

SECTION 5

SANITARY SEWER DESIGN

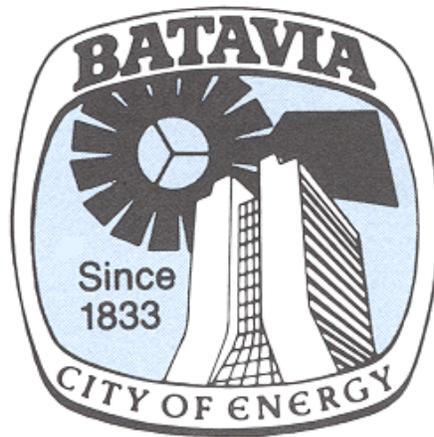


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SECTION 5

SANITARY SEWER DESIGN

5.1 GENERAL DESIGN CRITERIA

5.1.1 Requirement for Sanitary Sewer

All sanitary sewage of domestic and other water borne wastes shall be collected and conveyed in a sanitary sewer pipe system to a point of discharge into an existing sanitary sewer system, City of Batavia interceptor, or sewage treatment plant. No sanitary sewage shall be allowed to enter any storm sewer system or discharge onto the ground or into receiving streams without first being treated in accordance with city, county, state and federal regulations.

No unauthorized person shall uncover, make any connection with or opening into, use, alter or disturb any public sewer, including tributary sewers, without first obtaining a permit or written authorization from the City.

Each proposed sewer which is designed and is to be connected so as to be an integral part of the City of Batavia sanitary sewer system shall not be constructed without a permit issued by the City and the Illinois Environmental Protection Agency (IEPA) where required. Where possible, service connections should be made perpendicular to the main line. All connections shall be made with a manufactured tee or wye. Parallel sewers will not be permitted. All cleanout or inspection manholes are to be placed out of the right of way and are to be maintained by the property owner.

5.1.2 Fees

Refer to the City of Batavia Code Title 8, Chapter 3, Section 13 for Service Charges to determine the appropriate fees.

5.1.3 Design Approval

The Public Works Department shall approve all designs and shall alter the following design requirements as necessary to meet the City's Master Plan.

Proposal of new sanitary sewer lift stations requires approval from the Director of Public Works, prior to the design and review process.

The City of Batavia's standard details should be used in all construction plans. Any modifications to these standard details require approval from the City Engineer.

5.1.4 IEPA Permit Required

All public sanitary sewer mains require an IEPA Construction permit number and an Illinois Pollution Control Board permit number, prior to construction. Some private extensions may require a permit, dependent upon the design population equivalent.

A building sewer constructed to serve a single family home or a building producing less than 1500 g.p.d. domestic sewer flow may be exempt from being required to apply to the Illinois Environmental Protection Agency for a permit from the Bureau of Water, Division of Water Pollution Control, subject to specific standards hereinafter provided.

A building producing any amount of non-domestic flows, even though said building generates less than 1500 g.p.d. (15 P.E.) of domestic flows, shall be required to obtain a permit from the Illinois Environmental Protection Agency, Bureau of Water, Division of Water Pollution Control.

All sanitary sewerage systems shall meet the following minimum standards:

- A. For residential units average daily sewage flow (including allowances for infiltration) of one hundred (100) gallons per person per day, and a maximum peak sewage flow of four hundred (400) gallons per person per day or as shown in Appendix –D Figure 1 in the "Illinois Recommended Standards For Sewage Works" printed by the EPA.
- B. Commercial and light industrial development shall be designed for ten thousand (10,000) gallons per day per acre of property served.
- C. Medium and heavy industrial development shall be based on the type and volume of waste contemplated.
- D. Minimum population density for new areas not presently served of 3.5 people per unit for single-family and 2.5 people per unit for multi-family.
- E. Maximum allowable infiltration of not more than two hundred (200) gallons per inch diameter per mile per day.

5.1.5 Construction Rules and Regulations

The rules, regulations, and ordinances and policies listed herein, and issued by the authorities indicated, are incorporated herein by reference.

- A. The City of Batavia rules, regulations, policies, directives, specifications, general notes, construction details, permit forms and instructions that may be adopted or issued from time to time by the City Council.

