WINCHESTER MUNICIPAL UTILITIES

DEVELOPMENT MANUAL
FOR
WATER DISTRIBUTION SYSTEM AND WASTEWATER
COLLECTION SYSTEM EXTENSIONS

PREPARED BY
WINCHESTER MUNICIPAL UTILITIES
WINCHESTER, KY

MAY 2021
REVISION

The contents of this manual are written in conformance with existing design criteria of the Kentucky Department of Environmental Protection, Division of Water (KYDOW). In certain instances, the design criteria and construction standards of WMU exceed the requirements of KYDOW.

KYDOW review of plans and specifications for additions or modifications to the wastewater collection system is mandatory and additional, more stringent requirements, in addition to those of WMU may be stipulated by KYDOW.

Through an agreement between the Kentucky Department for Environmental Protection and the Winchester Municipal Utilities, the Kentucky Department for Environmental Protection will accept WMUs approval of water lines that comply with the following limitations:

1. Projects with an overall length of less than 10,000 contiguous feet.
2. Water lines no greater than 12 inches in diameter.
3. Upon completion, all projects shall meet all drinking water quality standards as set forth in 401 KAR Chapter 8.

Other restrictions and / or regulatory requirements not addressed in this document may be in place. The developer / contractor / engineer of record for developments and / or extensions shall bear the full burden of complying with any such restrictions and / or regulatory requirements without recourse to WMU, its successors or assigns.

The preparation of this manual has been financed by WMU. Mention of trade names or commercial products in this manual does not constitute endorsement of the product.

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PREFACE

Purpose

This manual is a guide to be used in the design and construction of water and sanitary sewer extensions in the areas served by Winchester Municipal Utilities (WMU). It outlines the policies and procedures approved by the Winchester Municipal Utilities Commission (WMUC), and the design requirements established under their direction.

The intent of the manual is:

- To establish uniform policies and procedures for the construction and acceptance of water and sewer line extensions that are compatable with the overall plans of the utility. However, it is recognized that development criteria can be set forth only for a portion of the development problems. A manual such as this cannot enumerate the acceptable & proper course of action for every situation which may arise. For matters not covered herein, and special situations which may arise, sound engineering judgement must be applied.
- To provide the necessary information to prepare and review a project design with a single document that is complete, organized, and easily referenced.
- To provide evaluation and design criteria that will help mitigate existing problems, prevent future problems, and enhance the environment and quality of life in the area served by WMU.

Description & Use of the Developer's Manual

This manual provides a digest of accumulated water and sanitary sewer design and construction experience, and basic engineering principles for application to present day water and sewer construction problems. Procedural requirements are outlined and engineering information and techniques are included as a guide to the various tasks necessary for design, construction, and dedication of water and sanitary sewer extensions for developments of all types in the area served by WMU.

Structure of the Developer's Manual

This manual is composed of many sections relating to the various steps in the development, design, construction, and dedication of water and sewer extensions. These are as follows:

- Section 100 – Administrative Requirements for Water, Sanitary Sewer and/or Fire Line Extentions
  Describes the requirements for preconstruction submittals, design review and approval, and dedication and acceptance for line extensions of any type. Also described are the clerical requirements of the developer, engineer, and contractor.
- Section 200 - Design Requirements for Water, Sanitary Sewer, and/or Fire Line Extensions
  Describes the design criteria for sanitary sewer line, water line, & sewer lift station design.
- Section 300 - Construction Specifications for Water Line Extensions
  Describes the construction requirements for Water Line construction.
- Section 400 - Construction Specifications for Sanitary Sewer Line Extensions
  Describes the construction requirements for Sanitary Sewer Line construction.
- Section 500 - Construction Specifications for Prefabricated Lift Stations
  Describes the construction requirements for Prefabricated Sanitary Sewer Lift Stations.

Updates to the Developer's Manual

The Developer's Manual is intended to be a dynamic and progressive document. As technology evolves, design criteria will change and the manual will require revisions and improvements. WMU welcomes constructive criticism on the contents and style of this manual and users are encouraged to make suggestions for revisions and improvements. A Development Manual comment form is provided in the front of this manual and may be used for this purpose. As changes are required, supplements or updates will be sent to registered holders of the Developer's Manual. It will be their responsibility to maintain the manual in a current state.

GLOSSARY

(A)

Abandoned - To cease from maintaining, practicing, or using.

Air Release Valve - A continuously active valve in a water line that is set at the high point of elevation and is used for the purpose of releasing pockets of air once the line is filled and under working pressure.

A.S.T.M. - American Society for Testing and Materials. They are a not-for-profit organization that provides a global forum for the development and publication of voluntary consensus standards for materials, products, systems, and services.

