter referred to as “MSD”). These O&M costs apply from the time of construction indefinitely into the future.

Therefore, it is the goal of MSD to provide for the conveyance of wastewater by natural gravity flow wherever and whenever possible.

## **ENGINEERING AND DESIGN**

### **200 SYSTEM DESIGN CRITERIA**

- 200.1 All LPSS networks shall be designed and constructed in accordance with the latest version of the MSD standard(s) in effect at the time. Additional recommended references:
- a) USEPA Manual: *Alternative Wastewater Collection Systems* (EPA/625/1-91/024), October 1991.
  - b) USEPA *Wastewater Technology Fact Sheet: Pressure Sewers* (EPA 832-F-02-006), September 2002.
- 200.2 System demand shall be based on Equivalent Residential Units (ERUs), sometimes called Equivalent Dwelling Units (EDUs). These are interchangeable terms and are the standardized unit of measure implemented by most designers to equate non-residential or multi-family residential properties to a specific number of single-family residences. For the purposes of designing most pressure sewer systems, 1 ERU/EDU shall be taken as a three-bedroom single family home having a minimum flow of 400 gal/day. It may be necessary to increase this value for some cases based on the project specifics.
- 200.3 Force main designs shall consider maximum daily velocity (i.e.–the maximum velocity anticipated to occur at least once each day) and shall not be less than 2.0 feet per second (fps), not more than 5.0 fps and in some cases up to 7.0 fps as approved by MSD. This requirement shall apply to each force main branch or zone. Zones shall be divided based on the number of grinder pumps connected as shown in the following table. A new zone shall also be defined on each side of any Pressure Sewer Main pipe junction. The following table shall be used to determine the maximum number of grinder pumps operating simultaneously daily in each zone:

<b>Number of Grinder Pump Cores Connected (Each range represents a separate zone)</b>	<b>Maximum Daily Number of Grinder Pump Cores Operating Simultaneously</b>
1	1
2-3	2
4-9	3
10-18	4
19-30	5
31-50	6
51-80	7
81-113	8
114-146	9
147-179	10
180-212	11
213-245	12
246-278	13
279-311	14
312-344	15
345-377	16
378-410	17
411-443	18
444-476	19
477-509	20
510-542	21
543-575	22
576-608	23
609-641	24
642-674	25
675-707	26
708-740	27
741-773	28
774-806	29
807-839	30
840-872	31
873-905	32
906-938	33
939-971	34
972-1004	35

**Table 1 – Maximum Number of Grinder Pump Cores Operating Daily**

200.4 All LPSS designs shall include an audible and visual alarm to warn the building's occupants of a high wet well level. The notification system must feature a battery backup to maintain alarm functionality in the event of a power outage. Other alarms at the exterior control panel are encouraged, but battery backups for the exterior components are not required.

## **201 SYSTEM DESIGN REPORT**

201.1 The System Design Report shall be simultaneously submitted with the development plans to MSD and shall be prepared by the System Designer. The System Design Report shall include, at a minimum:

- a) A cover page that clearly displays the project name and location.
- b) The cover page shall also include the name of the Company providing the report, as well as naming the System Designer(s) with their direct contact information.
- c) The type of occupancy and anticipated Equivalent Residential Units (ERUs) for each property;
- d) Development sequence and timetable, as applicable to Developers;
- e) Design flows (average, daily peak, instantaneous peak, etc.);
- f) Description of topographic conditions, frost depth, water table depth, and soil type(s);
- g) Grinder pump manufacturer and model number(s). Include manufacturer product cut-sheets, pump curve(s), and descriptions of system features;
- h) Small-scale sketch of entire proposed LPSS showing: pump locations and elevations; location and direction of flow for each Pressure Service Lateral (PSL) and each Pressure Sewer Main (PSM) or branch; location and elevation of discharge point(s); locations and elevations of any high points in the system. Each branch or zone shall be identified on the sketch with a unique branch number and indicate the number of properties served by each;
- i) All hydraulic design calculations shall be made assuming the properties of SDR 11 HDPE or SDR 21 PVC pipe materials.
- j) A listing and description of all alarm features planned to be included within the system, noting battery backup for the interior homeowner notification panel.
- k) Branch/zone information shall be divided into a table(s) that indicates the following information for each branch/zone:
  - Branch number
  - Number of pumps connected directly to the branch
  - Accumulated total number of pumps connected directly or indirectly
  - Maximum daily number of pumps operating simultaneously
  - Maximum daily flow in branch
  - Pipe sizes and materials
  - Maximum daily velocity in branch
  - Length of each branch
  - Friction loss in branch per Hazen Williams with C=120
  - Accumulated friction loss
  - Maximum force main elevation (between branch and discharge)
  - Minimum pump elevation (connected directly to the branch)
  - Maximum elevation difference
  - Maximum total dynamic head (for pumps connected directly to the branch)

