

## **SECTION 11800 – GRINDER PUMPS/LOW PRESSURE FORCE MAIN SYSTEMS FOR SINGLE FAMILY RESIDENTIAL DEVELOPMENT**

### **GRAVITY SEWERS PREFERRED**

- It is the goal of BCWS to provide for the conveyance of wastewater by natural gravity flow wherever and whenever possible. BCWS policies provide for the potential reimbursement of a portion of a developer's costs of off-site trunk sewer extensions to facilitate this goal.
- A developer proposing to provide sewer service to a new development (or part of a development) by means of grinder pumps and a low pressure force main system (hereinafter referred to as "grinder pump system") shall provide engineer's cost estimates of:
  1. All costs associated with construction of the grinder pumps, aerobic systems, force main(s) and other required sewer improvements.
  2. All costs associated with construction of the most reasonable gravity sewer that would provide natural gravity sewer service to the development. Gravity sewer systems shall be provided wherever reasonably achievable. Grinder pump systems will not be allowed where the estimated cost to extend a gravity sewer to the development minus any oversizing payable by the County is comparable to the total cost estimate for construction of the grinder pumps, aerobic systems, force main(s), etc. Other factors such as availability of sewer service to upstream properties and potential fee reimbursements (for off site trunk sewers) shall also be considered in this evaluation.

### **ADDITIONAL COSTS OF GRINDER PUMP SYSTEMS**

- The installation of grinder pump systems creates an ongoing operation and maintenance expense for the property owners and transfers the burden of extending off-site trunk sewers to the County and its sewer customers (existing and future).

### **FIRST FLOOR GRAVITY SEWER SERVICE**

- In developments where first floor gravity sewer service can be provided, but basements cannot be served by gravity, individual grinder pumps will be permitted to provide basement sewer service. In this event, gravity sewers shall be installed throughout the development such that each building can be provided with first floor only gravity sewer service. No public or shared force mains will be permitted where first floor gravity sewer service can be provided. The Butler County Health Department shall be consulted regarding applicable requirements when first floor only gravity sewer service will be provided.

### **BASIC DESIGN AND CONSTRUCTION REQUIREMENTS**

- All grinder pump systems shall be designed and constructed in accordance with BCWS standards in effect at the time. These standards shall include, but not be limited to, the following:
  1. The number of ERUs to be served through any single grinder pump system shall not exceed 80 ERUs. The maximum number of contiguous (or nearly contiguous) homes or ERUs allowed with private grinder pumps is 80 homes. Public wastewater lift stations will be considered for larger developments.

**Note: One ERU is considered equivalent to one single family residence, or 400 gallons per day average usage.**

2. Each individual grinder pump installation connected to a common force main shall be consistent with the overall system design approved by the pump manufacturer and BCWS.
3. All properties to be served by a particular common force main shall be included in the same section of the development and developed at the same time. Any future section requiring a common force main shall have a separate force main independent of any other common force mains. Each individual grinder pump installation connected to a common force main shall be consistent with the overall system design approved by the pump manufacturer and BCWS.
4. No public force main branches shorter than 300 feet will be permitted. Homes or other buildings on short cul-de-sac streets or panhandle/flag lots shall be served via parallel individual service laterals.
5. Where grinder pumps are required, each building or property that is (or could potentially be) owned by a different owner shall have a separate wet well tank, grinder pump and force main/service lateral.
6. No individual/private force main discharging directly to a gravity sewer will be permitted longer than will allow for complete turnover of the sewage in the force main at least four (4) times per day at 150 gallons/day per ERU (for 1 ERU: 37.5 gallons total storage or 410 feet of 1.25-inch SDR 21 PVC) - i.e. maximum 6-hour retention time, unless on-site aerobic treatment is provided for the discharge from the property.
7. On-site aerobic treatment shall be provided for the discharge from each property connected to a common force main, unless the total retention time in the force main (from grinder pump to gravity sewer) will be six (6) hours or less at 150 gallons/day per ERU.
8. The following requirements shall be met for on-site aerobic treatment systems utilized ahead of a private grinder pump system:
  - a) The system shall meet the requirements of the Butler County Health Department and shall be approved by the Ohio Department of Health for off-lot discharge.
  - b) The system shall be designed to retain solids.
  - c) The aerobic treatment system effluent shall discharge directly into the grinder pump wet well.
  - d) Piping between the aerobic system and grinder pump wet well shall be 4-inch (for residential) or 6-inch (for commercial) Schedule 40 PVC with a minimum grade of 2%.
9. Single-family residential pipe requirements: All individual force mains and service laterals shall be 1.25-inch or 1.5-inch nominal diameter SDR 21 PVC, Schedule 40 PVC (200 psi) or other approved material. Diameter (1.25-inch or 1.5-inch) shall be determined during design of each project/installation and shall be approved by BCWS. Joints shall be rated for at least 200 psi.

