Standard Design
And
Construction Specifications
For Water Systems

May 2022

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General Design Criteria

1. General Design Criteria

1.1. Introduction

These design criteria shall govern the engineering design of all KMPUD water facilities.

1.2. Intent of Criteria

The intent of these criteria is to ensure that the water system constructed that will dependably and safely convey the required amount of high-quality water throughout the distribution system at the least overall cost. In establishing the required amount of water, periods of peak day demand occurring in conjunction with an emergency fire flow demand, and peak hour demands, shall be considered.

Water utilities shall be designed to meet or exceed the lifespan, or deprecation period, listed in the KMPUD Asset Life Schedule (KMPUD Policy Statement 370).

KMPUD is committed to providing environmentally responsible services, therefore, all proposed installations shall be evaluated to ensure that the installation is environmentally sustainable and resource efficient throughout the life cycle of the system.

1.3. Current Standards

Pertinent and current requirements of the following agencies or standards shall be complied with:

- Laws and Standards of the State of California, Department of Public Health, relating to Domestic Water Supply, and particularly therein the Standards of Minimum Requirements for Safe Practice in the Production and Delivery of Water for Domestic Use.
- Title 17, Chapter V, Sections 7583-7622, California Administrative Code, regarding cross connections.
- Applicable ordinances, rules, and regulations of all federal, state, and local agencies.

1.4. Water Supply Pressure

Distribution and transmission design operating pressures shall not be less than forty (40) psi, nor more than one hundred (100) psi in the water main, service connection and meter box at all times, including peak hour. A minimum service pressure of fifty (50) psi is desired during maximum day demand (MDD). Normal operating pressures greater than one hundred (100) psi will require special approval and design criteria, as required by the KMPUD. The minimum pressure at any point in the system during periods of coincident peak hour plus fire flow shall not be less than twenty (20) psi.

The minimum peak hour demand (PHD), or peak hour during the peak day pressure in the system shall be not less than forty (40) psi. Services on which the peak hour pressure at the point of use is less than forty (40) psi shall be equipped with an individual backflow prevention device and hydro-pneumatic or pumped system, which shall be designed, installed, owned and maintained by the property owner.

The MDD shall equal one hundred and fifty percent (150%) of the maximum month demand (MMD). The MMD shall equal one hundred and fifty percent (150%) of the average day demand (ADD). Both are consistent with 22 CCR § 64554. Water models of the existing water system, using the above criteria, will have an average day to max day peaking factor of 2.25. PHD shall be a minimum of one hundred and sixty-seven percent (167%) of the MDD, or the KMPUD approved MDD to PHD factor, whichever is greater.

Services with more that eighty (80) psi static pressure shall be equipped with a pressure regulator set to less than eighty (80) psi. The regulator shall be installed, owned, operated, and maintained by the property owner. Pressure regulators shall be installed at the time of service line construction by the property owner, and shall be located after the customer owned shut off valve, outside of the KMPUD meter box.

1.5. Fire Flow

Water system storage or capacity shall be met entirely through reliable potable water storage capacity in each individual pressure zone and in the system as a whole, and shall not include allowances from additional pumping, treatment capacity, source capacity, emergency source connections or other non-automatic connections. All capacity shall be reliable or firm, as determined by the District, with the largest unit out of service, including fire pumps.

The local fire protection authority having jurisdiction shall determine the fire flow requirements. Minimum residential fire flow shall be one thousand (1,000) gpm for two (2) hours. Minimum commercial, industrial, utility and other than residential fire flow shall be one thousand five hundred (1,500) gpm for four (4) hours, in addition to other flow requirements. Fire flow for sprinklers shall also be added to the required fire flow, a minimum of sixty (60) gpm for two (2) hours shall be used, or larger as required.

The maximum allowable velocity anywhere in the system during all peak day demand conditions shall be seven feet per second (7) fps. The maximum allowable velocity during all peak day demand conditions plus fire flow shall be eleven (11) fps. The maximum allowable pipe headloss during all peak day demand conditions plus fire flow rate shall be ten (10) feet per thousand feet. The maximum allowable pipe headloss during all peak day demand conditions shall be two (2) feet per thousand feet in pipes twelve inch (12”) and larger. The minimum system-wide residual pressure during all peak day demand conditions, shall be forty (40) psi. The minimum system-wide residual pressure during all peak day demand conditions, plus fire flow, shall be twenty (20) psi.

1.6. Distribution System Design

1.6.1. Hydraulic Analysis

A hydraulic analysis of any proposed distribution system, impacted existing facilities, and associated necessary improvements to the existing system shall be provided to KMPUD upon request, in compliance with AWWA M32. The hydraulic analysis shall be based on the ten (10) year historical maximum day demand, in addition to all added connections and contractual requirements. The hydraulic analysis shall include analysis of average day, peak day and peak day with fire flow, each before and after any proposed improvements. If the Project will be

phased, water models are also required for every phase. All project requirements shall be met with each phase, including fire flow and looping requirements. Capacity and storage requirements shall be per 22 CCR, especially § 64554 New and Existing Source Capacity, and KMPUD standards, whichever is more stringent.

The hydraulic analysis shall be accurate to within five feet (5') of hydraulic grade lines & ten percent (10%) of approved fire flow test results and shall fully recover after MDD. The hydraulic analysis shall model chlorine residual, in compliance with KMPUD and AWWA requirements, during MDD and minimum month demand, which shall be greater than 0.2mg/L at all times in all parts of the system. The hydraulic analysis shall model water age in compliance with KMPUD and AWWA requirements, during average day and minimum month demand, which shall be less than one hundred (100) hours in all parts of the system, unless otherwise approved by the KMPUD. The hydraulic analysis report, including written explanation of assumptions, calibration and results, shall be stamped by a California licensed Professional Engineer, and submitted along with the associated computer files in WaterCAD format. Water models submitted to KMPUD are required to be geo-referenced in the NAD83 State Plane California Zone 2 Feet Coordinate System and Lambert Conformed Conic Projection.

1.6.2. Sizing

Water meter sizing shall be per AWWA M22 unless otherwise specified. The minimum water meter size for new residential homes with fire sprinklers shall be one inch (1") meters per KMW009, unless a separate fire protection service is provided or otherwise specified. Dedicated fire protection service lines may be connected to the domestic service line before the meter. Commercial and industrial connections require separate fire protection services. Compound water meters shall not be allowed. In certain areas, with limited capacity, meter size restrictions apply, as determined by the KMPUD. All water meters shall be of a size, type, make, model and with options determined by the District. The District shall purchase and install all water meters, at the District's discretion. All costs for meters, boxes, vaults, appurtenances, etc. shall be borne by the developer or contractor, as appropriate.

The minimum transmission pipe size shall be eight inches (8"). The minimum distribution pipe size shall be eight inches (8"), or six inches (6") if fully looped. The minimum pipe size to serve a single fire hydrant shall be a looped (two-way feed) six inch (6") or a single feed eight inch (8"). Water mains, hydrants, hydrant laterals and flushing appurtenances shall be sized to provide a minimum two and a half (2.5) feet per second continuous flushing velocity. Where piping or main line is replaced or paralleled, all substandard hydrants within the project alignment shall be replaced per KMW006 as part of the project and at the project's cost.

1.6.3. Material

Distribution allowable waterline pipe materials shall be Polyvinyl Chloride (PVC) C900 pressurized pipe or Ductile Iron Pipe with a minimum pressure rating of two-hundred thirty-five (235) psi. Transmission pipelines shall be a minimum of bonded Ductile Iron or welded steel pipe with an impressed current cathodic protection system, designed to maintain a stable potential in continuous immersion for a minimum of twenty-five (25) years and completely installed. Increased pipe pressure class ratings or materials may be applied as specifically annotated by these standards, or as required by KMPUD.

1.6.4. Water Service Piping

Water service piping shall be one inch (1") CL200, SIDR7 Polyethylene (PE) pipe confirming to ASTM D2239 for all three-fourth inch (3/4") or smaller meter installations and two inch (2") CL200, SIDR7 Polyethylene (PE) pipe confirming to ASTM D2239 for all one inch (1") to two inch (2") meter installations, per Section 3.4.

Crimping or uncrimping of service piping shall not be permitted. Where crimping has been performed, the entire service line shall be replaced without splicing. Water service piping shall have a minimum twenty-four inches (24") of cover and a maximum of forty-eight inches (48") of cover, installed per KMW003. Service lines larger than two inches (2") shall have a buried service gate valve with two inch (2") operating nut at the main.

1.7. Distribution System Layout Requirements

1.7.1. Water Line Locations and Clearances

Water lines shall be placed in a public utility easement in roadways unless KMPUD deems the alignment impractical, in which case a twenty-foot (20') easement in favor of the District is required. Water lines shall be installed in the center of the required twenty-foot (20') easement. Back-lot line utilities are prohibited. Water lines that are near or parallel sidewalks, drainage ditches, curbs, gutters, retaining walls, footings, foundations, concrete, rocks or other non-soil like structures shall not be installed under said improvements/structures, and shall have a minimum of five feet (5') horizontal clearance from improvements/structures, as measure from the outside of pipe.

When in a highway right of way and where required by KMPUD, water lines shall be cased. Minimum thirty-six inches (36") of cover required for pipe and casings in highway right of way. Casings shall extend five feet (5') beyond the right of way wherever possible. Water lines parallel to paved roads shall be installed with a minimum of five feet (5') horizontal separation from the edge of pavement.

All parallel dry utilities shall be installed with a minimum of twenty-four inches (24") horizontal separation and twelve inches (12") vertical separation from the water line. At a minimum, unless otherwise listed as requiring additional separation, all parallel utilities, including other potable water pipelines, shall be installed with a minimum of twenty-four inches (24") horizontal separation from the water line.

Storm drainage lines shall maintain a minimum of four feet (4') horizontal separation and one foot (1') vertical clearance. All wastewater lines, and

hazardous fluid lines shall maintain a minimum of ten feet (10') horizontal separation and one foot (1') vertical clearance below any potable water line.

All crossing utilities shall be installed with a one foot (1') minimum vertical separation (nearest outside diameter to nearest outside diameter), and non-potable lines shall cross under the water lines. All crossings shall be made at a ninety degree (90º) angle unless otherwise approved by KMPUD. No connection joints are allowed in a potable pipeline within eight (8) horizontal feet of the non-potable pipeline. All sewer/water crossings shall conform to California State Health Department regulations, and KMPUD standards and regulations, utilizing whichever is more stringent.

One hundred feet (100') of horizontal separation shall be provided from water mains to the nearest edge of any hazardous waste disposal site, or twenty-five feet (25') of horizontal separation to the nearest edge of any sewage leach field or underground hazardous material storage tank.

Water distribution lines shall be looped and connected wherever possible by development, even if outside the boundaries of the development and where required by KMPUD. In all cases, water lines shall be extended to the property lines of the development along all access roads or routes, where looping is possible, and where potential future development or connections may exist. All water systems shall be fully looped, with water being supplied from two sources or locations, with bidirectional flow.

When an area outside the development, but in reasonably close proximity as determined by KMPUD, can be logically served by future extension of a proposed water main, the water main shall extend to the tract boundary or to the end of a paved street in a manner to facilitate the future extension and include any necessary diameter over sizing and extra depth.

Private or non-District facilities, service lines or other appurtenances shall not be allowed within District trench sections, without written approval from the District.

Water service connections shall not be allowed on transmission pipelines. Contractors shall not be permitted to work on, access or excavate around KMPUD transmission lines, treatment plants or other critical infrastructure. Work on these facilities shall be performed by KMPUD or its delegates, at the contractors or developers cost.

1.7.2. Service Lines

Service lines from the water main to the property line or edge of easement shall normally be installed at the time the main is constructed. Service lines from mains installed in private roads shall extend one foot (1') beyond the edge of the pavement. Meters and boxes shall not be located in driveways.

Service lines shall be grouped at property lines and not placed on property lines having other utilities if possible. Service lines shall have a maximum length of one hundred (100) LF. Manifold services to more than one parcel shall not be permitted. Services and service lines shall not serve multiple parcels. Services shall not cross property lines, other than the parcel to be served, even if the current

ownership is the same. No service lines shall be permitted to tap into a fire hydrant lateral.

For multi-family, commercial and industrial customers, each water meter shall have a separate service. Multi-family residential, commercial and industrial customers shall have separate service lines and meters, for domestic use and fire protection.

Multi-family residential, commercial and industrial customers with more than five thousand (5,000) square feet of irrigated landscape shall have a separate irrigation service and water meter for irrigation use only.

1.7.3. Line Valves

The distribution system shall be equipped with a sufficient number of line valves so that no single shut-down will result in shutting down a transmission main of more than one thousand feet (1,000'), a distribution main of more than five hundred feet (500') or necessitate the removal from service of length of pipe greater than five hundred feet (500') in other areas. Preferably no more than two fire hydrants shall be removed from service.

Valves shall preferably be located at street intersections. If it is necessary to install valves between street intersections, they shall be located on property lines.

All valves shall be flanged or flange x M.J. Valves are required on all sides of tees and crosses. Use three (3) valves on all tees and four (4) valves on all crosses. Exceptions shall be shown on the plans and approved by the District.

Valve size shall conform to pipe size, unless clearly stated and approved otherwise on the plans. Ten inch (10") and smaller valves shall be gate type. Twelve inch (12") and larger valves shall be butterfly type. Valves sixteen inches (16") and larger shall have a two inch (2") minimum bypass valve.

1.7.4. Blow-Off Valve (BOV)

Blow off valve assemblies shall only be permitted in temporary locations. All installations where a permanent blow-off is required shall be accomplished through the use of a standard fire hydrant.

A. A fire hydrant blow-off shall be installed at all low points in the pipeline and at the ends of all water lines. All pipe shall slope down to fire hydrant blow-offs. Wherever possible, the fire hydrant blow-off shall be installed in the street right of way. In no case shall the location be such that there is a possibility of back-siphonage into the distribution system.

B. On stubs for future service extensions, a two inch (2") end of line BOV shall be installed.

1.7.5. Combination Air-Vacuum Release Valve (CAVRV)

A combination air-vacuum release valve shall be installed at all high points, and between valved sections of pipe as determined by the District. All pipe shall slope up to CAVRVs.

Provide one inch (1") CAVRV on line sizes up to twelve inches (12"); two inch (2") CAVRV on line sizes fourteen inches (14") to eighteen inches (18"), the CAVRV size shall be approved by the District.

1.7.6. Sample Stations

Provide at a minimum one sample station per subdivision and additional stations as directed by the District. Sample stations shall be located at the furthest end of the project from the water source. Sample stations should not be located at dead ends, but close to them, with approximately five to ten (5-10) service connections located after the sample station to keep water flowing past the sample point. Sample stations should be collocated with other KMPUD appurtenances whenever possible. Exact locations and quantities shall be determined by the KMPUD. Sample stations shall meet all requirements in Standard Drawing KMW012.

1.8. Minimum Site and Equipment Requirements

- Treatment plants, wells, pump stations, and all other infrastructure shall be designed and installed with reliable or firm capacity design constraints. Reliable or firm capacity shall be full design capacity with the largest unit out of service and shall include transmission, treatment, source, well, storage, pumping, distribution and all other District infrastructure.
- Treatment facilities shall provide a minimum capacity of the system maximum day demand, or two average days demand, whichever is greater, plus operational requirements. Deductions for source capacity, alternate capacity or pumping capacity shall not be allowed.
- Inlet and outlet piping shall be pressure class (PC) 350 ductile iron or welded steel, with isolation valves on all inlet an outlet piping. All exposed piping shall have adequately sized and located thrust blocks. A check valve isolated by shut off valves is required on all inlet and outlet piping.
- Fall protection and stairs shall be provided where appropriate. Snow load shall be three hundred pounds per square foot (300 psf) minimum. Site, building, and equipment drains shall be provided.
- SCADA controls operating with KMPUD SCADA system and compliant with KMPUD SCADA Standards shall be provided. All equipment shall be remotely controlled and alarmed via SCADA.
- Level sensing shall be via transducers. Additionally, a backup alarm system connected to an auto-dialer with battery back-up shall also be provided.
- Three phase power shall be brought to the site. The service shall be sized to allow startup of the largest pump, with all other equipment running.
- All electrical equipment shall be placed in minimum NEMA 4x rated enclosures.
- Arc Flash certification, labeling, and working space requirements shall be provided.
- All above grade electrical conduit shall be PVC coated rigid conduit.

- Provide sun and weather protection as appropriate for all equipment and working spaces.
- Surge protection and lighting arrestors shall be provided.
- All treatment, well and pump station sites shall be equipped with inlet and outlet magnetic flow meters connected to KMPUD SCADA.
- Sufficient interior and exterior lighting shall be provided for District Staff to perform night work. Interior and exterior receptacles shall be provided.
- The entire site shall be paved with a minimum of a) two inches (2") of Asphalt Concrete over five inches (5") of Class II Aggregate Base or b) four inches (4") of Portland Cement Concrete, or thicker, as determined by the site geotechnical report.
- The site shall be accessible either via a minimum twelve-foot (12') commercial driveway with a hammerhead turnaround and constructed of a) two inches (2") of Asphalt Concrete over five inches (5") of Class II Aggregate Base or b) four inches (4") of Portland Cement Concrete. The driveway shall be accessible from a PUE or access easement dedicated to the District.
- The site shall be a separate lot deeded to the District and clear title shall be provided. The site shall be sized to allow for twenty foot (20') level clearance on all sides from any equipment, buildings, fencing or piping, and shall include an entire replacement site immediately adjacent to, in conjunction with and suitable for replacement of the entire facility.
- Complete as-built and O&M manuals shall be submitted to the District and the Contractor shall provide all training necessary for maintenance and operation of facility.

1.8.1. Minimum Tank Requirements

- Tanks shall be welded steel with concrete ringwall, per AWWA D100. Tanks shall be coated per KMPUD requirements, with NSF approved products, with an interior coating system of fifteen (15) mils minimum and have a minimum coating life of twenty five (25) years. Storage tanks shall be disinfected per AWWA C652. Tanks shall pass a five-day VOC test and have the initial water fill properly disposed of prior to being placed online.
- Minimum storage capacity within tanks shall be calculated as follows: maximum day demand (or two average days demand, whichever is greater) for emergency storage, plus thirty three percent (33%) maximum day demand for operational storage, plus typical system losses (12% minimum), plus the maximum required fire flow plus sprinkler fire flow. Where an existing storage deficit exists, new development shall be required to provide storage as calculated above for the proposed development, including fire flow for the development. No credit for existing fire flow storage shall be allowed, where existing storage is deficient.
- Maximum storage capacity of the tank shall be actual usable volume, calculated from one foot above the top of the outlet pipe to one foot below the invert of the

overflow pipe or greater, depending on piping arrangement, as determined by the District.

- The tank shall have separate inlet and outlet piping. Tanks shall be equipped with Tideflex Series 35 mixing systems or KMPUD approved equal, which shall be fully modeled and proven effective under normal operating conditions. Anti-vortex devices shall be installed as appropriate.
- Tanks shall all have dedicated transmission pipe fill lines, with no service connections. Tanks in the middle of distribution service areas or fed from distribution piping shall not be allowed.
- Flexible couplings are required on all inlet and outlet tank piping.
- A visible, exterior, descending, half size water level indicator shall be provided.
- Baffling of the tank may be required at the discretion of the District.
- All overflow and drain water discharge plans shall be reviewed and approved by the governing entity and KMPUD. A twenty four inch (24") air gap separation shall be provided on all drain and overflow pipelines.
- All exterior tank and piping coatings and color shall be determined by KMPUD.
- Tank type, location and construction methodology shall be selected by KMPUD. Tanks shall be welded steel, be supported by a structurally sound concrete ringwall, have seismic anchor bolts and be fully coated, inside and out, where applicable.
- Tank modeling shall be performed to the satisfaction of KMPUD and shall show the tank provides adequate circulation, turnover, and chlorine residuals throughout the distribution system.
- Adequate storage shall be contained within a single storage tank at each site, or two tanks at the District's direction. Tanks shall operate individually, in sequence and parallel. An equal size replacement tank site, adjacent to the existing tank site shall be provided.
- The tank shall have a minimum of two (2) interior opening manway entry points. Each manway shall be a minimum of thirty-six inch (36") in diameter. All doors and lids shall require no more than fifty (50) pounds force to open, provide lift assistance as required.
- Tanks shall be equipped with minimum thirty-six inch (36") diameter roof vents, stainless steel inside ladder, OSHA approved outside ladder, thirty-six inch (36") square roof hatch, OSHA approved roof handrails completely around the tank, ½ travel liquid level gauges, and inlet and outlet magnetic flow meters connected to KMPUD SCADA. All metal parts in contact with water shall be stainless steel and electrically isolated. Fiberglass ladders shall not be allowed.

- Permanent lettering at least four inches (4") high shall be provided on the tank, nearest to the entrance, labeling the tank name, base elevation and rated capacity.
- A cathodic protection and monitoring system shall be provided per AWWA D104 or AWWA D106. It shall be designed to maintain a stable potential in continuous immersion for a minimum of twenty-five (25) years and completely installed.

1.8.2. Minimum Pump Station Requirements

- Pump design shall be a minimum of three (3) gpm per lot, plus seventy-five (75) gpm, deliverable with a single domestic pump. Domestic pumps shall be a minimum of five (5) horsepower and provide a minimum of seventy-five (75) gpm. Full size redundant/backup domestic pumps shall be installed, for a minimum of two full size domestic pumps. Pumps shall be designed for maximum use with largest unit out of service. Pumps shall operate lead-lag and cycle the lead pump.
- Fire pumps shall be provided, based on the sizing requirements of the authority having jurisdiction, plus peak hour domestic demand and in home fire sprinkler demand.
- Pumps and Motors shall have a minimum combined efficiency of eighty percent (80%). All pumps shall be VFD controlled. Pumps shall run in automatic or hand mode.
- Rubber expansion joints are required on all suction and discharge piping.
- Full size pump bypass piping is required.
- Pumps, VFD's and pump control wiring shall be installed in a fully enclosed, secure, sound attenuated and waterproof concrete or smooth-faced CMU building. A maximum of 60 dBA at the nearest property line is allowed. Allowed internal ambient air temperature shall be a maximum of one hundred (100) degrees and a minimum of fifty (50) degrees. Provide heating, HVAC or ventilation as appropriate. Minimum three foot (3') working spaces shall be provided in front of all equipment and on three sides of all pumps. Minimum five foot (5') working spaces shall be provided in front of all electrical equipment.
- Hydrostatic tanks shall be provided on all pump stations. Tanks shall be a minimum of seven hundred and fifty (750) gallons, with sizing based on KMPUD requirements.

2. Cross Connection Control

2.1. Purpose

The purpose of this program is:

1. To protect the public water supply against actual or potential contamination through cross connections by isolating sources of contamination that may occur within a water user's premises due to some undiscovered, unauthorized or potential cross connection(s) on the premises.

2. To eliminate existing connections between drinking water systems and other sources of water that are not approved as safe and potable for human consumption.
3. To eliminate cross connections between drinking water and sources of contamination.
4. To prevent the making of cross connections in the future.

These regulations are adopted pursuant to the State of California Administrative Code, Title 17 – Public health entitled "Regulations Relating to Cross Connections."

It is unlawful for any person, firm or corporation at any time to make or maintain or cause to be made or maintained, temporarily or permanently, for any period of time whatsoever, any cross connection between plumbing pipes or water fixtures being served with water by KMPUD and any other source of water supply or to maintain any sanitary fixture or other appurtenances or fixtures which, by reason of their construction, may cause or allow backflow of water or other substances into the water supply system of KMPUD and/or the service of water pipes or fixtures of any consumer of KMPUD.

2.2. Definitions

A. Air-Gap Separation: A physical break between a supply pipe and a receiving vessel. The air-gap shall be at least double the diameter of the supply pipe measured vertically above the top rim of the vessel, in no case less than one inch (1").

B. Approved Backflow Prevention Device: Devices which have passed laboratory and field evaluation tests performed by a recognized testing organization which has demonstrated their competency to perform such tests to the California Department of Health Services.