## 202 COMPONENTS AND CONSTRUCTION

### 202.1 PRESSURE SEWER MAINS (PSMs)

- a) Permanent easements shall be a minimum of twenty (20) feet in width.
- b) All Pressure Sewer Mains shall be constructed with at least 2-inch nominal diameter conduit. The appropriate size shall be determined by hydraulic calculations and listed in the System Design Report. Joints shall be rated for at least 200 psi.
- c) Pressure Sewer Mains shall be constructed of SDR 11 IPS (PE4710) High Density Polyethylene (HDPE) pipe with fusible joints and fusible or compression style fittings. SDR 21 IPS PVC is also permissible. Other pressure pipe materials may be considered if they are demonstrated to be reliable and suitable for the application and approved by MSD (product submittal required).
- d) All pipe materials, joints, and installation methods must comply with applicable MSD standards. The latest version of the Ohio Environmental Protection Agency's (OEPA) sewer pipe specifications must also be met and they are summarized in a document titled, "*Ohio EPA Pipe Specification List*" and available here:  
<https://epa.ohio.gov/static/Portals/35/pti/OhioEPAPipeSpecList.pdf>
- e) Pressure Sewer Mains shall be installed with a minimum of six (6) feet and maximum of twelve (12) feet of ground cover. A minimum of ten (10) feet horizontal clearance (for parallel installations) and 18-inch vertical clearance (at crossings) shall be maintained between all pressure sewers and laterals to all water mains and services.
- f) For open-cut installations, detectable magnetic marking tape (see separate section) shall be installed in the excavated trench for all non-metallic conduit one (1) foot below the final surface grade, and tracer wire installed on the conduit for the full length (see separate section).
- g) For trenchless installations, tracer wire is required for all non-metallic conduit for the full run (see separate section). Detectable tape is not required.
- h) Wherever possible, Pressure Sewer Mains shall be installed with a continuous positive grade to the discharge point on the receiving gravity sewer. Approved air/vacuum release valves (ARVs) shall be installed anywhere this is not possible, where localized high points exist, or on long runs greater than 2,000 feet having no clearly defined high point. ARVs (see separate section) shall be installed on upward turned tees. Taps and/or tapping saddles will not be accepted.
- i) Pressure Sewer Mains shall not discharge into the head/end manhole of a local gravity sewer. Instead, the discharge point shall be located on the gravity sewer conduit downstream of the head/end manhole a minimum of three (3) active building connections. MSD may require check valves to be installed at those upstream building connections for odor control purposes. The Pressure Sewer Main connection to the gravity sewer shall conform to all applicable MSD standards, specifically MSD Standard Drawing 49063 - Low Pressure Force Main Typical Receiving Manhole. This drawing is available to download in PDF form at the MSD Capital Project Resource Library at:  
[msdgc.org](http://msdgc.org)
- j) Flushing locations shall be installed at: the end of each Pressure Sewer Main farthest from the discharge point, at each junction of two (2) Pressure Sewer Main branches, and at intermediate points such that the maximum distance between flushing locations and/or the discharge point does not exceed 1,000 feet.



- k) All properties to be served by a particular Pressure Sewer Main shall be included within the same phase/zone of a project and developed as close to the same time as reasonably possible. Similarly, future phases/zones of new pressure sewer will not be approved for use until the properties in the previously approved phases/sections are substantially built-out and functioning.
- l) If not considered in the initial System Design Report, any future extension/expansion of an existing LPSS network shall submit a new System Design Report that evaluates not only the proposed conduits, but also considers and verifies the existing network for the proposed/*future* hydraulic conditions. This check on the changing variables felt by the existing LPSS is critical to ensure existing properties are not negatively impacted and ensures the future performance of the system (both existing and proposed zones) will function properly. Any costs for upgrades and/or adjustments necessary to an existing LPSS due to a proposed expansion will be the sole responsibility of the Applicant.
- m) A hydrostatic pressure test at 150 psi for at least two (2) hours shall be performed in accordance with the Hydrostatic Testing Requirements of AWWA C600 on all pressure sewer mains and laterals. If the pressure drops more than five (5) psi in two (2) hours, or leakage is greater than allowable as determined by the formula in AWWA C600, the test shall be considered failed. Pressure Sewer Mains shall be tested after all ARVs, flushing locations, and other appurtenances have been installed, and with all service laterals installed to at least the curb stop.