10. Commercial and Multi-Family residential pipe requirements: All individual force mains and service laterals shall be sized according to the estimated average sewage flows anticipated from each building or parcel, with a minimum size of 1.25-inch nominal diameter. Pipe diameter shall be approved by BCWS. Piping smaller than 3-inch nominal diameter shall be SDR 21 PVC, Schedule 40 PVC (200 psi) or other approved material. Piping 3-inch nominal diameter and larger shall be thickness Class 53 ductile iron. Joints shall be rated for at least 200 psi.
11. Private service laterals that connect to a common/public force main shall connect at a manufactured fitting. No direct taps or tapping saddles will be permitted on public force mains. No new service connections to existing force mains will be permitted; only those connections included in the original system design. A brass curb stop and cast iron curb stop box shall be installed inside the public right-of-way or easement on each service lateral and shall be located approximately five (5') feet from the public force main. Curb stops shall be at least two (2") inches lower than the connection of the service lateral to the public force main. 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 top of the ground.
12. Each individual/private force main or service lateral shall have at least two (2) independent check valves; one (1) at the pump and one (1) within 50 feet (50') of the connection to the public sewer (gravity sewer or common force main). Check valves and all other portions of the private force main or service lateral shall meet the pump manufacturer's requirements and recommendations.
13. All public force mains shall be at least 2-inch nominal diameter. Force mains 3-inch nominal diameter and larger shall be thickness Class 53 ductile iron. Force mains smaller than 3-inch nominal diameter shall be SDR 21 PVC (200 psi) with gasketed joints. Other materials may be allowed for force mains smaller than 3-inch if they are demonstrated to be more reliable and suitable for this application and are approved by BCWS. Detectable magnetic marking tape (in accordance with Paragraph 22) shall be installed in the ditch line for non-metallic public force mains both one foot (1') below the final surface grade and one foot (1') above the force main.
14. Private force mains shall be installed with a minimum of four feet (4') ground cover. Common/public force mains shall be installed with a minimum of six feet (6') and maximum of twelve feet (12') ground cover. A minimum of 10 feet (10') horizontal clearance (for parallel installations) and 18-inch vertical clearance (at crossings) shall be maintained between all force mains/service laterals and water mains/services.
15. Wherever possible, common/public force mains should be installed with a continuous positive grade to the discharge into the gravity sewer. Approved air/vacuum release valves shall be installed anywhere this is not possible and where localized high points exist or long runs (greater than 2,500 feet) with no clearly defined high point occur. Air/vacuum release valves shall be installed on upward turned tees; taps or tapping saddles are not allowed. The Engineer and Plumber should also evaluate the need for air release valve(s) at high points on private force mains and service laterals.
16. Flushing locations shall be installed at the end of each common force main (farthest from the discharge point), at each junction of two (2) common force main branches, and at intermediate points such that the maximum distance between flushing locations (or discharge point) is 1,000 feet. The Engineer and Plumber should also evaluate the need for flushing locations on private force mains and service laterals.

