

**City of Lawrence
Design Criteria
Section 5900 – Waterlines**



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SECTION 5901 SCOPE

This document establishes the minimum standards of design for water main extensions and relocations within the jurisdiction of the City of Lawrence, Kansas. The following requirements are minimum requirements.

SECTION 5902 GENERAL

- 5902.1 Pipe Size: Minimum pipe size shall generally be eight (8) inches in diameter. Pipe shall be PVC or ductile iron for water mains. Pipe shall be type K soft copper or polyethylene tubing (PE pipe) for all water mains or service lines two (2) inches or less in diameter.
- 5902.2 Phasing: Project phasing is permitted within a single set of improvement plans. Phase lines shall be delineated on the plans with consideration given to ensure that the phasing plan will permit all requirements of these design criteria to be met. Plan quantities shall be itemized for each phase of the project
- 5902.3 System Sources: Water mains shall generally be designed with a minimum of two feed sources. Dead end lines will not be allowed without the approval of the Department of Utilities.
- 5902.4 Connection to Existing Mains: Connections to existing 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 noted in the City of Lawrence Construction and Material Specifications Section 2900 – Waterlines.
- When connections are made to an existing system under normal conditions, the exposed pipe and fittings shall be disinfected per section 2903.9.2.d of the City of Lawrence Construction and Material Specifications Section 2900 – Waterlines.
- 5902.5 Customer Service: Water mains shall generally be designed such that not more than twenty five (25) customers will be without service when sections of the water main are isolated for service or emergency repairs.
- 5902.6 Easements: Where required, easements shall be provided for the installation and maintenance of the public water line. Permanent easements shall be a minimum of ten (10) feet in width when adjacent to right-of-way or access easements. Permanent easements shall be a minimum of fifteen (15) feet in width if not adjacent to right-of-way or access easements. Temporary easements shall be of sufficient width to allow the installation of the waterline as shown on the plans. Consideration should be given to size of equipment, materials storage, and trench spoils stockpiling when establishing temporary construction easement widths.

5902.7 Cross Connection: There shall be no physical connection between the public water main and any pipe, pump, hydrant, tank, or non-potable water supply whereby unsafe water or other contaminating material may be discharged or drawn into the system.

SECTION 5903 SUBMITTAL REQUIREMENTS

5903.1 Combined Submittal: Submittal requirements outlined in sections 5903.2 through 5903.5 shall apply in addition to City of Lawrence Public Works Submittal Requirements

5903.2 Initial Plan Submittal: The initial plan submittal shall include all of the following documentation: one (1) set of plans, the draft final plat or parcel legal description if the property will not be platted, and one (1) copy of the project specifications. In addition, all plan submittal documentation shall be provided on a CD-ROM, DVD, or equivalent media in portable document format (pdf).

The submittal will not be reviewed if any of the items listed above are incomplete or omitted from the submittal.

1. Plan Sets: One (1) set of plans shall be submitted with the initial submittal. All plan sheets in the initial submittal shall be signed, sealed and dated by a Professional Engineer (P.E.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements. Plans will not be reviewed if the seal, signature, or date have been omitted. All references to the Engineer in this document shall be to the Professional Engineer (P.E.) preparing the plans.
2. Draft Final Plat or Parcel Legal Description: The draft final plat shall be provided with the initial plan submittal. The property legal description shall be included on the layout sheet if the property will not be platted. The legal description shall be signed, sealed, and dated by a Land Surveyor (L.S.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements. It is recommended that draft written easements be submitted with the initial plan submittal.
3. Project Specifications: One (1) copy of the draft project specifications shall be provided with the initial submittal. The Engineer shall identify any special conditions that warrant deviation from the City of Lawrence Construction and Material Specifications Section 2900 – Waterlines, current edition.
4. Comments: The initial submittal and all subsequent submittals shall be reviewed by the City of Lawrence. The City of Lawrence shall provide written comments as well as plan “mark-ups” to the Engineer. The Engineer is encouraged to schedule a meeting with staff to review comments following the initial submittal. The Engineer must address all comments by revisions to the initial submittals or by written response as applicable. Plans will not be released for construction until all comments have been addressed by the Engineer.

