Consolidated Water District #1

Leavenworth County

Water Distribution System

Design Standards

July 2, 2013

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SECTION I – GENERAL

1.00 Purpose

The purpose of these Water Distribution Design Standards is to provide a consistent policy under which certain physical aspects of water distribution design will be implemented.

These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals by providing basic information. It is expected that Engineers will provide the knowledge and skills needed to ensure that the distribution system is designed to meet current and projected future needs.

The Standards are not intended to limit innovative or creative effort, which could result in a better quality, better long term solution and better product for our customers over the long term.

Following the above purpose, the standards have the objective of developing a water distribution system which will:

a) Be consistent with the latest version of the Water System Study.

b) Provide sufficient capacity to maintain minimum pressure during periods of maximum use and to provide sufficient volumes of water at adequate pressures to provide the expected maximum daily consumption plus emergency conditions at a minimum energy loss.

c) Be of materials strong enough to resist all expected loads, both internal and external, and able to preserve the potability of the water supply.

d) Be economical and safe to build and maintain.

e) Conform to the latest edition of the Kansas Department of Health and Environment's "Policies, General Considerations and Design Requirements for Public Water Supply Systems in Kansas." Referred to in this document as "KDHE Standards".

Alternate materials and methods will be considered for approval on the basis of these objectives.

1.01 Revisions to These Standards

It is anticipated that revisions to these Standards will be made from time to time. The date appearing on the cover page is the date of the latest revision. Users should apply the latest published issue to the work contemplated. Alterations and/or exceptions to these standards may be considered by the Board of Directors on a case by case basis.

1.02 Shortened Designation

The Consolidated Water District #1 Water Distribution Design Standards shall be cited routinely in this text as the "Standards".

1.03 Applicability

These Standards shall serve as a guide for all construction and upgrading of all public and private water system facilities in the service area of Consolidated Water District #1 of Leavenworth County.

1.04 References

These Standards are intended to be consistent with the most current provisions of the following standards and the most stringent shall apply:

a) The latest version of the Water System Study.

b) The Comprehensive Plans for the Cities of Basehor and Lansing.

c) Kansas Department of Health and Environment Design Standards

1.05 Definition of terms

Air Gap Separation – means a physical vertical separation between the free-flowing discharge end of a potable water supply pipeline and the rim of an open, non-pressurized receiving vessel.

Approved Backflow Prevention Assembly – means an assembly that has been proposed and approved as an appropriate assembly for the situation the assembly is designed to prevent.

As-Built Plans – means plans prepared by the District Engineer, District Engineers' Representative, Water District Official and/or the Contractor

indicating that the plans have been revised, if necessary, to accurately show all as-built construction details.

Backflow – means the flow of water or other fluids in a direction opposite to the normal flow. (see back-siphonage)

Benefit Unit – means the right in which a property owner is able to obtain domestic water from the Water District after paying the subscribed fee(s) and having complied with the standards for connecting to the Water District.

Board of Directors – means the Board of Directors for the Water District.

City – means either the City of Basehor and/or the City of Lansing. When appropriate the specific city will be identified to ensure clarity.

Cross Connection – means any connection or arrangement, physical or otherwise, between a public potable water supply system and any plumbing fixture or any tank, receptacle, equipment or device, through which it may be possible for non-potable water, well water or other water source, used, unclean, polluted and contaminated water, or other substances to enter into any part of the said potable water system under any condition.

County – means Leavenworth County, Kansas.

Distribution System – means distribution pipelines, pumping stations, valves, fire hydrants, pressure reducing devices, air releases etc… used to transmit water from the supply source(s) to the service line.

Double Check Valve Assembly – means an assembly composed of two single, independently acting, check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with properly located test ports.

Dwelling Unit – means a facility designed for permanent or semi-permanent occupancy and provided with minimum kitchen, sleeping, and sanitary facilities for one family.

Easement – means a right afforded to an entity (normally a, County or the District) to make limited use of real property not owned by the entity.. As used in these Standards, it may also refer to 1) an area of land within which the limited use right is afforded; or 2) the legal instrument through which the limited use right is conveyed to the entity.