17. Public force mains shall discharge into a gravity sewer through a separate manhole with no upstream gravity sewer connections. The force main shall be extended along the bottom of the manhole and approximately 10 feet (10') into the gravity sewer at the sewer's invert. A flow channel and benches shall be formed in the manhole to allow any water or sewage to drain into the gravity sewer but still allow access to the sewer for maintenance. No laterals may be connected to the gravity sewer within 12 feet (12') of this manhole.
18. 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. Common force mains shall be tested after all air release valves, flushing locations, and other appurtenances have been installed and with all service laterals installed at least to the curb stop. Private force mains and service laterals (on the pump side of the curb stop) shall be tested after the entire system is completely installed (except for the connection to the gravity sewer, when applicable).
19. The following requirements apply to installations connected to common force mains:

All pumps shall be progressive cavity non-clogging, non-jamming grinder pumps capable of pumping 15 gpm at zero feet (0') TDH, nine (9)-gpm at 138 feet TDH, and capable of operating at negative TDH without overloading the motor. The maximum design total dynamic head (TDH) for any pump shall be 138 feet (138') (60 psi) with the maximum number of grinder pumps operating simultaneously daily. Grinder pump motor 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. Level sensing control for grinder pump systems shall be non-fouling type with no moving parts in contact with the sewage. Each grinder pump system shall have a high level audible and visual warning alarm to warn the building's occupants of a high wet well level. A battery backup system is recommended. Grinder pump systems shall be E-One Extreme DH Series as manufactured by Environment One Corporation or approved equal. Future replacement pumps must be the same type and meet the same operating conditions as the original pump.

20. Detectable marking tape shall meet the following requirements:

- Minimum thickness of five (5)-mil, with a solid aluminum foil core. Construction is two (2)-mil clear film, reverse print laminated to aluminum foil to two (2)-mil clear film, making the film permanently printed.
- Minimum width of three inches (3").
- Color coded green to signify sewer or an associated line.
- Tensile strength of 35 lbs./in. (15,000 psi).
- Elongation of eighty percent 80%.
- Adhesives with the value of Morton 548 or higher.
- Bottom layer with the value of virgin PE.
- Top layer with the value of virgin PET.
- Printability value of 45 dynes.

21. Where future gravity service is reasonably possible (as determined by BCWS) and there is unsewered upstream property, a dry gravity sewer shall be installed from the most reasonable point at the downstream property line of the proposed development (for connection to the future trunk sewer) to the upstream boundary/boundaries of the development. This dry sewer shall be installed and on easement granted prior to acceptance of the grinder pump system by the County.
22. Whenever there is potential for installation of a future gravity sewer to serve the involved properties, each building utilizing a grinder pump system shall have a gravity sewer drain through the building's foundation to facilitate connection to the future sewer, whether the grinder pump is located inside or outside the foundation.
23. Where future gravity sewer service is reasonably possible, adequate platted public right-of-way and/or easements shall be provided for future local gravity sewers. Each building's gravity sewer drain shall leave the foundation at a location that will facilitate connection to the future gravity sewer.

### **COMPLETE SYSTEM DESIGN REQUIREMENTS**

- Plans shall be consistent with a complete system design, which shall be approved by the pump manufacturer and submitted to BCWS for approval with each set of plans.
  1. Complete system design submittal shall include:
    - (a) Numbers of properties served by each force main and force main branch
    - (b) Type of occupancy and anticipated ERUs for each property
    - (c) Development sequence and timetable
    - (d) Design flows (average, daily peak, instantaneous peak, etc.)
    - (e) Grinder pump system manufacturer and model number(s)-Include catalog cut sheets, pump curve(s), and description of system features.
    - (f) Small-scale sketch of entire grinder pump system, including: pump locations and elevations; location and direction of flow for each individual force main/service lateral and each common force main 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. Branches/zones shall be divided as described below.
    - (g) Table indicating the following information for each branch/zone:
      - i. Branch number
      - ii. Number of pumps connected directly to the branch
      - iii. Accumulated total number of pumps connected directly or indirectly
      - iv. Maximum daily number of pumps operating simultaneously
      - v. Maximum daily flow in branch
      - vi. Pipe size
      - vii. Maximum daily velocity in branch
      - viii. Length of branch
      - ix. Friction loss in branch per Hazen Williams with C 120
      - x. Accumulated friction loss
      - xi. Maximum force main elevation (between branch and discharge)
      - xii. Minimum pump elevation (connected directly to the branch)
      - xiii. Maximum elevation difference
      - xiv. Maximum total dynamic head (for pump connected directly to the branch)