5903.3 Intermediate Submittals: Intermediate submittals shall include all of the following documentation: one (1) set of plans, one (1) copy of the draft final plat or parcel legal description if the property will not be platted, one (1) draft copy of any written easements (if required), one (1) copy of the project specifications (if required), one (1) copy of a written response to comments, and original “mark-ups” as provided to the Engineer with the review of the previous submittal. In addition, all plan submittal documentation shall be provided on a CD-ROM, DVD, or equivalent media in portable document format (pdf).

The submittal will not be reviewed if any of the items listed above are incomplete or omitted from the submittal.

1. Plan Sets: One (1) set of plans shall be submitted with intermediate plan submittals. All plan sheets in the intermediate submittal shall be signed, sealed and dated by a Professional Engineer (P.E.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements. Plans will not be reviewed if the seal, signature, or date have been omitted. All references to the Engineer in this document shall be to the Professional Engineer (P.E.) preparing the plans.
2. Draft Final Plat or Parcel Legal Description: One (1) copy of the draft final plat shall be provided with intermediate plan submittals. The draft final plat shall fully address all comments from the previous submittal. The property legal description shall be included on the layout sheet if the property will not be platted. The legal description shall be signed, sealed, and dated by a Land Surveyor (L.S.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements.
3. Written Easements: One (1) draft copy of all easements required for the project shall be submitted with intermediate submittals. The written easements shall be signed, sealed, and dated by a Land Surveyor (L.S.) licensed in the State of Kansas in accordance with Kansas Board of Technical Professions requirements.
4. Project Specifications: One (1) copy of the project specifications shall be provided with the intermediate submittal. The Engineer shall fully address all comments from the previous submittal.
5. Written Response to Comments and “Mark-Ups”: The engineer shall prepare a written response to all comments received from the previous submittal. The Engineer shall return “mark-ups” received from the previous submittal with corrective actions taken noted on the “mark-up”.

5903.4 Final Submittal Requirements: Final plan submittal shall include three (3) sets of complete plans, one (1) copy of the recorded final plat and/or executed written easement(s), one (1) copy of the project specifications, and one (1) CD-ROM, DVD, or equivalent media containing all final plan submittal documentation in portable document format (pdf).

1. Plan sets shall be distributed as follows:
 - a. City of Lawrence 2 copies (1 set file copy, 1 set inspections department)
 - b. Engineer 1 copy

5903.5 Review Period: Review time for the initial and subsequent submittals shall be ten (10) business days.

SECTION 5904 PLAN CONTENT AND ORGANIZATION

5904.1 Cover Sheet: This section establishes the minimum standards relating to all items that must be included on the cover sheet for the project.

1. Sheet Size: Sheet size shall be 24"x36" unless otherwise specified by the Department of Utilities.
2. Project Title: The plat name and phase number, if applicable, shall be included in the project title. If the project will not be platted the physical address shall be used in the project title. All projects that are relocations only must include the word "relocation" in the project title.
3. Signature and Date Lines: Signature and date lines shall be provided for the following personnel:
 - a. City of Lawrence Department of Utilities
 - b. City of Lawrence Fire Marshall
 - c. Kansas registered professional engineer (P.E.) responsible for the project.
4. Engineer and Developer Information: The following information for both the engineering firm and registered Professional Engineer preparing the plans and the Developer responsible for the extension or relocation of the waterline:
 - a. Company Name
 - b. Address
 - c. Phone Number
 - d. Fax Number
 - e. Contact Person
 - f. Contact Email Address
5. General Location Map: A general location map shall be included on the cover sheet. The location map shall show the nearest north-south and east-west arterial streets surrounding the section, township, and range and those in the immediate vicinity of the project area must be shown and labeled. The scale of the vicinity map shall be, at a minimum, 1"=2000'. A north arrow and scale for the map must be noted. The project area shall be labeled and shaded. The section, township, and range where the project is located shall be noted on the general location map.

6. Utility Information: The following information shall be provided for all utilities providing service to the project area:
 - a. Utility Name
 - b. Address
 - c. Phone Number
 - d. Fax Number
 - e. Contact Person
 - f. Contact Email Address
7. Sheet Index: An index for all sheets included in the drawing set shall be provided on the cover sheet.