Emergency Condition – means a condition, of an abnormal nature, that causes increased demand on the water distribution system.

Fire Hydrant Assembly – means the fire hydrant. This can also refer to the fire hydrant, valve and piping between the two components.

Fire Line – means a connection to the public water main intended only for the extinguishment of fires and the flushing necessary for its proper maintenance. Flushing shall only be conducted after the approval from a Water District Management member has been received. All fire lines shall comply with the Standards herein.

Hydrant Lead – means the line connecting the fire hydrant to the Water District main or private fire line with the auxiliary valve.

Irrigation Service – means a metered connection intended for seasonal use and delivering water which is not discharged to the sanitary sewer.

Management – means Management team members employed by the Board of Directors for the Water District.

Multiple Family Dwelling – means a building or portion designed thereof for occupancy by two or more families, living independently of each other.

Owner – means any individual, partnership, firm or corporation who has ownership in property in the service area of the Water District.

Person – means individual, firm, corporation, association, agency, or other entity.

Plans – means construction plans, including system site plans, water system plans, and (when required) profiles, cross sections, detailed drawings, etc…, or reproductions thereof, approved or to be approved by the District Engineer and/or Water District Official, which show the location, character, dimensions, and details for the work to be done.

Potable Water – means water which is satisfactory for drinking, culinary, and domestic purposes and meets the requirements of the Kansas Department of Health and Environment.

Preliminary Review – means plans that have been reviewed by the District Engineer and/or Water District Official but are not approved for construction.

Private Distribution System – means a privately owned and maintained water distribution system serving an industrial or commercial subdivision or a multi-building development on a single lot served through a master meter installed at the approved location.

District Engineer – means the Engineer retained/employed by the Water District and licensed in the State of Kansas as a Civil Engineer under whose direction the

Plans and details for the work are prepared and submitted to the Water District for review and approval.

Residential User – means the owner, lessee, or occupant of a single dwelling unit in one structure.

Right-of-Way – means all land or interest therein which by deed, conveyance, agreement, dedication, usage or process of law is reserved for or dedicated to the use of the general public. Rights-of-ways are owned by the City of Basehor, City of Lansing or Leavenworth County.

Roadway – means ~~all of that~~that entire portion of the right-of-way used, or to be used, for vehicle movement, which exists between the curbs and/or edge of the surface used for vehicle movement.

Service Line – means the pipe carrying potable water from the main to the meter (Water District responsibility) and from the meter to the building (Customer responsibility).

Single Family Dwelling – means any residential building designed to house one family.

Street or Road – means any public highway, road, street, avenue, alley, way or right-of-way used or to be used for vehicle movement.

Water Main – means a water-supply pipe for public or community use.

Water Supply System – means the water supply system of a building or premises consisting of the building supply pipe, the water-distributing pipes, and the necessary connecting pipes, fittings, control valves, and all appurtenances carrying or supplying potable water in or adjacent to the building premises.

Water District – means Consolidated Water District #1 of Leavenworth County.

1.06 Engineering Policy

The engineering policy for the Water District allows for the research, preparation, design, review and oversight of all proposed extensions, replacements, upgrades etc… to the water distribution system of the Water District to be the responsibility of an Engineer retained by the Water District (District Engineer) at its sole discretion. Plans for a development that causes an extension, upgrade or replacement/relocation of any part of Water District's distribution system shall be communicated to the Water District and subsequently to the Engineer designated by the Water District. The Water District will not accept plans for extension, upgrade or replacement/relocation of any part of our distribution system from another Engineer and/or Agency.

1.07 Special Facilities

The design of the following are considered special facilities and are not covered in detail in these Standards:

a) Water Distribution Pump Stations
b) Reservoirs
c) Water Storage Tanks
d) Treatment Plants
e) Pressure Regulating Devices
f) Flow Measurement Devices
g) Air Release Devices

Review and approval of the above facilities shall be conducted by the District Engineer and the Board of Directors.

SECTION II - DESIGN

2.0 General Design Considerations

The distribution system shall have sufficient capacity to maintain 20 psi at the meter for all dwellings, commercial and industrial customers during peak hour use, and to provide sufficient volumes of water at adequate pressures to satisfy the expected maximum day demand plus emergency conditions. Normal working pressures may vary in the distribution system due to changes in elevation in topography, but will generally be between 50 psi and 120 psi.