#### 202.2 PRESSURE SERVICE LATERALS (PSLs)

- a) Pressure Service Laterals are privately owned and maintained when outside of the public right of way and/or dedicated easements. MSD will own and maintain the portion within the public right of way and/or dedicated easements.
- b) All Pressure Service Laterals shall be at least 1.25-inch nominal diameter conduit meeting the same material and velocity requirements as noted in the previous section for pressure sewer mains. The appropriate size shall be determined by hydraulic calculations and listed in the System Design Report. Joints shall be rated for at least 200 psi.
- c) All pipe materials, joints, and installation methods must comply with applicable MSD standards. The latest version of the Ohio Environmental Protection Agency's (OEPA) sewer pipe specifications must also be met and they are summarized in a document titled, "Ohio EPA Pipe Specification List" and available here:  
<https://epa.ohio.gov/static/Portals/35/pti/OhioEPAPipeSpecList.pdf>
- d) For all Pressure Service Laterals installed by open-cut or trenchless methods, tracer wire is required for all non-metallic conduit for the full run. The tracer wire will be laid in two distinct segments, one that extends from the Pressure Sewer Main to the public right of way and/or easement line (public side), and the second will be from that point to the face of building (private side). See separate tracer wire section for additional details. Detectable tape is not required.
- e) Pressure Service Laterals shall be installed with a minimum of four (4) feet ground cover. A minimum of ten (10) feet horizontal clearance (for parallel installations) and 18-inch vertical clearance (at crossings) shall be maintained between all pressure sewers and laterals to all water mains and services.

- f) Each Pressure Service Lateral shall have at least two (2) independent check valves; one at the pump, and one at the public right of way and/or dedicated easement line. Check valves shall have a stainless steel body and be pressure-tight in both directions, and provide a full-port 1-1/4" passageway that introduces minimal friction loss at the maximum rated flow. The ball valve actuator shall include position stops at the fully opened and closed positions and be rated for a working pressure of at least 235 psi. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressures. Check valves and all other portions of the Pressure Service Lateral shall meet the pump manufacturer's requirements and recommendations.
- g) Pressure Service Laterals shall only connect to the pressure sewer main at a manufactured fitting, except when adding a home to the system. No direct taps or tapping saddles will be permitted on the pressure sewer main. All property connections will need to be accounted for in the original System Design Report and included with the initial construction of the LPSS. If a new service connection is to connect to the system a revised System Design Report shall be submitted to MSD for approval.
- h) A stainless steel curb stop valve shall be installed at the public right-of-way and/or dedicated easement line on each Pressure Service Lateral and shall be located a minimum of five feet off the pressure sewer main. Curb stops shall be at least two inches lower than the connection of the PSL to the pressure sewer main. A curb stop box shall be provided that meets the specifications found later in this section. The top of each curb stop box shall be set in a concrete slab 18" x 18" x 6" thick (or 18" circular x 6" thick) with the top of the slab and box flush with the ground surface. Curb stop boxes shall generally not be located in pavement, driveways, or areas of regular vehicular traffic, unless approved by MSD.
- i) Curb stop boxes shall be a combined valve box and tracer wire access point (see tracer wire access point specifications for additional details and products). Standalone access point boxes are not permitted. Valve box shall be supported on a field-fabricated riser constructed of common 4" SCH 40 PVC (or SDR35) pipe for the connection to the combined curb stop box / access point, and can be stepped down to no less than 2.5" diameter for the lower half if desired by using a common reducer fitting. The low end of the riser section shall feature a notch or cut-out that spans over the valve and Pressure Service Lateral conduit, so that vertical forces placed on the curb box above cannot be transferred onto those components.
- j) Whenever there is potential for installation of a future gravity sewer to serve the involved properties, each building shall have a gravity sewer drain through the building's foundation to facilitate a connection to the future sewer. For this reason, a gravity sewer lateral that leaves the structure and discharges into an exterior wet well is the preferred construction layout. When reasonably possible, each building's gravity sewer lateral should also leave the foundation at a location that would facilitate that possible connection to a future gravity sewer.
- k) The System Designer should evaluate the need for flushing locations on Pressure Service Laterals. Similarly, the need for ARVs at high points on all Pressure Service Laterals should also be evaluated.

- l) A hydrostatic pressure test at 150 psi for at least two (2) hours shall be performed in accordance with the Hydrostatic Testing Requirements of AWWA C600 on all force mains and service laterals. If the pressure drops more than five (5) psi in two (2) hours, or leakage is greater than allowable as determined by the formula in AWWA C600, the test shall be considered failed. PSLs (on the pump side of the curb stop valve) shall be tested after the entire system is completely installed (except for the connection to the gravity sewer, when applicable).

### 202.3 DETECTABLE MARKING TAPE

- a) Detectable marking tape shall meet the following requirements:
- Minimum overall thickness of five (5) mil and rated for direct burial;
  - Detectable by either inductive or conductive mode using a pipe/cable locator.
  - Acid, Alkali, Chemical, and Oil Resistant;
  - Solid aluminum foil core;
  - Minimum width shall be six inches (6”);
  - APWA color-coded green with “Force Main Below” or similar wording factory printed on the face;
  - Virgin Clear Polyethylene (PE) Film Laminated Base Structure;
  - Virgin Clear Polypropylene Film Laminated Top Structure;
  - Printability value of 40+ Dynes;
- b) Pre-approved products:
1. Reef Industries, Terra Tape Diamond Detectable (6” Green);
  2. Seton Nameplate Corporation, Detectable Underground Warning Tape, “Caution Buried Sewer Line Below”, Green, Part # 85523
  3. Or approved equivalent (product submittal required).