5904.2 General Plan Layout: This section governs all information to be shown on the General Layout Sheet for the plan set.

1. Sheet Size: Sheet size shall be 24"x36" unless otherwise specified by the Department of Utilities.
2. North Arrow and Scale: A north arrow and scale shall be provided for the General Plan Layout. The preferred drawing scales for the General Plan Layout are 1"=50', 1"=100', or 1"=200' for larger plats.
3. General Elements: The following shall be considered minimum information to be shown on the general layout plan:
 - a. Location of existing and proposed waterlines, appurtenances, and easements/rights-of-way.
 - b. Phase lines shall be shown and labeled as appropriate.
 - c. Location of all existing utilities with pertinent information listed as appropriate.
 - d. Streets and paved areas shall be identified and labeled as appropriate.
 - e. On site parcels and buildings shall be shown and labeled as appropriate.
 - f. Surrounding parcels shall be identified by plat name, phase, and lot/block number. If surrounding parcels are unplatted they shall be identified as "Unplatted".
 - g. All storm sewers, water courses, detention or retention basins and 100-year floodplain boundaries must be shown and labeled as applicable. For drainage ways the centerline and top of bank must be shown and labeled. For detention or retention basins the maximum and normal water surface elevations and elevation outlines must be clearly shown and labeled. For detention basins a "dry bottom basin" note must be included to indicate the basin will not retain

water after the storm event routing has been completed. The limits of the dam structure for any basin must be shown and labeled. Boundaries and elevation for the 100-year floodplain must be clearly delineated and labeled.

4. **Project Control Points:** A minimum of two (2) permanent benchmarks and a minimum of three horizontal control points shall be referenced for the project. All benchmarks and control points shall include a verbal description and the location of project benchmarks and control points shall be noted on the general layout sheet. Method used to obtain topographic must be described (i.e. Ground survey, LIDAR, etc.) All points shall be surveyed in State Plane Kansas (feet), NAD 83 for horizontal control and NAVD 88 for vertical control. If the Kansas State Plane Datum is modified the appropriate combined adjustment factor and grid to ground scale factor must be included. All benchmarks and control points must be verified by the Department before construction notice to proceed is issued.
5. **General Notes:** The general notes shall include, at a minimum, the following:
 - a. Plans are initially approved for a period of one (1) year, after which they automatically become void and must be updated and re-approved by the City before any construction will be permitted.
 - b. The City of Lawrence plan review is only for general conformance with City of Lawrence Design Criteria and City code. The City of Lawrence is not responsible for the accuracy or adequacy of the design. The City of Lawrence through the approval of this document assumes no responsibility other than stated above for the completeness and/or accuracy of this document.
 - c. The Contractor shall have one (1) signed copy of the plans (approved by the City of Lawrence) and one (1) copy of the Project Specifications on site at all times.
 - d. The City of Lawrence Technical Specifications, latest edition, and City of Lawrence Construction and Material Specifications Section 2900 – Waterlines, latest edition, shall govern construction of this project.
 - e. Contractor shall not be allowed to work Sundays. Holiday or Saturday work shall be as approved by the Department of Utilities.
 - f. Contractor shall call 1-800-DIG-SAFE prior to any project excavation.
 - g. The utility information shown herein is based on the best information available to the engineer; however, all utilities actually existing may not be shown. The Contractor shall verify all utility depths and locations prior to construction, and coordinate any necessary relocations. Utilities damaged through the negligence of the Contractor to obtain the location of same shall be repaired and replaced by the Contractor at no additional expense to the project.