In general, the distribution system should be designed to provide for maximum development of the service area with recognition of possible urban renewal, commercial and industrial expansion etc…

As a condition of water service, all developments will be required to provide public mains of sufficient size for projected peak hour demands and maximum day demand plus fire protection to the proposed development and adjacent parcels. This shall include the extension of water mains in easements across the property to adjoining properties and across the street frontage of the property to adjoining properties. Off site improvements from a suitable water main as determined by the District Engineer and/or the Water District, to a development will be the financial responsibility of the developer.

Velocities in mains shall normally range from less than five feet per second for average demand to a maximum velocity of 10 feet per second for peak hour demand and combined maximum day demand plus emergency conditions. A 20 psi residual pressure under fire flow conditions shall be maintained in the distribution system.

2.01 Water System Capacity

Design capacities and pipe sizing shall be determined by the following as listed in order of priority:

a) As detailed or identified in the latest edition of the Water System Study.

b) Minimum pipe size as identified in section 2.06.

c) For service of commercial or industrial properties, and where there is an absence of detailed design information per subsection a) above, design capacities and pipe sizing shall be determined by considering the following factors and assumptions for areas to be served, both immediate and adjacent:

1) The ~~higher~~highest of current or projected population within the area to be served.

2) The maximum daily water demand based upon land use (the higher of current and projected land use).

3) Special needs of commercial, industrial, or institutional users to be served at specific locations.

d) Detailed design factors, consumption data, and other information to be used for design purposes.

1) Maximum day demand based upon factors by land use.

2) Peak hour demand based upon peaking factors by land use.

3) Demand for unique, commercial installations, industrial users, PUD's, multiple family dwellings, and institutional concerns will be calculated on an individual basis.

e) Needed Fire Flows shall conform to the fire codes adopted by the City of Basehor, the City of Lansing, or Leavenworth County as appropriate and available.

2.02 Main Classification

a) Transmission Mains (typically 10-inch and larger)

Mains which are used for transporting water from the source of supply (master meters), to elevated storage tanks, and then, water from the

elevated storage tanks throughout the service area along major streets/roads. Customers can be connected to these mains for their water supply needs.

b) Feeder Mains (typically 8-inch)

Mains that transport water from the transmission mains into developed areas but are typically smaller in size. These mains strengthen the distribution mains for domestic and fire flow purposes. Customers can be connected to these mains for their water supply needs.

c) Distribution Mains (typically 2-inch thru 6-inch)

Mains which are used for directly supplying the individual consumers. As a general rule, these are the smaller mains in the water distribution system.

2.03 Water System Construction Plans

a) General

Complete plans and specifications for all proposed water system improvements shall be designed by the District Engineer and approved by Management of the Water District prior to beginning construction.

b) Plan Preparation

Construction plans and specifications for improvements to Water District water mains shall be prepared by the District Engineer and shall meet the following requirements:

1) Dimensions – Construction plans shall be clearly and legibly drawn drawings and submitted on 24 x 36 inch sheets.

2) Form – Title Sheet, Plan and Profiles and Water Main Appurtenances.

3) Scale – Horizontal scale shall be 1" = 10', 20', 40', or 50'; vertical scale shall be 1" = 2', 4' or 5'.

2.04 Water System Requirements

Subsections 2.05 through 2.21 contain the physical design requirements for public and private water main systems in the service area of the Water District.

2.05 Pipe Materials

All 4-inch thru 12-inch pipe shall be PVC SDR 21 Class 200 (or higher pressure rating) conforming to ASTM D2241, PVCO Pressure Rated 200 psi ASTM F1483, PVC AWWA C900 DR 18 150 psi (or higher pressure rating) or PVCO AWWA C909 150 psi (or higher pressure rating) pipe. PVC pipe larger than 12-inch shall be AWWA C905 DR 21 200 psi (or higher pressure rating). Ductile Iron Pipe (typically used for straddle blocks) shall conform to AWWA C151, thickness Class 52 and shall be cement mortar lined conforming to AWWA C104. Higher thickness class pipe may be required where analysis indicates abnormal loading conditions.

