Colorado Springs Utilities

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2026

Water

Line extension and service standards

www.csu.org

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Pursuant to Colorado Springs City Code Section 12.1.110, on December 2nd, 2025, Colorado Springs Utilities provided public notice of its intent to amend the Water Line Extension and Service Standards. No substantial comments to these Standards and no request for a hearing were received. Therefore, Colorado Springs Utilities does hereby amend the Water Line Extension and Service Standards as Colorado Springs Utilities policy to become effective on January 1st, 2026.

Somer Mese, Chief Operations Officer

12/2/2025
Date Approved

Nicholas Peters, Chief System Planning & Projects Officer

12/2/2025
Date Approved

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COLORADO SPRINGS UTILITIES
WATER LINE EXTENSION AND SERVICE STANDARDS

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WATER LINE EXTENSION AND SERVICE STANDARDS

REVISION TABLE
(To the 2026 Water Line Extension and Service Standards, Effective date of 01/01/2026)

SECTION(S)	TITLE	REVISION DESCRIPTION
2.6.F.7	CTRB's Vs Bell Restraints	Change to prefer thrust blocks or restrained joint pipe systems over bell restrained joint pipe due to long term maintenance.
2.6.F.16	Separation Criteria to Stormwater Facilities	Updated requirements for separation between water mains and services and stormwater ponds
2.6.F.2, 2.7A, 2.7.F	Water Main Design/ Water Service Line Design Criteria	Update separation criteria and relocated some sections to improve readability.
2.6.D.5, 5.13.C, and 5.20	Water Quality Flushing Requirements Enforcement	Updated Various Water Quality requirements relating to water main storage, installation, and flushing to improve Water Quality at time of main acceptance.
4.4.B.5	Restrained Joint Pipe	Allow restrained joint PVC for open trench and casing pipe applications.
4.4.D.5	Flange Gaskets	Due to diminished lifespan, red rubber is no longer permitted for flange gaskets.
4.4.D.6	Mechanical Joint Gaskets	Material specifications added for gaskets used with MJ glands.
4.4.E.2	Butterfly Valves	PVC and HDPE pipe require the use of Widebody Butterfly valves to decrease beveling.
4.4.F and 4.4.G	Pressure Regulating and Reducing Valves	Removed alternative PRV manufactures which formerly required a variance for use.
4.4.K.1	Fire Hydrant Paint	Black hydrant paint should be used to indicate "operable and maintenance only" fire hydrants in alignment with CSFD Fire Code.
4.4.R.5	Test Stations for Cathodic Protection	Require valve boxes with "WATER TEST" lids and terminal boards for Cathodic Protection test stations placed in the roadway.
4.4.P, 5.16, 5.21.M, 6.6.C, 6.16	Tracer Wire Materials, Installation, and Boring	Revised specifications require copper clad steel tracer wire. Require 4 wires for boring applications. Locate requirements for deep installations.
4.5.A and 4.5.B	Water Service Line Fittings	Reorganized copper and HDPE service line fittings sections with new layout.
5.4.F	Stop Work Authority on Construction Sites	Language added to allow CSU personnel to stop their inspections or other work if unsafe utilities or underground construction practices are encountered on site.

5.13.D.3.f	Out of Service Rings for Fire Hydrants Not Yet in Service	Requirements added so that newly installed fire hydrants that are not in service yet are required to have Out of Service rings installed by Colorado Springs Utilities.
5.21.J	Contractor shall be on site during inspection	Added language clarifying the contractor shall be on site during inspections for new construction and repair work.
Chapter 7	Pump Stations	Overhaul of Chapter 7 – updated developer and CSU responsibilities, updated specifications
8.9 & 8.9A	Nonpotable Water Service Line Design	Updated qualification requirements for nonpotable water system designers. Updated nonpotable water service line tap sizes
Details A6-1 through A6-8	Pressure Regulation Stations	Updates of Details of Pressure Regulation Stations
B1-6	Water Main Entry Riser	Updates to existing 4" x 2" water entry riser detail and add new typical water main entry riser.
B1-6A	Service Line Reduction in Meter Vault	Added Detail B1-6A for 4" Reduction to 2" Meter in Vault.

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CHAPTER 1

General Information

1.1 General

The purpose of Chapter 1 is to provide an understanding of the organization and applicability of the *Colorado Springs Utilities Water Line Extension and Service Standards (Water LESS)* and how they should be utilized. By adopting and promulgating these *Water LESS*, Colorado Springs Utilities seeks to ensure safe and efficient design, construction, and operation of the Water System. Refer to the appropriate set of *Line Extension and Service Standards Documents* according to Utility Service: Water, Wastewater, Gas or Electric.

The criteria are written to ensure uniformity of design concepts, methodologies, procedures, Construction materials, types of equipment and quality of work products. Sound judgment shall be exercised in all applications to create safe, suitable, high-quality, energy efficient and cost-efficient facilities. Any deviations from these criteria shall be approved by Colorado Springs Utilities.

1.2 Authority

These *Water LESS* are promulgated by the Colorado Springs Utilities Executive Director (CEO) and approved by the Chief System Planning & Projects Officer in accordance with *City Code 12.1.110*. The interpretation, enforcement, and revision of these *Water LESS* are hereby delegated to the Chief System Planning & Projects Officer, or their designated agent.

1.2.A Interpretative Authority

The Chief System Planning & Projects Officer of Colorado Springs Utilities, acting either directly or through properly authorized agents, shall have the authority to interpret these *Water LESS*. In case of a dispute, the Chief System Planning & Projects Officer shall have final authority to interpret these *Water LESS*.

1.2.B Inspection Authority

Colorado Springs Utilities shall assign an Inspector and/or Project Manager (Inspector) as the designated agent of the Chief System Planning & Projects Officer during Construction of the proposed Water System to ensure these *Water LESS* and all contractual Specifications are met. The Inspector shall maintain overall authority over Construction. The Inspector is responsible for reviewing the Approved Construction Plans, the applicable *Water LESS* criteria, all Contract Documents and any other approved plans and/or reports necessary for the Construction of the proposed Water System. The Inspector shall coordinate with the appropriate Colorado Springs Utilities Staff and the Design Engineer to resolve significant conflicts between the Approved Construction Plans, these Water LESS, Contract Documents and any other approved plans and/or reports with due consideration given to the professional duties and responsibilities of the Design Engineer. The Inspector may require on-site changes and corrections be made to the Approved Construction Plans during any phase of Construction to ensure these *Water LESS*, *City Code,* Contract Documents and any other approved plans and/or reports are followed to ensure Construction of a safe and efficient Water System. The Inspector shall use the Approved Construction Plans as follows:

- Addenda and modifications including, but not limited to, field changes and revisions to the Approved Construction Plans take precedence over the original Approved Construction Plans.
- In the Approved Construction Plans, calculated dimensions shall take precedence over scaled dimensions and noted material over graphic indication.

1.2.C Conflicts Between Approved Construction Plans and these *Water LESS*

When a conflict occurs between the Approved Construction Plans and these *Water LESS*, the Chief System Planning & Projects Officer or its designees shall decide which stipulation will provide the best installation and their decision shall be final.

1.3 Applicability

These *Water LESS* are Colorado Springs Utilities' service standards and regulations relevant to the design, installation, Construction, maintenance, repair or replacement of the Water System and Water Service Lines, provision of Water Service to the Public, and assurance of Potable and palatable quality of water for the following:

- Private and Public Potable and Nonpotable Water System components including pump stations and Transmission and Distribution Water Mains up to and including 24 inches in diameter and
- Potable and Nonpotable Water Service Lines.

These Water LESS do not cover the design and Construction of Raw Water collection, storage, transmission, and treatment unless otherwise noted. Portions of these *Water LESS* are applicable and relevant to steel transmission lines and will be enforced as such. However, Colorado Springs Utilities recognizes that these *Water LESS* are not comprehensive for steel transmission line design, installation, Construction, maintenance, repair, and replacement. Applicability and enforcement of these *Water LESS* for steel transmission mains will be conducted on a case-by-case basis. Determination of applicability and subsequent enforcement requirements will be made by the Chief System Planning & Projects Officer or its designees.

1.4 Enforcement

Colorado Springs Utilities may enforce these *Water LESS* in accordance with *City Code § 1.1.201 and 12.1.115.*

No building permits shall be issued for building Sites within any plat until all required utility systems have been installed in accord with all Specifications of Colorado Springs Utilities or, alternatively, until acceptable agreements guaranteeing the completion of all required utility systems and other requirements, as specified by Colorado Springs Utilities, have been placed on file with Colorado Springs Utilities. *City Code § 7.4.306*

Colorado Springs Utilities is authorized to take appropriate action, up to and including discontinuation of service, against any Reclaimed Water User who does not meet the requirements of these standards, *Regulation No. 84*, CDPHE, or the User's *NOA*. *City Code § 12.4.1109*

1.5 Effective Date of Standards

These *Water LESS* shall be binding and in effect upon approval and adoption by the Chief System Planning & Projects Officer after notice and shall supersede all previously approved *Water Line Extension & Service Standards*. *City Code § 12.1.110.*

1.6 Organization of these *Water LESS*

These *Water LESS* have been organized to mirror the chronology of a Water Main Extension Projects from planning to Construction.

1.7 Errors and Omissions

When there are discrepancies within these *Water LESS* the more restrictive requirement shall apply unless otherwise approved by Colorado Springs Utilities.

Criteria not covered herein will be evaluated on a case-by-case basis with review and approval by Colorado Springs Utilities.

1.8 Revisions, Amendments or Additions

These *Water LESS* may be revised, amended, or added to by Colorado Springs Utilities. Such revisions, amendments and additions shall be binding and in full force and effect upon approval and adoption by the Chief System Planning & Projects Officer after Public notice and shall supersede all previously approved *Water Line Extension & Service Standards*. *City Code § 12.1.110.*

Colorado Springs Utilities may promulgate bulletins as addenda to the *Water LESS*. These bulletins shall be posted on Colorado Springs Utilities website at www.csu.org for review and comment for no less than 15 days prior to enforcement.

1.9 Requested Changes to Standards

Anyone wishing to submit a new product, method of installation, or design criteria for inclusion in these *Water LESS*, or to report an error within the *Water LESS*, may do so by contacting the Engineering Support Department, Leon Young Service Center, 1521 Hancock Expressway, MC 1821, Colorado Springs, CO. 80903, with the necessary support information.

1.10 Viewing These Standards Online

The *Water LESS*, forms, and drawings are available as Adobe files on the Colorado Springs Utilities web site at www.csu.org. AutoCAD drawings are available for Detail Drawings, notes and signature blocks and can be downloaded through links within the *Water LESS* Adobe® PDF file.

References to Detail Drawings and other sections of the *Water LESS* can be navigated with hyperlinks embedded within the text of the Adobe® PDF file.

1.11 Referenced Standards, Codes, Permits, Plans, Agreements and Specifications

Where all or part of a Federal, State, City, ASTM, ANSI, AWWA, etc., standard Specification is incorporated by reference in these *Water LESS*, the referenced standard shall be the latest edition and revision unless otherwise indicated by a specific revision date. Referenced documents will be italicized in the text.

1.12 Definitions

Definitions used in these *Water LESS*, or in the Detail Drawings, are shown as capitalized and shall have the meanings herein ascribed:

Agronomic Rate: The rate of application of water and associated nutrients to plants necessary to satisfy the plant's nutrition and watering requirements.

Approved Air Gap: The unobstructed vertical distance of free atmosphere between a discharge point and the prevailing grade or flood level of a receptacle. An Approved Air Gap must satisfy the requirements of ASME standard A112.1.2.

Approved Backflow Prevention Assembly: A testable Backflow prevention assembly, installed in accordance with the Water Line Extension and Service Standards, approved to prevent Backflow based on the Degree of Hazard. The Approved Backflow Prevention Assembly must also be approved by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California (USC) and/or the American Society of Sanitary Engineering (ASSE).

Approved Backflow Prevention Method: An inspectable Air Gap or other method approved by Colorado Springs Utilities to prevent Backflow based on the Degree of Hazard.

Approved Construction Plans: Plans that are signed and approved by Colorado Springs Utilities for installation within the Colorado Springs Utilities Water System. Includes Water, Wastewater and Utility Service Plans prepared by the Design Engineer.

Approved Manufacturer/Material: Manufacturers and materials that are approved for use within the Colorado Springs Utilities Water System: (All "or equal" materials shall be approved by Colorado Springs Utilities in advance of Construction). "Equal" means, of the same quality, material or product that meets or exceeds the approved material/product in the standards.

Asbestos: Any material that contains more than one percent Asbestos and is friable or is releasing Asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

Authority Having Jurisdiction (AHJ): An organization, office or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

Backflow: The reverse flow of water, fluids or gases into any Water Service Line, any Water Distribution Main, the Water Supply System caused by backpressure or back siphonage.

Best Management Practices: Any program, technology, process, operating method, measure, or device that controls, prevents, removes, or reduces pollution and these methods that have been determined to be the most effective, practical means of preventing or reducing pollution or contamination from non-point sources.

Certified Cross-Connection Control Technician: A person who possess a valid Backflow Prevention Assembly Tester certification from one of the following approved organizations: American Society of Sanitary Engineering (ASSE) or the American Backflow Prevention Association (ABPA).

Check Meter (Nonpotable or Potable): A water meter (not owned or installed by Colorado Springs Utilities and not connected to Colorado Springs Utilities system) that is used to measure water consumption for reimbursement of the Colorado Springs Utilities-invoiced charges to the Master-Metered Customer by a downstream entity through an appropriate allocation procedure in accord with *URR Section 10*.

Chief System Planning & Projects Officer: Executive level at-will position reporting directly to the Executive Director. Chief System Planning & Projects Officer is responsible for all water and wastewater operations for Colorado Springs Utilities.

City: The City of Colorado Springs, County of El Paso, State of Colorado. *City Code § 12.1.101*

Cohesionless Soils: Soils that do not exhibit the qualities of Cohesive Soils. Soils having an AASHTO soil classification of A-1, A-2, or A-3. (*City of Colorado Springs Standard Specifications*)

Cohesive Soils: Soils in which the absorbed water and particle attraction work together to produce a body which holds together and deforms plastically at varying water contents. Soils having an AASHTO soil classification of A-4, A-5, A-6, or A-7. (*City of Colorado Springs Standard Specifications*)

Colorado Primary Drinking Water Regulations: Any regulations promulgated by the State of Colorado or any State agency to assure the safety of Public drinking water supplies, and to enable the State of Colorado to assume responsibility for enforcing the standards established by the *Federal Safe Drinking Water Act* (*Public Law 93-523*), as amended. *City Code § 12.4.1202*.

Colorado Springs Utilities (Utilities): Utilities of the City of Colorado Springs created and operated as an enterprise pursuant to *article VI* of the *City Charter*. *City Code § 12.1.101*.

Commercial User: Any person whose use of the utility supply system is in connection with the operation of a business, trade, or occupation, whether or not for profit, or any other non-single-family residential purpose. The persons shall include, but shall not be limited to homeowners' associations, clubs, fraternities, sororities, lodges, hotels, apartment and rooming houses, tourist camps and cottages, multi-family dwellings where more than one dwelling unit is served through one meter, all common areas of multi-family dwellings when separately metered, schools, military facilities, industrial facilities, governmental buildings, and churches. *City Code § 12.1.101*

Community Garden: A single Premises gardened collectively by a group of natural people to produce edible produce, for non-commercial purposes, and operated by a nonprofit entity registered with the State of Colorado.

Competent Person: Means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

Concept Plan: An accurate graphic representation drawn to scale of the proposed development of a particular Site which indicates in a conceptual form the proposed and surrounding land use. The plan may include, but not be limited to, the intended lot lines, general uses, likely ranges of square footages of the proposed uses and the general location of building and parking areas, points of access, primary internal circulation, existing contour lines, existing Easements and required dedication areas for Public facilities.

Consecutive System: A Public Water System that receives some or all of its Finished Water from one or more Wholesale Systems. Delivery may be through a direct connection or through the distribution system of one or more Consecutive Systems.

Construction: The entire completed Construction or the various separately identifiable parts thereof required to be provided. Construction includes and is the result of performing or providing all labor, services, and documentation necessary to produce such Construction, and furnishing, installing, and incorporating all materials and equipment into Construction.

Construction Manager: An individual, or group of individuals, from Colorado Springs Utilities, or hired by Colorado Springs Utilities, to provide quality control and quality assurance of Construction.

Construction Plan: A drawing or set of drawings that includes but is not limited to: (a) Water Plan - showing horizontal alignment or plan and profile of the proposed Water Main(s), or (b) Wastewater Plan showing horizontal alignment or plan and profile of the proposed Wastewater Main(s), or (c) Utility Service Plan.

Containment or Containment Assembly: The installation of an Approved Backflow Prevention Assembly in a service line, at the User's expense, within the User's Potable Water System, immediately following the meter where the Water Service is metered, and in all cases, before the first branch line leading off the service line.

When the Water Service Line is unmetered (i.e., Fire Service Lines), the installation shall occur at the Service Entry Point.

Containment: A means of protecting the Water Distribution System through an Approved Backflow Prevention Assembly or Method at control points designated by Colorado Springs Utilities.

Contaminant: A foreign substance that if permitted to enter the User's Potable Water System, will degrade the Water Quality so as to constitute an immediate and severe health hazard leading to poisoning, acute illness, or the spread of disease.

Contaminant Source: Any source or system from which a Contaminant may originate, including but not limited to an Auxiliary Water Supply.

Contract Documents: Construction drawings and Specifications that detail the work to be completed by the Contractor during Construction.

Contractor: In the context of these standards, a person or persons, co-partnership or corporation employed by an Owner/Developer for the purpose of installing or conducting repairs or replacements to the Water System, Water Service Lines, or interior plumbing. This includes all Subcontractors, builders, excavators, and/or Master Plumbers.

Corporation Stop or Tapping Valve: Corporation Stop or Tapping Valve is the point of connection of a Water Service Line to Colorado Springs Utilities' Water Distribution Main.

Critical Care Facilities: Facilities where redundant water supply is necessary for operational purposes in order to provide needed medical patient care as determined by Colorado Springs Utilities.

Cross Connection: Any connection to the water supply system where a degree of hazard is present at the Premises served, which connection could allow any water, fluid, or gas to flow from any pipe, plumbing fixture, or a User's Water System into the Water System through Backflow.

Curb Stop: The Curb Stop is the shutoff valve at a point on the Water Service Line to the Premises being served; typically located at, near, or on the property or Easement line. The Curb Stop is the demarcation of ownership between the property Owner and Colorado Springs Utilities. **Only Utilities may operate, maintain, repair and/or replace a curb stop. Utilities is solely responsible for the operation and maintenance thereof.**

Customer: The person or authorized agent of the person designated in the records of Colorado Springs Utilities as the person responsible for payment of charges incurred for the use of the utility supply system of the City at the Premises being served. *City Code § 12.1.101*

Customer Drilled and Maintained Wells: Wells located on Private property, which are constructed, installed, operated, and maintained at the Customer's expense.

Customer Owned Stand-Alone Raw Water System: A system supplied only by Raw Water and is completely independent and not connected now or at any time in the future to any part of the Colorado Springs Utilities' Nonpotable Water System. Determination of a stand-alone Nonpotable Raw Water system shall be made by Colorado Springs Utilities.

Daisy Chains: Refers to a Private Water System connecting to another Private Water System that is receiving Water Service from a Colorado Springs Utilities Public Water Main.

Dead End Main or Single Feed Main, (herein after called Dead End Main): A water Distribution Main with only one connection to the Water Distribution System. If this one connection were not available, then the Water Service Lines connected to the Dead End Main could not be supplied with water. A Water Distribution Main extended from and connecting back to a Dead End Main is not considered a Looped Main and does not meet the looping requirements described herein. Additionally, if a Water Distribution Main has only two connections to the Water Distribution System and one of the two connections is through a PRV to a lower pressure zone, then such Water Main does not meet the looping requirements and is also considered a Dead End Main. Includes Temporary Dead End Mains.

Degree of Hazard: The classification of a cross connection based on the potential that a Backflow event would pose an unacceptable health and/or safety risk to the Public. The Executive Director shall have sole discretion to classify Cross Connections into one of the following hazard levels:

- High Hazard: A determination by the Executive Director that a Backflow event would result in an unacceptable health and/or safety risk to the Public.

- Low Hazard: A determination by the Executive Director that a Backflow event may result in an unacceptable health and/or safety risk to the Public.

Design Engineer: The Registered Professional Engineer or Engineering Firm that creates, for submittal to Colorado Springs Utilities, a Development Preliminary Utility Plan, Master

Plan, Concept Plan, Development Plan, Construction Drawings, and/or Service Plans for approval. Includes the Engineer of Record.

Detail Drawings: Construction and design details in drawing format located in Appendix A and B.

Detector Assembly: A general term to collectively refer to any Double Check Detector Backflow Prevention Assembly, Double Check Detector Backflow Prevention Assembly – Type II, Reduced Pressure Principle Detector Backflow Prevention Assembly or Reduced Pressure Principle Detector Backflow Prevention Assembly – Type II *(University of Southern California (FCCHR)*, 2012 Second Printing.

Development Plan: An accurate detailed, scaled, graphic representation of a proposed development which shows the specific land uses, Site design, and land dedication requirements for the property. It provides information including, but not limited to, building locations and building footprints, parking areas and designs, ingress/egress, access, and utility Easements. The development plan includes, but is not limited to, a detailed Site plan, a preliminary or final landscape plan, building elevation drawings, a preliminary utility/facilities plan, a preliminary grading plan or a phasing plan, as appropriate. The development plan shall contain the information required in the development plan application provided by the Department. *City Code § 7.6.301*

Double Check Backflow Prevention Assembly or DC: An Approved Backflow Prevention Assembly composed of two independently acting, approved check valves, including tightly closing, resilient seated shutoff valves attached at each end of the assembly and fitted with properly located, resilient seated test cocks. *(University of Southern California (FCCHR),* 2014 Third Printing)

Downstream Entity: An entity that is not a Colorado Springs Utilities Customer but is located/connected downstream (in the direction of water flow) of the Colorado Springs Utilities Master-Metered Customer.

Earthwork: Earthwork shall include all clearing, grubbing, grading, excavation, fill, backfill, excess excavation, bedding material, borrow material, and surface restoration as may be required.

Easement: A right, privilege, or liberty which one has in land owned by another; a right to limited use of another's land for some special and definite purpose within a specified boundary. It is not ownership of the land, but it includes the right to enter upon the land for the purpose(s) for which it was granted.

Engineer of Record: The registered licensed Professional Engineer who develops the overall design criteria for the Project elements, components, and systems and performs the analysis and is responsible for the preparation of the Construction engineering documents.

Essential Facilities: Hospitals, long term care facilities, schools, universities, hotels, and major manufacturing facilities, or other facilities deemed essential by Colorado Springs Utilities.

Excavator: One holding a license and permit under this part, and those departments of the City doing excavations under this part, or an agent, employee or Contractor working for, or under, one holding a license and/or permit. (*City Code § 3.3.201).*

Executive Director (CEO): The Executive Director of Colorado Springs Utilities or their designees, if any. The Executive Director shall have the duties and responsibilities of the Chief Executive Officer (CEO). The Executive Director is Colorado Springs Utilities Director appointed by City Council pursuant to *City Charter § 6-10. City Code § 1.1.106*

Fertigation System: Any system attached to a water-connected appurtenance and through which any fertilizers, soil amendments, pesticides, herbicides, fungicides, or any other water-soluble products are dispensed.

Fire Department Connection or FDC: A connection through which the fire department can pump supplemental water into the sprinkler system, standpipe, or other system furnishing water for fire extinguishment to supplement existing water supplies.

Fire Department Underground Flush Test: A test of a piping system using high velocity flows to remove debris from the piping system prior to it being placed in service.

Fire Hydrant Lateral: The extension pipe from the fire hydrant to the valve at the point of connection to the Water System.

Fire Main: A Water Distribution Main dedicated to serving fire protection systems and possibly hydrants, which may be looped around a building or complex.

Fire Protection System: Any system used for firefighting purposes and comprised of underground and/or overhead piping designed in accordance with fire protection engineering standards. For use in these standards, Colorado Springs Utilities defines a Fire Protection System into two classifications:

- **Class 1** – Direct connection to the Water Distribution System and the Fire Protection System contains storage tanks of any kind, or the system is supplemented or connected with any auxiliary water source, whether covered or uncovered, or the system contains any kind of chemical additive, including but not limited to antifreeze.
- **Class 2** – Direct connection to the Water Distribution System; no pumps, tanks, or reservoirs; no connections to auxiliary water supplies; no antifreeze or other additives of any kind; all sprinkler drains discharge to atmosphere, dry wells, or other safe outlets.

Fire Service Line: The water line and its appurtenance extending from the base of the system riser up to and including the connection to the Water Main for the exclusive purpose of supplying water to Fire Protection Systems.

Fire Suppression System: A type of Fire Protection System which generally includes – sprinklers or some type of fire extinguishing apparatus.

Flushing: The discharge of water to an approved outfall location.

Full Build Out: Occupancy of all buildings planned within the proposed development.

Groundwater: Subsurface waters in a zone of saturation which are or can be brought to the surface of the ground or to surface waters through wells, springs, seeps, or other discharge areas.

Hazardous Environmental Condition: The onsite presence of Asbestos, PCBs, petroleum, hazardous waste, or radioactive material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the work.

Hazardous Waste: The term hazardous waste shall have the meaning provided in latest version of the *Solid Waste Disposal Act (42 USC Section 6903)*.

Irrigation Lateral: That portion of the Nonpotable Water System which transmits Nonpotable Water from the Irrigation Main Line to the irrigation heads.

Irrigation Main: That portion of the Nonpotable Water System which transmits Nonpotable Water from the Nonpotable Service Line to the Irrigation Lateral Line.

Isolation Valve: A valve installed in the Water System that can be used for operation or maintenance of the Water Distribution System operated in either an open or closed position.

Laws and Regulations: Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

Looped Main: A Water Distribution Main with at least two separate connections to the existing Distribution System that are within the same designated water pressure zone. In order to be designated as a Looped Main, the connections to the Distribution System shall be designed such that if one of the connections is not available due to repairs or maintenance, then the other connection can supply water from the Distribution System to the Water Service Lines and Fire Service Lines served by the Looped Main.

Management Plan: A cross-connection-control plan which may include, but shall not be limited to, information on Approved Backflow Prevention Assemblies, Approved Backflow Prevention Methods, testing frequencies if applicable, installation requirements and locations, and a comprehensive hazard assessment for the entire property covered under the plan.

Master Meter: A meter that measures consumption of water through a service line to more than one Premise. *URR Section 1*

Master Plan: A plan for the development of a portion of the City which contains a generalized transportation system, proposed land use, and shows the relationship of the area included in the plan to surrounding property. *City Code § 7.6.301*

Master Plumber: As defined in and licensed pursuant to *title 12, article 58*, *Colorado Revised Statutes*, as the same may be now or hereafter amended, and registered with the Pikes Peak Regional Building Department pursuant to *Section RBC205.1* of the Pikes Peak Regional *Building Code*. *City Code § 12.4.201*

Meter Pit: Underground housing for ¾ and 1 inch water meters.

Mixed Use: A Premise that includes both nonresidential occupancy and Multi-Family Residential dwellings within one Structure. *URR Section 1*

Multi-Family Connection: A single residential connection to the Public Water System's distribution system from which two or more separate dwelling units are supplied water. For the purposes of administering *CDPHE Rule 11.39*, Multi-Family Connections are always considered Non-Single-Family-Residential Connections. (*CDPHE DW-007 "Multi-Family")*

Multi-Family Residential Premises: A common wall Premises for the purpose of multi-family residential dwelling. This may be described as a condominium, townhouse, duplex, stacked housing or other name form for multi-family housing, permanent or transient. This also includes service to buildings appurtenant to a residence including garage, cottages, and other minor buildings where a Colorado Springs Utilities' water meter is being utilized on a single platted lot and each dwelling unit in a Mobile Home Park.

Multipurpose System: A professionally engineered, *NFPA 13D* compliant, water piping system installed in a residential dwelling where the domestic Water System and a fire protection system are fully integrated, sharing a single, common piping system, in which each line serving a fire sprinkler terminates at either: a fixture that is used regularly for domestic purposes, or a common manifold used to supply multiple fixtures used regularly for domestic purposes.

Necessary Demand: The Finished Water turnover within a defined amount of time needed to meet Water Quality Requirements.

Non-Single-Family-Residential Connection: Any connection to the Water Distribution System, which in the sole discretion of Colorado Springs Utilities, does not meet the definition of a Single-Family-Residential Connection. For the purposes of administering *CDPHE Rule 11.39*, Multi-Family Connections are always considered Non-Single-Family-Residential Connections.

Notice of Authorization (NOA): A notice issued by the CDPHE/WQCD to Treaters and Users of Reclaimed Water containing terms, limitations, and conditions as deemed necessary by the CDPHE/WQCD, to ensure compliance with *Regulation No. 84*, CDPHE.

Owner/Developer: Any person, association, corporation, entity, or government agency desiring Utility Service for Premises under their control, often a sub-divider, Developer, an Owner, or their authorized representative.

Planned Infiltration Area (PIA): PIAs are vegetated, pervious areas that intercept stormwater runoff from nearby impervious surfaces (e.g., parking lots, roofs, roadways) to provide hydrologic and water quality benefits. Cobble ground cover and wood mulch may be used within PIAs with special design considerations.

Point of Compliance (POC) is typically located after the point of discharge (or dechlorination) and prior to entering or converging with State waters.

Preliminary Utility Plan: A document submitted with a Development Plan, Concept Plan, or Master Plan which shows among other things, all existing and proposed utility lines as well as existing and proposed Easements.

Premises: A lot, parcel of land, building, or establishment; the physical location where service is provided. Premises shall also include the point of connection between the water supply system and another Public Water System**.**

Project: The total design and/or Construction to be performed, may be the whole, or a part as may be indicated in a statement of work or on the Construction Plans.

Project Manager: An individual, or group of individuals, from Colorado Springs Utilities, or hired by Colorado Springs Utilities, to provide quality control and quality assurance of Construction.

Public User: The Owner or operator of a Public water supply system that is connected to the water supply system.

Raw Water Transmission Main: A Raw Water Transmission Main transports water from a surface storage Structure (e.g., Raw Water reservoir, a well, a lake, a pond, or a ditch) to a water treatment facility. The water contained in these mains is considered as Nonpotable Water as it is in its raw state prior to treatment and distribution to the Potable drinking Water System. Typically, these Raw Water Transmission Mains are large in size and carry high flows of water.

Reclaimed Water Control Regulation: A Colorado regulation promulgated pursuant to the *Colorado Water Quality Control Act* that establishes requirements, prohibitions, standards, and concentration limits on the use of Reclaimed Water to protect Public health and the environment while encouraging its use. Codified at *5CCR 1002-84*, also known as *Regulation No. 84*, CDPHE.

Record Drawing (As-built): Construction drawings revised to show significant changes made during the Construction process, usually based on marked-up prints, drawings, and other data furnished by the Contractor and/or the Colorado Springs Utilities Inspector.

Recovery Agreement: An Agreement between the Owner/Developer and Colorado Springs Utilities for the collection of a pro rata share of the eligible cost of facilities and interest as provided within the Colorado Springs *Utilities Rules and Regulations* from the property owner(s) or Developer of such unserved or undeveloped lands and for the refund of such cost as provided in the Recovery Agreement.

Reduced Pressure Principle Backflow Prevention Assembly or RP: An Approved Backflow Prevention Assembly two independently acting approved check valves, together with a hydraulically operated, mechanically independent pressure differential relief valve located between the two check valves and at the same time below the first check valve. The unit shall include properly located resilient seated test cocks and tightly closing, resilient seated shutoff valves at each end of the assembly. *(University of Southern California (FCCHR),* 2014 Third Printing)

Resident-Controlled Landscape Irrigation: Irrigation of grass, trees and other vegetation located on the property of a single family or other residential occupancy where the occupant is the User and is responsible for the maintenance and/or operation of the irrigation system.

Residential User: Any person whose use of the utility supply system is exclusively for domestic purposes in a Private home or individual dwelling unit where not more than one dwelling unit is served through one meter. Each person of full legal age who resides at the Premises shall be deemed to have received benefit of Utility Services supplied and shall be liable to Colorado Springs Utilities for payment, whether or not service is listed in that person's name. *City Code § 12.1.101*

Right-of-Way (ROW): A strip of land occupied or intended to be occupied by a street, crosswalk, railroad, electric transmission line, oil or gas pipeline, Water Main, sanitary or storm sewer main, telephone line, shade trees, or other similar uses. Rights of way are not Easements; however, Easements can be in rights of way. *City Code § 7.6.201*

Samples: Physical examples of materials, equipment, or workmanship that are representative of some portion of the work and which establish the standards by which such portion of the work will be judged.

Secondary Valve: A Secondary Valve is the valve at a point on the Private Water Main; located at, near, or on the property or Easement line, is owned and maintained by the Private Water System owner(s) and demarcates the change in ownership from Public to Private.

Service Entry Point: A single, horizontal, or vertical penetration of a wall, foundation, or slab floor of a Structure by a Water Service Line or a Fire Service Line.

Shop Drawings: All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared and submitted by the Contractor to illustrate some portion of the work.

Single-Family-Residential Connection: A single residential connection to the Public Water System's distribution system that meets one of the following criteria:

- A single dwelling which is occupied by a single family and is supplied by a separate service line; or
- A single dwelling comprised of multiple units where each living unit is supplied by a separate service line. *Safe Drinking Water Program (SDWP) policy number DW-007*

Single-Family-Residential Premises: A single-family residential Premises with one service line connection to one lot with one Premises.

Site: Lands or areas indicated in the Construction Plans as being furnished by Owner/Developer upon which the work is to be performed, including rights-of-way and Easements for access thereto, and such other lands furnished by Owner/Developer which are designated for the use of Contractor.

Specifications: Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the work and certain administrative details applicable thereto.

State Engineer: The executive officer in charge of supervising the work of all division engineers and may direct their supervision of their employees. The State Engineer has executive responsibility and authority with respect to items as identified in *Colorado Revised Statutes 37-80-102*.

Structure: A Construction that bears weight such that when undermined could collapse causing financial damage to itself or other property including but not limited to Vaults, walls, foundations, buildings, transformers, and encasements.

Subcontractor: An individual or entity having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the work at the Site.

Supplier: A manufacturer, fabricator, Supplier, distributor, or vendor having a direct contract with the Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the work by the Contractor or any Subcontractor.

Tap Connection: The Corporation Stop (3/4, 1, 1-1/2, and 2 inch) or the valve (4 inches and greater) connected directly to the Colorado Springs Utilities Water Distribution Main.

Tapping Valve or Corporation Stop: Corporation Stop or Tapping Valve is the point of connection of a Water Service Line to Colorado Springs Utilities' Water Distribution Main.

Temporary Dead End Mains: Water Distribution Mains that are approved by Colorado Springs Utilities with input from the Colorado Springs Fire Department on a case-by-case basis for an interim period to allow for development phasing until a second connection can be completed.

Temporary Loop: A Water Distribution Main or Water Service Line designed to allow water to flow through the Water Distribution System or Dead End Main in order to maintain Water Quality Requirements in the Water Distribution System for an interim period.

Traditional Neighborhood Development (TND): A development intended to provide a pedestrian-oriented residential neighborhood development pattern with diverse housing types integrated with neighborhood schools, parks, civic spaces, and commercial uses. Each development will identify its own development standards.

Treater: An entity that treats and provides Reclaimed Water to a User for approved uses. In the City of Colorado Springs, the Treater is Colorado Springs Utilities. The Treater and the User may be the same entity.

Trenchless Technology (Trenchless): A type of subsurface Construction work that requires few trenches or no continuous trenches. It can be defined as a "family" of methods, materials, and equipment capable of being used for the installation of new, replacement, or rehabilitation of existing underground infrastructure with minimal disruption to surface traffic, business, and other activities.

Underground Facilities: All underground pipelines, conduits, ducts, cables, wires, manholes, Vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

Underground Hydrostatic Test: Required by the Fire Department on Fire Protection Systems, which is a test of a closed piping system and its attached appurtenances consisting of subjecting the piping to an increased internal pressure for a specified duration to verify system integrity and leak rates. This is done on both underground (leaks permitted) and above ground (no leaks permitted) piping.

Uninterruptible Service: A facility that receives Water Service where interruption of the Water Service may, as determined by Colorado Springs Utilities, unreasonably affect the operation of the facility.

User: Any person who uses, takes service from, receives benefit of service supplied, or is connected to the utility supply system. User includes commercial Users, Residential Users, and Public Users as defined herein. A User may also be an Owner of a Premises or a Customer. *City Code § 12.1.101 and 12.4.201*

User Plan to Comply: The information and documentation a Reclaimed Water User is required to submit to the Treater that describes procedures and activities enabling the Reclaimed Water User to comply with the conditions for use of Reclaimed Water included in *Section 84.9* of *Regulation No. 84,* CDPHE.

User's Nonpotable Water System: The Nonpotable Water System piping, Meter Pit and appurtenances that extends from the connection at the Nonpotable Distribution Main to a Customer's point of use, as approved by Colorado Springs Utilities. A Nonpotable Water System that typically begins at the connection of Colorado Springs Utilities' meter to the Customer's main or service line and includes all Customer owned facilities downstream of the meter. Non-typical points for determination of where Publicly owned Nonpotable systems begin and end are subject to the sole determination of Colorado Springs Utilities.

User's Potable Water System: Any Potable Water supply located on the User's Premises whether supplied by the Utilities' Potable Water Supply System or an Auxiliary Water Supply.

Utilities: See Colorado Springs Utilities

Utility Service: The provision of regulated electric, natural gas, water, or wastewater service by Colorado Springs Utilities to Users or Customers. *City Code § 12.1.101*

Utility Service Plan: See Construction Plan definition.

Vault: An underground Structure large enough to accommodate equipment including but not limited to meters, pressure regulating valves (PRVs), meter bypasses, all valves and piping or other underground infrastructure.

Wastewater Main (Collection Line): That portion of the wastewater treatment system which collects and transmits wastewater from Users to the wastewater treatment plant, excluding service lines. *City Code § 12.5.201*

Water Plan: See Construction Plan definition.

Wastewater Service Line: The wastewater collector line extending from the wastewater disposal facilities of the Premises up to and including the connection to the Collection Line. *City Code 12.5.201*

Wastewater System: Any devices, facilities, Structures, equipment or works owned by the City or used by Utilities for the purpose of the transmission, storage, treatment, recycling and reclamation of industrial and domestic wastes, or necessary to recycle or reuse water at the most economical cost over the estimated life of the system, including intercepting sewers, outfall sewers, collection lines, pumping, power and other equipment, and their appurtenances and excluding service lines; extensions, improvements, additions, alterations or any remodeling thereof; elements essential to provide a reliable recycled supply such as standby treatment units and clear well facilities; and any works, including the land and sites that may be acquired, that will be an integral part of the treatment process or is used for ultimate disposal of residues resulting from the treatment. It does not include the stormwater drainage system, a separate Municipal operation which is not part of Utilities. *(City Code 12.1.101)*

Water Quality Control Division: A division of the Colorado Department of Public Health and Environment, headquartered in Denver, Colorado.

Water System Definitions:

These terms may be combined to form a single definition with respect to ownership, quality, and asset.

Quality

- **Nonpotable Water:** Water that is not treated to Potable drinking water standards and is not suitable, nor intended, for human consumption (drinking, washing, or culinary purposes), but is produced and delivered to Users for irrigation and approved commercial and industrial uses. Nonpotable water includes treated wastewater (Reclaimed Water) and raw (untreated) ground water and surface water. *City Code § 12.4.1103*
- **Potable Water (Finished Water):** Water that is intended for distribution and consumption without further treatment, except as necessary to maintain Water Quality in the distribution system (e.g., booster disinfection, addition of corrosion control chemicals).
- **Raw Water:** Surface water and Groundwater in its natural state, prior to any treatment.
- **Reclaimed Water:** Wastewater that has received secondary treatment by a domestic wastewater treatment works and such additional treatment as to enable the wastewater to meet Reclaimed Water standards for approved uses. *City Code § 12.4.1103*

Ownership

- **Private:** Utility infrastructure located outside of Public rights-of-way and/or Easements that is owned, operated, and maintained by an individual, property owner(s), corporation, homeowners' association, or partnership.
- **Public:** Utility infrastructure which resides in a Public rights-of-way or dedicated Easement that is owned, operated, and maintained by Colorado Springs Utilities. This definition does not include Public systems not owned and operated by Colorado Springs Utilities such as Consecutive Systems.

Asset

- **Water Distribution Main (Water Main):** That portion of the water supply system, which transmits and distributes water from treatment or storage facilities to Users, excluding portions of service lines as provided in *City Code § 12.4.201.*
- **Water Distribution System:** Water Distribution Mains, together with all necessary valves, fire hydrants, taps, meters, service pipes, appurtenances and associated materials, property and equipment distributing water to the service line.
- **Water Main Extension:** Extensions to the existing Colorado Springs Utilities' Water Distribution System.
- **Water Service Line:** The water line extending from the property, building, establishment, or grounds up to and including the connection to the Water Mai. *City Code § 12.4.201*
- **Water System:** Any and all devices, facilities, Structures, equipment or works owned by the City or used by Colorado Springs Utilities for the purpose of the collection, storage, transmission, treatment, regulation or distribution of Potable and Nonpotable water, including distribution mains, pumping facilities, metering facilities, pressure regulations facilities and their appurtenances and excluding service lines; any and all standby or contingency equipment, facilities or material which may be necessary to provide reliable Water Service; any and all devices, facilities, Structures, equipment or works owned by the City or used by Utilities for the purpose of the transmission, storage, treatment or distribution of Potable and Nonpotable Water, including treatment plants, pumping facilities, reservoirs, transmission lines and their appurtenances; any and all land or sites owned by the City or used by Utilities, for the purpose of providing Potable or Nonpotable Water to Users including streams or other waters which contribute to the water supply of the City and any area in or along the waters or within five (5) miles upgrade of any point from which water is taken by the City, and any and all watershed areas; and any and all extensions, improvements, additions, alterations or remodeling thereof. *City Code 12.1.101*

Water Transmission Main: That portion of the water supply system which transports untreated water to water treatment facilities. *City Code § 12.4.201*

Water Service: The provision of regulated water by Colorado Springs Utilities to Users or Customers.

Water Quality: The chemical, biological, and physical integrity of the water within the Water System.

Water Quality Devices: Include Colorado Springs Utilities approved post hydrants and fire hydrants. The purpose of the Water Quality Device is to promote the circulation of water and the maintenance of chlorine levels in the Water Distribution System including Dead End Mains.

Water Quality Requirements: The maximum allowable concentration of chemical, biological, and physical constituents within Colorado Springs Utilities Water System as established by Federal and State regulation and Colorado Springs Utilities.

Water Stub Outs: Any extension of a Water Distribution Main necessary for the future expansion of the Water Distribution System with no service connections or taps. Water Stub-

Outs are typically extended beyond the curb and gutter and pavement limits of a road to minimize roadway disturbance for future system extensions.

Wholesale System: A Public Water System that treats source water as necessary to produce Finished Water and then delivers some or all of that Finished Water to another Public Water System. Delivery may be through a direct connection or through the system of one or more Consecutive Systems.

