

**CITY OF BONNER SPRINGS, KANSAS**

**DIVISION V  
DESIGN CRITERIA**

**SECTION 5900 WATERLINES AND APPURTENANCES**

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## CITY OF BONNER SPRINGS, KANSAS

### SECTION 5900 WATERLINES AND APPURTENANCES

#### SECTION 5901 GENERAL

**5901.1 Introduction:** These criteria provide procedures for designing waterlines.

**5901.2 Reviewing Authority Compliance:**

- A. Master Plans:** The proposed design shall be in accordance with master plans for the indicated area if formulated. A predesign conference with the City is required.
- B. Other Requirements:** It shall be the design engineer's responsibility to comply with all standards and ordinances applicable to the project. This includes, but is not limited to, the most recent published edition of the following:
  - 1. Applicable ASTM Standards
  - 2. Applicable AWWA Standards
  - 3. "Policies, General Considerations and Design Requirements for Public Water Supply Systems in Kansas" by KDHE
  - 4. Applicable ANSI Standards
  - 5. "Standard Specifications for State Road and Bridge Construction" of the Kansas Department of Transportation.

All designs shall meet the minimum required by these standards.

#### SECTION 5902 SUBMITTALS

**5902.1 General:** Proper preparations with timely and complete distribution are essential elements of the submittal process.

**5902.2 Predesign Conference:** A predesign conference with the reviewing authority, the design engineer, the developer where applicable, and representatives of the State regulatory agencies where appropriate, shall be conducted prior to any extensive design effort. A report or plan outlining the proposed project's scope and objectives shall be prepared and shall be made available prior to the conference. A primary consideration of the proposed project development is conformance to current water master plans and other adopted policies of the City.

The design engineer shall demonstrate an understanding of local water ordinances, waterline standard specifications and documents, water rights-of-way, easement policies (both public and private), and State standards for water supply and distribution systems.

A preliminary schedule indicating proposed design submittal dates, construction drawings and specifications review, construction bidding and award schedule, construction period, and conforming to construction records submittal shall be presented.

Included in the predesign conference will be discussion of water main material selection. The City must concur with design engineer's material selection before Preliminary Design Memorandum will be accepted.

The design engineer shall be responsible for preparing minutes of the predesign conference and furnishing a copy to all conference attendants within one week following the conference. The purpose is to provide mutual understanding and documentation for reference to the conference's principal matters covered. Proposed dates for furnishing the Preliminary Design Memorandum submittal and Final Design submittal and distribution shall be included in the minutes.

### **5902.3 Preliminary Design Memorandum:**

- A. Purpose:** The design engineer shall prepare a preliminary design memorandum and distribute as agreed at the predesign conference for reviews and approvals prior to beginning final design work. The preliminary design memorandum shall be a condensed version of the final design submittal, but must contain sufficient detail to display adequate knowledge of the overall project requirements and scope.

The purpose of a preliminary design memorandum is to establish a common understanding, through review comments, among all principal representatives involved in the project as to requirements and objectives of the project. Decisions and agreements reached at the predesign conference, as included in the conference minutes, shall be reflected in the preliminary design memorandum.

The preliminary design memorandum shall outline the project from concept through detailed implementation. It shall briefly present the proposed water project's purpose and scope, and followed with a more detailed description of the project, including:

1. General location and information concerning the area to be served, including service area boundaries.
2. Project's relative location to existing water distribution systems and water facilities within and adjacent to the proposed service area.
3. Review of planning studies to determine land use, population projections and other factors affecting water demand requirements within the proposed service area.
4. Present and future hydraulic design flow estimates within the proposed service area with consideration of water facility expansion to serve the proposed area and future zoned areas per overall master water plan.