Fittings shall be ductile iron and conform to AWWA C110 or AWWA C153 for compact fittings. Fittings shall be rated at 350 psi.

2.06 Main Size

a) Grid System

The distribution system mains shall be looped at all possible locations. Providing service to areas with large demands by installing a single, dead end main should be avoided.

b) Size of Pipe

2-inch - shall not be used in the distribution system, except at the end of residential cul-de-sacs to supply the dwellings access directly from the circular portion of the cul-de-sac.

3-inch - shall not be used in the distribution system but for services to 3-inch meters.

4-inch - may only be used on dead end streets with service to not more than 5 dwellings, with no fire hydrant connections and shall be connected to a minimum 6-inch main which is looped.

6-inch - minimum size for mains supplying fire hydrants.

8-inch - minimum size for feeder mains and shall (when possible) be connected to a transmission main (10-inch or larger main). 8-inch pipe is the minimum size pipe for commercial/industrial areas. 8-inch pipe shall be arranged on a half mile grid within the distribution system when possible.

10-inch - shall not be used in the distribution system except existing

mains installed prior to the year of 2000.

12-inch - 12-inch and larger mains shall be used as transmission mains in the distribution system and when possible/feasible shall be constructed along all roads/streets at section lines and within commercial/industrial zoned developments depending on demand.

c) Future Extension

The Water District shall require water mains in new developments to be sized appropriately to provide the capacity for future development within the proposed development and adjoining properties. The water mains shall terminate at the property line along all streets of the proposed development which are planned to be extended in the future.

All dead-end mains shall terminate with a fire hydrant assembly (on 6" or larger mains) or an approved blowoff assembly on 4" and smaller mains.

2.07 Minimum Depth

The standard minimum cover over buried water mains shall be 42 inches from the finish grade. The Water District may require additional cover in order to protect pipe from damage.

2.08 Location

a) Relation to Sewer Lines and Other Utilities

Water mains shall be separated from sewer lines in accordance with Kansas Department of Health and Environment Standards. Water mains shall maintain as much possible separation from other utilities as possible to prevent potential damage.

b) Water Mains Within Street Right-of-Way

Water mains will not be constructed in the Right-of-Way where there is a platted utility easement or where the Water District has been or will be granted a private easement on private land. Water mains will only typically occupy the right-of-way at street crossings and in residential subdivisions where no utility easement has been provided.

c) Water Mains in Easements

When possible water mains will be constructed in utility easements or

private easements obtained by the Water District. In platted developments where utility easements are present, water mains can be constructed in these easements if there are no conflicts with other utilities and/or sewers. Utility easements need to be a minimum of 10 feet in width when adjoining the right-of-way, and 30 feet in width when not adjoining a right-of-way. Water mains constructed in private easements shall have a 30 foot wide easement. At no time shall a water main be constructed under a building or structure. At no time shall a building or structure be constructed above a water main. This includes overhanging structures located outside the easement.

d) Surface Water Crossing

1) Mains crossing a body of water, stream or drainage channel shall be designed to cross as near perpendicular to the channel as possible.

2) The minimum cover from the bottom of the body of water to the top of the pipe shall be 60 inches or the current KDHE requirement.

4) Water mains shall be constructed within an encasement extending past the body of water a minimum of 10 feet on either side of the body of water.

d) Street Crossing

All water mains crossing streets, roads or highways shall be encased. The casing, when appropriate, shall extend from the toe of ditch to the toe of ditch and/or from three feet beyond the curb on each side of the street.

e) Restrained Joint Pipe

Restrained joint PVC pipe or other approved material shall be used to traverse surface water crossings, and street crossings.