(B)

Backfill - The process of putting soil or crushed stone back into a trench or excavation once the related work has been completed.

Backflow - (1) The undesirable reversal of flow of a liquid, gas, or suspended solid into the potable water supply.

(2) The backing up of water through a conduit or channel in the direction opposite to original flow.

(3) A reverse flow condition created by a difference in water pressures that causes water to flow back into the distribution pipes of a drinking water supply from any source other than the one intended. Also known as *Back Siphonage*.

Backflow Preventer - A device intended to prevent backflow, that allows liquids only to flow in a direction away from a potable water main.

Barrel (Manhole) - The vertical portion of a manhole used to gain access to a sewer.

Base (Manhole) - The bottom, or supporting structure, on which the manhole barrel rests.

Basin - A geographic area consisting of a drainage system comprised of streams and often natural or man-made lakes. It may also be used to identify sanitary sewer collection areas within a sanitary sewer collection system.

Bedding - The earth or other materials on which a sewer line, water line, or other structure is supported.

Bell - The recessed, over enlarged, female end of a pipe into which the male or spigot end fits.

Blow Off - A waste gate or device for discharging accumulated solids or for emptying a depressed sewer.

Branch, Y (Wye) - A pipe joined to another pipe, usually at 60 degrees with alignment of the other, molded together and manufactured as a whole unit.

Bulkhead - A partition closing off an opening, usually constructed of timber, brick, or concrete. Normally associated with large diameter encasement pipe.

Bury Line - A line on a fire hydrant that signifies the area where finishing grade should be.

Bypass - An arrangement of pipes, conduits, gates, and valves by which the flow may be passed around a hydraulic structure appurtenance or treatment process.

(C)

Capacity - The amount of flow in terms of cubic feet per second that a conduit can or will discharge. Capacity depends on factors such as velocity, coefficient of roughness, size, shape, and slope of conduit.

Capacity Assurance Program – A program implemented as part of the CMOM Program to review sanitary sewer discharges to the collection system to ensure the collection system and treatment plants can accept the discharge without creating any adverse effects, such as overflows.

Castings - Metallic objects (historically Cast Iron) formed of molten metal in a mold, such as manhole lids and manhole frames.

Catch Basin (Storm Sewer) - A catch basin is an engineered drainage structure with the sole function of collecting rainwater and snowmelt from streets and parking lots and transporting it to local waterways through a system of underground piping, culverts, and or drainage ditches. Catch basins can be found on public or private property.

Chamfer - An angled, flat surface created by slicing off a square edge or corner. Also known as *Bevel.*

Chlorination - The application of chlorine or one of its compounds to water for the purpose of disinfecting.

CMOM Program (Capacity, Management, Operation, and Maintenance) – A program designed to help optimize the performance of the sanitary sewer system (collection and treatment) by identifying where the system and organization are thriving and what areas need improvement.

Collar - A cylindrical ring, typically pre-cast concrete, secured upon the cone or barrel of a manhole in which the frame will rest.

Collection System - A network of lateral lines and branch sewer lines, in a defined area, that collects and transports sewage into a larger sewer line (trunk or interceptor).

Compaction - To press soil particles to each other by mechanical methods. During compaction air is forced out from voids and hence density is increased. The objective of compaction is to increase the density, bearing capacity, and shear strength of the compacted material (crushed stone or soil).

Conduit - A piping or passage system used for protecting water services under roadways.

Consent Decree - A consent decree (CD) is a legal agreement entered into by the United States (through EPA and the Department of Justice) and Potentially Responsible Parties. CDs are lodged with a court.

Contaminant - A physical, chemical, or biological substance that is not normally present in water.

Contract Documents - The Agreement, Bonds, General Conditions, Special Provisions, Specifications, and Drawings as the same or more specifically identified in the Agreement, together with all Amendments, Modifications, and Supplements issued on or after the effective date of the Agreement for the purpose of completion of desired work.

Control Point - A physical point on the ground, such as a stake, pin or monument, that is used as a reference or station when surveying.

Corporation Stop - A water shut-off valve in the main line used for connecting water service lines, pressure testing of water lines, chlorination of water lines.

Cradle - Type of bed, usually a type of gravel or concrete, being laid upwards from the trench bottom to the spring line of the pipe.

Crown - The highest inside part of a conduit.

Cross Connection - A physical connection made between two or more distinct systems, through which a potable water system could become contaminated.

Cubic Feet Per Second (CFS or Ft3/sec.) - A unit of measurement expressing rate of discharge.

Cul-de-sac - An alley or street having no outlet at one end, usually having an area at its dead end for turning around.

