

### Design Criteria Checklist for Water Distribution System

#### Agreed Order Eligibility

Under WSB's Agreed Order with DOW, WSB can self-approve projects meeting the following requirements. If a project does not meet these criteria, the hydraulics and plans must initially be reviewed by WSB, but ultimately must be reviewed by DOW. This list is not comprehensive, but is sufficient for guidance on the large majority of projects.

- Projects with an overall length of proposed water main less than 10,000 contiguous feet. Two or more adjoining phases or sections of a project shall be considered one project.
- Projects consisting of water pipes greater than or equal to 3 inches or less than or equal to 12 inches in diameter. Circulating 2 inch water main projects of less than 500 feet shall qualify if future extension from the line will not occur. Projects consisting of water pipes greater than 12 inches shall qualify if the project only includes the relocation and/or rehab of the water main.
- \* WSB *cannot* self-approve projects with an overall length of proposed water main less than 10,000 contiguous feet that include new construction or installation of treatment plants, storage tanks, or chemical or pressure booster pumping stations.
- \* If project must be submitted to DOW, all review comments from DOW shall be shared with WSB.

#### Hydraulic Analysis & Design Narrative

- An excel sheet may be utilized to model a project as an unlooped connection. Otherwise, a waterline modeling software must be used such as EPANET or KY Pipe. Regardless, a brief design narrative shall accompany the hydraulic analysis summarizing the results of the scenarios below as well as population served, domestic demands, fire flow requirements, corresponding pressures, hydraulic grade lines, and pumping requirements. A node shall be placed at each hydrant, intersection of mains, and the highest point in the waterline.
- Boundary condition cannot be static. Use a rated pressure supply from static pressure, residual pressure, and residual flow at nearest hydrant provided by WSB.
- All of the following scenarios shall be provided with flow rates/velocities through the pipes and corresponding node residual pressures in PSI and absolute HGL.
- Scenario 1: Average demand output. Average demand, if not provided by MEP, can be estimated as (total number of units)\*(0.2 gal/min/unit). This scenario shall demonstrate that the proposed water main does not exceed 150 PSI at every node.
  - Scenario 2: Peak demand. Peak demand shall be evaluated using a diurnal curve or appropriate peaking factor. This scenario shall demonstrate that the proposed water main maintains 30 PSI at every node.
  - Scenario 3: Flushing scenario. The hydraulic analysis shall demonstrate that the proposed water main can be flushed at a minimum of 2.5 feet per second while keeping system pressure above 20 PSI within the pressure zone of the project.
  - Scenario 4: Ultimate Capacity. Show a continued increase in demand on the system until 20 PSI is achieved at a junction node. The ultimate capacity flow of the system shall be adequately larger than the flows from Scenario 3.
- All water mains, including those not designed to provide fire protection, shall be sized after a hydraulic analysis based on flow demand and pressure requirements. All water mains and feed lines for a fire hydrant shall be a minimum of 6" in diameter.
- Larger sized mains will be required if necessary to accommodate required fire flow while maintaining residual pressure.
- Hydrant spacing and flushing analysis shall be designed in accordance with the requirements listed below in the "Fire Protection" section of this checklist.
- Identify future phases of development. Verify initial design is adequate to serve future growth.
- Hydraulic analysis and design narratives shall be sealed by a KY-licensed professional engineer.



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Design Plans - General Information	
	Provide electronic file in AutoCAD .DWG in KY State Plane South US Survey Feet (1602) Projection.
	WSB's standard water note block shall be attached to any water or joint utility plan.
	WSB's most recent standard details shall be attached to the plan set.
	Include a vicinity map. Include a key map for linear or large projects.
	Proposed water features shall be bold or blue and water main shall include stationing.
	Show location of existing and proposed utilities (water, sewer, storm, gas, power, communication, etc.).
	Show faint proposed contours on utility plans.
	Water mains shall be proposed at least 5' horizontally from any existing or proposed utilities. Variances to this require DOW approval.
	Profile of proposed water main(s), including: all existing and proposed utility and storm crossing(s).
	Verify any proposed grading (i.e. site entrances, ditches, basins, etc.) maintains 30" of cover over existing/proposed waterlines and does not affect existing infrastructure (i.e meters, valves, etc.). If proposed grading affects existing infrastructure, coordinate with WSB for relocation.
	Where possible, water mains shall be installed along traversable paths. No water main shall be proposed in ditch lines and when passing through a steep slope, the main shall run perpendicular to the slope.
	When proposing water main extensions under paved areas, ductile iron pipe shall be utilized.
	Show utility crossings on water and sanitary sewer profile(s).
	Show service connections and meters for all lots.
	Show clear depiction of future phases of development with proper tie in location(s).
	Water mains shall be extended to the end of any proposed stub street.
	Dead end mains shall be equipped with a means to provide adequate flushing via a blow-off or fire hydrant. Install concrete reverse kicker ("deadman") at all dead end hydrants and blow offs unless development cannot continue from the dead end. When ending a water main in a cul-de-sac with a blow-off, the main shall extend to the center of the last lot served by a short-side service. If the line ends with a fire hydrant, the main shall end on the lot line and the lot shall be served by a long side service.
	No tree plantings shall be proposed within 5' of any water, sewer, or force mains or services.
	Profile shall include:
	<ul style="list-style-type: none"> <li>• Major and minor gridlines that allow for at least half a foot vertical accuracy.</li> <li>• Existing and proposed ground surfaces.</li> <li>• Alignment stationing at main intersections.</li> <li>• Locations of air release valves, if applicable.</li> </ul>
	<ul style="list-style-type: none"> <li>• Waterlines less than 12" in diameter require a minimum of 30" of cover. Waterlines 12" in diameter or greater require a minimum of 48" of cover.</li> </ul>
	<ul style="list-style-type: none"> <li>• Existing and proposed crossings with water, sewer, storm, or force mains with 2' of vertical separation or less shall include a dimension stating the vertical separation to the hundredth of a foot on a profile. If 18" cannot be achieved due to site constraints, casing can be utilized down to a minimum separation of 6". Where possible, water mains shall be installed above other utilities at crossings.</li> </ul>
	For projects requiring work in state or county rights-of-way, provide ROW Permit.
	Plans shall be sealed by a KY-licensed professional engineer.