1.13 Abbreviations

All references to documents or standards shall be the latest edition unless otherwise stated:

Associations:

AASHTO – American Association of State Highway and Transportation Officials
ABPA – American Backflow Prevention Association
ACI – American Concrete Institute
AISC – American Institute of Steel Construction Inc.
ANSI – American National Standard Institute
API – American Petroleum Institute
ASA – American Standards Association
ASLA – American Society of Landscape Architects
ASCE – American Society of Civil Engineers
ASSE – American Society of Safety Engineers
ASSE – American Society of Sanitary Engineering-Backflow Prevention
ASTM – American Society for Testing and Materials
AWWA – American Water Works Association
CDPHE – Colorado Department of Public Health and Environment
CDPS – Colorado Department of Public Safety
CSFD – Colorado Springs Fire Department
EPA – Environmental Protection Agency
FM – Factory Mutual
HI – Hydraulic Institute
IEEE – Institute of Electrical and Electronics Engineers
IPC – International Plumbing Code
ISO – International Organization for Standardization
MSS- Manufacturers Standardization Society of the Valve and Fittings Industry
NEMA – National Electric Manufacturers Association
NEC – National Electric Code
NFPA – National Fire Protection Association
NSF – National Sanitation Foundation
OSHA – Occupational Safety and Health Administration
PPI-Plastic Pipe Institute
PPRBD – Pikes Peak Regional Building Department
TMS – The Masonry Society
UL – Underwriter's Laboratory
WQCD – Water Quality Control Division of the CDPHE

Colorado Springs Utilities Abbreviations:

CCTV – Close Circuit Television
CSFD – Colorado Springs Fire Department
EVS – Environmental Services Department of Colorado Springs Utilities

LESS – Line Extension and Service Standards
LYSC – Leon Young Service Center – 1521 Hancock Expressway
MAOP – Maximum Allowable Operating Pressure
QBD – Quality By Design
RSS – Regulatory Services Section of the EVS
URR – Utilities Rules and Regulations

Water Abbreviations:
ARV – Air Release and Vacuum Relief Valve
BHP – Brake Horsepower
BMPs – Best Management Practices
CDPS – Colorado Discharge Permit System
CI-Cast Iron Pipe
CIOD – Cast Iron Outside Diameter Size
CIP – Cast Iron Pipe
CRA – Concrete Reverse Anchor
DC – Double Check Backflow Prevention Assembly
DIP – Ductile Iron Pipe
DIPS – Ductile Iron Pipe Size
DR – Dimension Ratio
GPM – Gallons per Minute
HDD – Horizontal Directional Drilling
HDPE – High Density Polyethylene Pipe
HP – Horsepower
HTH – High Test Hypochlorite
ID – Inside Diameter
MJ – Mechanical Joint
NICC – National Industrial Color Code
NGVD ’29 – National Geodetic Vertical Datum
NOA – Notice of Authorization
NPSH – Net Positive Suction Head
NPSHa – Net Positive Suction Head Available
NPSHr – Net Positive Suction Head Required
OD – Outside Diameter
POC – Point of Compliance
PPM – Parts Per Million
PRV – Pressure Reducing Valve
PSI – Pounds per Square Inch
PUE – Public Utility Easement
PVC – Polyvinyl Chloride – Plastic Pipe
ROW – Right-of-Way
RP- Reduced Pressure Principle Backflow Prevention Assembly
SU-Standard Units
SWMP – Storm Water Management Plan
TCR – Total Chlorine Residual
TSS – Total Suspended Solids
VFD – Variable Frequency Drive

Other Abbreviations

ACM – Asbestos Containing Materials
MUTCD-Manual on Uniform Traffic Control Devices
CFR – Code of Federal Regulations
CLSM – Controlled Low Strength Materials
dBA – A-Weighted Decibels
PCIS – Process Control and Instrumentation Systems
RTD – Resistance Temperature Detector
SCADA – Supervisory Control and Data Acquisition
UAP – Utilities Addressing Plan
UDCF – Utilities Design CAD File

1.14 Phone Numbers and Contact Information

WATER AND WASTEWATER LINE EXTENSION/SERVICE INSTALLATION PHONE NUMBERS & CONTACT INFORMATION

Colorado Springs Utilities

Colorado Springs Utilities Customer Service & Repair.....719-448-4800
Customer Contract Administration Office (Permits).....719-668-8111
Utilities Development Services: 719-668-8259
Master planning, Construction Plan review, Utility Service information
Utility Data Management: 719-668-3524
GIS maps, plat maps, Service Cards, Record Drawing files.....719-668-3524, option 3
Advanced Geomatics Team (Land-based Services).....719-668-7920

Utilities Inspections:
Inspections Supervisor – Water and Wastewater Mains.....719-668-4658
Inspections Supervisor – Water and Wastewater Service Lines.....719-668-4658
Scheduling Service Line Inspections 719-668-3524
Backflow Prevention Program Inspections.....719-668-4388

Other Entities

Colorado Department of Public Health and Environment (CDPHE).....303-692-2000
Pikes Peak Regional Building Department (Permits).....719-327-2880
El Paso County Public Health.....719-578-3199
Occupational Safety and Health Administration (OSHA).....800-321-6742
Repairs:
Comcast.....800-934-6489
Century Link Technical Support 877-348-9007
Traffic Signals.....719-385-6721
Utility Notification Center of Colorado (UNCC).....811
……..or 800-922-1987

1.15 References

Colorado Springs Utilities has utilized all or part of the following regulations, codes, and requirements as references for these *Water LESS*:

A. American Concrete Institute, *ACI 318 Appendix D – Anchorage to Concrete*
B. American Concrete Institute, *ACI 350.4R - Design Considerations for Environmental Engineering Concrete Structures*
C. American Concrete Institute, *ACI 351.3R - Foundations for Dynamic Equipment*
D. American Petroleum Institute, *API 610 – Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries*
E. American Water Works Association, *AWWA Manual M11 - Steel Water Pipe a Guide to Design and Installation*
F. American Water Works Association, *AWWA Manual M14 - Recommended Practice for Backflow Prevention and Cross-Connection Control, 1990 and 2004 Editions*
G. American Water Works Association, *AWWA Manual M17 - Fire Hydrants Manual*
H. American Water Works Association, *AWWA Manual M20 - Water Chlorination/ Chloramination Practices and Principles*
I. American Water Works Association, *AWWA Manual M23 - PVC Pipe Design and Installation*
J. American Water Works Association, *AWWA Manual M24 - Dual Water Systems*
K. American Water Works Association, *AWWA Manual M41 - Ductile –Iron Pipe and Fittings Manual of Water Supply Practices*
L. American Water Works Association, *AWWA Manual M51 - Air-Release, Air/Vacuum, & Combination Air Valve*
M. American Water Works Association, *AWWA Manual M55 - PE Pipe-Design and Installation*
N. American Society of Civil Engineers, *ASCE 7 - Minimum Design Loads for Buildings*
O. City of Colorado Springs, *City Code*
P. City of Colorado Springs, *Drainage Criteria Manual Volume I and II*
Q. City of Colorado Springs, *Fire Department Access Information Packet*
R. City of Colorado Springs, *Mixed Use Development Design Manual*
S. City of Colorado Springs, *Procedure Manual for the Acquisition and Disposition of Real Property Interests*
T. City of Colorado Springs, *Small Lot Planned Unit Developments*
U. City of Colorado Springs, *Standard Specifications and Traffic Manuals*
V. City of Colorado Springs, *Traditional Neighborhood Development Design Manual*
W. Colorado Springs Utilities, *Electric Line Extension and Service Standards*
X. Colorado Springs Utilities, *Gas Line Extension and Service Standards*
Y. Colorado Springs Utilities, *Physical Security Hardware Specifications*
Z. Colorado Springs Utilities, *Water System Operations – Safe Design Guidelines*
AA. Colorado Springs Utilities, *Site Design Guidelines*
BB. Colorado Springs Utilities, *Standard Requirements for Instrumentation, Control, and Electrical (SRICE) for Pumping Stations*
CC. Colorado Springs Utilities, *Utilities' Rules, and Regulations*
DD. Colorado Springs Utilities, *Utility Easement Acquisition Instructions*
EE. Colorado Springs Utilities, *Wastewater Line Extension and Service Standards*
FF. Colorado Department of Labor and Employment, Division of Oil and Public Safety, *Storage Tank Regulations*

GG. Colorado Department of Public Health and Environment, Air Quality Control Commission, *Regulation Number 8 - Control of Hazardous Air Pollutants*,

HH. Colorado Department of Public Health and Environment, Air Quality Control Commission, *Regulation Number 19 - The Control of Lead Hazards*

II. Colorado Department of Public Health and Environment, Water Quality Control Commission, *Design Criteria for Potable Water Systems*

JJ. Colorado Department of Public Health and Environment, Water Quality Control Commission, *Primary Drinking Water Regulations*

KK. Colorado Department of Public Health and Environment, Water Quality Control Commission, *Regulation Number 61 - Colorado Discharge Permit System Regulations*

LL. Colorado Department of Public Health and Environment, Water Quality Control Commission, *Regulation Number 84 - Colorado Reclaimed Water Control Regulation*

MM. Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division, *Part 1 – Regulations Pertaining to Solid Waste Sites and Facilities*

NN. Ductile Iron Pipe Research Association, *Installation Guide for Ductile Iron Pipe*

OO. Hydraulic Institute, *ANSI/HI 9.6.4 - Rotodynamic Pumps for Vibration Measurement and Allowable Values*

PP. Hydraulic Institute, *ANSI/HI 9.8 - Rotodynamic Pumps for Pump Intake Design*

QQ. Hydraulic Institute, *ANSI/HI 14.6 - Rotodynamic Pumps for Hydraulic Performance Acceptance Tests*

RR. Illuminating Engineering Society, *The Lighting Handbook*

SS. Institute of Electrical and Electronics Engineers, *IEEE 112- Standard Test Procedure for Polyphase Induction Motors and Generators*

TT. International Code Council, *International Building Code*

UU. International Code Council, *International Energy Conservation Code*

VV. International Code Council, *International Fire Code*

WW. International Code Council, *International Plumbing Code*

XX. International Code Council, *International Residential Code (approved version by the City of Colorado Springs and Pikes Peak Regional Building Department)*

YY. International Organization for Standards, *ISO 1940 - Balance Quality Requirements for Rotors in a Constant (Rigid) State*

ZZ. International Organization for Standards, *ISO 10816 - Evaluation of Machine Vibration by Measurements on Non-Rotating Parts*

AAA. National Fire Protection Association, *National Electric Code*

BBB. National Sanitation Foundation, NSF/ANSI *Standards 60 - Drinking Water Treatment Chemicals*

CCC. National Sanitation Foundation, NSF/ANSI *Standards 61 - Drinking Water System Components*

DDD. Occupational Safety and Health Administration, *OSHA-29 CFR 1910.1001-Asbestos in General Industry Standard*

EEE. Occupational Safety and Health Administration, *OSHA-29 CFR 1926.1101-Asbestos Standard for the Construction Industry*

FFF. Plastic Pipe Institute, *Handbook of Polyethylene Pipe*

GGG. Pikes Peak Regional Building Department, *Pikes Peak Regional Building Code*

HHH. UniBell PVC Pipe Association, *Tapping Guide for PVC Pressure Pipe*

III. University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research, *Manual of Cross-Connection Control, Ninth and Tenth Editions*,

JJJ. U.S. Environmental Protection Agency, *Asbestos Worker Protection (40 CFR Part 763, Subpart G)*
KKK. U.S. Environmental Protection Agency, *Clean Air Act*
LLL. U.S. Environmental Protection Agency, *Clean Water Act*
MMM. U.S. Environmental Protection Agency, *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*
NNN. U.S. Environmental Protection Agency, *Cross-Connection Control Manual*
OOO. U.S. Environmental Protection Agency, *Endangered Species Act*
PPP. U.S. Environmental Protection Agency, *National Emission Standard for Asbestos (40 CFR Part 61, Subpart M)*
QQQ. U.S. Environmental Protection Agency, *Oil Pollution Prevention Regulations (40 CFR Part 112)*
RRR. U.S. Environmental Protection Agency, *Reduction of Lead in Drinking Water Act*
SSS. U.S. Environmental Protection Agency, *Safe Drinking Water Act*
TTT. U.S. Fish and Wildlife Service, *Migratory Bird Treaty Act*

Documents referenced by number throughout these *Water LESS* include ANSI, AWWA, ASTM, PPI, and NFPA Standards.

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CHAPTER 2

Development and Design of Water Systems

2.1 General

The purpose of Chapter 2 of these *Water LESS* is to set forth the criteria for designing any proposed Private or Public Water System. The criteria are written to ensure that only proven high quality materials are installed in accordance with industry best practices. Determination of the best materials and Construction methods are based upon lowest life cycle costs. Sizing and layout of the system are parts of the total consideration of design, operation and maintenance of the Water System that yields optimum quality service.

2.2 Responsibilities

2.2.A Design Overview

"Distribution mains to supply and distribute water to and throughout areas or additions shall be extended by the Owner or Developer of the Premises to be served by the lines from the existing distribution main to the point or points of the property line of the Premises farthest from the existing distribution main. The extension requirement may be waived by the Executive Director in the event that the Executive Director determines that extension to the farthest point from the existing distribution main is not necessary for the efficient expansion of the water supply system. In any event, distribution mains shall be extended by the Owner or Developer of the Premises to be served by the mains to a point which permits the shortest possible service line between the distribution main and the property line of the Premises served thereby." (*City Code §12.4.413*)

Colorado Springs Utilities' determination of extension points for the Water Distribution System shall be final.

Colorado Springs Utilities does not guarantee Water to the development area. Allocation of Water to serve a new development area will depend upon the supply available at the time of application. The Colorado Springs Utilities' policy is first come first served at the time of application for service.

2.2.B Responsibility for Design

The Owner/Developer will be responsible for hiring a land development team which shall include a Design Engineer who will design and prepare Preliminary Utility Plans, Design Reports, and Construction Plans for the proposed Water System. Colorado Springs Utilities will review the Design Engineer's plans and reports relating to the requirements of these *Water LESS*. Despite Utilities' review of plans and reports, it is the Owner/Developer's responsibility to ensure that the Construction Plans meet these *Water LESS*.

New developments shall have a Development Plan approved by the City of Colorado Springs (or the Authority Having Jurisdiction) prior to Colorado Springs Utilities' approval of the Water Construction Plans. Following approval of the Water Construction Plans, the Owner/Developer will be responsible for hiring a Contractor to install the approved Water System and appurtenances, with inspection by Colorado Springs Utilities.

The design engineer shall incorporate best design practices to eliminate or mitigate safety hazards during the construction, operations, and maintenance of the utility infrastructure within their submitted plans.

2.2.B.1 Pressure Zones

There are multiple pressure zones in the Water Distribution System. The Owner/Developer shall be responsible for the design and cost of any pressure reducing, relief, or control valve, pump station, or tank necessary to provide adequate pressure to the proposed development. See Section 2.7.K for more information.

2.2.C Cost Responsibility

2.2.C.1 Cost Recovery

An Owner/Developer installing a Water System Extension shall pay all design, material, and installation costs for the required extension(s) necessary to serve the premise(s). In accordance with *Utilities Rules and Regulations*, the Owner/Developer can apply for a Recovery Agreement, for a 20 year term, providing that non-participating property owners benefitting from the extension pay a pro-rata share of all eligible extension costs before they are allowed to connect to the subject Water Main for service. Requests for cost recovery must be received no later than 365 days after the issuance of final acceptance for the Water System Extension by Colorado Springs Utilities. Details on Recovery Agreements can be found in *Section 43* of Colorado Springs *Utilities Rules and Regulations*. Information and forms for Recovery Agreements are available at www.csu.org .

The cost, or fair market value, of the Easements within the Developer's property that are granted to Colorado Springs Utilities for such Easements that are required for Utility Services are not recoverable.

2.2.C.2 Water Main Reimbursement

The Owner/Developer may be eligible for Cost Recovery for Water System infrastructure required by Colorado Springs Utilities. Please refer to *Utilities Rules and Regulations* or contact Utilities Development Services to determine if the proposed development might be eligible for a reimbursement. Details on reimbursements can be found in *Section 43* of Colorado Springs *Utilities Rules and Regulations*. Forms and checklists for reimbursements are available at www.csu.org.

2.2.C.3 Pressure Regulating Valve Costs and Reimbursement

a. All required piping, regulators, fittings, valves, and all other appurtenances within the confines of a station/Vault shall be furnished and installed by the Owner/Developer. Upon the completion and acceptance of the station/Vault, the Owner/Developer may submit a written request to Colorado Springs Utilities for reimbursement of materials. All requests for reimbursement must include a copy of the original invoice for the material and the Water/Wastewater Recovery Agreement Application form found at www.csu.org. Facilities

required for the sole purpose of an individual subdivision or Project may not be eligible for reimbursement at Colorado Springs Utilities' discretion.

b. All required concrete pits, reinforcing steel, manhole assemblies, and total installation shall be provided and installed by the Owner/Developer in accordance with Detail Drawings A6-1 through A6-7.

c. Colorado Springs Utilities shall supply and install remote monitoring systems.

2.2.C.4 Cost Responsibilities for Pump Stations

See Section 7.2.

2.2.C.5 Cost Responsibility of Storage Facilities

In the event that Water Distribution storage facilities are required (hydro-pneumatic and above-ground storage), Colorado Springs Utilities will be responsible for the costs of land, design, and construction. (*Section 42.D Utilities Rules and Regulations*)

2.2.D Agreement and Bill of Sale and Warranty

The Owner/Developer shall enter into an *Agreement and Bill of Sale* for all Water Main Extensions that the Owner/Developer intends to convey to Colorado Springs Utilities as a Public Water System. The *Agreement and Bill of Sale* form is available at www.csu.org . The *Agreement and Bill of Sale* shall be signed by the Owner/Developer and submitted to Utilities Development Services prior to approval of any Water Construction Plan for a Public Water Main.

The *Agreement and Bill of Sale* shall include a warranty for the Water Main Extension and portions of the Water Service Line for the satisfactory repair or replacement where required, or the cost thereof, of all work, material, services, and equipment which becomes defective as a result of faulty materials, faulty installation, improper location of the facilities or improper handling of material and equipment installed by the Contractor. Such warranty shall be for a period of 24 months from the date of preliminary acceptance of the installation and completion of all work performed; however, Colorado Springs Utilities shall reserve the right to extend the warranty period as set forth in the *Agreement and Bill of Sale*. Once the Water Main is approved for service, Colorado Springs Utilities will operate the system and may serve Customers with the facilities. The date of final acceptance shall be the approval date as recorded on the *Agreement and Bill of Sale* form, which identifies the end of the warranty period. After final acceptance by Colorado Springs Utilities, a copy of the fully executed *Agreement and Bill of Sale* will be sent to the Owner/Developer.

2.3 Public or Private Water System

This section outlines the types of Public and Private Water Systems allowable for connection to the Colorado Springs Utilities Water System. The *Federal Safe Drinking Water Act, Colorado Primary Drinking Water Regulation* and City of Colorado Springs *City Code* require all connections to the Colorado Springs Utilities Water System meet one of the allowable configurations listed in Table 2-1 below. Federal Water Systems on a Consecutive or Master Metered system are excluded.

2.3.A Public Water Systems

Public Water Systems are a portion of the Colorado Springs Utilities Water System which transmits and distributes water from treatment or storage facilities to Users and is owned, operated, and maintained by Colorado Springs Utilities.

2.3.B Private Water Systems

Private Water Systems are that portion of the Water System which transmits and distributes water from one or more connections to the Colorado Springs Utilities Public Water System to Users and is owned, operated, and maintained by an entity other than Colorado Springs Utilities.

When a Private Water System is connected to the Colorado Springs Utilities Public Water System, it is not allowed to have another Private Water System connected to it (i.e., no Daisy Chains). See Table 2-1 below for allowable connections.

Table 2-1: Public or Private System Options

Colorado Springs Utilities Water System Connection Configurations		(a) Single-Family Residential (Private Streets with Public Utilities, Multiple Lot Subdivisions)	(b) Multi-Family [1] (does not include apartments)	(c) All Non-Single-Family-Residential – Multiple Platted Lots	(d) All Non-Single-Family-Residential and apartments – One Platted Lot and One Building Receiving Water Service	(e) All Non-Single-Family-Residential and apartments – One Platted Lot and Multiple Buildings Receiving Water Service
	Public Water System in Public Right-of-Way	ALLOWED	ALLOWED	ALLOWED	ALLOWED (but not typical)	ALLOWED
	Public Water System in an Easement on Private Property	ALLOWED See Detail Drawing A1-1	ALLOWED See Detail Drawing A1-2	ALLOWED See Detail Drawing A1-2	NOT ALLOWED	ALLOWED See Detail Drawing A1-4
	Private Water System on Private Property Connected to Public Water Main	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	ALLOWED[2] See Detail Drawing A1-3	ALLOWED See Detail Drawing A1-4
	Water Service Line behind a Master Meter Connected to Public Water System[3]	NOT ALLOWED	ALLOWED See Detail Drawing A1-5	NOT ALLOWED	ALLOWED See Detail Drawing A1-3	ALLOWED See Detail Drawing A1-5

[1] Multi-family (including condominiums, duplexes, and triplexes) and apartments will be considered as non-residential for billing purposes if they are Master Metered.

[2] Water infrastructure feeding 1 building on a single platted lot is considered a Water Service Line. Water Service Lines shall be owned and maintained by property Owner receiving service.

[3] A Water Service Line serving multiple units behind a Master Meter is only allowed where the lot is under single ownership, the service line is maintained by the lot Owner and fire hydrants are not required behind the Master Meter connection. If a Private or Public Water Main needs to be extended into the lot to provide fire service, then all Water Services lines and/or Water Service Line manifolds need to be tapped from the Private or Public Water Main extended in the lot for fire service. Fire hydrants are not allowed to be located after Master Meters.

Additional Details for Table 2-1:

- Single-Family-Residential and subdivisions in private streets with public utilities are required to have Public Water Mains either in a Right-of-Way ("ROW") or acceptable Easement. Private Water Mains or Master Metered systems are not allowed.
- Multi-Family on individual or multiple lots are allowed the installation of Public Water Mains in a ROW or acceptable Easement, or where the multi-family is on a single lot, the option of a Water Service Line behind a Master Meter where no fire hydrants are required.
- Non-Single-Family-Residential Multiple Lots are allowed to have a Public Water Main in a ROW or acceptable Easement.
- Non-Single-Family-Residential and apartments – One Platted Lot with One Building are allowed to have a Private Water System or Water Service Line on Private property.
- Non-Single-Family-Residential and apartments– One Platted Lot with Multiple Buildings with individual meters are allowed to have a Public Water Main in a ROW or acceptable Easement; Private Water Main with individual, or Master Metered services or a Water Service Line behind a Master Meter where no fire hydrants are required.

2.3.C Operation and Maintenance Considerations for Private Water Systems

This section is to inform new and current owners of a Private Water System of the expectations, responsibilities, and requirements of owning and maintaining the Water System to provide safe drinking water and fire protection to their Users.

2.3.C.1 Private System Ownership

Private Water System ownership includes all Water Mains, fire hydrants, fittings, and appurtenances located on the Premises being served up to and including any Secondary Valve at the connection to Colorado Springs Utilities Water Main. The Secondary Valve shall be located on or near the property, Easement or ROW line closest to the distribution main. Colorado Springs Utilities retains the irrevocable right to operate the owner's Secondary Valve.

In the case where a Secondary Valve does not exist on an existing Private Water System then ownership shall begin at the property, Easement or ROW line and a Secondary Valve shall be installed by the Private Water System owner(s).

The Owner/Developer shall record a Notice of Private Water System for each individual parcel or platted lot served by the Private Water System and shall show the Reception Number (or Book and Page) on the proposed Water Construction Plan(s). The form for this notice of Private Water System can be found in Section 3.6.

If a Private Water System is already in existence and the owner(s) want to inquire about the possibility of converting the system to a Public Water System, contact Colorado Springs Utilities Development Services (See Section 1.14) for information and direction.

2.3.C.2 Private Water System Responsibilities

Installation, operation, maintenance, repair, and replacement of Private Water Systems shall be conducted in accordance with these *Water LESS*, and *AWWA Water Chlorination/ Chloramination Practices and Principles Manual M20* as further described below. The owner(s) shall keep all Private Water Mains, Private fire hydrants, Approved Backflow Prevention Assemblies and/or Methods, Water Service Lines, and appurtenances on the Owner's Premises in proper working order and in good repair so as to minimize line breaks and leaks, prevent waste of water and ensure Water Quality. The Owner shall only use approved materials to conduct repair or replacement of any Private Water Mains, fire hydrants, Water Service Lines, and appurtenances. The Owner shall contact Colorado Springs Utilities to inspect any installation, repair, or replacement. See CHAPTER 4 Approved Materials for a complete listing of approved materials. In the event of a risk to Public health, Colorado Springs Utilities will make emergency repairs and assess billable charges to the owner.

a) Multiple Premises Connected to a Private Water System

Where more than one Premise is connected to a Private Water System, the owners of the respective Premises shall be jointly and severally responsible for the operation, maintenance, repair and replacement of the Private Water Mains, Private fire hydrants, and appurtenances.

b) Multiple Owners of a Private Water System

If a Private Water System is owned by one or more persons or entities (other than the owners of the Premises), then those persons or entities owning the Private Water System shall be responsible for the operation, maintenance, repair, and replacement of the Private Water System.

2.3.C.3 Private Fire Hydrants

The Owner is responsible for the installation, operation, repair, maintenance, flow and pressure testing of Private fire hydrants which shall be conducted in accordance with Colorado Springs Fire Department (CSFD) standards and practices as described in the *City Code §8.4.*102, *AWWA Fire Hydrants Manual M17, NFPA 24* and manufacturers' recommendations. CSFD and Colorado Springs Utilities shall have the unrestricted right to use Private fire hydrants in an emergency and to sample, inspect, pressure test, and conduct flow analysis as required. This will also

apply to other appurtenances such as Water Quality Devices (above or below ground, temporary or permanent).

2.4 Alternate Water Systems - Consecutive and Master Metered Systems

Colorado Springs Utilities may provide Water to other systems in which Colorado Springs Utilities will become the Wholesale provider of Water to a new or existing Water System not owned by Colorado Springs Utilities. In the event that one of the following Master Metered or Consecutive Systems is requested, the system must comply with the *Federal Safe Drinking Water Act* and the *Colorado Primary Drinking Water Regulations*. Colorado Springs Utilities will evaluate Master Metered systems and Consecutive Systems on a case-by-case basis. These Master Metered systems and Consecutive Systems are rarely exercised alternatives and require agreements between Colorado Springs Utilities and the Master Meter or Consecutive System owner. Please contact Colorado Springs Utilities for more information.

2.4.A Master Metered System

A Master Metered System will have 1 or more meters, depending on system looping requirements. Everything downstream of the Master Meter shall be owned and operated as a Private Water System. Colorado Springs Utilities will bill 1 Owner or Customer of record for all water provided to a Master Metered System. Single-Family-Residential rates for Water Service are not available for Master Metered Systems regardless of the end use of the water, in accord with Colorado Springs Utilities tariffs. Connection to the Colorado Springs Utilities Water Distribution System may require, but is not limited to, a meter Vault, above-grade RP, post hydrant, and Secondary Valve. See Detail Drawing B4-10.

2.4.B Consecutive System

Consecutive Systems are Water Systems not owned by Colorado Springs Utilities that are subject to the monitoring and reporting provisions of the *Colorado Primary Drinking Water Regulations*. The Colorado Department of Public Health and Environment (CDPHE) shall determine if a Water System is a Consecutive System based on their regulations. Consecutive System owners will be responsible for contacting the CDPHE to determine Consecutive System requirements. Colorado Springs Utilities will provide water to these systems through a specified connection from the Public Water System. This specified connection may require but is not limited to a meter Vault, an Approved Backflow Prevention Assembly or Method, a Vault, post hydrant, continuous Water Quality monitoring instrumentation, and Secondary Valve. The quality of the water in the Consecutive System is the responsibility of the Consecutive System owner. Ownership between the two systems (Water System not owned by Colorado Springs Utilities and Water System owned by Colorado Springs Utilities) is typically delineated by a Secondary Valve, located between the meter Vault and the Approved Backflow Prevention Assembly or Method (if required). The cost of establishing the connection and any required maintenance shall be the responsibility of the Consecutive System owner. The connection point design shall be completed along with the Water Construction Plans specified in these *Water LESS*, additionally, the Design Engineer must show the hydraulic grade line at the point of ownership delineation (the Secondary Valve in most cases).

In all instances, the delineation point of all Consecutive System requirements will be determined by a contractual agreement between Colorado Springs Utilities and the

Consecutive System owner. All Vaults and appurtenances at this connection shall be installed outside of rights of way and roadway surfaces, in an Easement dedicated to the City of Colorado Springs on behalf of its enterprise Colorado Springs Utilities. For more details on these Easements, see Section 2.6.E. Plans shall be submitted to Utilities Development Services for review.

Consecutive Systems are uncommon in Colorado Springs Utilities service area. As a result, *City Code § 12.4.302* may be pertinent in these instances.

2.5 Planning

2.5.A Hydraulic Analysis Requirements/Water Main Sizing.

A *Hydraulic Grade Line (HGL) Request Form* is required with any Development Plan submittal which proposes the installation of a new Water Main. Colorado Springs Utilities recommends that an *HGL Request Form* be submitted with any Annexation, Master Plan, or Concept Plan. The *HGL Request Form* shall be submitted to Colorado Springs Utilities via the Construction & Development Hub. The submission of a PDF of the current Water Plans and UDCF are still required for FF Reports, but the Water Plans will be submitted through the Hub's intake. The *HGL Request Form* shall contain Site acreage with proposed demands based on land use, the maximum fire flow anticipated, a Site plan showing proposed connection points, and a preliminary alignment of pertinent Water Mains. Colorado Springs Utilities will respond with an *HGL Response Form* outlining the Project requirements and will advise if a *Hydraulic Analysis Report (HAR)* is required. The *HAR*, if required, shall be completed by the Owner/Developer and submitted to Colorado Springs Utilities for review and approval prior to the Development Plan approval. The *HAR* shall establish Water Main sizes and pressure zone infrastructure requirements (PRVs, pumps, tanks, etc.). For additional *HAR* requirements refer to the *Hydraulic Analysis Report and Fire flow Modeling Requirements* at www.csu.org.

Colorado Springs Utilities has the final authority related to the sizing of Water Mains for projected future needs including the location of Water Mains and placement of required appurtenances. All Water Mains shall be sized large enough to provide for domestic, irrigation, and fire protection flows to the area requiring service. Water Main sizes may be increased in adherence to the recommendations of the *International Fire Code* to provide adequate fire flows. Water Distribution Main minimum sizing shall be 8 inches unless the Water Main meets the criteria per Section 2.6.D. 10-inch Water Distribution Mains are not allowed.

The Owner/Developer may request that Colorado Springs Utilities complete the required modeling for the Site. Fees may apply for Colorado Springs Utilities to complete the *HAR* which will be assessed based on the latest *Utilities Rules and Regulations*.

2.5.B Preliminary Utility Plan

A Preliminary Utility Plan shall be prepared for land planning applications within the Colorado Springs Utilities Service Territory that have an impact on existing or future expansions of Colorado Springs Utilities Water System. Preliminary Utility Plans shall be included as part of the Development Plan submittal and may be required with the Master or

Concept Plan submittal depending on the complexity of the development. At the Development Plan Stage, the Preliminary Utility Plan shall address at a minimum:

- the location and separation of proposed and existing utility infrastructure, Structures, and obstructions,
- the identification of Private and Public Water Mains,
- access to existing and proposed utility infrastructure,
- the size and location of existing and proposed Public and Private utility Easements,
- Water System Extensions for future development,
- Water Quality Requirements,
- the location of any PRV's, tanks, pump stations, sub stations, and pressure boundaries,
- Water Main sizes, and
- other items deemed necessary by Colorado Springs Utilities.

For additional Preliminary Utility Plan requirements refer to the *Preliminary Utility Plan Checklist* at www.csu.org.

2.5.C Geological Hazard Identification and Mitigation

The Owner/Developer shall review all applicable *Geological Hazard Studies* (*City Code §7.4.501 – 7.4.507*) for the proposed Water System. Where the Water System is proposed within areas of known geologic hazards, mitigation or avoidance techniques shall be identified by the Owner/Developer as part of the Preliminary Utility Plan submittal that are designed so that it will continue to function in the event of a slope failure or movement of the underlying materials and will not increase the risk or consequences of static or seismic slope instability or result in a risk of mass wasting. Based on Site conditions Colorado Springs Utilities may require one or more of the following:

- restrained joint DIP, PVC or HDPE,
- trenchless technology,
- concrete reverse anchors,
- cathodic protection,
- over excavation,
- special bedding,
- slope stabilization,
- plans to address future operation and maintenance concerns,
- relocation of the Water Main and
- other mitigation measures as deemed necessary by Colorado Springs Utilities.

Colorado Springs Utilities may require additional studies for areas of known geological hazards along the Water System alignment. Copies of applicable reports shall be submitted to Colorado Springs Utilities when requested.

2.6 Water Main Design

2.6.A Water Mains General

All Water Main Extensions shall be designed in accordance with these *Water LESS*, and as approved by Colorado Springs Utilities. Plan submittal requirements for Water Main design can be found in CHAPTER 3 Submittal Requirements.

2.6.B Water Main Material and Pressure Class

The following materials are approved for use within Colorado Springs Utilities Water System:

- Steel,
- Ductile Iron Pipe (DIP)
- Polyvinyl Chloride (PVC)
- and High-Density Polyethylene Pipe (HDPE)

All pipe material utilized in the Water Distribution System is to be Ductile Iron Pipe Sized (DIPS). Any other proposed material must be evaluated and accepted by Colorado Springs Utilities prior to use. See CHAPTER 4 Approved Materials for additional information on pipe pressure ratings, uses, applications and other approved materials for use in Public and Private Water Systems.

Water Main materials and thicknesses shall be designed for internal pressure using the occasional surge conditions and safety factors as dictated in the table below. Reoccurring surge should be evaluated in areas where the operation of pumps and or valves causes frequent surges in the Water System. Materials and thickness shall also be designed for trench loads including earth loads and any anticipated live loads. Additional factors that should be considered when choosing materials include the presence of Contaminants, geotechnical concerns, corrosivity of the soil, and any other conditions which may affect material selection.

Table 2-2 shall be used for determining the appropriate pipe material based on the design Working Pressure and Occasional Surge Pressure for the proposed Water System (allowable pressure calculations in the table below were made in accordance with *AWWA C900* and *C150*).:

Table 2-2: Water Main Material and Pressure Class

Pipe Material	Nominal Size[1]	DR	Max Design Working Pressure	Required Pressure Class
	inches		psi	psi
PVC C900	4-24	14	180	305
HDPE PE4710	8-24	9	200	250
DIP	4-24	NA	250	350

[1] Pipelines larger than 24 inches shall be constructed of DIP or Steel pipe. Calculations for the thickness of DIP or steel pipelines larger than 24 inches shall be provided to Colorado Springs Utilities for review.

Note: 3, 10, and 18 inch pipe sizes are not allowed for use in the Colorado Springs Utilities Water System.

Note: 4 and 6 inch Water Service Lines shall be designed as a Water Main.

When steel is utilized in the Water System it shall be designed by a qualified Design Engineer in accordance with *AWWA M-11 Steel Pipe Guide for Design and Installation*.

2.6.B.1 HDPE

If HDPE is proposed, see CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies for additional design requirements. Where pressure may exceed 200 psi, use of HDPE will be reviewed on a case-by-case basis.

2.6.C Connection Requirements

Connections to the existing Water Distribution System for a Public or Private Water System extension must be approved by Colorado Springs Utilities. Connection to an existing Colorado Springs Utilities Public Water Main must be completed by Colorado Springs Utilities or their designated representative. Unauthorized connections to Colorado Springs Utilities' Water System are a violation of the *City Code* and may be subject to fines, time and material charges and prosecution. (*City Code § 12.1.113 and § 12.4.604*) See Section 5.12.A of these *Water LESS* for additional Construction connection requirements.

2.6.C.1 Valves

Connections 4 inches and larger require a tee and valves be installed per Section 2.6.F.6.

Where a connection requires the shutdown of an existing Water Main, Colorado Springs Utilities will identify the valves that need to be operated to isolate the Water Main. Utilities Development Services shall contact Inspections (668-4658) after the initial Water Construction Plan review to schedule the identification and inspection of the valves required for the shutdown. Valves required for the Project should be brought up to grade, cleaned and inspected by Colorado Springs Utilities prior to scheduling the shutdown.

2.6.C.2 Outage Modeling

An outage model will be prepared by Colorado Springs Utilities for connections to existing Water Mains 16 inches or larger. In some situations, smaller sized mains may need outage modeling as determined by Colorado Springs Utilities. Colorado Springs Utilities may establish conditions for new connections based on modeling existing system reliability, redundancy, and criticality. These conditions shall be shown in the Water Construction Plans.

2.6.D Looping Requirements

In general, Potable Water Distribution Main Extensions shall be looped such that Water Service Lines and Fire Service Lines supplied from these Water Main Extensions are supplied from at least two separate connections within the same pressure zone. As determined by Colorado Springs Utilities, additional off-site Water Main Extensions may be required to be designed and installed by the Owner/Developer in order to achieve the required Water Distribution System looping requirements for a proposed development.

Looping requirements are based on the following elements and are also subject to other factors without limitation:

- fire flow
- Water Quality Requirements
- Service Interruption Criteria

- land use
- development phasing

2.6.D.1 Permanent Dead-End Main Criteria

Permanent Dead End Mains shall be at least 8 inches in diameter (12 inches in diameter for HDPE). Permanent Dead End Mains shall be evaluated on a case-by-case basis, and will be allowed if:

- CSFD fire protection requirements are met at all times,
- Water Quality Requirements can be met at all times without flushing at Full Build Out,
- Service Interruption Criteria, as determined by Colorado Springs Utilities, are met, and
- Any additional conditions that may apply, as determined by Colorado Springs Utilities.

6 inch diameter Permanent Dead End Mains will be allowed if:

- the above criteria are met,
- the Water Distribution Main is 250 feet or less in length, and
- is within a residential area with no more than 10 single family dwelling units connected to the 6 inch diameter Dead End Main.

As determined by Colorado Springs Utilities, Permanent Dead End Mains shall be equipped with an approved Water Quality Device. Water Quality Devices shall be located:

- on property lines within a permanent Easement,
- outside of driveways,
- a minimum of 5 feet from vertical Structures and,
- per the horizontal and vertical separation as described in Section 2.6.F.2 of these *Water LESS.*

Bollards may be required to ensure the Water Quality Device is protected from vehicular movements.

2.6.D.2 Temporary Dead End Main Criteria

Temporary Dead End Mains shall be evaluated on a case-by-case basis and will be allowed if they meet fire protection requirements, Water Quality Requirements, and Service Interruption Criteria at all times. A maximum of 50 single family dwelling units will be allowed on a Temporary Dead End Main.

As determined by Colorado Springs Utilities, Temporary Dead End Mains shall be equipped with an approved Water Quality Device. The Water Quality Device may be located as described above or within the Owner/Developer's property or a temporary Construction Easement.

Temporary Dead End Mains may be fitted with a Temporary Loop to meet Water Quality Requirements. Temporary Loops shall be sized to provide flows which will

maintain Water Quality Requirements in the Water Main being looped. Temporary Loops including all appurtenances shall be owned and maintained by the Owner/Developer. Colorado Springs Utilities may elect to own and maintain the Temporary Loop after the warranty period. A Development Agreement may be required to address the ownership and maintenance and duration of Temporary Loops. The Owner/Developer shall be responsible for obtaining all Easements necessary for the Temporary Loop. Temporary Loops may be removed or abandoned when the Temporary Dead End Main is extended and becomes a Looped Main. Temporary Loops shall not be tapped for Water Service.

The Owner/Developer shall be responsible for meeting Water Quality Requirements on all Dead End Mains until the Water Distribution Main becomes a component of a Looped Main or until the Necessary Demand requirements are met, as determined by Colorado Springs Utilities per Section 2.6.D.4. If owner/Developer fails to meet Water Quality, Colorado Springs Utilities may take actions to protect Water Quality and will bill Owner/Developer per applicable *URRs* and Tariffs.

2.6.D.3 Water Stub-Out Criteria

Water Stub-Outs are an extension of Water Main necessary for the future expansion of the Water System with no service connections. Water Stub-Outs are typically extended past curb and gutter and pavement limits to minimize roadway disturbance for future system extensions.

All Water Stub-Outs shall be fitted with a temporary blow off valve assembly at the end of the main. (See Detail Drawing A2-3)

Water Stub-Outs shall be fitted with a Water Quality Device with an isolation valve located before and after the Water Quality Device (See Detail Drawing A2-3) to allow for future chlorination under the following conditions:

- the Water Stub Out is 16 inches in diameter or greater,
- the Water Stub Out is 12 inches in diameter and greater than 200 feet in length, or
- the Water Stub Out is 8 inches in diameter and greater than 400 feet in length.

Water taps on the Water Stub-Outs shall not be allowed between the Water Quality Device and/or isolation valve and the temporary blow off valve assembly until the main is extended and accepted by Colorado Springs Utilities.

Water Stub-Outs shall be isolated at the branch valve or at the valve after the Water Quality Device. The Owner/Developer shall install a lock out tag out valve box insert to ensure the valve is not operated before Water Quality Requirements are met.

2.6.D.4 Service Interruption Criteria

Colorado Springs Utilities seeks to achieve a reliable and redundant Water Distribution System to minimize interruptions of service. Service Interruption Criteria is the measure of the type and maximum number of Customers considered reasonable to experience an outage during operation and maintenance of the Water Distribution System. Service Interruption Criteria is driven by land use, which dictates water use characteristics of a proposed development. Water use characteristics include, but are not limited to, average and peak daily water use, time of peak water usage, and business and community impacts of water outages. Colorado Springs Utilities will evaluate each proposed development to determine the Service Interruption Criteria as described below.

Current land uses in the City of Colorado Springs may be generally classified in the following categories:

- Residential (single family)
- Commercial- Office
- Commercial- Retail
- Multi-Family (condominiums, duplexes, triplexes, apartments)
- Industrial
- Parks and Open Space
- Public/Institutional
- Mixed Use

If fire flow requirements and Water Quality Requirements, as specified above, are met, then the following general guidelines will apply in evaluating onsite and offsite Water Distribution Main looping requirements based on Service Interruption Criteria:

- Dead End Mains with greater than 50 single-family dwelling units will not be allowed and must be looped.
- Commercial-office, commercial-retail, multi-family, industrial, Mixed Use and Public/institutional land use designations will be evaluated on a case-by-case basis to determine Service Interruption Criteria.
- Dead End Mains will not be allowed for Essential Facilities.
- If information is not available on the type of land use for the proposed development, then conservative assumptions of water use and Service Interruption Criteria may apply.

Parks and open space areas will be evaluated to determine the risk of a water outage in meeting domestic service, fire, Water Quality, irrigation, and other requirements.

2.6.D.5 Water Quality Requirements

The Owner/Developer is responsible for ensuring Safe Drinking Water Act standards are maintained in Temporary Dead End Mains until full build-out. This includes maintaining a free chlorine residual of ≥ 0.20 mg/L or residual equal to

that of the surrounding distribution system, whichever is less, during all phases of construction. Acceptable methods for meeting Water Quality Requirements include, but are not limited to:

- constructing a Permanent Loop,
- constructing a Temporary Loop (pumping may be required),
- construction or irrigation watering to meet the Necessary Demand,
- project phasing to minimize the length of proposed Dead End Mains,
- isolation of the proposed Water Distribution System not in use,
- bleeding through of PRVs to force water through the proposed Water Distribution System from a higher-pressure zone to a lower pressure zone,
- timing of construction to minimize lack of demand on the proposed Water Distribution Mains, and
- management of the existing Water Distribution System where valves are closed to force water through the proposed Water Distribution System.

If requested, Colorado Springs Utilities will calculate minimum volume of water turnover required to maintain water quality and will advise Owner/Developer of best practices (from above) specific to the job.

The Owner/Developer shall be responsible for any permitting necessary to meet Water Quality Requirements. All costs of meeting Water Quality Requirements shall be in accordance with Utilities Rules and Regulations. Costs will vary and may include pump installation and pumping costs, Water Quality Devices, labor, and equipment. Utilities may extend the two-year construction warranty period if water quality violations are persistent. A separate development agreement may be required to address cost requirements and time.

Colorado Springs Utilities will periodically spot check system extension sites to ensure adequate chlorine residual is being maintained. If the Owner/Developer fails to meet Water Quality Requirements, Colorado Springs Utilities may take actions to ensure water quality, including but not limited to on-site chlorination and flushing the Water Main, and may bill the Owner/Developer for time, labor, and material hours per applicable *Utilities Rules and Regulations.*

2.6.D.6 Temporary Loop Criteria

Temporary loops shall be sized based on hydraulic modeling that identifies minimally required water flow through the Temporary Loop in order to maintain Water Quality Requirements. Pumping may be required to force the necessary water volume through the Temporary Loop. Pumping facilities shall be evaluated on a case-by-case basis.

Temporary Loops 2 inch and less shall be designed as Water Service Lines per Section 2.6.H.10. Connection to the Dead End Main and the existing Looped Main shall be accomplished with a water tap per Detail Drawing B1-1 and a Curb Stop located directly after the tap.

Temporary Loops 4 inch and greater shall be designed as Water Mains per Section 2.6. Connection to any Dead End Main and the existing Looped Main shall be accomplished with a tap and gate valve per Detail Drawing B1-2. Requirements for additional valves along the Temporary Loop will be evaluated on a case-by-case basis with consideration to future maintenance.

The Owner/Developer will be responsible for owning and maintaining the Temporary Loop and obtaining all necessary Easements for Construction.

2.6.D.7 Looped Fire Mains

Fire Mains shall be looped, as determined by the CSFD and Colorado Springs Utilities, when necessary to meet the required fire flow or other provisions of the current adopted version of the *International Fire Code* by the City of Colorado Springs. Looped Fire Mains shall be a minimum of 8 inches in diameter and shall be connected to the existing Water Main with two tees and valves per Section 2.6.F.6. Additional isolation valves within the loop may be required to ensure fire protection reliability.

2.6.D.8 Dead End Fire Mains

Unless approved by the fire code official, dead-end fire service mains shall not be used when there is not a reliable secondary or redundant means of water supply within 500 feet of a Structure along an approved route. (*City Code § 8.4.105 Section 903.3.5.3*) See Detail Drawing A2-2.

2.6.E Utility Cross Sections and Easement Requirements

The preferred location for a Public Water Main is within a Public Right-of-Way (i.e., Public street). See Detail Drawings A3-1 through A3-10 for utility locations within a Public street. It is also acceptable to install Public Water Mains on Private property within a utility Easement dedicated to the City of Colorado Springs on behalf of its enterprise Colorado Springs Utilities. Alternatively, Public Water Mains can be installed within tracts allowing for the installation of Public utility infrastructure.

The Owner/Developer shall be responsible for acquiring and shall ensure that all Utility Easements necessary for water infrastructure are dedicated to the City of Colorado Springs on behalf of its enterprise Colorado Springs Utilities. Utility Easements are dedicated either by plat (via a dedication statement on the property plat), or by a separate instrument in which the Owner executes a *Permanent Easement Agreement* independent of the platting of the property. If dedicating an Easement by separate instrument, the Owner/Developer should begin by downloading the proper forms from the Colorado Springs Utilities website www.csu.org. The forms available on the website are kept current and can be used to ensure the Easement language will be suitable to Colorado Springs Utilities resulting in efficient processing of the Easement.