2.09 Valves

a) Sizes

Valves shall be the same size as the mains in which they are installed. Valves shall be Kennedy brand resilient wedge gate valves and conform to ANSI/AWWA C509. If, by design, butterfly valves are to be installed they must conform to ANSI/AWWA C504. All valves shall open left.

b) Location

Distribution valves shall be located as close as possible to the tee or cross fitting. There shall be sufficient number of valves so located that each branch can be isolated from the other to promote interruption of service to the minimum number of customers as possible. Consideration shall be given to construct in-line valves in high value areas, such as commercial/industrial areas or institutional areas. Valves shall be placed on each side of a hazardous crossing such as a body of water, highway or any other location deemed necessary by the District Engineer and/or Water District Management.

c) Phased Construction

Water mains installed by phased construction, which will be extended in the future, shall terminate with a temporary blow off assembly.

All developments will be required to extend mains across existing or proposed streets for future extensions by the Water District to serve other developments. All terminations shall be planned and located to minimize the amount of new or existing pavement to be cut in the future when the main is extended.

2.10 Backflow Prevention

a) General

When deemed appropriate by the Water District, all approved metering systems shall be required to install an approved backflow prevention device.

b) Refer to the Water District's Back Siphonage / Backflow Prevention Policy for further information and requirements.

2.11 Fire Hydrants

a) Coverage

Distribution of fire hydrants shall be based upon the required fire flow listed in Section 2.01. Preferred coverage shall result in the hydrant spacing of 500 feet in residential developments, and 300 feet in high value districts including commercial, industrial or institutional areas. Distribution of hydrants in rural areas will be based on protecting existing structures of existing customers as new mains are constructed or replacement of mains is completed. Additional fire hydrants may be

installed in rural areas at the discretion of the District Engineer and/or Water District Officials.

b) Location

No fire hydrant shall be installed on a main of less than 6-inches in diameter without the approval of Water District Management and/or the Board of Directors.

Fire hydrants shall be located as nearly as possible to the corner of street intersections and at intervals as near as possible to the coverage identified in 2.11 a) of this section. Fire hydrants shall be placed at the termination of a 6-inch or larger main on dead end streets and/or cul-de-sacs.

c) Fire Hydrant Valves

Each fire hydrant shall have a hydrant valve and valve box anchored to the main line tee which will permit repair of the hydrant without shutting down the main supplying the fire hydrant. The fire hydrant valves shall have mechanical joint ends. The entire assembly shall be restrained with mechanical restraints.

d) Specifications

Fire hydrants shall be Kennedy brand K-81-D model dry barrel fire hydrant. Fire hydrants shall be configured with a four-foot bury depth (unless otherwise indicated), 6-inch mechanical joint shoe, 5-1/4" barrel, 1 pumper nozzle, 2 hose nozzles, yellow in color and open left. Fire Hydrants shall meet AWWA/ANSI standards for dry barrel fire hydrants.

Fire hydrants shall have extensions added to the barrel to ensure the bury depth is at the finished grade level.

2.12 Blowoff Assemblies

Blowoff assemblies shall be placed on all four-inch and smaller water mains that dead-end. Blowoff assemblies consist of an appropriate size valve and an Eclipse No. 2 post hydrant. Blowoff's will have a four-foot bury, 2-inch FMNPT inlet, open left and 1, 2-1/2" discharge with cap compatible for connection to a fire hose.

2.13 Service Lines

The term "service line" is meant to be used only for the water line extending from the distribution main to the consumer's meter. This term can often times be used for the consumer's line extending from the structure (house, building, etc.) to the

meter (point of delivery), however, this should be identified as the "customer's service line". The Water District is only responsible for the service line from the main to the delivery point (meter). Taps or connections can be made to any water main in the distribution system, providing there is sufficient capacity to accommodate the new connection without degrading water service to existing customers.

a) Sizes

The sizes of service lines which may be used are ¾", 1", 1-1/2", and 2". Larger sized service lines require approval by the Board of Directors. Service lines supplied from the main to the delivery point (meter) will directly correlate to the size of meter purchased. The Water District is not obligated to supply a larger service line than the size of meter purchased. The size of service line will be equal to or greater than the meter size. At no time will a service line be greater in size than the distribution main.

Three-inch and larger services must have approval by the Board of Directors after the projected water use demand of the customer has been evaluated by an Engineer retained by the Water District. The cost of this evaluation will be the responsibility of the customer.

b) Location

1) Domestic

In general, individual service connections shall be set in front of the property to be served and shall be located approximately 10 feet from a driveway and 15 feet from the edge of the roadway (in platted developments with curbs) or at a location outside the road right-of-way in rural areas. The domestic service shall not be connected to a fire line.