C. Approved Water Supply: Any water supply whose potability is regulated by a State or local health District.

D. Auxiliary Supply: Any water supply on or available to the premises that is connected or poses a reasonable likelihood of being connected other than the approved water supply.

E. Backflow: A flow condition caused by a differential in pressure that causes the flow of water or other liquids, gases, mixtures or substances into the distributing pipes of a potable supply of water from any source or sources other than an approved water supply source. Backsiphonage is one cause of backflow. Back pressure is the other cause.

F. Contamination: A degradation of the quality of the potable water by any foreign substance which creates a hazard to the public health, or which may impair the usefulness or quality of the water.

G. Cross Connection: Any unprotected actual or potential connection between a potable water system used to supply water for drinking purposes and any source or system containing unapproved water or substance that is not or cannot be approved as safe, wholesome and potable. Bypass arrangements, jumper connections, removable sections, swivel or changeover devices, or other devices through which backflow could occur, shall be considered cross connections.

H. Double Check Detector Check Valve Assembly: An assembly of at least two independently acting check valves including flanged, full port resilient wedge shut off valves on each side of the check valve assembly.

I. Health District: The California Department of Health Services, or the local county health District.

J. Local Health District: The Alpine, Amador, or El Dorado County Environmental Health Department, as applicable.

K. Public Water System: A system for the provision of piped water to the public for human consumption that has five (5) or more service connections or regularly serves an average of twenty-five (25) individuals daily at least sixty (60) days out of the year.

L. Reduced Pressure Principle Backflow Prevention Device: A device incorporating two or more check valves and an automatically operating differential relief valve located between the two checks, a flanged, full port resilient wedge shut off valve on each side of the check valve assembly, and equipped with necessary test cocks for testing.

2.3. Cross Connection Protection Requirements

2.3.1. General Provisions

Unprotected cross connections with the public water supply are prohibited. Whenever backflow protection has been found necessary, KMPUD will require the customer to install an approved backflow prevention device by and at his expense for continued services or before a new service will be granted.

Wherever backflow prevention has been found necessary on a water supply line entering a customer's premises, then any and all water supply lines from KMPUD's mains entering such premises, buildings, or structures shall be protected by an approved backflow prevention device. The type of device to be installed will be in accordance with the requirements of this program.

Backflow assembly shall be the same size as the pipe size or larger. Minimum clearance of twelve inches (12") shall be provided on all sides of all backflow devices. Minimum clearance of twenty-four inches (24") shall be provided on all sides of backflow devices three inches (3") and larger.

2.3.2. Where Protection is Required

Each service connection from KMPUD's water system for supplying water to premises having an auxiliary water supply shall be protected against backflow of water from the premises into the public water system unless the auxiliary water supply is accepted as an additional source by KMPUD and is approved by the public health District having jurisdiction.

Each service and fire connection from KMPUD's water system for supplying water to any premises on which any substance is handled in such fashion as may allow its entry into the water system shall be protected against backflow of the water from the premises into the public system.

Backflow prevention devices shall be installed on the service connection to all commercial buildings and any premises having (a) internal cross connections that

cannot be permanently corrected and controlled to the satisfaction of the state of local health department, or (b) intricate plumbing and piping arrangements or where entry to all portions of the premises is not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not cross connections exist.

Any other connection or use of water from KMPUD's system, where protection of KMPUD's system is in question (such as hydrant connections for construction purposes), shall have backflow protection.

All backflow prevention devices for fire protection systems and for three inch (3") and larger devices shall be installed with a five-eights by three-fourths inch (5/8" x 3/4") bypass meter, three-fourths inch (3/4") bypass backflow device of the same type as the main backflow device, three-fourths inch (3/4") shutoff valves per KMW015 layout and test cocks for testing the water tightness of each check valve. All piping for backflow prevention devices three inch (3") and larger shall be class 350 ductile iron pipe or greater.

2.3.3. Fire Protection Systems Using Chemicals

Antifreeze solutions must be premixed in accordance with sections 3.4.1.1, 7.6.2, of NFPA 13. Any other antifreeze solution shall not be permitted.

Installation of antifreeze fire protection systems must follow all applicable standards in NFPA 13, Sections 7.6 and 23.1.3, NFPA 13R, Sections 5.4.2 and 5.4.3, and NFPA 13D Sections 9.2 and 12.3.5.

Inspections, tests, and maintenance of antifreeze fire protection systems must follow all applicable standards in NFPA 25.

Antifreeze solutions must be tested, and verification provided to ensure compliance with the above conditions.

2.3.4. Type of Protection Required

The minimum types of backflow protection required to protect the approved water supply, at the customer's water connection to premises with varying degrees of hazard are given in Table 1. Situations which are not covered in Table 1 shall be evaluated on a case-by-case basis and the appropriate backflow protection shall be determined by KMPUD.

Table 1
Type of Backflow Protection Required

Protective Device	Required For
Reduced Pressure Principle Device	All non-residential applications, including all non-residential fire protection systems. Premises where there are dedicated irrigation connections, or irrigation systems into which fertilizers, herbicides or pesticides are, or can be, injected, spread or sprayed. Premises where chemicals or contaminants may be introduced into the water system. Fire protection systems using chemicals, per Section 2.3.3. All services where there is an unopposed auxiliary water supply interconnected with the public water supply.
Double Check / Detector Check Valve Assembly	Residential fire protection systems not using chemicals.
Double Check Valve Assembly	Two or more domestic service supplying water from different street mains to the same building, structure or premises through which an inter-street main flow may occur.

If more than one hazard is present, the more protective device type shall be required, as determined by KMPUD.

2.4. Backflow Prevention Devices

2.4.1. Approved Devices

Only backflow prevention devices which have been approved by the California Department of Health Services shall be acceptable for installation by a water user connected to KMPUD's potable water system. A list of approved backflow prevention devices can be found at http://fccchr.usc.edu/list.html.

2.4.2. Installation

Backflow prevention devices shall be installed in a manner prescribed in Section 7603, Title 22 of the California Administrative Code and as shown on Standard Drawings No. KMW015 and KMW016. Location of the devices should be as close as practical to the customer's connection. KMPUD shall have the final authority in determining the required location of a backflow prevention device.

2.4.3. Testing and Maintenance

The owners of any premises on which, or on account of which, backflow prevention devices are installed, shall have the devices tested by a person who is licensed and has demonstrated their competency in testing of these devices to KMPUD. Backflow prevention devices must be tested at least annually and immediately after installation, relocation or repair. KMPUD may require a more frequent testing

schedule if it is determined to be necessary. No device shall be placed back in service unless it is functioning as required. A report in a form acceptable to KMPUD shall be filed with KMPUD each time a device is tested, relocated or repaired. The annual test report for each device is due to KMPUD by September 30th of each year. These devices shall be serviced, overhauled or replaced whenever they are found to be defective and all costs of testing, repair and maintenance shall be borne by the water user.

2.4.4. Removal

Approval must be obtained from KMPUD before a backflow prevention device is removed, relocated or replaced.

A. Removal: The use of a device may be discontinued and the device removed from service upon presentation of sufficient evidence to KMPUD to verify that a hazard no longer exists or is not likely to be created in the future;

B. Relocation: A device may be relocated following confirmation by KMPUD that the relocation will continue to provide the required protection and satisfy installation requirements. A retest will be required following the relocation of the device;

C. Repair: A device may be removed for repair, provided the water use is either discontinued until repair is completed and the device is returned to service, or the service connection is equipped with other backflow protection approved by KMPUD. A retest will be required following the repair of the device; and

D. Replacement: A device may be removed and replaced provided the water use is discontinued until the replacement device is installed. All replacement devices must be approved by KMPUD and must be commensurate with the degree of hazard involved.

Technical Standards

3. Construction Specifications

3.1. Treated Waterline Piping

Allowable treated waterline pipe materials shall be Polyvinyl Chloride (PVC) Pressure Pipe, Ductile Iron Pipe, or Polyethylene Pipe. Specifications for individual pipe materials are given below.

All pipes shall be designed for a minimum internal working pressure of two hundred and thirty-five (235) psi or as otherwise specified by KMPUD.

Design Conditions:

- Minimum trench width shall be one pipe outside diameter plus eight inches (8”) on either side of the pipe, and a maximum of one pipe outside diameter plus thirty-six inches (36”) unless otherwise approved by the District.
- Bedding tamped to twelve inches (12”) above pipe, load factor 1.5.

- Soil density one hundred thirty-five (135) pounds per cubic foot.
- Bedding angle ninety (90) degrees.
- Live load AASHTO H-20, sixteen thousand (16,000) pound wheel load.
- Rigid pipe 1.5 factor of safety versus crushing.
- Flexible pipe allowable deflection – as specified by pipe manufacturer.
- Above design conditions apply to an empty conduit with no internal pressure.
- No Star Pipe Products materials are allowed.

3.2. Pipeline Depths

All piping and services shall normally have thirty-six inches (36") minimum cover, except where specifically approved by KMPUD and noted on the project plans. If elevations shown on profile drawings results in less than thirty-six inches (36") of cover, then the thirty-six inches (36") of cover requirement shall prevail.

- Less than twenty-four inches (24") of Cover: Not allowed.
- Twenty-four to thirty-six inch (24" to 36") Cover: Use C-900 PC 235 or Ductile Iron Pipe. Two sack sand slurry backfill and/or special thickness class ductile iron pipe may be required, per KMW001. Approval of KMPUD required.
- Thirty-six to sixty inch (36" to 60") Cover: Use C-900, PC 235 or greater, or Ductile Iron Pipe.
- Greater than sixty inches (60") of Cover: Not allowed, without special approval by KMPUD.
- No service connections or ARVs shall be allowed where cover is less than thirty-six inches (36") without special permission from KMPUD.
- Where concrete pipe covering is required, KMPUD approval is required. Pipe shall be covered in a minimum of twelve inches (12") of two thousand (2,000) psi concrete, specially designed and stamped by a California licensed Professional Engineer. Pipe bedding shall be placed under the pipe, around pipe haunches and to two inches (2") above the pipe per KMPUD standards, pipe installation and locating wire per KMPUD standards. Concrete covering shall consist of a minimum of concrete intermediate backfill concurrently poured from two inches (2") above the top of pipe, to a twelve inch (12") minimum thickness above top of pipe or to the bottom of the roadway base course, whichever is greater. Concrete intermediate backfill shall be a minimum of twelve inches (12") wider than the outside of the pipe wall on both sides. Install rebar as required. Locating tape shall be laid on top of the concrete.

Maximum trench depth shall be six feet (6'), without special approval from KMPUD. Contractor shall comply with OSHA and Cal-OSHA trench safety requirements.

Pipelines greater than twelve inch (12") or with hazardous laying conditions require different material and specifications, see KMPUD standard specifications and details.

3.3. Pipeline Types

3.3.1. Polyvinyl Chloride (PVC) Pressure Pipe

Polyvinyl Chloride (PVC) Pressure Pipe in sizes four inches (4") through thirty-six inches (36"), shall conform to current AWWA C900 and have Underwriters' Laboratories, Factory Mutual and NSF approval. PVC pipe shall be a minimum of dimension ratio (DR) eighteen (18), Pressure Class (PC) 235 for internal working pressures up to one hundred fifty (150) psi; use a minimum of DR fourteen (14), PC 305 for internal working pressures between one hundred fifty (150) psi and two hundred (200) psi. For internal working pressures greater than two hundred (200) psi, the pipe DR/Class shall be approved by KMPUD.

Pipe shall have bell and spigot joints conforming to ASTM D 3212 and have flexible watertight elastomeric seals conforming to ASTM F 913 or F 477. Solvent, glue-joints or butt fused pipe shall not be allowed.

Joints between PVC pipe, and other types of pipe shall be made by means of the proper sized and type compression adapters. Lengths of PVC shall be joined by a locked-in flexible elastomeric gasket coupling with bell and spigot configuration. Lubricants intended for use with PVC pipe shall be compatible with the plastic material and not adversely affect the potable quality of the water being transported. Joints between PVC pipe and fittings shall be slip-on type or mechanical type as shown on the plans. Slip-on type joints shall be sealed by means of rubber rings designated for use with the type of pipe being installed.

3.3.2. Ductile Iron Pipe

3.3.2.1. Materials

Ductile iron water pipe shall conform to current AWWA C151 specifications, shall be cement lined per AWWA C104, and shall be plastic film wrapped. Ductile iron pipe shall be minimum pressure class 350 and thickness class 50 unless otherwise required by the pressure, loading or as specified on the plans.

3.3.2.2. Joints

Joints that are aboveground, submerged, or located in vaults and structures shall be flanged. Joints in buried piping shall be of the restrained, slip-on or mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment. Assembly of pipe and joints shall follow the manufacturer's instructions. After assembly of each slip-on joint, the final location of rubber rings within each joint shall be checked by gauge as recommended by the manufacturer.

Joints between ductile iron pipe, and other types of pipe shall be made by means of the proper sized and type compression adapters.

All ductile iron, steel, ferrous, copper, brass or metal pipe and joints shall be completely bonded and catholically protected.

3.3.2.3. Fittings

Fittings shall conform to AWWA C110 with a minimum pressure rating of two hundred fifty (250) psi. Size bells specifically for OD of cast iron equivalent PVC pipe including rubber ring retaining groove. Mechanical joint fittings conforming to AWWA C153 may be used in lieu of AWWA C110 fittings, except where otherwise shown or noted. Mechanical joint ductile-iron fittings conforming to AWWA C110 (except for laying length) with a minimum pressure rating of two hundred fifty (250) psi may also be used, except where otherwise shown or noted. Fittings shall be cement-mortar lined per AWWA C104, protected with bituminous coating, or fusion bonded epoxy lined and coated fabricated steel fittings.

3.3.2.4. Flanges

Flanges shall be solid back, minimum Class 125 per AWWA C115. Flanges on pipe shall be either cast or threaded. Flanged pipe and fittings shall be shop fabricated, not field fabricated. Threaded flanges shall comply with AWWA C115. Flanges shall be individually fitted and machine tightened in the shop, then machined flat and perpendicular to the pipe barrel. Flanges shall be back-faced parallel to the face of the flange. Prior to assembly of the flange onto the pipe, apply a thread compound to the threads to provide a leak-free connection. There shall be zero leakage through the threads at a hydrostatic test pressure of two hundred fifty (250) psi without the use of the gasket. Material for blind flanges shall be cast or ductile iron. Restrained flange adapters may be used in lieu of cast or threaded spool pieces. See Section 3.6.24.

3.3.2.5. Coatings

Above ground pipe, exposed pipe, in vault pipe, or pipe and fittings not otherwise buried shall be Epoxy Coated.

3.3.3. Restrained Joint Pipe

Provide Restrained Joint Pipe where restrained joints are specifically shown on the drawings or otherwise required. Restrained joints shall consist of a follower gland having a seal gasket and individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The system manufacturer shall provide all the components (follower ring, wedges, and gaskets) for the restraining device. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial.

Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51 or PVC manufactured in accordance with AWWA C900 or C905. PVC bell restraints will not be allowed. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11 “Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings”. Any pipe restraint in lieu of thrust blocks shall be designed by a California Registered Professional Engineer

in accordance with applicable standards, guidelines and actual field soil and laying conditions. Restraint lengths and other requirements shall be clearly noted on the Drawings.

Restrained joint fittings and the restraining components shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.0 and/or C153/A21.53 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11.

Restrained joint glands shall be EBAA Iron 1100 MEGALUG for Ductile Iron or EBAA 2000PV MEGALUG for PVC, or approved equal. Restraint gaskets shall be US Pipe "FIELD LOK", or approved equal. US Pipe "TR Flex" restrained joint pipe and fittings are approved for use at any locations where restrained joints are required or elected to be utilized by the Contractor. Pressure ratings for restrained joint glands shall at a minimum equal the pressure rating of the pipe required for the installation. Requests for use of any other restraint types, such as split restraint rings, shall be submitted to the District for approval on a case by case basis.

3.4. Treated Water Service Piping

Five-eighths inch (5/8") and three-fourths inch (3/4")meters shall be served with one inch (1") polyethylene service piping. One and one-half inch (1 1/2") and two inch (2") meters shall be served with two inch (2") polyethylene service piping.

Specifications for individual pipe materials are given below.

3.4.1. Polyethylene (PE)

Polyethylene pipe shall be Class 200, SDR7 and shall conform to ASTM DD2239. All pipe connections shall be compression type, Mueller C-110, Ford Pack-Joint or KMPUD approved equal.

3.5. Epoxy Coating

"Epoxy Coating" or "Epoxy Coated" shall mean a high-performance high solids epoxy and polyurethane coating for use in severe environments.

Surfaces to be epoxy coated shall be sandblasted per SSPC-SP 6/NACE No. 3 commercial blast cleaning. Sandblasted surfaces shall be coated with primer to a dry film thickness of 3 mils. A high performance, high solids epoxy coat (dry film 5 mils) shall be applied to the primed surface, Rust-Oleum 9100 System DTM Epoxy Mastic or equal. A high performance, aliphatic acrylic polyurethane finish (dry film 3 mils), shall be applied to the epoxy, Rust-Oleum 9700 System 250 VOC Polyester Urethane or equal.

The manufacturer's recommendations and recommended drying time between coats shall be followed. The contractor shall prepare multiple-component coatings using all of the contents of the container for each component as packaged coatings that have been mixed beyond their pot life shall not be used. Touch up paint shall be provided. The contractor shall mix only the components specified and furnished by the paint manufacturer. The contractor shall not intermix additional components,

even within the same generic type of coating. Coating color shall be as directed by the Kirkwood Volunteer Fire Department Chief for hydrants and safety red for bollards, or per ANSI A13.1 for all other infrastructure.

3.6. Valves and Appurtenances

3.6.1. Gate Valves

Treated waterline valves two inches (2”) to ten inches (10”) shall be gate type.

Gate valves shall be resilient seated wedge type, minimum two hundred fifty (250) psi WOG rated, and conform to AWWA C509 or AWWA C515 with ASME B16.1 Class 125 flanges minimum. All interior ferrous surfaces shall be protected against corrosion by factory applied fusion-bonded epoxy coating, which shall be a minimum of eight (8) mils thick and per AWWA C550. Valves shall have a smooth inside bore on the bottom half so that sediment cannot accumulate. Valves shall open counter-clockwise. Valves installed underground shall have a non-rising stem and a two inch (2”) square operating nut that is accessible through a valve box. Valves installed above ground shall have outside stem and yolk (OS&Y), rising stem, and be hand wheel operated.

Stems shall be Type 304 or 316 stainless steel or cast, forged, or rolled bronze. Stem nuts shall be made of solid bronze. Bronze shall conform to ASTM B 62 or ASTM B 584 (Alloy C83600). All exterior valve body bolting shall be type 304 stainless steel with hexagonal heads. Valves shall be NSF 61 and NSF 372 certified.

Surfaces of gate valves one and a half inches (1 1/2") and smaller that are in contact with water shall be constructed of lead-free brass (e.g. UNS C28500, C89550 or C89833). Valves one and a half inches (1 1/2”) or smaller shall be hand wheel operated, non- rising stem, minimum two hundred (200) psi WOG.

Valves installed above ground shall be flanged and hand wheel operated. End connections for buried gate valves four inch (4”) and larger shall be mechanical joint, flanged, or mechanical joint by flanged type as required.

3.6.2. Butterfly Valves

Treated waterline valves twelve inches (12”) or larger shall be butterfly type.

All butterfly valves shall be rubber seated, minimum two hundred fifty (250) psi WOG rated and conform to the requirements of AWWA C504 with ASME B16.1 Class 125 flanges. Valves shall be short cast iron body type.

Valve shafts shall be Type 304 or 316 stainless steel. Valve shafts shall be stub shaft or one-piece units extending completely through the valve. Body bolts and nuts shall be Type 304 or 316 stainless steel. Where the rubber seat is applied to the disc, it shall be bonded to a stainless steel seat retaining ring which is clamped to the disc by Type 304 or 316 stainless steel screw fasteners. The rubber valve seat shall be secured to or retained in the valve body.

Valve disks shall be ductile iron ASTM A536 grade 65-45-12. The valve assembly shall be furnished with a non-adjustable factory set thrust bearing to center the disk at all times. Valves shall be NSF 61 and 372 certified.

All butterfly valves shall be operated manually and shall open counter-clockwise. Valves installed underground shall be traveling nut operated with all gearing fully encased with a double stop feature and have a two inch (2") square operating nut that is accessible through a valve box. Actuators on twelve inch (12") to fourteen inch (14") butterfly valves shall have ratings of four hundred fifty foot pounds (450' lbs.) input torque at the open and closed stops without damage. Actuators shall be sized to provide sufficient output torque to operate the valve.

Valves installed above ground shall be flanged and be lever operated through eight inch (8") and hand wheel operated for larger sizes. Butterfly valves four inches (4") and larger shall be flanged with flange adaptors as required.

All interior ferrous surfaces shall be protected against corrosion by a factory applied fusion-bonded epoxy coating which shall be a minimum of eight (8) mil thick per AWWA C550.

3.6.3. Tapping Valves

Flanged gate valves shall be used for hot tapping waterlines. All gate valves conform to these specifications.

3.6.4. Tapping Sleeves/Saddles

Tapping sleeves shall be entirely Type 304 Stainless Steel, including the flange, nuts and bolts, as manufactured by JCM, Ford, Smith-Blair or Romac. Tapping saddles shall be ductile iron as manufactured by Mueller. Size on size taps, or taps greater than 75% of the nominal size of the main, shall not be permitted.

For two inch (2") and smaller taps on pipelines, the taps shall be spaced a minimum of twenty-four inches (24") apart and installed forty-five degrees (45^{o}) apart. For three inch (3") and larger taps on pipelines, the taps shall be spaced a minimum of four feet (4') apart. No tapping sleeve or saddle shall be placed within twenty-four inches (24") of any bell, fitting or cut end.

3.6.5. Flanged Gaskets

Gaskets for ductile iron flanged joints shall be full-face type SBR or Neoprene elastomer per ANSI/AWWA C111/A21.11 and shall be one-eighth inch (1/8") thickness. Flanged gaskets shall be U.S. Pipe FLANGE-TYTE II or KMPUD approved equal. No bonding agent (i.e. Permatex) shall be used on the flange or gasket. The flange face shall be free of any foreign matter and/or rough surface.

3.6.6. Nuts and Bolts

Nuts and bolts, not specified elsewhere, shall be stainless steel conforming to ASTM F593 & F594, SAE Grade 2 or better. Threads shall be coated with Loctite anti-seize, or equivalent, before assembly.

The bolt shall extend at least three (3) threads past the nut and no more than one inch (1").

3.6.7. Service Saddles

All service saddles shall be female NPT threads. Service saddles shall be NSF 61 certified. Service saddles for ductile iron pipe shall be of 85-5-5-5 bronze

construction and may be wide strap, double strap type, or a combination of the wide/double types. Service saddles for all other types of pipe shall be wide strap. Recommended manufacturers are Mueller, Ford, Jones, and Romac, or KMPUD approved equal.

3.6.8. Corporation Stops

Corporation Stop components that are in contact with the water shall be of made of lead-free brass alloy (e.g. UNS C89833, C89550 or C28500). Components not in contact with the water may be 85-5-5-5 bronze (UNS C83600) as manufactured by the James Jones Company, Mueller Company or Ford. Corporation stops must comply with AWWA C800.

Inlet threads shall be male iron pipe (MIP) threads. Outlet shall be Mueller Insta-tite.

3.6.9. Plastic Film Wrap

Plastic Film Wrap shall be used around all ductile iron pipe, buried valves, bolted flanges and other fittings. All exposed or buried copper, brass or bronze pipe or fittings, shall also be wrapped with Plastic Film Wrap. The polyethylene film shall be of virgin polyethylene as produced from DuPont Alathon resin and shall meet the requirements of ASTM Designation D3350 and AWWA C105, and shall have a flow rate or nominal melt index of 0.4 g/min maximum.

The polyethylene film shall be colored ‘blue’ and a minimum six (6) mils in thickness. The length shall be sufficient to firmly attach the film to the pipe on either side of the valve, flange or fitting with ten (10) mil PVC tape. Plastic film wrap shall be completely sealed on all ends, edges, cuts and seams with ten (10) mil PVC tape.