The exhibits for the Easements shall be signed and stamped by a Professional Land Surveyor licensed to practice in the State of Colorado. Additionally, there is a page entitled “Joinder and Consent of Holder of Deed of Trust” which must be signed by the holder(s) of any and all deeds of trust on the property. Colorado Springs Utilities will sign the *Permanent*

Easement Agreement to indicate acceptance of the Easement and will be responsible for recording the Easement document. A copy of the recorded Easement will be returned to the Owner/Developer for their records allowing the Design Engineer to place the Easement reception number on the Water Construction Plan.

The Easement document contains language that prohibits Construction of Structures within the Easement. The Easement is non-exclusive, allowing other utilities, such as telecommunication and storm sewer lines, to be installed within the Easement subject to written approval by Colorado Springs Utilities.

In all cases the Water Main shall have a minimum of 15 feet between the centerline of the water line and the edge of the Easement resulting in a minimum Easement width of 30 feet for a single 8 inch or 12 inch Water Main. A minimum distance of 20 feet is required from the centerline of a 16 inch to 24 inch Water Main, resulting in a minimum Easement width of 40 feet for a single Water Main in this size range. Easement width requirements for water lines larger than 24 inches will be addressed on a case-by-case basis. In each case the Easement shall be graded to allow for maintenance and is preferred to be centered over the water line. In areas where additional utilities are to be included in the Easement, the Easement width shall then be increased to accommodate separation distances as described in Table 2-4.

In areas where the water line exceeds 10% grade, the Easement width must be increased to 50 feet with the Easement centered over the water line unless otherwise specified by Colorado Springs Utilities.

Table 2-3 establishes the standard Easement widths for the combination of utilities represented by the cell in the matrix.

Table 2-3: Minimum Easement/Corridor Width (feet) Requirements for Utility Combinations

	No Gas or Electric Lines		Gas and/or Electric Distribution or Joint Trench		Gas Main ≥150 psig	
No Water, Storm, or Wastewater	N/A		20		50	
Water Main ≤ 12-inch diameter	30		40		50	
Wastewater Main ≤ 15 feet deep	30		40		50	
Wastewater Main 15-20 feet deep	40		45		50	
Water Main ≤ 12-inch diameter with Wastewater Main ≤ 15 feet deep	50		50		50	
Water Main ≤ 12-inch diameter with Wastewater Main 15-20 feet deep	60		60		60	
	Utility Ease-ment	**Total Corri-dor[1]**	**Utility Ease-ment**	**Total Corri-dor[1]**	**Utility Ease-ment**	**Total Corri-dor[1]**
Storm Sewer with Water Main ≤ 12-inch diameter	30	40	40	45	35	45
Storm Sewer with Wastewater Main ≤ 15 feet deep	30	50	40	50	40	50
Storm Sewer with Wastewater Main 15-20 feet deep	40	60	50	60	50	60
Storm Sewer with Water Main ≤ 12-inch diameter and Wastewater Main ≤ 15 feet deep	50	55	50	55	50	60
Storm Sewer with Water Main ≤ 12-inch diameter and Wastewater Main 15-20 feet deep	60	60	60	60	60	65

[1] The Total Corridor is the encumbered width by Easements to Colorado Springs Utilities and the City of Colorado Springs for Storm Sewer. Two Easements will be required in corridors where storm sewer is located with another utility. The Easements are Public Utility Easements for Colorado Springs Utilities, and a Public Drainage Easement for the City of Colorado Springs

Table 2-3 is intended to provide minimum Easement widths for typical utility installations and combinations. Case by case Easement width determinations will be made based on soil type, depth, size, Site conditions, and Construction methods for the following utilities:

- Water Mains greater than 12 inches in diameter and/or greater than 8 feet deep (Easement width no less than 40 feet)
- Wastewater Mains greater than 20 feet deep
- Electric transmission and 600A sub-transmission lines
- High pressure natural gas lines
- Storm Sewers 60 inches and larger
- Multiple utility infrastructure of the same designation (water with water, wastewater with wastewater, etc.)

Easement widths depicted above are intended for utility infrastructure located on Private property outside of Public Rights of Way. Where utility infrastructure is located with a Public Right-of-Way refer to Detail Drawings A3-1 through A3-10. Utility locations and Easements in Traditional Neighborhoods, Small Lot Planned Unit Developments, Mixed Use Developments, and developments in private streets with public utilities will be evaluated on a case-by-case basis. Guidance on utility locations and Easements in these developments can be found in:

- *Traditional Neighborhood Development Design Manual*, April 22, 2005
- *Small Lot Planned Unit Developments*, April 22, 2005, and
- *Mixed Use Development Design Manual*, September 23, 2003
  as published by the City of Colorado Springs.
- Guidance for utility locations for developments in private streets with public utilities is included/shown in Detail Drawings A3-12 through A3-14.

All Public fire hydrants will be located within street rights-of-way or utility Easements. If the proposed location of a fire or flushing hydrant is less than 5 feet from or is beyond the edge of the Right-of-Way or utility Easement line, then additional Easement must be dedicated that is 30 feet wide and extends a minimum of 5 feet beyond the hydrant location.

A complete integrated Water System may also require a pressure regulating valve (PRV) and associated Vault placed at the point where two pressure zones are connected. These shall be installed outside of the paved street and may require additional Easement. The size and location of the PRV Vault as well as the size and orientation of the necessary Easement will be determined on a case-by-case basis. See Detail Drawing A6-8.

2.6.F Water Main Horizontal Design Criteria

The following are the criteria needed for the layout of a Public or Private Water Main System. Water Plan and Profile or Utility Service Plan Checklists are located at www.csu.org**.**

2.6.F.1 Pipe Alignment

Normal practice is to lay the Water Main on the north or east side of the street, based on the approved street cross sections. The minimum distance between the

Water Main and the edge of pavement should be as noted on the approved utility street cross sections.

The horizontal distance between the Water Main and any Structure or building shall be a minimum of 15 feet. Private and Public Water Mains shall be located in roadways, or in the drive aisles of any parking areas, or at a minimum of 15 feet from the edge of any Easement. Water Mains shall be a minimum of 15-foot from the base of trees to mitigate issues such as root intrusion or damage to pipes. Reductions in these separations may be considered on a case-by-case basis if the trees have shallow roots; see the *Approved Street Tree with Shallow Roots* table in the Colorado Springs Utilities *Gas Line Extension and Service Standards*. Street cross section guidelines are shown on Detail Drawings A3-1 through A3-10.

2.6.F.2 Separation Criteria

Water Mains shall be separated from utility facilities and shall meet the minimum separation requirements as depicted in the Clearance Matrix in Table 2-4. If compliance with these requirements is not feasible, the Owner/Developer shall design and construct the stormwater, Nonpotable, Wastewater Main, or Water Main so as to protect the Water Main by means of secondary containment. The following methods of installation shall be considered secondary containment by Colorado Springs Utilities:

- The Water Main or the Wastewater, storm sewer, or Nonpotable Water Main shall be installed in a casing pipe or
- The Water Main or the Wastewater, storm sewer, or Nonpotable Water Main shall be encased in flow fill, per the Specifications in Section 4.4.S, throughout the embedment zone or
- The Water Main shall be bored and/or constructed of HDPE or welded steel and there are no mechanical fittings for the length of pipe that does not meet minimum separation criteria.

If the Water Main is greater than 5 feet below the Wastewater, storm sewer, or a Nonpotable Water Main secondary containment is not required.

All tees off of Water Mains shall have a minimum separation of 5 feet from adjacent tees or taps to allow for operations and maintenance between parallel Water Mains. This 5 feet of separation between mains shall be maintained throughout extent in accordance with Table 2-4.

Where fire service lines are located parallel to a structure less than 15’ from a structure but at least 7.5’, they shall be constructed of HDPE.

If compliance with these separation requirements, or those set forth in Table 2-4 and this Chapter cannot be met they will be addressed on a case-by-case basis following variance procedures described in the applicable Line Extension and Service Standard. This includes areas of redevelopment within alleys. Colorado

Springs Utilities subject matter experts for the utility being impacted will make the determination regarding clearances.

For public streets, use the Utility Street Cross Sections in Detail Drawings A3-1 through A3-10.

Table 2-4: Clearance Matrix for Typical Colorado Springs Underground Utilities

All separations shown are the clear distance between two objects measured outside edge to outside edge. Gray rows denote horizontal distances whereas white rows denote vertical distances (All dimensions are in feet).

Colorado Springs Utilities (Underground)	Potable Water	Non-potable Water	Wastewater	Storm Sewer	Gas Mains 150 psig (MAOP)	Gas Main	Gas Service	Electric Primary up to 34.5kV	Electric Secondary (0-480 Volt)	Telecom/Fiber
Potable Water	5	10	10[c]	10[c]	10	6	3	10[d]	3	5
	1.5	1.5[a]	1.5[a]	1.5[a]	5	1	1	1	1	1
Non-potable Water	10	5	10	10	10	6	3	10	3	5
	1.5[a]	1.5	1.5[a]	1.5[a]	5	1	1	1	1	1
Wastewater	10[c]	10	5	10[c]	10	6	3	10[d]	3	5
	1.5[a]	1.5[a]	1.5	1.5[a]	5	1	1	1	1	1
Storm Sewer	10[c]	10	10[c]	-[g]	10	6	3	10	3	2
	1.5[a]	1.5[a]	1.5[a]	-[g]	5	1	1	1	1	1
Gas Mains 150 psig (MAOP)	10	10	10	10	-[e]	6	6	10	10	10
	5	5	5	5	[e]	[e]	5	5	5	5
Gas Main	6	6	6	6	6	6	3	6	3	5[e]
	1	1	1	1	[e]	1	1	1/5[b]	1	1
Gas Service	3	3	3	3	6	3	3	3	3	3
	1	1	1	1	5	1	1	1	1	1
Electric Primary up to 34.5kV	10[d]	10	10[d]	10	10	6	3	-[f]	3	5
	1	1	1	1	5	1/5[b]	1	1	0	1
Electric Secondary (0-480 Volt)	3	3	3	3	10	3	3	3	3	5
	1	1	1	1	5	1	1	0	1	1
Telecom/Fiber	5	5	5	5	10	5	3	5	5	2
	1	1	1	1	5	1	1	1	1	1

[a] These utilities may require a casing pipe when crossing under another utility.
[b] 1' separation from electric primary to plastic pipe gas main and 5' separation from electric primary to metallic gas main.
[c] Exception: Minimum 5' separation if meets the means of secondary containment listed in the Section 2.6.F.2 and *Wastewater LESS* Section 2.5.D.2 and City Street Cross Sections.
[d] Exception: Minimum 6'-10" clearance from Electric Primary to Potable Water and Wastewater.

[e] Separations shall meet Gas LESS requirements.
[f] Separations shall meet Electric LESS requirements.
[g] Clearances for stormwater facilities to other stormwater facilities are determined by the City of Colorado Springs. Refer to the City of Colorado Springs standards and regulations.

Notes:

1. Additional Water Service Lines horizontal and vertical separation requirements are defined in Sections 2.7.F and 2.7.G respectively.
2. Storm Sewer clearances must be verified by City Engineering.
3. See the *Gas LESS*, 2.02c, for certain exceptions.

2.6.F.3 Access Roads

Some appurtenances (Vaults, valves, manholes, fire hydrants) may need an access road if the appurtenance is not located in a dedicated street area. This access road will be used for maintenance.

The maximum grade allowed on the access road is 10%, with a maximum cross-slope of 2%. Grades for cul-de-sacs and turnarounds shall not exceed 6%. An access drive shall be constructed within a 30 foot wide Easement with a 16 foot wide all weather surface such as asphalt paving, concrete paving, or an adequate gravel base, and shall be designed to carry HS-20 loading and compacted to the City of Colorado Springs, Engineering Standards. A vehicle turnaround area is required at the end of the access road when the back-up distance for any maintenance vehicle exceeds 200 feet in length. See Detail Drawing A3-11 for additional information.

2.6.F.4 Abandonment of Water Mains

When the proposed Water System includes the abandonment of an existing Public or Private Water Main, the Water Main may be abandoned in place and left in the ground, on a case-by-case basis as approved by Colorado Springs Utilities and shown on the Water Construction Plans. All abandoned metal Water Mains shall be drained, filled with sand, grout, or approved CLSM and sealed by grouting and plugging or capping the exposed ends of the pipe. PVC or HDPE pipe shall be drained, sealed by grouting and plugging or capping the exposed ends of the pipe and does not need to be filled. Where the Water Main to be abandoned is located under an existing or proposed Structure, the Water Main shall be removed or drained, filled with sand, grout, or approved CLSM and sealed by grouting and plugging or capping the exposed ends of the pipe. Refer to Section 5.10.

All above grade appurtenances (i.e., fire hydrants, valve boxes) need to be removed when they are part of a Water Main abandonment. Any type of pit or Vault Structure will need to have all appurtenances removed, the Vault removed or the bottom crushed and the Structure filled with compacted dirt or sand.

Abandoned in place mains and appurtenances shall be documented on the Water Construction Plans and in the Colorado Springs Utilities infrastructure mapping system by the Colorado Springs Utilities Inspector.

2.6.F.5 Removal of Unused Stub Outs

If it is determined that a previously placed stub out or tee installed by an Owner/Developer for a future connection is no longer usable or not intended to be used in the future, then the tee, valve and pipe of the stub out shall be removed by the Owner/Developer and/or Contractor, and shall be replaced with a solid piece of pipe in the remaining Water Main.

2.6.F.6 Line Valve Design Criteria

When installing valves within the Water Distribution System, the following objectives shall be met:

- Minimize outages for both Commercial and Residential User.
- Minimize interruptions to the fire safety system as determined by Colorado Springs Utilities and CSFD.
- Minimize Construction and maintenance costs.
- Provide the ability to fill/release air, chlorinate, flush, and drain mains.
- Add only necessary valves and combine multiple purposes wherever possible.

All crosses installed on a Water Main require 4 line valves, 1 in each direction. All tees for Water Main connections installed on Water Distribution Mains require 3 line valves, 1 in each direction with the exception of fire hydrants. Service connections 4 inches and greater require the cut-in installation of a tee with 3 line valves. Line valves on Fire Service Lines shall be evaluated on a case-by-case basis. The number of valves required may be impacted by the adjacent existing and proposed valves and other connections between the proposed tee and the adjacent valves. The number of valves required may also be impacted by the proposed land use of each Structure, square footage of Structures, the frontage of each lot, and the resultant effectiveness of each valve added.

An existing Water Main in service may be wet tapped in lieu of a tee at the discretion of Colorado Springs Utilities. Wet taps shall be a minimum of one size smaller than the Water Main being tapped.

Additional valves may be required adjacent to fire hydrants and on fire hydrant tees, to minimize disruptions during repair or maintenance of the Water System. See Detail Drawing A4-5. Where grade exceeds 5%, two line valves are required with one at the high point hydrant and one at the low point hydrant for flushing and chlorination purposes.

Line valves are required a minimum of every 600 feet in the Water Distribution System to ensure reliability of water to Customers. On Transmission Water Mains with no Water Service connections, line valve placement will be evaluated on a case-by-case basis. Where necessary, Colorado Springs Utilities may require the installation of additional line valves in order to meet the above listed objectives. In commercial building complexes, additional valves may be required to isolate buildings to minimize service disruptions during repair or maintenance of the Water System.

The Inspector may require the installation of additional valves not shown on the plans, when determined necessary in the field, with the coordination of the Owner/Developer and/or Design Engineer.

Valves shall be designed in such a manner that the valve stems and valve boxes are accessible and valve stems operable. All valves must be opened RIGHT for Potable Water and opened LEFT for the Nonpotable Water System. All adjacent existing valves are to be identified and labeled on the Water Construction Plans.

2.6.F.7 Concrete Thrust Reaction Blocks, Concrete Reverse Anchors and Mechanical Joint Restraints

Concrete thrust reaction blocks (CTRB), concrete reverse anchors (CRA), and/or restrained pipe length with the use of Mechanical Joint (MJ) restraints are required on all appurtenances 4 inches in diameter and larger which necessitate reaction support due to unbalanced thrust forces. Uses of these would be required, but are not limited to, the following applications:

- CTRBs shall be constructed at all tees and taps 4-inch and larger opposite the branch. See Detail Drawing A4-5.
- CRAs shall be constructed at all Temporary Dead End Mains 4-inch and larger. See Detail Drawing A2-4 through A2-8.
- CTRBs or restrained pipe lengths shall be constructed at all horizontal bends. See Detail Drawing A4-6.
- A CRA is required to be set on one side of a line valve (on the upstream side of the valve, if known) when the valve is stand alone and does not have another appurtenance to tie back to per these *Water LESS*. See Detail Drawing A4-5.
- Vertical bends shall be restrained using CRAs or restrained joints per Detail Drawing A4-6.
- Slopes greater than or equal to 10% shall be restrained throughout the slope and with a CRA at both the top and bottom of the slope. See Detail Drawing A4-6.
- CTRBs shall be constructed at the end of Fire Hydrant Laterals and Fire Service Line risers 4 inches and greater. See Detail Drawing A5-3.
- A CRA shall be required for the fire hydrant valve when a fire hydrant is installed at the end of a Dead End Main.
- Restrained joints shall be used where Fire Hydrant Laterals exceed one joint length. See Detail Drawing A4-4.
- Restrained joints are required on all fire service lines.
- Restrained joint DIP or HDPE is required in areas of geologic hazard, areas of erosion or unstable slopes (i.e., floodplain areas, stream, or creek beds, and potentially hillside overlay areas.) If the Project lies within a Geologic Hazard Overlay Zone, a copy of the Project Geologic Hazard Report or Geologic Hazard Exemption Letter shall be submitted to Colorado Springs Utilities with the initial review set of the Construction Plans. Based on the Site conditions, Colorado Springs Utilities will determine if MJ pipe or HDPE is required.
- For additional restraints required for HDPE Water Mains, see Section 6.3.B.

CTRBs, CRAs, and restrained pipe lengths shall be shown on the Water Construction Plans, with bearing surface area and volume of concrete called out for the concrete thrust reaction blocks and concrete reverse anchors.

Standard size and dimensions of CTRBs and CRAs for appurtenances 4 inch through 16 inch in size are shown on Detail Drawing A4-2, A4-7, and A4-8. However, the Design Engineer may be required to size these CTRBs and CRAs based on Site conditions. CTRBs and CRAs for appurtenances 24 inch and larger in diameter shall be sized by the Design Engineer. CTRBs and CRAs which require custom calculations shall be designed and stamped by a Design Engineer registered in the State of Colorado. The associated calculation data shall be submitted with the Water Construction Plans for approval. Sizing methodology and equations used shall conform to *AWWA M23 – PVC Pipe – Design and Installation* and *AWWA M41 – Ductile-Iron Pipe and Fittings*.

2.6.F.8 Fire Hydrant Criteria

All Public fire hydrants will be located within street rights-of-way or within utility Easements. See Section 2.6.E for additional Easements for fire hydrants that may extend outside of rights-of-way and utility Easements. The number and location of fire hydrants in a given area is determined by the Design Engineer based on theoretical fire flows modeled by Colorado Springs Utilities. Reference the Fire Flow Report Process in Section 3.3. The approval of fire hydrant numbers and their locations must be obtained from both the CSFD and Colorado Springs Utilities, in accordance with the currently adopted Fire Code by the CSFD, and the Water LESS. A valve is required for a standalone Private fire hydrant that is served off a Public Water Main at the connection point to the Public Water System, and a Secondary Valve is to be installed at the property line. The extension pipe from the fire hydrant to the valve at the point of connection to Water System is considered the Fire Hydrant Lateral. See Detail Drawing A5-3. Normal practice is to install fire hydrants near the corners of street intersections, see Detail Drawing A5-2. If hydrants are proposed at locations other than street intersections, they shall be located in relation to lines which are established by extending a perpendicular line from the property corner to the centerline of the Water Main, See Detail Drawing A5-1. Fire Hydrant Laterals shall be set at right angles to street mains. The hydrant shall be set at the end of the lateral line and shall face the main distribution water line and valve.

For Permanent Dead End Mains in residential areas, more than 250 feet in length the Water Main shall have a minimum diameter of 8 inches and have a minimum of 2 fire hydrants (per CSFD). One hydrant shall be located at the entrance to the cul-de-sac, tapped off the looped Water Distribution Main and the other hydrant must be located at the end of the cul-de-sac. If additional hydrants are required due to spacing requirements, then these additional hydrants shall be installed between the 2 required hydrants as directed by CSFD and approved by Colorado Springs Utilities. See Section 2.6.D for additional dead end requirements. When a fire hydrant is installed at the termination point of a Main Extension, a CRA shall be

required for the fire hydrant valve and the fire hydrant shall be secured to the valve. For fire hydrant placement and requirements in non-residential areas refer to CSFD.

For developments adjacent to streets with inadequate fire hydrant spacing, the Owner/Developer shall install fire hydrants to meet spacing requirements on respective streets.

Hydrants shall not be designed with horizontal bends, vertical bends, or offsets without the approval of Colorado Springs Utilities. If the Design Engineer requires bends or offsets to adjust a hydrant to a desired horizontal or vertical position, and the change in positioning is 100 feet or more horizontal and or 10 feet or more vertical, then an additional fire flow modeling approval by Colorado Springs Utilities is required. In addition, CRAs, MJ restraints, CTRBs or a combination of these may be required. A riser no higher than 2 feet will be acceptable and it will be the Contractor's responsibility to set the safety flange at the proper elevation. The maximum allowed depth of a fire hydrant from shoe to flange is 8-1/2 feet. See Detail Drawing A5-3 for additional hydrant placement information.

Fire Hydrant Laterals shall be connected to the main by a 6 inch branch tee with PVC or DIP lateral line. A 6 inch gate valve shall be installed on each Fire Hydrant Lateral. For PVC or DIP Fire Hydrant Laterals greater than 20 feet in length, the pipe joint(s) are to be restrained with a restraining clamp or coupling or the appropriate use of a reverse anchor.

If HDPE Fire Hydrant Laterals are being installed see Section 6.3.C.

Bollards shall be required where fire hydrants are not protected from vehicular movements by curb and gutter or some other means. See Detail Drawing A5-4.

Under no circumstances shall any connection be made on a Fire Hydrant Lateral.

2.6.F.9 Bends and Deflection

Bends utilized in the Water Distribution System on DIP or PVC pipelines shall be ductile iron material. Standard bends are 11-1/4°, 22-1/2° or 45°. For HDPE pipe bends see Section 6.3.D. Note: 90° bends are not allowed in the Water Distribution System.

When it is necessary to deflect pipe from a straight line, in either a horizontal or vertical plane, the amount of joint deflection should not exceed the listed maximum deflections shown in Detail Drawing A4-1. Bends shall be used whenever individual deflections exceed those specified by Colorado Springs Utilities. A 3° deflection is allowed on each side of a fitting if needed, however the purpose of a bend fitting in the pipe alignment is to alleviate the need for deflection. Deflection is not allowed at either side of a valve.

All deflecting joints or bends shall be specified on the designed curve. Short lengths of pipe shall be used as necessary to accomplish the curvature without exceeding individual deflections specified by Colorado Springs Utilities. PVC pipe high

deflection couplings may be utilized as an option for deflection. For HDPE pipe bends refer to Section 6.3.D of these *Water LESS*.

2.6.F.10 Blow off Assemblies on Dead Ends (Temporary and Permanent).

All temporary dead ends on new mains shall be closed with ductile iron plugs or caps and shall be fitted with a Water Quality Device; such dead ends shall be equipped with suitable concrete anchors and blow-off facilities as required. There shall be no Water Service Line taps between the last main line valve on the Dead End Main and the Temporary Blow Off Assembly. See Detail Drawings A2-4 through A2-8. The use of temporary Dead End Mains shall conform to the criteria described in Section 2.6.D.

A permanent Dead End Main is required to have a Water Quality Device constructed at the end of the main. The use of permanent Dead End Mains shall conform to the criteria described in Section 2.6.D. The Design Engineer shall indicate any appurtenances on the Construction Plans and must consult with Colorado Springs Utilities as to type of Water Quality Device to be utilized.

2.6.F.11 Pressure Regulation and Water System Control

Regulating installations are required to control pressure, provide pressure, or air relief, separate pump, and gravity zones, or to monitor pressures and flows throughout the Water Distribution System. The need for regulating installations will be determined by Colorado Springs Utilities, based on existing and proposed pressure zones, pumped areas, tank locations, and required operation and monitoring of the existing Water Distribution System.

Regulating installations shall be categorized as follows:

- Pressure Regulating Station, see Detail Drawings A6-3 through A6-8
- Pressure Relief Station, see Detail Drawing A6-2
- Check Valve Station, see Detail Drawing A6-1
- Flow Meter Installation, see Detail Drawing A6-11
- Altitude Valve, Pressure Sustaining Valves
- Control Valve Station

All regulating installations shall be designed and installed by the Owner/Developer per these *Water LESS*. Regulating installations shall be constructed within a Vault located behind the curb unless otherwise noted.

Vault design for regulating installations greater than 12 inches in diameter shall be specified by the Design Engineer.

The Design Engineer shall coordinate with Colorado Springs Utilities Water System Operations on the location of remote monitoring systems.

2.6.F.12 Air and Vacuum Relief Valves

Air and vacuum relief valves shall be required for Water Mains 16 inches and larger and may be required for Distribution Mains less than 16 inches at the discretion of Colorado Springs Utilities. Air and vacuum relief valves shall be designed in accordance with *AWWA M51*, *AWWA M11*, and the manufacturer's recommendations. Locations shall be specified by the Design Engineer and shown on the Construction Plans. The Design Engineer needs to call out seating head in the design notes for ARV Vaults. For details regarding Air and Vacuum Relief Valve Stations, see Detail Drawings A6-9 and A6-10.

Air and vacuum relief valves are typically not required on Water Distribution Mains as Water Service Lines and fire hydrants provide acceptable means of air relief. Fire hydrants should be located to provide for a means of air relief and drainage when charging the main.

2.6.F.13 Pumping Facilities

Pumping facilities may be allowed on mains supplying water from the Colorado Springs Utilities Water Distribution System only where specifically authorized by Colorado Springs Utilities. Colorado Springs Utilities prohibits the installation of pumping facilities where, in its opinion, such installations would cause injury to the operation, or future operation, of the Colorado Springs Utilities system. All proposed pumping facilities shall be considered as a special feature and will be dealt with on an individual case basis. This may include pressure testing of the total installation when determined necessary by Colorado Springs Utilities. For more information regarding pump station criteria see CHAPTER 7 Pump Stations.

2.6.F.14 Storage Facilities

Water storage reservoirs are required throughout the Water Distribution System to maintain adequate supply during peak demand periods. Storage reservoirs may also be required adjacent to and on the suction side of pumping facilities. The size, location and type of storage reservoirs shall be determined by Colorado Springs Utilities.

All proposed storage facilities will be evaluated on an individual case basis.

2.6.F.15 Water Quality Device Requirements

Water Quality Devices for sampling and flushing of Water Mains shall be installed a minimum of every 1 mile. All Water Quality Devices shall be located within street rights-of-way or within utility Easements. Water Quality Devices shall be located in residential rights-of-way at 90 degrees to the Water Main and 100 feet upstream of storm inlets to ensure adequate drainage. Water Quality Devices may be required at the end of permanent dead end Water Mains where a fire hydrant is not required by CSFD per Section 2.6.D.2. Water Quality Devices shall be installed according to Detail Drawing A2-3 and Detail Drawing A5-6.

2.6.F.16 **Water** Mains Parallel to Streams, Drainage Channels, and Detention Ponds

When the Water Main is installed parallel to a stream or drainage, it shall be installed 25 feet horizontally outside the 100-year water surface elevation as it exists at the time of the Water Main installation. The Design Engineer shall determine the location of the 100-year water surface elevation which shall be reviewed by Colorado Springs Utilities Water Planning and Design.

The Design Engineer will determine necessary drainage improvements to protect Water Mains from future erosion and will design all necessary improvements. Colorado Springs Utilities Water Planning and Design will review the design as part of the Water plans submitted to Colorado Springs Utilities Development Services to ensure Water Mains are properly protected.

If channel improvements are proposed that will change the location of the 100-year water surface elevation, those improvements shall be constructed prior to or in conjunction with the Construction of the Water Main. At no time shall the Water Main be constructed within the 100-year water surface elevation prior to the drainage improvements being constructed.

When the Water Main is installed adjacent to a detention pond, it shall be installed 15 feet outside the maximum water elevation, outfall structure, and/or berms of the detention pond. Water mains are allowed within a Planned Infiltration Area (PIA) where it can be maintained within standard rehabilitation methods.

2.6.G Vertical Design

The criteria needed for the vertical layout of Public or Private Water Main System plans follows in this section. In addition, it will be helpful to have the *Water Plan and Profile or Utility Service Plan Checklists* which are located at www.csu.org.

2.6.G.1 Depth of Bury

All Water Mains shall be installed to the depth shown on the Water Construction Plans. The depth of fill over the pipe measured from the proposed finish grade over the pipeline to the top of the pipe shall be a minimum depth of 5 feet and a maximum of 6 feet unless otherwise specified. Due to a deeper frost depth that exists in the Green Mountain Falls area, the depth of fill over the pipe measured from the proposed finish grade to the top of the pipe shall be a minimum of 7 feet for DIP pipe and 7 feet for PVC/HDPE pipe. If difficulties arise when crossing an obstruction in the field or where specifically approved by Colorado Springs Utilities or its Inspector, deviations from the above minimum and maximum depths of cover may be permitted.

2.6.G.2 Utility Crossings

When crossing another utility, minimum vertical separation is required to be maintained, refer to Section 2.6.F. When crossing a storm sewer or Wastewater

Main, it is preferred to lay the Water Main above the storm sewer or Wastewater Main. However, a water lowering may be required to meet depth and vertical Separation Criteria, refer to Detail Drawing A7-1. Where the Water Main crosses under another utility 36 inches and greater in diameter, the Water Main shall be installed in a casing pipe, see Detail Drawing A7-2.

Where the Water Main crosses other utility infrastructure and the required separation cannot be met, the Design Engineer shall design and construct the crossing to protect the Water Main from other utility infrastructure. Where the Water Main crosses a wastewater, storm sewer, or a Nonpotable Water Main or Service Line and the Water Main is the lower utility or where the minimum separation cannot be met, the water or other utility shall have secondary containment. If the Water Main is greater than 5 feet below the wastewater, storm sewer, or a Nonpotable Water Main secondary containment is not required. The following methods of installation shall be considered secondary containment by Colorado Springs Utilities:

- The Water Main or the wastewater, storm sewer, or Nonpotable Water Main shall be installed in a casing pipe extending no less than 9 feet on either side of the centerline of the crossing. See Detail Drawing A7-3, or
- The Water Main or the wastewater, storm sewer, or Nonpotable Water Main shall be constructed without mechanical joints for 9 feet on either side of the crossing, or
- A full joint of Water Main shall be centered under the upper utility, or
- The Water Main or the wastewater, storm sewer, or Nonpotable Water Main shall be encased in flow fill, per the specification in Section 4.4.S, for 9 feet on either side of the crossing, with limits extending to 6 inches below and above the pipe, or
- The Water Main is constructed of HDPE or welded steel and there are no mechanical fittings within 9 feet on either side of the crossing.

Wherever minimum separation cannot be met, flow fill, per Section 4.4.S, shall be used to achieve acceptable compaction between the upper and lower utility, see Detail Drawing A7-6.

If the Water Main crosses another utility, and a geotechnical analysis or field conditions indicate potential settlement that may cause a point load on the Water Main, a safety hazard exists that would compromise maintenance of the Water Main, or adequate separation cannot be attained to prevent a potential point load on the Water Main, then bridging of the Water Main or other utility may be required at the discretion of Colorado Springs Utilities. See Detail Drawings A7-5 and A7-6.

2.6.G.3 Crossing Beneath Streams, Drainage Channels, and Detention Ponds

Water Mains that cross below streams, drainage channels, and detention ponds should be avoided if possible, and will be reviewed on a case-by-case basis.

When the Water Main crosses under a drainage channel, the casing pipe for the Water Main shall be encased in concrete, per Detail Drawings A7-7 and A7-8. Caissons may be required based on drainageway flow line instability and shall be designed by a structural engineer. The Design Engineer shall be required to demonstrate that the appropriate clearances are adequate for existing and future conditions based on scour analyses and planning in Drainage Basin Planning Studies, Master Plans, and design plans that have been approved by the City of Colorado Springs.

Aerial crossings are not recommended and will be reviewed on a case-by-case basis. Supports for the Water Main in an aerial crossing shall be designed by a structural engineer. The bottom of the aerial Structure shall be located above the 100-year floodplain plus freeboard. Freeboard shall be defined by the following equation:

$$H=1.0+0.025*V*D^{0.33}$$

where:
H=freeboard in feet
V=average channel velocity in fps
D=depth of flow in feet

2.6.G.4 Crossing Bridges

Bridge crossings are not recommended and will be reviewed on a case-by-case basis. Where necessary design of Water Mains attached to bridges shall be done by a Design Engineer with experience in bridge design. The details of the design will be reviewed and approved by Colorado Springs Utilities on a case-by-case basis. The following are minimum design considerations:

- the water main is to be welded steel consisting of insulation and pipe skids within a welded steel carrier pipe,
- provision for thrust restraints at the points of transition from a buried pipe to an exposed pipe,
- horizontal and vertical stability of the pipe under the bridge,
- provisions for increased loading on the bridge created by a full main and its supports,
- access to the main for maintenance,
- provisions for corrosion control,
- the freeze potential of the Water Main,
- expansion joints shall be designed as needed, and
- freeboard shall be maintained from the 100-year floodway.

2.6.G.5 Crossing Major Roadways, Railways, and Rights of Way

Installation of mains across rights-of-way or Easements of the City of Colorado Springs, El Paso County, Colorado Department of Transportation, Fountain Mutual Irrigation Company, or other entities, such as major roadways, railroads, irrigation channels etc., may require casing pipes for the installation of the main as determined by Colorado Springs Utilities and the Authority Having Jurisdiction.

The type of casing material and its properties will be specified by the Authority Having Jurisdiction with the approval of Colorado Springs Utilities. Refer to Detail Drawings A7-3 and A7-4 for design and Construction of the casing.

All design plans (showing the area of Construction, including the railroad or highway mile marker location) and calculations submitted to another agency for Projects that may impact the Public Water System shall also be submitted to Colorado Springs Utilities for approval.

2.6.G.6 Crossing Roundabouts and Medians

Where the existing or proposed Water Main crosses roundabouts or medians, the following design criteria apply:

- The Water Main shall be located outside of the roundabout or median or shall be installed in a casing pipe through the roundabout or median see Detail Drawings A7-10 and A7-11, and Detail Drawings A7-3 and A7-4. It will be the responsibility of the Owner/Developer to relocate or encase any existing Water Main.
- Valves, tees, Vaults, service taps, and crosses, shall be located outside of the roundabout or median see Detail Drawing A7-10 and A7-11. It will be the responsibility of the Owner/Developer to relocate any existing Water fittings outside a roundabout or median.
- Service Taps shall be located a minimum distance of 15 feet outside the roundabout or median. It will be the responsibility of the Owner/Developer to relocate any Service Taps outside a roundabout and medians.

Colorado Springs Utilities will evaluate Construction Plans on a case-by-case basis where the Water Main crosses a traffic calming device such as a chicane, stamped concrete, speed bump etc.

2.6.G.7 Crossing Above-Ground Structures

The Water Main should be designed to avoid crossing underneath any above-ground Structures or retaining walls greater than 4 feet high where possible. The Design Engineer shall design the crossing to protect the Water Main and the Structure without significant risk of damage if there is a Water Main leak.

Colorado Springs Utilities will evaluate such designs on a case-by-case basis. Lowering's, valves, casing pipes, and additional restrictions may be required by Colorado Springs Utilities to ensure reasonable access for operation and maintenance of the Water Main and Water Service Lines.

There may be instances where Trenchless Technology can be employed to limit the disturbance of above-ground Structures. Refer to Section 6.8 for Trenchless Technology design requirements.

2.6.G.8 Crossing Overhead Structures

The vertical clearances outlined below must be followed when a Water Main crosses underneath an overhead structure such as a bridge or building overhang:

- Where a Water Main is located under an overhead structure the minimum vertical clearance from the bottom of the overhead structure to final grade shall be 30 feet.
- Where an overhead structure crosses perpendicularly to the Water Main and is equal to or less than 10 feet in width, the minimum clearance shall be 20 feet from the bottom of the overhead structure to the final grade.
- Where the overhead structure crosses perpendicular to the Water Main and is less than 10 feet in width, no vaults or manholes shall be located within 15 feet of the overhead structure.

2.6.G.9 Crossing Raw Water Transmission Mains

When crossing a Colorado Springs Utilities Raw Water Transmission Main with another utility, the criteria in this section must be met or exceeded to ensure the safety, clearance requirements, long term access, and maintainability for each proposed utility system and the existing Main. Contact Colorado Springs Utilities to discuss alternatives and develop an acceptable solution. This section must be applied in conjunction with these *Water LESS*.

a) Design

Any proposed crossing of a Raw Water Transmission Main shall have a detailed profile Construction Plan to be approved by Colorado Springs Utilities. The crossing utility shall be sleeved or encased within 20' of the Raw Water Transmission Main crossing. Electric needs to be encased in a conduit and then concrete.

b) Horizontal Layout - Parallel Facilities

Proposed utility infrastructure should not be located within Colorado Springs Utilities Raw Water Transmission Main Easements. Any proposed encroachment, crossing or grade change within the Easement must be approved in writing by Colorado Springs Utilities.

Colorado Springs Utilities will review the separation between a Raw Water Transmission Main and the proposed utility considering future maintenance and replacement of the Raw Water Transmission Main and the Construction and future maintenance of the proposed utility. Separation criteria is extended with regards to Raw Water Transmission Mains and are not typical of the limits of the Clearance Matrix for Typical Parallel Colorado Springs Utilities facilities in Section 2.6.F of this *Water LESS*, due to the extents of the larger Raw Water Transmission Main Easements.

c) Vertical Design and Separation

Crossing separations shall be 36" inches or greater above or below the pipeline for water distribution, electric distribution, gas distribution lines and telephone or fiber communication lines, while a 5 foot separation or greater is required for all electric transmission, wastewater mains, nonpotable water mains, and gas transmission mains crossing a Raw Water Transmission Main. This separation criteria is extended and critical with regards to Raw Water Transmission Mains and are not

typical of the limits of the Clearance Matrix for Typical Crossings of the Colorado Springs Underground Utilities in Section 2.6.F of this *Water LESS*. Any proposed encroachment, crossing or grade change within the Easement must be approved in writing by Colorado Springs Utilities

Water Transmission Mains are typically buried with 5 feet of cover, a minimum of 3' of cover is required for any portions crossing under vehicle access roads. Actual depth varies based on installation location and grade changes that occurred over time after the Colorado Springs Utilities installation was completed. Due to the size and nature of high-pressure, high-flow Raw Water Transmission mains, crossing under any Raw Water Transmission Main is strongly discouraged. If crossing under a Raw Water Transmission Main is proposed, contact Colorado Springs Utilities as soon as possible to discuss the proposed design and Construction methods. Under no circumstances shall a Water Transmission Main be undermined such that its support soil is removed without other approved support mechanisms in place.

d) Location of Water Transmission Mains & Existing Utility Infrastructure

The Design Engineer shall obtain existing infrastructure records of all Colorado Springs Utilities' facilities from the Infrastructure Records Department as well as records from other utility entities in the area of the proposed Construction prior to design.

Utility locates must be obtained before any excavation, potholing, or sub-surface work occurs. Call the Utility Notification Center of Colorado (Colorado 811) at "8-1-1" to request locates at least three days prior to excavation. Potholing is required for visual verification of the location and depth of the Raw Water Transmission Main. For questions regarding locates for Colorado Springs Utilities' infrastructure, contact the Colorado Springs Utilities Locating Office at 719-668-7205 and/or the Raw Water Pipeline Operations office at 719-661-6206.

All crossings and encroachments must be potholed prior to any work being performed.

e) Construction Plan Submittal Guidelines

Detailed plans must be submitted to Colorado Springs Utilities for review 30 days prior to Construction.
Items to be included on the plans are listed below. For additional information see the section on Construction Plan Submittal Guidelines.

- All pertinent information to clearly understand the nature and location of all proposed crossings,
- vicinity map,
- specific Site information (township/range description, subdivision map where applicable, mile marker or other Site data),
- plans and profiles (or equivalent indicating proposed horizontal and vertical separations),
- Description of proposed facility including Construction material type, and

- Construction methods to be utilized.

The review criteria will include, but is not limited to, the nature of the proposed utility, depth of bury, unique safety hazards, soil conditions, existing pipe bedding, construction methods, and Easements.

f) Inspection

Unless waived in writing by Colorado Springs Utilities, no work shall be done unless a Raw Water Pipelines Operations Inspector is on Site to observe the activities. Colorado Springs Utilities reserves the right to inspect the installation of all crossings of its facilities. The Colorado Springs Utilities' Raw Water Pipelines Operations Inspector has the final approval on all clearances and other crossings, safety requirements as field conditions warrant or requirements as stated in the *Water LESS*. Contact Colorado Springs Utilities 72 hours prior to commencing Construction to schedule a Colorado Springs Utilities' Raw Water Pipelines Operations Inspector for the project (See Section 1.14) at 719-661-6206.

g) Safety Precautions

When excavating in close proximity to the existing Raw Water Transmission Main, the Contractor shall exercise extreme caution to ensure the safety of both the Construction crew and the general Public.

2.6.H Cathodic Protection Design Criteria

All metallic Water Mains, fittings, hydrants, valves, and appurtenances shall be cathodically protected by a coating and either galvanic anodes or an impressed current system. Colorado Springs Utilities will design a cathodic protection system based on field conditions for all metallic Water Mains. This design will be initiated once the Construction Plans have been submitted to Colorado Springs Utilities and will be delivered to the Design Engineer with the review comments within 5 business days of the initial submittal. The Owner/Developer shall be responsible for materials and Construction of the cathodic protection system.

2.6.H.1 Coatings and Wraps

The following coatings and wraps are allowed for use in the Water System; thickness of coating may vary and shall be specified based on the manufacturer's recommendations:

- Concrete encasement
- Bituminous enamels
- Polyethylene tubing
- Tape coating
- Epoxy coating
- Polyolefin
- Petroleum Wax Tape
- Polyurethane coating

A bonded coating may be required for critical Water Transmission Mains, 16 inches in diameter or larger, when installed in a corrosive environment.

2.6.H.2 Protection of Bolts

All mild steel bolts shall be protected by zinc end caps, wax tape, and/or a cathodic protection coating.

2.6.H.3 Bonding Joints

Electrically discontinuous ductile iron pipe joints may require bonding as determined by Colorado Springs Utilities.

2.6.H.4 Insulating Joints

Approved Insulating Joint Kits are in Section 4.4.R.1. Insulating joints shall be shown on the Water Construction Plans and may be required for the following:

- where dissimilar metals come in contact,
- where new metallic pipe is connected to old metallic pipe and testing shows a significant pipe to soil potential difference between the two pipes,
- at pump stations and PRV's or anywhere an electric connection is made,
- to prevent transmission of stray current and
- at locations determined by the Design Engineer or Colorado Springs Utilities as deemed necessary for protective electrical isolation.

2.6.H.5 Galvanic Anodes on Metallic Water Mains

Anode location and size shall be shown on the Water Construction Plans. Colorado Springs Utilities shall design the cathodic protection system based on field conditions. The Owner/Developer shall be responsible for materials and Construction.

Design for anode placement on ductile iron pipe will be based on a holiday area of 5%, a current density of 1.5 mA/sq ft, and high potential magnesium anodes. Other factors that may impact design include but are not limited to: the proximity of other cathodic protection systems, induced AC current, resistivity, pH, moisture content, ground water influence, the presence of chlorides, sulfides, bacteria, redox potential, and chemical activity. If these factors are found to exist in the field, changes to the anode design may be required by Colorado Springs Utilities.

Soil resistivity will be evaluated based on the following categories in Table 2-.

Table 2-54: Soil Resistivity and Corrosivity Rating

Soil Resistivity (ohm-cm)	Corrosivity Rating
>20,000	Essentially Non-corrosive
10,000 to 20,000	Mildly Corrosive
5,000 to 10,000	Moderately Corrosive
3,000 to 5,000	Corrosive
1,000 to 3,000	Highly Corrosive
<1,000	Extremely Corrosive

In highly corrosive and extremely corrosive environments HDPE or PVC may be required. Additionally, anodes may be required at the lower bends of water lowering fittings to maximize current distribution on the pipe.

2.6.H.6 Impressed Current

Metallic pipelines for water tanks, pump stations, water treatment facilities, and transmission mains that have large current requirements may require the installation of an impressed current system. These systems shall be designed by a qualified Design Engineer.

2.6.H.7 Test Stations

Test Stations shall be shown on the Water Construction Plans and will be required for the following:

- at insulating joints,
- at casing pipes,
- at crossings with other metallic utility infrastructure,
- every 1000 feet, and
- at locations determined by the Design Engineer or Colorado Springs Utilities.