2) Fire Line

The point of delivery for a fire line shall be the consumers side of the gate valve connected immediately to the distribution main. For further information and specifications for fire line service, see the standards below for fire lines.

2.14 Meters

All residential water meters served by the Water District will be furnished by the Water District and installed by a contractor retained by the Water District. The District may require that other types of meters (commercial, industrial etc.) be provided and installed by the customer's contractor. The District shall dictate the

meter type, model and manufacturer for all meters installed in the District. Meters will be set only after all applicable forms and fees have been received. All water meters will be of type determined by the Water District and read in gallons.

Prior to setting the meter, customers must have their service line extended to the location where the meter will be set and a shut off valve shall be installed on the inside of the structure.

2.15 Separation of Water Sources

On premises where water is supplied from two or more different sources, a public water main being one of them, the systems shall be kept entirely separate to prevent any possibility of other supplies mixing with the public water supply. If this is determined to not be feasible, then an appropriate approved backflow prevention assembly shall be installed.

2.16 Pipe Bedding

Water mains will typically be bedded in natural earth material (dirt). When rock is present, pipe shall be bedded in granular rock material to provide a cushion between the natural rock formations and the pipe. Granular rock material may at times, when deemed appropriate, be used to encompass the entire height of the pipe to limit the exposure of the pipe to rigid edges present in excavated rock formations.

2.17 Back Filling of Trenches

Back filling of trenches used to construct a water main shall be completed in layers and compacted to minimize or eliminate settling. Trenches shall be graded level with the established grade and readied for re-seeding.

2.18 Tracer Wire

a) General

Install electrically continuous tracer wire with access points as described herein

to be used for locating pipe with an electronic pipe locator after installation. Tracer wire shall be installed on all water mains and services.

b) Products

1) Tracer Wire Material

Tracer wire to be twelve (#12) AWG HS-CCS minimum, high strength copper clad steel conductor (HS-CCS) insulated with a 30

mil, high density, high molecular weight polyethylene (HDPE) insulation and rated for direct burial use at 30 volts. Insulation color shall meet the APWA color code standard for identification of buried utilities. The insulation color shall be blue. Tracer wire shall be made in the USA.

2) Tracer Wire Access Boxes

For locations where valve boxes are not present, the tracer wire access point shall be composed like a typical valve box, composed of 6" PVC pipe and an approved ring and lid, or a SnakePit tracer wire access box. Sub-meter or better GPS coordinates shall be obtained for each tracer wire access point.

c) Testing Requirements

Contractor shall perform a continuity test on all tracer wire in the presence of the Engineer, Engineers' representative or Water District Official. If the tracer wire is found to not be continuous after testing, Contractor shall repair or replace the failed segment of the wire at Contractor's expense.

d) Execution

1) Installation – General Requirements

Tracer wire shall be installed on ALL water mains and services regardless of size. The wire shall be installed in such a manner as to be able to properly trace all mains without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire. At no point shall tracer wire be installed with access points spaced greater than 1,000 feet or as directed by the District Engineer, Engineers' Representative and/or a Water District Official.

2) Tracer wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be laid in the trench below the pipe (off to one side, under the curvature of the pipe) and bedding material being installed to ensure that the wire is not damaged during future repair operations. The tracer wire shall be securely bonded together at all wire joints with an approved, watertight connector to provide electrical continuity, and it shall be accessible at all tracer wire access points.

3) Tracer wire access points shall in general be located at every fire hydrant valve box, intersecting valve boxes, concentrations of multiple valve boxes near pipe intersections (i.e., tee's, crosses

etc…) and all service lines with the termination point being inside the meter pit. Additional locations for tracer wire access points may be directed to be located and installed by the District Engineer, Engineers' representative and/or Water District Official. At each intersecting points of tracer wire where there are single or multiple valve boxes, tracer wire ends shall not be connected to each other. Termination points of tracer wire brought to the surface shall remain independent and separate from each other to promote greater conductivity in the direction the tracer wire is to be placed. Weather proof tags shall be affixed to each termination point (approximately six (6) inches from the end of the tracer wire) that indicates the direction the wire is traceable.