3.6.10. Meter Boxes

Standard meter boxes shall be a single Mueller Thermal-Coil Meter Box. If irrigation service is installed a dual Mueller Thermal-Coil Meter Box is required. Lids shall be marked “Water”. For three inch (3”) and larger meters, boxes shall be sized to allow adequate room for the meter, meter stop, gate valve, check valve and full line size bypass with locking valve.

In areas where vehicle traffic may occur, meter boxes shall be traffic rated with steel lids. An accessible walking path, from the street to each meter box shall be provided with a maximum 10% slope.

Meter boxes shall be set or bedded on a minimum of 6” of three-fourth inch (3/4”) crushed rock and extended a minimum of 6” on all sides of meter boxes.

3.6.11. Angle Meter Stops

Angle Meter Stops shall have a locking wing. Components that are in contact with the water shall be of made of lead-free brass alloy (e.g. UNS C89833, C89550 or C28500). Components not in contact with the water may be 85-5-5-5 bronze (UNS C83600) as manufactured by Mueller, James Jones, or Ford. Inlet shall be Mueller “Insta-Tite,” with a meter coupling nut outlet. Angled meter stops greater than one inch (1”) shall have a flange connection to the meter.

3.6.12. Combination Air and Vacuum Release Valves

Air and vacuum release valves shall be combination air and vacuum release valves (CAVRV or ARV) as manufactured by the Valve and Primer Corporation (APCO) 143C, 145C, etc., Crispin UL10, 20, etc. or Val-Matic 201C, 202C, etc., bronze or stainless steel trim. Size shall be per these Specifications, as shown on the plans and/or Standard Drawing No. KMW005. Boxes shall be sized as necessary.

Provide one inch (1") CAVRV with a minimum air release orifice diameter of 5/64" on line sizes up to twelve inches (12") and two inches (2") CAVRV with a minimum air release orifice diameter of 3/32" on line sizes fourteen inches (14") to eighteen inches (18"), the CAVRV size shall be approved by the District.

Pipe taps for CAVRV shall always be at actual high points of waterline, except as noted in 1.7.5. The service line from the water main to CAVRV shall slope up at a minimum of two percent (2%) and be at least the same size as the nominal CAVRV size. Service lines for CAVRVs two inches (2") and smaller shall comply with 1.6.4 Water Service Piping.

3.6.13. Control Valves

Control valves include all pressure reducing and pressure relief valves. Control valves larger than two inches (2") shall be of the diaphragm type with hydraulic pilot controls that are top mounted in the factory and tested prior to shipment as manufactured by Cla-Val. Control valves two inches (2") and smaller shall be direct acting type. All control valves of any given type shall be supplied by one manufacturer. All operators shall be hydraulically controlled with manual overrides that can shutdown the valve without disrupting the spring setting on the pilot control.

Control valves shall be equipped with these features: Pilot line wye strainers, inlet and outlet pressure gauges, flanged, closing speed control, opening speed control, portion indicator, stainless steel ball shutoff valves (not on pressure relief valves), v-port seating, fusion epoxy coating (wetted parts only), stainless steel trim and stainless steel tubing. Control valves shall have flanged isolation valves.

All control valves require submittals, which shall be reviewed and approved prior to field installation.

3.6.13.1. Pressure Reducing Valves

Pressure Reducing Valves (PRV) shall be a combination pressure reducing and pressure sustaining, Cla-Val Model 92-01. No comparable products or equals shall be allowed due to standardization requirements. Properly designed CAVRVs shall be installed immediately downstream of all PRVs.

3.6.13.2. Pressure Relief Valves

Valves shall be diaphragm type designed to maintain a steady upstream pressure by relieving excess pressure without causing line surges, Cla-Val Model 50-01. No comparable products or equals shall be allowed due to standardization requirements.

3.6.13.3. Altitude Valves

Altitude valves shall be hydraulic operated, diaphragm actuated, pilot controlled type. Valves shall be single-seated and have a resilient disc for tight closure. Valves shall be combination altitude and pressure-sustaining valves equipped with pressure sensitive closing, differential control, opening speed control. Valves shall be Cla-Val Type 210-01. No comparable products or equals shall be allowed due to standardization requirements. Valves shall be furnished with options and featured similar to Pressure Control Valve requirements. For differential pressure higher than 60 psi, valve shall be piston type or include an orifice plate.

3.6.14. Ball Valves

Threaded ball valves, two inches (2") and smaller shall have lead-free bronze (e.g. UNS 87600, 89836, 89833, 89550, 69300, 27451, 46500, 23000, 28500 etc.) body and plug ball retainer. Ball and stem shall be bronze (as specified for the body) or Type 316 stainless steel. Provide chrome plated ball, if ball is bronze. Valves shall have screwed ends (ANSI B1.20.1), non-blowout stems, reinforced Teflon seats, and have plastic-coated lever operators. Valves shall have a pressure rating of at least three hundred (300) psi WOG at a temperature of 150°F.

Double true union thermoplastic ball valves, three inches (3") and smaller shall be rated at a pressure of one hundred and fifty (150) psi. Body, ball, and stem shall be PVC conforming to ASTM D 1784, Type 1, Grade 1. Seats shall be Teflon. O-ring seals shall be EPDM. Valve ends shall be of the double-union design. Ends shall be socket welded except where threaded or flanged-end valves are specifically shown on the plans. Valves shall have handle for manual operation. Valves shall be as manufactured by Spears Manufacturing Company, or KMPUD approved equal.

3.6.15. Globe Valves

Globe valves, three inches (3") and smaller, shall be all bronze with screwed ends, union bonnet, inside screw, rising stem, and composition or PTFE disc. Valves shall have a pressure rating of at least three hundred (300) psi at a temperature of 150°F. Wetted surfaces shall be lead-free bronze (e.g. UNS 87600, 89836, 89833, 89550, 69300, 27451, 46500, 23000, 28500 etc.). Stem shall be bronze: ASTM B 371 (Alloy C69400), ASTM B 99 (Alloy C65100), or ASTM B 584 (Alloy C87600). Valves shall be Crane 7TF, or KMPUD approved equal.

Globe valves larger than three inches (3") shall be iron body with yoke bonnet and bronze trim and shall have a designated working pressure of two hundred (200) psi.

3.6.16. Solenoid Valves

Solenoid valves shall be two-way, full line size, normally closed, diaphragm type, one hundred twenty-five (125) minimum psi body pressure, five (5) psig minimum operating differential for use with cold water or air. Solenoid valves shall have forged brass (Alloy C23000) or bronze (ASTM B 62) bodies with Teflon main seats. Internal plunger, core tube, plunger spring, and cage assembly shall be stainless

steel (Types 302, 304, or 305). Seals shall be Teflon. Valve shall be suitable for one hundred fifteen (115) volt, sixty (60) Hz AC power supply, and shall be as manufactured by Automatic ASCO Switch Company, Model 8210, or KMPUD approved equal.

All solenoid valves shall have manual operators, encapsulated coils and shall have electrical characteristics as indicated on the drawings. All valves shall be mounted horizontally.

3.6.17. Swing Check Valves

Swing check valves one and a half inches (1½") and smaller shall be minimum Class 125, wye or tee pattern, lead-free brass (UNS C89550 or C28500). Ends shall have female NPT threads per ANSI B1.20.1. Disc shall be lead free brass (UNS C89550 or C28500), swing type. Minimum working pressure shall be two hundred (200) psi WOG at a temperature of 150°F, or 50 psi higher than static pressures.

Swing check valves for waterlines two inches (2") and larger shall be cast iron (ASTM A 48, Class 30, or ASTM A 126, Class B) body and cover. All interior ferrous surfaces shall be protected against corrosion by factory applied fusion-bonded epoxy coating, which shall be a minimum of eight (8) mils thick and per AWWA C550. Flapper shall consist of a steel disk insert and a steel bar hinge covered with Buna-N vulcanized to the metal pieces. Provide O-ring seal vulcanized onto the disk. Valve shall be designed for a minimum working pressure of not less than one hundred seventy-five (175) psi, or fifty (50) psi higher than static pressures, and tested at three hundred fifty (350) psi. They shall be of the balanced, swing gate type with a clear opening at least equal to that of the connecting pipe. Cast in place or pre-cast concrete vaults will be required for all buried check valve installations. Two inch (2") and larger swing check valves shall be ductile iron body APCO Series 100SR, with reinforced NBR flapper, or KMPUD approved equal.

3.6.18. Valve Boxes

Valve boxes shall be provided for all underground valves and shall be pre-cast concrete, Brooks or Christy G5 Traffic Valves boxes. Lids shall be cast iron traffic type G5C and marked "WATER." If noted on the plans additional markings may be necessary.

3.6.19. Valve Riser Extensions

A single piece of eight inch (8") diameter PVC conforming to AWWA C900 water pipe or SDR35 sewer pipe shall be used and installed per KMW004. No joints, cuts, splices or extensions shall be allowed in risers. Valve operating nuts shall be installed between two feet (2') and four feet (4') of the top of the surface or top of the G5, whichever is higher, per KMPUD Standards or extended per KMW010.

3.6.20. Strainers

Unless otherwise noted, air and gas line strainers shall be Y-pattern bronze body, with 40 mesh screen packed with copper or stainless steel wool. Air line strainers shall be fitted with a brass blowoff cock.

Unless otherwise noted, water line strainers shall by Y-pattern, iron body with 20 mesh Monel screen, and fitted with a brass blowoff cock.

3.6.21. Pressure Gauges

Unless otherwise noted, pressure gauges shall be stainless steel bourdon type with a two and a half inch (2½") diameter dial and black alumalite cases suitable for mounting as required. Pressure range and calibrations shall be as required and the dial shall be engraved with the units in which the gauge is calibrated. All pressure gauges shall be glycerin filled.

Pressure gauges shall be rated for service intended, including negative pressure (vacuum gauge or compound gauge). All pressure gauges shall be installed with a brass isolation valves and blowoff valve. Full scale pressure range shall be approximately twice the normal operating pressure. The normal operating pressure should not exceed seventy-five percent (75%) of the full range scale.

3.6.22. Locating Cable & Locator Tape

Direct burial blue copper wire solid, Soft Drawn No. 10 insulated, shall be taped to the top of all pipe every five (5) feet with ten (10) mil PVC tape. The wire shall be procured from the vendor complete with an approved gel splice and insulation kit, and cable joints shall be spliced in accordance with the manufacturer's instruction and KMW004 to form a set of continuous electrical conductors throughout the pipe system. Where pipe branches occur, the wire shall be branched also so that wire is provided to each valve, fire hydrant, water service, all other appurtenances and to the locating wire of the branch if the existing branch has one.

All water pipe shall be marked with a three inch (3") blue metallic locator tape, located twelve inches (12") directly above the pipe and bedding material. The tape shall be marked with one and a half inch (1½") black "CAUTION – WATER LINE BURIED BELOW" lettering and be placed face up in the trench.

3.6.23. Flexible Couplings

Flexible couplings shall have a minimum pressure rating equal to the pipe class. Care shall be taken to see that smooth surfaces have been provided on the pipe so that the coupling can be properly fitted. Flexible couplings for cast iron, ductile iron, PVC or AC pipe shall be Smith-Blair Model 411, 441 or KMPUD approved equal. Transition couplings shall be Smith-Blair Model 413, 441 or KMPUD approved equal. Reducing couplings shall only be used where approved by KMPUD and shall be Smith-Blair Model 415, R441, or KMPUD approved equal.

3.6.24. Flanged Coupling Adapters

Flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with AWWA C115.15. For PVC pipe, the flange adapter shall have a pressure rating equal to or greater than the pipe. For Ductile Iron pipe, the flange adapter shall have a minimum safety factor of 2:1. The flange adapter shall be Series 2100 Megaflange adapter by EBAA Iron, Inc., or KMPUD approved equal.

3.6.25. Rubber Expansion Joints

Rubber expansion joints, which allow expansion and control vibration when connecting rigid piping to pumps and other mechanical equipment, shall be Holz Series 980, by Holz Rubber Company, or KMPUD approved equal.

3.6.26. Fire Hydrants

Fire hydrants shall be dry barrel type, with five and one-fourth inch (5¼") main valve, and meet AWWA C502. Unless otherwise indicated on the plans or as required by KMPUD, all hydrants shall have one, four and a half inch (4 ½") outlet and two, two and a half inch (2 ½") outlets with National Standard Fire Hose Threads (NH/NST). Hydrants shall be installed with breakaway spools. Where fire flow requirements exceed one thousand (1,000) gpm, eight inch (8") hydrant laterals shall be used. Where fire flow requirements exceed one thousand seven hundred and fifty (1,750) gpm, ten inch (10") hydrant laterals shall be used. Where fire flow requirements exceed three thousand (3,000) gpm, two, four and a half inch (4 ½") outlets and one, two and a half inch (2½") outlet will be required along with special design considerations as determined by KMPUD. Contractor shall install a valve key and riser assembly meeting the specifications of KMW006A and KMW006B.

Hydrants shall be Mueller A-421, or KMPUD approved equal.

For every one to five (1-5) hydrants installed, and for every five (5) hydrants thereafter, contractor shall provide a complete rebuilding kit including but not limited to all special tools, O-rings, gaskets, seats, seals, caps, shear and clevis pins, bolts, nuts, nozzles washers, safety couplings, bonnets, stems, oils, sleeves and greases and break-a-way spool prior to the installation of the hydrant.

All fire hydrants, guard posts and bollards shall be Epoxy Coated in a color as approved by the Kirkwood Volunteer Fire Department Chief per NFPA 291 sec 5.2.1.1. Bollards per KMW007 and KMW007B are required on all sides of fire hydrants where required to protect the hydrant from vehicle impact as determined by KMPUD.

Hydrants shall be completely covered or "bagged" until available for use with three (3) mil heavy duty forty two (42) gallon garbage bags and wrapped with at least four wraps of ten (10) mil tape spaced a minimum of six inches (6") apart.

3.6.27. Sampling Stations

Sampling stations shall have a twenty-four inch (24") bury, with a three quarter inch (¾") FIP inlet and a three quarter inch (¾") unthreaded nozzle. All stations shall be enclosed in a lockable, non-removable aluminum housing. When opened, the station shall require no key for operation, and the water will flow in an all brass waterway. All working parts will also be of brass or stainless steel and be removable from above ground with no digging. The exterior piping will be brass. Unless otherwise approved by KMPUD, all sampling stations shall be Station Guard XLT or KOR-Cold manufactured by Koraleen Enterprises, and meet all requirements of Standard Drawing No. KMW012. All piping shall be protected with closed cell pipe insulation, minimum one inch (1") thick.

3.6.28. Magnetic Flowmeters

Magnetic flowmeters and transmitters shall be by Rosemount; no comparable products or equals shall be allowed due to standardization requirements.

3.6.29. Vaults

Cast in place or pre-cast concrete vaults will be required for all buried valves and appurtenances. Valve vaults shall provide twenty-four inches (24") minimum clearance from the inner wall of the vault to any piping, valves or appurtenances. Traffic rated lids shall be used in all traffic areas. Lids weighing over fifty (50) lbs shall be equipped with mechanical lift assistance devices so that no more than fifty (50) lbs of effort is required to open the lids. Fiberglass tanks or vaults shall not be permitted. All vaults and boxes shall have a twelve inch by twelve inch (12" x 12") concrete collar with two horizontal #4 rebar placed four inches (4") apart vertically and four inches (4") from any edge. The exterior and interior of all vaults shall be thoroughly coated with Thoroseal (MasterSeal 581) or KMPUD approved equal prior to installation.

Above ground, exposed, in vault or pipe and fittings not otherwise buried shall be Epoxy Coated.

3.7. Backflow Devices

All backflow prevention assemblies shall be as approved by the State of California department of Health Services. All backflow assemblies shall be installed above ground. See Standard Drawing No. KMW015 and KMW016.

3.8. Installation and Testing

3.8.1. Laying of Pipe

Pipe trenching and/or excavations shall not be permitted until the site has been brought to finish grade or the roadway has been brought to subgrade.

Pipe shall be laid and joined in accordance with manufacturer's and/or KMPUD Inspector's directions. Necessary facilities including slings shall be provided for lowering and properly placing pipe sections into the trench without damage.

Each section of pipe shall be thoroughly cleaned before it is lowered into the trench.

If clean pipe sections and fittings cannot be placed in the trench without getting dirt into open pipe, the KMPUD Inspector may require a piece of material to be tied over the ends of the pipe or fitting until it has been lowered into position in the trench. After the pipe has been lowered the trench, all foreign matter shall be completely brushed from the pipe ends before assembly.

The pipe shall be cut to provide closure pieces of correct lengths to permit the proper location of the pipe sections, or to locate valves, fittings and appurtenant structures where specified on plans.

The pipe and fittings shall be laid to the lines and grades specified on plans and centered in the trench. All horizontal and/or vertical bends of eleven and one fourth (11¼) degrees or more shall have thrust blocks as shown on Standard Drawing No. KMW013 or be fully restrained, except where specifically noted.

The alignment and elevation of the pipeline as shown on the drawings are designed to avoid conflict with new and existing underground utilities.

Trenches must be kept dry until pipe has been laid, joints closed and backfill completed to a depth of one foot (1') above top of pipe. Crushed rock or pea gravel shall be provided for drainage, backfill and/or bedding as directed by KMPUD. Crushed rock shall not be used for PVC pipe bedding.

Temporary water tight plugs shall be provided for closure of the open ends of the pipelines each time pipe laying activity stops and at the end of each working day to prevent the entry of dirt and/or other contaminants.

3.8.2. Connections to Existing Pipelines

All connections to existing pipelines shall be made as shown on the plans and in accordance with these Specifications.

Where the existing main is provided with fittings for connecting to the new main, the face of the connection shall be clean and free of all foreign materials. The Contractor shall remove the plug, cap or blind flange, clean the ends and make the new joint. Where necessary, as determined by the District, Developer and/or Contractor shall be responsible for flushing and disinfecting per Section 3.8.5 and AWWA C651 previously installed water pipes, stub-outs, or other points of connection, to which the project is connecting prior to tie-in or connection.

Where the existing main is not provided with fittings for connecting to the new main, connections shall be made either by hot tap or by cutting and inserting sections of pipe and fittings, as shown on the plans or as directed by KMPUD Inspector.

For hot tap installations, the tapping saddle shall have a test plug and shall be air tested at fifty (50) psi for five (5) minutes. Tapping valves shall be flange by flange. All hot taps shall be witnessed by KMPUD Inspector.

Contractor shall submit shutdown requests, in writing on the appropriate KMPUD form, at least ten (10) full working days prior to any shutdown. After the shutdown request is received in writing, shutdowns will be scheduled by KMPUD, as determined by KMPUD. Approval for shutdowns shall be received prior to scheduling the work. In no case shall any shutdowns or connection operations commence prior to passing pressure and bacteria tests, in conformance with AWWA C651, and receiving KMPUD approval.

When deemed necessary by the KMPUD Inspector, shutdowns of existing in-service pipeline, treatment and other facilities shall be made by KMPUD as required to complete pipeline connections. A shutdown shall be only for as short a period of time as necessary. This varies with each job and must be planned accordingly. Unless dictated by water system consideration, or emergencies, in no case will a shutdown and/or connection be scheduled with less than ten (10) working days' notice. Interference with the operation of KMPUD's distribution system shall be kept at a minimum. Shutdowns shall be less than eight (8) hours, unless specifically approved in writing by the KMPUD Inspector. While an existing pipeline is shut down, the connection work shall be performed without interruption, continuing after regular working hours if necessary, until completed, unless

otherwise directed by KMPUD Inspector. Shutdowns may be required by KMPUD at times other than normal working hours and/or days. Shutdowns shall not be scheduled Fridays through Mondays. All costs for labor, equipment and meals shall be the responsibility of the Contractor.

In all cases, shutdowns shall be made under the direction of KMPUD Inspector. If the work is not fully excavated and product assembled as much as physically possible eighteen (18) hours prior to the scheduled shutdown, the shutdown shall be deemed mishandled due to the contractor failing to diligently prosecute the work, and the shutdown shall be cancelled, rescheduled and re-noticed as required above. If the shutdown is cancelled in this way due to the contractor's failure to properly prepare or schedule the work, the labor, time, noticing and material costs of the shutdown and rescheduling shall be paid for by the Contractor or Developer, or deducted from the contract. KMPUD shall close all valves in making a shutdown and shall open all valves to restore pressure to the existing main, as well as initiate pressure to the new installation. Contractors or anyone other than KMPUD personnel shall not operate any valves, whether part of the KMPUD accepted system or not.

3.8.3. Abandonment of Existing Facilities

Existing facilities shall be abandoned as indicated on the plans and specifications. Ends of pipelines four inches (4") and larger to be abandoned in place shall be plugged with concrete for a distance of not less than twelve inches (12"), unless otherwise shown on the plans. Valve boxes to be abandoned shall be removed and the valve risers shall be filled with concrete.

3.8.4. Hydrostatic Testing

Hydrostatic testing shall be performed on all pipelines per the pipe manufacturer's recommendations, AWWA, or as directed by the KMPUD Inspector, whichever is more stringent. The KMPUD Inspector shall be notified two full business days prior to testing and must approve any water placement in any portion of the pipeline. All new, rehabilitated or otherwise taken out of service pipelines exceeding twenty feet (20') in length shall be positively separated from the system by means of pipe plate or other means of physical separation. Until all testing, flushing, disinfection, chlorination, secondary flushing and approval from KMPUD is completed, all new water mains shall be connected to the existing system only through an RP type backflow device with a certification from within the last year. The pipeline shall be filled with water and all air evacuated.

For pipelines, the pressure shall then be slowly increased to not less than: one hundred fifty (150) psi, one hundred fifty percent (150%) of the working pressure measured at the lowest elevation of the test section, or one hundred twenty-five percent (125%) of the working pressure measured at the highest elevation of the test section, whichever is greater. Pipeline design and installation shall account for pipelines operating continuously at this test pressure. The test pressure shall not exceed the thrust restraint design pressures, the rated pressure of closed valves, or one and a half (1.5) times the pressure rating of the pipe or joint,

whichever is less, as specified by the manufacturer or KMPUD Inspector. The test pressure shall be maintained in the line for the test period of two (2) hours.

During the test, any leakage or drop in pressure, shall constitute a failed test. All pipelines with failed tests shall be repaired, regardless of the amount of loss, at the Contractor's expense. All leaks shall be repaired, regardless of the amount of leakage, at the Contractor's expense.

All or part of the pipeline may be drained as necessary to repair leaks. All leaks shall be repaired in a manner approved by KMPUD Inspector and retested before acceptance by KMPUD. The Contractor shall provide all labor, equipment and materials required for filling, flushing and testing the pipelines. After successful completion of the hydrostatic test, the preliminary flushing, chlorination, chlorination flushing and bacteriological testing may be completed, in that order, per these specifications and with KMPUD Inspector approval.

3.8.4.1. Make-up Water Allowance for PVC Pipe

The maximum make-up water allowance shall be per the pipe manufacturer's recommendations, AWWA, or as directed by KMPUD Inspector, whichever is more stringent.

Make-up water allowance for PVC pipe shall be determined from the following equation:

$$M = \frac{SD(P^{\frac{1}{2}})}{148000}$$

Where: M = Make-up Water Allowance (gal/hr)

S = Length of Pipe Tested (ft)

D = Nominal Diameter of Pipe (in)

P = Average Test Pressure (psi)

The table below provides a summary of the make-up water allowance per one thousand feet (1,000') for various pipe sizes and pressures calculated from the equation above.

Make-up Water Allowance for PVC Plastic Pipe
With Elastomeric Joints
in Gallons per hour per 1000 LF

Nominal Pipe Size (Inches)	Average Test Pressure in Line (psi)			
	100	150	200	250
4	.27	.33	.38	.43
6	.45	.50	.57	.64

8	.54	.66	.76	.85
10	.68	.83	.96	1.07
12	.81	.99	1.15	1.28

3.8.4.2. Make-up Water Allowance for Ductile Iron Pipe

The maximum make-up water allowance shall be per the pipe manufacturer's recommendations, AWWA, or as directed by KMPUD Inspector, whichever is more stringent.