### 202.4 TRACER WIRE

- a) THHN (PVC insulation) and multi-conductor stranded wire shall not be used.
- b) Minimum 19 AWG, tin-coated solid copper conductor;
- c) Rated for direct bury and directional boring applications;
- d) Will not conduct an electrical current when struck by lightning;
- e) APWA color-coded green;
- f) Tensile strength 38,500 psi nominal;
- g) Breaking strength: 1800 lbs.;
- h) Elongation: 30% max;
- i) Conductor Insulation: Polyethylene, 0.006” thickness, 300V max voltage;
- j) Dielectric constant: 2.29 @ 1 MHz;
- k) Core Material: Woven polyester and water blocking polyester yarns;
- l) Outer Jacket: High Density Polyethylene
- m) Pre-approved products:
1. Chase Corporation, Trace-Safe RT Series, Part # RT1803W
  2. Or approved equivalent (product submittal required).

### 202.5 TRACER WIRE INSTALLATION AND ACCESS [PUBLIC PSMs]

- a) All PSMs shall have tracer wire access points inside every manhole. Standalone access boxes located outside of manholes will not be permitted.

- b) All tracer wires shall run at conduit level to the exterior face of a manhole before running vertically up the exterior manhole face and penetrating into the manhole at grade-ring level. Incoming wires shall make their entry penetration directly above the conduit being traced.
- c) All tracer wires entering a manhole shall feature five (5) feet of coiled tracer wire supported on a non-corrosive hook located no more than 24" below grade.
- d) The PSM tracer wire must remain continuous and without splices between access points (manholes). No electrical connector shall be used that requires cutting or splicing of the main PSM tracer wire.
- e) Pre-approved products:
  1. PANDUIT Masonry Push-In Cable Tie Mount, Model SGMPMS25-C0, Grainger Item #1LEV5
  2. PANDUIT Metal Detectable Cable Tie Mount, Model MBMS-S10-CY, Grainger Item #62PD14
  3. TAPCON Concrete Anchor Screw: 2-1/4 in Overall Lg, 0.19 in Dia, Steel, Blue Climaseal, Hex, Model 3143407, Grainger Item #4AK83
  4. RETYZ Releasable Cable Tie: 6 in Lg, Green, Model EVT-S06GN-TA, Grainger Item #800DW4
  5. Or approved equivalent (product submittal required).

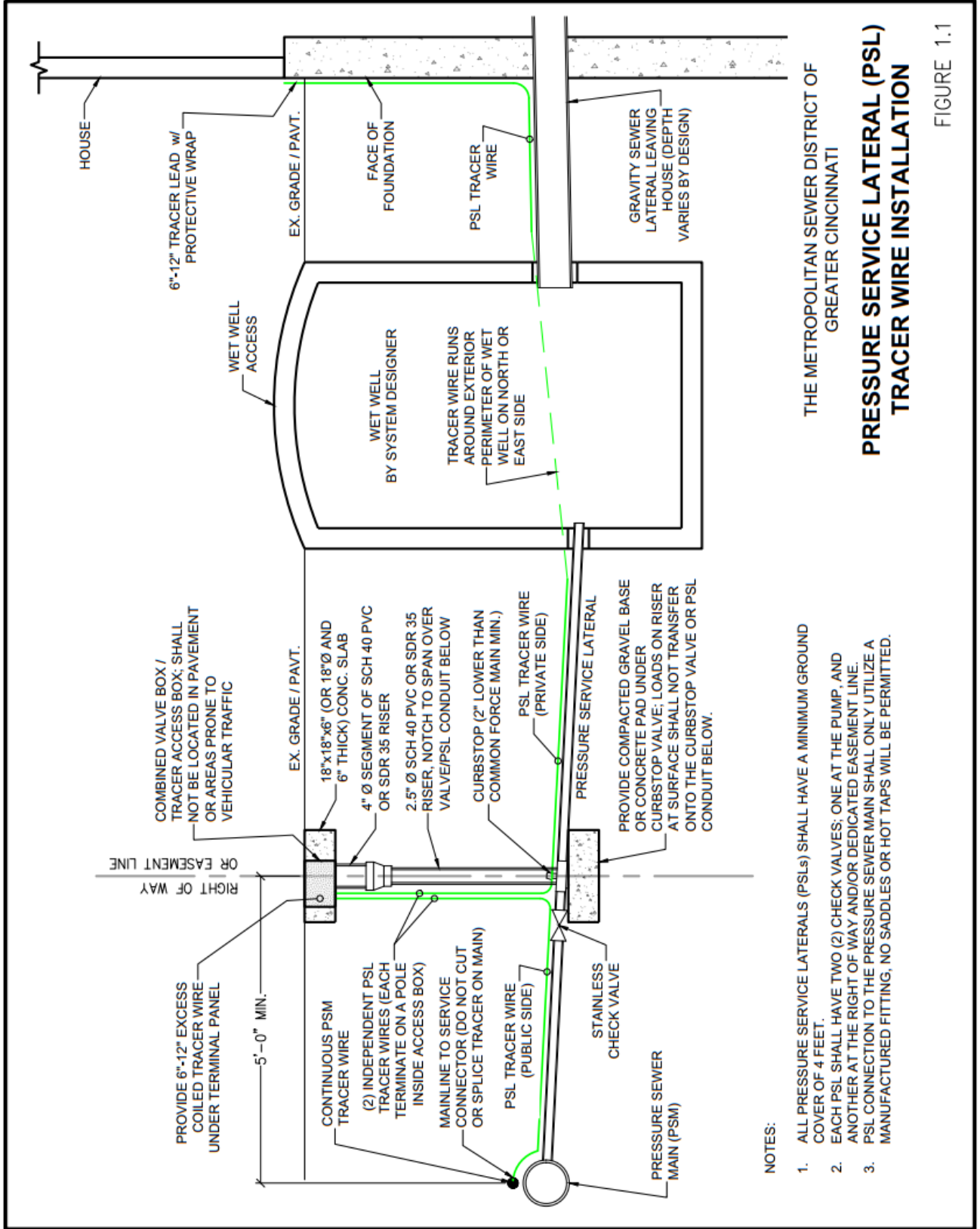
#### 202.6 TRACER WIRE INSTALLATION AND ACCESS POINTS [PRIVATE PSLs]