2. Force main design maximum daily velocity (i.e. maximum velocity anticipated to occur at least once each day) shall be not less than 1.90 feet per second (fps) and not more than 4.0 fps. This requirement shall apply to each force main branch or zone. Zones shall be divided based on number of grinder pumps connected as shown in the following table. A new zone shall also be defined on each side of any common force main 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 Pumps Connected (Each range represents a separate zone.)</b>	<b>Maximum Number of Grinder Pumps Operating Simultaneously Daily</b>
1	1
2-3	2
4-9	3
10-18	4
19-30	5
31-50	6
51-80	7

## **OPERATION AND MAINTENANCE**

- All individual grinder pump facilities and force mains serving only one (1) home or property shall be privately owned and maintained by the property owner. All common force mains serving multiple properties will be publicly owned and maintained by Butler County.
- The property owner will be responsible for the private service lateral from the force main to the pump. The property owner shall maintain all check valves on the private service lateral and/or force main.
- The property owner shall be responsible for operation, maintenance and future replacement of the private grinder pump system and on-site aerobic treatment system. At least annual maintenance of each grinder pump system and on-site aerobic treatment system shall be performed by a licensed and bonded plumber/contractor, which is certified and approved by the equipment manufacturer. Solids shall be pumped from each on-site aerobic system at least every five (5) years. Documentation of all maintenance and pumping shall be provided to BCWS. Failure to adequately maintain the on-site aerobic treatment system or provide the required documentation will be cause for disconnection of sewer service by BCWS.

## PLATTING REQUIREMENTS

- The following language shall be included on all record plats for developments that include any lots to be served by private grinder pump systems. Such plats shall clearly indicate which lots require grinder pumps and which lots also require on-site aerobic treatment systems (if applicable).
  1. Where grinder pumps are required, each building or property that is (or could potentially be) owned by a different owner shall have a separate wet well tank, grinder pump and force main/service lateral.
  2. Each individual grinder pump installation connected to a common force main shall be consistent with the overall system design approved by the pump manufacturer and BCWS.
  3. Each building utilizing a grinder pump system shall have a gravity sewer drain through the building's foundation at a location that will facilitate connection to a future gravity sewer, unless future gravity sewer service is not possible.
  4. All individual grinder pump facilities and force mains serving only one (1) home or building shall be privately owned and maintained by the property owner. All common force mains serving multiple properties will be publicly owned and maintained by Butler County.
  5. All individual force mains and service laterals shall be 1.25-inch or 1.5-inch nominal diameter SDR 21 PVC, Schedule 40 PVC (200 psi) or other approved material. Detectable magnetic marking tape shall be installed in the ditch line one foot (1') below the final surface grade for non-metallic pipe installed within the public right-of-way and easements.
  6. Private force mains that connect to a public gravity sewer shall connect via a wye fitting. No private force main connections to public manholes will be allowed.
  7. Private service laterals that connect to a common/public force main shall connect at the original laterals installed with the public force main. No direct taps or tapping saddles will be permitted on public force mains. No new service connections to existing force mains will be permitted; only those connections included in the original system design. The curb stop and curb stop box shall remain when the connection is made and the elevation of the curb stop shall not be changed. 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 top of the ground. The property owner will be responsible for the private service lateral from the common force main to the pump.
  8. Each individual/private force main or service lateral shall have at least two (2) independent check valves, one (1) at the pump and one (1) within 50 feet (50') of the connection to the public sewer (gravity sewer or common force main). The property owner shall maintain both check valves. Check valves and all other portions of the private force main or service lateral shall meet the pump manufacturer's requirements and recommendations.
  9. No individual/private force main discharging directly to a gravity sewer will be permitted longer than will allow for complete turnover of the sewage in the force main at least four (4) times per day at 150 gallons/day per ERU, i.e. maximum 6-hour retention time, unless on-site aerobic treatment is provided for the discharge from the property.
  10. On-site aerobic treatment shall be provided for the discharge from each property connected to a common force main, unless the total retention time in the force main (from grinder pump to gravity sewer) will be six (6) hours or less at 150 gallons/day per ERU.