Make-up water allowance for ductile iron pipe shall be determined from the following equation:

$$M = \frac{SD(P^{\frac{1}{2}})}{133200}$$

Where: M = Make-up Water Allowance (gal/hr)

S = Length of Pipe Tested (ft)

D = Nominal Diameter of Pipe (in)

P = Average Test Pressure (psi)

The table below provides a summary of the make-up water allowance per one thousand (1000) LF for various pipe sizes and pressures calculated from the equation above.

Make-up Water Allowance for Ductile Iron Pipe
With Elastomeric Joints
in Gallons per hour per 1000 LF

Nominal Pipe Size (Inches)	**Average Test Pressure in Line (psi)**			
	100	**150**	**200**	**250**
4	.3	.37	.43	.74
6	.45	.55	.64	.71

8	.60	.74	.85	.95
10	.75	.92	1.06	1.19
12	.90	1.10	1.28	1.42

3.8.5. Disinfection/Chlorination and Flushing

After successful completion of the hydrostatic test, the Contractor shall make the necessary piping connections, furnish and install all necessary equipment required for, and conduct the preliminary high velocity flushing operations. Preliminary high velocity flushing is required on all water mains prior to chlorination and shall include a scour flush at a minimum of three (3) feet per second or greater if possible, for a minimum of three (3) pipe volumes. The Contractor shall provide all equipment and materials for the high velocity flushing operation, and for safe and legal disposal of water from such flushing. The Contractor shall remove all temporary flushing facilities.

After successful completion of the high velocity flushing, the Contractor shall chlorinate, flush and test the pipeline per the most current AWWA C651 standard. All materials, equipment, parts and costs for chlorination, bacteriological testing and flushing shall be provided for by the Contractor. Testing equipment must have current calibration and test strips and chemicals must be within their current shelf life (not expired). All chlorinating and testing operations shall be performed in the presence of the KMPUD Inspector. Per California Title 22, water systems shall utilize only certified Distribution Operators to make decisions addressing the disinfection, testing, and tie-in of new water mains and appurtenances to existing systems. One of the following three chlorination methods shall be used, including: the continuous-feed method, the slug method, or the spray method. The tablet/granule method of chlorination shall not be utilized in any treated water pipeline. The KMPUD Inspector shall approve which method is most suitable for each situation considering length and diameter of pipeline, type of joints present, availability of materials and safety considerations. The interior of all pipe and fittings used in making final connections shall be swabbed or sprayed with one percent (1%) hypochlorite solution.

For the continuous-feed method the chlorinated water shall be retained in the main for at least a twenty-four (24) hour hold time, or per AWWA C651, whichever is greater. At the end of this hold time the treated water in all portions of the main and appurtenances shall have a residual of not less than ten parts per million (10 ppm). During the hold time, new valves shall be exercised to promote disinfection of the appurtenances.

After chlorination, the pipeline shall be flushed and de-chlorinated per AWWA C651 Section 4.9. Discharges of highly chlorinated water that can make it to waters of the state or waters of the US are not allowed. Flushing shall continue until the chlorine residual in the water leaving the main is no higher than that of the existing distribution system or 0.3 ppm. The water shall then remain unmoved for

a minimum of twenty-four (24) hours after which KMPUD shall collect bacteriological samples which shall be tested by an independent laboratory. Bacteriological testing shall be per KMPUD Standards and AWWA C651, Section 5.1, whichever is more stringent, and shall be completed by KMPUD at the Contractor's cost. The number and location of samples shall be per AWWA C651, Section 5.1 or as directed by KMPUD Inspector and shall be approved by the KMPUD Inspector prior to sampling. If emergency work is under way, disinfection is to be per AWWA C651 Section 4.11, or as directed by the KMPUD Inspector. Treatment plants, sites and equipment shall be disinfected per AWWA C653.

3.8.6. Continuity Testing

The Contractor shall test for the continuity of the locating wire prior to paving and prior to the final walk-thru. Continuity shall be present from each location to every other location, or the test shall not be considered as passing. Continuity testing shall be performed in the presence of the KMPUD Inspector. The Contractor shall provide all labor, equipment and materials required for testing the continuity of the locating wire at each meter, valve, fire hydrant, blow off and ARV. Should continuity not be present and/or observed, the Contractor shall repair, replace and retest as necessary, entirely at Contractor's expense.

4. Boring, Jacking and Tunneling

Allowable casings shall be steel. Alternate casings may be permitted by the KMPUD if they meet or exceed steel strength specifications and pose no health or safety hazards. Lap weld or corrugated pipe shall not be used for boring nor open cut casing. Casing shall be of a size to permit installation and removal of the carrier pipe. Multiple casing installations shall conform to the latest revised copy of the California Department of Transportation's specifications.

When practical, the bores and tunnels shall be installed before open cut carrier pipe. If (due to permits, etc.) it is not possible to install bores or tunnels at the start of construction, then one hundred feet (100') of carrier pipe at the bore pit side, and three hundred feet (300') at the receiving pit side shall not be constructed until after completion of the bore or tunnel.

For casing pipe crossing under roadways, railroads, or other installations not within the jurisdiction of KMPUD, comply with regulations and permit requirements of said authority.

State highway casing installations shall be as specified in the California Department of Transportation specifications.

4.1. Steel Casing

Fabrication of casing shall be in accordance with AWWA C200, as modified below. Casing material shall conform to ASTM A 283, Grade C; ASTM A 139, Grade B; or ASTM A 36. Spiral weld steel casing shall have three sixteenths of an inch (3/16") maximum weld height over plate thickness. Spiral welds shall be one hundred percent (100%) of the welds.

4.1.1. Outside Diameter Tolerances

The outside diameter (O.D.) shall not vary by more than the following (percent of O.D.):

6” O.D. through 18” O.D.	+0.75%	-0.75%
20” O.D. and larger	+1.00%	-1.00%

For casing used in any one bore, maximum variation between maximum and minimum outside diameter shall not exceed a quarter inch (¼”) for six inches (6”) O.D. to forty-eight inches (48”) O.D. and one half inch (½) for over forty-eight inches (48”) O.D.

4.1.2. Wall Thickness Tolerances

The wall thickness in any one location on the casing shall not vary from the required thickness by more than the following (percent of wall thickness):

6” through 18”	+15.0%	-10.0%
23” and larger	+17.5%	-10.0%

4.1.3. Wall Thickness Minimum

Minimum wall thickness for steel pipe casing shall be as shown on the table that follows. However, in no case shall wall thickness be less than a quarter inch (¼”).

The Contractor may select a greater thickness and diameter to accommodate the method of work, loadings involved, the site and possible interferences, but at no additional cost to KMPUD.

Lengths listed as “Maximum” may be exceeded, if ground conditions are favorable, and KMPUD can give larger alignment tolerances than shown in the Specifications.

For six inches to forty inches (6”-40”), a heavy wall lead joint may be required due to adverse ground conditions. If a heavy wall lead joint is required, it should be ten feet (10’) long, but must be one (1) diameter long, and shall have a minimum wall thickness of one and a half (1½) times the wall thickness of the casing being used.

Minimum Casing Dimensions
(Smooth Steel Pipe)

Diameter Pipe	Min. Casing Diameter	Length (1’-100’)	Length (100’-200’)	Length (Over 200’)
6”	18”	¼”	Max Length 100’	
8” – 10”	20”	¼”	Max Length 120’	

12” – 14”	24”	¼”	3/8”	Max Length 150’
16” – 18”	30”	¼”	3/8”	Max Length 200’
20” – 26”	36”	¼”	5/16”	3/8”
Over 26”	Subject to Applicant Design & KMPUD Approval			

4.1.4. Casing Surface Conditions

Casing shall be bare or coated with pneumatically applied enamel. The enamel coating is not required, but when it is used, it shall not exceed three (3) mils in thickness. No wrapped casing shall be allowed.

4.1.5. Lengths and Ends

Unless otherwise approved, the casing shall be square cut by mechanical methods. Torches held by machinery shall be considered to meet this requirement. This does not apply to field cutting. All casing lengths shall be equal to the auger length.

4.1.6. Straightness

Casing shall be measured by the cord method with either string or wire stretched taut to take out all visible sag. Maximum cord measured along the casing shall be true length x 0.02 percent. This is to be measured on actual lengths before loading for delivery to the job site.

4.1.7. Welding

All welding shall be done by qualified welders in accordance with the requirements of the American Welding Society (AWS). Welders and welding operations shall be qualified by tests as prescribed in AWS D1.1. Section 5. Proposed operators may be examined at the site of work and upon satisfactory completion of test welds, designated by the KMPUD, may be permitted to perform welding operations on the project. The Contractor shall furnish to KMPUD upon request records the welder has been engaged in similar processes of welding for which he/she is pre-qualified for a period of six (6) months prior to the work and records of all welding test results and certifications of any welder prior to and during that period.

4.2. Grouting

Fittings shall be put at the proper position to fill all known cavities. When grouting, the road and the casing being installed shall be watched closely so that the road surface, casing or other structure(s) nearby, are not altered or damaged. Grouting pressure shall be the minimum pressure to feed the grout, but in no case shall it be more than four (4) psi measured at the grouting fitting. For safety reasons, the minimum size casing allowable for inside grouting shall be thirty inches (30”). Grouting shall be necessary only if there is reason to believe that voids, exceeding one inch (1”) over the outside diameter of casing or liner plate, are present. If grouting is required, grout fittings shall be at a

maximum of two (2) rows. Each row shall be twenty-two and a half (22½) degrees off top center, one (1) row left and one (1) row right. If casing joints are ten feet (10') or in multiples of ten feet (10'), each row shall have fittings spaced at a minimum of ten feet (10') on centers, staggered so there is one fitting for every five lineal feet (5 LF) of casing.

If the casing joints are eight feet (8') or in multiples of eight feet (8'), each row shall have fittings spaced at a minimum of eight feet (8'), on centers, staggered so one fitting for every four lineal feet (4 LF) of casing. In tunneling, when liner plates or sets are used, the fittings shall be placed uniformly in sets, but shall not exceed the five lineal feet (5 LF) on centers specified as maximum spacing. Small casings shall be grouted from top of ground in severe conditions only, and shall be five feet (5') on centers on center line of casing. Reinforced concrete pipe (RCP) grout fittings shall be at least two feet (2') from edge of the joint. After completion of grouting, close the grout connections with cast-iron threaded plugs.

4.3. Wing Cutters/Bands/Flairs

Wing cutters, if they are used shall cut a maximum of one inch (1") larger than the casing measured on the outside diameter. Any voids that occur from the use of wing cutters are required to be grouted in accordance with Section 4.2. Bands or flairs shall not create a hole over one inch (1") larger than the outside diameter of the casing.

4.4. Jacking and Receiving Pits

The distance from the edge of the pavement to each end of the bore shall be ten feet (10') or five feet (5') beyond the outside toe of the slope. Jacking and Receiving Pits shall conform to these specifications. Where Jacking and Receiving Pits are within Caltrans or County right-of way, it shall be subject to their requirements.

All boring, jacking, and receiving pits shall be:

A. located at least ten feet (10') from edge of pavement on conventional highways in rural areas; and

B. located five feet (5') outside toe of slope in embankment areas; and

C. adequately protected with fencing and/or type "K" barriers; fence shall be a minimum of six foot (6') high, in panel sections, securely fastened together with reflectors secured to the side of the fence that faces the traffic. Partially buried posts with fencing attached to form a continuous fence, with reflectors secured to the side of the fence that faces traffic may also be used; and

D. adequately shored in accordance with Cal/OSHA or FED-OSHA.

4.5. Alignment Tolerances

The centerline of the casing shall not vary in line or grade from the desired alignment by more than one percent (1%) or one foot (1') per hundred feet (100') of casing.

4.6. Rotary Drilling

The face must be mechanically cut (not cut with fluid pressure); the water must be mixed with bentonite, as required by ground conditions; the fluid must be supplied to the face from a controlled tank. (Under no circumstances shall the fluid line be hooked directly to the water system or the water truck while drilling); the controlled tank must be able to mix

and agitate the fluid; the controlled tank must also be capable of regulating volume and pressure; and the fluid mix shall be used only for lubrication and to bring back cuttings, not to cut the face. This method can be used for various sizes, lengths and ground conditions.

4.7. Casing Insulators/Spacers

Lined steel casing insulators with plastic runners or skids shall be used to support and insulate the carrier pipe within the casing. The size, type, spacing, installation and manufacture of these insulators shall be per the manufacturer's recommendations and these Specifications. If a discrepancy exists between the two, these Specifications shall override. Casing insulators shall be by PSI, Inc. or approved equal, see Standard Drawing KMW014.

4.7.1. Band/Shell

The bank, shell, or body of the insulator shall be constructed of fourteen (14) gage 304 stainless steel, or shall be hot rolled, pickled, fourteen (14) gage steel with a coating of rust-inhibiting enamel or hot fused PVC.

4.7.2. Connecting Flanges

The connecting flanges shall be of the same material as the shell and shall be ribbed or gusseted for rigidity.

4.7.3. Bolts/Studs

All bolts or studs shall be five sixteenths of an inch (5/16") or larger in diameter and shall be cadmium plated steel or stainless steel.

4.7.4. Insulating Liner

The insulator shall have an insulating liner made of Polyvinyl Chloride. It shall have a thickness of 0.090 inches or greater and shall be 85-90 durometer.

4.7.5. Skids/Runners

The insulator shall have high density plastic skids. The skids shall have a high resistance to abrasion and a low coefficient of friction. The skids may be supported by a riser to be of the same material as the shell and welded thoroughly to the shell. The skids shall be either bolted or have a stud welded connection to the shell or riser. Glued connections are not acceptable.

Skids shall be greased before installation of carrier pipe into casing.

4.8. Carrier Pipe

Carrier pipe shall be ductile iron pipe. All carrier pipe joints shall be fully restrained using a method approved by the KMPUD, see Standard Drawing KMW014. All carrier pipe shall be installed with tracer wire.

WATER STANDARD DETAILS

LIST OF FIGURES

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

WATER STANDARD DETAILS

DATE:	APPROVED BY:	DRAWING NUMBER:
9/30/18	E.M.C.	KMW000
SCALE: N.T.S.	DRAWN BY: L.P.B.	

GENERAL NOTES:

1) THE TYPES, LOCATIONS, SIZES, AND DEPTHS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE IMPROVEMENT PLANS WERE OBTAINED FROM SOURCES OF VARYING RELIABILITY AND ARE APPROXIMATE. A REASONABLE EFFORT HAS BEEN MADE TO LOCATE AND DELINEATE ALL KNOWN UNDERGROUND FACILITIES. HOWEVER, THE ENGINEER CAN ASSUME NO RESPONSIBILITY FOR THE COMPLETENESS OR ACCURACY OF THE DELINEATION OF SUCH UNDERGROUND FACILITIES, NOR THE EXISTENCE OF OTHER BURIED OBJECTS OR FACILITIES WHICH MAY BE ENCOUNTERED BUT WHICH ARE NOT SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE EXISTING UTILITIES, WHETHER SHOWN OR NOT SHOWN ON THE DRAWINGS AND TO FIELD VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL EXPOSE ALL UNDERGROUND FACILITIES THAT ARE TO BE CONNECTED TO OR THAT ARE IN THE PATH OF THE PROPOSED IMPROVEMENTS FOR VERIFICATION OF LOCATION AND ELEVATION PRIOR TO THE COMMENCING OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTING THE WATER LINE AND APPURTENANCES PER THE IMPROVEMENT PLANS DESPITE THE PRESENCE OF BURIED OBJECTS OR FACILITIES WHICH WERE NOT EXPECTED TO BE ENCOUNTERED, AND THE CONTRACTOR SHALL NOT BE REIMBURSED FOR ANY EXPENSES BROUGHT UPON BY SUCH BURIED OBJECTS OR UTILITIES. THE CONTRACTOR OR ANY SUBCONTRACTOR SHALL NOTIFY UNDERGROUND SERVICES ALERT (USA) AT 811 IN ACCORDANCE WITH THE SPECIFICATIONS PRIOR TO ALL EXCAVATION.

2) THE CONTRACTOR SHALL CONTACT THE KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT ("KMPUD") AT (209)258-4444 48 HOURS OR TWO (2) BUSINESS DAYS, WHICHEVER IS GREATER, PRIOR TO COMMENCEMENT OF THE PRE-CONSTRUCTION MEETING AND INITIAL WATER LINE CONSTRUCTION, AND TWENTY-FOUR HOURS PRIOR TO EACH DAY WORK ON WATER LINE INSTALLATION OCCURS.

3) ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE MOST CURRENT KMPUD STANDARDS AND "STANDARD SPECIFICATIONS OF THE STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION". WHERE THERE IS ANY CONFLICT, KMPUD STANDARDS SHALL PREVAIL.

4) THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS THAT ARE TO REMAIN IN PLACE. ALL IMPROVEMENTS DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED AT THE CONTRACTOR'S EXPENSE AND INSPECTED BY THE AGENCY OR CONTROLLING AGENCY, WITHOUT ADDITIONAL COMPENSATION.

5) ALL PIPING SHALL HAVE 36" MINIMUM COVER EXCEPT WHERE SPECIFICALLY NOTED ON THE PROJECT PLANS. IF INVERT ELEVATION SHOWN ON PROFILE DRAWINGS RESULT IN LESS THAN 36" OF COVER, THEN 36" OF COVER SHALL PREVAIL.
   - GREATER THAN 60" OF COVER NOT ALLOWED
   - 60" TO 36" OF COVER USE C900, PC 235 OR GREATER PIPE
   - 24" TO 36" OF COVER MAY REQUIRE 2 SACK SAND SLURRY BACKFILL AND/OR SPECIAL THICKNESS CLASS DUCTILE IRON PIPE AND WILL BE APPROVED ON A CASE BY CASE BASIS ONLY.
   - LESS THAN 24" OF COVER NOT ALLOWED UNDER ANY CIRCUMSTANCES.

   WATER LINES GREATER THAN 12" OR WITH HAZARDOUS LAYING CONDITIONS REQUIRE DIFFERENT MATERIAL SPECIFICATIONS. SEE KMPUD STANDARDS AND DETAILS.

6) PIPE BENDS AND TIE IN DETAILS INDICATED ON THE PLANS ARE APPROXIMATE HORIZONTAL ANGLES AND ARE INTENDED TO SHOW THE ESSENTIAL ELEMENTS REQUIRED OF THE CONNECTION. ACTUAL FIELD PIPING ANGLES MAY BE DIFFERENT. THE CONTRACTOR SHALL SUPPLY ALL LABOR, STANDARD OR FABRICATED FITTINGS, AND APPURTENANCES REQUIRED FOR THE BEND OR TIE-IN INSTALLATION, WITH NO ADDITIONAL REIMBURSEMENT. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ALL CUSTOM FABRICATED FITTINGS.

7) THE CONTRACTOR SHALL NOT EXCEED THE MANUFACTURERS RECOMMENDATION FOR LAYING PIPE ALONG HORIZONTAL CURVES. WHEN SLOPES ARE GREATER THAN 10% PIPE SHALL BE LAID UPHILL UNLESS OTHERWISE NOTED. CUT OFF WALLS SHALL BE INSTALLED EVERY 200' FOR SLOPES BETWEEN 10% AND 20% GRADE AND EVERY 100' FOR SLOPES GREATER THAN 20% UNLESS OTHERWISE NOTED. VERTICAL CURVES SHALL NOT BE PERMITTED, FITTINGS SHALL BE USED FOR ALL VERTICAL DEFLECTIONS.

8) THE CONTRACTOR SHALL PROVIDE THE LABOR AND MATERIALS REQUIRED FOR HYDROSTATIC & BACTERIOLOGICAL TESTING, CHLORINATION AND FLUSHING. ALL TESTING AND FLUSHING SHALL BE OBSERVED AND ACCEPTED BY KMPUD. KMPUD PERSONNEL SHALL COLLECT ALL SAMPLES FOR BACTERIOLOGICAL TESTING. ACTUAL CONNECTIONS TO EXISTING KMPUD WATER LINES WILL NOT BE PERMITTED PRIOR TO THE COMPLETION OF STERILIZATION AND TESTING OF NEW WATER MAINS. ALL EXISTING WATER VALVES SHALL BE OPERATED BY KMPUD PERSONNEL ONLY.

9) THE CONTRACTOR SHALL BE RESPONSIBLE FOR LAYOUT OF THE LINE AND GRADE OF ALL PIPING WITHIN THE PROJECT SITE.

10) THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING RECORD DRAWINGS FOR ALL WORK THROUGHOUT THE COURSE OF CONSTRUCTION. SUCH DRAWINGS SHALL RECORD THE LOCATION AND GRADE OF ALL UNDERGROUND IMPROVEMENTS CONSTRUCTED AND SHALL BE DELIVERED TO KMPUD PRIOR TO, AND IN CONSIDERATION OF KMPUD'S ACCEPTANCE OF WORK.

11) THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ALL SURPLUS EXCAVATION MATERIAL AND DEBRIS PROMPTLY FROM THE SITE AND SHALL MAINTAIN THE SITE IN A NEAT AND ORDERLY CONDITION. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY FILL AND GRADING PERMITS.

12) THE CONTRACTOR SHALL ADJUST ALL GRADE RINGS AND VALVE BOXES TO FINISHED GRADE UNLESS OTHERWISE SHOWN ON DRAWINGS OR DIRECTED.

13) PIPE STATIONING IS BASED ON HORIZONTAL DISTANCE AND DOES NOT REPRESENT ACTUAL LENGTH OF PIPE.

14) CONTRACTOR SHALL AT ALL TIMES COMPLY WITH THE SAFETY RULES AND REGULATIONS ESTABLISHED BY CAL-OSHA AND OTHER AGENCIES HAVING JURISDICTION OVER THE WORK AND SHALL BE REQUIRED TO OBTAIN ALL PERMITS. CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY.

15) ALL EXISTING IMPROVEMENTS, INCLUDING BUT NOT LIMITED TO LANDSCAPING, DRIVEWAYS, DRAINAGE DITCHES AND MONUMENTS, SHALL BE RESTORED TO THE CONDITION IN WHICH THEY WERE PRIOR TO CONSTRUCTION, OR BETTER.

16) A WRITTEN REQUEST TO REMOVE AND/OR TRIM ANY TREES SHALL BE SUBMITTED IN WRITING TO THE OWNER; NO REMOVAL AND/OR TRIMMING SHALL TAKE PLACE WITHOUT WRITTEN RESPONSE BY THE OWNER.

17) ALL TREES REQUIRING TRIMMING OR REMOVAL SHALL BE IDENTIFIED BY THE CONTRACTOR AND THE CONTRACTOR SHALL COMPLY WITH ALL KIRKWOOD TRI-TAC COMMITTEE REQUIREMENTS REGARDING TRIMMING OR REMOVAL WORK. WHERE APPROPRIATE, CONTRACTOR SHALL ALSO NOTIFY THE PROPERTY OWNER, HOMEOWNER ASSOCIATION AND KMPUD.

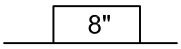
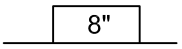
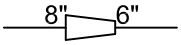
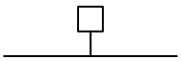
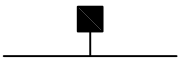
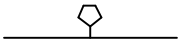
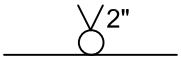
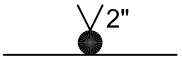
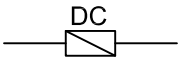
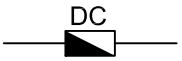
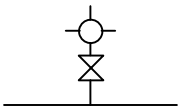
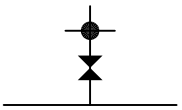
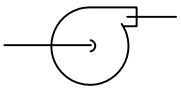
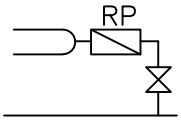
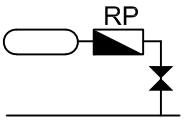
18) THRUST BLOCKS SHALL BE INSTALLED PER KMW013. RESTRAINED JOINT DESIGNS OMITTING THRUST BLOCKS WILL BE CONSIDERED UPON SUBMITTAL TO KMPUD.