- h. Only authorized employees of the City of Lawrence, Utility Department shall operate valves.
- i. The Contractor shall notify all landowners in writing at least one (1) week prior to any construction activities which would take place adjacent to their property. Individual detailed notices of access restrictions shall be hand delivered forty eight (48) hours prior to construction. Twenty four (24) hour notice shall be given to any water customer prior to interruption of service to make connections.
- j. Where existing utilities and service lines are to be encountered, the Owner thereof shall be notified by the Contractor at least 48 hours in advance of performing any work in the vicinity.
- k. Relocation of any water line, sewer line or service line thereof required for the construction of this project shall be the responsibility of the Contractor and shall be at his expense.
- l. The Contractor shall install the proposed waterlines without disruption of water service to customers until connections to the proposed waterlines are ready to be made. Once service to customers has been interrupted, the Contractor shall work continuously until service is restored.
- m. Utilities exposed during construction shall be adequately supported by the contractor to prevent the conduits/lines from sagging and putting stress on any joints.
- n. The Contractor shall maintain drainage during construction and is responsible for any dewatering necessary during construction.
- o. All signing, barricades, and drums utilized in traffic control shall be provided, erected, and maintained by the Contractor. Traffic control shall be in conformance with the Manual of Uniform Traffic Control Devices (MUTCD), latest edition.
- p. All water required for the construction of this project shall be purchased from the City of Lawrence Utilities Department through the use of a fire hydrant water meter. Meters can be obtained from the Utility Department for a nominal deposit, refundable upon the return of the meter.
- q. Construction staking is to be provided by the Contractor. Survey stakes, benchmarks, and property pins destroyed by the Contractor shall be replaced at Contractor's expense.
- r. All areas disturbed during construction shall be fertilized, seeded, and mulched by the Contractor in accordance with current City of Lawrence Technical Specifications, latest edition.

- s. All surface features disturbed by construction activities shall be restored by the Contractor to original condition.
 - t. When blasting is permitted by Lawrence-Douglas County Fire and Medical Services, the Contractor shall use the utmost care to protect life and property. The Contractor shall comply with all laws, ordinances, and the applicable safety code requirements and regulations relative to the handling, storage and use of explosives and protection of life and property, and he shall be responsible for all damage thereto caused by his or his subcontractor's operations.
 - u. The Contractor shall install and properly maintain a mechanical plug at all connection points with existing lines until such time that the new line is tested and approved.
- 6. Summary of Quantities: A summary of quantities for the project shall be provided and shall include all items of work for the project.
 - 7. Legend: A legend of standard drawing symbols, linetypes, etc. shall be included on the general layout plan.

5904.3 Plan and Profile: All waterlines are required to be shown in both plan and profile views. This section governs all information to be shown on the Plan and Profile sheets for the plan set. The horizontal alignment is examined for conflicts or access restrictions, and service availability to all lots and buildings. The vertical alignment is reviewed for depth, protection of the main at creeks and water courses, minimum and maximum cover, conflicts with other underground utilities, and other issues.

- 1. General Requirements:
 - a. Show and label the proposed and existing waterlines, appurtenances, and easements.
 - b. Show and label all structures such as retaining walls, trash enclosures, carports, separate garages, signs, subdivision monuments, etc..
 - c. Show and label all existing utilities.
 - d. Sheet size shall be 24"x36" unless otherwise specified by the Department of Utilities.
 - e. Label all concrete encasements as "reinforced concrete encasement".
 - f. Label the beginning and ending stationings of reinforced concrete encasements on the main in the profile view and on the plan view. The stationings of the reinforced concrete encasement may be rounded to the nearest foot.

2. Existing and Proposed Streets and Rights-of-Way:
 - a. Label the name for all existing and proposed streets. All paved areas must be shown and identified as necessary.
 - b. Show and label all street right-of-way in the vicinity of the waterline. Label the width of the right-of-way for streets and the radius of the right-of-way at cul-de-sacs.
 - c. Label all private drives as “private”. The “private” label must be included with the street name as applicable. Drives that are private and will not be named must be labeled as “private drive”.
3. Existing and Proposed Grade:
 - a. Show and label the existing and proposed ground profiles along the centerline of the waterline. Show existing profiles as a dashed line and proposed profiles as a solid line.
 - b. If the proposed grade equals the existing grade, label the grade as “Proposed Grade = Existing Grade”.
4. North Arrow and Scale:
 - a. Provide a north arrow and horizontal and vertical drawing scales. Preferred scales are 1” = 20’ horizontal and 1”=5’ vertical. The minimum allowable drawing scale is 1” = 50’ horizontal and 1”=10’ vertical.
5. Reference to Project Control:
 - a. Show and label project and temporary benchmarks in the plan view as applicable.
 - b. Show and label all horizontal control points in the plan view as applicable.
6. Lot or Property Lines:
 - a. Label all lot numbers, tracts, and block numbers, if applicable. Property lines and lot lines shall be shown and a draft copy of the final plat provided for each labeled reference.
 - b. Unplatted parcels shall be labeled as “unplatted”.
 - c. For projects other than single family residential, label all buildings with a unique designation or number and where applicable label units within the building.