Culvert - A closed conduit of pre-cast pipe or monolithic structure of sufficient length for the passage of water other than sanitary sewage under roadways, driveways, railways, or other obstructions.

Curb Stop - A water shut-off valve located in a water service pipe near the curb and between the water main and the building.

(D)

Datum - The agreed standard point or plane of stated elevation.

Dead End - An end of a water main which is not connected at both ends to another water main or part of the distribution system.

Dedication - The act of accepting a development or project into the water distribution or sanitary sewer collection system by an entity or entities for ownership and maintenance purposes.

Dense Graded Aggregate (DGA) - A very compactable combination of small, 3/4-inch-or-less crushed stone and stone dust.

Design Capacity - The volume of water or sewage that a pipe, line, or system is able to convey.

Disinfect - To kill or render harmless microbiological organisms that cause disease.

Discharge - The rate of flow, or volume of water flowing therein at a given place and within a given period of time.

Distribution System - Any combination of pipes, pumps, tanks and so forth that delivers water from water sources or reservoirs to the consumer. Also known as a *delivery system*.

Ditch - A long narrow trench or furrow designed for the placement of water and/or sanitary sewer lines.

Diversion - An arrangement of pipes, conduits, gates and/or gate valves that allow flow to be passed around a hydraulic structure or appurtenance.

Division of Water (DOW) - A branch of the Kentucky Energy and Environment Cabinet. The mission of the Division of Water is to manage, protect and enhance the quality and quantity of the Commonwealth's water resources for present and future generations through voluntary, regulatory and educational programs.

Drop Inlet - A sanitary sewer collection entry point into a sanitary sewer manhole with an inlet invert elevation abnormally higher than the trough of the manhole receiving the flow.

(E)

Easement - A legal instrument used to enable the selling, giving, or taking of certain land or water rights without transfer of title, such as passage for utility lines within a set corridor within a parcel. An affirmative easement gives the owner of the easement the right to use land for a stated purpose. A negative easement is an agreement with a property owner to limit the development of land in specific ways.

Effluent - Water or wastewater that flows from a Basin, treatment process or treatment plant.

Elevation - Height above or below a given level, especially sea level. The variation of the earth's surface as measured by the vertical distance from known point(s).

Encasement - Usually steel or monolithic concrete used to protect and/or separate by enclosing the periphery of a pipe (water or sanitary).

(F)

Fats, Oils and Grease (FOG) Program - The goal of the FOG Program is to minimize costs, and protect the environment by keeping fat, oil and grease from getting into the sewer system.

Flow - Rate of water discharged from a source given in volume with respect to time.

Force Main - A pipe under internal pressure created by being on the discharge side of a pumping/lift station.

(G)

Gauge - An instrument that is used to measure pressure and velocity of flowing water.

Gasket - A leather or rubber "O" ring that is used in the installation of pipe in order to make a connection water-tight.

Gate Valve (Isolation Valve) - A valve that operates either fully opened or fully closed. It functions as a shut-off for water flow within the water distribution system or sanitary collection system.

Grade - The inclination or slope of a stream channel, conduit or natural ground surface. It is usually expressed in terms of the ratio or percentage of vertical rise or fall per 100 feet of horizontal distance.

Ground Water - Water that exists underground in saturated zones beneath the land surface.

(H)

Hydrant - A fixture in a street or other public place with a nozzle by which a hose may be attached to a water main or a discharge pipe with a valve and a spout at which water may be drawn from a water main.

(I)

Invert - The base interior level of a pipe, trench or tunnel; it can be considered the "floor" level. The invert is an important datum for determining the functioning or flowline of a piping system.

Interceptor (Sewer) - A sewer line that receives the flow from collection and trunk sewer lines and directs it to the wastewater treatment plant. It is among the larger lines of a sewer collection system.

(J)

Joint (Bell-and-Spigot) - A form of pipe connection which has a straight end on one side (Spigot), and an enlarged end on the other (Bell). The spigot fits inside the bell and made tight with a gasket or rubber “O” ring.

(L)

Lateral (Sanitary Sewer Service Line) - A service line that extends from the main sanitary sewer line to the building served or consumer(s) system.

(M)

Main - A relatively large pipe in a distribution system for drinking water or in a collection system for municipal wastewater.

Manhole - An opening by which a man may enter or leave a sewer, conduit, or other closed structure for inspection, cleaning, and maintenance operations closed by a removable cover.

Monolithic - Formed of a single large block, such as poured in place concrete versus pre-cast.

(O)

Outfall - Piping leading to a discharge stream through which effluent flows.

(P)

Pipe (Vitrified Clay) - Pipe made of clay that is burned in a kiln with surfaces glazed for water tightness.