4) At each valve/meter location (including fire hydrant isolation valves), a single wire is to be brought up to the outside of the valve/meter location with enough wire to extend three (3) feet outside of the uppermost portion of the valve box or meter pit. At valve boxes, the tracer wire is to be brought up outside the valve box to a point one (1) foot below the final grade elevation and looped inside through a hole drilled into the valve box. At no time shall tracer wire be looped around the top of the valve and/or valve nut so that damage from turning the valve can compromise the integrity of the tracer wire.

5) Tracer wire shall be installed with all non plastic water mains. Tracer wire shall be installed in the same manner with metallic pipe as it is for plastic pipes.

6) Tracer wire shall be laid flat under the pipe and if warranted (as determined by the District Engineer, Engineers' Representative and/or Water District Official) securely affixed to the pipe at 10 foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. At service saddles, the tracer wire shall not be allowed to be placed between the saddle and the main.

7) Except for approved spliced in connections, tracer wire shall be continuous and without splices from each tracer wire access point. Where any approved spliced-in connections occur, 3M DBR water tight connectors shall be used to provide electrical continuity. The tracer wire shall be tied in a loose knot below the spliced connection to ensure the connection will not be pulled on during installation and/or future repairs.

8) At all main end caps, a minimum of six (6) feet of tracer wire shall

be extended beyond the end of the pipe, coiled and secured for future connections. The end of the tracer wire shall be spliced to the wire of a six (6) pound zinc anode and is to be buried at the same elevations as the water main.

9) Spliced connections between the main line tracer wire and branch connection tracer wire shall only be allowed at water service connections or where the branch main does not have an isolation valve installed. The branch connection tracer wire shall be a single wire properly spliced, using a Snake Bite DryConn Direct Bury Lug.

10) At all repair locations where there is existing tracer wire, the tracer wire shall be properly reconnected and spliced as outlined above.

2.19 Private Fire Lines

a) General

The Water District may allow private fire line connections to the distribution system, only after a feasibility study by the District Engineer, indicates the distribution system can adequately supply the requested tap without disrupting the normal quantity and pressure of the water supply to existing customers, and approval by the Board of Directors.

The Water District operates a water distribution system that has been designed for the delivery of water for domestic consumption. Connections for the purpose of supplying private fire lines will only be allowed if adequate supply and pressure, as determined by a feasibility study, is available.

The requirements outlined in this section are to be considered minimum standards and may be subject to change at any time based on recommendations by the District Engineer, on-site conditions and changes to local, state and federal regulations.

b) Fire Lines

Fire lines are defined as any main and/or appurtenances designed for the sole purpose of aiding in the suppression of a fire and not for normal domestic water consumption. Fire lines begin at the discharge side of a gate valve connected to a water main owned and operated by the Water District. From the point described above, the ownership of the mains, fire hydrants, valves and all other appurtenances is that of the customer. Private fire lines are subject to all standards outlined in these Design

Standards and all provisions of these standards shall be complied with in consideration for service by the Water District.

Fire lines are to be used for fire suppression purposes only. No connections for domestic purposes are allowed on any fire line. Any unauthorized use or tap of a fire line may result in forfeiture of the fire line service as determined by the Board of Directors.

c) Establishing Service

An application for fire line service shall be submitted to the Water District along with the appropriate feasibility and engineering review fees (see rate fee schedule). The Water District will have the District Engineer review the fire line application and supplied documentation, and if determined feasible, the Board of Directors will consider the fire line application for final approval.

If approved by the Board of Directors, customers will be provided with an estimated cost for the fire line connection. The estimated costs will include (but not limited to); system expansion fee of appropriate size, tapping fee of appropriate size, materials to install a gate valve on the distribution main, labor, restoration of area and any other costs associated with establishing the fire line as determined by the Water District. Once all fees and requested documentation are submitted to the District office, the Water District will schedule the work to be completed by the Water District.