- d. Label all surrounding areas with the plat name and lot number or as “unplatted”. Do not provide lot numbers for unplatted future lots. Label those lot areas as “unplatted” or “future platting”.
 - e. Show and label the building setback lines for residential projects.
7. Existing and Proposed Utilities:
- a. All existing and proposed utilities shall be shown in the plan and profile views, as applicable. Specific crossing requirements shall be noted on the plans for each affected utility.
 - b. Label the existing and proposed pipe size and length.
8. Creek and/or Watercourse Crossings
- a. Show and label the centerline and top of banks for all creeks and/or watercourses, existing or proposed, for the project in plan and profile views.
 - b. Protection of the waterline, as required, shall be clearly identified on both the plan and profile view.
9. Detention and Retention Basins:
- a. Show and label all existing or proposed water detention or retention facilities including dam structure limits. For retention and detention basins the maximum and normal water surface elevations and elevation outlines must be clearly shown and labeled.
 - b. For detention basins, a note must be included to indicate whether the detention basin will or will not retain water after the storm event routing has been completed, i.e. if it is a “dry” or “wet” basin.

5904.4 Details

- 1. This section governs all information to be shown on the Standard Details for the plan set.
- 2. Sheet size shall be 24”x36” unless otherwise specified by the Department of Utilities.
- 3. Details for the project shall be City of Lawrence Standard Details. Additional details required for the project shall be reviewed and approved on a case by case basis by the Department of Utilities.

5904.5 Drafting Standards:

1. General: While the construction drawings are used primarily for construction, the project drawing as-builts are the permanent record of the City of Lawrence water system. The information provided on these drawings is also used for additional extensions to the system, system modeling, system maintenance, and is used in providing location services under the one call system. This information is used by engineers, developers, contractors, builders, architects, and the public in general, it is critical for the long term management of the system that the information provided on these drawings be accurate and clearly shown.
2. General Drafting Requirements:
 - a. All sheets in the plan set shall be 24"x36" unless otherwise specified by the Department of Utilities.
 - b. A single plan/profile view format for each sheet shall be used for each plan and profile sheet. A plan view is required for each profile on the same sheet. The profile should be located immediately under the corresponding plan view.
 - c. Stationing shall increase from left to right across the plan sheet.
 - d. Stationing shall be indicated at 100 foot intervals in both plan and profile views.
 - e. Elevations shall be provided in the profile view at a minimum of 10 foot intervals. The elevation grid label shall be placed on the horizontal grid line instead of in the middle of the grid line.
 - f. Labels shall be positioned as close as possible to the feature they are identifying without conflicting with other lines. Text overwrites are not permitted.
 - g. Revisions to plans that have been released for construction shall be clouded and checked with an explanation of the change included in the revision. All revisions to previously approved plans shall be approved by the City of Lawrence Utility Department prior to construction.

SECTION 5905 LOCATION

5905.1 Horizontal:

1. Waterlines shall generally be located three (3) feet from the back of curb.
2. Waterlines, if located within dedicated easements, shall generally be centered within the easement and maintain a minimum separation of five (5) feet from the centerline of the pipe to the edge of the easement.
3. Waterlines shall be located a minimum of fifteen (15) feet from a building structure and eight (8) feet from all other structures.
4. Waterlines shall generally be located to minimize special engineering conditions and to provide adequate separation from other utilities.
5. Allowable joint deflection shall not exceed manufacturers recommended maximums. Minimum radii are listed below. Should a smaller radius than the listed minimum be required, fittings shall be used to achieve the required deflection.