- B. Facility Requirements:** Following a project area limits and water service needs assessment, the design engineer shall evaluate water service facilities requirements to meet the present and future needs, including:

1. Review available information concerning service area topography, geology, subsurface soil types and groundwater table elevation range and assess design effects, and project construction and operation.
2. Preliminary routing of proposed waterline distribution system.
3. Preliminary site selections for water facilities such as booster pump stations and water towers, where applicable.
4. Preliminary sizing based on capacity requirements and additional capacity requirements per overall master planning shall be considered.
5. Proposed construction material alternates for waterline pipes and appurtenances.
6. Determine temporary construction and permanent easement requirements and other site access needs.
7. Prepare location drawings showing proposed waterline distribution system and other pertinent water facilities on current topographic map suitable for exhibit display.
8. Prepare preliminary cost estimate, including construction, engineering, fiscal, legal and administrative, with separate allowances for easements and rights-of-ways, using the best information available without appraisals. A contingency should also be included.

**C. Distribution:** The design engineer shall make distribution of the preliminary design memorandum as established at the pre-design conference. Reasonable time shall be allowed for comments on the preliminary design memorandum reviewing parties with corresponding dates set for review comment receipt and final design submittal.

**5902.4 Final Design Submittal:** The final design submittal shall consist of construction drawings or plans, specifications and contract documents, adequate in detail and clarity for project bidding and construction. Engineer shall place the waterline test pressure on the plan set. See sections 5000, 5001, and 5002.

## **SECTION 5903 WATERLINE PIPE SIZING**

**5903.1 Allowable Sizes:** Proposed extensions of the water distribution system shall adhere to the City's water master planning. In general, the City prefers constructing twelve-inch waterlines along all section lines and eight-inch waterlines along all half-section lines. Deviations from this general policy may be warranted due to provisions of the water master planning, adequacy or inadequacy of service to prospective customers, fire protection needs, existing or anticipated needs, or as determined by the City Engineer. Line sizes must be approved by the City Engineer.

No public waterline shall be constructed less than six inches in diameter except at the end of cul-de-sacs where four-inch diameter piping will be permitted only when a fire hydrant is located on a six-inch line which reduces to the four-inch line.

Standard pipe sizes utilized by the City are as follows: 4,6,8,10,12,16,20,24,30, and 36-inch.

**5903.2 Fire Protection:** All public improvement plans for waterline projects shall be reviewed for fire protection sufficiency as determined by the Fire Chief for the City. The Fire Chief shall determine the amount of water that is required for fire protection based on guidelines for the proposed structure types being built within the development. The design engineer shall obtain the flow requirement and determine if the existing and proposed waterlines can provide this flow, based on existing operating conditions. Calculations verifying that the required flows can be met shall accompany the submitted drawings.

## **SECTION 5904 WATERLINE APPURTENANCES**

**5904.1 Fire Hydrants:** Fire hydrants shall be placed at or near street intersections and at intermediate points when block lengths become long. Under no circumstances shall fire hydrant spacing exceed 500 feet in residential areas and 300 feet in commercial areas. The Fire Chief shall determine fire hydrant spacing in industrial areas. Preference is to install hydrants 36' from back of curb, but can be installed a minimum of 24' and a maximum of 8' from back of curb. It is preferred that hydrants be placed at high points to limit the installation of air-release and vacuum-relief valves.

**5904.2 Valves:** Isolation valves shall be placed in all straight pipe runs at intervals not to exceed 800 feet. Where two lines intersect, an isolation valve should be placed on each pipe run on each side of the intersection. Isolation valves should be so placed that any pipe one block long can be cut out of the general circulation without interrupting service in the remaining system. Isolation valves shall also be placed in conjunction with tapping sleeves (refer to Section 5904.3).

Combination air-release and vacuum-relief valves at a minimum should be located at key high points in the waterline's profile where air can accumulate. Pressure reducing valves should be located in zones of excessive high-pressure. The design engineer should coordinate with the valve manufacturer for sizing and placement locations for air valves and pressure reducing valves. Valves other than buried operated isolation valves shall be installed in a precast concrete vault as indicated in the Section 2901.5 Specials.

**5904.3 Tapping Sleeves:** Connections to existing water mains shall be made in such a manner as to provide the least amount of interruption to water service. In the event that closing of valves to make a connection will affect a customer who cannot be without service, provisions shall be made on the plans for a temporary service. Where possible, connections to existing mains shall be made using tapping sleeves and valves as approved in the City's supplement of Section 2900 of the Kansas City Metropolitan Chapter of the American Public Works Association – Standard Specifications and Design Criteria.

