

### 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 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.

\* 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 unlopped 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.

For developments with phase lines provide hydraulic calculations for each phase demonstrating that minimum fire flow per governing county is being met.

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 (ensure correct water district notes are attached i.e. WCWD,SCWD,BCWS).
	WSB's most recent standard details shall be attached to the plan set (ensure correct water district details are attached i.e. WCWD,SCWD,BCWS).
	Include a vicinity map. Include a key map for linear or large projects.
	Provide phasing plan for proposed development, if applicable.
	Proposed water features shall be bold or blue.
	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.
	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.
	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.
	All service lines ending in valves for large meters shall have a tapped cap, 2" threaded nipple and 2" ball valve for flushing and be restrained to the tee in lieu of the installation of a reverse concrete anchor ("deadman").
	When relocating waterlines, include cut and plugs and a means of flushing the new waterline via service saddle with corporation stop when no fire hydrants or blow offs are available.
	When relocating waterlines show existing appurtenances (meters, hydrants, etc.) and method of reconnecting existing appurtenances.
	No tree plantings shall be proposed within 5' of any water, sewer, or force mains or services.
	Profile of proposed water main(s), including: all existing and proposed utility and storm crossing(s).
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> </ul>
	<ul style="list-style-type: none"> <li>Existing and proposed ground surfaces.</li> </ul>
	<ul style="list-style-type: none"> <li>Alignment stationing at main intersections.</li> </ul>
	<ul style="list-style-type: none"> <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 the profile. If 18" cannot be achieved due to site constraints, casing can be utilized down to a minimum separation of 6".</li> </ul>
	<ul style="list-style-type: none"> <li>Water lines crossing sanitary or storm sewers shall be proposed such that the water line is located above the other utilities while maintaining minimum cover and minimum vertical separation. If minimum vertical separation cannot be maintained, the water line may be installed in steel casing with less than minimum vertical separation if approved by WSB.</li> </ul>
	Show stationing on water main in plan view and ensure it matches profile stationing.
	Plans shall be sealed by a KY-licensed professional engineer.



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**Material & Construction Requirements**

<b>Material &amp; Construction Requirements</b>	
<b>Main Line</b>	
	Proposed waterlines larger than 12" shall be ductile iron pipe (DIP)
	Pipe material shall be DR18 C900 PVC or class 350 ductile iron pipe (DIP) . All water contact materials shall meet ASTM, AWWA, and ANSI/NSF standards. For pipe diameter greater than 12" pressure class shall be determined by WSB.
	When proposing water main extensions under paved areas, ductile iron pipe shall be utilized.
	No cross fittings will be accepted by WSB. All four-way intersections at mains shall include two offset tees with valving on each main.
	Two 45° fittings shall be used in lieu of a 90° fitting where possible.
	Hydrant leads and feed lines shall be ductile iron pipe (DIP) and a minimum of 6" in diameter. Auxiliary valves shall be installed on all
	All proposed bores under existing roadways shall be cased in steel pipe with a diameter as specified in WSB's standard casing detail.
	For crossings in roadways classified as collector or arterial, steel casing is required.
	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).
	When proposing water main through a creek, construct main and leak detection by WSB Standard Details.
	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 ductile iron pipe (DIP) and utilize non-permeable "nitrile" gaskets.
	Show 200' radius from edge of fuel storage tanks to show where DIP and non-permeable "nitrile" gaskets need to be utilized.
	On system transmission lines, air release valves or hydrants shall be installed at high points in water mains, where air can accumulate.
<b>Line Valves</b>	
	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.
	3 gate valves shall be installed at every intersection between mains.
<b>Service Lines &amp; Meters</b>	
	Show service connections and meters for all lots.
	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.
	When no curb and gutter is proposed on roadways, ensure long side services have enough cover under ditches and ensure no hydrants are proposed in ditches.
	For multi-family developments, note the requested metering (meter per unit, meter per building, etc.).
	Meter size shall be determined by WSB Engineering Department. Developer's Engineer shall provide anticipated demands for use in sizing meters.
<b>Fire Hydrant Spacing &amp; Location</b>	
	Hydrants shall be placed on property lines where applicable.
	Verify sufficient hydrant spacing per proposed zoning and local regulations.
	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).



COUNTY WATER DISTRICTS

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<b>Easements &amp; Property</b>	
	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.
	For projects requiring work in state or county rights-of-way, provide ROW Permit.
	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.