Radius of Curvature for C900 PVC Pipe	
Pipe Diameter (In)	Radius* (ft)
4" - 12"	573
>12"	764

Radius of Curvature for DIP Pipe Push-On Joints	
Pipe Diameter (In)	Radius* (ft)
6"	230
8"	230
12"	230
16"	380
24"	380

Radius of Curvature for DIP Pipe Mechanical Joints	
Pipe Diameter (In)	Radius* (ft)
6"	160
8"	220
12"	220
16"	320

24"	500
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*Radius based on laying lengths of twenty (20) feet

5905.2 Vertical:

1. Back of curb waterlines shall be installed with a minimum of forty two (42) inches of cover.
2. Waterlines installed under pavement shall be installed with a minimum of sixty (60) inches of cover.
3. Operable appurtenances such as hydrant and line valves shall generally be located at a depth of six (6) feet or less. Depths of cover for operable appurtenances greater than six (6) feet require the approval of the Department of Utilities.

5905.3 Sanitary Sewer Separation:

1. Horizontal Separation:

- a. A minimum of ten (10) feet horizontal separation, as measured from the outside edge to outside edge, shall be required between a potable waterline and a sanitary sewer main, forcemain, service line, or manhole.
- b. Under no circumstance shall potable waterline and sanitary sewer be placed in the same trench.
- c. Potable waterlines shall meet the minimum separation requirements from all pollution sources as set forth by the appropriate reviewing agency.
- d. When waterlines and other utilities are laid parallel to each other the separation distance shall be determined based on geotechnical considerations. A minimum of three (3) feet of undisturbed earth separating the trenches shall be required. Under no circumstance shall waterlines and other utilities be installed in the same trench.

2. Vertical Separation:

- a. A minimum of two (2) feet vertical separation, as measured from the outside walls of the pipe, shall be required between a sanitary sewer main or service line and potable waterline.
- b. In general potable waterlines shall be located above sanitary sewer lines.
- c. Potable waterlines shall maintain a minimum of two (2) feet of vertical separation, as measured from the outside walls of the pipe, and shall always cross above any sewer force main.

3. Protective Measures: When potable waterlines and gravity sanitary sewers cross with less than two (2) feet of vertical clearance, and in all cases where the potable waterline is located below the gravity sanitary sewer, additional measures must be employed to protect the potable waterline.

Acceptable measures include:

a. Construction of the sanitary sewer line using one of the following materials:

1. Ductile iron pipe conforming to ASTM A536 or ANSI/AWWA C151/A21.52 with a minimum thickness class 50, and gasketed, push-on, or mechanical joints in conformance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C111/A21.11.
2. PVC pipe conforming to ASTM D3034 with minimum wall thickness of SDR41, ASTM F679, or ASTM F794, with gasketed push-on joints in conformance with ASTM D3212.
3. Reinforced concrete pipe conforming to ASTM C76 with gasketed joints in conformance with ASTM C361 or ASTM C443.

Install a minimum twenty (20) foot length of sanitary sewer pipe on the crossing to maximize the joint spacing to a minimum of ten (10) feet from the crossing.

- b. Provide concrete encasement of the sanitary sewer line a minimum of six (6) inches in thickness for a minimum distance of ten (10) feet either side of the pipeline crossing.
- c. Sanitary sewer service lines may be constructed using schedule 40 PVC pipe with solvent welded joints. Pipe joints shall be located a minimum of ten (10) feet either side of the pipeline crossing.

5905.4 General Utility Separation

1. Horizontal Separation: A minimum of five (5) feet of horizontal separation, as measured from outside walls of the pipe, shall be required between all utilities, excluding sanitary sewer, and potable waterlines.
2. Vertical Separation: A minimum of two (2) foot of vertical separation, as measured from the outside walls of the pipe, shall be required between all utilities and potable waterlines.

5905.5 Watercourse Crossings:

1. Aerial Crossings: The pipe shall be adequately supported, protected from damage and freezing, and be accessible for repair or replacement.

2. Waterlines crossing a watercourse shall be designed to cross the watercourse as nearly perpendicular to the flow direction as possible and shall be on a constant grade.
3. Water distribution systems shall be designed to minimize the number of watercourse crossings.
4. Protection of the waterline shall be provided at all watercourse crossings as required to prevent erosion.
5. If the depth of cover over the waterline is five (5) feet or less, reinforced concrete encasement, casing pipe, or other protective measure as appropriate shall be provided extending the full width of the watercourse crossing to a point ten (10) feet beyond the top of bank.
6. Valves shall be provided on both sides of the crossing to facilitate testing and repair of the pipeline. Valves should be easily accessible and shall be placed a minimum of ten (10) feet outside the top of bank.
7. Impervious ditch checks, as detailed on the standard drawings, shall be provided immediately downstream of the watercourse crossing.