Potable Water - Water that is drinkable and meets the quality standard set forth by the Kentucky Division of Water and the Environmental Protection Agency.

PPM - Parts Per Million. The measure of the weight of a substance per unit of volume.

Pre-cast - That which is formed in a mold or form and distributed by the manufacturer as a complete form.

Pressure - Force per unit area.

Pressure Gauge - An instrument, graduated in any units desired, for registering the pressure of gases, liquids, and solids.

Pretreatment - Any process used to reduce pollution before the wastewater is introduced into a sanitary sewer system for further treatment.

Programmable Logic Controller (PLC) – A Programmable Logic Controller, or PLC, is a special computer device used for industrial control systems. The basic units have a CPU (a computer processor) that is dedicated to run one program that monitors a series of different inputs and logically manipulates the outputs for the desired control.

Property Service Connection - That portion of a water system or a sanitary sewer system located within an easement or right of way which transports sewage from private property to the main sewer.

Proposed - That which is to have immediate consideration for construction.

Pump - A device which moves, compresses, or alters the pressure of a fluid being conveyed through a natural or artificial channel.

(R)

Raw Water - Water that is direct from the source, ground or surface water, that is untreated or domestic.

Residual Chlorine - The low level amount of chlorine remaining in the water after a certain period or contact time after its initial application. It constitutes an important safeguard against the risk of subsequent microbial contamination after treatment.

Riser - A concrete device used for the vertical extension of a manhole, typically for bringing to grade.

(S)

Sanitary Sewer - A pipe or network of pipes that transports only municipal, residential, commercial, or industrial wastewater (sewage) and not rain or storm waters from streets.

Sanitary Sewer Overflow (SSO) – The release of raw sewage from a sewer collection system. Possible causes of SSOs are blockages, line breaks, sewer defects that allow storm water and groundwater to overload the system, power failures, improper sewer design, and vandalism.

Service Area - The geographic land area served by a distribution or collection system of a water and/or sewer agency.

Service Line - The pipeline extending from sanitary sewer and water mains to the buildings served or consumer(s) system.

Sewage (Sanitary) – Residential, Commercial and Industrial refuse liquids or waste matter usually carried off by sanitary sewers. Groundwater, surface water and storm water may be present.

Sewer - A pipe or conduit that carries wastewater or drainage water.

Sewer (Branch) - A sewer which receives sewage from lateral sewer lines and discharges into a larger sewer line.

Sewer (Main) - The principal sewer to which a branch (collector) discharges, and is transported to a Trunk Sewer.

Sewer (Sanitary) - A sewer which primarily carries sewage, and to which, storm waters, surface waters, and ground waters are not intentionally admitted.

Sewer (Trunk) - A sewer which receives any number of branch lines, and which serves a large area. Typically characterized by a mid-sized piping system.

Slope - The inclination of the invert of a conduit expressed in a decimal or as feet per stated length measured horizontally in feet. Typically, identified as the difference in elevation of the two ends of the pipe divided by the length of the line section in question.

Sounding (Refusal) – Also called “Core Drilling” a method used to ascertain the depth of bedrock.

Spring line (pipe) - A pipe's spring line is the horizontal line located at the pipe's widest part. In circular pipes this level exactly divides the pipe into two equal halves. In elliptical, vertically elongated, arched and underpass pipe, the spring line lies at a different level. The crown is the highest, upper interior point of the pipe.

Sub-grade - The prepared earth surface on which a pavement or structure is built; the bottom of a trench or other excavation that is below the predetermined elevation of the bottom of the final excavation or structure; the intervening space between backfill with some special material such as sand, crushed stone, compacted soil, or impervious lining. The term is also applied to the elevation of such bottom.

Surcharge - A condition where a sewer cannot adequately discharge the total amount of flow when it is just filled or flowing at the planned depth or head. The amount of surcharge is measured by the volume or rate of excess flow or by the excess height of the hydraulic grade line. Surcharge conditions are typically noticed/discovered at manholes.

(T)

Transition - A short section of a conduit used as a conversion section to unite two conduits having different hydraulic elements. May also be used to identify a coupling used to join piping of different size and materials (i.e. VCP to PVC).

(V)

Velocity (Self-Cleaning) - The minimum velocity of flow at which the solid particles present in the sewage will be held in suspension and also at which the scour of the deposited particles will take place so that the sewer will be kept clean.

(W)

Wastewater - Used water. It includes substances such as human waste, food scraps, oils, soaps and chemicals. In homes, this includes water from sinks, showers, bathtubs, toilets, washing machines and dishwashers. In industry it can represent all the above plus manufacturing byproducts introduced into the sewer stream.

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