19) PLAN APPROVAL SHALL EXPIRE TWO YEARS FROM DATE OF KMPUD SIGNATURE OR CONDITIONAL WILL SERVE COMMITMENT, WHICHEVER COMES FIRST.

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

WATER GENERAL NOTES

DATE:	APPROVED BY:	DRAWING NUMBER:
3/30/22		KMW001
SCALE: N.T.S.	DRAWN BY: L.P.B.	

EXISTING	PROPOSED
 DOMESTIC PIPELINE WITH SIZE	 DOMESTIC PIPELINE WITH SIZE
 GATE VALVE	 GATE VALVE
 BUTTERFLY VALVE	 BUTTERFLY VALVE
 REDUCER	 REDUCER
 CHECK VALVE	 CHECK VALVE
 PRESSURE REDUCING VALVE WITH SIZE	 PRESSURE REDUCING VALVE WITH SIZE
 ALTITUDE VALVE	 ALTITUDE VALVE
 PRESSURE RELIEF VALVE WITH SIZE	 PRESSURE RELIEF VALVE WITH SIZE
 SERVICE LATERAL	 SERVICE LATERAL
 SAMPLING STATION	 SAMPLING STATION
 AIR/VACUUM RELEASE VALVE	 AIR/VACUUM RELEASE VALVE
 BLOWOFF WITH SIZE	 BLOW-OFF-VALVE WITH SIZE
 DOUBLE CHECK VALVE ASSEMBLY	 DOUBLE CHECK VALVE ASSEMBLY
 DOUBLE CHECK-DETECTOR CHECK VALVE ASSEMBLY	 DOUBLE CHECK-DETECTOR CHECK VALVE ASSEMBLY
 REDUCED PRESSURE PRINCIPAL BACK FLOW PREVENTION ASSEMBLY	 REDUCED PRESSURE PRINCIPAL BACK FLOW PREVENTION ASSEMBLY
 REDUCED PRESSURE PRINCIPAL DETECTOR ASSEMBLY	 REDUCED PRESSURE PRINCIPAL DETECTOR ASSEMBLY
 FIRE HYDRANT	 FIRE HYDRANT
 PUMP	 PUMP
 HYDROPNEUMATIC TANK	 HYDROPNEUMATIC TANK

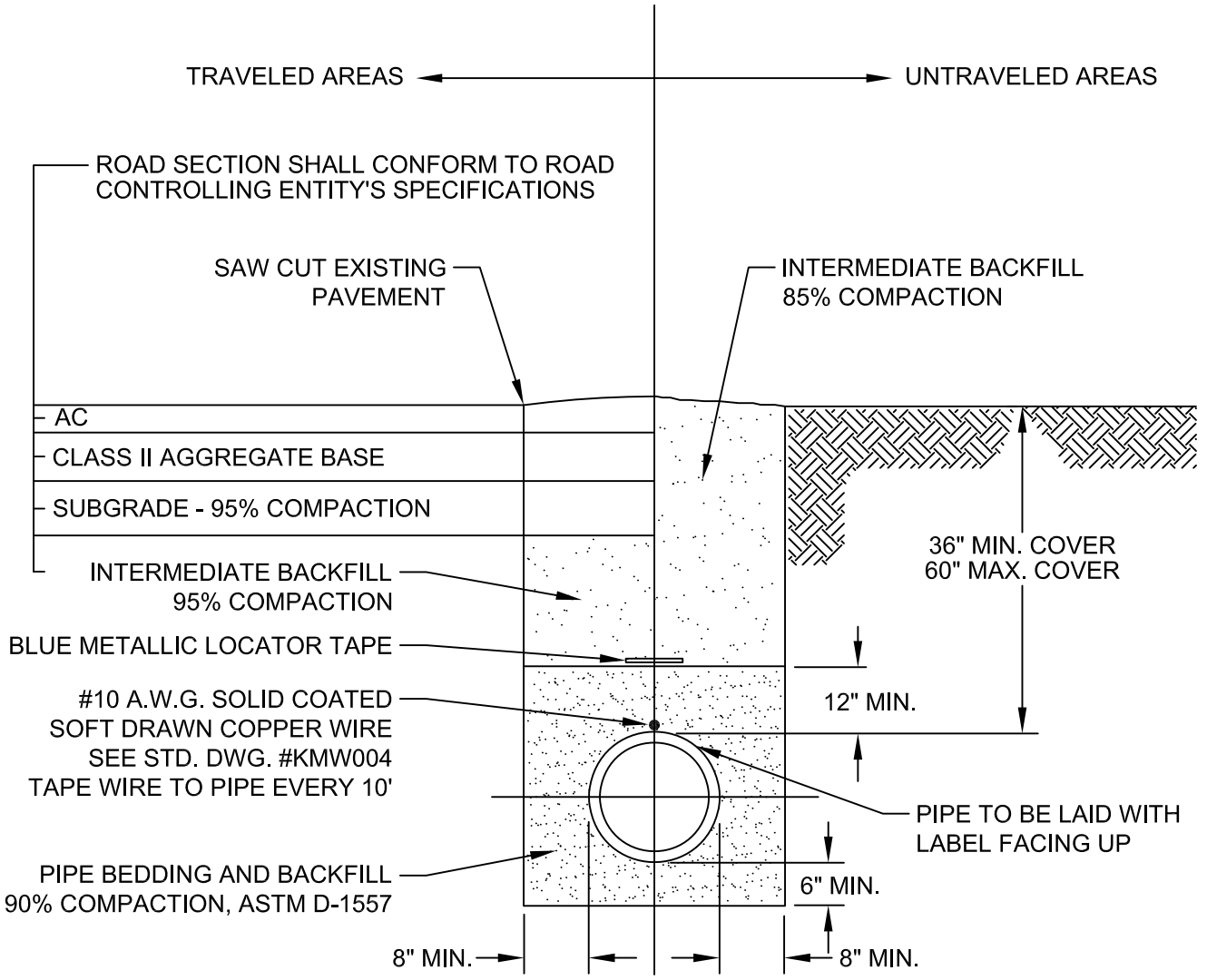
NOTES:

1. THESE SYMBOLS SHALL BE USED ON ALL PLANS TO BE APPROVED BY KMPUD
2. VALVE SIZE IS SAME AS LINE SIZE UNLESS OTHERWISE NOTED.

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

WATER SYMBOLS LEGEND

DATE:	APPROVED BY:	DRAWING NUMBER:
6/30/21	E.M.C.	KMW002
SCALE: N.T.S.	DRAWN BY: L.P.B.	



PIPE BEDDING & BACKFILL: WELL GRADED CLEAN SAND CONFORMING TO THE FOLLOWING GRADATION:

NO. 4 SIEVE: 75-100% PASSING BY WEIGHT
NO. 30 SIEVE: 12-60% PASSING BY WEIGHT
NO. 100 SIEVE: 5-20% PASSING BY WEIGHT
NO. 200 SIEVE: 0-10% PASSING BY WEIGHT

NOTES:

1. CLASS 2 AGGREGATE BASE WILL BE ACCEPTABLE FOR PIPE BEDDING AND BACKFILL AND INTERMEDIATE BACKFILL FOR WATER MAINLINES.
2. INTERMEDIATE BACKFILL MAY ALSO CONSIST OF IMPORTED OR NATIVE MATERIAL WITH ALL ROCKS OVER 3" REMOVED AND FREE OF VEGETATIVE MATERIAL.
3. USE $\frac{3}{4}$" CRUSHED ROCK AS BEDDING AND BACKFILL IN AREAS WITH GROUNDWATER AND AS DIRECTED BY KMPUD.
4. 60" OR GREATER PIPE COVER MUST BE PRE-APPROVED BY KMPUD
5. BLUE LOCATOR TAPE AT TOP OF SAND TO BE MARKED: "CAUTION - WATER LINE BURIED BELOW".
6. 4" MIN. SAND BETWEEN WATER SERVICE LATERALS AND TRENCH WALL SIDE WILL BE ALLOWED.

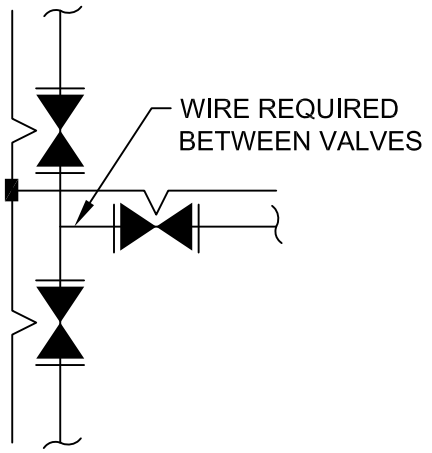
KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

PIPE TRENCH BEDDING AND BACKFILL

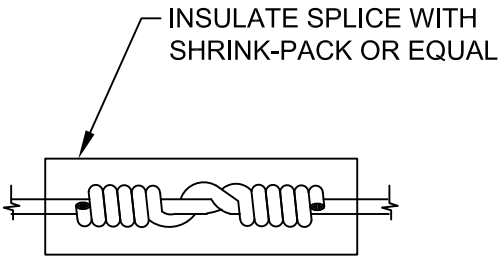
DATE:	APPROVED BY:	DRAWING NUMBER:
6/30/21	E.M.C.	KMW003
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

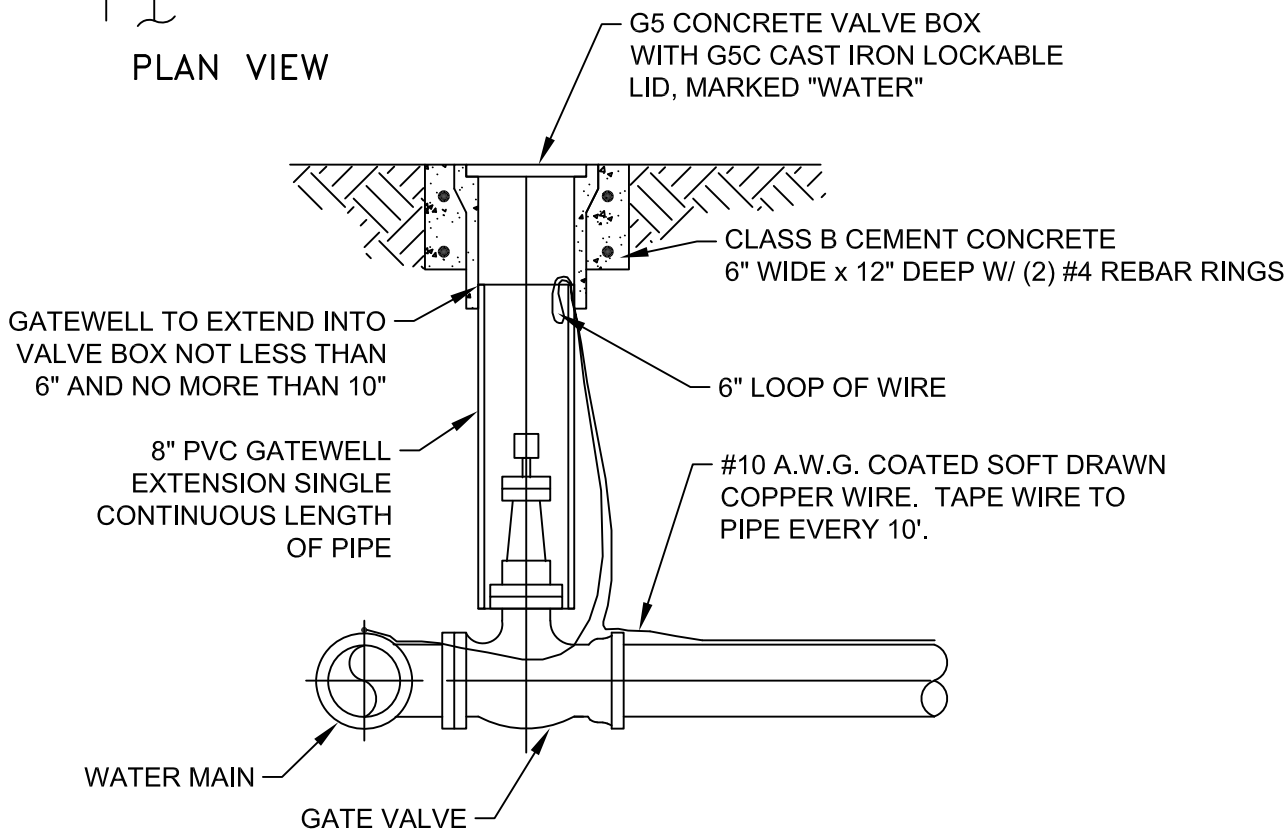
1. WIRE TO BE CONTINUOUS BETWEEN VALVE BOXES. A CONTINUITY TEST SHALL BE PERFORMED BY CONTRACTOR PRIOR TO FINAL ACCEPTANCE BY KMPUD.
2. ALL FITTINGS TO BE WRAPPED WITH MINIMUM 6 MIL. POLYETHYLENE FILM.



PLAN VIEW



SPLICE DETAIL



PROFILE
VALVE INSTALLATION

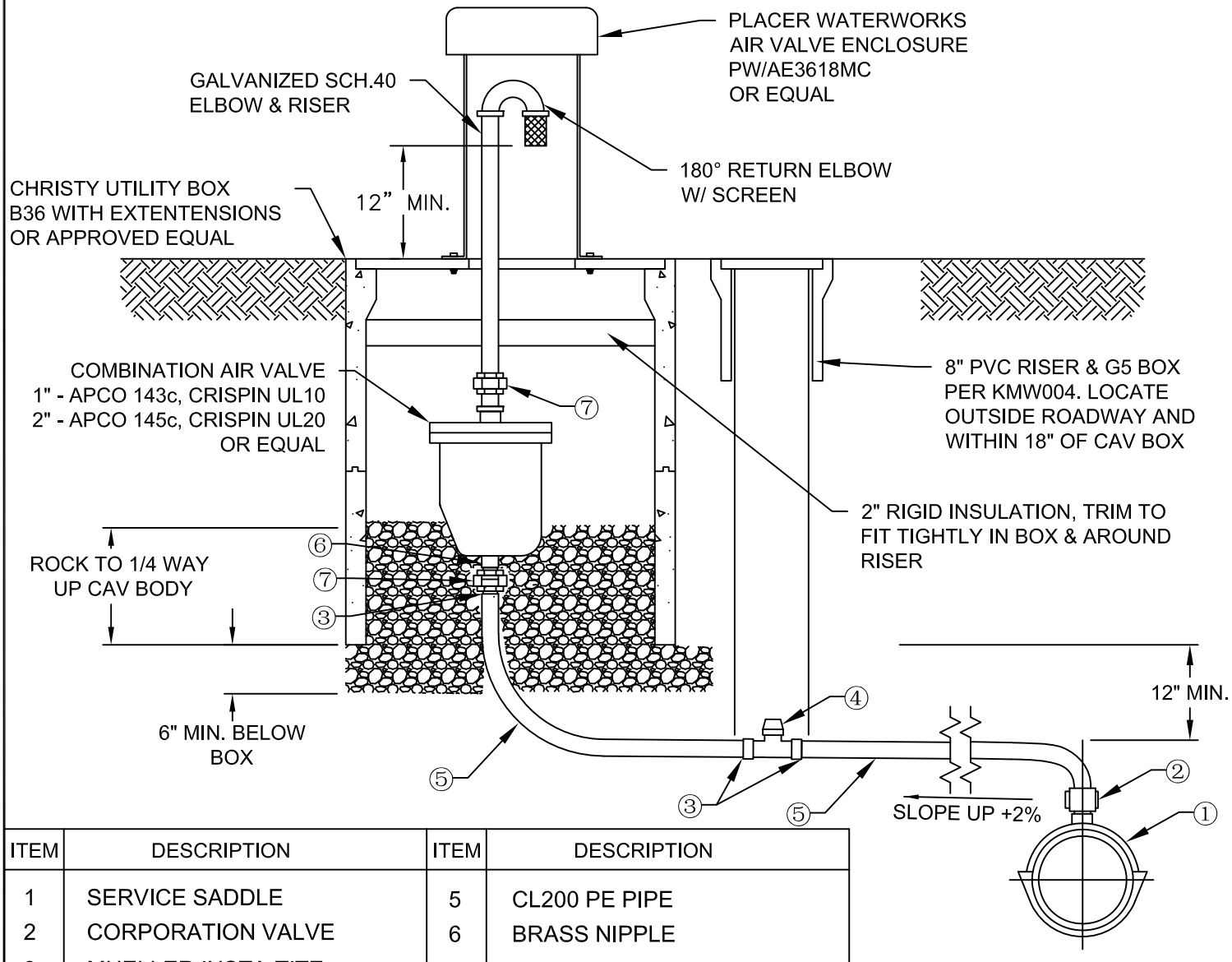
KIRKWOOD MEADOWS
PUBLIC UTILITY DISTRICT

VALVE AND LOCATING WIRE INSTALLATION

DATE:	APPROVED BY:	DRAWING NUMBER:
6/30/21	E.M.C.	KMW004
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1. UNLESS OTHERWISE CALLED OUT SADDLES, BALL VALVES, ETC. SHALL COMPLY WITH KMPUD STANDARD SPECIFICATIONS. MATCH ALL PIPE AND APPURTENANCE SIZES TO COMBINATION AIR & VACUUM RELEASE VALVE SIZE.
2. COMBINATION AIR & VACUUM RELEASE VALVE MUST BE PLACED IN BOX SO THAT IT MAY BE REMOVED WITHOUT REMOVING THE BOX.
3. PLACE VENT AND SECOND CORP STOP OUTSIDE TRAVELED WAY AS DIRECTED BY KMPUD. UNLESS OTHERWISE DIRECTED, SET BOXES 3"-6" ABOVE GRADE
4. VENT SIZE SHALL MATCH COMBINATION AIR & VACUUM RELEASE INLET SIZE.
5. LOCATE COMBINATION AIR & VACUUM RELEASE VALVE AT ALL INTERMEDIATE HIGH POINTS AND AS CALLED FOR ON PLANS.
6. PROVIDE 1" CAVRV ON LINE SIZES UP TO 12" AND 2" ON LINE SIZES 14" TO 18" OR AS DIRECTED OR REQUIRED.
7. MAINTAIN MINIMUM 2% CONTINUOUS UPWARD SLOPE FROM CORP STOP TO AIR VALVE.
8. BOLLARDS REQUIRED PER KMW007 IF AIR & VACUUM RELEASE VALVE IS NOT BEHIND LARGE ROCK OR OTHERWISE PROTECTED.
9. GRAVEL TO BE 3/8" CLEAN RIVER RUN PEA GRAVEL, CLASS II AB OR APPROVED EQUAL.
10. PROVIDE THERMAXX ANTIFREEZE JACKETS DESIGNED FOR -30°F FOR ALL AIR VALVE INSTALLATIONS.



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	SERVICE SADDLE	5	CL200 PE PIPE
2	CORPORATION VALVE	6	BRASS NIPPLE
3	MUELLER INSTA-TITE	7	BRASS FEMALE NPT UNION
4	BALL CURB VALVE		

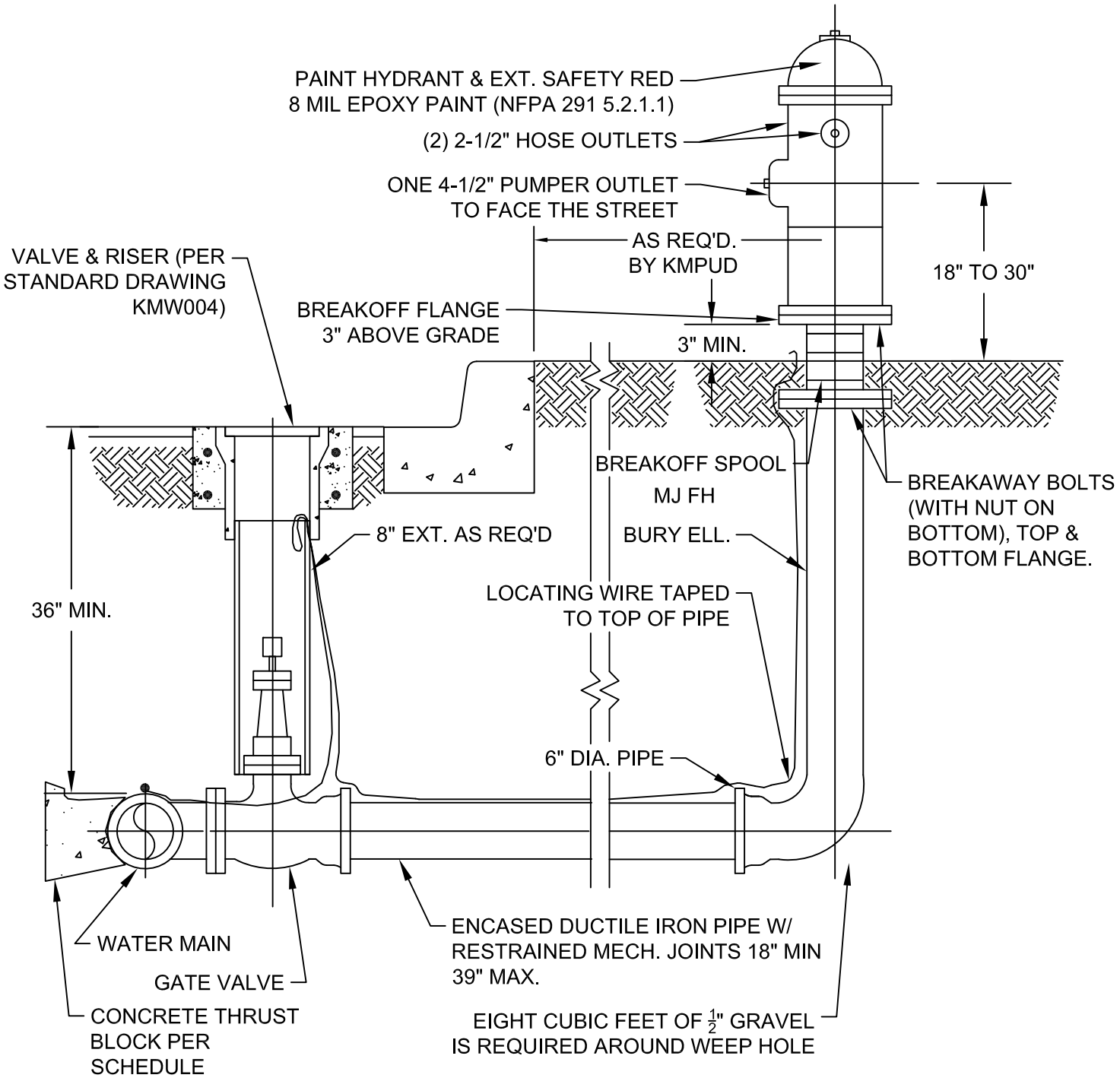
KIRKWOOD MEADOWS
PUBLIC UTILITY DISTRICT

COMBINATION AIR & VACUUM RELEASE VALVE

DATE:	APPROVED BY:	DRAWING NUMBER:
3/30/22		KMW005
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1. CONTRACTOR TO SET FIRE HYDRANT TO CORRECT GRADE. HYDRANT LOCATION TO BE DETERMINED BY KMPUD.
2. BOLLARDS REQUIRED PER STANDARD DETAIL KMW007, UNLESS OTHERWISE APPROVED BY KMPUD.
3. FIRE HYDRANTS MUST BE COVERED (BAGGED) UNTIL AVAILABLE FOR USE.
4. HYDRANT LATERALS IN FILL AREAS SHALL BE DUCTILE IRON WITH RESTRAINED JOINTS.
5. LOCATING WIRE AFTER VALVE BOX IS NOT REQUIRED IF HYDRANT LATERAL IS PERPENDICULAR TO THE MAIN AND LESS THAN 40'.
6. FIRE HYDRANT SHALL BE MUELLER A421 DRY BARREL HYDRANT.
7. SEE DRAWING KMW006A FOR VALVE RISER SUPPORT FRAME AND KMW006B FOR VALVE KEY AND RISER.