2.6.H.8 Galvanic Anodes with PVC Pipe and HDPE Installations

All metallic fittings and appurtenances (valves, hydrants, bends, crosses, tees, etc.) shall be installed with one high potential magnesium anode bonded to the metal. Where fittings are electrically continuous at tees and crosses, a minimum of one anode may be installed to protect all the fittings. Anode sizes shall be a minimum of 9 lbs. for individual fittings and 17 lbs. for hydrants, temporary blow off valve assemblies, bridging supports, and bonded fittings, based on the average soil resistivity in Colorado Springs and a design life of 25 years for the anode.

2.6.H.9 Cathodic Protection of Casing Pipe

Casing pipe shall be cathodically protected with an approved painted on coating or Polyethylene tube coating and at a minimum a one 17 lbs. high potential magnesium anode. Casings used for boring pipe Projects do not need to be cathodically protected but may need to be a greater thickness steel to accommodate potential corrosion.

2.6.H.10 Water Service Line Fittings

Fittings on HDPE Water Service Lines (i.e., corporations, Curb Stops and couplings) shall be cathodically protected by coating the fittings with primer and wax tape or wrapping the fittings with polyethylene tubing. Care shall be taken when placing the wax tape on the Curb Stop to make allowance for operation of the Curb Stop valve. See Detail Drawing A8-12.

Copper Water Service Lines shall be cathodically protected by wrapping the tap and the Water Service Line from the Water Main, extending for 4 feet or to the edge of the Water Main trench with polyethylene tubing and attaching a 17 lbs. anode to the Service Line. See Detail Drawing A8-12.

2.7 Water Service Line Design Criteria

2.7.A General Requirements

All Water Service Lines and Fire Service Lines shall be designed and constructed by the Owner/Developer in accordance with all applicable requirements set forth in these *Water LESS* and *City Code*.

> The Owner shall provide a separate and independent domestic service line, and an individual meter shall be provided from mains for each and every structurally independent residential, commercial, or industrial building, whether or not they are on a single platted lot under common ownership, unless the Utilities, in the reasonable exercise of its discretion, may determine that other means are more suitable in the operation of its system. (*City Code § 12.4.407*)

Water Service Lines that need to extend across a property other than the one being served shall be located within an Easement granted by the Owner of the property being crossed. Water Service Lines crossing Public property need an agreement with the governmental agency with jurisdiction over the Public property being crossed. Colorado Springs Utilities must approve the location of all Water Service Line taps to Water Mains to ensure that Water Service Lines are not connected to Water Mains that are scheduled for abandonment.

For structures with non-permanent foundations such as RVs, mobile homes, and construction trailers, the Water Service Line must be connected to a Potable Yard Hydrant, see Detail Drawing B1-9 and the Wastewater Service Line must be connected to a dump station, see Detail Drawing D1-12 and D1-13 in *Wastewater LESS*.

The number of joints in the Water Service Lines and Wastewater Service Lines shall be kept to a minimum, and the materials and joints of building drain and Wastewater Service Lines shall be installed in such a manner, and shall possess the necessary strength and durability, to prevent escape of solids, liquids and gases there from, under all known adverse conditions such as corrosion, strains due to temperature changes, settlement, vibrations and superimposed loads.

Given the difficulty of future operation of Private Water and Wastewater Service Lines in close proximity to building foundations and adjacent property (less than 3 feet), Water and Wastewater Service Lines shall not be installed in the PUE.

2.7.B Ownership and Maintenance

Responsibility for the maintenance and replacement of the service line and appurtenances thereto, in Public rights of way, generally between the connection to the distribution main and the property line or the Curb Stop if the Curb Stop is on or near the property line, shall be borne by Utilities. Responsibility for the maintenance and replacement of the service line and appurtenances thereto, from the property line or Curb Stop if the Curb Stop is on or near the property line, shall be borne by the Owner of the Premises. The Owner shall keep the

service line and all pipes and fixtures on the owner's Premises in good repair so as to prevent waste of water. Where more than one premise is connected to a single service line, the owners of the respective Premises shall be jointly and severally responsible for maintenance and repair of the service line which is the owner's responsibility. Maintenance and replacement of the service line within Private rights of way or Private Easements is the responsibility of the owner. (*City Code § 12.4.410*)

2.7.C Master Meter and Water Service Line Serving Multiple Units for Non-Single Family Residential on a Single Lot Under Single Ownership

A Water Service Line serving multiple units behind a Master Meter connected to a Private or Public Water Main may be extended into a single lot with multiple units where the following conditions exist:

- The lot is under single ownership and is not subdividable.
- Fire hydrants behind the Master Meter are not required by CSFD. Where an 8 inch Water Main must be extended thru the lot for fire protection, to ensure Water Quality and efficient use of Water Main capacity, units shall be served by individual Water Service Lines or Water Service Line manifolds tapped off of the 8 inch main within the lot. See Detail Drawing A1-4 to A1-8.
- The engineer shall ensure adequate sizing of the Water Service Line behind the Master Meter to meet domestic irrigation if applicable, and fire sprinkler system demands if required by CSFD.
- Meter by-pass systems for fire flow are not allowed.

When requested by the Owner/Developer, the following criteria shall be applied:

- The Water Service Line Manifold size shall be a maximum of 2 inch HDPE per Detail Drawing A1-7 and A1-8.
    - 2 inch Water Service Line Manifolds and individual service lines shall meet all Water Service Line criteria including vertical and horizontal separation.
    - The meter shall be a minimum 1.5” in diameter to connect to the 2” HDPE manifold and must meet Commercial Water Meter Sizing Form criteria.
    - No more than 10 units shall be served off a Water Service Line manifold with no irrigation use. Irrigation usage shall be through a separate irrigation meter.
    - Curb stops shall be installed for each individual unit and shall be tagged with the unit number. Curb stops may not be installed closer than 6 feet to an individual unit.
- Water Service Lines serving multiple units that do not serve fire hydrants shall be 4 inch or 6 inch HDPE, PVC or DIP and shall meet the criteria for Water Main design and installation including both vertical and horizontal separation and disinfection requirements, see Detail Drawing A1-6.
    - A maximum of 50 units is allowed from a single 4 or 6 inch Water Service Line serving multiple units, after that a second Master Metered connection or loop is required.
    - Service lines serving more than 50 units will be modeled per water modeling requirements to show adequate pressure at furthest fixture.

    - Meter shall be a minimum 3" diameter and will maintain 3" throughout meter loop including the Backflow prevention assembly.
    - 4 and 6 inch Water Service Lines serving multiple units shall have flushing hydrants installed for Water Quality.
    - Individual units may be tapped from the 4 inch HDPE, PVC or DIP Water Service Line per Water Main standards and material Specifications.
- Water Service Lines to individual units shall be designed per the criteria in this section including vertical and horizontal separation and Curb Stop requirements, manifolds may be utilized per Detail Drawing A1-7 and A1-8.
- Yard Hydrants for Water Service shall be frost proof and sanitary per Section 4.5.G.

2.7.D Water Service Line Serving Single Family Residential with Detached ADU

A Water Service Line serving a Single Family Residential property with a detached Accessory Dwelling Unit (ADU) on a single lot under single ownership may be extended on to the lot. Refer to Detail Drawings B2-8 and B2-9.

If the lot is to be subdivided, individual service lines shall be provided by the Owner/Developer for each individually platted lot.

2.7.E Water Taps and Service Line, Sizing and Material

Water Service Line taps and sizes include 3/4-inch, 1 inch, 1-1/2 inch, and 2 inch. Water Service Lines 3 inches in diameter are not allowed in the Colorado Springs Utilities Service area. Water Service Lines (3/4 inch-2 inches) shall be Type K Copper CTS or HDPE DR 9, see Approved Materials Section 4.5. If HDPE is utilized see Section 6.5 for design requirements. Water and Fire Service Lines 4 inches and above shall meet the Water Main design requirements as described in Section 2.6 and this section as indicated. Water Service Line connections may be accomplished by a direct or saddle tap; see Detail Drawing B1-1.

Water Service Line taps are not allowed in the following conditions:

- on any transmission Water Mains,
- on mains 16 inches and greater,
- between the primary valve and Secondary Valve on a Private Water System,
- where the main pressure is less than 60 psi,
- within a Water Main lowering,
- within 36 inches of another Water tap on the same side of the pipe or 18 inches on opposite sides of the pipe,
- within 24 inches from both the back of the bell and the spigot insertion line and from any MJ fitting,
- on Fire Hydrant Laterals,
- on Fire Service Lines,
- under traffic calming devices, and
- within 10 feet on either side of a utility crossing.
- Fire Service Line taps are not permitted from a Nonpotable Water Main

For a Water Service Line branch before the Structure receiving service, the branched line shall be a threaded or soldered tee connection located after a RP Backflow Prevention

Assembly. The branch shall have its own dedicated shutoff valve and RP Backflow prevention assembly. See Detail Drawing B1-10.

2.7.E.1 Service Line Size and Material Changes

The maximum change in size of a type K copper Water Service Line and tap can be accomplished as depicted in Table 2-. HDPE will typically need to be upsized one size from type K copper sizing to accommodate the reduction in internal diameter.

The Water Service Line shall be the same size from the Corporation Stop to the Curb Stop or Secondary Valve. Then, if necessary, the size of the Water Service Line may be increased or reduced from the Curb Stop or Secondary Valve to the meter by one size as specified in the table below. The Water Service Line 4 inches and smaller may be reduced by one size before the meter within the meter loop. For Water Service Lines greater than 4 inches, any size reduction or increase in the Water Service Line size before the meter shall take place a minimum of 10 pipe diameters from the inlet to the meter, see Section 2.7.L.4 for allowable distances between the proposed meter and any fittings.

The Water Service Line shall be one material from the Corporation Stop to the Curb Stop/Secondary Valve and one material from the Curb Stop/Secondary Valve to the entry/transition point in the building prior to the meter loop. The meter loop shall be all one material (copper or DIP pipe) from the entry point in the building to the discharge side of the Approved Backflow Prevention Assembly or Method.

Table 2-65: The maximum change of Water Service Lines by size and material

Water Service Line Material Main to Curb Stop	**Tap and Water Service Line Size** Main to Curb Stop	**Water Service Line Material** Curb Stop to Meter	**Water Service Line Size** Curb Stop to Meter	**Meter Size**
HDPE	1”	HDPE	1”, 1 ½”	¾,” 1”
HDPE	1”	Type K Copper	¾,” 1”	¾,” 1”
HDPE	1 ½”	HDPE	1”, 1 ½”	¾,” 1”, 1 ½”
HDPE	1 ½”	HDPE	2”	1”, 1 ½”
HDPE	1 ½”	Type K Copper	1”	¾,” 1”, 1 ½”
HDPE	1 ½”	Type K Copper	1 ½”	1”, 1 ½”
HDPE	2”	HDPE	1 ½”, 2”	¾” *,1”, 1 ½”, 2”
HDPE	2”	Type K Copper	1”	¾” *, 1”, 1 ½”
HDPE	2”	Type K Copper	1 ½”, 2”	1”, 1 ½”, 2”
Type K Copper	¾”	Type K Copper	¾,” 1”	¾,” 1”
Type K Copper	¾”	HDPE	1”, 1 ½”	¾,” 1”
Type K Copper	1”	Type K Copper	¾,” 1”, 1 ½”	¾,” 1”, 1 ½”
Type K Copper	1”	HDPE	1”, 1 ½”,	¾,” 1”, 1 ½”
Type K Copper	1”	HDPE	2”	1”, 1 ½”
Type K Copper	1 ½”	Type K Copper	1”, 1 ½”, 2”	¾” *, 1”, 1 ½”, 2”
Type K Copper	1 ½”	HDPE	1 ½”, 2”	¾” *, 1”, 1 ½”, 2”
Type K Copper	2”	Type K Copper	1 ½”, 2”	1” *, 1 ½”, 2”, 3”
Type K Copper	2”	HDPE	2”	1” *,1 ½”, 2”, 3”

*This meter size is only allowed where a reduction of one service line size is made at Curb Stop.

2.7.E.2 Sizing of Residential Potable Water Service Lines and Fire Service Lines

Typical Single-Family-Residential Water Service can be accomplished with a ¾ inch type K copper Water Service Line or a 1 inch CTS HDPE DR-9 Water Service Line (see Section 6.5), however it is the responsibility of the Owner/Developer to determine the required Water Service Line size based on Single-Family-Residential Water demand, elevation changes, and friction losses. Where Water Service Line lengths are greater than 180 feet from the Water Main to the building, the Owner/Developer shall submit friction loss calculations to Colorado Springs Utilities demonstrating that acceptable pressure can be maintained in the residence per the latest adopted *International Plumbing Code* (*IPC*). Table 2- may be used as a guide to size the Water Service Line.

Table 2-76: Single-Family-Residential Water Service Line Sizing Chart

3/4" Water Meter Size
Maximum flow – 20GPM
80% capacity – 16GPM

Static Pressure at Water Main/Point of Connection (psi)	Linear feet of type "K" copper service from the Water Main to the primary meter location																
130	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
120	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B
110	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B
100	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B
90	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B
80	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B
70	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B
<60	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	<20	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**	**160**	**170**	**180**

1" Water Meter Size
Maximum flow– 50GPM
80% capacity – 40GPM

Static Pressure at Water Main/Point of Connection (psi)	Linear feet of type "K" copper service from the Water Main to the primary meter location																
130	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	C
120	B	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C
110	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	C	C
100	B	B	B	B	B	B	B	C	C	C	C	C	C	C	C	C	C
90	B	B	B	B	B	C	C	C	C	C	C	C	C	C	C	C	C
80	B	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
70	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
<60	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	<20	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**	**160**	**170**	**180**

Legend

A= ¾ inch copper/ 1" HDPE Water Service Line, B=1 inch copper/ 1 ½ inch HDPE Water Service Line, C=1 ½ inch copper/ 2 inch HDPE Water Service Line

Notes:

- Calculations assume 10 feet of elevation gain between the tap and the meter. The Design Engineer shall verify elevation differences and adjust the minimum Water Service Line size, as necessary.
- Water Service Line size shown in the table is based on a minimum pressure of 35 psi on the outlet side of the meter. The Design Engineer shall verify pressure requirements within the Structure per the *International Plumbing Code* (*IPC*) and adjust the minimum Water Service Line size, as necessary.

If a Single-Family-Residential Fire Protection System is required by the CSFD then the combined Potable Water Service Line and Fire Service Line shall be sized to accommodate fire flow from the tap to the Fire Protection System branch and shall be a minimum 1 inch copper or 1 ½ inch HDPE. Combined Potable Water and Fire Service Line installations for Single-Family-Residential buildings must have plans pre-approved by the CSFD. The Single-Family-Residential Fire Protection System must be designed in conformance with the current version of *NFPA 13, 13D and 13R*, and approved UL Fire Protection Equipment (*City Code § 8.4.105 Section 903.3.5.1.2*). The Water meter may be located after the Fire Protection System branch and should be sized based on the domestic service demands. If the Fire Protection System presents a degree of hazard as specified in *City Code § 12.4.1201 et seq.*, an RP is required on the incoming Water Service Line and prior to the first branch line of the Water Service Line. See Detail Drawing B2-2.

2.7.E.3 Sizing of Commercial Water Service Lines and Fire Service Lines

Sizing of Commercial Water Service Lines and Fire Service Lines shall be developed by a Design Engineer. Commercial Water Service Lines and Fire Service Lines shall be sized based on the flow requirements of the proposed use, friction losses, and internal Water pressure requirements per the *International Plumbing Code*. Calculations shall be based on pressure in the Water Main at maximum day demand. Fire Service Lines shall meet all requirements as established by CSFD.

2.7.F Water Service Line Horizontal Design Criteria

2.7.F.1 Single-Family-Residential Water Service Line Horizontal Design Criteria

When designing Single-Family-Residential Water and Wastewater Service Lines, be aware that in most development areas, the electric and gas service lines will generally enter the property within 5 feet of either side lot line of the property. Water and Wastewater Service Lines shall be a minimum of 15 feet from the side

property line to allow for separation from the gas and electric service lines. The Service Line trench must enter the lot as near 90 degrees to the street as is practical and not at an extreme angle, See Detail Drawing B2-1 and B2-2. It is the Owner/Developers' responsibility to determine the location of the Water Service Lines and to show placement on the Water Construction Plans.

In hillside development areas or in developments with significant terrain changes, the placement of the electric and gas service lines may vary and separation criteria in Section 2.6.F must be followed.

For Single-Family-Residential meter sets, the Water Service Line shall remain inaccessible through the structure before the meter to prevent tapping of the Service Line before the meter. If unfeasible, a Meter Pit will be required outside of the Structure, See Section 2.7.L.3.

Multi-family Water and Wastewater Service Line installations require the submittal of a Utility Service Plan, see CHAPTER 3 Submittal Requirements. For Multi-family configurations see Detail Drawings B2-4 thru B2-5.

- Where the Water and Wastewater Service Lines penetrate foundation walls before entering the basement the following criteria shall be met:
    - The Water and Wastewater service lines penetrations and sleeves shall be in accordance with the Pikes Peak Regional Building Department Requirements.
    - The Water and Wastewater Service Lines shall be installed in separate sleeves.

2.7.F.2 Commercial Water Service Line Horizontal Design

Commercial Fire Service Lines shall be tapped separately from the domestic Water Service Line**.** No provision or omission in these *Water LESS* shall be interpreted to allow a Commercial User to combine Water Service for both domestic use and a Fire Protection System from a single wet tap on a Colorado Springs Utilities Water Distribution Main, nor shall the two systems be cross-connected in any manner. See Detail Drawing B2-6.

Commercial Fire Service Lines must be connected to a looped Water System main unless specifically approved by Colorado Springs Utilities and Colorado Springs Fire Department and meets all of the requirements of 2.6.D. See also Detail Drawing B2-6 for fire and domestic Water Service Line configurations for a commercial building.

All facilities that meet I-2, condition 2 occupancy per the Pikes Peak Regional Building Department (hospitals, foster care, detoxification facilities, nursing

homes, psychiatric hospitals, and facilities that provide emergency care) shall have not fewer than two Water Service Lines sized in accordance per the Pikes Peak Regional Building Department Plumbing Code, such that with the loss of the largest service pipe, the remaining service pipes will meet the water demand for the entire facility in the event of a Water Main or Service Line failure. Each Water Service Lines shall have a shutoff valve in the building and a shutoff valve at the utility-provided point of connection to the Water Main(s); and should be tapped from two separate Water Mains.

Horizontal separation between the Water Service Line and other utility mains and services shall meet the requirements as stated in Section 2.6.F. Additional Water Service Lines horizontal and vertical separation requirements are defined in 2.7.F.3.

Commercial Water Service Lines should enter building within 5 feet of an exterior wall. The Water meter and Backflow Prevention Assembly should be located within 5 feet of an exterior wall immediately following the Water Service Line's point of entry. Exposed Water plumbing shall be minimized inside the building prior to the Water meter and/or Approved Backflow Prevention Assembly or Method. If unfeasible to locate the water meter within 5 feet of an exterior wall, a Meter Pit will be required outside of the Structure, See Section 2.7.L.4.

Water Service Lines shall be located a minimum of 15 feet from any Structure.

2.7.F.3 Separation Design Alternatives

Horizontal and vertical separation between the Water Service Line and other utility mains shall meet the requirements as stated in Section 2.6.F.

Where the Water Service Line is 2 inch and less, the Water Service Line and the Wastewater Service Line shall be separated by a minimum of 5 feet of undisturbed or compacted earth, except for the following: (*IPC Section 603.2*)

- The Water Service Line may be placed on a solid shelf excavated at one side of the common trench, at least 12 inches apart, vertically, and horizontally from the Wastewater Service Line outside diameter to outside diameter (*IPC Section 603.2*). The Water Service Line shall be above the highest point of the Wastewater Service Line. See Detail Drawing B2-7.
- The Water Service Line may be placed in the same trench as the Wastewater Service Line if the Wastewater Service Line is constructed of Schedule 40 PVC and is located a minimum of 12 inches from the Water Service Line outside diameter to outside diameter. See Detail Drawing B2-7.
- The Wastewater Service Line may be placed in the same trench at equal or higher elevation as the Water Service Line if the Wastewater Service Line is constructed of Schedule 40 PVC and is located a minimum of 12 inches from the Water Service Line outside diameter to outside diameter and the Water Service Line has no joints. See Detail Drawing B2-7.

Where building constraints make installation of the Water and/or Wastewater Service Lines 15 feet from the building foundation infeasible, the following criteria applies upon approval of Colorado Springs Utilities:

- For Single Family Residential Lots provide equal separation between foundation and the Public Utility Easement (PUE) with no less than 7 feet of separation from the foundation and property line, and the water and wastewater joint trench. This allows for adequate separation from gas and electric utilities and future operation and maintenance of service lines. In these cases, the Water Service Line shall be constructed of HDPE, and the Wastewater Service Line shall be constructed of Solid Schedule 40 PVC.
- Water service lines shall be a minimum of 7.5' from the structure and shall be constructed of HDPE.

2.7.F.4 Curb Stop and Stop Box

All Water and Fire Service Lines (including those 4 inches and greater) shall have a Curb Stop or Secondary Valve and stop box installed on or near the property line nearest to the Water tap and shall have no permanent Structures or landscaping within a 5-foot radius. Curb Stops and Secondary Valves shall be located a minimum of 9 feet from any building foundation to allow for operation and maintenance. Alternatively, curb stops may be installed at a minimum of 6 feet from any building foundation provided that the foundation has a minimum 3 foot below finished grade foundation wall. Secondary Valves for Water Service Lines 4 inches and larger shall be restrained. For Single-Family-Residential Users the Curb Stop and stop box shall not reside in driveways, sidewalks, or other concrete surfaces. For Commercial Users stop boxes that are in a drivable surface must have a traffic rated valve box. See Detail Drawings B2-1, B2-2, B2-3 and B2-6.

Additional valves on Fire Service Lines after the Curb Stop or Secondary Valve are not permitted per the CSFD.

Curb stops or Secondary Valves on Private Water Systems shall be located to facilitate operation and maintenance of Water Service Lines.

2.7.F.5 Water Service Lines Parallel to Streams, Drainage Channels, and Detention Ponds

Horizontal separation between the Water Service Line and streams, drainage channels, and detention ponds shall meet the same requirements as Water Mains stated in Section 2.6.F.16

2.7.G Water Service Line Vertical Design Criteria

2.7.G.1 Depth of Bury

All Water Service Lines and Curb Stops shall be a minimum depth of 6 feet and a maximum depth of 7 feet. Due to deeper frost depths that exist in the Green

Mountain Falls area, the depth shall be a minimum of 8 feet for all Water Service Lines.

2.7.G.2 Crossings

Vertical separation between Water Service Lines and other utility infrastructure shall meet the requirements as stated in Section 2.6.F. Water Service Lines must be in a casing pipe when crossing under another utility where the utility is 30 inches or greater in size or where there is less than 18 inches of vertical clearance between the utility and the Water Service Line. Where the Water Service Line is 2 inch and less, the casing pipe material shall be schedule 40 PVC pipe (or other material as approved by Colorado Springs Utilities) when the minimum clearance cannot be met. There must be a minimum of 6 inches separation between the utility and the casing pipe, Reference Detail Drawing B1-7.

2.7.H Abandonment or Removal of Existing Corporation Stops

Where an existing Corporation Stop (tap) is not expected to be reconnected or reused or is relocated with a new Corporation Stop of equal or larger size, then the Owner/Developer shall be responsible for removal of the old Water Service Line and the tap and Water Main line pipe repair. All abandonments or removals shall be inspected by Colorado Springs Utilities.

If the tap being removed at the main is 1 inch in size or less and is directly tapped into the main, then the tap once turned off, and the Water Service Line disconnected from it, may be abandoned in place.

At the direction of the Inspector, when a saddle tap has been used, the tap and saddle must be removed from the main. Where the existing main is 8 inch or less it may be repaired with a Stainless Steel Repair Clamp. Water Mains under warranty and Water Mains 12 inches and greater require the tap be cut out from that section of main and replaced with a solid sleeve coupling and new pipe piece prior to the new tap and Water Service Line being placed. Placement of the new tap should be a minimum of 2 feet from the replacement section. Taps 4 inch and larger shall be removed and replaced with a new section of pipe using solid sleeve couplings.

If Colorado Springs Utilities is required to remove the Water Service Line and tap, Colorado Springs Utilities will invoice the Owner for all removal costs and main line repairs on a time and materials basis.

2.7.I Demolition or Remodel of Property

If for any reason a building is to be demolished or remodeled on a property that is currently receiving Water Service, a *Request for Removal of Utilities for Demolition or Construction* (available at www.csu.org) must be approved by Colorado Springs Utilities for disconnection of Colorado Springs Utilities' Services prior to application for an Alteration or Wrecking Permit through PPRBD. If the Water Service is not going to be reused in accordance with *City Code*, the Water Service Line and tap shall be removed and inspected in accordance with Section 2.7.H at the time of disconnection. If a copper or HDPE Water Service Line is to be reused, the Contractor shall disconnect and temporarily plug the Water

Service Line a minimum of 15 feet outside the limits of demolition to minimize potential damage to or contamination of the Water Service Line. On all demolitions Colorado Springs Utilities requires that galvanized Water Service Lines are removed to the Curb Stop and replaced with approved materials. The *Request for Removal of Utilities for Demolition or Construction* form will identify the date, not to exceed 2 years, when the Water Service Line will be in regular use. All demolitions shall be inspected by Colorado Springs Utilities.

2.7.J Special Considerations for Groundwater Services

All Standards shall apply to Groundwater services with the addition of the following:

- a meter calibration tee must be included in the line immediately downstream of the meter. The tee is to be situated between the meter and the downstream valve,
- any additional control equipment, such as pumping assemblies and control, installed in the pit/Vault will be installed in such a way as to not interfere with the installation, removal, and maintenance of the meter,
- all plumbing from the well head to the point of use is the responsibility of the property owner,
- Meter Pits shall be installed as close to the well as possible. Colorado Springs Utilities must approve all Meter Pit locations, and
- Meter loops and appurtenances may be required when Augmentation Service is provided by Colorado Springs Utilities.

2.7.K Pressure Reducing Valve

2.7.K.1 General Requirements

A water pressure reducing valve rated for 250 psi shall be installed in all Water Service Lines with the exception of Fire Service Lines and Fire Protection Systems.

2.7.K.2 Ownership and Maintenance

The water pressure reducing valve shall be provided, installed, owned, and maintained by the Owner/Developer.

2.7.K.3 Sizing

The size of the pressure reducing valve shall be equal to or one size greater than the size of the water meter. Where a meter is not present, the pressure reducing valve shall be equal in size to the Water Service Line.

2.7.K.4 Installation

The pressure reducing valve shall be located after the first shut off valve and before the meter. On 1-1/2 inch through 12 inch meter installations, a ¼ inch or 3/8 inch device may be installed to allow for a pressure gauge before and after the pressure regulator to monitor incoming (main line) and internal pressure. Under no circumstances shall the pressure exceed 80 psi at the inlet side of the meter. The Y strainer shall not be modified in any manner. Pressure reducing valves located within a Meter Pit shall be located before the Water meter using a tandem coppersetter.

2.7.L Water Meters

2.7.L.1 General Requirements

All water supplied by Colorado Springs Utilities must be metered with the exception of Fire Service Lines and Fire Protection Systems. All water meters require an address for billing purposes. Typical water meter sizes include 3/4 inch, 1 inch, 1-1/2 inch, 2 inch, 4 inch, and 6 inch. Meter sizes greater than 6 inch shall be evaluated on a case-by-case basis. Meter piping shall be constructed of type K copper, DIP, steel, and/or brass from the end of the Water Service Line to 1 foot downstream of the meter or after the Approved Backflow Prevention Assembly, whichever is greater, unless otherwise indicated in these *Water LESS*.

All meter loops must follow an allowable meter configuration as shown in Detail Drawings B4-16 to B4-22. Each allowable configuration has associated minimum clearances that must be met. No obstructions may be present within the meter clearance area.

2.7.L.2 Operation and Maintenance

All water meters shall be furnished and installed by Utilities at the expense of Utilities and Utilities shall retain ownership of the meters. Utilities shall perform all necessary maintenance and/or repair of meters, including replacement of meters; provided, however, that the property Owner shall be responsible for protecting the meter against freezing and damage. (*City Code § 12.4.703*). Meter Pits and appurtenances shall be owned and maintained by the property owner.

2.7.L.3 Residential Water Meters

a) Residential Water Meter Sizing

Residential water meters shall be sized based on anticipated water usage. It is the responsibility of the Owner/Developer or the builder to determine the water meter size. Typical residential water meter sizes are 3/4 inch and 1 inch.

b) Residential Water Meter Installation

Water meters installed inside a Structure shall be located in the basement or other lowest floor of the Structure, not to include any crawl space, areas only accessible by ladder or designated storage areas**.** The location of the meter shall not require climbing, stooping, or crawling to gain access to inspect or replace the meter. Water meter locations shall be such that the water meter is unobstructed on one side, i.e., easily accessible for reading or servicing. Water meter loops shall be constructed per Detail Drawing B4-1, fittings shall consist of sweated, threaded, or fixed flanges. No pro-press fittings are allowed in the Meter Loop. If clearances cannot be met with a vertical meter setting, then a horizontal meter setting shall be installed per Detail Drawing B4-1.

Water meters (3/4 inch and 1 inch) installed outside a Structure shall be located in a Meter Pit on the property line just after the Curb Stop, only upon approval of Colorado Springs Utilities. The Meter Pit shall be a minimum 24 inches in diameter. Meter Pits shall be accessible at all times and therefore must be located outside of

driveways, sidewalks, parking spaces, etc. No permanent Structures or landscaping which obstructs access, or where roots may cause damage to the pit, shall reside within a 5 foot radius of Meter Pits. See Detail Drawing B2-1 and B2-2.

c) Early Residential Water Meter Set

An Owner/Developer may request an early set of a Residential Water Meter provided the following conditions have been met:

- All requirements with Section 2.7.J, 2.7.K, 5.21.N, and 5.21.O are met.
- Remote meter wires and reader shall be protected from damage during Construction activities. All requirements per Detail Drawings B4-3 and B4-4 shall be met before final approval is granted.
- Colorado Springs Utilities may disconnect Water Service to any premise where all requirements are not met upon final inspection.
- Any additional inspection requirements shall be subject to charges by Colorado Springs Utilities.
- Early water meter sets are not allowed for commercial Water Service
- All applicable charges and fees will apply in accordance with Colorado Springs Utilities URR and Tariffs.

Construction water use is subject to all applicable Rules, Regulations and Standards. Any water for Construction or irrigation activities shall have an Approved Backflow Prevention Method or Assembly.

2.7.L.4 Commercial Water Meters

a) Commercial Water Meter Sizing

Commercial water meters shall be sized based on anticipated water usage for the proposed use. The Owner/Developer shall utilize the Commercial Water Meter Sizing Form to determine the required water meter size. This form is available at www.csu.org**.** This form shall be submitted with the request for service contract and will be used by Colorado Springs Utilities to verify proposed meter size and type.

b) Commercial Water Meter Installation

Commercial water meters are typically located within the commercial unit in a utility or a mechanical room. Plans for inside water meter installations (to include support) for 1-1/2 inch and larger water meter shall be submitted to Colorado Springs Utilities for approval with the Commercial Water Meter Sizing Form. Water meter installations shall be constructed per Detail Drawing B4-8, fittings shall consist of sweated, threaded, or fix flanges. No pro-press fittings are allowed in the Meter Loop.

Commercial Water meters may be located outside, only upon approval of Colorado Springs Utilities. When located outside, 3/4 inch and 1-inch meters shall be located within a Meter Pit and 1 ½ inch and larger meters shall be located within a meter Vault. The Meter Pit or Vault should be located outside of a drivable surface. All

Vaults shall be accessible via an H-20 rated drivable surface. No permanent Structures or landscaping which obstructs access or whose roots may cause damage to the Vault shall reside within a 5-foot radius of Meter Pits or Vaults. If it is not possible to locate the Meter Pit or Vault outside a drivable surface, then the Meter Pit or Vault shall be H-20 traffic load rated. Meter Pits or Vaults shall be designed per Detail Drawings B3-1 through B3-5.

Recommended upstream and downstream distances for fittings in a meter Vault from a proposed 4 inch or larger meter installation for compound and Class 1 and 2 turbine meters are defined in

Table 2-87: Recommended Upstream and Downstream Distances for Fittings in a Meter Vault from a Proposed 4 Inch or Larger Meter Installation for Compound and Class 1 and 2 Turbine Meters

Type of Fitting	Distance Upstream (Pipe Diameters)	Distance Downstream (Pipe Diameters)
Tees and Crosses	10	5
Elbows and Reducers	10	5
Tees and Crosses with Strainers or strengtheners	5	5
Elbows and Reducers with Strainers or Strengtheners	5	5
Gate Valve	1-3	1-3
Butterfly Valve	5	5
Plug Valve	5	5
Check Valve	*	5
Pressure Regulator	*	5
Test tee and plug	*	3
Saddle	*	3
Angle Strainer	5	3
Basket Strainer	5	3

*Check with manufacturer's recommendations for proposed meter, and *AWWA* M6 – Water Meters. Distances may vary by type of meter, i.e., Turbo, Compound or Mag. Meter.

2.7.L.5 Meter Bypass

Colorado Springs Utilities may require a meter bypass for Essential Facilities to ensure continuous service during meter maintenance. Only the meter may be bypassed; the pressure reducing valve and Approved Backflow Prevention Assembly shall not be bypassed. See Detail Drawings B4-6 and B4-7.

2.7.M Commercial Water Meters for Consumptive Use

A Commercial User who qualifies for the Consumptive Use Adjustment (CUA) Program may receive a reduction in their wastewater charges for water that is not discharged into the Colorado Springs Utilities' Wastewater System. The CUA program and applications are described in Colorado Springs Utilities' wastewater tariff.

The following configurations can be utilized for Commercial Users who qualify for the CUA program:

- The Water Service Line for the CUA process may be tapped and metered separately from the domestic Water Service Line. The Water Service Line shall meet all of the requirements set forth in these Standards and shall have a water meter and an RP, see Detail Drawing B4-15.
- The supply line to an approved CUA process may branch off the domestic Water Service Line from the discharge side of the RP. A submeter and an additional RP are required on all branch lines serving an approved CUA process. Reference Detail Drawing B4-15.
- Pursuant to *City Code*, installation of a branch line between the meter and the RP is prohibited.

2.7.N Backflow Prevention

2.7.N.1 General Requirements

Colorado Springs Utilities requires protection of the Water Distribution System through installation of Approved Backflow Prevention Assemblies or Methods. Where Backflow prevention is required, Water Service will not be provided to any Premises until an Approved Backflow Prevention Assembly or Method has been installed and tested. See Table 2- to determine the applicable criteria based upon the proposed connection type:

Table 2-98: Backflow Prevention Requirements Per Connection Type

Connection Type	Backflow Prevention Required?	Type of Backflow Prevention Required	Applicable Sections
Single-Family-Residential	No, unless a Degree of Hazard exists	Degree of Hazard Based	2.7.N.1-6, 2.7.N.7, 2.7.N.8
Non-Single-Family-Residential Fire	Yes	Degree of Hazard Based	2.7.N.1-4, 2.7.N.9, 2.7.N.10
New Non-Single-Family-Residential Domestic and Irrigation	Yes	RP	2.7.N.1-4, 2.7.N.11a)
Existing Non-Single-Family-Residential Domestic	Yes, if a Degree of Hazard exists	RP or Approved Air Gap	2.7.N.1-4, 2.7.N.11b)
Existing Non-Single-Family-Residential Irrigation	Yes	RP or Approved Air Gap	2.7.N.1-4, 2.7.N.11b)
Non-Single-Family-Residential Critical Care and Uninterruptible Service	Yes	RP or Approved Air Gap	2.7.N.1-4, 2.7.N.12

2.7.N.2 User's Responsibilities (Ownership, Maintenance, and Testing)

It is the User's responsibility to consult with a qualified professional to evaluate the impact of the Approved Backflow Prevention Assembly or Method, and to ensure proper supply and relief of system pressures within plumbing or piping systems on the User's Premises.

a) Cost

The User shall own and be responsible for all cost related to Approved Backflow Prevention Assemblies and Methods installed at their Premises, including but not limited to installation, testing, inspection, maintenance, repair, and replacement.

b) Testing and Inspection

At the User's expense, all Approved Backflow Prevention Assemblies must be tested, and all Approved Backflow Prevention Methods must be inspected, upon installation and annually thereafter by a Certified Cross-Connection Control Technician. In those instances where Colorado Springs Utilities deems a hazardous condition to exist, tests may be required at more frequent intervals. Records of all tests and inspections must be provided to Colorado Springs Utilities within 5 days of completion.

c) Repair and Replacement

Any Backflow Prevention Assembly or Method required by these *Water LESS* that does not meet all requirements specified herein shall be repaired or replaced at the User's expense. Any repair or replacement shall be made with an Approved Backflow Prevention Assembly or Method within 20 days of discovery. Only a person who is a Certified Cross-Connection Control Technician.is authorized to perform repairs or replacements. Records of all repairs and/or replacement of an Approved Backflow Prevention Assembly or Method must be provided to Colorado Springs Utilities within 5 days of completion.

2.7.N.3 Specifications

a) USC Approval

An Approved Backflow Prevention Assembly installed to satisfy the requirements of this section shall be approved and listed by the University of Southern California – Foundation for Cross-Connection Control and Hydraulic Research (USC) before installation. Please reference the USC List of Approved Assemblies prior to purchase and installation. For any specific model, Users should be cautioned that *not all sizes, orientations, and configurations are necessarily approved by USC*. Manufacturers are required to identify the make, model, and size with markings on the assembly or on a plate permanently affixed to the assembly. Assemblies that cannot be identified by the required manufacturer's markings are not approved. Existing installed assemblies certified by the American Society of Sanitary Engineering (ASSE) may continue to be used until retrofit or replacement is required, at which time a USC approved assembly must be installed.

b) Temperature Ranges

Unless otherwise specified by the manufacturer, all assemblies are to be installed on cold Potable Water applications - below 110ºF.

c) Orientation

Assemblies listed by USC are for the indicated orientations only. Rotation of assemblies on either axis will invalidate the USC's approval. The test cocks on the Approved Backflow Prevention Assembly shall not be modified and shall allow for the routine testing of the assembly. Use of spare parts other than those of the original manufacturer invalidates the approval. For 2 ½ inches and larger flanged assemblies, rotation of shutoff valves of one bolt hole is permitted.

d) Non-Approved Backflow Prevention Assemblies

Colorado Springs Utilities does not allow vacuum breakers (pressure, spill resistant or atmospheric type) nor detector type (Type I or Type II) Backflow prevention assemblies to meet the requirements of this part.

e) Approved Air Gap

An Approved Air Gap Backflow prevention method installed to satisfy the requirements of this section shall conform to ASME A112.1.2.

f) Lead-Free

An Approved Backflow Prevention Assembly installed to satisfy the requirements of this section shall be Lead Free in accordance with the Safe Drinking Water Act as amended by the Federal Reduction of Lead in Drinking Water Act 111-380 and shall be NSF 61 certified.

2.7.N.4 Sizing

a) Water and Irrigation Service Lines

The Approved Backflow Prevention Assembly shall be equal in size to the respective water meter. When the equivalent size is not available, the User shall install the next largest available size.

b) Fire Service Lines

The Approved Backflow Prevention Assembly shall be sized according to the following:

1. The Approved Backflow Prevention Assembly shall be equal in size to the fire system riser at the point of entry to the building.

2. A one-size reduction is permitted when all downstream plumbing is of smaller diameter than the fire riser. A further reduction to 2 inches is acceptable when the incoming line size is 4 inches.

3. The Approved Backflow Prevention Assembly may be greater than or equal in size to the largest downstream piping where a reduction is made to the

fire service line at the point of entry to the building. These plans shall be prepared by a qualified fire sprinkler system designer and submitted to Colorado Springs Utilities for review and approval in addition to CSFD.

4. The assembly must be located at the fire Service Entry Point into the building so that the amount of exposed piping is minimized. Any size reduction after point of entry to the building must be made on the fire riser prior to the assembly.

2.7.N.5 Identification

Colorado Springs Utilities is required by State regulation to survey every Non-Single-Family-Residential connection to the Water Distribution System to determine if a cross-connection exists on the Premises. Utilities will identify the control point(s) wherever the User is required to install an Approved Backflow Prevention Assembly or Method. To help ensure accurate record-keeping of the Approved Backflow Prevention Assembly or Method, Colorado Springs Utilities may identify each control point.

2.7.N.6 Installation

The Approved Backflow Prevention Assembly or Method must be installed in a location that prevents submersion. Installations in pits, Vaults, and other similar underground Structures are not allowed. Existing Backflow Prevention Assemblies installed below grade within the Premises will be approved on a case-by-case basis. The Approved Backflow Prevention Assembly or Method shall be installed in a location that prevents exposure to chemical vapors, caustic materials, or a similarly corrosive environment.

All Approved Backflow Prevention Assemblies and Methods shall be permanently installed and shall not be removed or changed to any other type of assembly or method unless otherwise allowed in these *LESS* and approved by Colorado Springs Utilities.

When the Water Service Line is abandoned it shall be properly terminated in accordance with Section 2.7.N.6.d below (Seasonal Removal for Lawn Irrigation Systems) of these *Water LESS.*

a) Clearances

The Approved Backflow Prevention Assembly or Method is designed for in-line service and shall be installed in a manner that allows adequate and safe testing, inspection, and repair. The assembly shall be installed so identification markings created by the manufacturer are unobstructed and easy to read. The assembly should be installed in a manner that provides easy and convenient access to the test cocks. In order to meet these requirements, the Approved Backflow Prevention Assembly should be installed with the following clearances:

- 30 inches in front (floor to ceiling);
- 12 inches above;
- 8 inches on all remaining sides;

- a centerline height from 30 inches to 60 inches above the floor (any installation at a greater height should be provided with a fixed platform, a portable scaffold, or a lift meeting OSHA standards);
- 12 inches between the bottom of the relief valve (body) and the floor or prevailing grade. When desired, manufacturer-approved-air-gap drains, without alterations, may be attached to the body of the assembly at the relief valve. Other fittings or Constructions intended to maintain the air gap are not approved and shall not be used.
- Please reference Detail Drawing B4-9 for clearance requirements.
- Colorado Springs Utilities shall have the sole discretion to determine whether clearances that do not meet the clearances set forth above provide adequate and safe access for testing, repair, and/or replacement based on Site specific circumstances.

b) Support and Bracing

All Approved Backflow Prevention Assemblies and Methods shall be adequately supported and restrained to prevent movement and to maintain required clearances. Support and bracing shall be constructed by methods external to and separate from the plumbing or pipe fitting. Dead-end supports or similarly plumbed methods are prohibited. Points of support and bracing shall not obstruct operation, testing or inspection of the Approved Backflow Prevention Assembly and Methods. Support and bracing for Approved Backflow Prevention Assemblies up to 6 inches must utilize Uni-strut (those greater than 6 inches must have engineered support and bracing). See Detail Drawing B4-8.

c) Drainage Requirements for Inside Installations

A drain connected to the Wastewater System shall be installed within 10 feet of an Approved Backflow Prevention Assembly. The drain shall be sized (at a minimum) to prevent submersion and to accommodate all discharges from the Approved Backflow Prevention Assembly (maintenance, discharge from the relief valve, etc.). When a drain connected to the Wastewater System is not installed, a drain to daylight that allows unlimited positive drainage and prevents contamination of any State waters shall be installed. When a drain to daylight is installed, the User shall be responsible for freeze protection and for any discharge from the drain to ensure compliance with all applicable regulations, codes and standards which govern that discharge. A drain to daylight shall be fitted with screening to prevent rodent intrusion. Except as determined by Colorado Springs Utilities in its sole discretion based on the present Degree of Hazard, any existing Approved Backflow Prevention Assemblies installed inside the Premise without positive drainage as described above may remain in place.

d) Seasonal Removal for Lawn Irrigation Systems

An RP installed in a Water Service Line used exclusively for lawn irrigation may be temporarily removed during winter months and for a period not to exceed 9 months. In instances where removal of the Approved Backflow Prevention Assembly is desired, flanges shall be installed on both in-ground pipe stubs and the RP. During removal period, Water Service shall be disconnected at the Curb Stop

and both pipe stubs shall be capped with a bolted blind flange. Prior to irrigating after reinstallation, the same Approved Backflow Prevention Assembly that was removed for the winter months shall be reinstalled and immediately tested. Please reference Detail Drawing B4-10. Existing Approved Backflow Prevention Assemblies with threaded caps for seasonal removal may remain until such time that the Backflow prevention assembly is replaced. At such time, installation of a flanged Backflow prevention assembly is required.