- a) All PSLs shall feature a tracer wire that is a separate, independent wire from the one found on the pressure sewer main (See Figure 1.1).
- b) All PSL tracer wires shall be connected to the continuous pressure sewer main tracer wire by utilizing a 3-way mainline-to-service connector that does not require a cut/splice at the main (i.e. - the PSM tracer wire must remain continuous). The 3-way connector shall be rated for direct bury, waterproof when closed, and filled with a dielectric, non-hardening silicone for continued corrosion resistance after the connection is complete.
- c) The combined curb stop box/access point shall be constructed of injection molded, UV resistant composite and utilize a single, common body with separate watertight lids to access either the curb stop valve or tracer wire compartment. The curb stop box lid shall be permanently marked "SEWER" and contain a magnet or other ferrous metal to assist with location equipment. The lid for the tracer wire compartment shall be permanently marked "TRACER WIRE."
- d) The public portion of the PSL shall have tracer wire from the continuous pressure sewer main wire that runs along the service lateral conduit to the curb stop valve and then continues up the exterior face of the riser and terminates on the first pole of the access point terminal found inside the combined curb stop box/access point (see Figure 1.1). Inside the access point compartment and under the wire terminal area, all incoming/outgoing tracer wires should have at least 6-12" of available coiled wire.
- e) The private portion of the PSL shall have tracer wire starting at the second pole of the same access point terminal that runs back down the exterior face of the riser to the curb stop valve, and then continues along the service lateral conduit until reaching the face of building foundation and extending up to grade level, where 6-12" of tracer wire shall be available at the surface and protected from the elements and string trimmer lines by either a section of 1/2" diameter gray PVC electrical conduit with cap, or by using a premanufactured wire protection product intended for this purpose (see approved product list).

f) Pre-approved products:

1. Copperhead Industries, BoaBox Curb Stop Box/Access Point, Part #: BOABOX SWR
2. Copperhead Industries, Mainline-to-Service Connector, Part #:3WB-01
3. Copperhead Industries, SnakeBite Locking Twist Connector
4. Copperhead Industries, SnakeSkin Tracer Wire Protective Wrap
5. Trace-Safe, Service Lateral Connector, Part #: TS-19-C/TS12-19-C
6. Trace-Safe, End to End Butt Splice Connector, Part #: TS-19-IL-C/TS12-19-IL-C
7. Trace-Safe, Universal Connectors, RT Series and TS Series
8. Or approved equivalent (product submittal required).

*(Figure Follows)*



THE METROPOLITAN SEWER DISTRICT OF  
GREATER CINCINNATI  
**PRESSURE SERVICE LATERAL (PSL)  
TRACER WIRE INSTALLATION**

FIGURE 1.1

FILE PATH: \\MSR\ER\SHARED\PROJECTS\2022\22-043 STANTIC-MSD VARIOUS STANDARDS DEVELOPMENT\TASK A-IPSS\CAD\IPSS TRACER WIRE DETAILS.MWG  
PLOT DATE: Jun 27, 2023 - 11:18 AM  
PLOT BY: SEMS