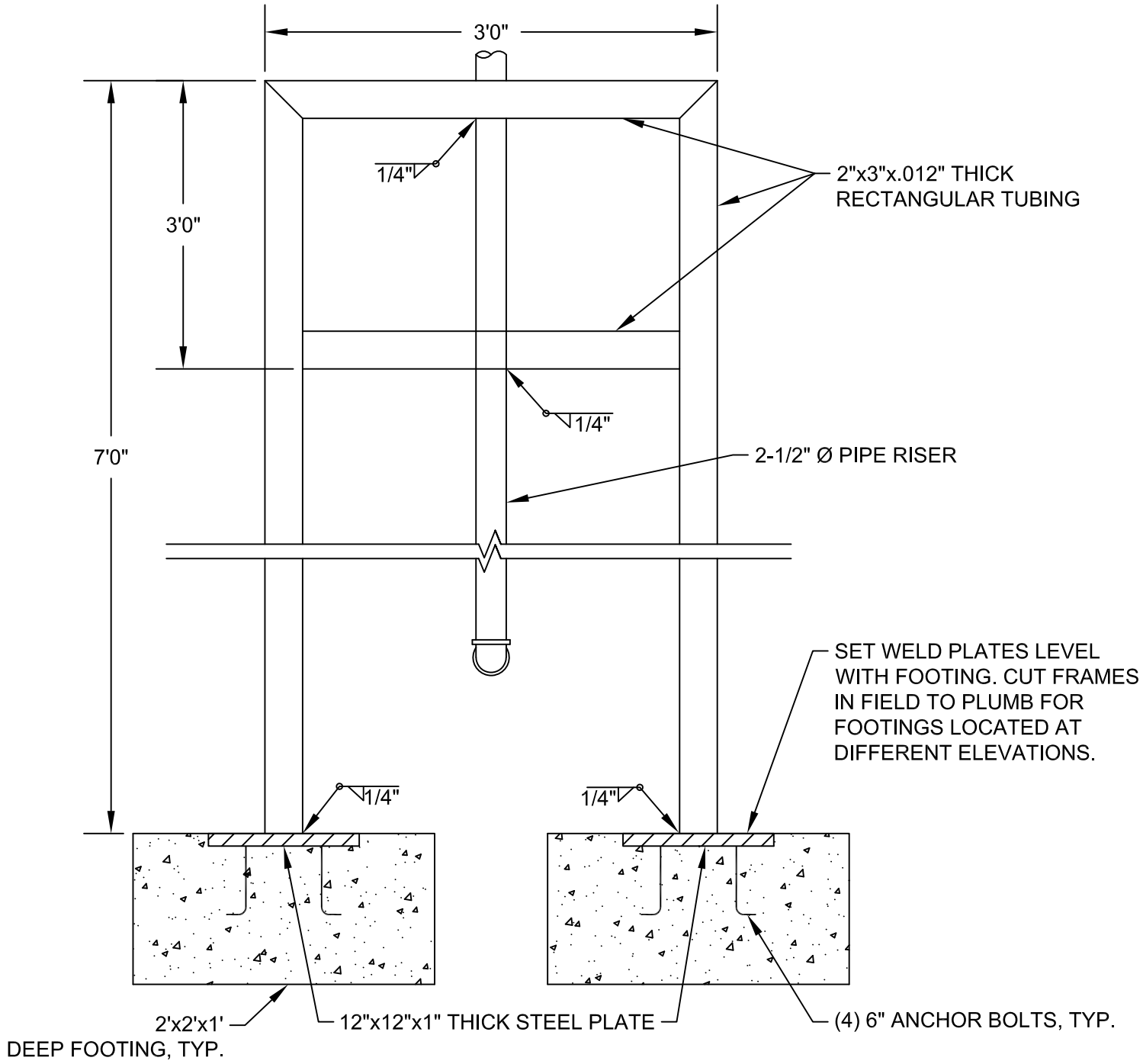
KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

FIRE HYDRANT & BLOW OFF ASSEMBLY

DATE:	APPROVED BY:	DRAWING NUMBER:
6/30/21	E.M.C.	KMW006
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1. CONTRACTOR TO SET FIRE HYDRANT TO CORRECT GRADE. HYDRANT LOCATION TO BE DETERMINED BY KMPUD.
2. BOLLARDS REQUIRED PER STANDARD DETAIL KMW007, UNLESS OTHERWISE APPROVED BY KMPUD.
3. SEE DRAWING KMW006 FOR HYDRANT ASSEMBLY AND KMW006B FOR VALVE KEY AND RISER DETAIL.
4. CONCRETE SHALL BE 2,500 PSI, MINIMUM WITH 5% AIR ENTRAINMENT, +/- 1%.
5. WELD TOP TUBE AND CENTER CROSS BRACE TO RISER PIPE IN 4 PLACES, TYP.



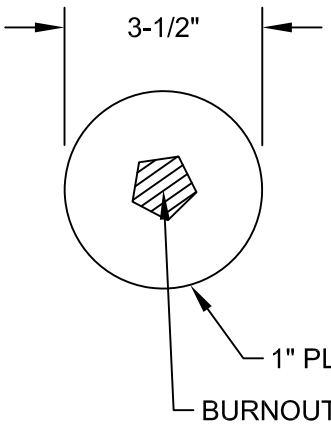
KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

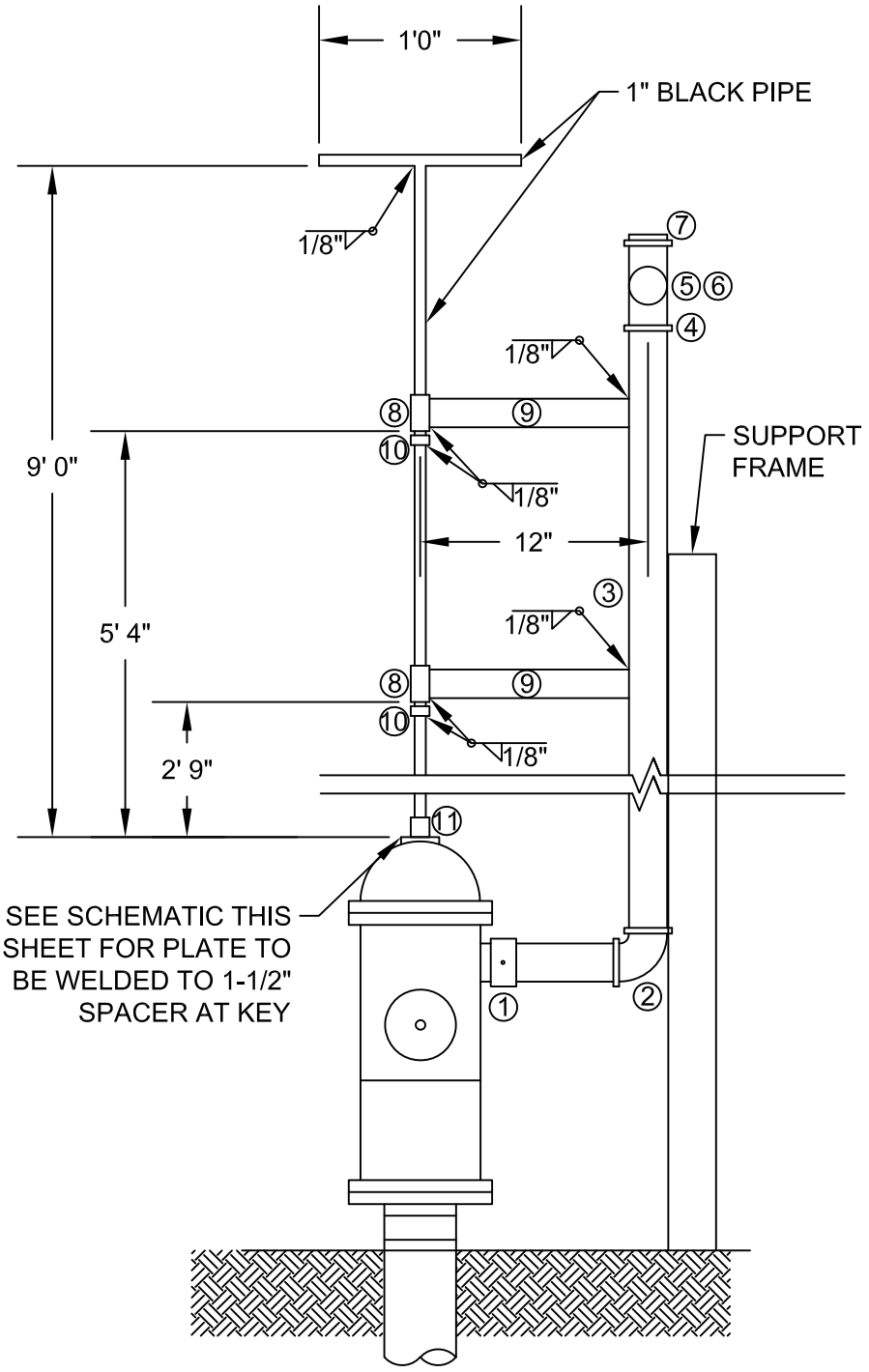
VALVE AND RISER SUPPORT FRAME

DATE:	APPROVED BY:	DRAWING NUMBER:
9/30/18		KMW006A
SCALE: N.T.S.	DRAWN BY:	

NOTES:

1. CONTRACTOR TO SET FIRE HYDRANT TO CORRECT GRADE. HYDRANT LOCATION TO BE DETERMINED BY KMPUD.
2. BOLLARDS REQUIRED PER STANDARD DETAIL KMW007, UNLESS OTHERWISE APPROVED BY KMPUD.
3. SEE DRAWING KMW006 FOR HYDRANT ASSEMBLY AND KMW006A FOR VALVE AND RISER SUPPORT FRAME.
4. USE PIPE JOINT COMPOUND, ALL JOINTS.
5. WELD TOP TUBE AND CENTER CROSS BRACE TO RISER PIPE IN 4 PLACES, TYP.



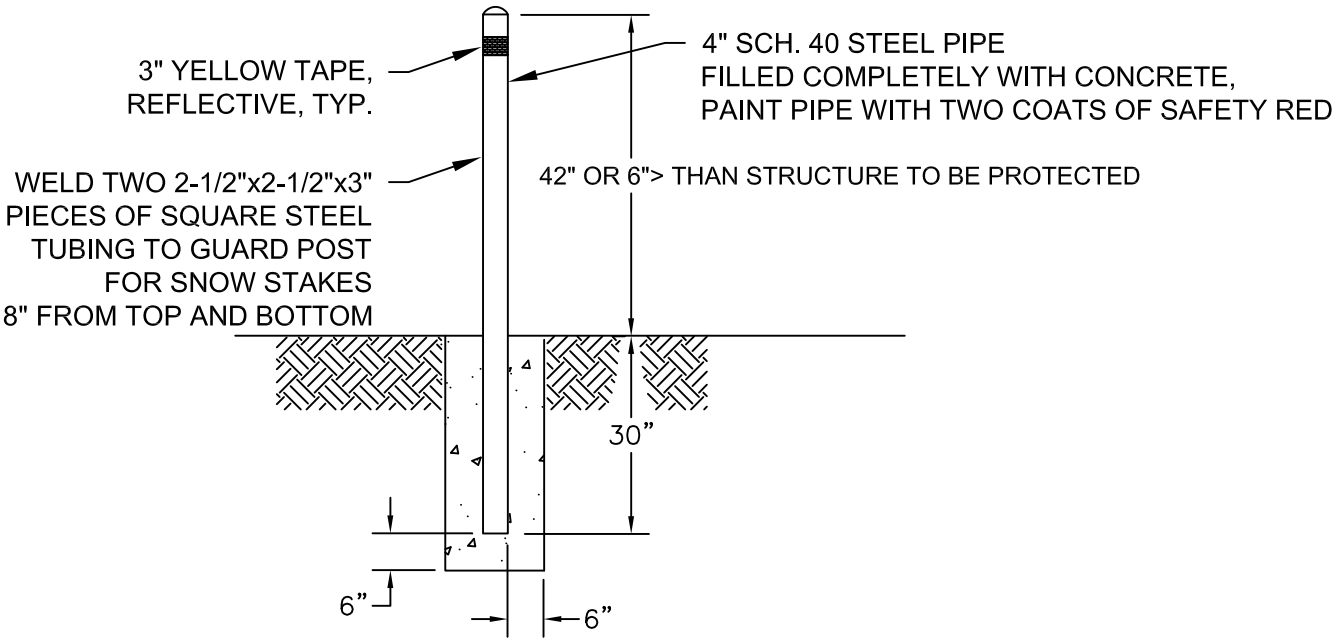


ITEM	DESCRIPTION
1	SM 260F BRASS MALE SWIVEL ADAPTER. 2-1/2" NST x 2-1/2" NPT
2	2-1/2" FEMALExFEMALE THREADED 90° ELL
3	2-1/2" x 7' THREADED NIPPLE
4	2-1/2" THREADED FEMALE TEE
5	2-1/2" MALExMALE HEX NIPPLE 2-1/2" NPT x 2-1/2" NST
6	2-1/2" FEMALE HYDRANT CAP (REMOVE FROM HYDRANT, ATTACH TO BRASS NIPPLE
7	2-1/2" MALE PLUG
8	3" x 1-1/4" SLEEVE
9	2" CHANNEL
10	3/4" x 1-1/4" SPACER
11	1-1/2" x 1-1/4" SPACER

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

VALVE KEY AND RISER

DATE:	APPROVED BY:	DRAWING NUMBER:
9/30/18		KMW006B
SCALE: N.T.S.	DRAWN BY:	



PROFILE

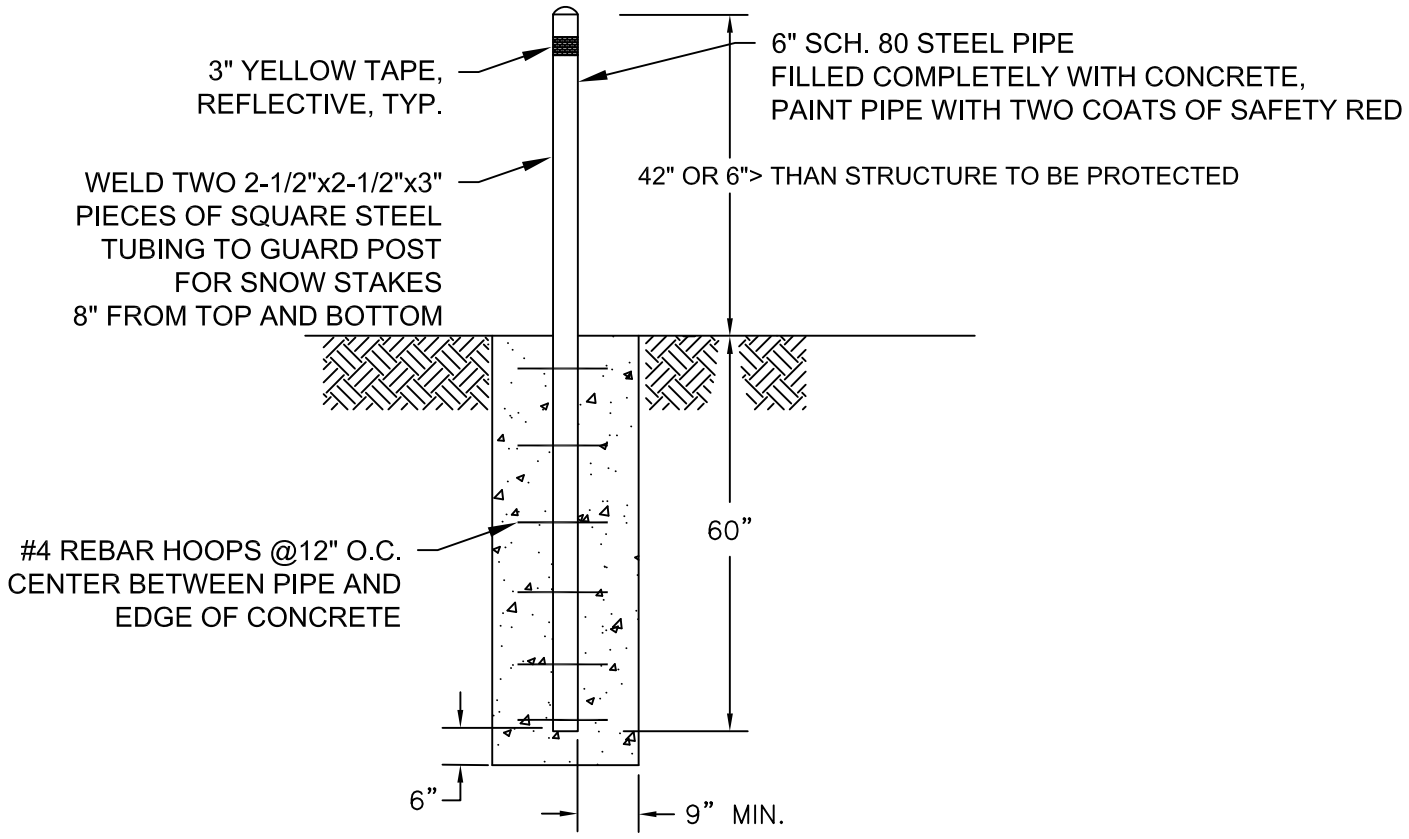
NOTES:

1. GUARD POSTS ARE REQUIRED ON ALL SIDES AS NEEDED TO PROTECT THE STRUCTURE.
2. CONCRETE TO BE 2,500 PSI MINIMUM.
3. BOLLARDS SHALL BE PLACED THREE (3) FEET MINIMUM FROM THE FACE OF FIRE HYDRANTS. ALL ORIFICES SHALL BE UNOBSTRUCTED. BOLLARDS SHALL BE SUFFICIENT NUMBER TO PROTECT THE HYDRANT, MINIMUM 2.

KIRKWOOD MEADOWS
PUBLIC UTILITY DISTRICT

BOLLARD DETAIL

DATE:	APPROVED BY:	DRAWING NUMBER:
5/23/22	E.M.C.	KMW007
SCALE: N.T.S.	DRAWN BY: L.P.B.	



PROFILE

NOTES:

1. GUARD POSTS ARE REQUIRED ON ALL SIDES AS NEEDED TO PROTECT THE STRUCTURE.
2. CONCRETE TO BE 2,500 PSI MINIMUM.

KIRKWOOD MEADOWS
PUBLIC UTILITY DISTRICT

HIGH TRAFFIC BOLLARD DETAIL

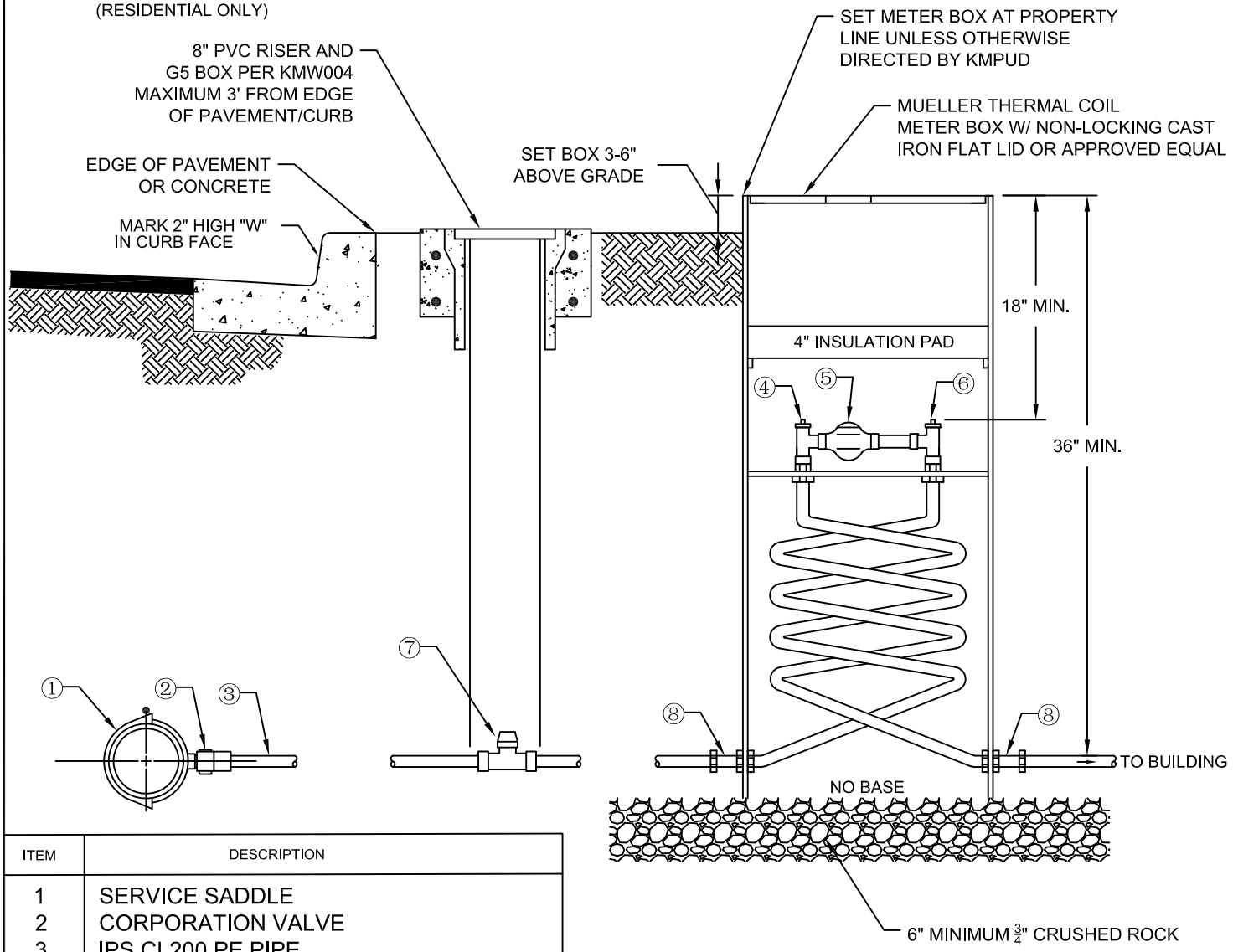
DATE:	APPROVED BY:	DRAWING NUMBER:
5/23/22	E.M.C.	KMW007B
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1. ALL PIPING FROM WATER MAIN TO METER BOX SHALL BE CL200, SIDR7 PE PIPE (ASTM D2239), SIZES SHALL CONFORM TO KMPUD STANDARD SPECIFICATIONS.
2. ALL PIPE CONNECTIONS SHALL BE COMPRESSION TYPE WITH STAINLESS STEEL INSERT STIFFENERS: MUELLER "INSTA-TITE"; FORD "ULTRA-TITE"; OR EQUAL.
3. METER BOXES AND PIPE SHALL NOT BE IN DRIVEWAYS OR AREAS WITH VEHICLE TRAFFIC.
4. BEDDING & BACK FILL REQUIRED ALONG SERVICE LINE PER STANDARD DETAIL DWG. KMW003.
5. NON-RESIDENTIAL CONNECTIONS SHALL HAVE A SEPARATE CONNECTION FOR FIRE PROTECTION PURPOSES.
6. CUSTOMERS WITH STATIC PRESSURES ABOVE 80 PSI WILL NEED TO INSTALL A PRESSURE REDUCING DEVICE ON THEIR SIDE OF THE METER. KMPUD RECOMMENDS THIS BE INSTALLED INDOORS IN AN ACCESSIBLE, FREEZE PROOF AREA.
7. 1-1/2" AND 2" METERS SHALL UTILIZE MUELLER EZ-VAULT.
8. DEDICATED METER ROOMS SHALL BE DESIGNED AND SUBMITTED TO KMPUD FOR REVIEW.