2.7.N.7 Single-Family-Residential Connections Backflow Prevention Assembly Selection

Single-Family-Residential Users typically are not required to install an Approved Backflow Prevention Assembly or Method in each Water Service Line but shall be required to do so if a Degree of Hazard is identified by Colorado Springs Utilities as defined by the following:

a) High Hazards

The following conditions are a High Hazard and the User is required to install an RP or Approved Air Gap in the respective Water Service Line or Fire Service Line:

- a dedicated irrigation line is connected directly to the Water Main;
- a Fertigation System is installed;
- a Class 1 Fire Protection System is connected;
- auxiliary water sources (e.g., wells, ponds, lagoons, irrigation ditches), hot tubs or swimming pools piped with permanent plumbing, Reclaimed Water systems, graywater systems, or onsite water storage tanks with permanent plumbing are installed;
- home business and hobbies including but not limited to agricultural commerce and hydroponic systems, doctor's offices, photo laboratories, hide tanning operations, and metal plating operations exist;
- other High Hazards, as determined by Colorado Springs Utilities.

b) Low Hazards

The following conditions are a Low Hazard and require installation of a DC (at a minimum) in each Fire Service Line:

- a Class 2 Fire Protection System is connected and is not a Multipurpose System;
- any Fire Protection System is connected and is constructed from any materials that are not approved for the conveyance of Potable Water;
- other Low Hazards, as determined by Colorado Springs Utilities.

c) Multipurpose Systems

Multipurpose Systems, as defined in these standards, generally do not require Backflow prevention and may be exempted by Colorado Springs Utilities following review.

2.7.N.8 Single-Family-Residential Connections Backflow Prevention Assembly Location

Single-Family-Residential Users who are required to install an Approved Backflow Prevention Assembly or Method must adhere to the following standards:

a) Inside Meter Installations

When the water meter is installed inside a Premises, the Approved Backflow Prevention Assembly must be installed within 6 linear inches of pipe after the outlet valve of the meter loop. Reference Detail Drawings B4-11, B4-12 and B4-13 for clearance requirements. Stacking may be allowed where clearances dictate, see Detail Drawing B4-13.

(1) Site-Specific Variations

Colorado Springs Utilities may allow a greater distance between the meter and the Approved Backflow Prevention Assembly or Method based on site-specific installation challenges.

b) Outside Meter Installations

When approved by Colorado Springs Utilities, the water meter may be installed outside in accordance with standards listed in 2.7.L.4. When the water meter is installed outside, the Approved Backflow Prevention Assembly shall be installed:

- within 10 feet of the outside edge of the Meter Pit;
- with bottom of relief valve (body) at least 12 inches above prevailing grade (RP Only);
- in a protective enclosure engineered for positive drainage; and
- when year-round use is required, the protective enclosure shall conform to ASSE Standard 1060 Type I Enclosures.

(1) Site-Specific Variations

Colorado Springs Utilities may require a larger-sized Approved Backflow Prevention Assembly or Method, and may allow a greater distance between the meter and the Approved Backflow Prevention Assembly or Method based upon site-specific installation challenges.

(2) Alternative Locations

In the sole discretion of Colorado Springs Utilities, when the prescribed location of the Approved Backflow Prevention Assembly or Method is impossible or impractical, Colorado Springs Utilities may allow installation of Approved Backflow Prevention Assemblies or Methods at alternative locations. Alternative locations will be evaluated on a case by case basis where the following conditions exist, making installation within 10 feet impossible or impractical:

- cutting of man-made impervious surfaces (such as drive aisles or sidewalks) in order to provide electricity for freeze protection;
- destabilization of building supports/walls, or reduction of structural integrity of an adjacent Structure/building;
- a location between a Meter Pit and the Backflow prevention assembly where adequate trenching/shoring cannot be safely accomplished (i.e., less than 10 feet exists between the Meter Pit and the building);
- other site-specific challenges requiring relief, as determined by Colorado Springs Utilities.

c) Installation Requirements for Dedicated Fire Service Lines

Single-Family-Residential Users who are required to install an Approved Backflow Prevention Assembly or Method in a dedicated Fire Service Line (an independent tap from the Water Distribution System) shall locate the Approved Backflow Prevention Assembly or Method at the Fire Service Line entry to the building so that the amount of exposed piping is minimized.

d) Residential Combination Service Protection

When a Residential User installs a Fire Protection System that is served by a branch off the domestic Water Service Line and an Approved Backflow Prevention Assembly or Method is required for the Fire Protection System, the Approved Backflow Prevention Assembly or Method shall be installed prior to the first branch line leading off the Water Service Line, regardless of the meter location. Reference Detail Drawing B2-2 for clearance requirements.

2.7.N.9 Non-Single-Family-Residential Connection Fire Backflow Prevention Assembly Selection

An Approved Backflow Prevention Assembly or Method is required, per the following:

a) Fire Protection System, Class 1

The User at any Premises where a fire service line is connected to the Water Distribution System shall install an RP or an Approved Air Gap.

b) Fire Protection System, Class 2

The User at any Premises where a Fire Service Line is connected to the Water Supply System shall install a DC, at a minimum. If at any point a chemical is used in a Class 2 system for any means, temporary or otherwise, an RP will be required.

c) Fire Department Connections (FDC)

All FDCs shall connect to the Fire Protection System after the outlet valve of the Approved Backflow Prevention Assembly.

d) Booster Pumps

All booster pumps shall be installed on the discharge side of the Approved Backflow Prevention Assembly or Method.

2.7.N.10 Non-Single-Family-Residential Connection Fire Backflow Prevention Assembly Location

The Approved Backflow Prevention Assembly or Method on a Fire Service Line shall be installed at the service entry to the building so that the amount of exposed piping is minimized.

2.7.N.11 Non-Single-Family-Residential Connection Backflow Prevention Assembly Selection and Location

a) New Connections for Domestic and/or Irrigation Use

Any User desiring to create a Non-Single-Family-Residential Connection, shall install an RP, immediately following the meter, and in all cases, before the first branch line leading off the Service Line.

(1) Inside meter installations

When the water meter is installed inside a Premises, the RP must be installed within 6 linear inches of pipe after the outlet valve of the meter loop. Stacking may be allowed where clearances dictate, see Detail Drawing B4-13.

(2) Outside meter installations

When approved by Colorado Springs Utilities, the water meter may be installed outside in accordance with standards listed in 2.7.L.4. When the water meter is installed outside, the RP shall be installed:

- within 10 feet of the outside edge of the Meter Pit;
- with bottom of relief valve (body) at least 12 inches above prevailing grade;
- in a protective enclosure engineered for positive drainage; and
- when year-round use is required, the protective enclosure shall conform to ASSE Standard 1060 Type I Enclosures.

b) Existing Connections for Domestic and/or Irrigation Use

Any User at a Premises where a Non-Single-Family-Residential Connection exists and where any of the high hazards listed below exist on the Premises, shall install an RP or Approved Air Gap, immediately following the meter, and generally before the first branch line leading off the Service Line:

- agricultural commerce;
- auto repair shop;
- auxiliary water source;
- blood banks;
- boiler;
- bulk fill water station;
- car wash;
- chemical processes (including temp. maintenance);
- chiller;
- cleaning company (carpet, or use of soaps and chemicals);
- cooling tower;
- Construction company (utilizing water for Construction purposes);
- dental facility;
- display fountain;
- double wall heat exchanger;
- dry cleaning/laundries;

- facilities with restricted access;
- fire suppression;
- graywater system;
- green house;
- hair salons;
- hospitals;
- hot tub;
- hydronic cooling;
- hydronic heating;
- ice machines;
- industrial;
- irrigation;
- laboratories;
- livestock facility;
- manufacturing facility;
- medical facility and clinics;
- mitigation company (filling tanks and trucks for cleaning purposes);
- mortuaries;
- onsite storage tanks;
- pet store;
- pool;
- Reclaimed Water system;
- restaurants;
- solar panels;
- veterinary;
- other high hazards, as determined by Colorado Springs Utilities.

(1) Inside meter installations

When the water meter is installed inside a Premises, the RP must be installed within 6 linear inches of pipe after the outlet valve of the meter loop. Reference Detail Drawings B4-11, B4-12 and B4-13 for clearance requirements. Stacking may be allowed where clearances dictate, see Detail Drawing B4-13.

(2) Alternative Location

Where site-specific installation challenges exist on a case by case basis, Colorado Springs Utilities may allow a greater distance between the meter and the Approved Backflow Prevention Assembly or Method. Colorado Springs Utilities may also allow installation of an Approved Backflow Prevention Assembly or Method after the first branch line or in other locations deemed acceptable by Colorado Springs Utilities. Greater distances and installations after the first branch line may only be allowed where all of the piping between an Approved Backflow Prevention Assembly and the meter can be visually inspected to ensure no other cross connections exist.

(3) Outside meter installations

When approved by Colorado Springs Utilities, the water meter may be installed outside in accordance with standards listed in 2.7.L.4. When the water meter is installed outside, the RP shall be installed:

- within 10 feet of the outside edge of the Meter Pit;
- with bottom of relief valve (body) at least 12 inches above prevailing grade;
- in a protective enclosure engineered for positive drainage; and
  when year-round use is required, the protective enclosure shall conform to ASSE Standard 1060 Type I Enclosures.

i. Site-Specific Variations

Colorado Springs Utilities may require a larger-sized Approved Backflow Prevention Assembly or Method, and may allow a greater distance between the meter and the Approved Backflow Prevention Assembly or Method based upon site-specific installation challenges on a case by case basis.

ii. Existing PVB Variation

Where an existing irrigation service line is protected by a PVB, the PVB shall be replaced with an RP. The existing PVB may be utilized if the Owner can verify thru survey by a licensed professional surveyor or plumbing Contractor that the PVB is 12 inches or greater above the highest irrigation head served.

iii. Alternative Location

In the sole discretion of Colorado Springs Utilities, when the prescribed location of the Approved Backflow Prevention Assembly or Method is impossible or impractical, Colorado Springs Utilities may allow installation of Approved Backflow Prevention Assemblies or Methods at alternative locations. Alternative locations will be evaluated on a case by case basis where the following conditions exist, making installation within 10 feet impossible or impractical:

- cutting of man-made impervious surfaces (such as drive aisles or sidewalks) in order to provide electricity for freeze protection;
- destabilization of building supports/walls, or reduction of structural integrity of an adjacent Structure/building;
- a location between a Meter Pit and the Backflow prevention assembly where adequate trenching/shoring cannot be safely accomplished (i.e., less than 10 feet exists between the Meter Pit and the building);
- other site-specific challenges requiring relief, as determined by Colorado Springs Utilities.

2.7.N.12 Critical Care and Uninterruptible Service

At the sole discretion of Colorado Springs Utilities, certain facilities may install a manifold in order to ensure uninterruptible water supply. In these instances, an RP or Approved Air Gap of the same size must be installed on each branch of the manifold. The manifold must be limited to two lines of the required size, allowing water to flow through either line. Multiple manifolds or expanded manifolds beyond two lines are not allowed. See Detail Drawing B4-7.

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CHAPTER 3

Submittal Requirements

3.1 General

Construction Plans to install, repair or retrofit Water Mains and Water Service Lines shall be prepared and submitted to Colorado Springs Utilities at Utilities Development Services' office at the Leon Young Service Center, 1521 S. Hancock Expressway, Colorado Springs, CO 80903, or they may be submitted electronically via the website at www.csu.org. All plans submitted shall be in compliance with the guidelines set forth in this Chapter.

Construction Plans include Water Plans and Utility Service Plans. Water Plans are prepared for all Water Main Extensions and Utility Service Plans are prepared for Water Service Lines that connect the Water Main to the Premises (except for single family Water Service Lines not part of a Water Main Extension). The initial plan submittal shall include the appropriate checklist which shall be signed by the Design Engineer and their applicable staff. The checklists may be obtained from the website at www.csu.org. Contact Utilities Development Services if you have questions or need assistance.

All Water Construction Plans shall be prepared under the supervision of a Professional Engineer registered in the State of Colorado and each sheet of the final Construction Plans signed and stamped by the Professional Engineer. Utility Service Plans do not need to be signed and stamped by a registered Professional Engineer unless it includes a service line that is 4 inches or larger. The cover sheet of all final Construction Plans shall also be approved and signed by the Owner/Developer, the Colorado Springs Fire Department, and other required signatories prior to approval by Colorado Springs Utilities unless specific signature blocks are required on additional sheets.

No work shall commence on any extensions or services until the Construction Plans are approved by Colorado Springs Utilities and copies of the Approved Construction Plans are delivered by the Owner/Developer to the Colorado Springs Utilities Inspections office located at the Leon Young Service Center.

Construction shall begin within 1 year of the plan approval date or the approval will expire and the plans shall be submitted for re-approval. Plans that are submitted for re-approval must conform to the *Water LESS* in effect at the time of re-submittal. Note that any *Fire Flow Reports* also expire after 1 year and must be updated prior to re-approval.

3.2 Construction Plan Preparation

3.2.A Quality Guidelines

This section sets forth items for the Design Engineer to consider in preparation of Water Plans and Utility Service Plans to ensure an acceptable quality of the submittal.

- The plans should be based on actual field surveys referenced to land corners or other official survey control points and accurate to 1/10 of 1 foot so that the facilities can be accurately staked for installation and can be readily located after installation for maintenance, tapping and control. All elevations shall be referenced to the NGVD '29 datum.

- The plans should be of suitable scale to show all necessary information on a 24 inches X 36 inches size sheet. The preferred scale for all drawings is 1 inch=50 feet horizontal and 1inch =5 feet vertical. Other scales may be used when necessary to adequately show specific details of mains, connections, and other facilities.
- The plans should show sufficient adjacent area to provide the relationship of proposed facilities to existing facilities.
- The plans should show necessary details. Detail Drawings, signature blocks, and Plan Notes from these *Water LESS* are available online in AutoCAD downloadable format. Specific Detail Drawings include water line lowering's, pressure regulator stations, and water meter schematics. These details can be used for Construction clarification and include elevations dimensions and Construction notes. They may be placed on the drawings or referenced at the applicable locations.
- The plans should be neat, orderly, and legible. Information not needed to clarify the design should not be shown on the plans.

3.2.B Required Information

The following information is required to be included on all Construction Plans. Additional detail is listed on the applicable checklist, which shall be utilized to ensure that the submittal contains sufficient information to minimize review times.

- The name of the project, applicable Water Plan Notes or Utility Service Plan Notes and applicable signature blocks, which can be found in Section 3.6. The CSFD Acceptance signature block shall be included unless there are no new fire hydrants or Fire Service Lines are proposed. he Utility Grade Review signature block shall be included whenever a Water Main is to be installed in a proposed or future City street.
- Vicinity map, Site map, north arrow, and scale
- The Colorado Springs Utilities Project no. for the Water Main being connected to
- GIS map number, water pressure zone, maximum static water pressure for the project, the Development Plan number assigned by City Land Use Review (e.g., CPC DP-XXXXX) with its approval date, the applicable plat name with its recordation information, and the Utility Addressing Plan (UAP) number, if applicable. To obtain a UAP number, see Section 3.5. A Plan Information Block is provided in Section 3.6.F for use by the Design Engineer. It can be edited to meet project-specific needs.
- Property lines, lot numbers, and addresses
- Location and dimensions of dedicated streets, alleys, rights-of-way, and Easements
- The proposed alignment, size, and material of the Water Mains to include the location of all appurtenances such as, valves, fire hydrants (including flange elevation), bends, fittings, and high-deflection couplings
- The results of the *Fire Flow Report* to include building data if applicable and the flows and pressures at maximum day demand at each fire hydrant. See Section 3.6.C.
- All existing and proposed pavement, curb and gutter, sidewalks, and medians

- All existing and proposed utilities, including stormwater mains, to include size, type, horizontal and vertical location, and the separation of such utilities. Show stationing for all utility crossings in both the plan and profile sections of the drawings. Colorado Springs Utilities reserves the right to request a pothole of the crossing in the absence of data that reasonably verifies the proposed separation.
- All existing and proposed Potable and Non-Potable yard hydrants
- All existing and proposed utility Easements with the recordation information
- All existing or proposed surface improvements, including, but not limited to, signs, retaining walls, fences, Vaults, catch basins and traffic islands
- PC and PT stations and radius for all curvilinear pipes
- The stations of all valves, fittings, and casing pipes, whether or not profiles are included
- For submittals with more than 5 sheets, include a "Key Map". The Key Map should show the proposed street layout and proposed street names for the subdivision with the current sheet highlighted.
- If applicable, lay out such that plan and profiles do not overlap or duplicate on continuing sheets. A "MATCH LINE" with a "STA. X+XX.XX" should be placed at the match-line location on both sheets.
- If applicable, include phase lines
- If a Private Water Main is being proposed, ensure that the "private facilities proposed" box is checked in the Owner/Developer signature block. In addition, the Owner/Developer shall execute and record a Notice of Private Water System identifying each platted lot served by the extension and show the reception number on the Water Plan. A copy of the Notice of Private Water System is available at www.csu.org.

3.2.C Development Plan Requirements for Private Utility Cross Sections or City Cross Sections with Structure Setbacks that are Less than 15 Feet From Back of Curb

1. The information and preliminary meeting in item 2 (below) shall be provided for Development Plans that include any of the following criteria:
   a. Structure Setbacks that are less than 15 feet from the back of curb.
   b. Less than 22 feet roadway (edge to edge of pavement) width.
   c. Lots that follow the Utilities Private Cross Sections.
   d. Lots that have 42 feet or less between the front of the buildings (Private Cross Sections).

2. A Preliminary Utility Plan, meeting the most recent edition of Colorado Springs Utilities Electric, Natural Gas, Water, and Wastewater Line Extension and Service Standards, showing the location of the following shall be submitted prior to the Development Plan and application. A preliminary meeting with CSU is to be arranged. Some of the information below may be unknown, however, will need to be accounted for during the preliminary meeting:
   a. Building footprints, including any covered patios or overhead structures, elevations, basement or crawl space details, and the locations of all doors, windows, and window wells.
   b. Driveway dimensions and locations.

c. Trees within the public rights-of-way.
d. Attached or detached sidewalk(s).
e. Retaining wall(s).
f. Swales with service line depth noted to ensure proper cover and clearances.
g. Location and size of any drainage pipes installed in swales.
h. Street cross-section.
i. Product type detail (elevation view).
j. Proposed Electric, Gas, Water, and Wastewater main lines within the street sections.
k. Electric, Gas, Water, and Wastewater Service line(s) detail and location for each product type.
l. Water curb stop(s) and Wastewater clean-outs. These may be shown on the typical detail for each product type.
m. Gas, electric, & water meter(s). These may be shown on the typical detail for each product type.
n. Adequate space for potential Electric transformers, J-boxes, vaults, switches, and streetlights (required at public intersections) to be determined prior to DP at preliminary meeting.
o. Air conditioner (pad-mounted condenser) units.
p. Preliminary fire hydrant locations.
q. Preliminary layout of any stormwater facilities.

3.2.D Profile Guidelines

All Water Mains 12 inches and larger in diameter shall have both plan and profiles submitted as part of the Water Plan set. At the discretion of the Design Engineer, the profile of Water Mains less than 12-inches is optional, unless any of the following conditions exist, in which case a profile is required regardless of the size of the Water Main:

- Slopes greater than 10 percent – where the Water Main is laid with a slope of this magnitude, the Design Engineer will evaluate and establish a design that ensures the system will operate effectively for its life without joint separation or other damage.
- Project Geological Hazards Study denotes Site problems – where a project's Geological Hazards Study identifies unstable Site conditions, the Water Mains may be required to be profiled. The Design Engineer shall design the system to clearly address Site conditions. A copy of the geologic hazards report and/or grading plan shall be submitted with the Construction Plan at the request of Colorado Springs Utilities.
- Lowering of Water Main – profile all Water Main lowering's, half lowering's, and grade breaks including those using high deflection couplings.
- Water Main outside of Right-of-Way – plan and profiles are required for Water Mains that will be located outside Public Right-of-Way or outside paved areas. The plan and profile shall show existing and proposed ground conditions and existing or proposed surface improvements. For short distances (50 feet or less) where the Water Main travels between two paved areas (e.g., parking lots) and there are no grade changes, a profile is not required.

- Dedicated Fire Service Lines – 4 inch and larger Fire Service Lines need to be profiled from the Water Main to the building. The profile must include all bends, both horizontal and vertical.

3.3 Fire Flow Report Process

Prior to approval of a Water Plan by Colorado Springs Utilities, the Design Engineer shall submit a completed *Request a Fire Flow Report* form to waterplanning@csu.org. A description of the process and the form can be found online at www.csu.org. The submittal shall also include a PDF of the current Water Plans and a UDCF as described in Section 3.5. Colorado Springs Utilities will perform the necessary calculations, generate a Fire Flow Report, and provide a copy to the Design Engineer.

The Fire Flow Report provided to the Design Engineer shall be used to complete the necessary information on the Water Plan. If additional copies of the report are required as part of the plan approval process with Pikes Peak Regional Building Department or Colorado Springs Fire Department, the Design Engineer shall provide copies of the report. The Fire Flow Report is good for one year from the date of issue. Colorado Springs Utilities will complete a total of 2 fire flow reports for the same address or Project within a 1-year period. More than 2 requests for Fire Flow Reports for the same address or Project within the 1-year period will result in the charges outlined in *Utilities Rules and Regulations*.

The Design Engineer can submit the Fire Flow Request at any time during the project. Colorado Springs Utilities reserves the right to reject any Fire Flow Request if adequate information is not supplied with the request.

3.4 GIS Maps

GIS maps may be utilized to identify the general location of water, gas, electric, and wastewater pipes and appurtenances. These maps are for information only and are not to be used for design purposes. Maps may be obtained from Colorado Springs Utilities through its website at www.csu.org.

A service area map can be obtained from the Colorado Springs Utilities website at www.csu.org. Specific questions regarding Utility Service should be directed to Utilities Development Services.

3.5 Utilities Addressing Plan and Utilities Design CAD File

There are two types of support documents universal to all service extensions: the Utilities Addressing Plan (UAP) and the Utilities Design CAD File (UDCF). Depending upon the nature and timing of the project, a UAP and/or a UDCF may need to be submitted as part of the flow of information to Colorado Springs Utilities in support of the design or review of the proposed utility infrastructure. The following sections describe each item in detail.

3.5.A Utilities Addressing Plan

Colorado Springs Utilities/Advanced Geomatics (ADG) uses the UAP to obtain addressing from the Enumerator's office of the Pikes Peak Regional Building Department (PPRBD) for the lots in the project. ADG will create lot geometry and address pointers for the lots within the GIS system. The GIS address data is then synchronized with the Colorado Springs Utilities' Customer systems database.

3.5.A.1 Conditions Requiring a Utilities Addressing Plan

An UAP is required anytime an application for extension of electric, gas, Water or Wastewater Mains and/or service lines to a parcel of land is made and any of the following conditions apply:

- the parcel has not been platted,
- the parcel does not have assigned addressing in place as of the date of the request,
- the parcel has an existing recorded plat in place, but the parcel geometry will be modified as part of a land development process and has not yet been re-platted,
- an approved UAP exists, but changes have been made (or are proposed) to the geometry of the development which alters the lot or street configuration of the development, or
- the proposed development activity will in any way change approved addressing on the parcel.

3.5.A.2 Utilities Addressing Plan Submittal

The UAP shall be submitted in electronic format at www.csu.org. The Utilities Addressing Plan must be submitted at least 7 business days prior to a request for service. Requests for service may be submitted concurrently with the Utilities Addressing Plan but will not be acted upon until after the Utilities Addressing Plan has been processed.

The Utility Addressing Plan Checklist and Submittal Form can be found in Section 3.6. A subdivision plat prepared as per the City of Colorado Springs Specifications will suffice as a UAP submittal. Although a preliminary version of the plat is acceptable for the UAP, fictitious, incomplete, or erroneous plat geometry is not. ADG needs complete dimensioning information on the UAP to calculate coordinate geometry on the boundary, the rights of way and the lots/tracts. ADG will refer errors back to the submitter for correction before completing the UAP.

A revised Utilities Addressing Plan must be submitted whenever dimensions or addresses are revised. To expedite processing Digital UAP submittals are preferred using the website www.csu.org. A receipt will be emailed to the submitter once a submittal is made online. The receipt will include the Utilities Addressing Plan Identification Number which is required for any request for service. Upon successful completion of ADG processing, a second email notification will be sent and all addressing will be available for service requests.

A digital submission consists of an AutoCAD drawing (.dwg) file with a layout for each sheet containing all necessary model and paper space elements. All dimensional data shall use AutoCAD Drawing Units of:

- Length: Decimal (Precision: 0.00)
- Angle: Surveyor's Units (Precision: N 0d00'00" E)
- Insertion Scale: Unitless

For information or assistance in performing online UAP submittal, contact ADG.

3.5.B Utilities Design CAD File

The Utilities Design CAD File (UDCF) is an AutoCAD drawing (.dwg) file that contains specific point, line and text features related to the design and analysis of new utility lines in proposed land developments and Public works Projects.

3.5.B.1 Conditions Requiring a Utilities Design CAD File

A UDCF shall be submitted on all Projects which meet the following criteria:

- Single-Family-Residential Projects requiring new Right-of-Way or street design
- mobile home parks, Multi-Family developments, commercial or industrial Projects
- Public works Projects requiring utility design or relocation

3.5.B.2 Purpose of the Utilities Design CAD File

The UDCF will be used by:

- the Water System planners to do pressure zone modeling and fire flow reporting,
- the gas and electric system designers as a background environment to support their system extension design, and
- ADG, at its discretion, to update base mapping.

The submitter is responsible for ensuring the Project data supplied to Colorado Springs Utilities is current through all of the Project design phases. If Colorado Springs Utilities does not have the most up to date version of Project data, the Construction schedule could be negatively impacted. The submitter consents to Colorado Springs Utilities' use of the electronic data being used to update GIS base mapping. Colorado Springs Utilities acknowledges the submitter has no responsibility for the accuracy or completeness of the data in the "Record Drawing" stage of the project.

3.5.B.3 Utilities Design CAD File Submittal

A UDCF must be submitted to Colorado Springs Utilities prior to or concurrent with any application for water or wastewater plan review or service extension design is initiated. The file shall be submitted at www.csu.org complete with the submittal form (see Section 3.6.K).

The digital file submittal must contain the appropriate data to perform CAD based system design and analysis on new service system extensions (see Utility Design CAD File Recommended Feature Data in Section 3.6.L). Single-Family-Residential Projects contain most of the features on the Water Construction Plan. Commercial, Multi-family and industrial Projects include the features from the Utility Service Plan.

The submitted (.dwg) file is to be defined by the GIS coordinate system, which is the Colorado State Plane Coordinate system, Central Zone, North American Datum of 1983 (NAD 83/86), using the National Geodetic

Vertical Datum of 1929 (NGVD 1929). Otherwise, the information below must accompany the submittal:

- A combined scale factor (grid and sea level)
- An average elevation (NGVD 29)
- The location of the point about which scaling should take place
- Information on deviation from Grid North
- Any other necessary translation/transformation information required to convert to the GIS coordinate system.

The submitted (.dwg) file must contain all applicable feature elements listed in Section 3.6.L. Feature elements must be in model space. No XREF data links are allowed. XREF files need to be bound to a single file. Multiple zipped files will not be accepted.

The features shall be placed on separate layers. The layer organization delineated in in Section 3.6.L shall be followed. Single-Family-Residential subdivision Projects shall include pertinent elements checked under the "Residential" column. All other development types (Commercial, Multi-Family, industrial and mobile home parks, Public works, and state highway) shall require that the CAD file include pertinent feature types checked under the column titled "All Others." On Single-Family-Residential Projects, the UDCF will contain the same feature data as the Water Service plan and on commercial and multifamily Projects the UDCF will contain the same feature data as the Site plan or the Site/utility plan.

ADG will contact the submitting agent to resolve any issues. Ultimately, the Customer is responsible for the content of the file. Missing or inaccurate data may affect the timing of design or Construction schedules. The Customer will be responsible for submitting an amended file should any of the project's feature details change after the time of the initial submittal but prior to completion of the use of the data by water, gas, and electric designers. The online application was designed to make iterative resubmission of data more convenient for the Colorado Springs Utilities Customers.

When a CAD file is not generated by the Design Engineer a hard copy plan shall be submitted showing the same level of detail as described above. Additional time will be required to process hard copy plans as system designers will have to spend time manually digitizing key features to complete their work.

3.6 Signature Blocks, Forms, and Notes

3.6.A Colorado Springs Utilities Signature Blocks

Link to AutoCAD

COLORADO SPRINGS UTILITIES WASTEWATER PLAN DESIGN APPROVAL
PROJECT NUMBER: _____ WORK ORDER NUMBER: _____ CSU SHEET ____ OF ____
APPROVAL EXPIRES ONE (1) YEAR FROM THE DATE ABOVE AND RESUBMITTAL OF THESE PLANS FOR REVIEW AND APPROVAL IS REQUIRED IF CONSTRUCTION DOES NOT BEGIN DURING THIS PERIOD.

COLORADO SPRINGS UTILITIES WATER PLAN DESIGN APPROVAL
PROJECT NUMBER: _____ WORK ORDER NUMBER: _____ CSU SHEET ____ OF ____
APPROVAL EXPIRES ONE (1) YEAR FROM THE DATE ABOVE AND RESUBMITTAL OF THESE PLANS FOR REVIEW AND APPROVAL IS REQUIRED IF CONSTRUCTION DOES NOT BEGIN DURING THIS PERIOD.

COLORADO SPRINGS UTILITIES NONPOTABLE WATER PLAN DESIGN APPROVAL
PROJECT NUMBER: _____ WORK ORDER NUMBER: _____ CSU SHEET ____ OF ____
APPROVAL EXPIRES ONE (1) YEAR FROM THE DATE ABOVE AND RESUBMITTAL OF THESE PLANS FOR REVIEW AND APPROVAL IS REQUIRED IF CONSTRUCTION DOES NOT BEGIN DURING THIS PERIOD.

COLORADO SPRINGS UTILITIES UTILITY SERVICE PLAN DESIGN APPROVAL
PROJECT NUMBER: _____ CSU SHEET ____ OF ____
APPROVAL EXPIRES ONE (1) YEAR FROM THE DATE ABOVE AND RESUBMITTAL OF THESE PLANS FOR REVIEW AND APPROVAL IS REQUIRED IF CONSTRUCTION DOES NOT BEGIN DURING THIS PERIOD.

3.6.B Owner/Developer Signature Block

Link to AutoCAD

OWNER/DEVELOPER PLAN APPROVAL

THE UNDERSIGNED OWNER/DEVELOPER AGREES THAT THEY SHALL, AT THEIR EXPENSE, BE SOLELY RESPONSIBLE FOR 1) THE INSTALLATION OF THE PROPOSED UTILITY INFRASTRUCTURE IN ACCORDANCE WITH THESE PLANS, AND 2) ALL DAMAGES AND DEFECTS ARISING FROM, OR RELATED TO, THE INSTALLATION, MAINTENANCE OR OPERATION OF THE PUBLIC UTILITY INFRASTRUCTURE FROM THE DATE OF PRELIMINARY ACCEPTANCE FOR A PERIOD OF TWO YEARS, OR UNTIL FINAL ACCEPTANCE, WHICHEVER IS LATER.

THE UNDERSIGNED UNDERSTANDS THAT ALL PRIVATE UTILITY INFRASTRUCTURE, AS INDICATED ON THESE PLANS, SHALL REMAIN THE PROPERTY OF THE OWNER AND SHALL BE MAINTAINED BY THE OWNER, AS REQUIRED BY *COLORADO SPRINGS UTILITIES' LINE EXTENSION AND SERVICE STANDARDS.*

☐ **PUBLIC WATER MAIN PROPOSED** ☐ **PUBLIC WASTEWATER MAIN PROPOSED** ☐ **PRIVATE WATER SERVICE LINE (<4") AND/OR PRIVATE WASTEWATER SERVICE LINE (<8")**

☐ **PRIVATE WATER MAIN PROPOSED** ☐ **PRIVATE WASTEWATER MAIN PROPOSED**

SIGNED: _____ DATE: _____
OWNER/DEVELOPER

_____
OWNER/DEVELOPER (PRINT NAME)

DBA: _____

ADDRESS: _____

_____

PHONE: _____

EMAIL: _____

3.6.C Fire Flow Information

Link to AutoCAD

BUILDING DATA

BUILDING SIZE (GROSS SQUARE FOOTAGE):
TYPE OF CONSTRUCTION:
LARGEST BUILDING SQUARE FOOTAGE:
REQ GPM FIRE FLOW:
REQ. MIN NUMBER HYDRANTS:
AVG. DIST. BETWEEN HYD:
MAX. HOSE LAY DIST.:
BUILDING SPRINKLED:

FIRE FLOW

ACCORDING TO CALCULATIONS REVIEWED BY COLORADO SPRINGS UTILITIES, THE THEORETICAL AVAILABLE FIRE FLOW AT EACH FIRE HYDRANT NODE UNDER MAXIMUM DAY DEMAND CONDITIONS WITH A 20 PSI RESIDUAL AND THE MAXIMUM STATIC PRESSURE AT BURY DEPTH (9') IS AS FOLLOWS (ACTUAL FIRE FLOW MAY VARY DUE TO VARIOUS PARAMETERS):

NODE	FIRE FLOW (GPM)	STATIC PRESSURE @ MDD[1] (PSI)	MAX STATIC PRESSURE @ BURY DEPTH[1,2] (PSI)

[1] THE MAXIMUM PRESSURE LISTED FOR EACH NODE DEFINES THE MAXIMUM DESIGN WORKING PRESSURE FOR MATERIAL SELECTION IN WATER LESS TABLE 2-2. IF THE MAXIMUM DESIGN WORKING PRESSURE IS GREATER THAN 177 PSI, PVC SHALL NOT BE USED.
[2] BURY DEPTH IS ASSUMED TO BE 9 FEET BELOW THE HYDRANT FLANGE ELEVATION.

3.6.D CSFD Signature Block

Link to AutoCAD

CSFD ACCEPTANCE

ALL FIRE HYDRANTS SHALL BE INSTALLED ACCORDING TO COLORADO SPRINGS UTILITIES' WATER LINE EXTENSION AND SERVICE STANDARDS.

THE NUMBER OF HYDRANTS AND HYDRANT LOCATIONS AS SHOWN ON THIS WATER PLAN ARE CORRECT AND ADEQUATE TO SATISFY THE FIRE PROTECTION REQUIREMENTS AS SPECIFIED BY THE CITY OF COLORADO SPRINGS FIRE DEPARTMENT.

SIGNED: _____
CSFD, DIVISION OF THE FIRE MARSHAL

CSFD PLAN REVIEW NO.: _____

NOTICE OF FIRE SERVICE LINE INTEGRITY TEST:

PRIOR TO ACCEPTANCE OF ANY FIRE SERVICE LINE BY THE COLORADO SPRINGS FIRE DEPARTMENT:

- ALL FIRE SERVICE LINES SHALL BE HYDROSTATICALLY TESTED AND FLUSHED PER COLORADO SPRINGS FIRE DEPARTMENT REQUIREMENTS
- ALL ACCEPTANCE TESTING OF WATER SUPPLY SYSTEMS FOR FIRE PROTECTION SHALL BE WITNESSED BY AN APPROVED COLORADO SPRINGS FIRE DEPARTMENT REPRESENTATIVE

PRESSURE TEST

PRESSURIZE THE FIRE SERVICE LINE FROM THE POINT OF CONNECTION AT THE MAIN TO THE POINT OF CONNECTION TO THE SPRINKLER SYSTEM AT 200 PSI, OR 50 PSI ABOVE STATIC PRESSURE FOR A MINIMUM OF 2 HOURS. THIS TEST IS BEST PERFORMED BEFORE COMPLETELY BACKFILLING SO THAT ALL JOINTS ARE EXPOSED.

FLUSH TEST

THE FIRE SERVICE LINE SHALL BE FLUSHED AT PER NFPA 24 "STANDARD FOR THE INSTALLATION OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES"

3.6.E Utility Grade Review Signature Block

Link to AutoCAD

UTILITY GRADE REVIEW

CENTERLINE LINE AND GRADE IS REVIEWED FOR CONFORMANCE TO STANDARDS TO ALLOW FOR THE DESIGN AND CONSTRUCTION OF UTILITY MAINS. DRAINAGE FACILITIES DESIGN HAS BEEN CHECKED BY THE DESIGN ENGINEER TO AVOID CONFLICTS WITH UTILITY MAINS. THIS IS NOT A CURB & GUTTER REVIEW AND THE DEVELOPER WILL BE RESPONSIBLE FOR ANY COST DUE TO DESIGN CHANGES PRIOR TO CURB & GUTTER REVIEW.
THIS REVIEW EXPIRES IN 180 DAYS.

SIGNED: _____ DATE: _____

3.6.F Plan Information Block

Link to AutoCAD

FIMS MAP NUMBER:
TAX SCHEDULE NO.:
PRESSURE ZONE:
MAX STATIC PRESSURE: XX PSI
UTILITY DESIGN CAD FILE NO.:
UAP FILE NO:
DEVELOPMENT PLAN NO.:
APPROVAL DATE:
PLAT REC. NO.:
PUBLIC UTILITY EASEMENT REC. NO:
NOTICE OF PRIVATE WASTEWATER SYSTEM REC. NO.:
NOTICE OF PRIVATE WATER SYSTEM REC. NO.:

3.6.G Water Plan Notes

Link to AutoCAD

WATER PLAN NOTES

THE CONTRACTOR SHALL NOTIFY COLORADO SPRINGS UTILITIES' INSPECTIONS OFFICE 719–668–4658 A MINIMUM OF 48 HOURS PRIOR TO THE START OF CONSTRUCTION.

GENERAL:

1. ALL CONSTRUCTION METHODS AND MATERIALS SHALL MEET *COLORADO SPRINGS UTILITIES' WATER LINE EXTENSION AND SERVICE STANDARDS* (*WATER LESS*).
2. THE CONTRACTOR SHALL OBTAIN LOCATES PRIOR TO ANY EXCAVATION.
3. COLORADO SPRINGS UTILITIES DOES NOT GUARANTEE THE ACCURACY OF LOCATIONS OF EXISTING PIPELINES, HYDRANTS, VALVES AND SERVICE LINES. IF FIELD CONDITIONS ARE FOUND TO BE DIFFERENT THAN SHOWN ON THE PLANS, THE CONTRACTOR SHALL NOTIFY THE INSPECTOR AND THE ENGINEER OF RECORD IMMEDIATELY.
4. NO TREES OR STRUCTURES ARE PERMITTED WITHIN FIFTEEN FEET (15') OF A WATER MAIN.
5. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO ANY UTILITY FACILITIES AS A RESULT OF HIS ACTIONS. THE CONTRACTOR SHALL MAKE ALL THE REQUIRED REPAIRS IMMEDIATELY TO THE SATISFACTION OF COLORADO SPRINGS UTILITIES.
6. ALL FIELD STAKING SHALL COMPLY WITH THE *WATER LESS*.
7. THE CONTRACTOR SHALL MAKE THEIR BEST EFFORT TO ENSURE THAT WATER SERVICE TO ADJACENT PROPERTIES IS MAINTAINED DURING CONSTRUCTION.
8. CORROSION PROTECTION MEASURES SHALL COMPLY WITH THE *WATER LESS*.
9. NO SERVICE TAPS WILL BE ALLOWED UNTIL THE MAIN IS EXTENDED TO THE NEXT MAIN–LINE VALVE.
10. NO SERVICE TAPS SHALL BE MADE UNTIL AUTHORIZATION HAS BEEN GRANTED BY THE COLORADO SPRINGS UTILITIES' INSPECTOR.
11. ALL BENDS SHALL BE FIELD STAKED PRIOR TO CONSTRUCTION AND THE STATIONING ON THE FIELD STAKES SHALL MATCH THE STATIONING ON THE PLANS.
12. FIELD MODIFICATIONS TO A FIRE SERVICE LINE OR FIRE HYDRANT DESIGN OR LOCATION MAY NEED TO BE APPROVED BY THE DESIGN ENGINEER, COLORADO SPRINGS FIRE DEPARTMENT AND COLORADO SPRINGS UTILITIES, AS REQUIRED BY THE INSPECTOR.
13. REUSE OR SALVAGE OF ANY MATERIAL IS LEFT TO THE DISCRETION OF THE COLORADO SPRINGS UTILITIES INSPECTOR.
14. ALL TRENCH BACKFILL AND COMPACTION SHALL BE IN ACCORDANCE WITH SECTION 206 OF THE *CITY OF COLORADO SPRINGS STANDARD SPECIFICATIONS MANUAL*.
15. ALL WATER SERVICE LINES SHOULD ENTER THE BUILDING WITHIN 5 FEET OF AN EXTERIOR WALL. EXPOSED WATER PLUMBING SHALL BE MINIMIZED INSIDE THE BUILDING PRIOR TO THE WATER METER AND/OR APPROVED BACKFLOW PREVENTION ASSEMBLY OR METHOD.

WATER PROJECT - SPECIFIC NOTES

	APPLICABLE	NOT–APPLICABLE	
1.	☐	☐	ANY EXISTING STUBS AND APPURTENANCES THAT WILL NOT BE USED SHALL BE REMOVED AND REPLACED WITH AN ACCEPTABLE SECTION OF MAIN AT THE EXPENSE OF THE CONTRACTOR.
2.	☐	☐	A CONNECTION TO AN EXISTING STUB IS PROPOSED. COLORADO SPRINGS UTILITIES DOES NOT GUARANTEE THE ACCURACY OF THE DEPTHS OR LOCATIONS OF EXISTING STUBS SHOWN ON ANY "AS–BUILT" DRAWINGS.
3.	☐	☐	A WATER STUB–OUT(S) IS/ARE PROPOSED. COLORADO SPRINGS UTILITIES DOES NOT GUARANTEE THAT THE DESIGN OR INSTALLATION OF THE PROPOSED WATER STUB–OUT WILL MEET FUTURE DEVELOPMENT NEEDS.
4.	☐	☐	A WATER QUALITY PLAN HAS BEEN APPROVED FOR THIS PROJECT

3.6.H Utility Service Plan Notes

Link to AutoCAD

UTILITY SERVICE PLAN NOTES

THE CONTRACTOR SHALL NOTIFY COLORADO SPRINGS UTILITIES' INSPECTIONS OFFICE 719–668–4658 A MINIMUM OF 48 HOURS PRIOR TO THE START OF CONSTRUCTION.

GENERAL:

1. ALL CONSTRUCTION METHODS AND MATERIALS SHALL MEET *COLORADO SPRINGS UTILITIES' WASTEWATER AND WATER LINE EXTENSION AND SERVICE STANDARDS (WATER/WASTEWATER LESS).*
2. COLORADO SPRINGS UTILITIES DOES NOT GUARANTEE THE ACCURACY OF LOCATIONS OF EXISTING PIPELINES, MANHOLES, HYDRANTS, VALVES AND SERVICE LINES. IF FIELD CONDITIONS ARE FOUND TO BE DIFFERENT THAN SHOWN ON THE PLANS, THE CONTRACTOR SHALL NOTIFY THE INSPECTOR AND THE DESIGN ENGINEER IMMEDIATELY.
3. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO ANY UTILITY FACILITIES AS A RESULT OF HIS ACTIONS. THE CONTRACTOR SHALL MAKE ALL THE REQUIRED REPAIRS IMMEDIATELY TO THE SATISFACTION OF COLORADO SPRINGS UTILITIES.
4. ALL FIELD STAKING SHALL COMPLY WITH THE *WATER/WASTEWATER LESS.*
5. CORROSION PROTECTION MEASURES SHALL COMPLY WITH THE *WATER/WASTEWATER LESS.*
6. FINAL LOCATION OF ALL WASTEWATER AND WATER SERVICES SHALL BE APPROVED IN THE FIELD BY THE COLORADO SPRINGS UTILITIES INSPECTOR.
7. ALL TRENCH BACKFILL AND COMPACTION SHALL BE IN ACCORDANCE WITH SECTION 206 OF THE *CITY OF COLORADO SPRINGS STANDARD SPECIFICATIONS MANUAL AND SECTION 5.18 OF THE WATER LESS.*

WASTEWATER:

1. SERVICE STUBS SHALL BE INSTALLED A MINIMUM OF SEVEN FEET (7') INTO THE PROPERTY, UNLESS OTHERWISE SHOWN, AND THE END OF THE STUB SHALL BE MARKED WITH A 2"X4"X12' STEEL OR WOODEN POST.
2. SERVICES SHALL BE CONNECTED A MINIMUM OF FIVE FEET (5') FROM THE OUTSIDE EDGE OF ANY MANHOLE ON THE MAIN LINE AND SHALL MAINTAIN TWO FEET (2') OF SEPARATION BETWEEN TAPS CENTER TO CENTER.
3. ALL CLEANOUTS SHALL BE THE SAME SIZE AS THE SERVICE LINE.
4. THE CONTRACTOR SHALL NOTIFY EL PASO COUNTY DEPARTMENT OF HEALTH AND ENVIRONMENT WHEN ANY SEPTIC TANK IS TO BE ABANDONED AND PAY ALL FEES NECESSARY TO OBTAIN A PERMIT.