## 202.7 GRINDER PUMPS

- a) A grinder pump is required for each property that is (or could potentially be) owned by a different owner. No combining of multiple building flows into common pits or similar sharing of sewer components will be approved. Each grinder pump shall also have its own wet well tank, PSL, and unique connection fitting at the pressure sewer main.
- b) Each individual grinder pump connected to the PSM shall match the information submitted in the System Design Report and LPSS Information Table found on the development plans. Pumps not conforming to the submitted design documents will be rejected.
- c) All pump chambers/wet wells shall include a plate permanently attached to the lid that states, *"Plumbers: Contact MSD Development Services for pump size requirements at (513) 244-1300"*
- d) The following requirements apply to installations connected to PSMs:
  1. All pumps shall be progressive cavity non-clogging, non-jamming grinder pumps capable of pumping 14.5 gpm at five (5) feet design total dynamic head (TDH), nine (9) gpm at 138 feet TDH. The maximum TDH for any pump shall be 138 feet (60 psi) with the maximum number of grinder pumps operating simultaneously daily. Grinder pump motors shall have built-in, automatic reset overload protection. Grinder pumps shall be designated for the specific purpose of grinding and pumping domestic wastewater. Grinder pumps shall be suitable for operation under varying conditions in a system with multiple other grinder pumps. An anti-siphon valve and check valve shall be integral with the grinder pump.
  2. Future replacement pumps must be of the same type and match the original pump performance curve as closely as possible as determined by a qualified pump expert. MSD Development Services should be contacted at (513) 244-1300 prior to any work to confirm the pump criteria.
  3. All replacement pumps will require a plumbing permit and special inspection documentation as outline in Section 204.
- e) Pre-approved products:
  1. Environment One Corporation, E-One Extreme DH Series;
  2. Zoeller "Shark" 810/815/7020/7021 Series;
  3. Or approved equivalent (product submittal required).

## 202.8 ODOR CONTROL

- a) Construction and materials shall comply with the relevant MSD Low Pressure Force Main Package standard drawings. These are also available to download in PDF form at the MSD Capital Project Resource Library at: [msdgc.org](http://msdgc.org)
- b) A force main chemical injection pumping system located and injected in the upstream 10-25% of the proposed sewer system, by linear footage, will be required for all low-pressure force main systems which must include the following components at a minimum:
  1. Concrete pad on provided easement within 25 feet of the public right of way.
  2. Minimum electrical service of at least 120 VAC, 60 Hz, 20-amp single phase.
  3. Double-wall, high density, cross-linked polyethylene tank manufactured in accordance with ASTM D-1998-93. The volume of the tank must be able to hold 125% of one month's worth of chemical demand. Maximum tank size is 2,550 U.S. gallons.
  4. Properly sized chemical pumping system with two pump timers, control panel set for base flow conditions and diurnal variation, leak detection and chemical containment.

5. Connection to force main in an accessible manhole with force main injection quill, solution tubing and fittings.
6. Privacy fence with locked access gate and chemical storage signage.
- c) If the force main chemical injection pumping system is on a privately owned low-pressure force main, the following additional requirements apply:
  1. The chemical used shall be an aqueous solution of calcium nitrate containing a minimum of 3.5 pounds of nitrate-oxygen per gallon and shall be capable of reducing the dissolved hydrogen sulfide concentration in wastewater to less than 0.1 mg/L.
  2. Hydrogen Sulfide gas monitoring equipment shall be installed in the low-pressure force main discharge manhole and chemical dosing shall be adjusted to keep peak levels below 10 ppm and average levels below 1 ppm.

## 202.9 ACCESS CHAMBERS AND CASTINGS, FLUSHING CHAMBERS, AIR-RELEASE VALVES (ARVs) AND CHAMBERS

- a) Construction and materials shall comply with the relevant MSD Low Pressure Force Main Package standard drawings and standard drawing Acc. 49063 LPFM Typical Receiving Manhole. These are available to download in PDF form at the MSD Capital Project Resource Library at: [msdgc.org](http://msdgc.org)
- b) Air-Release valves shall be Vent-Tech or Vent-O-Mat or approved equivalent (product submittal required).

## 203 PLAN REQUIREMENTS

### 203.1 LPSS INFORMATION TABLE

- a) In addition to any other plan requirements established by MSD, other agencies, or applicable codes, all development plans shall have an LPSS Information Table containing the following information:
  - Address, lot number, or other unique identifier for each grinder pump location being proposed. This should match the corresponding label(s) shown on the plans.
  - The pump manufacturer, pump type, and model number for each location being proposed. This must match the information provided inside the System Design Report.
  - The proposed wet well tank capacity and invert elevation for each location.