- B. The Federal Water Pollution Control Act Amendment of 1972 as amended (33 U.S.C. §1251 et seq.)
- C. The Illinois Pollution Control Board including all orders, rules and regulations thereof.
- D. Environmental Protection Act, including all orders, technical releases, rules and regulations issued from time to time.
- E. “Standard Specifications for Water and Sewer Main Construction in Illinois”, latest edition.
- F. “Recommended Standards for Sewage Works”, Great Lakes-Upper Mississippi River Board of State Sanitary Engineers (Ten State Standards).
- G. “77 Illinois Administrative Code, part 890, Illinois Plumbing Code”, latest edition.
- H. The Occupational Safety and Health Administration (O.S.H.A.)– Regulations (Standards-29 CFR) – Standard Number 1926.652.

5.1.6 Differentiation between Public and Private Sanitary Sewers

Those portions of the main line sanitary sewer system that are located within the public right-of-way are the responsibility of the City. The City shall also maintain public mains, serving more than one customer. The maintenance and repair costs for the sanitary sewer system located on private property, beyond the limits of the right-of-way, are the responsibility of the property owner or property owner’s association depending on the associate’s covenants and guidelines. The maintenance of service laterals in the right-of-way are the responsibility of the property owner, except in such cases where the City deems the maintenance of such service lateral within the ROW requires structural, or other repair, and at such time the City shall be responsible for the repair of such line. In such cases where the City – is required to perform maintenance or repairs on the private sanitary sewer system where conditions deem that health or environmental mitigation is necessary and the owner declines to perform the necessary repair, the City reserves the right to charge the property owner for necessary work.

All engineering plans shall clearly differentiate between public and private sanitary sewers.

5.1.7 Easements

All public sanitary sewers that are not located within a publicly dedicated right-of-way shall be placed in a public utility and drainage easement, minimum 10 feet wide or as directed by the City Engineer. The easement shall be granted to the City either through a recorded plat of subdivision or a recorded plat of

easement. The City shall be granted access to these easements if not directly adjacent to public right-of-way.

At the discretion of the City Engineer, the City may require additional easements for future maintenance or repair of sanitary sewers, even those sewers that may be located within the public right-of-way. For example, the City may have an extra deep sanitary sewer located within the public right-of-way. However, the City may require a public utility and drainage easement parallel to the edge of the right-of-way to accommodate future repair of the sanitary sewer if it ever needs to be excavated and repaired.

5.2 SANITARY SEWERS

5.2.1 Sanitary Sewer Pipe Materials

All sanitary sewer pipe materials and appurtenances shall be in conformance with applicable ASTM, ANSI, AWWA, Section 5 of the City of Batavia Design Manual, or other standards as set forth by the City.

Sewer pipe and fittings shall conform to the following specifications except as approved by the city engineer:

1. Between depths of six feet (6') and fourteen feet (14'), polyvinyl chloride (PVC) pipe ASTM D-3034 SDR 26 shall be required for pipe diameters up to fifteen inch (15") For pipe sizes over fifteen inch (15"), PVC pipe ASTM F679 PS115 shall be required.
2. For depths shallower than six feet (6') or deeper than fourteen feet (14') PVC pipe shall be required meeting the latest requirements of AWWA C900/C905, latest edition. AWWA C900/905 PVC pipe shall be minimum DR18 with push on joints or restrained joints where applicable. For both shallow depth burial and deep burial, design calculations shall be provided which shows the required wall thickness by considering the soil class, trench load, and degree of backfill compaction.
3. For pipe twenty four inches (24") and larger, PVC pipe shall be required meeting the latest requirements of either ASTM F679 Class PS115 (minimum).
4. Sanitary services shall be a minimum diameter of six inches (6").