**5904.4 Dead End Assemblies:** At the termination of all water mains or at locations specified by the City Engineer, a dead end assembly, in accordance with the City's supplement of Section 2900 of the Kansas City Metropolitan Chapter of the American Public Works Association – Standard Specifications and Design Criteria, shall be provided to allow for future water main extensions. Fire hydrants on 6 inch lines and larger or flushing assemblies for lines less than 6 inches shall be installed at locations where required to provide for thorough flushing of all waterlines in the project area.

**5904.5 Thrust Blocks:** Blocking to prevent movement of lines due to hydrostatic pressure at bends, tees, caps, valves, and hydrants shall be Portland Cement Concrete, placed between

undisturbed earth and the fittings. Sized of thrust blocking shall be in accordance with the Standard Drawings. The blocking shall be anchored in such a manner that pipe and fitting joints will be accessible for repairs.

All bends of 11¼ degrees or greater, and all tees and plugs shall be thrust protected to prevent movement of the lines. Where unstable soil or backfill conditions exist, it may be necessary to install thrust blocking at deflected sections as well as at fittings. If required by the Engineer, deflection blocking shall be installed at a point approximately one-fifth of the pipe length on each coupling side. Couplings shall not be blocked.

Where conditions prevent concrete thrust block use, tied joints or mechanically restrained joints, as approved by the City Engineer, shall be used. For waterlines 16 inches and greater, where the volume of concrete required for thrust blocking becomes too large, mechanically restrained joints may be required. The design engineer shall indicate mechanical restraining length required from both direction from the fitting. Restraining length shall be indicated on the plans by individual call-outs or by a schedule in table format.

**5904.6 Service Meters:** Service meters and appurtenances should be located in accordance with 2900. Appurtenances, where required, may include the meter box, meter box cover, meter yoke, corporation cock, curb stop, and incidental fittings. All items shall be in accordance with the materials specified in 2900.

At all locations where fire lines are installed, fire lines must be separate and isolatable from domestic service. Under no circumstances shall it be necessary to turn off domestic service to maintain a fire line or the reverse. The domestic water system shall be protected from contamination from the fire system by use of a method approved by the City Engineer. See section 2904.4.B.

## **SECTION 5905 WATERLINE ALIGNMENT AND LOCATION**

### **5905.1 Laying of Pipe on Curves and Around Obstructions**

The Engineer shall indicate maximum pipe lengths that can be used if standard pipe lengths will not allow for the curvature as shown on the drawings. Maximum deflections at pipe joints and laying radius for various pipe lengths are as found in ANSI/AWWA C600 for ductile iron and pipe manufacturer's installation guide for other types of pipe used.

The design engineer shall not design fittings into the waterline when it is possible to deflect pipe at multiple pipe joints to install the waterline around a curve or to avoid obstructions in horizontal and vertical alignments.

### **5905.2 Location**

- A. General:** Proposed water mains shall be so located within street right-of-way to provide the least interference with the location of other utility lines. Street grades and elevations of the proposed main shall be taken into consideration so that, once constructed, they will not require regrading or relocating.

All waterlines shall be designed for a minimum depth of cover over the top of the pipe as indicated below:

1. 48" of cover for pipes and up to 16" pipes
2. 60" of cover for pipes larger than 16"

**B. Easements:** Where public waterlines are located outside of existing right-of-ways, a minimum permanent easement of twenty (20) feet (ten (10) feet from the centerline in each direction), and the necessary temporary construction easement shall be provided. Minimum easement width required for pipe sizes 24 inches and larger will be determined on a case-by-case basis by the City. In addition, provisions shall be made for access to maintain the entire water service system. The equipment types and sizes used for waterline maintenance shall be considered for access easements.