## 204 SPECIAL INSPECTIONS

### 204.1 AUTHORITY

- a) The Ohio Revised Code (ORC Section 3781.03, Part D) grants MSD *“complete authority to supervise and regulate the entire sewerage and drainage system in the jurisdiction in which it is exercising the authority described in this division, including the building sewer and all laterals draining into the street sewers.”* Additionally, that section also requires MSD to *“keep a permanent record of the installation and location of every drain and sewer of the drainage and sewerage system of the jurisdiction.”*
- b) The Ohio Building Code (OBC Section 1705.1.1) grants authority to Building Officials to require Special Inspections for various “special cases.” Due to the uncommon application of these sewer systems in general, as well as their engineered specifics, OBC Special Inspections will need



to be employed. Therefore, additional documentation of Special Inspections will need to be submitted for the following situations:

- Individual grinder pump and appurtenances
  - Replacement of Individual grinder pump
- c) The PSM components are publicly owned and typically reside within the public right of way and/or dedicated easements. These public assets will be inspected by MSD.
- d) Per OBC Section 1704.3, when applying for the initial construction permits, the Licensed Professional responsible for preparing the plans being submitted will need to also submit a “Statement of Special Inspections” to the Building Department having jurisdiction. Most Building Departments will have this form available with their typical permit application paperwork. An example is provided in the Appendix of this guide. This form is filled out prior to obtaining your permit and is merely an outline of future deliverables to the building department that confirm the Applicant’s understanding of what inspection(s) are required, which party will be performing those inspections, and also notes the scope/documentation necessary to satisfy the Special Inspection. The “Statement of Special Inspections” should not be confused with the actual documentation/deliverable that will be provided by the Inspector.
- e) The scope of the MSD LPSS Special Inspection is to confirm the installed components are a match to the submitted System Design Report and/or the required LPSS Information Table on the submitted plans. This data is very important to retain, so that when replacing a pump later the overall pressure sewer system performance can be maintained over time. The MSD LPSS Special Inspections are not intended to replace any typical Building or Plumbing Department inspections, procedures, or policies that are already in place, but merely to create the OBC required permanent records of the LPSS system that can be archived and later retrieved. All other typical inspection policies and procedures by the Building/Plumbing Department having jurisdiction should remain unchanged.

#### 204.2 ROLE OF BUILDING DEPARTMENTS AND INSTALLATION OF GRINDER PUMP

- a) The MSD service area contains many distinct Building Departments. Depending on the physical location of any project, the Building/Plumbing Department having jurisdiction will vary, as will availability of inspection services and personnel. Coordinate with the building/plumbing official having jurisdiction for your project to determine how the MSD LPSS Special Inspection is best handled.
- b) If the local Building Department does not offer the necessary Special Inspection services, then arrangements for a third-party inspector will be necessary at the Applicant’s expense.
- c) Regardless of project location, note that all sewer components located outside of the public right of way and/or dedicated easements will NOT be directly inspected by MSD personnel.
- d) TAP PERMIT
- A Tap permit must be issued prior to connecting the pressure sewer lateral to the low pressure sewer.
  - The signed off Special Inspection Documentation as required herein (one for each grinder pump installation) must be provided to MSD inspection to achieve an approved tap.

#### e) INDIVIDUAL GRINDER PUMP REPLACEMENT

- Once the Applicant has filed for the plumbing permit to replace a grinder pump in an LPSS zone, request the historic System Design Report and/or original construction plans from MSD Project Development Services at (513) 244-1300.
- By reviewing the historic data, an equivalent pump of the same type and performance will be required. If the same pump model is no longer available, obtain written verification from a qualified pump supplier that confirms the replacement pump being provided will match the performance curve at the installed head pressures of the original. **MSD does not provide pump design guidance.**
- MSD requires a new/updated Special Inspection document for the replacement pump. Replacement pump Special Inspection documentation can be prepared by either the new pump installer (plumber) or a qualified inspector as outlined in this document. If alternate pump model verification was obtained (see previous bullet), then provide that information as part of the Special Inspection Documentation.

#### 204.3 INSPECTORS (OUTSIDE PUBLIC RIGHT OF WAY AND/OR DEDICATED EASEMENTS)

- a) Preparation of the Special Inspection documentation is the primary role of the Inspector.
- b) The inspector can be an employee of the Building or Plumbing Department having jurisdiction, or any person designated or recognized by the Building or Plumbing Department as having the training and experience necessary to be familiar with an LPSS system. This extends to the System Designer as well as their trained installers/representatives.
- c) Note that an LPSS wet well is considered a confined space by OSHA (appropriate training is required).