WATER:

1. SERVICE STUBS SHALL BE INSTALLED WITH THE CURB STOP AT OR NEAR PROPERTY LINE AND SHALL NOT BE INSTALLED WITHIN DRIVEWAYS OR SIDEWALKS (SEE DETAIL DRAWING B2–3).
2. SERVICE TAPS SHALL BE MADE A MINIMUM OF THREE FEET (3') FROM THE BELL OR APPURTENANCE ON THE WATER MAIN. TAPS SHALL BE A MINIMUM OF THREE FEET (3') APART ON THE SAME SIDE OF THE WATER MAIN AND A MINIMUM OF ONE–AND–A–HALF FEET (1.5') WHEN TAPS ARE MADE ON OPPOSITE SIDES OF THE WATER MAIN.
3. ALL SERVICES FOR COMMERCIAL USE AND SOME RESIDENTIAL USES REQUIRE INSTALLATION OF A BACKFLOW PREVENTION ASSEMBLY IMMEDIATELY AFTER THE METER. THE BACKFLOW PREVENTION ASSEMBLY SHALL BE APPROVED BY THE FOUNDATION FOR CROSS–CONNECTION CONTROL AND HYDRAULIC RESEARCH OF THE UNIVERSITY OF SOUTHERN CALIFORNIA (USC–FCCCHR) AND INSTALLED IN ACCORDANCE WITH THIS LISTING. PLEASE REFERENCE THE WATER LINE EXTENSION STANDARDS FOR ADDITIONAL REQUIREMENTS.
4. ALL TAPS ON COLORADO SPRINGS UTILITIES WATER MAINS SHALL BE PERFORMED BY COLORADO SPRINGS UTILITIES. ALL OTHER TAPS SHALL BE PERFORMED BY THE CONTRACTOR.
5. ANY ABANDONED SERVICES MUST BE PHYSICALLY DISCONNECTED AT THE MAIN. ANY NECESSARY REPAIRS TO THE MAIN AND/OR SHUT DOWN OF THE TAPPING VALVE SHALL BE AS DIRECTED BY COLORADO SPRINGS UTILITIES.
6. ALL WATER SERVICE LINES SHOULD ENTER THE BUILDING WITHIN 5 FEET OF AN EXTERIOR WALL. EXPOSED WATER PLUMBING SHALL BE MINIMIZED INSIDE THE BUILDING PRIOR TO THE WATER METER AND/OR APPROVED BACKFLOW PREVENTION ASSEMBLY OR METHOD.
7. ALL HDPE WATER SERVICE LINES MUST EXTEND A MINIMUM OF 6 INCHES ABOVE THE FLOOR AND BE 90 DEGREES FROM THE FLOOR PLAN TO ALLOW FOR BRACING AND TRANSITION TO THE METER LOOP ASSEMBLY.

3.6.I Utilities Addressing Plan Checklist

FORM 1

Utilities Addressing Plan Check List

1 Name of the Utilities Addressing Plan

2 Name and address of the legal owner and/or manager of the project.

3 Name and address of the preparer of the Utilities Addressing Plan

4 Date of preparation

5 North arrow

6 Vicinity Map

7 Graphic scale

8 Delinate all lands to be conveyed or reserved for public use or reserved for the common use of all property owners in the proposed subdivision/project.

9 The dimensions of the exterior boundary of the proposed project, which must be the result of a boundary survey. All lines are to be annotated with a bearing and distance. All curved lines should be annotated with a minimum of three curve elements. Non-tangent curves should have a bearing reference (i.e., bearing to radius point or chord bearing).

10 The dimensions of all interior streets and lots. All lines are to be annotated with a bearing and distance. All curved lines should be annotated with a minimum of three curve elements. Non-tangent curve should have a bearing reference (i.e., bearing to radius point or chord bearing).

11 Lot and block numbers

12 Dimensions sufficient to clearly locate and define the extents of all easements to allow for the final design of the associated utilities. Side and rear lot easements may be described as text rather than graphical if a blanket statement is possible.

13 Names of the public or private streets or other public or private ways. Any private street name shall be clearly labeled "Private".

14 Area in square feet of each lot within the Utilities Addressing Plan.

15 Addressing is complete and legible (If Addressing is obtained from the Enumerator prior to UAP submittal. Note: This will not speed up the processing as SU will need to get verification from Enumerator that addressing is correct).

UAP ID #

Utilities Addressing Plan Name

Checked by:

Date:

NOTES:

1) Although not a requirement for the acceptance or approval of a UAP, in the instances of multi-family, commercial, or industrial developments where the plans for the development have progressed to the point of having final building locations and configurations, this plan may (at the discretion of the submitter) accompany the UAP submittal to assist the enumerator in assigning addresses to the project.
2) A final plat document prepared in accordance with City of Colorado Springs specifications will be acceptable as a UAP document.

3.6.J Utilities Addressing Plan Submittal Form

FORM 2

Colorado Springs Utilities

Utilities Addressing Plan Submittal Form

UAP Number _____ **Date** _____

Project Name: _____

Legal Description/Location: _____

_____

Submitted By: _____

Company Name: _____

Company Address: _____

_____

_____

_____

Contact Name: _____

Telephone: _____

Contact email address: _____

Resubmittal Date: _____ _____ _____

Processing Information

Received by: ☐ FIMS ☐ Dev Services Date Rec'd _____

Entry/Check by: _____ Date/Time _____

Notes:

Customer Copy of Addressing ☐ pickup ☐ mail Date: _____

Utility Notification ☐ Date: _____

Rev 2.2 ** 11/01/2008

3.6.K Utility Design CAD File Submittal Form

FORM 3

Colorado Springs Utilities

Utility Design CAD File Submittal Form

UDCF Number _____ **Date** _____

UAP Number	
Project Name:	
Legal Description/Location:	
Recorded Plat (Y/N)	
Submitted By:	
Company Name:	
Company Address:	
Contact Name:	
Telephone:	
Contact email address:	

Resubmittal Date:			

Acknowledgements

By submitting the attached Utility Design CAD File (UDCF) the contact person (CUSTOMER) acknowledges that he/she is acting on behalf of the named organization and that he/she or the named organization has the **ownership rights** to the data contained in the attached CAD file.

The CUSTOMER acknowledges the UDCF submitted to the City and SU herein are to be made available to the desktops of those SU employees performing system modeling and design work based on the UDCF and that this is to be accomplished using a high-speed communications network, personal computers, CAD and geographic information systems software.

The CUSTOMER grants to the City and SU the right to use the data submitted to update FIMS' database and other facilities databases and records. SU may at a later date have the FIMS database and other Utilities databases and / or records, registered with the U.S. Copyright Office.

The City and SU acknowledge that the data contained in the UDCF is design data and that the CUSTOMER is not responsible for any changes that occur in the construction phases of the named project.

Ver 2.1 ** 10/2008

3.6.L Utility Design CAD File Feature Data

Table A

Recommended Feature Data	Residential	All Others	Recommended CAD Layer Name
Lot Lines	X	X	xx-lots-ln
Project Exterior Boundary Lines	X	X	xx-sub-bdy
Street Lines	X	X	xx-row-street
Easements	X	X	**see list below**
			xx-esmt-access
			xx-esmt-avig
			xx-esmt-drain
			xx-esmt-pub
			xx-esmt-scenic
			xx-esmt-trail
			xx-esmt-util
			xx-easmt-util-gas
			xx-easmt-util-elec
			xx-easmt-util-water
			xx-easmt-util-ww
			xx-esmt-util_drain
			xx-esmt-util_pub
			xx-esmt-util-misc
Building Footprints		X	xx-building-ftprnt
Water Lines	X	X	xx-water-line
Water Services	X	X	xx-water-serv
Water Valves		X	xx-water-valve
Fire Hydrants	X	X	xx-water-fh
Gas main lines (proposed)	X	X	pp-gas-line
Gas service lines (proposed)	X	X	pp-gas-stub
Electric lines (proposed)	X	X	pp-elec-line-ug (underground)
			pp-elec-line-ug (overhead)
Transformer Location		X	pp-elec-tr_pad
Elec sevice attachment points (proposed)		X	pp-elec-serv_att_pt
Secondary Electric		X	xx-electric-line-ug (overhead)
			xx-electric-line-ug (underground)
Sanitary Sewer Lines	X	X	xx-ww-line
Sanitary Sewer Manholes	X	X	xx-ww-mh
Sanitary Sewer Services	X	X	xx-ww-serv
Underdrains	X	X	xx-drain-udline
Storm Sewer Lines	X	X	xx-drain-line
Storm Sewer Inlets (Catch Basins)	X	X	xx-drain-catch
Curb Lines	X	X	xx-curb-back
			xx-curb-fl
			xx-curb-lip
Hard Surfaces (Paved Areas)		X	**see list below**
			xx-alley-pvd
			xx-drain-chan-lnd
			xx-drain-cross
			xx-drive-pvd

Recommended Feature Data	Residential	All Others	Recommended CAD Layer Name
			xx-parking-pvd
			xx-sidewalk-ln
			xx-street-pvd
			xx-trail-rec
Private Lighting		X	xx-landscape-light
Private Signs		X	xx-sign-post
Grading / Contours		X	xx-cont-index
			xx-cont-int
Project Phase Lines		X	xx-devel-phase
Existing Adjacent Utilities (non SU)		X	**see list below**
			xx-phone-serv
			xx-phone-line-oh (overhead)
			xx-phone-line-ug (underground)
			xx-phone-mh
			xx-phone-pole
			xx-phone-riser
			xx-phone-vault
			xx-pipeline-oh (overhead)
			xx-pipeline-ug (underground)
			xx-tower-loc
			xx-catv-line-oh (overhead)
			xx-catv-line-ug (underground)
			xx-catv-riser
			xx-fibop-line
			xx-fibop-box
Annotation			
Lot Dimensions	X	X	xx-lot-anno
Lot/ Block Numbers	X	X	xx-lots-anno
Addresses	X	X	xx-building-add

3.7 Callouts and Abbreviations

3.7.A Callouts

Link to AutoCAD

CONSTRUCTION NOTES TO BE USED FOR ALL WATER PLANS:

TEE
STA 0+00.00 ELEV = 0000.00
XX" x XX" TEE W/ CTRB = XX CY XX" VALVE (CL____) N,S,E,W. TIE TO TEE W/ MJ RSNTS, XX" CPLG (INS.) N,S,E,W,

CROSS
STA 0+00.00 ELEV = 0000.00
XX" x XX" CROSS. XX" VALVES (CL____) N,S,E,W. TIED TO CROSS W/ MJ RSNTS, XX" VALVES (CL ___) N,S,E,W., TIED TO CROSS W/ MJ RSNTS. , XX" CPLG (INS) N,S,E,W.

HYDRANT
STA 0+00.00 OFFSET = XX' N,S,E,W ELEV = 0000.00
NODE "X"
XX" x XX" HYDRANT TEE & ( ) BURY HYDRANT ASSY
W/ CTRB(S) = XX CY & CRA = XX CY, FLG. ELEV = 0000.00
XXX PSI, XXXX GPM
W/ MJ RSNTS

BEND
STA 0+00.00 ELEV= 0000.00
X" x XX° (HORIZ. OR VERT.) BEND W/ CTRB = XX CY W/ MJ RSNTS (ACT. DEFL. XX°XX'XX")

CROSSING
STA 0+00.00 ELEV= 0000.00
PROPOSED XX" WL CROSSES (UNDER/OVER)
(EXISTING/PROPOSED) XX" (UTILITY) (TOP, BOP) ELEV= 0000.00
CLEARANCE = XX.XX'

VALVE
STA 0+00.00 ELEV = 0000.00
XX" VALVE (CL_____) W/ MJ RSNTS & CRA = XX CY

REDUCER
STA 0+00.00 ELEV= 0000.00
XX" x XX" MJ X MJ RED.

COUPLING
STA 0+00.00 ELEV= 0000.00
XX" CPLG (STR) OR (INS) OR (RED)

TAP
STA 0+00.00 ELEV= 0000.00
XX" x XX" TAP W/ (INSUL. FLG. KIT) CTRB = XX CY

GRADE BREAK
STA 0+00.00 ELEV = 0000.00
DEFL. BRK.

OFFSET
STA 0+00.00 ELEV= 0000.00
XX" x XX" MJ x MJ OFFSET.

3.7.B Abbreviations

Link to AutoCAD

ABBREVIATIONS

(A)	ANODE
ACT	ACTUAL
BFV	BUTTERFLY VALVE
BOP	BOTTOM OF PIPE
BOV ASSY	BLOWOFF VALVE ASSEMBLY
C&G	CURB AND GUTTER
CB	CATCH BASIN
CMP	CORRUGATED METAL PIPE
CPLG (INS), (RED), (STR), (DEFL)	COUPLING (INSULATING),(REDUCING), (STRAIGHT), (DEFLECTION)
CRA	CONCRETE REVERSE ANCHOR
CTRB	CONCRETE THRUST REACTION BLOCK
DEFL	DEFLECTION
DIP	DUCTILE IRON PIPE
ELEV	ELEVATION
EOP	EDGE OF PAVEMENT
ESMT	EASEMENT
EX	EXISTING
FL	FENCE
FLG	FLOWLINE
FO	FLANGE
FX	FIBER OPTIC LINE
G	GAS LINE
GPM	GALLONS PER MINUTE
GRD BRK	GRADE BREAK
HYD ASSY	INCLUDES FIRE HYDRANT, LATERAL, VALVE, TIE RODS, AND REVERSE ANCHOR.
HDPE	HIGH DENSITY POLYETHLENE PIPE
INV	INVERT ELEVATION
MJ	MECHANICAL JOINT
N,S,E,W	NORTH,SOUTH,EAST,WEST
OHE	OVERHEAD ELECTRIC
PH	POTHOLE
PL	PROPERTY LINE
PP	POWER POLE
PSI	POUNDS PER SQUARE INCH
PUPS	12" OR SMALLER, USE PLAIN END BY PLAIN END, 30" LENGTH, 16" OR LARGER USE PLAIN END BY PLAIN END,24" LENGTH
PR	PROPOSED
PVC	POLYVINYL CHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
RED	REDUCER
ROW	RIGHT-OF-WAY
RSTNT	MJ RESTRAINT (i.e. MEGALUG)
SJ	SLIP JOINT
STA	STATION
STM	STORM SEWER
SDWK	SIDEWALK
TOP	TOP OF PIPE
(TS)	TEST STATION
UGE	UNDERGROUND ELECTRIC
WALL	RETAINING WALL, WALL (OTHER)
WL	WATER LINE
WW or SS	WASTEWATER
.333	4" ABOVE EX TOP OF CURB OR GROUND (FIRE HYDRANT)

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CHAPTER 4

Approved Materials

4.1 General

The purpose of Chapter 4 of these Water Line Extension & Service Standards (*Water LESS*) is to establish the material Specifications for pipe, pipe fittings, hydrants, and appurtenances used within the Colorado Springs Utilities Water System (including Private systems served by Colorado Springs Utilities.

All material to be used within the Colorado Springs Utilities Water System shall be designed and constructed in accordance with these *Water LESS*, and all applicable industry standards, such as AWWA, ANSI, ASTM, etc.

All materials shall conform to these materials Specifications and to all limitations on acceptable make, style, and Approved Manufacturers. For actual detailed material specification of an approved product contact Colorado Springs Utilities. Safety Data Sheets (SDS) shall be supplied with all materials when required.

Note that some technical information, weights, and dimensions vary with each manufacturer and may be slightly different than what is listed in this Chapter**.**

4.2 Materials and Testing

This Chapter of approved materials does not include all materials approved by Colorado Springs Utilities due its large inventory of small parts; therefore, any materials not listed must first be verified that it has been tested and approved by Colorado Springs Utilities, before being used in the Water Distribution System.

If Colorado Springs Utilities deems that a new water industry product or material has some merit, it will establish the criteria for testing or evaluating the product. New products or materials will be installed and tested by Colorado Springs Utilities, who reserves the right to accept or reject any product or material regardless of the test results.

All pipe and materials utilized in the Water Distribution System shall be Ductile Iron Pipe Sized (DIPS), Cast Iron Pipe size (CI) or Copper Tube Sized (CTS). Any other proposed material must be evaluated and accepted by Colorado Springs Utilities prior to use.

Where no manufacturer is specified, any product that meets the specification may be used.

All Materials used in the Water Distribution System must comply with *NSF 61* regulations. All pipe, fittings, fixtures, solder and flux including all valves, fittings, hydrants and appurtenances or parts made from a brass or bronze component used in the Potable Water System for permanent or temporary water supply for human consumption shall be constructed of a *UNS* Copper Alloy or "No-Lead Brass" and shall be in compliance with the *Safe Drinking Water Act*, *Federal Public Law 111-380*, effective 1-04-2014.

4.3 Pressure Classes

Water Main materials and thicknesses shall meet the internal pressure requirements for maximum static pressure and occasional surge conditions dictated in the table below.

Reoccurring surge should be evaluated in areas where the operation of pumps and or valves causes frequent surges in the Water System. Materials and thickness shall also be designed for trench loads including earth loads and any anticipated live loads. Additional factors that should be considered when choosing materials include the presence of Contaminants, geotechnical concerns, corrosivity of the soil, and any other conditions which may affect material longevity.

Table 2-2 shall be used for determining the appropriate pipe material based on Maximum Static Pressure and Occasional Surge Pressure for the proposed Water System (calculations were made in accordance with *AWWA C150, C900, C906*, and *ASTM F714)*. See Section 2.6.B for design information.

Definitions applying to this Chapter 4:

Pressure Class: The design capacity to resist Working Pressure.

Working Pressure: Maximum internal pressure exerted under normal operating conditions and the Manufacturer tested psi rating of a pipe, valve or fitting for use in a Water System.

Surge Pressure: Internal pressure in excess of the Working Pressure caused by rapid changes in pipeline flow velocity also includes Occasional Surge Pressure.

Flanges
All flanges, unless otherwise specified, will be *Class 125/ANSI 150* or *Class 250 /ANSI 300* per these *Water LESS*.

Valves
Due to high pressures in the Colorado Springs Utilities Water Distribution System, all valves shall be rated for a minimum Working Pressure of 250 psi. At times this will necessitate the use of a class 250 valve body with an ANSI 150 bolt hole pattern flange.

4.4 Water Main Materials

4.4.A Pipe Bedding

4.4.A.1 Well Graded Sand

General

The bedding material shall be a clean, non-corrosive, well-graded sand or other approved material as determined by the Inspector. The well-graded sand shall have the gradation limit as outlined in Table 5-1 when tested by means of laboratory sieves.

4.4.B Pipe

4.4.B.1 Ductile Iron Pipe - Slip Joint

Approved Manufacturer(s): N/A



General: All ductile iron pipe shall be manufactured in accordance with *AWWA C151*, with the following additional requirements or exceptions for slip joint pipe:

Size(s): This specification shall cover ductile iron pipe in 4, 6, 8, 12, 16, 20, 24, 30, 36 and 42-inch nominal diameters. Note that 3, 10 and 18 inch pipe sizes are not allowed for use in Colorado Springs Utilities Water System.

Pressure Class: Pipes 4 inch through 24 inch shall conform to pressure class 350 as defined in *AWWA C150* and *C151*, Pressure Class for pipes greater than 24 inch shall be a minimum pressure class 250 or calculated utilizing the Working Pressure and a Surge Pressure of 1.5 times maximum static pressure per *AWWA C150* if pressure is higher than 250. Larger DIP pipe shall be manufactured true round.

Pipe is available with thicknesses greater than Pressure Class 350. Higher pressure class pipe will be required when Colorado Springs Utilities or the Design Engineer determines that internal pressure, excessive dead load, or other conditions warrant increased wall thickness.

Specifications:
Joint Type. "Push-on single gasket" type conforming to applicable requirements of *AWWA C111* Where flanged fittings are used, the lowest nominal thicknesses shall meet *ANSI/AWWA C115/A21.15*. Pipe with grooved and shouldered joints may be used only at the discretion of Colorado Springs Utilities and in accordance to *ANSI/AWWA C606*.

Pipe Length. Pipe furnished under this specification shall have normal laying lengths of either 18 feet or 20 feet.

Material Strength. Iron used in the manufacture of pipe furnished under this specification shall be grade 60/42/10:
Minimum tensile strength: 60,000 psi
Minimum yield strength: 42,000 psi
Minimum elongation: 10%

Cement Mortar Lining. Pipe furnished under this specification shall have standard thickness cement mortar linings in accordance with *AWWA C104/A21.4*.

Installation:
Pipe Lubricant. Joint lubricant may be supplied by the pipe manufacturer or purchased separately. Joint lubricant shall be non-toxic and water-soluble and meet current *EPA* and *NSF* Standards.

4.4.B.2 Ductile Iron Pipe Restrained Joint

Approved Manufacturer(s):



- **US Pipe – HDSS**
- **McWane Ductile – TR Flex or Thrust-Lock**
- **American – Flex-Ring**

General: All ductile iron restrained joint pipe shall be manufactured in accordance with *AWWA C151*, with the following additional requirements for restrained joint pipe:

Size(s): This specification shall cover ductile iron pipe in 4, 6, 8, 12, 16, 20, 24, 30, 36, 42, 48, 54, 60 and 64-inch nominal diameters.

Specifications:
Joint Type. "Restrained push-on single gasket" type conforming to applicable requirements of *AWWA C111*.

Pressure Class: Pipes 4 inch thru 24 inch shall conform to pressure class 350 as defined in *AWWA C150* and *C151*. Pressure Class for pipes greater than 24 inch shall be a minimum pressure class 250 or calculated utilizing the Working Pressure and a Surge Pressure of 1.5 times maximum static pressure per *AWWA C150* if pressure is higher than 250.

Pipe Length. Pipe furnished under this specification shall have normal laying lengths of either 18 feet or 20 feet.

Material Strength. Iron used in the manufacture of pipe furnished under this specification shall be grade 60/42/10:

Minimum tensile strength: 60,000 psi
Minimum yield strength: 42,000 psi
Minimum elongation: 10%

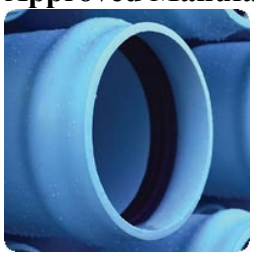
Cement Mortar Lining. Pipe furnished under this specification shall have standard thickness cement mortar linings in accordance with *AWWA C104/A21.4*.

Bell Type Restrained Joint. Bell Type Restrained Joint Pipe **s**hall incorporate an MJ type socket with an MJ restraint.

Installation:
Pipe Lubricant. Joint lubricant shall be supplied by the pipe manufacturer or purchased separately. Joint lubricant shall be non-toxic and water-soluble and meet current *EPA* and *NSF* Standards.

4.4.B.3 Polyvinyl Chloride (PVC) C900 DR 14 Pressure Pipe

Approved Manufacturer(s):



- **Diamond Plastics Corporation** - Diamond PVC Pipe
- **JM Eagle Manufacturing -** Blue Brute
- **Vinyltech**
- **Westlake Pipe & Fittings**
- **Pipelife Jet Stream**

General: All PVC pipe shall be manufactured in accordance with *AWWA C900*, with the following additional requirements or exceptions:

Size(s): This specification shall cover PVC pipe in 4, 6, 8, 12, 16, 20 and 24-inch nominal diameters with equivalent Cast Iron Outside Diameters (CIOD).

Pressure Class: Pipe shall be Pressure Class 305 (DR-14),
(Factory Mutual (FM) rating = 200 psi)
Note: DR-14 C900 PVC pipe is to be used only to 180 psi in the Colorado Springs Utilities Water System.

Material(s): PVC Pipe materials shall be manufactured in accordance with *AWWA C900*, made from class 12454 A or 12454 B virgin compounds as defined in *ASTM D1784*. All compounds shall qualify for a rating of 4000 psi for water at 73.4° F (23° C) per the requirements of *PPI TR-3* and shall be *NSF 61* approved.

Specifications:
Joint Type. Slip joints shall be made using an integral bell with an elastomeric gasket push-on type joint or using machined couplings of a sleeve type with rubber ring gaskets and machined pipe ends to form a push-on type joint. Elastomeric Gaskets shall conform to *ASTM F477*. **NOTE:** Pipelife Jet Stream pipe has a deeper bell; home line must be adjusted when using another manufacturer's pipe.
Pipe Length. Each length of pipe will be a standard laying length of 20 feet. Random lengths shall not be acceptable, unless approved by the Inspector.
Dimensions (Average) Cast Iron Sized (CIOD)

Nominal Pipe Size (In.)	Outside Dia. (In.)	Inside Dia. (In.)
4"	4.80	4.07
6"	6.90	5.86
8"	9.05	7.68
12"	13.20	11.20
16"	17.40	16.15
20"	21.60	20.05
24"	25.80	23.95

Color(s): Blue-Potable
Purple- Nonpotable

Installation:
Pipe Lubricant**.** Joint lubricant shall be supplied by the pipe manufacturer or purchased separately. Joint lubricant shall be non-toxic and water-soluble and meet current *EPA* and *NSF* Standards.

Note: C909 pipe is not accepted in Colorado Springs Utilities' Water Distribution System.

4.4.B.4 Polyvinyl Chloride (PVC) C900 DR 18 Pressure Pipe

(ONLY ALLOWED WITH COLORADO SPRINGS UTILITIES APPROVAL PREFERENCE IS C900 DR14 PVC PIPE)

Approved Manufacturer(s).



- **Diamond Plastics Corporation**
- **JM Eagle Manufacturing** Big Blue
- **Westlake Pipe & Fittings**
- **Northern Pipe Products**

General:
All PVC pipe shall be manufactured in accordance with *AWWA C900*, with the following additional requirements or exceptions:

Size(s): This specification shall cover PVC pipe in 16, 20 and 24 -inch nominal diameters with equivalent Cast Iron Outside Diameters (CIOD).

Pressure Class: PVC 16-24 inch pipe shall be Class 235 (DR-18**)**
Note: DR-18 C900 PVC pipe is to be used only to 180 psi in the Colorado Springs Utilities Water System.

Material(s): PVC Pipe materials shall be manufactured in accordance with *AWWA C900* and made from class 12454 A or 12454 B virgin compounds as defined in *ASTM D1784*. All compounds shall qualify for a rating of 4000 psi for water at 73.4° F (23° C) per the requirements of *PPI TR-3* and shall be *NSF 61* approved.

Specifications:
Joint Type. Pipe joints shall be made using an integral bell with an elastomeric gasket push-on type joint or using machined couplings of a sleeve type with rubber ring gaskets and machined pipe ends to form a push-on type joint. Elastomeric Gaskets shall conform to *ASTM F477*.
Pipe Length. Each length of pipe will be a standard laying length of 20 feet. Random lengths shall not be acceptable, unless approved by the Inspector.

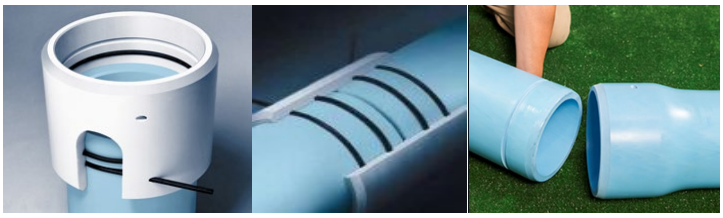
Pipe Dimensions. (Average) 235 PSI (DR18)

Pipe Size (In.)	Outside Dia. (In.)	Nom. Inside Dia. (In.)
16”	17.40	15.35
20”	21.60	19.06
24”	25.80	22.76

Color(s): Blue-Potable Water
Purple- Nonpotable Water

Installation:
Pipe Lubricant. Joint lubricant shall be supplied by the pipe manufacturer and approved by Colorado Springs Utilities. Joint lubricant shall be non-toxic and water-soluble and meet current *EPA* and *NSF* Standards.

4.4.B.5 Restrained Joint Polyvinyl Chloride (PVC) DR 14 Pressure Pipe



Approved Manufacturer(s):

- **Westlake -** Certa-Lok C900/RJ or RJIB PVC restrained joint municipal water pipe. DR14 (305 psi)

General: Restrained joint PVC pipe may be used for open trench and casing pipe applications only. Absolutely no field bending may be applied to PVC piping. All PVC pipe shall be manufactured in accordance with *AWWA C900*, with the following additional requirements or exceptions:

Size(s): This specification shall cover restrained joint DR 14 PVC pipe in 4, 6, 8 and 12-inch nominal diameters with cast iron equivalent outside diameters.

Pressure Class: Pipe shall be Pressure Class 305 (DR-14) per manufactured in accordance with *AWWA C900*. Note: DR-14 C900 PVC pipe is to be used only to 180 psi in the Colorado Springs Utilities Water System.

Material:
PVC Pipe materials shall be made from class 12454 A or 12454 B virgin compounds as defined in *ASTM D1784*. All compounds shall qualify for a rating of 4000 psi for water at 73.4° F (23° C) per the requirements of *PPI TR3* and shall comply with *NSF 61* for Potable Water Service.

Specifications:
Joint Type. Pipe joints shall be non-metallic restrained joints designed with precision-machined grooves on the pipe and, if applicable, in the coupling. When aligned, a nylon spline is inserted, resulting in a fully circumferential restrained joint that locks the pipe and coupling (RJ) or bell and spigot (RJIB) together. A flexible elastomeric seal (O-ring) in the coupling (RJ) or pipe bell (RJIB) provides a hydraulic pressure seal.
Elastomeric Gaskets shall conform to *ASTM F477*.

Pipe Length. Each length of pipe will be a standard laying length of 20 feet. Random lengths shall not be acceptable, unless approved by the Inspector.

Nominal Pipe Size (In.)	Outside Dia. (In.)	Inside Dia. (In.)
4”	4.80	4.11
6”	6.90	5.91
8”	9.05	7.75
12”	13.20	11.31

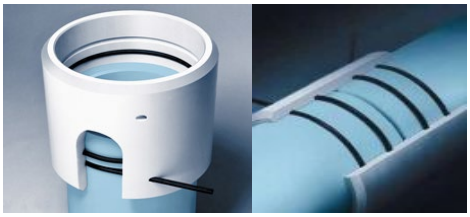
Color. Blue

Installation:

Pipe Lubricant. Joint lubricant shall be supplied by the pipe manufacturer and approved by Colorado Springs Utilities. Joint lubricant shall be non-toxic and water-soluble and meet current *EPA* and *NSF* Standards.

4.4.B.6 Restrained Joint Polyvinyl Chloride (PVC) DR 18 Pressure Pipe

(ONLY ALLOWED WITH COLORADO SPRINGS UTILITIES APPROVAL PREFERENCE IS C900 DR14 PVC PIPE)



Approved Manufacturer(s):

- **Westlake -** Certa-Lok C900/RJ or RJIB PVC restrained joint municipal water pipe. DR18 (235 psi)

General: Restrained joint PVC pipe may be used for open trench and casing pipe applications only. Absolutely no field bending may be applied to PVC piping. All PVC pipe shall be manufactured in accordance with *AWWA C900*, with the following additional requirements or exceptions:

Size(s): This specification shall cover restrained joint DR 18 PVC pipe in 16, 20, and 24-inch nominal diameters with cast iron equivalent outside diameters.

Pressure Class: Pipe shall be Pressure Class 235 (DR-18) per manufactured in accordance with *AWWA C900*. Note: DR-18 C900 PVC pipe is to be used only to 180psi in the Colorado Springs Utilities Water System.

Material:
PVC Pipe materials shall be made from class 12454 A or 12454 B virgin compounds as defined in *ASTM D1784*. All compounds shall qualify for a rating of 4000 psi for water at 73.4° F (23° C) per the requirements of *PPI TR3* and shall comply with *NSF 61* for Potable Water Service.

Specifications:
Joint Type. Pipe joints shall be non-metallic restrained joints designed with precision-machined grooves on the pipe and, if applicable, in the coupling. When aligned, a nylon spline is inserted, resulting in a fully circumferential restrained joint that locks the pipe and coupling (RJ) or bell and spigot (RJIB) together. A flexible elastomeric seal (O-ring) in the coupling (RJ) or pipe bell (RJIB) provides a hydraulic pressure seal.
Elastomeric Gaskets shall conform to *ASTM F477*.

Pipe Length. Each length of pipe will be a standard laying length of 20 feet. Random lengths shall not be acceptable, unless approved by the Inspector.

Nominal Pipe Size (In.)	Outside Dia. (In.)	Inside Dia. (In.)
16”	17.40	15.46
20”	21.60	19.20
24”	25.80	22.93

Color. Blue

Installation:

Pipe Lubricant. Joint lubricant shall be supplied by the pipe manufacturer and approved by Colorado Springs Utilities. Joint lubricant shall be non-toxic and water-soluble and meet current *EPA* and *NSF* Standards.

4.4.B.7 High Density Polyethylene Pipe (HDPE)

Approved Manufacturer(s):




- **CPChem™ Performance Pipe** - Driscoplex™ 4000
- **WL Plastics Corporation**
- **Pipeline Plastics, LLC**
- **Georg Fischer Central Plastics, LLC Company** - Design-Flow
- **JM Eagle Manufacturing**

General:
All High Density Polyethylene Pipe (HDPE) pipe shall be manufactured in accordance with *AWWA C906*, and *ASTM F714*, with the following additional requirements or exceptions:

Size(s): This specification shall cover HDPE DR9 pipe in 4, 6, 8, 12, 16, 20 and 24 inch nominal diameter with ductile iron pipe size (DIPS) equivalent outside diameters.

Pressure Class: All HDPE pipe shall be DR9 PE4710.
Note: HDPE pipe is to be used only to a maximum Working Pressure of 200 psi in the Colorado Springs Water Systems.

Material: Black PE materials used for the manufacture of HDPE pipe and fittings shall be PE4710 high density polyethylene meeting *ASTM D3350* cell classification 445574C and the Manufacturer shall be listed in the Plastic Pipe Institute (PPI) TR-4. The HDPE pipe or fitting shall have a standard grade HDB rating of 1600 psi at 73°F per *ASTM D2837*. Colored HDPE material, when used, shall meet the same *ASTM D3350* cell classification 445574C. HDPE material shall be listed and approved for Potable Water in accordance with *NSF 61*. The manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

Specifications:
The manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. Colorado Springs Utilities shall approve qualified manufacturers.

Joint Type. HDPE pipe shall be joined by thermal butt fusion or mechanical joint.

Pipe Length. Each length of pipe will be a standard laying length of 40 feet. Random lengths shall not be acceptable, unless approved by the Inspector.

Pipe Dimensions. (Average) 250 PSI (DR9) Matching DIP Outside Diameters

Size of pipe	Nominal DIPS OD (in)	Minimum Wall (in)	Average ID (in)
4”	4.80	0.533	3.67
6”	6.90	0.767	5.274
8”	9.05	1.006	6.917
12”	13.20	1.467	10.090
16”	17.40	1.933	13.302
20”	21.60	2.400	16.512
24”	25.80	2.867	19.722

Pipeline Identification. All pipes must be clearly marked and identified with the Manufacturer Name, Date Manufactured, PE4710, DR Rating, Pressure Class and ASTM Specifications applied. Permanent identification of piping shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell, or colored print line. The striping material shall be the same material as the pipe material except for the color. The following colors shall be used to identify the various piping within the Colorado Springs Utilities Water Distribution System:

- Blue for Potable Water
- Purple for Nonpotable Water

Preference is for the manufacturer to supply black pipe with the appropriate colored stripes; alternate option is to have the pipe identification information printed in the appropriate reference color.

Note: Plain Black HDPE Pipe without color code markings may not be used in the Colorado Springs Utilities Water Distribution System.

4.4.B.8 Steel Pipe

Approved Manufacturer(s):



Vender Supplied per engineered Project Specifications

General: All steel pipe, fittings, and specials (specials-are designed and specially fabricated steel fittings) shall be designed and fabricated in accordance with *AWWA C200, C208* and *AWWA M-11 Steel Pipe Manual*, and the requirements on the drawings.

Approvals: Steel pipe layout and design will require review and approval by Colorado Springs Utilities prior to submittal for fabrication. Any time a design involves steel pipe (installing new steel, replacing, or retiring existing steel, or transitions between PVC, DIP, and steel) a review shall be done by the Colorado Springs Utilities.

Size(s): Colorado Springs Utilities' requirements for nominal diameter of fabricated steel pipe shall be as follows:
4 through 12-inch - ID (Inside Diameter),
14 and Greater - OD (Outside Diameter),

Specified pipe shall be to the nominal inside or outside diameter of the pipe as indicated above. Minimum wall thickness shall be designed based *AWWA M11* and shall be no less than 0.25 inch minimum wall thickness.

Drawings: Complete Shop Drawings, design drawings, and Specifications shall be submitted to Colorado Springs Utilities for approval prior to any fabrication. Steel pipe, fittings, and specials shall be fabricated to the sizes, dimensions, and shapes as indicated in the Shop Drawings.

Material: All material used shall be acceptable per *ASTM A283*, Grade C or D. Mill pipe shall meet *ASTM A53* grade B or *ASTM A139* grade B.

When mating to flat faced ductile iron or cast flanges, all steel flanges shall be flat faced and manufactured in accordance with *AWWA C207* Class E.

Built-up ends and harness lugs shall be a part of the fabrication as indicated on the Shop Drawings.

CONTINUED ON NEXT PAGE

Specifications:
Protective Coatings. All steel pipe, fittings, and specials shall be prepared, primed, lined, coated, painted, or wrapped as hereinafter specified.

Exterior Surfaces in Interior Locations. Exterior surfaces of all pipe, fittings, specials, flanges, and accessories exposed in interior locations shall be thoroughly cleaned by sand-blasting and given a prime coat of rust inhibitive, lead and chromate free, primer, with a minimum thickness of 2 mils. Primer shall be Tnemec 37 Chem Prime, or equal. Coating shall be 3 to 10 mil Valspar IF5817P, or equal.

Exterior Surfaces Underground. Exterior surfaces of all pipe, fittings, and specials which are to be installed underground shall be cleaned by sand-blasting, primed and coated with a shop applied tape coating system in accordance with *AWWA C214*. Alternatively, a plural component polyurethane coating system in accordance with *AWWA C222* with a minimum 30 mils Dry Film Thickness (DFT) may be used.

When underground pipe extends through a concrete Vault wall, the coating shall terminate at a minimum of 1-inch inside the edge of the Vault wall.

Coating shall be held back a minimum of 6-inches from ends of pipe to be mechanically coupled or welded.

Interior Surfaces. The interior of all steel pipe, fittings and specials shall be sandblasted, primed, and lined with one of the following *NSF 61* approved coatings:

- Cement Mortar in accordance with *AWWA C205*
- Liquid Epoxy according to *AWWA C210*
- Plural Component Polyurethane coating system in accordance with *AWWA C222* with a minimum 30 mils DFT.

Colorado Springs Utilities reserves the right to specify which type of lining is to be used. No coal tar shall be used as a coating inside the pipe.

Welding. All shop fabricated welding shall be in compliance with *AWWA C200.*

Testing. All pipe sections shall be hydrostatically tested in accordance with AWWA C604.

Installation.
All field welding shall be in compliance with *AWWA C206*, and *AWS D1.1*.

All welders involved with field welding shall be certified in welding procedures in accordance with *AWWA C206* and *AWS D1.1.*

Coat exterior pipe joints and unwrapped sections of pipe with a heat shrinkable sleeve in accordance with *AWWA C216*.

Quality Control. All welds for steel pipe, fittings, and specials shall be performed under the supervision of a certified welding inspector and non-destructively tested in accordance with *AWWA C200*. All test records and data shall be submitted to Colorado Springs Utilities before acceptance of the materials. All newly installed pipeline shall be hydrostatically tested and pass a leakage test prior to acceptance.

4.4.B.9 Galvanized Steel Pipe

Approved Manufacturer(s):
N/A



General: Galvanized steel pipe shall only be used in temporary blow off valve assemblies.

Size(s): 2 inch

Pressure Class: The minimum Working Pressure rating of the pipe shall be 300 psi.

Materials: Galvanized steel pipe shall be either seamless or Electric Resistance Welded Schedule 40 or 80, and shall be NPT. The pipe shall conform to *ASTM A53* Grade B and shall be *NSF 61* rated. Fittings shall be NPT, *NSF 61,* and pressure rated to 300 psi.

4.4.C Casing Pipe, Spacers and End Seals

4.4.C.1 Casing Pipe

Approved Manufacturer(s):
N/A



General: Casing pipe shall be steel with the following Specifications:

Casing Pipe Size (inch)	Minimum Steel Thickness (inch)
12 or less	0.25
14	0.312
16	0.312
18	0.312
20	0.375
24	0.50
30	0.50
32	0.50
36	0.50
38	0.562
54	0.781

Steel pipes shall have minimum yield strength of 35,000 pounds per square inch.

Cathodic Protection: Casing Pipe shall be coated with an approved painted on coating or wrapped with Polyethylene tubing with the minimum of one 17 lbs. anode. For Boring applications, coating is not required; however, anodes are required.

4.4.C.2 Metallic Casing Spacers (Insulators)

Approved Manufacturer(s):



- **Garlock Sealing Technologies**
- **Advance Products and Systems, Inc.**
- **PowerSeal Pipeline Products Corporation**
- **CCI Pipeline Systems**
- **BWM Company**
- **Cascade Waterworks Mfg. Co.**

General: Casing spacers center Water Mains in casings for ease of installation, are virtually corrosion proof, and provide insulating protection from a possible electrical shorting between the carrier pipe and casing. Eliminating the need for annular fill allows for easy removal to repair or replace damaged pipes.

COATED STEEL CASING INSULATOR SPECIFICATIONS

Specifications:
Band – 8" or 12" Wide, 14 ga, Hot Rolled and Pickled, Two-piece 6" – 36"
Risers – 10 ga min, Hot Rolled and Pickled, Mig Welded to Band
Runners – 2" Wide Glass Reinforced Plastic or Nylon
Studs, Nuts and Washers – Electro Plated, 5/16" – 18 X 1-1/2" min Studs SAE 2330
Liner – Polyvinyl Chloride, .090" min, Hardness-Durometer "A" 85-90, Dielectric Strength 1/8" Thick Surge Test – 60,000V min
Coating – Fusion Bonded Epoxy
Design – Center Restrained, Top Clearance 1" max

STAINLESS STEEL CASING INSULATOR SPECIFICATIONS

Specifications:
Band – 8" or 12" Wide, 14 ga, 304 Stainless Steel, Two-piece 6" – 36"
Risers – 10 ga min., 304 stainless Steel, Mig Welded to Band
Runners – 2" Wide Glass Reinforced Plastic or Nylon
Studs, Nuts and Washers –304 Stainless Steel - 5/16" – 18 X 1-1/2" min Studs
5/16" Hex Nuts
5/16" Washers, SAE 2330
Liner – Polyvinyl Chloride, .090" min, Hardness-Durometer "A" 85-90, Dielectric 1/8" Thick Strength Surge Test – 60,000V min
Design – Center Restrained, Top Clearance 1" min

4.4.C.3 Non-Metallic Casing Spacers (Insulators)

Approved Manufacturer(s):



- **Garlock Sealing Technologies**
  Ranger II Casing Spacers

General: Non-metallic casing spacers shall be all non-metallic (polypropylene), molded in segments for field assembly without any special tools.

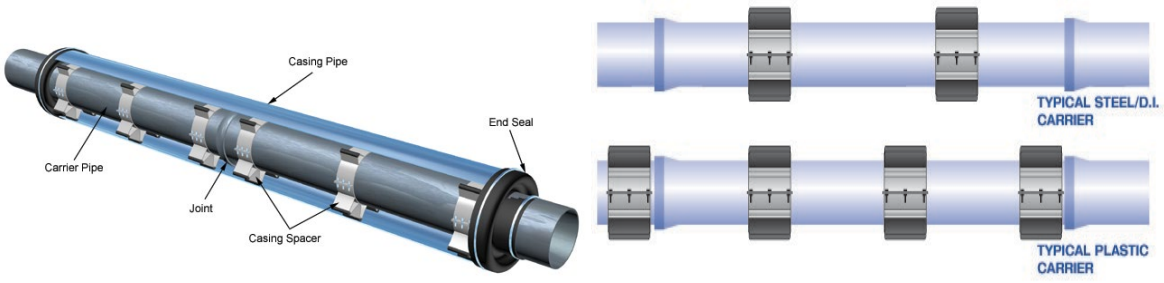
Specifications:
The casing spacer polymer shall contain ultraviolet inhibitors and shall have a minimum compressive strength of 3,000 psi, an 800 volts/mil dielectric strength and impact strength of 1.5 ft-lbs. /inch. Each casing spacer shall have full length, integrally molded skids which extend beyond the bell of mechanical joint of the carrier pipe.

Spacers shall be at least as wide as listed below:

Carrier Pipe Diameter Inches	Ranger II Model	Length Inches
4.49 to 16.65”	Midi	5.12”
16.77 to 37.60”	Maxi	8.66”

Installation:
Spacer segments shall be secured around carrier pipe by insertion of a Slide-Lock.

Spacing recommendation: See Detail Drawing A7-3 and A7-4.



4.4.C.4 End Seals

Approved Manufacturer(s):



- **Pipeline Seal and Insulator, Inc.** - Model "C", 1/8" thick seamless synthetic rubber pull-on end seals
- **Advance Products and Systems, Inc**.
- **Cascade Waterworks Mfg. Co.**
- **CCI Pipeline Systems**

General: After insertion of the carrier pipe into the casing, the ends of the casing shall be closed by installing thick synthetic rubber end seals.

Size(s): Shall be designed for carrier-casing combination.

Material: 1/8" thick seamless synthetic rubber.

Specifications:
End seal shall be watertight and manufactured from a minimum 1/8" thick neoprene rubber. End seal shall be secured with ½" wide 304 stainless steel bands with worm screws.

Style. Pull-on with stainless steel bands and clamps.

Installation:

- Prepare outside surfaces by removing dirt from casing and carrier pipe.
- After carrier pipe is inserted into casing, slide small end of end seal over the carrier pipe with stainless steel banding clamp. Large end should face casing.
- Position large end of end seal over the casing pipe.
- Position banding clamp approximately 1" from the end of the casing pipe and then tighten onto the end seal.
- Fold end seal in an S shape so it will extend into the casing.
- Position banding clamp approximately 1" from the end of the end seal on the carrier pipe and then tighten. (Make sure the end seal is folded into the casing. This relieves stress during backfilling and allows for expansion and contraction movement.)