5.2.2 Force Main

Sanitary sewer force main shall conform to the following:

1. 4" minimum diameter;

2. Ductile Iron Pipe Class 52 (minimum) meeting the latest requirements of AWWA C-151. All pipe shall be furnished with asphaltic exterior coating and ceramic epoxy interior lining (Protecto 401 or approved equal) and installed with polyethylene encasement;
3. Ductile iron pipe shall be with Push-On joints meeting the requirements of AWWA C-111, latest edition.
4. Force main fittings shall be constructed of ductile iron with mechanical joints conforming to the latest edition of AWWA Standard C110. Mega-lug restrained joints and thrust blocks shall be required on all fittings;
5. Clean-outs at all vertical and/or horizontal bends, or at 700' minimum intervals in a precast concrete vault. Cleanouts will be installed via the use of a "T" connection with a cap at the top of the cleanout. Longer force main designs shall consider pig and retrieval stations to facilitate cleaning of the pipeline;
6. Minimum flow velocity of two (2) fps. Design calculations shall be submitted for review and approval by the City of Batavia Public Works Division;
7. Air release valves shall be located at the high point of the force main. Air release valves shall be installed in precast concrete vaults with

5.2.3 Location in the Public Right-Of-Way

Sanitary sewers shall be located within the public right-of-way as directed by the City Engineer. In general, sanitary sewers shall be located 7.5 feet inside the right-of-way on the south and east sides of the right-of-way.

5.2.4 Curvilinear Alignment of Sanitary Sewers

Curvature of sanitary sewers is not allowed.

5.2.5 Sewer and Water Main Separation

Sanitary sewers and services that are laid in the vicinity of pipelines designated to carry potable water shall meet the conditions set forth in Section 6 of this manual.

5.2.6 Depth of Pipe Cover

All pipe shall be laid to a minimum depth of 7 feet measured from the proposed ground surface to the top of the pipe, unless specifically allowed otherwise in special circumstances by the Director of Public Works or the City Engineer. In no case shall sanitary sewer and services be installed with ground cover less than 42 inches. For sewer depths shallower than six feet (6') or deeper than fourteen feet (14') PVC pipe shall be required meeting the

latest requirements of AWWA C900/C905, refer to Section 5.2.1. All sanitary sewers and services with less than 4 feet of cover shall be insulated with a 2-inch exterior grade rigid insulation board. The insulation shall have a minimum R-value of R-9, and comply with ASTM C 578-15 Type VI (minimum).

5.2.7 Overhead Sewers

Homes may be required to be constructed with Overhead Sewers where required by the City Engineer.

5.2.8 Sanitary Sewer Sizing

Sewer size shall be designed on the basis of a design average flow of not less than 100 gallons per capita per day and provide a minimum of 2.0 feet per second velocity when flowing full. The Director of Public Works may increase sewer size in accordance with Section 8-3-10-1 noted below. In no case shall a public sewer be sized less than 8 inches in diameter.

5.2.9 Oversizing and Extra Depth Requirements

The Director of Public Works or the City Engineer may request that sanitary sewers either be oversized or installed at an additional depth in order to provide service to additional benefiting properties.

5.2.10 Sanitary Sewer Slopes

All sanitary sewer slopes shall meet the requirements of the following sections:

5.2.11 Minimum Slopes

Sanitary sewers shall be designed such that the minimum slopes are not less than the following:

Pipe Diameter	IEPA Minimum Slope	COB Desired Slope
8 inch	0.40%	0.45%
10 inch	0.28%	0.30%
12 inch	0.23%	0.25%

5.2.12 Maximum Slopes

Sanitary sewers shall be designed such that the slopes do not exceed a maximum of 12%. If the sanitary sewer system cannot be designed without exceeding a slope of 12%, then drop manhole assemblies shall be utilized.

5.2.13 Last Run of Manhole Sets

On last runs of all manhole sets, a minimum 1% slope needs to be provided in order to provide adequate flushing due to low flows.

5.2.14 Limits of Installation

At a minimum, sewers shall extend across the frontage of the property, at the

developer's cost, such that a connection can be made with minimal disturbance in the future. In some cases, the City may require that the sanitary sewer be installed from one corner to the diagonally opposite corner, at the developer's cost.