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Material & Construction Requirements	
	Main Line
	<ul style="list-style-type: none"> <li>Hydrant leads and feed lines shall be a minimum of 6" in diameter. Auxiliary valves shall be installed on all hydrants.</li> </ul>
	<ul style="list-style-type: none"> <li>Pipe material to be DR18 C900 or ductile iron pipe (DIP). All water contact materials shall meet ASTM, AWWA, and ANSI/NSF standards.</li> </ul>
	<ul style="list-style-type: none"> <li>No cross fittings will be accepted by WSB. All four-way intersections at mains shall include two offset tees with valving on each main.</li> </ul>
	<ul style="list-style-type: none"> <li>Two 45° fittings shall be used in lieu of a 90° fitting where possible.</li> </ul>
	<ul style="list-style-type: none"> <li>All proposed bores under existing roadways shall be cased in steel pipe with a diameter as specified in WSB's standard casing detail.</li> </ul>
	<ul style="list-style-type: none"> <li>All casings shall extend through ROW unless otherwise approved by WSB. Carrier pipe in casings at or above 50 feet shall be restrained joint ductile iron pipe (DIP).</li> </ul>
	<ul style="list-style-type: none"> <li>When proposing water main through a creek, construct main and leak detection by WSB Standard Details.</li> </ul>
	<ul style="list-style-type: none"> <li>All water main within 200' of an underground storage tank or area of known organic contamination must be DIP and utilize non-permeable gaskets. If installing an underground storage tank (i.e. for a gas station), all existing non metallic water mains must be replaced with DIP and utilize non-permeable gaskets.</li> </ul>
	<ul style="list-style-type: none"> <li>On system transmission lines, air release valves or hydrants shall be installed at high points in water mains, where air can accumulate.</li> </ul>
	Line Valves
	<ul style="list-style-type: none"> <li>In-line valves shall maintain a spacing of no more than 500 ft in commercial and industrial uses, and no more than 800 ft in single family residential uses - or as directed by WSB. In-line valve spacing shall be maintained even when the main will run under paved areas.</li> </ul>
	<ul style="list-style-type: none"> <li>3 gate valves shall be installed at every intersection between mains.</li> </ul>
	Service Lines & Meters
	<ul style="list-style-type: none"> <li>For single-family residential, each lot shall be served by a service line and meter. Long-side service meters shall be double set at property corners of two adjacent lots and checked to ensure no conflicts with other utilities.</li> </ul>
	<ul style="list-style-type: none"> <li>For multi-family developments, note the requested metering (meter per unit, meter per building, etc.).</li> </ul>
	<ul style="list-style-type: none"> <li>Meter size shall be determined by WSB Engineering Department. Developer's Engineer shall provide anticipated demands for use in sizing meters.</li> </ul>
Fire Protection	
	Provide proposed fire flow requirements for hydrant and fire protection systems on design plans and hydraulic analysis. <ul style="list-style-type: none"> <li>NOTE: Proposed system improvements as needed to meet fire flow conditions shall be subject to WSB's review and acceptance.</li> </ul>
	Fire Hydrant Spacing & Location
	<ul style="list-style-type: none"> <li>Verify sufficient hydrant spacing per proposed zoning and local regulations.</li> </ul>
	<ul style="list-style-type: none"> <li>Minimum fire flow rate at hydrant shall be 600-gpm for residential and 1000-gpm for commercial and industrial. Flows shall be adequate based on governing zoning requirements (Ordinance 23-42WC in Warren County).</li> </ul>
Easements & Property	
	10-ft Utility Easement (5' ESOL) is required for all public water mains.
	It is the responsibility of the developer to obtain all needed easements.
	Property for Water Booster Station shall be deeded to WSB. Depending on location, WSB may require a dedicated 20-ft wide access easement to booster station.
	Utility Easements or subdivision plats must be recorded before the system will be accepted by WSB.