11. The following requirements shall be met for on-site aerobic treatment systems utilized ahead of a private grinder pump system:
  - a. The system shall meet the requirements of the Butler County Health Department and shall be approved by the Ohio Department of Health for off lot discharge.
  - b. The system shall be designed to retain solids.
  - c. The aerobic treatment system effluent shall discharge directly into the grinder pump wet well.
  - d. Piping the aerobic system and grinder pump wet well shall be 4-inch (for residential) or 6-inch (for commercial) Schedule 40 PVC with a minimum grade of 2%.
12. The property owner shall be responsible for operation, maintenance and future replacement of the private grinder pump system and on-site aerobic treatment system. At least annual maintenance of each grinder pump system and on-site aerobic treatment system shall be performed by a licensed and bonded plumber/contractor, who is certified and approved by the equipment manufacturer. Solids shall be pumped from each on-site aerobic system at least every five (5) years. Documentation of all maintenance and pumping shall be provided to BCWS, 130 High St., Hamilton, OH 45011. Failure to adequately maintain the on-site aerobic treatment system or provide the required documentation will be cause for disconnection of sewer service by BCWS.
13. The Engineer and Plumber should evaluate the need for air release valve(s) and/or flushing locations on private force mains and service laterals.
14. A hydrostatic pressure test of each private force main/service lateral shall be performed in accordance with BCWS requirements.
15. The following requirements apply to installations connected to a common force main:

All pumps shall be progressive cavity non-clogging, non-jamming grinder pumps capable of pumping 15-gpm at zero feet (0') TDH, 9 gpm at 138 feet (138') TDH, and capable of operating at negative TDH without overloading the motor. The grinding pump motor 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. Level sensing control for grinder pump systems shall be a non-fouling type with no moving parts in contact with the sewage. Each grinder pump system shall have a high level audible and visual warning alarm to warn the building's occupants of a high wet well level. A battery backup system is recommended. Grinder pump systems shall be E-One Extreme DH Series as manufactured by Environment One Corporation or an approved equal. Future replacement pumps must be the same type and meet the same operating conditions as the original pump.

## **DEED RESTRICTIONS**



- The following language shall appear on the recorded deed for each property to be served by a private grinder pump system. The language shall be included on any and all subsequent deeds, certificates of transfer, etc. until such time as the grinder pump system is eliminated and replaced by a different means of providing sanitary sewer service to the property.
  - 1) The individual force main(s) serving the building(s) on this property, both check valves and all other appurtenances that are a part of the force main or are connected to it, are private and shall be owned and maintained by the property owner, including the curb stop, curb stop box and force main between the pump and public force main.
  - 2) The property owner shall be responsible for operation, maintenance and future replacement of the private grinder pump system and on-site aerobic treatment system (where required). At least annual maintenance of each grinder pump system and on-site aerobic treatment system shall be performed by a licensed and bonded plumber/contractor, which is certified and approved by the equipment manufacturer. Solids shall be pumped from each on-site aerobic system at least every five (5) years. Documentation of all maintenance and pumping shall be provided to BCWS, 130 High St., Hamilton, OH 45011. Failure to adequately maintain the on-site aerobic treatment system or provide the required documentation will be cause for disconnection of sewer service by BCWS.
  - 3) For installations connected to a common force main:
    - a) All pumps shall be progressive cavity non-clogging, non-jamming grinder pumps capable of pumping 15-gpm at zero feet (0') TDH, 9 gpm at 138 feet (138') TDH, and capable of operating at negative TDH without overloading the motor. The grinding pump motor 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. Level sensing control for grinder pump systems shall be a non-fouling type with no moving parts in contact with the sewage. Each grinder pump system shall have a high level audible and visual warning alarm to warn the building's occupants of a high wet well level. A battery backup system is recommended. Grinder pump systems shall be E-One Extreme DH Series as manufactured by Environment One Corporation or an approved equal. Future replacement pumps must be the same type and meet the same operating conditions as the original pump.
    - b) These conditions are to run with the land and shall be binding upon the Owner(s) as well as the heirs, successors, administrators, and assigns of the Owner(s), until such time as the grinder pump system is eliminated and replaced by a different means of providing sanitary sewer service to the property.
    - c) Invalidation of any condition herein by a judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

END OF SECTION