5.2.15 Trenches

Pipe installation and backfill shall in accordance with the "Standard Specifications for Water and Sewer Main Construction in Illinois" with the following exceptions. No backfill shall be placed until the work has been inspected by the City. All utility and service trenches within (3) feet of paved surfaces, or at a distance specified by the Engineer, shall be backfilled with Select Granular Backfill materials. For further details, refer to the City of Batavia typical utility trench details. Flowable fill in accordance with IDOT special provision for controlled low strength materials (CLSM) Mixture #1 may be required under certain circumstances but only as directed by the Department of Public Works.

5.2.16 Testing

All sanitary sewers shall be tested in accordance with the applicable sections of the "Standard Specifications For Water And Sewer Main Construction In Illinois", latest edition. In addition, all sewer manholes shall be vacuum tested.

All completed sewers shall be inspected using color closed circuit television camera (CCTV) and document the inspection on a digital recorder. The contractor or developer shall pay to have the lines televised. Televising shall be done with approximately one-half inch (1/2") continual flow in the sewer. All inspection video shall be captured in either MPEG or Windows Media Video (.WMV) file format and saved to portable hard drives for submittal and repairs completed, if necessary, prior to acceptance of the sewers by the city. The final inspection videos provided shall become the property of the City. All work will conform to current NASSCO Pipeline Assessment Certification Program (PACP) coding conventions and all software used by the Contractor will be PACP compliant.

Vacuum testing shall test all manholes for leakage. Vacuum testing shall be carried out immediately after assembly and prior to backfilling. All lift holes should be plugged with an approved nonshrink grout, or rubber plug. No grout will be placed in the horizontal joints before testing. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole.

All manholes will be inspected prior to acceptance and the testing shall be witnessed by the City of Batavia Engineering Division representative. Testing shall be in conformance with the ASTM C1244. A vacuum of ten inches (10") of mercury shall be placed on the manhole and the time measured for the vacuum to drop to nine inches (9") of mercury. The vacuum shall not drop

below nine inches (9") of mercury for the following time periods for each size manhole:

1. Forty eight inch (48") diameter - sixty (60) seconds.
2. Seventy two inch (72") diameter - ninety (90) seconds.

Vacuum tester shall be manufactured by P.A. Glazier, Inc., Worcester, MA 01613, or other testing equipment meeting the same standards, if approved by the city Public Works Department. All work of testing shall be done in accordance with the requirements of P.A. Glazier, Inc. The contractor shall provide all materials and equipment necessary for testing. If testing fails, the contractor shall seal all leaks with material and methods recommended by P.A. Glazier, Inc., and retest until acceptable. It is recommended that this testing be done before backfilling so that any leaks can be found and fixed externally. The manhole frame and adjusting rings shall be in place when testing.

5.2.17 Inspections

The sanitary sewer contractors for all sanitary sewer main extension projects shall notify the City of Batavia Engineering Division two (2) working days prior to the start of work. Notification shall be done via telephone (630) 454-2750 AND fax at (630) 454-2351 to the Engineering Division. For service connections, call the Community Development Office at least twenty-four (24) hours in advance to schedule an inspection at (630) 454-2700 during the hours of 8:00am and 4:00pm.

5.2.18 Construction

All excavations for building sewer installations shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the City.

5.2.19 Sanitary Services

Domestic sanitary services shall be constructed of PVC SDR 26 with a minimum diameter of 6". All domestic services shall connect to the public sewer with a wye fitting. Industrial and commercial sanitary services shall be constructed of PVC SDR 26 or 21 with a minimum diameter of 6". The minimum slope of sanitary services shall be one percent (1.0%).

Wyes or sanitary sewer tap to be installed to receive building sewers.

All building sewer extensions which are under proposed or existing streets shall be constructed to a distance of seven feet (7') from paved or proposed paved area at the time of construction of the sanitary lateral sewer. In new subdivisions, all sewer services shall extend to the property ROW line.

The connection of the building sewer into the public sewer shall be made at the "Y" branch, if such branch is available at a suitable location. If the public sewer is twelve inches (12") in diameter or less and no properly located "Y" branch is available, the owner shall at his expense install a sewer tap in the sewer at the location specified by the City Engineer or Building Inspector. Where the public sewer is greater than twelve inches (12") in diameter, and no properly located "Y" branch is available, an Inserta-Tee type fitting or equivalent shall be required as the means by which a connection will be constructed on the interceptor pipe. The centerline of the new sewer shall be installed at no greater than a 45 degree angle on the public sewer, above the horizontal "zero degree" point of the existing interceptor pipe, followed by a 45 degree elbow on the upstream side of the riser where the proposed line and grade of the new sewer shall commence. If the new sewer connection is a public sewer, a manhole shall also be constructed outside the District's permanent easement, no greater than 20' from the interceptor sewer.