STANDARD CONNECTION:

(RESIDENTIAL ONLY)



ITEM	DESCRIPTION
1	SERVICE SADDLE
2	CORPORATION VALVE
3	IPS CL200 PE PIPE
4	LOCKABLE ANGLE METER STOP
5	METER-SUPPLIED BY KMPUD
6	BRASS ANGLE CHECK VALVE
7	BRASS BALL CURB VALVE
8	DIELECTRIC UNION

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

STANDARD SERVICE CONNECTION FOR RESIDENTIAL METERS

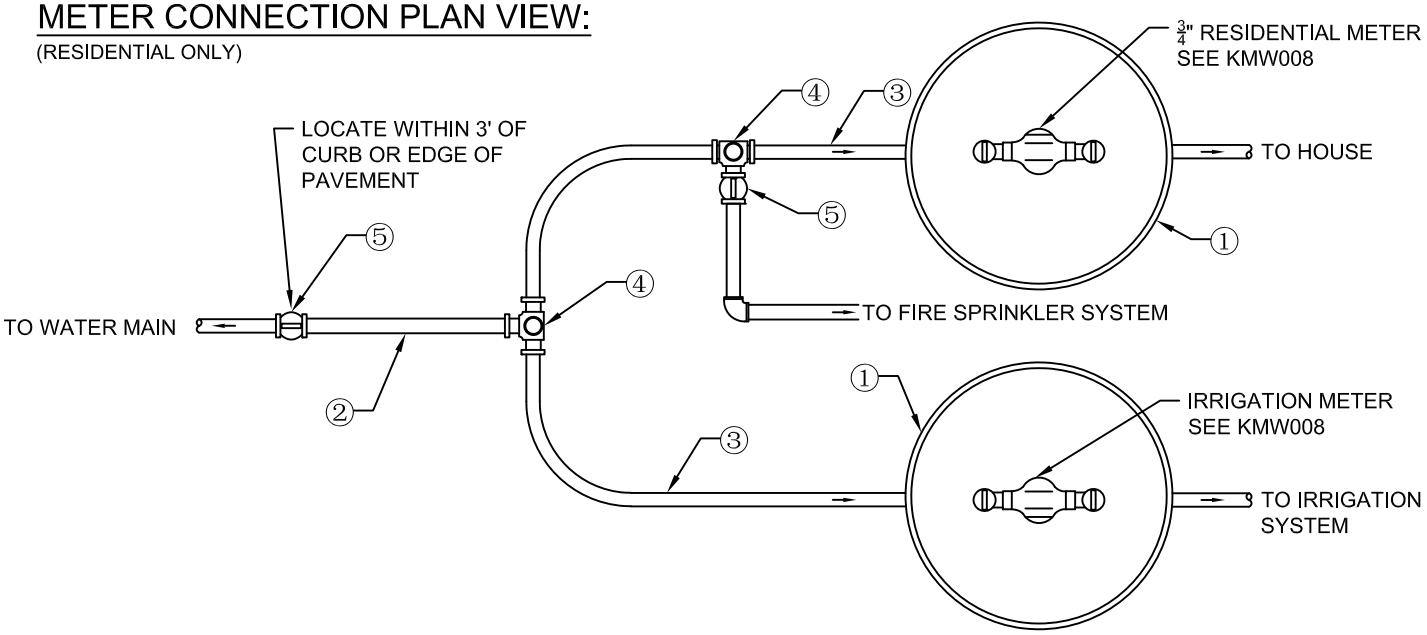
DATE:	APPROVED BY:	DRAWING NUMBER:
4/11/22	E.M.C.	KMW008
SCALE: N.T.S.	DRAWN BY: L.P.B.	

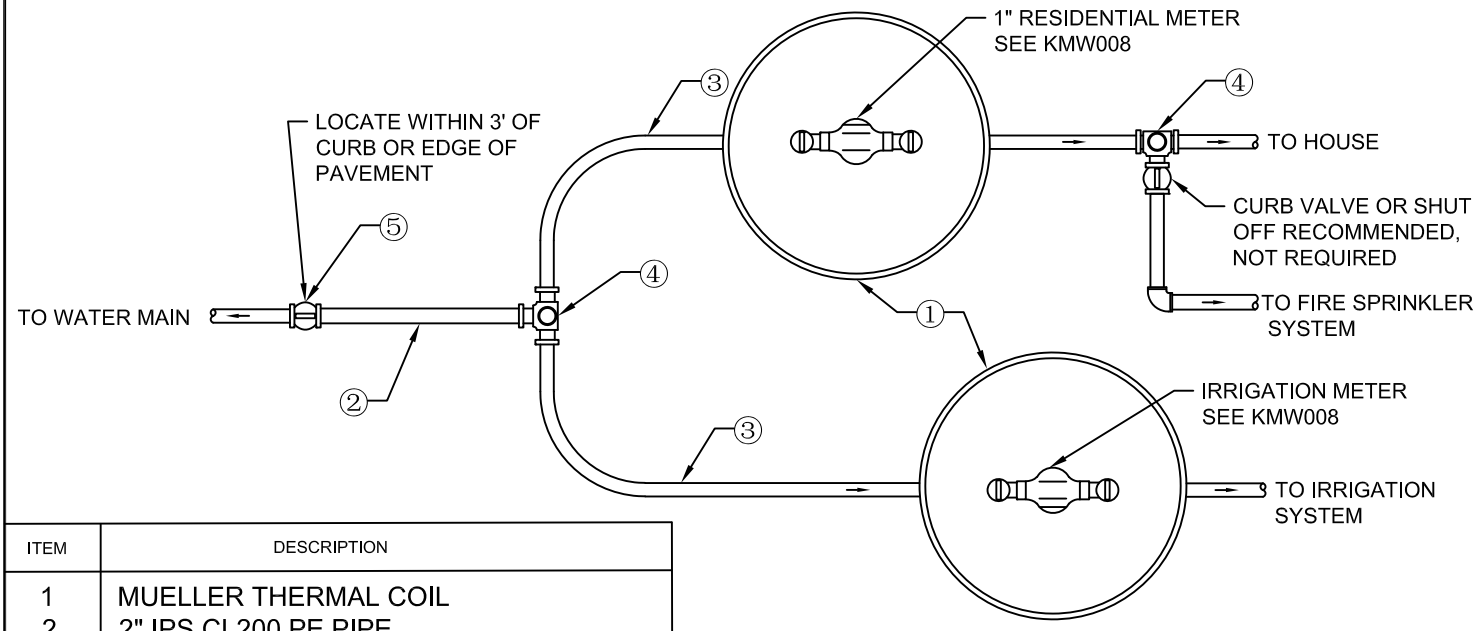
NOTES:

1. ALL PIPING FROM WATER MAIN TO MAIN TEE SHALL BE 2" CL200, SIDR7 PE PIPE (ASTM D2239). PIPE DOWNSTREAM OF MAIN TEE SHALL BE PER KMPUD STANDARD SPECIFICATIONS.
2. ALL PIPE CONNECTIONS SHALL BE COMPRESSION TYPE: MUELLER "C-110"; FORD "PACK JOINT"; OR EQUAL.
3. METER BOXES AND PIPE SHALL NOT BE IN DRIVEWAYS OR AREAS WITH VEHICLE TRAFFIC.
4. BEDDING & BACK FILL REQUIRED ALONG SERVICE LINE PER STANDARD DETAIL DWG. KMW003.
5. NON-RESIDENTIAL CONNECTIONS SHALL HAVE A SEPARATE CONNECTION FOR FIRE PROTECTION.
6. ALL VALVE, FITTING AND PIPE SIZES SHALL BE PER KMPUD STANDARD SPECIFICATIONS.

METER CONNECTION PLAN VIEW:

(RESIDENTIAL ONLY)



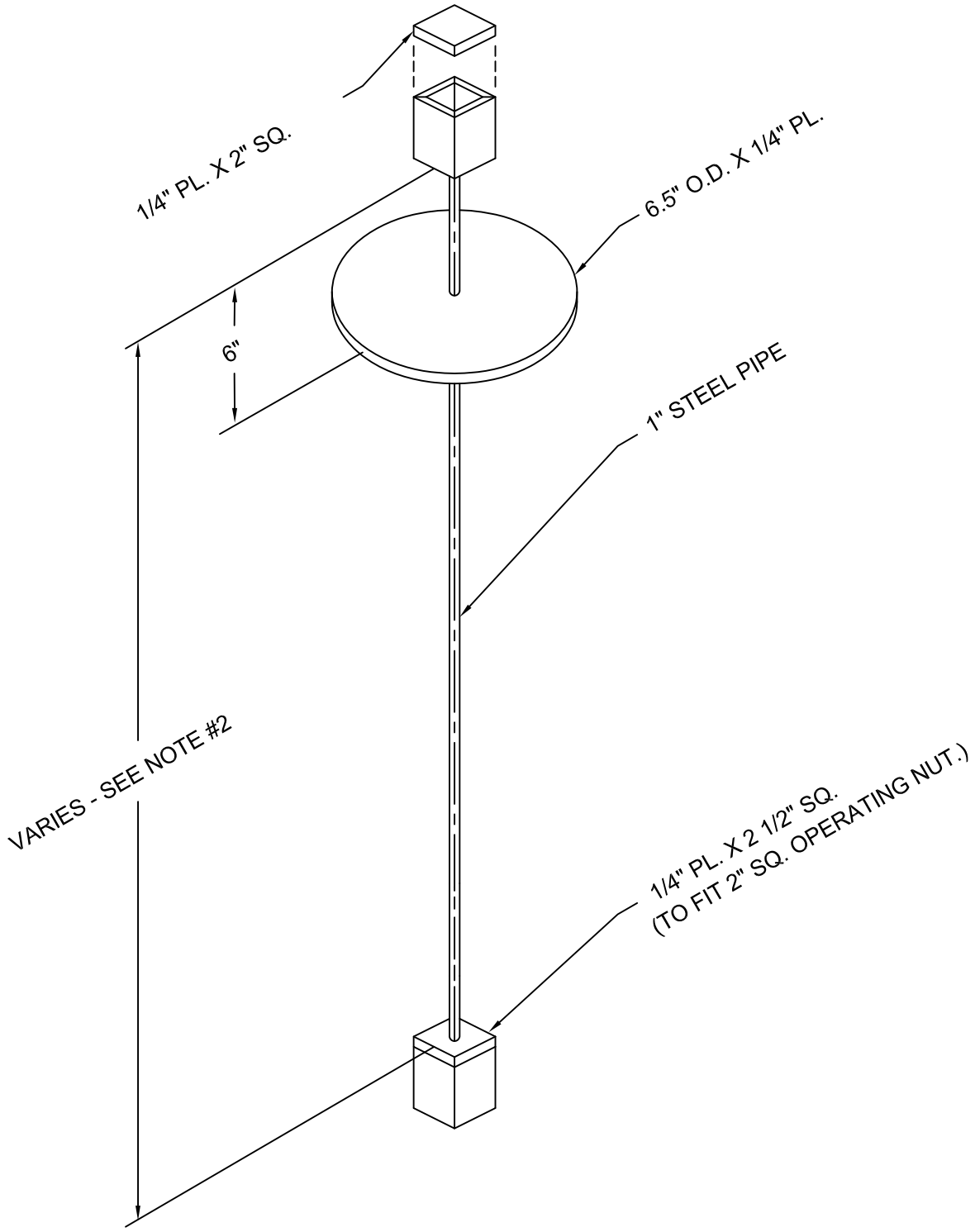


ITEM	DESCRIPTION
1	MUELLER THERMAL COIL
2	2" IPS CL200 PE PIPE
3	CL200 PE PIPE (MATCH METER SIZE)
4	BRASS TEE
5	BALL CURB VALVE, RISER AND G5 BOX PER KMW004

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

METER PLAN FOR RESIDENTIAL METERS

DATE:	APPROVED BY:	DRAWING NUMBER:
3/30/22	E.M.C.	KMW009
SCALE: N.T.S.	DRAWN BY: L.P.B.	



NOTES:

1. REQUIRED WHERE VALVE NUT IS DEEPER THAN 48" BELOW FINISHED GRADE.
2. TOP OF FABRICATED EXTENSION TO BE 24" - 36" FROM FINISHED GRADE.

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

VALVE OPERATING NUT EXTENSION

DATE:	APPROVED BY:	DRAWING NUMBER:
9/30/18	E.M.C.	KMW010
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1. IF NON-POTABLE MAIN OR LATERAL IS CUT OR DAMAGED, IMMEDIATELY NOTIFY NON-POTABLE UTILITY.

2. ALTERATION OF THE NON-POTABLE GRADE WILL BE PERMITTED ONLY AFTER WRITTEN PERMISSION HAS BEEN RECEIVED FROM KMPUD.

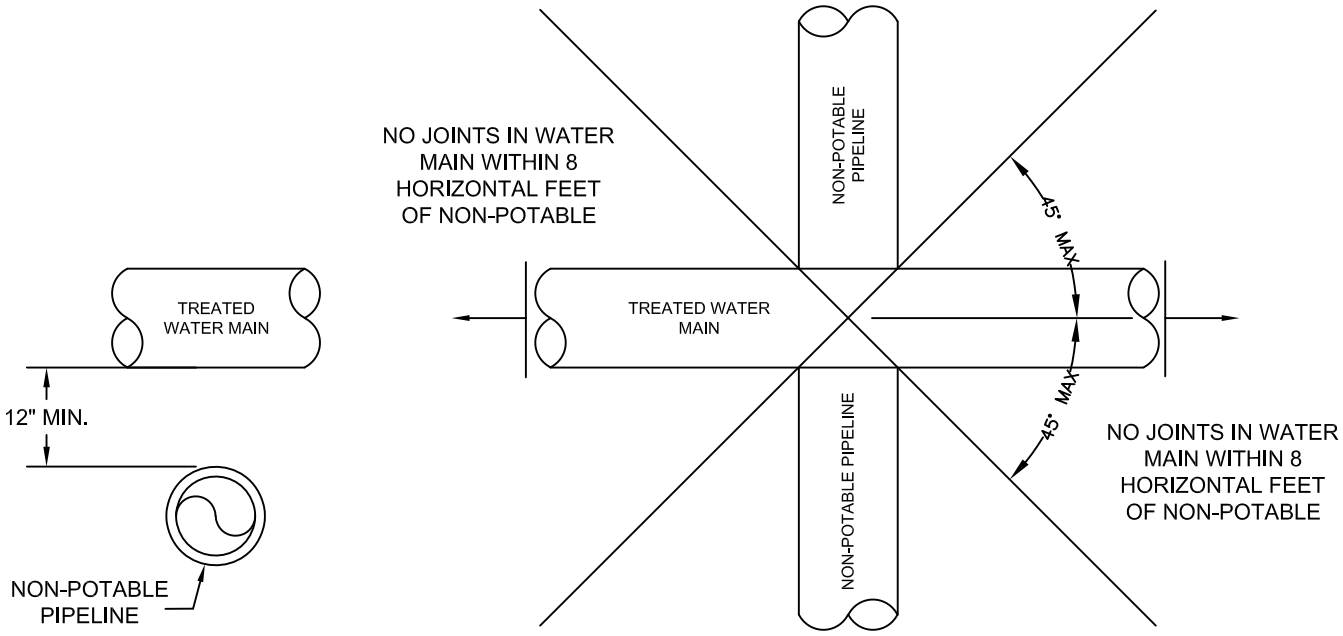
3. ALL STATE & LOCAL NON-POTABLE UTILITY REQUIREMENTS MUST BE MET.

4. ALL CROSSINGS SHALL BE AT 90°, UNLESS OTHERWISE APPROVED BY KMPUD.

5. NO CONNECTION JOINTS ALLOWED IN THE WATER MAIN WITHIN 8 HORIZONTAL FEET OF THE NON-POTABLE FLUID PIPELINE.

6. IF THE SEPARATION REQUIREMENTS OF TITLE 17 OR TITLE 22, ESPECIALLY SECTION 64572, CANNOT BE MET, WRITTEN AUTHORIZATION AND AN APPROVED INSTALLATION PLAN FROM THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD MUST BE PROVIDED TO KMPUD PRIOR TO CONSTRUCTION.

7. PROPANE IS NOT A HAZARDOUS FLUID/GAS.



NON-POTABLE PIPELINE FLUIDS:

1) UNTREATED SEWAGE
2) PRIMARY OR SECONDARY TREATED SEWAGE
3) HAZARDOUS FLUIDS OR GASES (FUELS, INDUSTRIAL WASTES, SLUDGE, ETC.)
4) DISINFECTED TERTIARY RECYCLED WATER
5) STORM DRAINAGE

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

SEWER/WATER LINE CROSSING

DATE:	APPROVED BY:	DRAWING NUMBER:
6/16/21	E.M.C.	KMW011
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

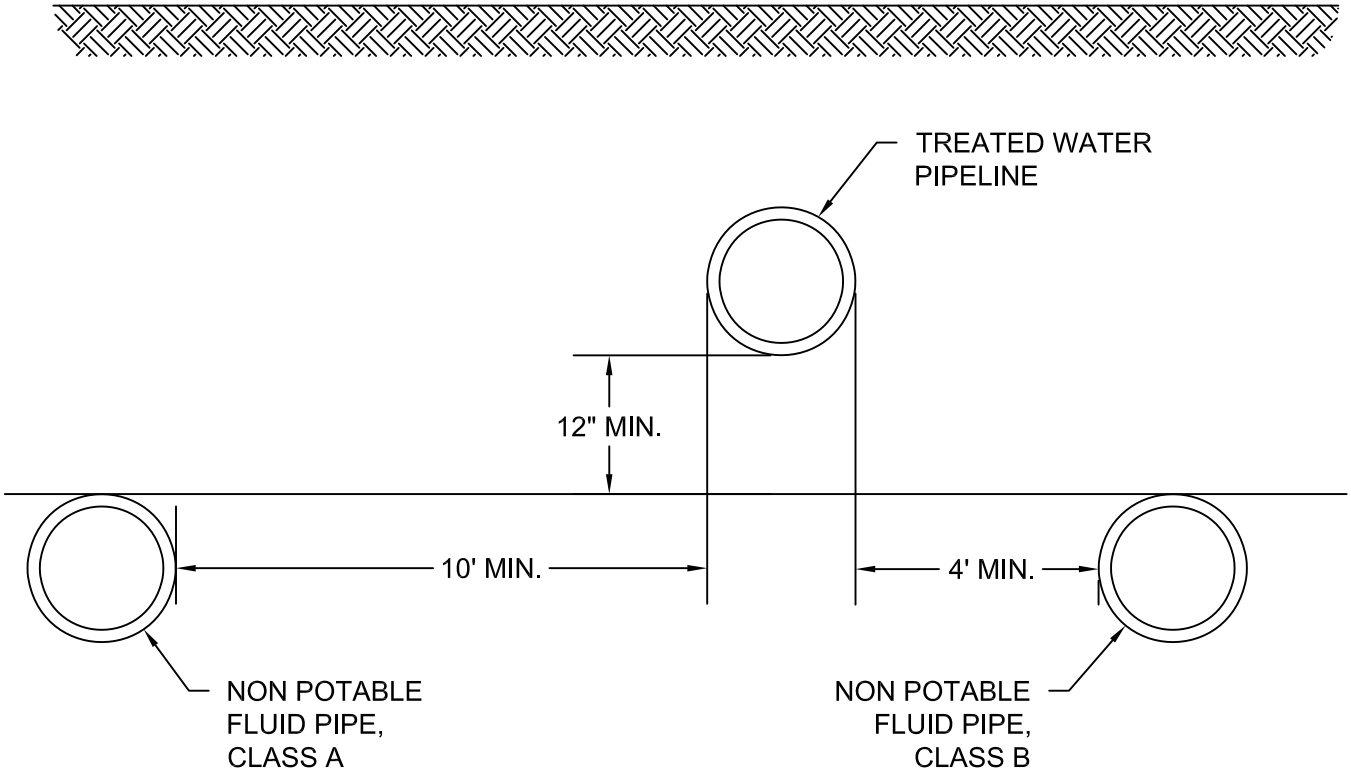
1. IF NON-POTABLE MAIN OR LATERAL IS CUT OR DAMAGED, IMMEDIATELY NOTIFY KMPUD.

2. ALTERATION OF THE NON-POTABLE GRADE WILL BE PERMITTED ONLY AFTER WRITTEN PERMISSION HAS BEEN RECEIVED FROM KMPUD.

3. ALL STATE & LOCAL NON-POTABLE UTILITY REQUIREMENTS MUST BE MET.

4. IF THE SEPARATION REQUIREMENTS OF TITLE 17 OR TITLE 22, ESPECIALLY SECTION 64572, CANNOT BE MET, WRITTEN AUTHORIZATION AND AN APPROVED INSTALLATION PLAN FROM THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD MUST BE PROVIDED TO KMPUD PRIOR TO CONSTRUCTION.

6. PROPANE IS NOT A HAZARDOUS FLUID/GAS.



INSTALLATION PER CLASS A SEPARATION IF NON-POTABLE PIPELINE CONVEYS:

1) UNTREATED SEWAGE
2) PRIMARY OR SECONDARY TREATED SEWAGE
3) DISINFECTED SECONDARY-2.2 RECYCLED WATER
4) DISINFECTED SECONDARY-23 RECYCLED WATER
5) HAZARDOUS FLUIDS OR GASES

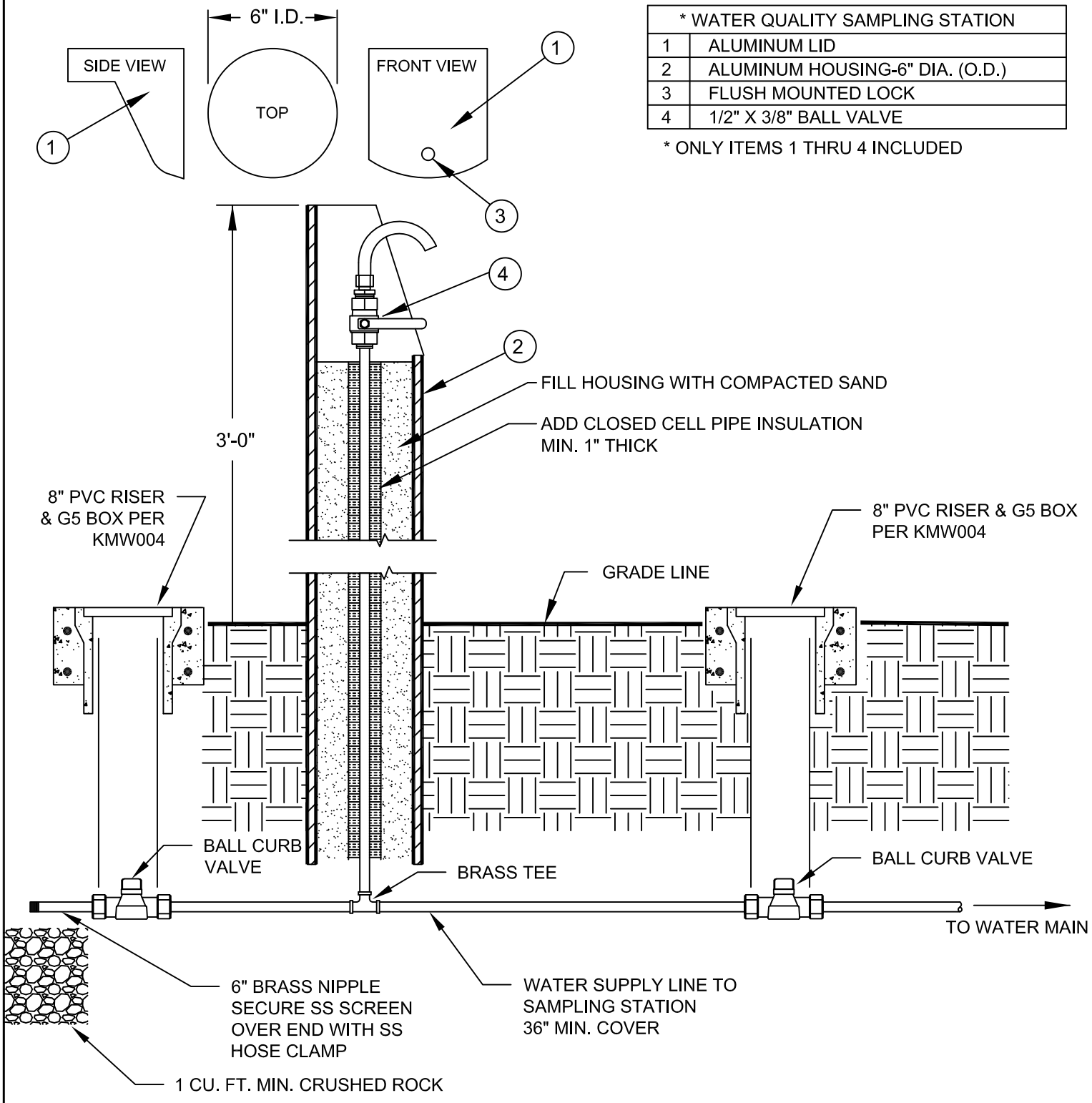
INSTALLATION PER CLASS B SEPARATION IF NON-POTABLE PIPELINE CONVEYS:

1) DISINFECTED TERTIARY RECYCLED WATER
2) STORM DRAINAGE
3) RAW WATER PIPELINES ARE TO BE PLACED 4' HORIZONTALLY AND 1' VERTICALLY BELOW ANY WATER MAIN.