**C. Streams:**

1. Alignment: Waterlines crossing streams should be designed to cross the stream as nearly perpendicular to the stream flow as possible. Waterlines shall be designed to minimize the number of stream crossings. Waterlines adjacent to streams shall be located outside of the high bank line plus a minimum of two (2) times the depth of bury, and sufficiently removed to provide for future possible stream widening and to prevent siltation during construction. Valves will be placed outside the stream banks, one on each side of the stream.
2. Cover Depth: The top of all waterlines crossing streams shall be at a sufficient depth below the natural streambed bottom to protect the waterline. Non-navigable streams require a 5 foot minimum depth from bottom of streambed to top of pipe. See standard detail 29-16. Navigable streams require a 7 foot minimum depth from bottom of streambed to top of pipe.

All waterlines crossing drainage ways shall be encased in concrete if open cut. In no case shall the encasement top be above the drainage bed. Alternate method using a casing pipe with casing spacers and end seals may be used at no additional cost. Casing pipe must extend beyond the stream banks. Horizontal directional drilling may also be used at no additional cost. Drilled pipe must extend beyond the stream banks.

3. Erosion Protection: All stream crossings shall have adequate erosion protection material type, thickness, and dimensions detailed on the Construction Plans.
4. Materials: Concrete encasement if required shall be a minimum of six (6) inches thick.

**D. Aerial Crossings:** Support shall be provided for all pipe joints used for aerial crossings. The support shall be designed to prevent frost heave, overturning, and settlement.

Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above-ground and below ground waterlines.

The aerial crossing shall be located as to not interfere with the stream flow, as required by the agency governing the stream.

Waterlines in aerial crossings shall be ductile iron pipe, mechanically restrained joint.

- E. Highway and Railroad Crossings:** All highway and railroad crossings shall be made by boring or tunneling. The waterline shall be ductile iron pipe. The work shall be in conformity with all requirements and regulations and be under the control of the authority owning or having jurisdiction over and control of the right-of-way.
- F. Street Crossings:** Open cutting of streets shall be allowed only when permitted by the City Engineer. At locations where open cutting is not permitted, the crossing shall be by boring or tunneling. Crossings by boring or tunneling shall require a casing pipe unless otherwise approved by the City Engineer. The diameter and length of the casing pipe to be used shall be as determined by the City Engineer.

### **5905.3 Utility Protection**

- A. Sewers:** Waterlines shall be located at least 10 feet horizontally from any existing or proposed drain, storm sewer, or sanitary sewer.

Water mains may be located closer than 10 feet to a sewer line when:

1. Local conditions prevent a 10-foot lateral separation.
2. The waterline invert is at least 2 feet above the sewer crown; and
3. The waterline is in a separate trench on an undisturbed earth shelf located to one side of the sewer
4. Waterlines laying closer than 10 feet or with less than 2 feet vertical clearance to sanitary or storm sewers require consultation with the Kansas Department of Health and Environment.

A waterline shall be separated from a sewer (storm sewer, sanitary sewer, or sewer service connection) so that its invert is a minimum of 2 feet above the drain or sewer crown. The vertical separation shall be maintained for that portion of the water main located within 10 feet horizontally of any sewer or drain crossed. A length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the sewer or drain. The same rules shall apply for waterlines crossing beneath sewers except that the sewer pipe material shall be replaced with one standard 18-20 foot section of ductile iron pipe centered over the waterline.

Under no circumstances shall a water main cross under a sanitary sewer force main. If necessary, the force main shall be removed and reinstalled at a lower elevation to maintain 24 inches clear from the bottom of the water main.

- B. Gas, Electric, Telephone:** A minimum horizontal distance of five (5) feet should be maintained between parallel utility lines other than sewers.

**5905.4 Steep Grades:** Waterlines on 20 percent slope or greater shall be anchored securely with concrete anchors or approved equal. Spacing shall be as follows: not over 36 feet center to center for grades 20-35 percent; not over 24 feet center to center for grades 35-50 percent; and not over 16 feet center to center for grades 50 percent or greater.

**5905.5 New Development Building Services:** Where waterlines are located in the street or alley right-of-way, a connection shall be provided for each building site in new development. The

connection shall be extended with a service line to the back of curb and shall terminate with an appropriate valve assembly.

END OF SECTION