4.4.D Fittings

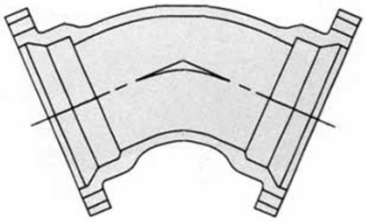
4.4.D.1 Ductile and Gray Iron Waterworks Fittings

Approved Manufacturer(s):

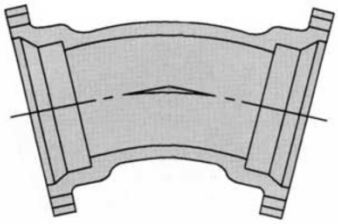
- **Tyler Union**
- **Star**
- **Sigma**
- **SIP**

Bends
MJ and MJ or Flanged

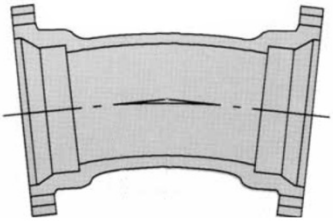
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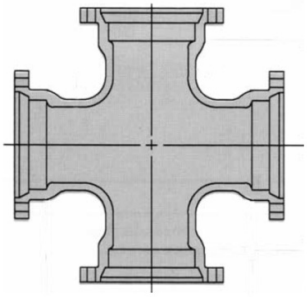
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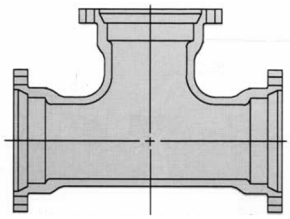
11.25°



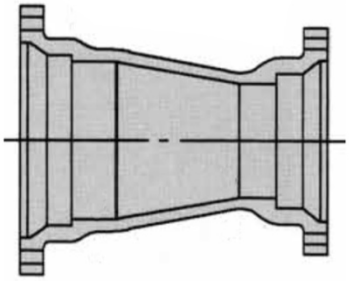
Crosses
MJ and MJ or Flanged



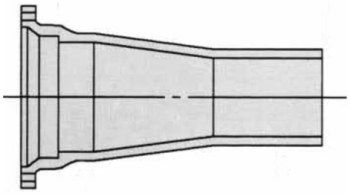
Tees
MJ and MJ or Flanged



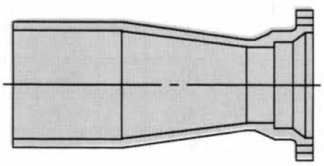
Reducers
MJ and MJ or Flanged



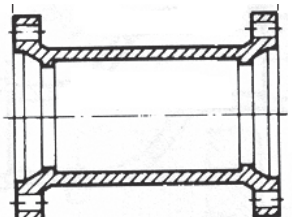
Large End Bell
MJ or Flanged by
plain end Flanged



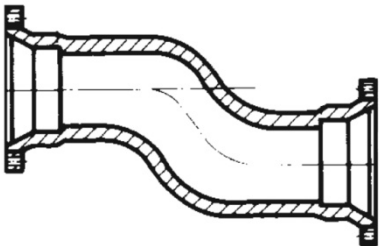
Small End Bell
MJ or Flanged by
plain end



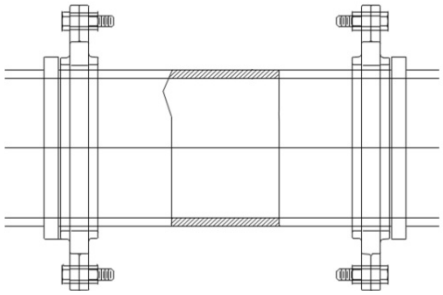
Solid Sleeves MJ x MJ



Offset



Adaptor or Anchor Pipe



General: Ductile and gray iron fittings are used to make connections, change angles, and make reductions in piping systems.

Size(s): This Specification shall cover ductile iron fittings in 4, 6, 8, 12, 16, 20, 24, 30, 36, 42 and 48-inch nominal diameters.

Pressure Class: All fittings 3" through 24"shall be rated to 350 psi Working Pressure and 30" through 48" shall be rated for 250 psi Working Pressure. Fittings shall conform to the dimensions and weights shown in the tables of referenced *AWWA* and *ANSI* Standards.

Material: All fittings shall be made from ductile or gray iron which meets Grade 70-50-05 in accordance with *AWWA C110* or *C153*. The manufacturer of fittings produced from grade 60-42-10 material must be able to provide records to demonstrate that the fittings conform to *AWWA C110* or *C153*.

Specifications:
The manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings. Colorado Springs Utilities shall approve qualified manufacturers.
All ductile and gray iron fittings shall be manufactured in accordance with the following *AWWA Standards*: *C104, C110, C153, C111*.
Cement Mortar Lining. All sizes of ductile and gray iron fittings shall be furnished with a cement-mortar lining of standard thickness as defined in *AWWA C104*.

Type of Joint. All fittings shall be furnished with mechanical joint, flanged, and/or plain ends conforming to referenced Specifications.

External Coating. The manufacturer may supply either an asphaltic coating or a fusion bonded epoxy coating on the outside of the fitting per *AWWA C110*. Fusion bonded epoxy coating shall be in accordance with *ANSI/AWWA C116/A21.16* where used.

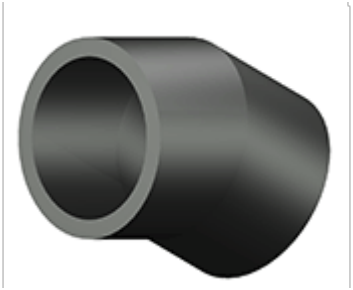
4.4.D.2 High Density Polyethylene (HDPE) Pipe Fittings

Approved Manufacturer(s):

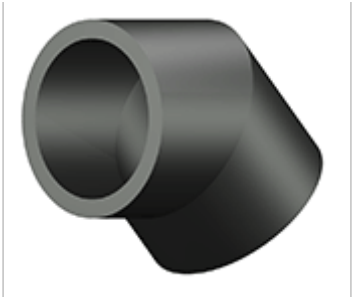
- **Plasson USA**
- **ISCO Industries, Inc.**
- **+GF+ Georg Fischer Central Plastics, LLC Company**
- **Secor, Inc.**

HDPE Elbows

22-1/2°



45 °



HDPE Crosses





Crosses are rarely used and must come with attached fitting ends to fit into a valve or reducer. Care must be taken when placing a cross in the trench to avoid stress fractures in the center of the cross.

HDPE Tees

Standard Tee **Reducing Tee**





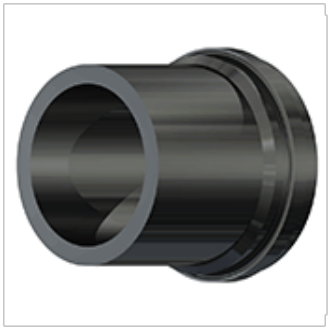
HDPE Tees will need to have additional fittings fused onto each end of the tee and branch to accommodate valves or other appurtenances.

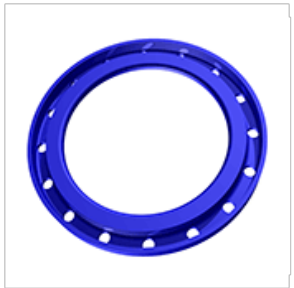
Electrofusion



HDPE electrofusion fittings are NOT allowed for use in the Colorado Springs Utilities Water Distribution System.

Mechanical Joint (MJ) Adapter.

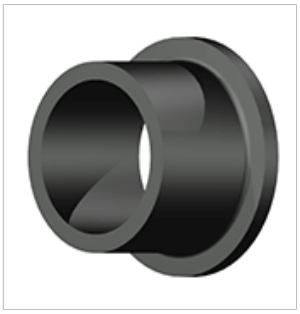


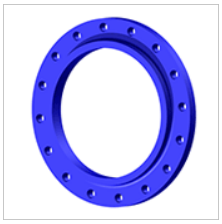


MJ Adapter 4" through 24" must be provided with a Stainless Steel Stiffener (included in the manufactured fitting). All MJ Adapters shall be provided with a Heavy Duty Back-up Ring and Kit (*AWWA C110* with minimum 8 mils fusion bonded epoxy coated follower/back-up ring). The kit shall also include bolts and nuts which are Grade 3 or higher and long enough to accommodate the added length of HDPE fittings to attach to valves or other appurtenances.

Polyethylene Flange Adapters

Flange Adaptor C207 Class E Ring Beveled Flange Adaptor







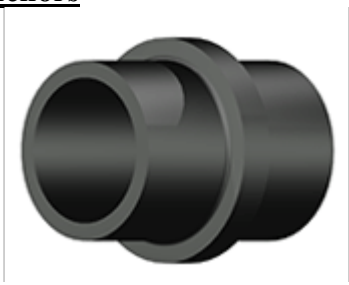
Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serration) to promote gasket-less sealing, or restrain the gasket against blowout. A Beveled Flange Adaptor is for use with Butterfly Valves.

HDPE flange and beveled flanged adaptors may be used with approval of Colorado Springs Utilities and must be installed according to *PPI TN-38*.

Note: The utilization of HDPE flange adaptors will add to the overall length of time in installation and construction.

Flange adapters shall be fitted with back-up rings that are pressure rated equal to or greater than the mating pipe (*AWWA C207* Class E with minimum 8 mil fusion bonded epoxy coated follower or back-up ring). The back-up ring bore shall be chamfered or raised to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 3 or higher and long enough to accommodate the added length of HDPE fittings.

Wall Anchors



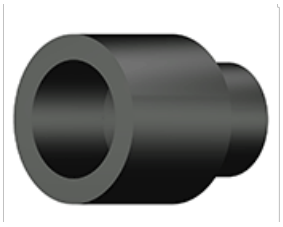
Wall anchors shall be manufactured according to *AWWA C906* with the PE 4710 cell classification and shall be manufactured as one piece, compatible to the HDPE pipe being placed, and shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe. Wall anchors are used to restrain HDPE pipe at connections, tees, valves and transitions in pipe materials. The HDPE wall anchor shall be fused to the pipe and supported to allow for the placement of a concrete thrust reaction block (CTRB) or a concrete reverse anchor (CRA).

HDPE Reducers

Swage Reducer



Concentric Reducer



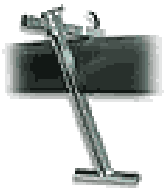
Swage reducers are preferred for use when reducing one nominal pipe size. When reducing more than one size, the Contractor needs to be aware that the reducer length can be longer than expected due to step down from each size. Check with the manufacturer for reducer lengths.

Stiffeners



Stiffeners shall be used any time a mechanical fitting is to be applied to plain end HDPE Pipe.

Bead Removal Tool



Internal fusion beads between HDPE fittings and Pipe Pup additions shall be removed and all additional internal beads created during manufacturing (if required) after the allowable cooling time for bead removal using a suitable bead removing tool specified for HDPE pipe. The bead removal tool shall not induce any slits, gouges, or defects in the pipe wall, as recommended by the manufacturer. External beads must be removed to provide access for rings to be applied to fittings, where applicable.

General: HDPE fittings are manufactured for use with HDPE pipe.

Size(s): 8, 12, 16, 20, 24-inch DIPS, 6 inch upon Colorado Springs Utilities approval.

Pressure Class: Fittings shall be DIPS DR9 PE4710 250 psi Working Pressure rated and shall be butt fused to the HDPE pipe unless otherwise stated.

Material: Fitting Materials shall be manufactured with Black PE materials of PE4710 high density polyethylene meeting *ASTM D3350* cell classification 445574C and shall be listed in the name of the pipe and fitting manufacturer in the *Plastic Pipe Institute (PPI) TR-4* with a standard grade HDB rating of 1600 psi at 73°F per *ASTM D2837*. Color material, when used, shall be the same except for meeting *ASTM D3350* cell classification 445574C. The material shall be listed and approved for Potable Water in accordance with *NSF 61*. The manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

Specifications: HDPE fittings shall be manufactured in accordance with the current version of:

- *AWWA C906*
- *ASTM F714*
- *ASTM D3350*
- *ASTM D4976*
- *ASTM D3261*
- *NSF 61*

Marking: HDPE Fittings shall be marked on the pipe either with a tag or imprinted with the following information:

- Manufacturer name or trademark
- Fitting description
- Material designations (DIPS DR9 PE4710)
- All applicable standards designations
- Date of manufacture
- Fitting size

- HDPE Fittings and Custom Fabrications. Polyethylene fittings and custom fabrications shall be molded or fabricated by Approved Manufacturers per Colorado Springs Utilities. All fittings and custom fabricated fittings shall be pressure rated for the same Working Pressure rating as the mating pipe.
- Molded HDPE Fittings. Molded fittings shall be manufactured and tested in accordance with *ASTM D 3261, AWWA C906* and shall be so marked.
- Fabricated HDPE Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes out of pipe, polyethylene sheet stock or machined from molded fittings or special extruded pipe made for machining fittings. Fabricated fittings shall be pressure rated for the same working pressure rating as the mating pipe. All fabricated fittings shall be tested in accordance with *AWWA C906*, *ASTMD3261 and D3350*.

  Note: Colorado Springs Utilities orders all fittings with additional DR9 HDPE PE4710 pipe pups for ease of installation in the field. When a Contractor orders a HDPE fitting per the current Colorado Springs Utilities Material Specifications, additional costs will be incurred for the additional material, manufacturing, and freight costs. Not a requirement.
- Fittings shall be butt fused to the HDPE pipe unless otherwise stated.

4.4.D.3 High Deflection Polyvinyl Chloride (PVC) Deflection Couplings

Approved Manufacturer(s):



- **Westlake Pipe & Fittings**

Fluid-Tite HD (High Deflection) PVC restrained joint municipal water pipe.

General:
High Deflection Couplings are used to achieve gradual deflections in curvature when placing PVC pipe. Each coupling is capable of deflecting 4 degrees (2 degrees per side) and can be used in place of small bends. High Deflection Couplings shall be shown on a plan and profile when used for a slight deflection or grade break of the pipe under other utilities or appurtenances to maintain minimum clearance from said utilities and appurtenances. All High Deflection Couplings shall be shown and noted on the Construction and Record Drawings.

Size(s): 4, 6, 8 and 12-inch

Pressure Class: 200psi (DR21) Working Pressure rating.

Size	Working Pressure rating (psi)	Insertion depth (inches)	Length (inches)
4”	200	3.00	7.25
6”	200	3.625	8.25
8”	200	4.125	9.25
12”	200	5.375	12.00

Specifications:
Polyvinyl Chloride (PVC) Pipe Couplings with Cast Iron (CI) outside diameters.

Couplings shall meet the requirements of *AWWA C900* for Municipal Water pipe and *NSF 61* for use with Potable Water.

Testing
Each coupling shall be hydrostatically tested to 800 psi (4 times its rated working pressure of 200 psi) by the manufacturer. All sizes and classes shall be listed by *Underwriters Laboratories Inc. (UL 1285)*.

4.4.D.4 Swivel Tee

Approved Manufacturer(s):

- **Infact Corporation**



Swivel x Swivel x Swivel

General: Swivel tees shall meet the Specifications for ductile iron fittings as described in Section 4.4.D.1 with the following additions:

Swivel: Swivel MJ glands shall have the capability of rotating 360 degrees. The glands shall bolt to internally cast ribs without the use of lug bolts and shall be interchangeable to allow MJ glands or flange glands to be attached in the field.

External Coating: The manufacturer may supply either an asphaltic coating or a fusion bonded epoxy coating on the outside of the fitting per *AWWA C110*. Fusion bonded epoxy coating shall be in accordance with *ANSI/AWWA C116/A21.16* where used.

4.4.D.5 Flange Gaskets

Approved Manufacturer(s):





- **Specification Rubber Products**
  EPDM Flat Gasket
- **Garlock**
  3760U 3000 Series

General: Full faced gaskets are used to seal metal flanges together**.**

Specifications: All gaskets shall be *NSF 61* certified and have a hole pattern of *Class 125/ANSI 150* or *Class 250 /ANSI 300* to mate with the hole pattern of the flange as needed. Gaskets are to be applied as specified by the Design Engineer and per Manufacturer's recommendations.

- EPDM Gaskets shall be rated for a minimum 250 psi Working Pressure and Stamped with NSF-61 and Date of Manufacture.

- Fiber Gaskets shall be specified as needed for special applications and must be rated for a minimum Working Pressure greater than or equal to the Working Pressure of the pipe.

Gaskets for HDPE applications must be ordered on case-by-case basis, reference *PPI TN-38* for design requirements.

4.4.D.6 Mechanical Joint Pipe Restraints

General: Mechanical pipe joint restraints (MJ) restrain mechanical joints for many applications including valves, hydrants, and pipe. They can be used on all types of pipe when joining to mechanical appurtenances. MJs are used to replace external restraints such as concrete thrust blocks and metal tie rods. There are specific restraints for each type of pipe.

Size(s): 6-inch up to 36-inch Diameter Ductile Iron Pipe (DIP) and 6, 8, and 12-inch Diameter PVC Pipe.

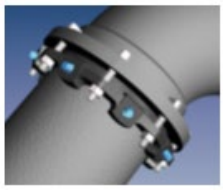
Pressure Class: Mechanical pipe joint restraint devices shall have minimum Working Pressures not less than the Working Pressure ratings of the pipe.

Material: MJ restraints shall be manufactured of ductile iron. MJ gaskets shall be made from SBR or EPDM rubber.

Specifications: Glands of the mechanical joint restraint shall be manufactured of ductile iron in accordance to *ASTM A536*, grade 65-45-12. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 bhn. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to *ANSI/AWWA C111/A21.11* and *ANSI/AWWA C153/A21.53*. MJ gaskets shall be *NSF 61* certified, conform to *AWWA C111/A21.11*, and be *Underwriters Laboratories* listed.

Approved Manufacturer(s):

a. <u>Ductile Iron Pipe MJ Restraint:</u>



EBAA Iron, Inc.
Megalug, Series
1100
(3”-36”)



Ford Meter Box
Uni-Flange Corp.
Series 1400
(3”-36”)



Sigma
One Lok Series
SLDE
(3”-36”)



Smith Blair
Series 111
(3”-24”)



Tyler Union
TUF Grip
Series 1000
(3”-24”)

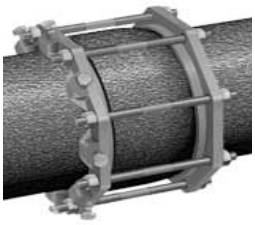


Star Pipe Products
Stargrip
Series 3000
(3”-24”)

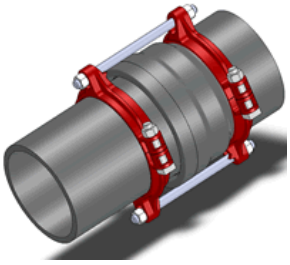


SIP Industries
EZ Grip
(3”-24”)

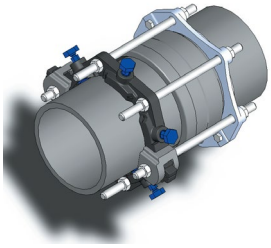
b. DIP Slip Joint Restraint:



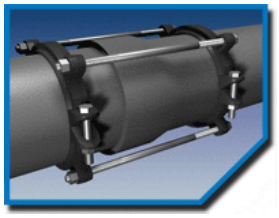
Ford Meter Box Company
Series 1450 Series
for DIP
(3”-36”)



Sigma
PV- Lok series PWP
for DIP
(4”-12”)

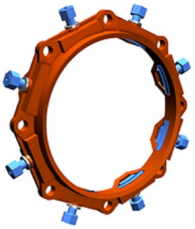


Sigma
One Lok Series SLDEH
for DIP
(3” – 8” @ 350 psi, 10”-16” @ 300 psi,
18” – 36” @ 200 psi)



EBAA Iron, Inc.
Megalug Series 1500TD
for Joint Restraints
for DIP
(4”- 12”)

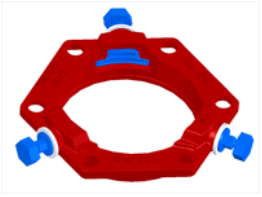
c. PVC MJ Restraint:



EBAA Iron, Inc.
Megalug Series
2000 PV
(3”-16”)



Ford Meter Box Company
Uni-Flange Series 1500
“Circle Lock” (3”-12”)



Sigma
One Lok Series SLCE
(3”-24”)



Smith Blair
CamLock
Series 120
(3”-24”)



Tyler Union
TUF Grip
Series 2000
(3”-24”)



Star Pipe Products
Stargrip
Series 4000
(3”-20”)



SIP Industries
EZ Grip
(3”-24”)

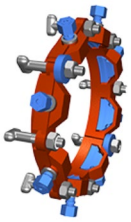
d. PVC Slip Joint Restraint:

Slip joint restraints are not allowed on PVC within the Colorado Springs Utilities Water Distribution System. See restrained joint PVC in Section 4.4.B.5.

e. Split Megalugs | **Plain End to Flange Adaptor**



EBAA Iron
Series 1100SD for DIP
(3" – 48")



EBAA Iron
Series 2000SV for PVC
(4" – 12")



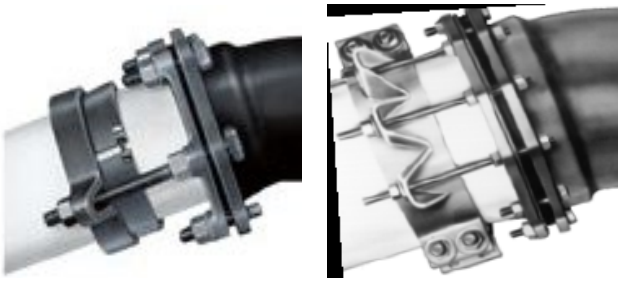
EBAA Iron
Series 2100 MEGAFLANGE for allowed material and sizes see Table below.

EBAA Iron Megaflange Series 2100 Allowable Material and Sizes

Approved Material	Allowable Sizes
DIP	3" – 16"
Steel[1]	3" – 12"
C900 PVC DR 14	4" – 12"
C900 PVC DR 18[2]	4" – 20"

[1]Transition gasket required
[2]Upon approval by Colorado Springs Utilities. See Section 4.4.B.4.

f. HDPE Pipe Restraints:



Approved Manufacturer(s):
JCM 610 Sur-Grip Restrainers
4" -12" 14" – 30"

Material: Pressure Vessel Quality Steel ASTM A285 Grade C or equal

Specifications: Standard Shop Coat - heavy coating of corrosion inhibiting metal primer. Optional Fusion applied Epoxy Coating *ANSI/AWWA C-213*

Bolts and Nuts: Corrosion resistant high strength, low alloy *AWWA C-111, ANSI 21.11* Stainless Steel 18-8 Type 304.

4" - 12" for use with C-900 PVC, Ductile Iron Pipe, DIPS HDPE
14" - 30" are **not** for use on ductile iron, cast iron, Asbestos cement, steel or any other rigid types of pipe.

4.4.D.7 Mechanical Joint Pipe Restraint with Tie Rods

Approved Manufacturer(s): Springs Fastener Company

Ductile Tie Lug



All Thread Rod and Couplings





General: Tie-Lugs are for use in restraining mechanical joint valves, fittings, pipe, and hydrants. MJ pipe restraints with tie rods, when used, shall conform to the Specifications described above.

Material(s):

- **Tie Lugs.** Shall be cast from high strength Ductile Iron per *ASTM A536* Grade 65-45-12 with a tensile strength of 65,000 psi and yield strength of 45,000 psi. Tie-lugs are intended for use between the MJ bell and gland in sizes 4" through 16".
- **Tie Rods**. may be black steel; in all cases they shall be equal to a minimum grade *ASTM A307*, except where high strength steel is required, in which case they shall have a minimum strength equal to *ASTM A325*.

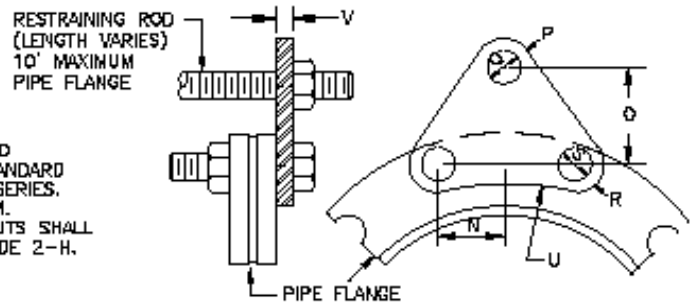
Minimum # of Eye Bolts/Ductile Tie Lugs									
Nom Pipe Size (in)	**Working Pressure (psi)**								
	100	**125**	**150**	**200**	**225**	**250**	**300**	**325**	**350**
4	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
6	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**4**	**4**
8	**2**	**2**	**3**	**4**	**4**	**4**	**6**	**6**	**6**
12	**4**	**4**	**6**	**8**	**8**	**8**	**NR**	**NR**	**NR**
16	**6**	**8**	**10**	**12**	**NR**	**NR**	**NR**	**NR**	**NR**

NR= Not recommended

Threaded rod, B7 per ASTM A193, High strength

Size (Threads per inch)
7/16" – 14 TPI
1/2:" – 13 TPI
5/8" – 11 TPI
¾" – 10 TPI
7/8" – 9 TPI
1" – 8 TPI
1 1/8" – 8 TPI
1 ¼" – 8 TPI
1 ½" – 8 TPI

Flange Lug:



NOTES:

1. M.S. MEANS MILD STEEL ROD, A.S.T.M. STANDARD DESIGNATION A-36 NUTS SHALL BE S.S.T.M. STANDARD DESIGNATION A-307 GRADE A OR B HEXAGON SERIES.
2. H.S. MEANS HIGH STRENGHT STEEL ROD, A.S.T.M. STANDARD DESIGNATION A-193 GRADE B-7 NUTS SHALL BE A.S.T.M. STANDARD DESIGNATION A-193 GRADE 2-H.

PIPE DIA.	PRESS. CLASS	N	O	H.S. ROD			M.S. ROD			R	S	U	V	NO. REQD.
				P	Q	ROD DIA.	P	Q	ROD DIA.					
6"	150 LB.	1 13/16"	2 1/4"	1"	7/8"	3/4"	1"	7/8"	3/4"	7/8"	7/8"	3 3/4"	3/4"	2 EA.
	300 LB.	1 3/8"	2 3/4"	1"	1"	7/8"	1"	1"	7/8"	7/8"	7/8"	4 7/16"	1"	
8"	150 LB.	2 1/4"	2 3/4"	1"	7/8"	3/4"	1"	7/8"	3/4"	1"	7/8"	4 7/8"	3/4"	2 EA.
	300 LB.	1 11/16"	2 7/8"	1"	1"	7/8"	1"	1"	7/8"	1"	1"	5 1/2"	1"	
12"	150 LB.	2 3/16"	2 3/4"	1 1/4"	1 1/8"	1"	1 1/4"	1 1/8"	1"	1 1/8"	1"	7 1/4"	7/8"	2 EA.
	300 LB.	1 3/4"	3 3/4"	1 5/8"	1 1/4"	1 1/2"	1 3/8"	1 3/8"	1 1/4"	1 1/4"	1 1/4"	7 5/8"	1 1/4"	
16"	150 LB.	2 1/16"	2 3/4"	1 1/2"	1 3/8"	1 1/4"	1 1/2"	1 3/8"	1 1/4"	1 1/4"	1 1/8"	9 3/8"	1 1/8"	3 EA.
	300 LB.	1 3/4"	4 1/4"	1 1/2"	1 1/2"	1 3/8"	1 1/2"	1 1/2"	1 3/8"	1 1/2"	1 3/8"	8 7/8"	1 1/2"	
20"	300 LB.	2"	3 1/16"	1 3/8"	1 9/16"	1 1/2"	1 3/8"	1 9/16"	1 1/2"	1 3/8"	1 3/8"	10 1/2"	2 1/2"	4 EA.
24"	300 LB.	2 5/16"	3 1/8"	1 1/2"	1 9/16"	1 1/2"	1 1/2"	1 9/16"	1 1/2"	1 1/2"	1 5/8"	12 1/2"	2 1/4"	6 EA.
30"	300 LB.	2"	3 1/4"	1 5/8"	1 9/16"	1 1/2"	N/A	N/A	N/A	1 5/8"	1 7/8"	15 5/8"	2 5/8"	8 EA.
36"	300 LB.	2 1/16"	3 1/2"	1 7/8"	1 9/16"	1 1/2"	N/A	N/A	N/A	1 7/8"	2 1/8"	18 5/8"	3"	10 EA.

4.4.D.8 Bolts and Nuts for Mechanical Joints

Blue Bolts:



Approved Manufacturer(s):

- **Sigma**
- **Star**
- **Tyler Union**
- **Trumbull**

General: T-Head bolts are utilized to bolt together all pipe, fittings, and appurtenances.

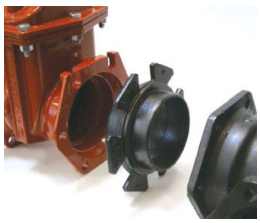
Size(s): Varies depending on fitting being installed, Bolts are generally 3/4 or 5/8 inch in diameter and length varies

Material: Bolts shall be manufactured from low alloy steel in accordance with *ANSI/AWWA C111/A21.11*.

Specifications: All Tee Head bolts and nuts shall be coated with a corrosion resistant XYLAN 1424 Polytetrafluoroethylene (PTFE) Dry-Film protective coating/lubricant or fluoropolymer coating. Bolt strength shall be equal to minimum *ASTM A307*. Additional cathodic protection is not required.

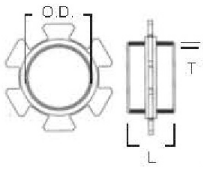
4.4.D.9 Bolt-Thru Mechanical Joint Connection (Foster Adaptor)

Approved Manufacturer(s):



- **Infact Corporation -** Foster Adaptor
- **Star**
- **Sigma**

General: The Foster Adaptor is an Ultra-compact, bolt-through MJ restraint, for valves and fittings.



Size(s):

Size (inches)	Dimensions (inches)			Adaptor Weight
	OD	T	L	lbs.
4	4.80	0.35	4	8
6	6.90	0.37	4	15
8	9.05	0.39	4	19
10	11.10	0.40	4	24
12	13.20	0.43	4	31
16	17.30	0.51	6	60
18	19.40	0.55	6.75	92
20	21.50	0.58	6.75	101
24	25.80	0.62	6.75	117

Pressure Class: The device shall have a minimum Working Pressure rating of 350 psi
Material: Connection shall be manufactured of ductile iron conforming to *ANSI/AWWA C153/A21.53*.
Specifications:
Mechanical joint (MJ) valves and fittings shall be connected using a bolt-through positive restraint mechanism manufactured of ductile iron conforming to *ASTM A80-55-06*. The bolt-through MJ positive restraint mechanism shall connect the valves and/or fittings at a linear distance not to exceed 1 inch and without attachment to pipe. Fittings shall be sized to be used with standard mechanical joint fittings (*AWWA C110* or *C153*) and valves.
Coating. The bolt-through MJ positive restraint mechanism shall be supplied with asphaltic/epoxy coatings in accordance with *ANSI/AWWA C153/A 21.53* or fusion bonded epoxy coating in accordance with *ANSI/AWWA C116/A21.16*.

Installation: Not for use directly on hydrant shoes (longer bolts and spacers will not fit.) This may not fit on both the "branch" and "run" of compact tees or crosses for the same reason noted above. The bolt-through MJ positive restraint mechanism may not be used between two 45 degree bends which would create a 90 degree bend.

4.4.D.10 Mechanical Coupling(s).

Approved Manufacturer(s):

Straight Coupling(s)



Dresser
Style 38
2 – 24 inch



Dresser
Style 253
2 – 16 inch



Romac
Style 501
2- 24-Inch



JCM
Style 241
3-16 inch
Standard
Length



JCM
Style 242
3-16 inch
Long
Length



Romac
Style 400-
12-Inch and
larger



Romac
Macro HP 2 Bolt
2-16-Inch

Insulating Coupling(s)



Dresser
Style 39- 4-14
inch



Romac
Style IC501
4-14 inch

Transition Coupling



Romac
Style XR501
4- 12 Inch
Standard and Long
Length

Reducing Coupling(s)



Romac
Style RC501
3- 24 Inch



Romac
Style RC400
12-Inch and larger

Dismantling Joint



Romac
Style DJ405/DJ400
Class E Flange 150 x 150 Flg
Or 250 x 150 Flg
3 - 24 inch
(Used in meter and regulator
valve vaults)

General: All mechanical couplings shall be of a gasketed, sleeve-type, with diameter to properly fit the pipe. Tolerance on pipe and coupling, together with proper bolt and gasket arrangements, shall be sufficient to ensure permanent watertight joints under all conditions.

Size(s) and Pressure Class:

Manufacturer	Size (in)	Working Pressure (psi)
Straight Coupling		
Dresser Style 38	2-24	343
Dresser Style 253	2-16	200
Romac 501	2-24	260
Romac 400	12-96	500
Romac Macro	2-16	305
Insulating Coupling		
Dresser Style 39	4-14	300
Romac IC 501	4-14	260
Transition Coupling		
JCM 241/242	3-16	250
Romac XR501	4-12	260
Reducing Coupling		
Romac RC501	3-24	260
Romac RC400	12-96	500
Dismantling Joint		
Romac DJ405/DJ400	3-24	varies

Materials: Materials used in the manufacture of couplings shall be Ductile Iron or Steel in accordance to *AWWA C111* and *AWWA C219*.

Specifications: Steel couplings shall meet or exceed *ASTM A283/A283M*, Grade C for Carbon steel, or *ASTM A666*. Ductile Iron shall meet or exceed *ASTM A536* Grade 65-45-12. Gaskets shall meet the requirements of *ASTM D2000*.

External Coating: The manufacturer may supply either an asphaltic coating or a fusion bonded epoxy coating outside the fitting per *AWWA C 110*. Fusion bonded epoxy coating where used shall be in accordance with *ANSI/AWWA C116/A21.16*.

Installation: Couplings may need to be restrained.

Restrained Coupling(s) and End Cap



Romac
ALPHA- 350psi
4-12 Inch
HDPE pipe
W/Stiffener



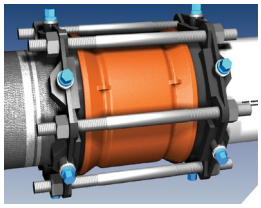
Romac
ALPHA EC- 350psi
4-12 Inch
HDPE pipe
W/Stiffener



Romac
ALPHA FC 350psi
4-12 Inch
HDPE pipe
W/Stiffener



Romac
RFCA 275psi
3-24 Inch
PE X Flange



EBAA-Series 3800
DIP 4-54 Inch
C900 4-36 Inch
Steel 4-12 Inch
HDPE 4-12 Inch
W/Stiffener

4.4.E Valves

4.4.E.1 Gate Valves, Resilient Seat Type

Approved Manufacturer(s):





- **American Flow Control**
- **Mueller**
- **AVK Series 65**
- **Clow**
- **Kennedy**

General: Resilient seat type gate valves shall be used when line valves are required for 4" through 12" diameter pipe and shall conform to these Specifications.
Size(s): 4, 6, 8, 12, *16-inch nominal diameter. *16 inch shall only be used with Colorado Springs Utilities Approval.
Pressure Class: The Working Pressure for all sizes shall be 250 psi.
Material: All valves shall be manufactured with Cast or Ductile Iron in accordance with *AWWA C500/C509/C515*, with the following additional requirements or exceptions:
Specifications:
Gate valves shall be resilient wedge/seat gate with cast iron or ductile iron body in compliance with *ASTM A536/A126* CL B, corrosion resistant material, with non-rising stem and rubber encapsulated wedge. All valves shall have epoxy coating both internally to *AWWA C550* and *NSF 61*, and externally to *AWWA C116*.
Valve Stems**.** Valve stems are used to raise the wedge using a 2" square-operating nut. Valve stems shall be made of a corrosion resistant material. The stem shall be non-rising and be sealed with "O" ring packing. Valve stems shall be threaded per the following:

- **open right (clockwise) for Potable Water valves**
- **open left (counterclockwise) for Nonpotable Water valves**

End Connections. All direct bury valves shall have mechanical joint end connections which shall have a gasket gland and fasteners conforming to the *ANSI A21.11, AWWA C-111.* Flanged end connections for Vault applications shall be *Class 125/ANSI 150* or *Class 250/ANSI 300* drilled and manufactured according to *ASME/ANSI B16.1*; the type of flange is dependent upon PSI of the gate valve and flanged fitting it is being attached to.
Additional Corrosion Protection. May include an integral anode lug or anode attachment device to prevent having to break the bonded epoxy on the valve body to attach an anode.
Color.
Potable Water - Per Manufacturer's Specifications
Nonpotable Water **-** purple color Pantone PMS 512C or Pantone PMS 522C
Deep Valve Extension. The extension rod shall have a 2" square wrench nut at the top and a wrench nut coupling at the bottom. The wrench nut coupling fits over the 2" square nut of the valve stem being raised and is held to the nut by a set screw threaded in the wrench nut coupling. The wrench nut and wrench nut coupling are pinned to the extension rod, which is drilled to receive steel drive pins. The wrench nut and wrench nut coupling shall be made of ductile iron, Grade 65-45-12, or stainless steel, Type 316. The pinned connections permit the removal of the casting so the rod can slide through the stem guides.

4.4.E.2 Butterfly Valves

a) **Widebody Butterfly Valves**

Approved Manufacturer(s):

- **American AVK**



Note: Widebody butterfly valves are required for use with PVC and HDPE pipe.

General: Butterfly valves shall be used when line valves are required for 16" and larger diameter pipe and shall conform to these Specifications.

Size(s): 16, 20, and 24, inch Nominal Diameter

Pressure Class: The Working Pressure for all sizes of the mechanical joint valves shall be 250 psi.

Material: Ductile iron body

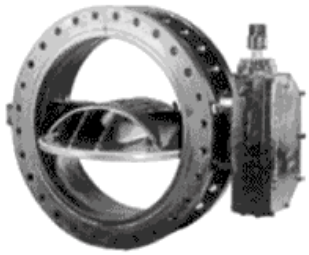
Specifications: Butterfly valves shall be manufactured in accordance with *AWWA A536* Class 250B valve body, with the following additional requirements or exceptions:

Butterfly valves shall be of the rubber-seat type, ductile iron body manufactured in accordance with *ASTM CL B/A536*. Valve shall have an *NSF 61* EPDM Liner, Valve discs shall be Cast or Ductile Iron to *ASTM A536* and shall rotate ninety (90) degrees from the full open position to the tight shut position and have a positive stop. All valves shall have an approved epoxy coating both internally to *AWWA C550* and *NSF 61*, and externally to *AWWA C116*.
Valve Operators. Valve operators shall be designed to hold the valve disc in any intermediate position between fully closed and fully opened without creeping or fluttering. All valves shall be equipped with a two-inch (2") operating nut. Valve operators shall be geared per the following: open right (clockwise) for Potable Water valves.

End Connections. Buried valves shall have mechanical joint ends with gasket gland and fasteners conforming to the *ANSI A21.11* and *AWWA C111*.

Color. Potable Water - Per Manufacturer's Specifications

b) **Standard Butterfly Valves**



Approved Manufacturer(s):

- **Clow/Kennedy/M&H (McWane Plant Industrial)**
- **American AVK**
- **Mueller/Pratt**
- **DeZurik**
- **Val-Matic with Colorado Springs Utilities Approval**

Note: Widebody butterfly valves are required for use with PVC and HDPE pipe. Standard butterfly valves are not permitted for use with PVC and HDPE pipe.

General: Butterfly valves shall be used when line valves are required for 16" and larger diameter pipe and shall conform to these Specifications.

Size(s): 16, 20, 24, 30, 36, 40, 42, and 54-Inch Nominal Diameter

Pressure Class: The Working Pressure for all sizes both flanged and mechanical joint valves shall be 250 psi. Flanged valves shall have Class 150 flanges or Class 300 flanges.

Material: Cast iron or ductile iron body

Specifications: All butterfly valves shall be manufactured in accordance with *AWWA C504* Class 250B valve body with the following additional requirements or exceptions:

Butterfly valves shall be of the rubber-seat type, cast iron or ductile iron body manufactured in accordance with *ASTM A126 CL B/A536*. Valve discs shall be Cast or Ductile Iron to *ASTM A126/A536* and shall rotate ninety (90) degrees from the full open position to the tight shut position and have a positive stop. All valves shall have an approved epoxy coating both internally to *AWWA C550* and *NSF 61*, and externally to *AWWA C116*.

Valve Operators. Valve operators shall be designed to hold the valve disc in any intermediate position between fully closed and fully opened without creeping or fluttering. All valves shall be equipped with a two-inch (2") operating nut. Valve operators shall be geared per the following:

- open right (clockwise) for Potable Water valves
- open left (counterclockwise) for Nonpotable Water valves

End Connections. Buried valves shall have mechanical joint ends with gasket gland and fasteners conforming to the *ANSI A21.11* and *AWWA C111*. Valves to be placed in Vaults shall have flanged valve connections and shall have either *Class 125/ANSI 150* or *Class 250 /ANSI 300* drilled pattern per *ASME/ANSI B16.1*. The type of flange is dependent upon the pressure rating of the butterfly valve and flanged fitting it is being attached to.

Color.

Potable Water - Per Manufacturer's Specifications

Nonpotable **-** purple color Pantone 512 or Pantone 522

Note: Larger Diameter Butterfly Valves (36 inch and larger) will be specified by a Design Engineer, which will be reviewed and approved by Colorado Springs Utilities due to pipeline application and Site conditions.

4.4.E.3 Specialty Valves

**Specialty valves to be evaluated on a case-by-case basis.

Triple Offset Butterfly Valves
Approved Manufacturer:
Vanessa - Metal Seated



To be specified by the Design Engineer as well as reviewed and approved by Colorado Springs Utilities due to pipeline application and site conditions.

4.4.F Pressure Reducing Valves

4.4.F.1 Pressure Regulating Valves

Approved Manufacturer:



Cla-Val Company



Watts/Ames *(only with CSU approval)*

General: The valves shall be capable of maintaining a constant downstream pressure regardless of varying inlet pressures. When the downstream pressure exceeds the pressure setting of the control pilot, the main valve and pilot valve shall close drip-tight.

Size(s) and Configuration: To be determined by the Design Engineer and Colorado Springs Utilities.

Specifications: Pressure regulating valves shall be accurate, single seated, hydraulically operated, pilot controlled, diaphragm type, globe valves**,** flanged body. Valve Body and Cover, Grade *ASTM A536* for Ductile Iron and *ASTM A743* for Stainless steel.

Model.

Cla-Val Model 90-01 (Uses Basic Value Model 100-01)

Watts/Ames with Colorado Springs Utilities Approval

End Connections. All pressure regulating valves shall have *ANSI* CL 150 drilled flanged ends in accordance with *ANSI B16.42, B16.5*, and as determined by the Design Engineer.

4.4.G Pressure Relief Valves

Pressure Relief Valves
Approved Manufacturer(s):



Cla-Val Company



Watts/Ames *(only with CSU approval)*

General: The valves shall be installed where a fast opening- slow closing pressure relief valve is required to maintain a constant upstream pressure to close limits without causing surges.

Size(s) and Configuration: To be determined by the Design Engineer and Colorado Springs Utilities.

Specifications: Pressure relief valves shall be hydraulically operated, pilot controlled, single seated, diaphragm type globe valves (with resilient disc) capable of maintaining a constant upstream pressure by bypassing or relieving excess pressure, with valve position indicator.

Model. Cla-Val Model 50-01 Series Pressure Relief Valve, with X101 Valve Position Indicator

Watts/Ames with Colorado Springs Utilities Approval

End Connections. All pressure reducing valves shall have ANSI CL 150 drilled flanged ends in accordance with *ANSI B16.42, B16.5*, and as determined by the Design Engineer.

4.4.H Check Valves

Check Valves
Approved Manufacturer(s):



Cla-Val Company



Singer



Watts/Ames

General: Check valves shall be used to establish flow in one direction and open when the pressure at the inlet exceeds the pressure at the discharge.

Size(s) and Configuration: To be determined by the Design Engineer and Colorado Springs Utilities.

Specifications: Check valves shall be single seated, hydraulically operated, diaphragm type, globe valve (with resilient disc) capable of closing drip tight when pressure reversal occurs.

Model.

Cla-Val 81-02 Series Check Valve, with X101 valve position indicator.

Singer 106-HC with Colorado Springs Utilities Approval

Watts/Ames with Colorado Springs Utilities Approval

End Connections. All pressure reducing valves shall have ANSI CL 300 drilled flanged ends in accordance with *ANSI B16.42, B16.5*, and as determined by the Design Engineer.

4.4.I Air and Vacuum Relief

Air and Vacuum Relief
Approved Manufacturer(s):



- **Vent-O-Mat**
  Air release and Vacuum Break Valves
  Series RBX
  Approved Size(s): 2", 4", 6", and 8".



- **A.R.I.**
  Combination Air Valve "Barak" for 6" and 8" water pipelines
  Series D 040 (D-040-P: with Nylon base or D-040-B: Brass base).
  Approved Size(s): 2"
  Non-corrosive or corrosion protected materials including—Nylon, plastic, cast iron, steel, stainless steel.
  Working Pressures from 2 psi to 250 psi.