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

SEWER/WATER LINE PARALLELING

DATE:	APPROVED BY:	DRAWING NUMBER:
6/30/21	E.M.C.	KMW011A
SCALE: N.T.S.	DRAWN BY: L.P.B.	



* WATER QUALITY SAMPLING STATION	
1	ALUMINUM LID
2	ALUMINUM HOUSING-6" DIA. (O.D.)
3	FLUSH MOUNTED LOCK
4	1/2" X 3/8" BALL VALVE

* ONLY ITEMS 1 THRU 4 INCLUDED

KORALEEN
ENTERPRISES
1340 Loma De Paz, Escondido, CA 92027
Phone 760-743-0407
Fax 760-743-1396

NOTES:

1. USE SPECIFIED MANUFACTURER OR EQUAL.
2. USE STATION GUARD XLT OR KOR-COLD.

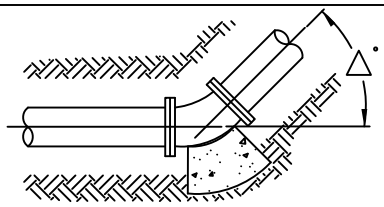
KIRKWOOD MEADOWS
PUBLIC UTILITY DISTRICT

WATER QUALITY SAMPLING STATION

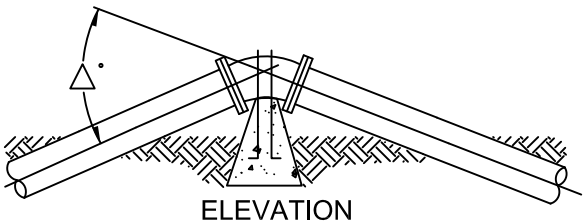
DATE:	APPROVED BY:	DRAWING NUMBER:
9/30/18	E.M.C.	KMW012
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1. THRUST BLOCK AREAS & VOLUMES GIVEN ARE FOR A TEST PRESSURE OF 150 PSI, A SOIL LATERAL PRESSURE OF 1000 lb/sf AND 3 FEET OF COVER. INSTALLATIONS WITH HIGHER TEST WATER PRESSURES, LOWER SOIL BEARING PRESSURES OR LESS THAN 3 FEET OF COVER WILL REQUIRE ADJUSTMENT OF THRUST BLOCK SIZE; SUBJECT TO APPROVAL BY KMPUD. ALTERNATE THRUST BLOCK DETAILING FOR INSTALLATIONS WITH HIGHER SOIL LATERAL PRESSURES OR GREATER COVER, AS CONFIRMED BY A SITE SPECIFIC GEOTECHNICAL REPORT AND PREPARED BY A LICENSED ENGINEER MAY BE ALLOWED, SUBJECT TO REVIEW AND APPROVAL BY KMPUD.
2. THRUST BLOCKS SHALL BE CONSTRUCTED OF MINIMUM 2,500 PSI CONCRETE & SHALL BE POURED AGAINST UNDISTURBED SOIL.
3. DOUBLE WRAP ALL FITTINGS, NUTS, & BOLTS WITH 6 MIL. POLYETHYLENE FILM.
4. JOINTS, FACE OF PLUGS AND NUTS & BOLTS TO BE KEPT CLEAR OF CONCRETE AND MUST BE ABLE TO OPERATE WITHOUT DISTURBING THRUST BLOCK.
5. VERTICAL BENDS SHALL USE RESTRAINED JOINTS AND A FULL LENGTH OF PIPE ON EACH SIDE OF FITTING.
6. (2) #5 REBAR SHALL BE PLACED AS SHOWN, REBAR TO BE SHAPED WITH 90° BEND AT EACH END, AND COATED WITH TWO COATS OF CHRISTY'S HD50 OR APPROVED EQUAL, 18 MILS EACH COAT. 12" 90° AND 45° VERTICAL BENDS AND 10" 90° VERTICAL BENDS SHALL UTILIZE #6 BARS. ALL REBAR SHALL BE GRADE 60 AND BE EMBEDDED A MINIMUM OF 30" INTO CONCRETE FOR THRUST BLOCKS GREATER THAN OR EQUAL TO 1 CY.
7. THRUST RESTRAINT FOR PIPE GREATER THAN 12" SHALL BE SUBMITTED TO KMPUD FOR REVIEW AND APPROVAL. CONCRETE THRUST BLOCKING FOR THESE LARGER PIPE SIZES MAY BE REJECTED.

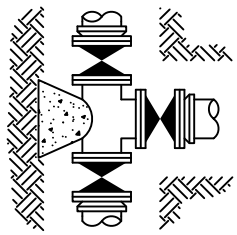
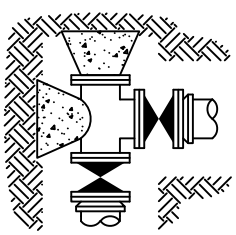
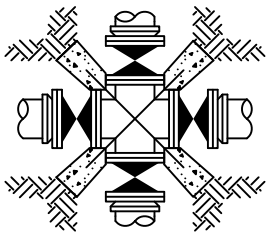
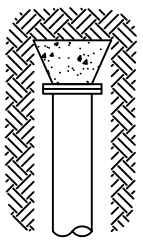
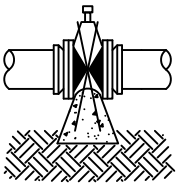


PLAN



ELEVATION

NOMINAL PIPE DIA. (IN.)	HORIZONTAL THRUST BLOCK BEARING AREA (SQ. FT.)				VERTICAL THRUST BLOCK VOLUME OF CONCRETE (CU. YD.)			
	△° =11 1/4°	△° =22 1/2°	△° =45°	△° =90°	△° =11 1/4°	△° =22 1/2°	△° =45°	△° =90°
4"	1.0	1.0	2.0	3.0	0.1	0.2	0.5	1.0
6"	1.0	2.0	4.0	7.0	0.3	0.5	1.1	2.0
8"	2.0	3.5	7.0	13.0	0.5	1.0	2.0	3.5
10"	3.0	5.5	11.0	20.0	0.8	1.5	3.0	5.5
12"	4.0	8.0	15.5	29.0	1.1	2.2	4.5	8.0

NOMINAL PIPE DIA. (IN.)	 TEE	 TEE W/ BLD. FLG.	 CROSS	 DEAD END	 IN LINE VALVE
4"	2.5	2.5	2.5	2.5	2.5
6"	5.0	5.0	5.0	5.0	5.0
8"	9.0	9.0	9.0	9.0	9.0
10"	14.0	14.0	14.0	14.0	14.0
12"	20.0	20.0	20.0	20.0	20.0
EACH HORIZONTAL THRUST BLOCK BEARING AREA (SQ. FT.)					

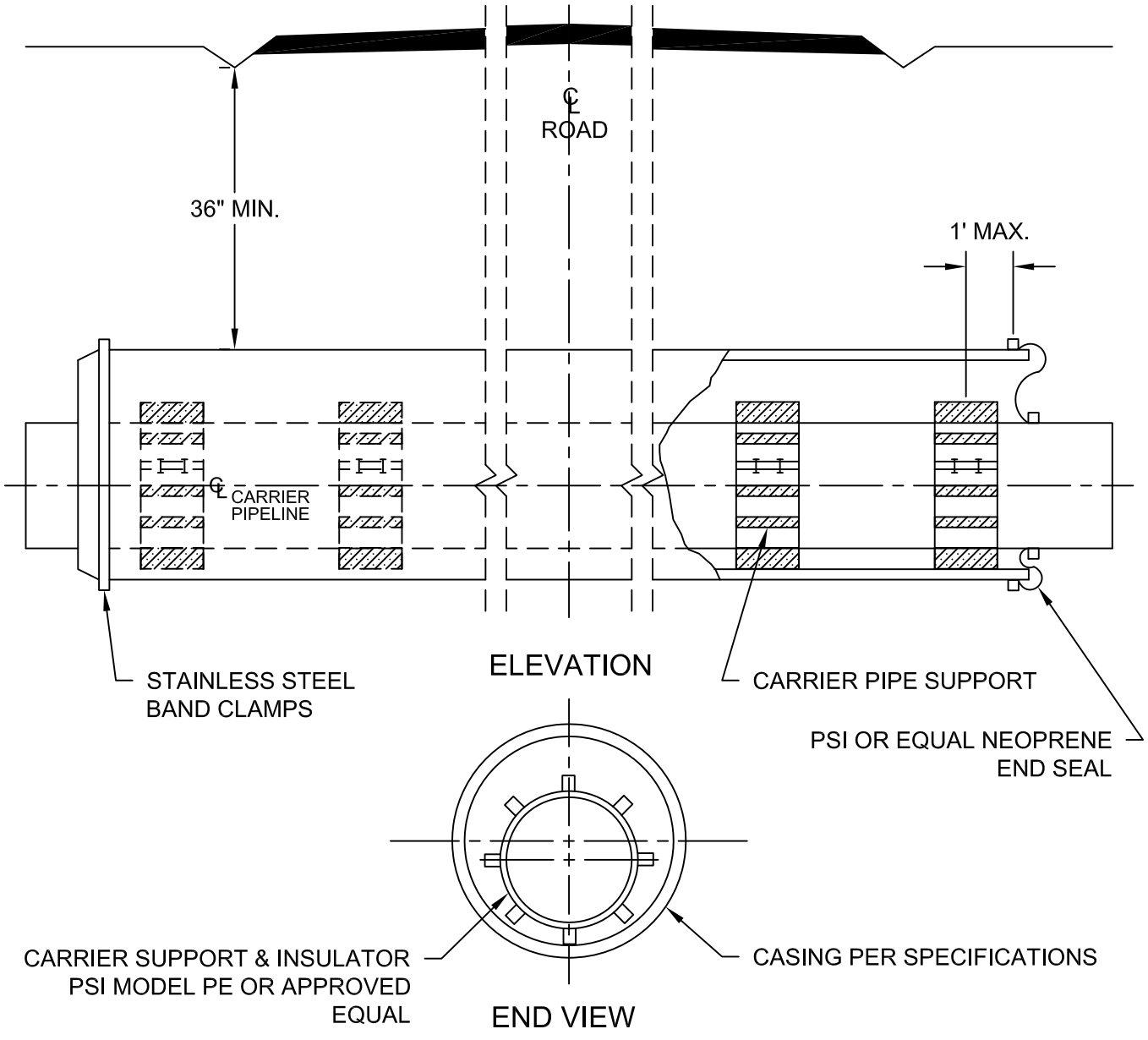
KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

THRUST BLOCK DETAILS

DATE:	APPROVED BY:	DRAWING NUMBER:
5/2/22	E.M.C.	KMW013
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1. SKIDS OF CARRIER PIPE SUPPORTS SHALL BE GREASED BEFORE INSTALLATION.
2. SPACING OF CARRIER PIPE SUPPORTS SHALL BE PER MANUFACTURERS' RECOMMENDATION OR 9', WHICH EVER IS LESS.
3. CARRIER PIPE SHALL BE TESTED BEFORE SEALING ENDS.
4. BELLS OF CARRIER PIPE SHALL NOT REST ON CASING PIPE.
5. CASING LENGTH & THICKNESS SHALL CONFORM TO KMPUD STANDARDS OR ROADWAY CONTROLLING AGENCY'S SPECIFICATIONS WHICH EVER IS MORE STRINGENT.
6. CARRIER PIPE TO BE DUCTILE IRON PIPE WITH RESTRAINED JOINTS.
7. VALVES SHALL BE LOCATED ON EACH SIDE OF CASING.



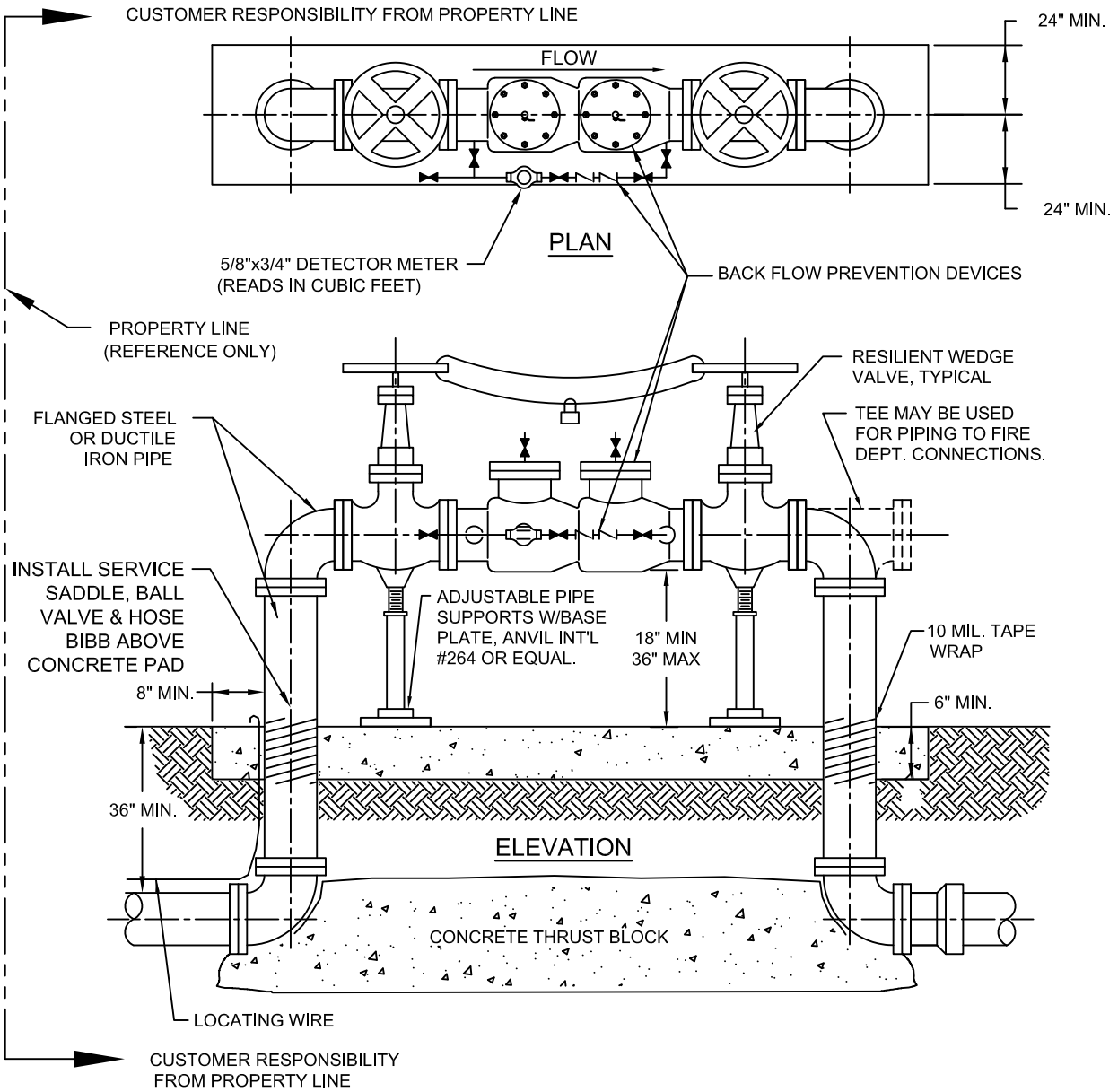
KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

CASING & CARRIER PIPE

DATE:	APPROVED BY:	DRAWING NUMBER:
9/30/18	E.M.C.	KMW014
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1) ALL PROPERTY HAVING A SECOND SOURCE OF WATER, SUCH AS A WELL OR RAW IRRIGATION WATER, OR FIRE PROTECTION SPRINKLERS SHALL HAVE AN APPROVED BACK FLOW PREVENTION ASSEMBLY INSTALLED ON THE PROPERTY SIDE OF AND ADJACENT TO THE WATER METER. WHERE CONSTRUCTION OR EQUIPMENT LOCATION PRESENT SITING PROBLEMS FOR THE ABOVE NOTED ASSEMBLY, A DEVIATION MAY BE GRANTED, PROVIDING SUCH REQUEST IS MADE IN WRITING PRIOR TO INSTALLATION OF THE ASSEMBLY.
2) NO TEES, TAPS, OUTLETS OR OTHER CONNECTIONS ARE ALLOWED ON KMPUD SIDE OF THE ASSEMBLY. THE BACK FLOW PREVENTION ASSEMBLY SHALL BE INSTALLED AS CLOSE AS PRACTICAL TO THE MAIN AND SHALL NOT BE INSTALLED BELOW GRADE. INSTALLATIONS MUST BE INDOORS IN FREEZE PROOF AREAS. DEVICE MUST BE EASILY ACCESSIBLE FOR TESTING.
3) ALL BACK FLOW PREVENTION DEVICES SHALL CONFORM TO THE LATEST REVISED CALIFORNIA DEPARTMENT OF HEALTH SERVICES' APPROVED LIST FOR CROSS-CONNECTION.
4) THE TYPE OF DEVICE (REDUCED PRESSURE PRINCIPAL ASSEMBLY OR DOUBLE CHECK/DETECTOR ASSEMBLY) SHALL BE DETERMINED BY KMPUD.
5) THE CUSTOMER SHALL OWN & MAINTAIN THE BACK FLOW DEVICE AND ALL PIPING FROM PROPERTY LINE.
6) INITIAL INSTALLATION, TESTING, ANY ADDITIONAL RE-TESTING AND ANNUAL TESTING TO BE THE RESPONSIBILITY OF THE CUSTOMER.
7) VALVE REQUIRED AT MAIN PER STANDARD DETAIL KMW004.



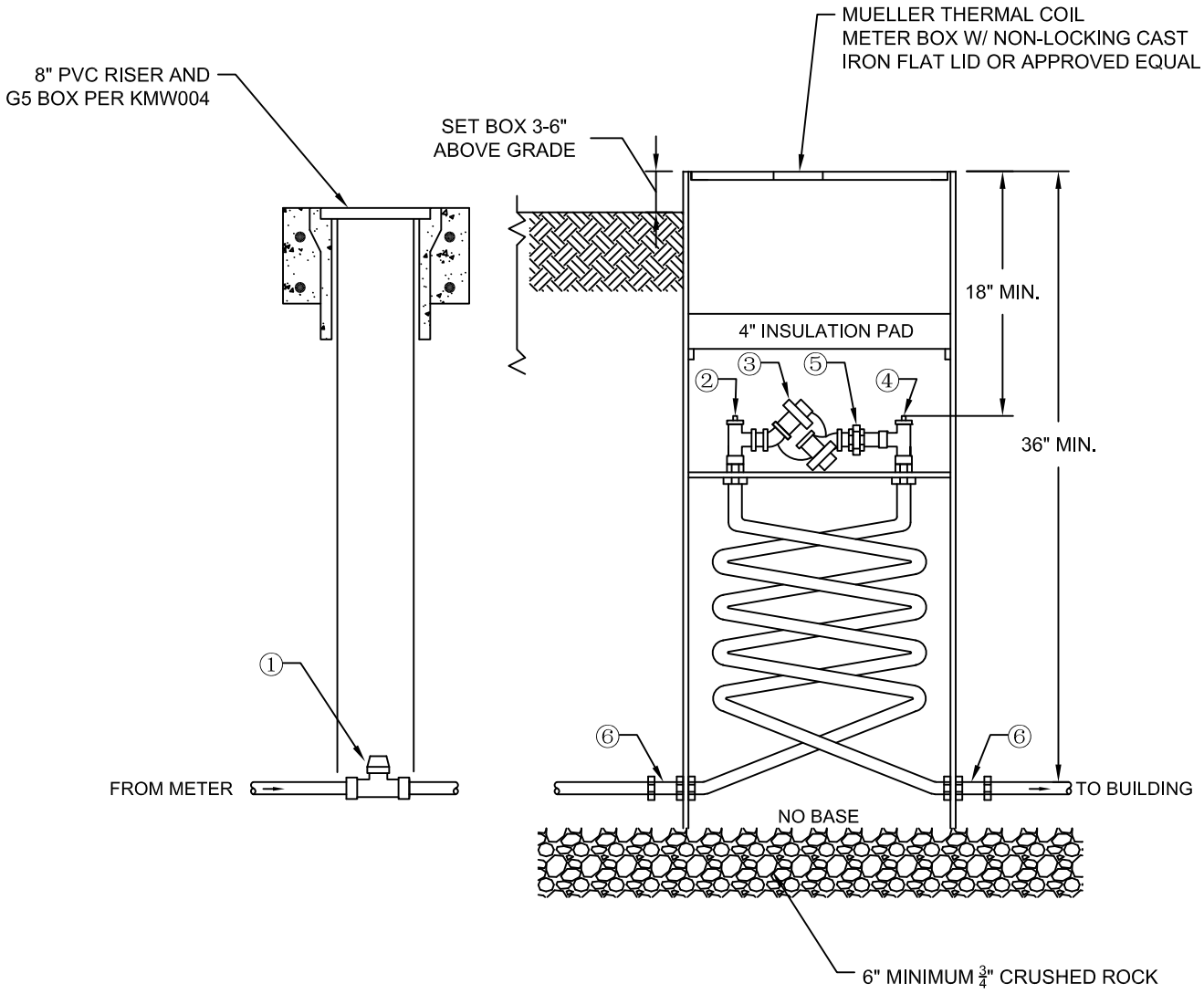
KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

BACKFLOW PREVENTION ASSEMBLY FOR MULTI-UNIT OR COMMERCIAL SYSTEMS

DATE:	APPROVED BY:	DRAWING NUMBER:
9/30/18	E.M.C.	KMW015
SCALE: N.T.S.	DRAWN BY: L.P.B.	

NOTES:

1. ALL PIPING FROM WATER MAIN TO METER BOX SHALL BE SIDR7 PE PIPE (ASTM D2239).
2. ALL PIPE CONNECTIONS SHALL BE COMPRESSION TYPE: MUELLER "INSTA-TITE"; FORD "ULTRA-TITE"; OR EQUAL.
3. METER BOXES AND PIPE SHALL NOT BE IN DRIVEWAYS OR AREAS WITH VEHICLE TRAFFIC.
4. BEDDING & BACK FILL REQUIRED ALONG SERVICE LINE PER STANDARD DETAIL DWG. KMW003.
5. NON-RESIDENTIAL CONNECTIONS SHALL HAVE A SEPARATE CONNECTION FOR FIRE PROTECTION PURPOSES.
6. ALL VALVE, FITTING AND PIPE SIZES SHALL BE THE SAME SIZE AS THE BACKFLOW PREVENTION DEVICE.



ITEM	DESCRIPTION
1	BRASS BALL CURB VALVE
2	LOCKABLE ANGLE METER STOP
3	BACKFLOW PREVENTION DEVICE
4	BRASS ANGLE CHECK VALVE
5	BRASS FEMALE NPT UNION
6	DIELECTRIC UNION

KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

BACK FLOW PREVENTION DEVICE

DATE:	APPROVED BY:	DRAWING NUMBER:
3/30/22	E.M.C.	KMW016
SCALE: N.T.S.	DRAWN BY: L.P.B.	