The customer shall obtain any required permits from the appropriate agencies prior to commencing their work, if needed.

d) Point of Connection

The point of connection will be the discharge side (point closest to the customer) of a gate valve installed on the distribution main. The Water District will retain a contractor to complete the installation of the gate valve on the distribution main. This gate valve will remain the property of the Water District and shall only be operated by a Water District employee. Once this is complete the customer can then make the connection to the gate valve. The connection to the Water District's gate valve must be completed in the presence of a Water District employee.

e) Inspection

A Water District employee shall inspect all installation and repairs of fire lines prior to backfilling.

f) Backflow Prevention

All fire line systems must have backflow prevention devices in place and tested by a certified backflow prevention specialist immediately upon placing the fire line system into operation. When water is the only extinguishing agent used in the fire line system, a Double Check Detector Valve assembly shall be required. If other agents, in part or whole, are used in a fire line system then a Reduced Pressure Zone (RPZ) Backflow Prevention Assembly is required. All Backflow prevention devices shall be tested no less than annually unless otherwise requested by the Water District in accordance with the Water Districts Cross Connection Control Policy. Failure to have an annual test preformed on the backflow prevention device when required may result in forfeiture of the fire line service and termination of service may result anytime thereafter as per the Cross Connection Policy of the Water District. All backflow prevention assemblies must be installed in accordance with the manufacturer's recommendations.

Backflow prevention devices may be placed inside buildings if the distance from the water main to the location inside the building does not exceed 75 feet, or as determined by the Water District. All Backflow prevention devices placed inside of buildings shall be readily accessible to Water District personnel at all times. Buildings located a distance greater than 75 feet from the water main shall provide for backflow prevention as close as reasonably possible to the water main, but outside the right-of-way as agreed upon by the owner and the Water District. All Double Check Detector Valve assemblies located outside of the building shall be located in a vault **(approved by the Water District).** All Reduced Pressure Zone (RPZ) assemblies located outside of a building shall be located above ground in an approved "hot box".

g) Fire Hydrants

All fire hydrants connected a fire line shall meet the established standards previously mentioned in this document. Fire Hydrants connected to a fire line are to be "private hydrants" and be the sole property of the customer. All fire hydrants shall be provided with an auxiliary gate valve. Private fire hydrants shall be painted red to differentiate private hydrants from Water District fire hydrants, which are painted yellow. Any flow test conducted on private fire hydrants shall be approved, in advance, by the Water District. Private fire hydrants on fire lines are to be used for fire fighting purposes only.

h) Valves

Fire lines shall be designed as described in these standards previously, including the installation of valves to isolate sections of the fire line. Valves shall meet the standards for valves as previously described in these standards.

A post indicating valve shall be placed at the right-of-way/property line.

i) Unauthorized Use

Fire lines are a non-metered convenience for our customers. There shall be no flushing of any portion of the fire line system without the consent of a Water District Official. Any unauthorized use of the fire line shall be subject to forfeiture of the fire line service as determined by the Board of Directors.

j) Interruption of Service

For known, scheduled, interruptions of service to a fire line system, the Water District will attempt to notify the customer and local fire department. The Water District shall not be responsible, nor be held liable, for any damages resulting in the unforeseen interruption of service to a fire line. Reasonable efforts will be made to minimize the length of time service is interrupted.

k) Fire Line Drawings

An engineer, registered in the State of Kansas, must design all fire line services. Three complete sets of engineered stamped construction drawings and/or electronic files must be submitted to the Water District at the time the application for fire line service is submitted. These drawings must be approved by the Water District before any construction begins. The Water District will retain these construction drawings for our records. Changes, alterations and/or variations to the fire line system must be submitted to the Water District for our records.

l) Monthly Fees

Fire lines will be charged the minimum rate for residential customers per month, plus any registered usage through the detector assembly. See the Water Districts “Rate Fee Schedule” for current fees.

m) Leaks and/or Breaks

Upon discovering a leak or break in a fire line system where water is, or potentially could leak, the customer shall make immediate repairs. The Water District shall be notified of all leaks and/or breaks at the earliest possible moment. If determined by the Water District that the amount of

water being lost is excessive or has existed for an extended period of time as determined by the Water District, the fire line system may have service interrupted until repairs are made.