A neat hole may be cored into the public sewer to receive the building sewer, with entry in the downstream direction at an angle of about forty five degrees (45°). A forty five degree (45°) ell may be used to make such connection, with the spigot end cut so as not to extend past the inner surface of the public sewer. The invert of the building sewer at the point of connection shall be at higher elevation than the invert of the public sewer. A smooth, neat joint shall be made, and the connection made secure and watertight by encasement in concrete. Special fittings may be used for the connection only when approved by the City.

5.3 SANITARY SEWER MANHOLES

Manholes for sanitary sewers shall have a minimum inside diameter of 48 inches and shall be constructed of pre-cast concrete units in accordance with ASTM C 478 and Section 32 of the "Standard Specifications for Water and Sewer Main Construction in Illinois," and shall follow the City of Batavia sanitary sewer standards.

Cone sections shall have a 3 inch integrally cast precast concrete collar; Pipe penetrations are to be sealed via the use of a flexible rubber water tight connector per ASTM C-923. All new or adjusted steps shall be made of steel reinforced plastic, using an approved plastic meeting ASTM D4101, Type II, Grade 49108 over a #3 Grade 60, ASTM A615, reinforcing bar.

Manholes frames shall have a waterproof lid with a concealed pick hole and have the words "City of Batavia Sanitary" on top of the lid. External chimney seals shall be installed on all sanitary sewer manholes and shall be manufactured by Mar Mac Construction (SurSeal), Cretex Specialty Products (Classic Seal), Sealing Systems, Inc. (Infi-Shield) or pre-approved equal.

Each manhole joint shall be sealed with an external sealing bands meeting

the requirements of ASTM C877 (Type II), Inc., as manufactured by MacWrap or approved equal. For further details, refer to the City of Batavia Sanitary Sewer Manhole detail.

5.3.1 Manhole Location and Spacing

Manholes shall be located at the junction of two sanitary sewer pipes or at any change in grade, horizontal alignment, pipe material, or size of pipe. Maximum spacing shall be 500 feet for larger diameter sewers 15" and greater and 400 feet for sewers 14" and less. Greater spacing of manholes may be allowed on a case-by-case basis as approved by the Department of Public Works.

Manholes shall be required to be constructed on the existing sanitary main where two or more customers are connecting a new private sanitary sewer service, lateral, or public sewer main to the existing public sanitary sewer system. Details for the construction of the new manhole including any required bypass pumping shall be submitted for review and approval by the Department of Public Works.

In general, the City of Batavia prefers to minimize the number of manholes needed for a project. This will help reduce future operation and maintenance costs.

5.3.2 Invert Elevations in Manholes

Inverts of similar size pipe are to match other inverts. The inverts of all pipes entering a manhole where the existing or proposed outlet sewer is fifteen (15) inches in diameter or larger shall be set so as to match the eighty percent (80%) flow line of the pipe leaving the manhole. A new concrete flow-channel shall be required to be poured inside of the new or existing manhole, or the existing bench shall be cored in conjunction with the manhole wall at the calculated elevation, so as to provide proper flow characteristics through the manhole. If connection to any manhole is a drop connection, this method shall pertain to the lower point of said drop.

The inverts of all pipes entering a manhole where the existing or proposed outlet sewer is less than fourteen (14) inches in diameter shall be set by matching the elevations of the top and existing pipe(s). It shall be required that the bench of any existing manhole be cored in conjunction with the manhole wall in order to provide a situation where there is no vertical "drop" between the new pipe's flow line and the new flow channel of the bench. If a connection to any manhole is a drop connection, this method shall pertain to the lower point of said drop.