#### 204.4 SPECIAL INSPECTION DOCUMENTATION

- a) The following data shall be first submitted to the Building/Plumbing Department having jurisdiction. There is no established format for the requested information, but the submitted document is required to be typewritten for legibility reasons. Upon receipt of said documentation, the Building Official can submit the documentation to MSD Development Services.
- b) The Special Inspection documentation shall include (typewritten):
  - Inspector name, company or agency, pertinent credentials, and full contact information.
  - Name of project and/or subject pump street address.
  - Grinder pump manufacturer and specific model, including serial number.
  - Measurement of the installed depth (wet well rim to invert).
  - Legible photographs of all pump/motor nameplates.
  - Photographs of any applicable electric boxes or panels.
  - Photograph of the tracer wire leads and final position at the face of building (w/ confirmation of their functional status).
  - Photographs of any other pertinent or related hardware installed.
  - Brief comments regarding the site topography/accessibility, installation workmanship, any issues of concern to the inspector that need addressing, and any general information that may be relevant in the future to an installer when the pump is to be replaced.
  - The documentation should contain a signed statement, "I hereby certify that I am a qualified Special Inspector as established in the Ohio Building Code Section 1704.2 and have personally made the above observations and verified the stated equipment is installed at the subject property." [signature]

- c) To provide better photographs, an Inspector may choose to take photos for some items above prior to their actual installation into the wet well, but ONLY if the inspector later verifies the installed units are a match for the provided information (down to serial numbers). The comment section should note if this option is utilized and note the dates of photos vs. dates of confirmation.

#### 204.5 ALTERNATIVE SPECIAL INSPECTION DOCUMENTATION

- a) Some LPSS pump vendors and/or manufacturers are heavily involved in the installation process and offer startup and field testing that automatically produce written documentation of a properly installed and operating pump). Such startup documentation (when prepared by manufacturer-trained sources) that confirm the field-installed components match the System Design Report and are installed to meet all manufacturer requirements shall be considered full and complete Special Inspection documentation. **This is the preferred method to generate Special Inspection documentation**, as it lowers the paperwork burden as well as costs to all parties, while confirming the necessary information.

### 205 SUBMITTALS, PLAN REVIEW, AND APPROVAL

#### 205.1 INITIAL PLAN REVIEW

- a) The following are in addition to the regular plan review process and will be considered a complete LPSS submittal package:
  - Development plans that include a plan and profile view of all runs inside the proposed system, as well as appropriately calling out the details and requirements previously outlined.
  - An LPSS System Design Report that meets the requirements previously outlined.
  - Product submittal datasheets for any alternate materials or products not listed in this standard as being pre-approved.
  - A Copy of the Statement of Special Inspections being provided to the Building/Plumbing Department having jurisdiction. This is to confirm the applicant understands that MSD LPSS Special Inspections are required, and to establish who will be performing and documenting those inspections.
- b) Once reviewed, the applicant will receive MSD comments and/or plan markups that are necessary to be resolved. Once those edits are made, the resubmit/review/comment process repeats until all issues are resolved to MSD satisfaction.
- c) MSD will then issue their approval of the plans. *Note: MSD is one agency inside a larger plan approval process, and the total resolution of all review comments from all agencies will also be required before the construction permit will be issued from the Building Department and actual construction may begin.*

#### 205.2 FINAL LPSS APPROVAL

- a) MSD gives final approval/acceptance after a one-year successful inspection of the project and all required documentation (approved as-builts, required easements are recorded, and bond) have been accepted by MSD.

## 206 DEED RESTRICTION

### 206.1 REQUIRED NOTE

- a) For the benefit of future owners and maintaining system integrity, all new developments being serviced by an LPSS shall contain the following language on the recorded deed for all properties:

*“This parcel is located inside a special sanitary sewer zone with conditions and criteria that are to perpetually run with the property for all future transfers. Contact MSD Wastewater Engineering for additional details on pump replacement.”*

*[END OF MAIN DOCUMENT]*

# *APPENDIX*

**CITY OF CINCINNATI**  
**DEPARTMENT OF**  
**BUILDINGS AND INSPECTIONS**  
**STATEMENT OF SPECIAL INSPECTIONS**

**LOCATION:** \_\_\_\_\_

**PERMIT APPLICATION NUMBER:** \_\_\_\_\_  
(by City)

Because of the complexity, size, or special conditions associated with this project, the special inspections checked under "REQ" on the attached schedule are to be provided by the owner or owner's agent, other than the contractor, as required by Section 1704.1.1 of the Ohio Building Code (OBC).

Please indicate the inspection agent performing the specific inspections, the Inspection Coordinator who will submit the reports required by Section 1704.1.2 OBC and the extent of inspection services if other than full-time.

This *Statement of Special Inspections* shall be submitted as a condition for permit issuance. It includes a Schedule of Special Inspections applicable to this project as well as the name of the special inspectors, and the identity of other testing laboratories or agencies intended to be retained for conducting these inspections. Special Inspectors and testing agency personnel shall be under the direct supervision of a registered design professional who shall sign inspection reports; otherwise the qualifications of the person performing the inspections shall be submitted to the Department for acceptance.

An overall inspection coordinator shall keep records of all inspections and tests and shall furnish such reports to the code official and to the design professional of record. All discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the code official and the design professional of record. Interim reports shall be submitted to the code official and the design professional of record monthly, unless more frequent submissions are requested by the code official.

During the course of construction, additional third party inspections may be required in addition to those specified in the attached schedule if conditions warrant.

\_\_\_\_\_  
Date P.E. or R.A.