SECTION 5906 APPURTENANCES

5906.1 Fire Hydrants:

1. Fire hydrants shall be placed no less than four (4) and no more than twelve (12) feet from the back of curb.
2. Hydrant spacing shall generally not exceed six hundred (600) feet. Fire hydrant spacing will be reviewed and approved by Lawrence Douglas County Fire and Medical Services on a case by case basis.
3. Fire hydrants shall generally be placed at intersections, end of permanent dead end lines, and intermediate points when block lengths exceed the required spacing. It is preferred to locate mid-block hydrants at property lines.
4. Only dry-barrel hydrants will be approved for installation and shall comply with Section 2902.4 of the City of Lawrence Construction and Material Specifications Section 2900 – Waterlines.
5. Hydrant installation shall conform to the standard drawings.
6. Hydrant drains shall not be connected to a sanitary or storm sewer.

5906.2 Valves:

1. Line valve spacing shall not exceed eight hundred (800) feet.
2. Valves shall be placed at all tees, crosses, and other pipe intersections such that pipes in the system can be isolated and service interruptions, if required, may be limited to no more than twenty five (25) customers at a time.
3. Valves shall generally be placed no more than three (3) feet from the tee, cross or other pipe intersection unless the valves can be appropriately relocated to an unpaved area.
4. Line valves shall generally be located at property lines or placed such that they can be referenced with respect to certain obvious monuments.
5. At high points in the waterline where air can accumulate, provision shall be made to remove air by means of hydrants or air relief valves. Automatic air relief valves shall not be used where flooding of the vault may occur.

5906.3 Flushing Assemblies: Flushing assemblies, in accordance with the standard details, shall be placed at the end of all public two (2) inch waterlines, at temporary dead end lines, and at other locations as specified by the Department of Utilities.

5906.4 Thrust Restraint:

1. Thrust restraint shall be provided for all fittings and shall extend to solid undisturbed earth.
2. Thrust restraint shall be installed so that all joints are accessible for repair.
3. The bearing area of concrete reaction blocking shall be as shown on the standard drawings or as determined by the Engineer.
4. If adequate support against undisturbed ground cannot be obtained, metal harness anchorages consisting of steel rods across the joint and securely anchored to pipe and fitting or other adequate anchorage facilities shall be installed to provide the necessary support.

5906.5 Casing Pipe:

1. Casing pipe and appurtenant materials shall be installed at locations identified on the plans and materials shall conform to City of Lawrence Construction and Material Specifications Section 2900 – Waterlines.
2. Waterline to be inserted in casing pipe shall be restrained joint to a point ten (10) feet either side beyond the limits of the crossing.

SECTION 5907 FIRE LINES

5907.1 General:

1. All water lines and hydrants connected to a dedicated fire line shall be considered private.
2. A fire line shall be defined as a fire protection water main which only has connections to hydrants and/or building fire sprinkler systems.

5907.2 Backflow Prevention:

1. Construction of all private waterlines requires the installation of an isolation valve located at the point the fire line becomes privately owned as well as an approved backflow prevention assembly. At a minimum backflow assemblies shall consist of a double check detector assembly.
2. For fire lines two (2) inches in diameter and smaller, backflow prevention may be located in a building only if the backflow prevention is within one hundred (100) feet of the water main. If the building is greater than one hundred (100) feet from the water main then backflow prevention may not be located in the building unless approved by the Department of Utilities. Backflow prevention located outside the building must be within a privately owned and maintained manhole.
3. For fire lines greater than two (2) inches in diameter, backflow prevention may be located in a building only if the backflow prevention is within fifty (50) feet of the water main. If the building is greater than fifty (50) feet from the water main then backflow prevention must be located outside the building within a privately owned and maintained vault.

SECTION 5908 ABANDONMENTS

5908.1 Scope: This section governs construction methods and procedures for the abandonment of waterlines, service lines, fire lines, fire hydrants, and appurtenances.