5.3.3 Drop Manholes

Drop manhole assemblies shall be provided at the junction of sanitary sewers where the difference in grade is in excess of 2 feet. Drops are to be made

outside of the structure unless otherwise approved by the Batavia Department of Public Works. A minimum of 24 inches between the inverts of the drop assembly must be provided. The drop assembly shall follow the requirements as shown in the City of Batavia Drop Connection Detail.

5.3.4 Requirement for Inspection Manholes

Commercial, office, institutional, industrial, and manufacturing buildings shall have an inspection manhole located outside of the building that will allow the City to observe the discharge from the building into the public sanitary sewer system. The manhole shall be minimum forty eight inches (48") in diameter, located approximately ten feet (10') from the building on the sanitary service line. If metering devices or other devices are required to be located in the inspection manhole, then a separate manhole shall be required for sampling. Said manholes shall be easily accessible.

An inspection manhole is required for any multi-family building that has more than six (6) units. Additionally, clean-outs shall be required on multi-family services serving between two (2) and six (6) units.

A clean-out will also be required for any service line over 90 feet in length which does not have an inspection manhole.

5.3.5 Grease/Oil/Sand Trap Manholes

Grease/oil/sand trap manholes, as required by the Illinois Plumbing Code, shall be shown on the engineering plans. Grease and oil interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight and equipped with easily removable covers which when bolted in place shall be gastight and watertight.

5.4 APPURTENANCES

5.4.1 Casing Pipes

Manufactured non-metallic or non-corrosive casing spacers, adjustable runners, or cradles shall be used to support the pipe in the casing. A minimum of two supports shall be used per pipe for lengths up to 12.5 feet, and a minimum of three supports shall be used for lengths greater than 12.5 feet, or per manufacturer's recommendation. The annular space shall be filled with pea gravel or as required by permitting agency, and provisions shall be made so that no voids are left to prevent flotation.

5.4.2 Casing Pipe Material

The steel casing pipe shall be bituminous coated, a minimum of 30 mils thickness inside and out, and shall be of leak proof construction, capable of withstanding the anticipated loadings. The steel casing pipe shall have minimum yield strength of 35,000 psi and shall meet the requirements of

ASTM A139, Grade B. Ring deflection shall not exceed 2% of the nominal diameter. The steel casing pipe shall be delivered to the jobsite with beveled ends to facilitate field welding.

<u>Steel Casing Diameter</u>	<u>Minimum Wall Thickness (Inches)</u>
20" and 22"	0.344
24"	0.375
28"	0.438
30"	0.469
32"	0.501
34" and 36"	0.532

5.4.3 Sizing of Casing Pipes

The diameter of the casing pipe shall be a minimum of 12 inches greater than the outside nominal diameter of the sewer.

5.4.4 Non-Shear Couplings

A non-shear "Mission" brand coupling shall be used when joining pipes made of dissimilar material or where no "hub" end exists. PVC transition fittings shall be used when joining PVC pipes of dissimilar material specifications such as with storm sewer or water main.

5.5 INDUSTRIAL WASTE PERMIT

No Significant Industrial User or "SIU" shall discharge wastewater to the public sewers without having a valid Industrial Waste Discharge Permit issued by the City. A Significant Industrial User shall mean:

1. Any Industrial User of the City of Batavia wastewater treatment system who is subject to Categorical Pretreatment Standards under 40-CFR-403.6 and 40-CFR, Chapter I, Subchapter N; or
2. Any Industrial User of the City of Batavia wastewater treatment system who:
 - a) discharges an average of 25,000 gallons per day or more of process wastewater into the wastewater treatment system (excluding sanitary, noncontact cooling and boiler blow-down wastewater); or
 - b) contributes a process waste stream which makes up 5% or more of the average dry weather hydraulic or organic capacity of the wastewater treatment plant; or
 - c) is designated as such by the City of Batavia on the basis that the Industrial User has a reasonable potential for adversely affecting the City of Batavia's wastewater treatment system's operation or for violating any pretreatment standard or requirement (in accordance with 40-CFR-403.8(f)(6)).

Refer to Title 8 – Chapter 3 (Sanitary Sewerage System) of the current City of Batavia code detailed information regarding the requirements of the Industrial Waste Discharge Permit.