5908.2 General: All waterline abandonments shall conform to the following requirements.

1. **Waterline:** The abandoned waterline shall be disconnected and capped. At the point of disconnection any valve remaining shall be removed and the waterline remaining active shall be capped with a mechanical joint plug and a thrust block shall be installed.
2. **Service Line:** Water service lines shall be abandoned at the main. The curb stop/corporation stop and tapping saddle shall be removed, and the main shall be repaired with stainless steel repair clamp. If in the opinion of the Department of Utilities a repair clamp cannot be properly installed, a section of main may need to be replaced as directed by the Department.

3. Fire Line: Fire lines shall be abandoned at the main. The curb stop, corporation stop, or valve and tapping saddle or tapping sleeve shall be removed and the main shall be repaired with a stainless steel repair clamp. If in the opinion of the Department of Utilities a repair clamp cannot be properly installed, a section of main may need to be replaced as directed by the Department.

4. Fire Hydrant: Fire hydrants shall be abandoned at the main. The entire hydrant assembly shall be removed at the tee and the tee shall be plugged and blocked. If a tapping saddle is present the tapping saddle shall be removed and the main repaired with a stainless steel repair clamp. If in the opinion of the Department of Utilities a repair clamp cannot be properly installed, a section of main may need to be replaced as directed by the Department.

Attachment A
Standard Easement Document - Permanent

INDIVIDUAL ACKNOWLEDGMENT

BE IT REMEMBERED, that on this _____ day of _____, 20__, before me, the undersigned, a Notary Public in and for the County and State aforesaid came _____, who is personally known to me to be the same person who executed the within and foregoing instrument of writing, and duly acknowledged the execution of the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal the day and year last above written.

Notary Public

My Commission Expires: _____

CORPORATION ACKNOWLEDGMENT

BE IT REMEMBERED, that on this _____ day of _____, 20__, before me, the undersigned, a Notary Public in and for the County and State aforesaid came _____, an authorized agent of _____, a corporation duly organized, incorporated and existing under and by virtue of the laws of the State of _____, who is personally known to me to be such officer, and who is personally known to me to be the same person who executed, as such officer, the within instrument on behalf of said corporation, and such person duly acknowledged the execution of the same to be the act and deed of said corporation.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal the day and year last above written.

Notary Public

My Commission Expires: _____

LIMITED LIABILITY COMPANY ACKNOWLEDGMENT

BE IT REMEMBERED, that on this _____ day of _____, 20____, before me, the undersigned, a Notary Public in and for the County and State aforesaid came _____, of _____ L.L.C., who is personally known to me to be the same person who executed the within and foregoing instrument of writing, and duly acknowledged the execution of the same on behalf of said Limited Liability Company..

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal the day and year last above written.

Notary Public

My Commission Expires: _____

Attachment B
Standard Easement Document – Temporary

INDIVIDUAL ACKNOWLEDGMENT

BE IT REMEMBERED, that on this _____ day of _____, 20__, before me, the undersigned, a Notary Public in and for the County and State aforesaid came _____, who is personally known to me to be the same person who executed the within and foregoing instrument of writing, and duly acknowledged the execution of the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal the day and year last above written.

Notary Public

My Commission Expires: _____

CORPORATION ACKNOWLEDGMENT

BE IT REMEMBERED, that on this _____ day of _____, 20__, before me, the undersigned, a Notary Public in and for the County and State aforesaid came _____, an authorized agent of _____, a corporation duly organized, incorporated and existing under and by virtue of the laws of the State of _____, who is personally known to me to be such officer, and who is personally known to me to be the same person who executed, as such officer, the within instrument on behalf of said corporation, and such person duly acknowledged the execution of the same to be the act and deed of said corporation.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal the day and year last above written.

Notary Public

My Commission Expires: _____

LIMITED LIABILITY COMPANY ACKNOWLEDGMENT

BE IT REMEMBERED, that on this _____ day of _____, 20____, before me, the undersigned, a Notary Public in and for the County and State aforesaid came _____, of _____ L.L.C., who is personally known to me to be the same person who executed the within and foregoing instrument of writing, and duly acknowledged the execution of the same on behalf of said Limited Liability Company..

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal the day and year last above written.

Notary Public

My Commission Expires: _____