- **Vent Tech by International Valve**
  Combination Air/Vacuum Valves
  Air Release Valve
  Several Models will need to determine which is needed for the application.
  Non-corrosive or corrosion protected materials including- cast iron, steel, stainless steel.
  Working Pressures from 2 psi to 363 psi.
  Note: Vent Tech Valves can be taller than other manufactured air/vacuum valves.

  Note: Colorado Springs Utilities review and approval is required for low seating head pressures (10-15 psi).

General: The valves shall be installed to control air during filling and draining of a pipeline and to release any accumulations of air, which may collect while the line is in operation and under pressure.

Size(s): To be determined by the Design Engineer and Colorado Springs Utilities. The Design Engineer needs to call out seating head in the design notes for ARV Vaults.

Specifications: Air and vacuum valves shall be combination valves with an air vacuum unit and a pressure unit, which are capable of operating independently. Air Release and Vacuum Break Valves shall be of a compact single chamber design with solid cylindrical High Density Polyethylene control floats housed in a tubular stainless steel or corrosion protected body with epoxy powder coated cast iron, or stainless steel ends secured by means of stainless steel tie rods. The valve shall have an integral surge alleviation mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure due to high velocity air discharge or the subsequent rejoining of separated water columns. The limitation of pressure rise must be achieved by deceleration of approaching water prior to valve closure. Relief mechanisms that act subsequent to valve closure cannot react in the low millisecond time span required and are therefore unacceptable.

Large orifice sealing shall be affected by the flat face of the control float seating against a nitrile/EPDM rubber O-Ring housed in a dovetail groove circumferentially surrounding the large orifice. Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice on a natural/EPDM rubber seal affixed to the control float.

The intake/discharge orifice area shall be equal to the nominal size of the valve i.e., a 6" valve shall have a 6" intake/discharge orifice.

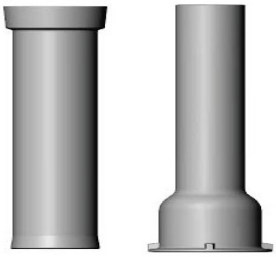
The valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. The feature shall consist of easily replaceable components such as gaskets, seals, or the like.

End Connections. All air and vacuum valves shall have threaded end connections.

4.4.J Valve Boxes

4.4.J.1 Valve Box Assemblies (Potable Water and Nonpotable Water)

Approved Manufacturer(s)*:



- **Castings, Inc**. – Slip Type C.I.- 664-A W/O F
- **D & L –** M80
- **East Jordan Iron Works, Inc –** 8555 Series
- **Star Pipe Products –** VB-0007
- **Tyler Union –** 7126 Series
- **Sigma –**VB466NH-35B

***Threaded Valve Boxes May Be Allowed With Colorado Springs Approval.**

General: All Gray iron valve boxes shall be rated for traffic service. Valve boxes shall conform to the Specifications described in this Section. See Detail Drawing A9-1 and A9-2.

Size(s): Two Piece Slip Type, Top (26") plus Lid, Bottom (36")

Materials: Material for valve boxes shall be heavy duty classification cast or gray iron. Use of an aluminum alloy as a casting material is not acceptable.

Specifications: Gray iron castings shall be manufactured from iron conforming to *ASTM48* Class 35B (and marked) for Gray iron and to the *ASTM A536* grade 80-55-06 for ductile iron. Castings shall also meet *Federal Specification A-A60005 (formerly RR-F-621E)*. Valve boxes shall be the three-piece (including lid), adjustable slip type, and the top section shall be without a flange. Castings shall be of uniform quality, free from sand holes, gas holes, shrinkage, cracks, and other surface defects. Casting shall be reasonably smooth and well cleaned by shot blasting. Surfaces of the castings shall be free from burned-on sand and shall be reasonably smooth. Runners, risers, fins, and other cast-on pieces shall be removed from the castings and such areas ground smooth. Bearing surfaces between covers and top sections shall be cast or machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact. Nominally, casting dimensional tolerances shall be +/- 1/16" per foot. All published casting weights are average and approximate values and shall vary +/-5%. All castings shall fit together properly and be fully interchangeable.

Markings. Each casting shall be identifiable and show the following optional markings including, but not limited to, name of the producing foundry, country of manufacture (such as "Made in USA" or "USA"), *ASTM A48*, CL 35B, cast or heat date and the individual part number. All castings shall be marked in accordance with all applicable laws and/or regulations.

4.4.J.2 Valve Box Lids

Approved Manufacturer(s):



- **Castings Inc**. **–** sizes 1 ½", 2"
- **D&L Supply –** Model M-8044, sizes 1 ½"
- **East Jordan Iron Works –** Model 6800, sizes 1 ½, 2, 2 ½, 4"
- **Star Pipe Products –** Model VBLID HD35, size 1 ½"
- **Tyler Union –** Model 145325, size 2"

Size(s): 5-1/4 inch drop lid With Skirt Lengths of 1-1/2, 2, 2-1/2, and 4 inches

Lid Specifications:
Minimum weights for Valve Box "WATER" lids,

- Non-Locking Lid (Drop) approx. 13lb– 1-1/2", 14lb- 2" and 16lb- 2 ½" skirt.
- Locking Lid 18lb – 1- 1/2" skirt

All valve lids on Potable Water lines shall contain a recognizable inscription "WATER" cast on the top surface.

4.4.J.3 Valve Box Lid for Nonpotable Water

Approved Manufacturer(s):



- **Trumbull**, Model 367-5049, Size 2"
  (or Approved equivalent)

Size(s): 5-1/4 inch drop lid With Skirt Length of 2 inch

Specifications: All castings shall be marked in accordance with all applicable laws and/or regulations, shall be purple in color and be marked with "NONPOTABLE WATER" on the lid, and painted Nonpotable purple.
Weight: Minimum weights for Valve Box "NONPOTABLE WATER" lid,
Non-Locking Lid (Drop) 13lb, with a 2" skirt.

4.4.J.4 Debris Caps

Approved Manufacturers:



- 2B Enterprises
- Infact Corporation
- Or equivalent



General: Debris caps are used to keep dirt and debris material out of Valve Boxes. Compressible foam plugs may be used for debris caps, foam caps will be minimum of 4" thick.

Size(s): Debris Caps are adjustable to all 6" valve boxes

Specifications: The 6" debris cap is designed for installation and removal inside a valve box riser and conduit.

Approved Manufacturer(s):



- **The Debris Cap ™ manufactured by SW Services, Inc**.
  Model Number:
  DC400 – (special Colorado Springs Utilities Water applications)
  DC457 - Fits valve box top section (typical Tyler style)
  (Standard padlock model) Lockout/Tagout

General: Debris caps are used to keep dirt and debris material out of Valve Boxes.

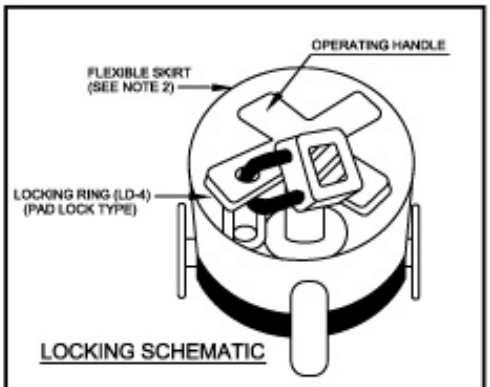
Size(s): Debris Caps are adjustable to all 6" valve boxes

Material: Made of flexible rubber that can be cut to fit if needed.

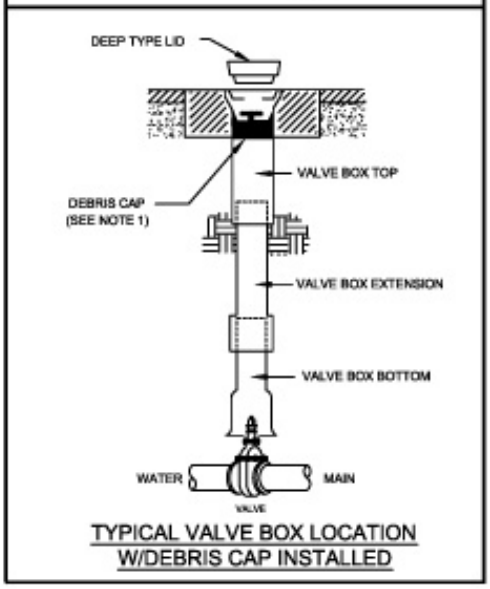
Specifications:
See next page for drawing and details

Color Codes.

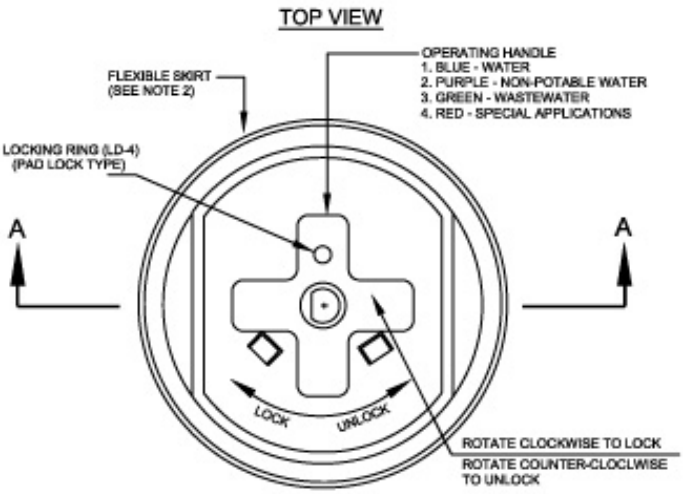
- Blue – Water,
- Purple – Nonpotable Water,
- Red – (Special Colorado Springs Utilities water applications) Lockout-Tag out

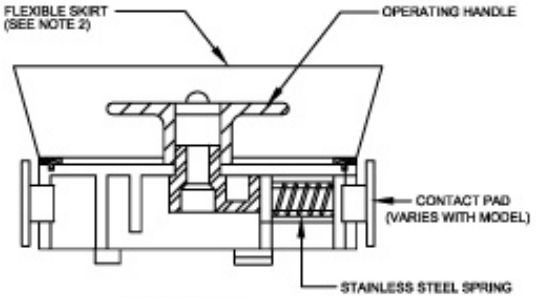


LOCKING SCHEMATIC

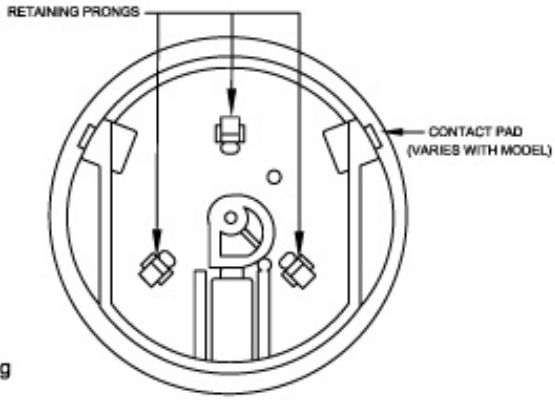


TYPICAL VALVE BOX LOCATION
W/DEBRIS CAP INSTALLED





SECTION A-A



BOTTOM VIEW

GENERAL NOTES:

1. Valve box is to be cleaned of all debris and obstructions prior to installation of the debris cap.
2. Debris cap shall be installed as close under the cast iron cover without interfering with cover operation.
3. Flexible skirt shall be trimmed to provide a smooth contact with the interior diameter of the pipe.
4. The debris cap shall be comprised of a hollow member having a cylindrical outer surface, a closure for one end and three point resilient contact pads projecting from the outer surface. The cap shall have a flexible skirt providing an outward seal preventing debris from getting past the cap. The cap must withstand, without slippage, a minimum vertical force of 50 pounds, at a loading rate of 1.0 in/ minute. The cap shall be molded using General Electric ABS #him 4500. The cap shall have retaining prongs to retain a standard locating coil.

4.4.K Fire Hydrants

Fire Hydrants: Dry Barrel, Modern Style, Two piece, Open Right, Static Pressure to 250 psi
Approved Manufacturer(s):

Modern style
Two piece



AVK Series 2700, Modern style



Waterous Pacer WB-67-250



Kennedy K81DDCSU



Clow Medallion Mountain Hydrant



Mueller Super Centurion A-403

General: The following fire hydrant Specifications shall be met within the service area of the Colorado Springs Utilities Water Distribution System, regardless of whether the maintenance is performed by Colorado Springs Utilities or by Private owners.

Size(s): Hydrants shall have a main valve opening size of five and one-quarter (5-1/4”) inches and shall be ordered for a six-foot (6’) bury unless otherwise required and approved by Colorado Springs Utilities. Hydrant bury will be measured from the bottom of the hydrant lateral pipe to bury line.

Pressure Class: Fire hydrants shall be rated for a Working Pressure of 250 psi.

Material: Gray Iron to *ANSI/AWWA C110/A21.10, ASTM A126*, Ductile Iron to *ANSI/AWWA C110/A21.10*, *ASTM A395/A536* or *ANSI/AWWA C151/A21.51*, Copper and Brass Alloys comply to UNS designations for Hydrant Components and shall be Lead Free in accordance with NSF/ANSI 372.

Specifications: All fire hydrants shall be designed and manufactured in strict compliance with the latest version of *AWWA C502*. Two-piece modern style fire hydrant is preferred of the approved listed models above. Fire hydrants shall meet all test requirements and be listed by Underwriters Laboratories Inc and have Factory Mutual Research approval. All references made in this Specification are to the above standards unless otherwise noted. The manufacturing facility for the hydrant must have current ISO 9001 certification. All brass alloys in the hydrant exposed to the Potable Water shall comply to UNS designations for Hydrant Components and shall be Lead Free in accordance with NSF/ANSI 372 in the open position effective January 5, 2015, for all new installations and repair pieces.

Color: Hydrants shall come painted Equipment Yellow with Ford Blue Bonnet and Pumper Nozzle Cap.

Warranty: Hydrants shall be warranted by the manufacturer against defects in materials or workmanship for a period of 10 years from the date of manufacture. No Fire Hydrant more than 2 years old from the date of manufacture shall be accepted into the Water Distribution System.

Type of Hydrant: Hydrants shall be the three-way type with one (1) pumper nozzle and two (2) hose nozzles, all located on the same horizontal plane. All hydrants shall be a "traffic-model" having upper and lower barrels joined at the ground line by a separate and breakable "swivel" flange providing 360^0 rotation of upper barrel for proper nozzle facing. This flange shall employ not less than four bolts. The safety flange segments shall be located under the upper barrel flange to prevent the segments from falling into the lower barrel when the hydrant is struck. The pressure seal between the barrels shall be an O-ring. The proper ground line shall be cast or marked clearly on the lower barrel and shall provide not less than 18" of clearance from the centerline of the lowest nozzle to the ground. (Hydrant bury/groove line on hydrant assembly may vary with manufacturer for clearance distance from ground).

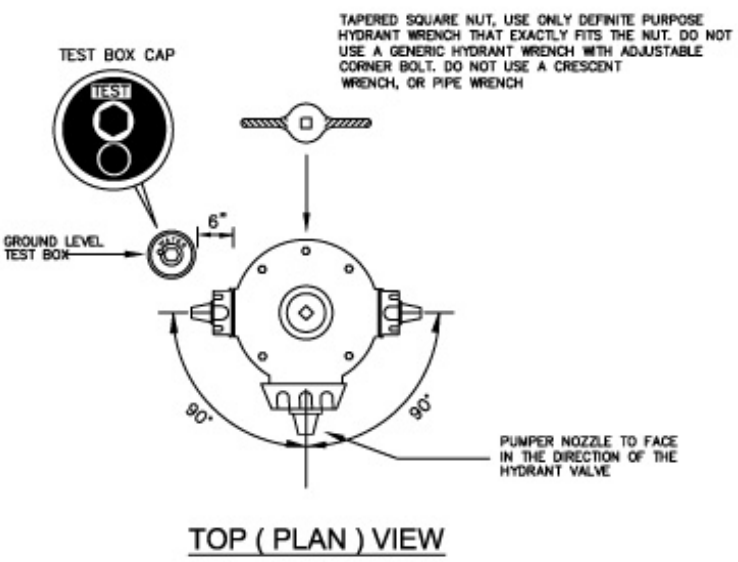
Inlet Connection: Hydrant base shall be provided with a mechanical joint inlet to accommodate 6-inch diameter DIP or PVC or HDPE pipe, all in accordance with *ANSI A21.11*, and *AWWA C111*.

Main Valve Assembly: Main valve of the hydrant shall be 5-1/4 inch diameter compression type which closes with the water pressure. Gaskets for valves shall be a replaceable type fabricated of a resilient material, with a threaded bottom plate or nut, complete with seal to prevent leakage of the hydrant shaft.
The valve assembly shall include one or more drain valves, which will work automatically with the main valve, and drain the barrel when the main valve is in the closed position. All parts of the main valve assembly shall be so designed that removal of the assembly from the barrel is accomplished without excavation.

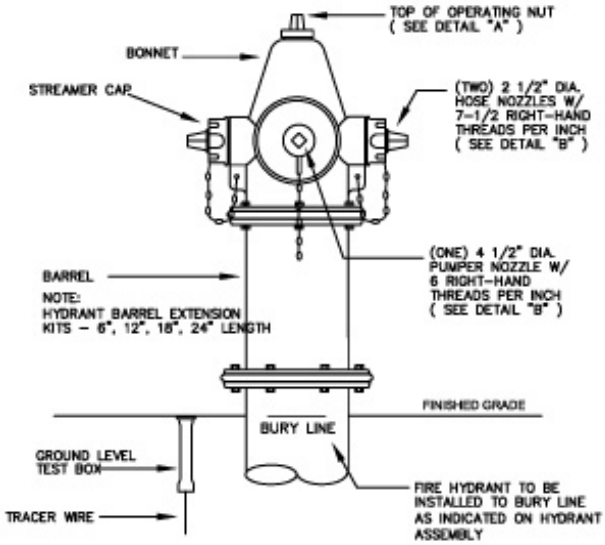
Operating Shaft Nut: The operating shaft nut shall be a truncated pyramid in shape, 7/8 inch square on the bottom, ¾ inch square on the top, with a finished height of 1-1/4 inches. See following drawings. Bushings in the bonnet shall be so constructed that it will prevent the operating nut from traveling during opening or closing operation; also, the bushing shall house a gasket or seal to prevent moisture or foreign material from entering the lubricant reservoir. The hydrants for the main distribution system shall **open by turning the operating nut to the right in a clockwise** direction and shall have an arrow on top of the bonnet to designate the direction of opening. Hydrants for the non-potable system shall open by turning the operating nut to the left in a counter-clockwise direction with an arrow on top of the bonnet to designate the direction of opening.

Pumper Nozzle and Cap: The pumper nozzle shall be 4-1/2 inch nominal diameters with 6 threads per inch. Threads shall be right-hand. All pumper nozzle caps shall be removed by turning counterclockwise. Nozzle caps shall be furnished with a synthetic rubber gasket installed in a retaining groove and the dimensions and shape of the nozzle cap nut shall be the same as the operating shaft nut as described above. Nozzle caps shall be furnished with security chains with one end of each securely attached to the upper barrel section of the hydrant.

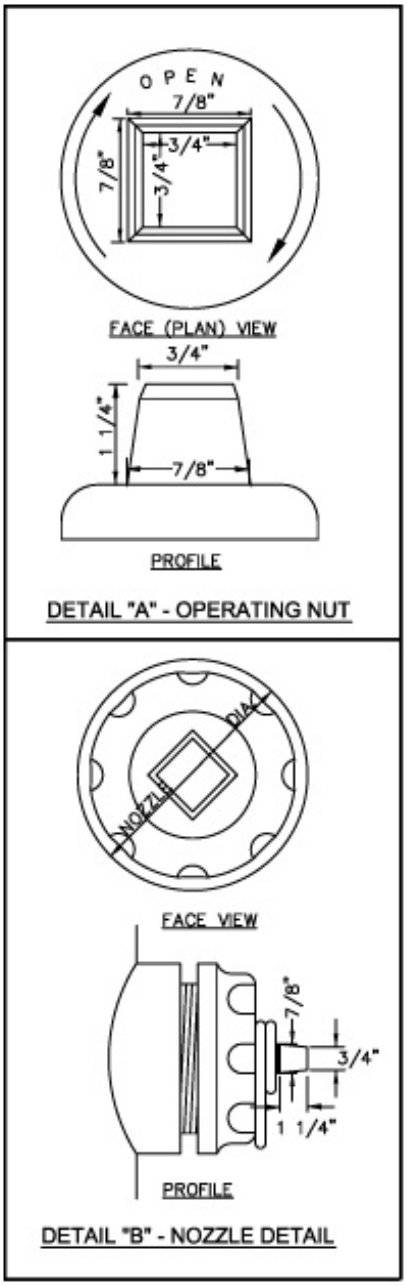
Hose Nozzles and Caps: The two hose nozzles shall be 2-1/2 inch nominal diameters with 7-1/2 threads per inch. Threads shall be right-handed. All nozzle caps shall be removed by turning **counterclockwise**. Each hose nozzle shall include a nozzle cap with nut and security chain. Steamer Nozzles are 4-1/2 inch in diameter with 6 right hand threads per inch. Specification on Steamer nozzle threads are available upon request and must meet CSFD hose threads.



TOP (PLAN) VIEW

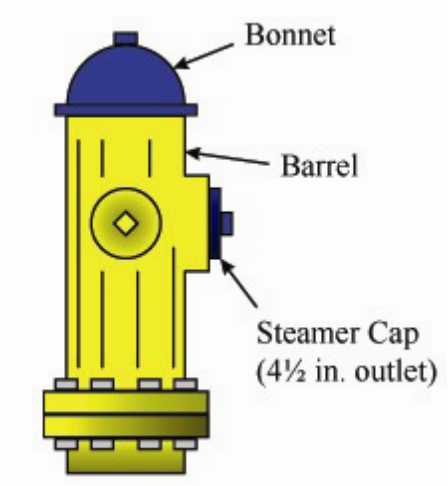


FACE (FRONT) VIEW



4.4.K.1 Fire Hydrant Color Coding [Water Supplies for Fire Protection]

Manufacturer:



Potable Hydrant Paint:

Approved Paint Manufacturers

Colors	Arvoe	Rustoleum
Ford Blue	560	7424830
John Deere Green	157	7435830
OSHA Safety Orange	305	1653830
OSHA Safety Red	301	2163
Equipment Yellow	302	282148
Safety Gloss Black	306	1679830

Non-Potable Hydrant Paint:
Aervoe paint
OSHA Safety Purple #300
Gloss White #5019

Rustoleum Paint
Safety Purple #160830
Gloss White #2192

Purple Pantone PMS 512 or 522 C

The fire hydrant color codes are as follows:

Ford Blue	**3000+ gpm bonnet and steamer cap**
Ford Blue	**1500 – 2999 gpm bonnet only**
John Deere Green	**1000 -1499 gpm bonnet only**
Bright Orange	**500 – 999 gpm bonnet only**
Red	**Less than 500 gpm bonnet only**
Yellow	**All Barrels**
Black	**Operable and maintenance only; bonnet, caps, barrel**

In all cases, the hydrant is painted yellow as delivered from the manufacturer. Bonnet and Steamer Caps are painted accordingly after Construction placement.

The upper exposed section of the hydrant above ground shall be painted Equipment Yellow Rustoleum 2148. The buried portion of the hydrant shall be coated with black asphalt varnish.

Nonpotable Water hydrants shall be painted white on the barrel and purple on the steamer cap and bonnet. Nonpotable-purple Color Pantone PMS 512C or Pantone PMS 522C from the manufacturer.

Coatings: Fire hydrants shall be coated to prevent atmospheric corrosion.

4.4.K.2 Out of Service Fire Hydrant Rings

Approved Manufacturer(s):



LEM Products, Inc

General: "Out-of-service" hydrant rings provide identification of fire hydrants determined to be out-of-service.

Size: 10.5" OD x 5.75" ID

Material and Color: Red ring with white text transcribed with "OUT OF SERVICE." Ring to be made from durable UV and weather resistant plastic and shall be reflective.

4.4.L Water Quality Device/Test Station

4.4.L.1 Post Hydrant

Approved Manufacturer(s):



- **AVK**
  Series 67
  Flushing/Sampling Hydrant
  4” MJ connection

General: Post Hydrants are used to test or flush the Water Main. Post Hydrants may not be used for Fire Protection purposes.

Size(s): 4-inch

Pressure Class: Post hydrants shall be rated for a minimum Working Pressure of 250 PSI.

Material: Ductile Iron

Specifications:

a. Mechanical joints shall comply with the requirements of *AWWA C111*, 4” in size for flushing hydrants.
b. Post Hydrants shall meet or exceed *AWWA C502* where applicable.
c. Post Hydrants shall be manufactured and tested in an *ISO 9001* certified facility.
d. Post hydrants shall be of the compression type, opening against system pressure and closing with system pressure.
e. All brass alloys in the hydrant exposed to the Potable Water shall comply to current UNS designations for Hydrant Components and shall be Lead Free in accordance with NSF/ANSI 372 in the open position effective January 5, 2015, for all new installations and repair pieces.

Color: Post Hydrant shall be painted John Deere Green in color Paint for Post Hydrants.

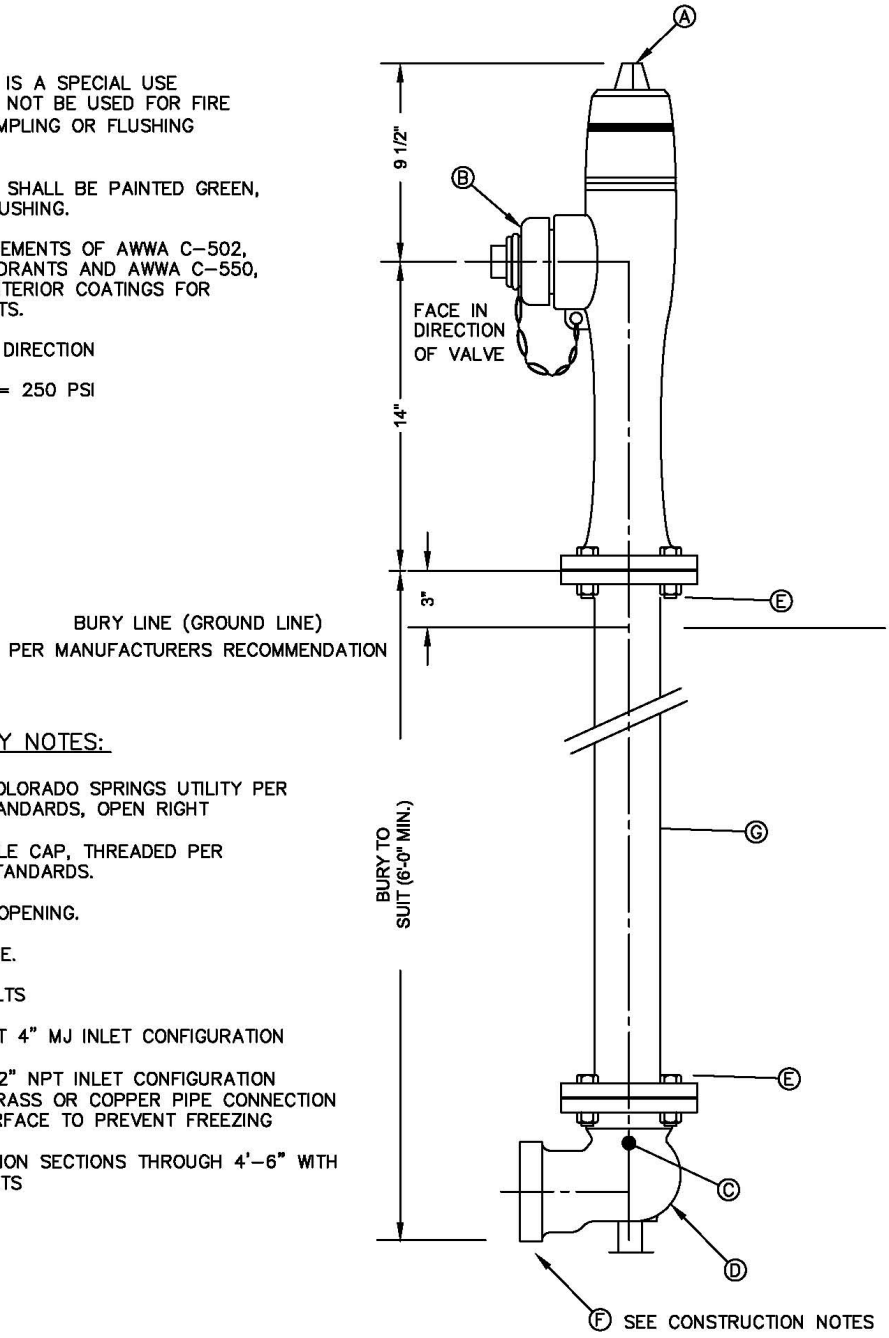
Approved Manufacturer(s):



Sherwin Williams
John Deere Green
#B65T605
Rustoleum Paint
John Deere Green
#7435830

GENERAL NOTES:

1. POST TYPE HYDRANT IS A SPECIAL USE HYDRANT AND SHALL NOT BE USED FOR FIRE FIGHTING. (WATER SAMPLING OR FLUSHING APPLICATION)
2. ALL POST HYDRANTS SHALL BE PAINTED GREEN, FOR SAMPLING OR FLUSHING.
3. COMPLY WITH REQUIREMENTS OF AWWA C-502, DRY BARREL FIRE HYDRANTS AND AWWA C-550, PROTECTIVE EPOXY INTERIOR COATINGS FOR VALVES AND HYDRANTS.
4. OPENING IN A RIGHT DIRECTION
5. WORKING PRESSURE = 250 PSI



CONSTRUCTION KEY NOTES:

A. WEATHERSHIELD – COLORADO SPRINGS UTILITY PER SPRINGS UTILITIES STANDARDS, OPEN RIGHT

B. ONE 2½" HOSE NOZZLE CAP, THREADED PER SPRINGS UTILITIES STANDARDS.

C. 2 1/4" MAIN VALVE OPENING.

D. HYDRANT ELBOW BASE.

E. STAINLESS STEEL BOLTS

F. a. FLUSHING HYDRANT 4" MJ INLET CONFIGURATION

b. SAMPLE HYDRANT 2" NPT INLET CONFIGURATION WITH THREADED BRASS OR COPPER PIPE CONNECTION INSULATED TO SURFACE TO PREVENT FREEZING

G. BARRELS: 6" EXTENSION SECTIONS THROUGH 4'-6" WITH STAINLESS STEEL BOLTS

4.4.M Concrete for Thrust Restraint Blocks, Concrete Reverse Anchors and Vaults

Concrete:

Cement. All cement used shall be Portland Cement acceptable under the *"Standard Specifications and Tests for Portland Cement," ASTM C150* and conform to the latest *ACI 318* Building Code Requirements. Cement used shall be Type II.

Aggregates. The limits for deleterious substances and physical property requirements of the coarse aggregates shall be selected for the applicable class designation from those listed under severe weathering regions, Table 3, *ASTM C330*.

Fine Aggregate. Fine aggregate shall conform to *ASTM C330*. Fine aggregate shall consist of sand or other inert materials, or combinations thereof, and having hard, strong, durable particles, free from adherent coating. Fine aggregate shall be thoroughly washed to remove shale, coal, mica, clay, loam, alkali, organic matter, or other deleterious matter.

1. Deleterious Substances. The amount of deleterious substances in the washed aggregate shall not exceed the following values:
   a. Clay lumps and Friable Particles, % by weight 3.0 MAX
   b. Coal and Lignite, % by weight 1.0 MAX
   c. Friable Particles, % by weight 1.0 MAX
   d. Sand equivalent 75 MIN
   e. Fineness Modulus 2.3 -- 3.1 MAX
   f. Sodium sulfate soundness, % by weight 10 MAX

2. Grading. Fine aggregate shall be regularly graded from coarse to fine in two (2) sizes and when tested by means of the *ASTM C330 Standard*, sieves shall conform to the following requirements expressed as percentages by weight:

Sieve Size or Test Procedure	Percent Passing or Test Requirement *(Concrete Sand)
3/8*	100
No. 4	85-100
No. 16	40-80
No. 50	10-35
No. 100	5-25

* The fine aggregate shall have not more than 45% passing any sieve and retained on the next consecutive sieve.

Coarse Aggregate. Gravel and crushed stone shall conform to *ASTM C33*. Coarse aggregate shall consist of gravel, crushed stone, or other inert material or combinations thereof, and having hard, strong, durable pieces free from adherent coating. Coarse aggregate shall be thoroughly washed of clay, loam, bark, sticks, alkali, organic matter, shale, coal, mica, or other deleterious material.

1. Deleterious Substances. The amount of deleterious substances shall not exceed the following values:

a. Clay lumps and Friable Particles, % by weight 3.0 MAX
b. Coal and Lignites, % by weight 0.5 MAX
c. Sum of Clay Lumps, Friable Particles and Chert, 5.0 MAX % by weight
d. Abrasion, % by weight 50 MAX
e. Sodium Sulfate Soundness, % by weight 12 MAX

2. Grading. Coarse aggregate, when tested in conformity with *ASTM C136*, shall conform to one or more of the following gradings.

Sieve size or Test Procedure	**Percent Passing or Test Requirement**		
	No. 357	**No. 467**	**No. 57**
2 ½"	100	--	--
2"	95-100	100	--
1 ½"	--	95-100	100
1"	35-70	--	95-100
¾"	--	35-70	--
½"	10-30	--	25-60
3/8"	--	10-30	--
No. 4	0-5	0-5	0-10
No. 8	--	--	0-5
No. 200	*1.0 MAX.	*1.0 MAX.	*1.0 MAX.

*1.5 MAX. for crusher fines

NOTE: Size No. 67 may also be used on a case-by-case basis when approved by the Engineer. The above values are in percentages by weight from *AASHTO M-80 No. 357* and *467*.

Water. The water used in all concrete shall be free from objectionable quantities of silt, organic matter, alkali, salts, and other impurities.

Admixtures. An air-entraining agent shall be used in all concrete. The agent used shall conform to *ASTM C260*. The amount of air-entraining agent used shall be such as will affect the entrainment of 6% (+ or – 1%) of volume of the concrete.

A water-reducing admixture (WRA) may be used unless otherwise noted by Colorado Springs Utilities. The admixture shall conform to *ASTM C494* for Type A or Type D chemical admixture, shall contain no calcium chloride, and shall be compatible with the cement being used.

Temperature Control. No concrete shall be poured when the temperature is below 35° F or dropping during a 24-hour period preceding the pouring. Concrete which is being cured below 32° F shall be heated during curing.

Concrete Quality.

a. All cast (poured or batch concrete)-in-place concrete for thrust reaction blocks, reverse anchors and encasements shall have a minimum 28 day compressive strength of 3,000 PSI and maximum slump of four inches (4") ±.

b. All cast (poured or batch concrete)-in-place and precast concrete for Vaults and bridging shall have a minimum compressive strength of 4,000 PSI and maximum slump of four inches (4") ±.

Concrete Reinforcement:

General. Reinforcements shall be accurately formed and shall be free from loose rust, scale, and Contaminants, which will destroy or reduce bonding including mortar from previous concrete pours. Unless otherwise shown on the drawings or specified herein, all requirements shall conform to *ACI 318* and the *Uniform Building Codes*.

Reinforcements shall be accurately positioned on supports, spacers, hangers, or other reinforcements and shall be secured in place with wire ties or suitable clips adequate to ensure against displacement during the course of Construction.

Material. All deformed reinforcing bars shall conform to *ASTM A615*, minimum Grade 60, clean and void of rust.

Dowels, conforming to the requirements of *ASTM A15*, shall be intermediate grade plain bars rolled from billet stock.

Bending. Reinforcement shall be bent cold. Bars shall be full length and accurately bent to details shown on drawings. No bars partially embedded in concrete shall be field bent except as shown on the drawings or specifically permitted by the Engineer/Inspector.

4.4.N Safety Ladders

Safety Ladders – (Ladder Up)

Approved Manufacturer(s):



- **Bilco Ladder UP Safety Post**

Model-1 High Strength Steel/Black Enamel (regular conditions)

Model-2 High Strength Steel/Hot Dip Galvanized (corrosive conditions)

Model-3 Stainless Steel, Model-4 Mil Finish Aluminum

See manufacturer's specification for correct installation.

General: The Bilco LadderUP safety post is to aid personnel to enter and exit a Vault in a safe manner.

Materials: Steel

Specifications: The existing ladder must be structurally sound and securely anchored. LadderUP shall be designed with a telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

The LadderUP is furnished completely assembled ready to mount on the rear of an existing ladder with brackets on the climbing side. Included are two (2) channel clamping brackets, four (4) 2" stainless steel bolts and eight (8) stainless steel washers (washers used only when securing to ¾" square or round rungs).

4.4.O Manhole Ring and Covers

Manhole Ring and Covers

Approved Manufacturer(s):



- **D&L Supply Company** –
  Model No. A-1423 (Heavy Duty)

General: Manhole ring and cover are for Water Vault applications

Size(s): 36 inch MH Ring and Cover, Inside Diameter = 37 inches, Outside Diameter = 45 inches

Material: Ductile Iron

Specifications: All heavy-duty manhole ring and covers shall be manufactured to meet *HS-20* traffic load conditions and shall have a minimum ring clearance diameter of 34-inches.
All covers shall be ductile iron, manufactured according to *ASTM A536*, Grade 60, or better.
All rings shall be iron, manufactured according to *ASTM A48*, Class 35B, or better.
Markings: All manhole assemblies shall be stamped with the name and model identification of the Approved Manufacturer.
Gasket: Manhole lid and ring will need to be ordered special with a 1/16 inch Neoprene flat gasket, Lid and ring are specially drilled for additional bolts for securing the lid to the ring with gasket for a tight seal.

Inverted rings shall not be permitted within Colorado Springs Utilities' System.

4.4.O.1 Vault Adjustment Rings

Approved Manufacturer(s):



- **EJ- Infra-riser**

Size(s): 38 inch ring for Water Vaults

General: Adjustment rings are used to raise a manhole ring and cover to meet changes in grade.

Material: Polyethylene

Specifications: Ring is to be manufactured to *AASHTO HS25* and *ASTM D1248*

4.4.O.2 Vault Venting

Vault venting shall be done with 4" Steel Pipe per Detail Drawing A6-1.

An Alternative to the Steel Candy Cane vent piping rising above ground is:

Husky Air Vent:



Approved Manufacturer(s):

- **Blue Water Innovations**

General: The Husky Air Vent shall be placed over the 4" Steel Piping that will be coming from a Water Vault. Once the vent. pipe rises above ground the Husky may be placed over the piping and secured to a Concrete base poured around the vent pipe.

4.4.P Tracer Wire

Tracer Wire (Blue for Potable Water and Purple for Nonpotable Water)



Approved Manufacturer(s):

- **Copperhead**
- **Agave Wire LTD**
- **Pro Line Safety Products**
- **Regency Wire**
- **Performance Wire**

General: Tracer Wire shall be used with all buried DIP, PVC and HDPE pipe and service line installations for location of the pipe for future Construction.

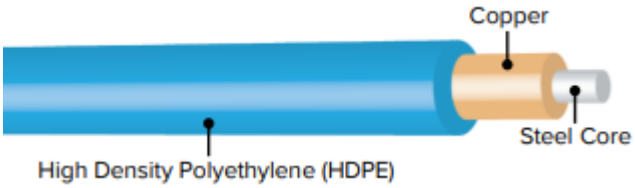
Wire insulation will be colored Blue for Water, Purple for Nonpotable Water in accordance with the *American Public Works Association (APWA) uniform color code.* Wire is to be used in all DIP, PVC, and HDPE applications.

Minimum 1 pound anodes/ground rods are to be placed on tracer wire at every wire dead end. See 4.4.P.3 Ground Rods and 4.4.R.3 High Potential Magnesium Anodes.

Specification:

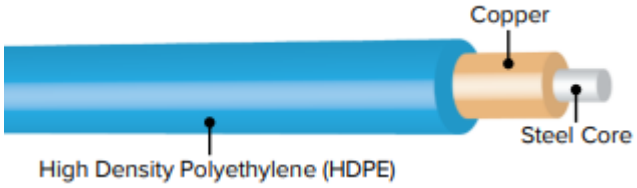
Direct Bury Applications

Wire shall be # 12 AWG copper clad steel with 30 mil HDPE jacket complying with *ASTM D1248* and a minimum average tensile break load of 280 pounds.



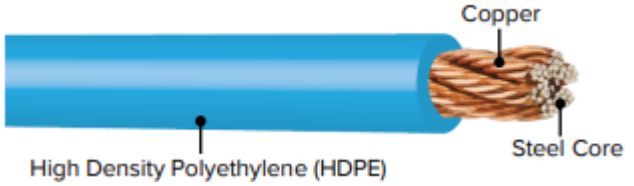
Boring Applications

Wire shall be #12 AWG copper clad steel with 45 mil HDPE jacket complying with *ASTM D1248* and a minimum average tensile break load of 1,150 pounds. The bore contractor is responsible for specifying alternative tracer wire if the pull force may exceed 1,150 pounds.



Pipe Burst Applications

Wire shall be #5 AWG 7x7 stranded copper clad steel with 45 mil HDPE jacket complying with ASTM D1248 and a minimum average tensile break load of 4,700 pounds. The pipe bursting contractor is responsible for specifying alternative tracer wire if the pull force may exceed 4,700 pounds.



4.4.P.1 Tracer Wire Connectors

General: Tracer wire should be as continuous as possible. All tracer wire connections must be made via an approved waterproof connection method and sized for the appropriate gauge wire.

A. Split Bolt and Housing

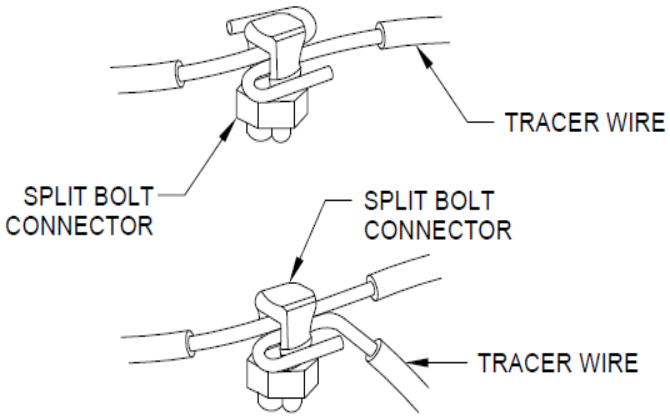


Split Bolt
Approved Manufacturer(s): Burndy

General: Split bolt is used to secure two ends of tracer wire while maintaining electrical conductivity throughout. Split bolt must be encapsulated in an approved Split Bolt Housing.

Specification: 6-14 AWG wire as applicable, copper to copper, square head, made from copper alloy.

Correct Split Bolt Splicing Method:



Once the wire split bolt connector is in place, it shall be encapsulated with an approved Split Bolt Housing and exposed wire shall be covered by the approved tape wrapping method described in 4.4.P.2.

Split Bolt Housing
Approved Manufacturer: King Innovation

General: Housing is to protect split bolt wire nut and tracer wire in buried applications.

Specifications: Housing shall be made of high impact polypropylene and be filed with a dielectric silicone gel.



Aqua Housing 69105 (Only comes in blue)

Max. Voltage: 50V
Housing: High Impact Polypropylene
Sealant: Dielectric Silicone Gel
Wire Range: #14-10 Solid Copper; #14-10 Steel Core Tracer Wire
Split bolt size not to exceed 1.0” tall by 0.8”wide by 0.7” deep



Visilock Housing 98010

Max. Voltage: 100V
Temperature Rating: -40°C - 90°C (194°F)
Measurements: See specification sheet for complete product measurements
Wire Range:
#8 - 1/0 (.363" - .625" O.D.)
#12 - #4 (.305" - .443" O.D.)
Amperage not to exceed maximum temperature of the conductor

B. Direct Bury Lug with Housing

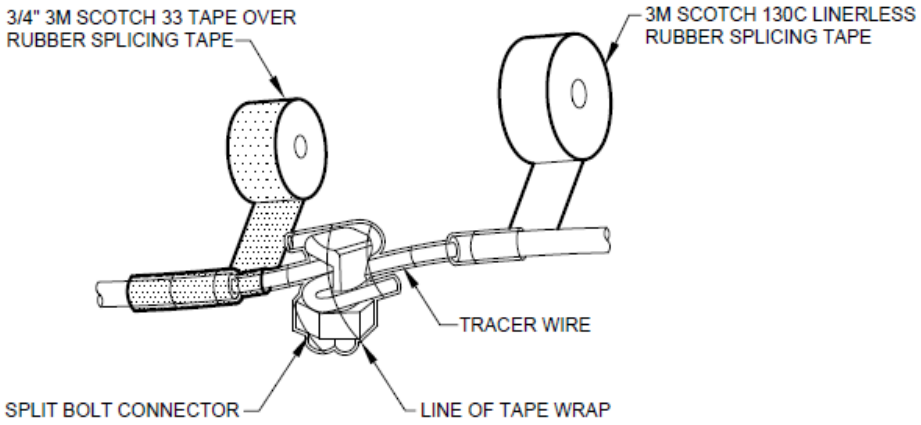


Approved Manufacturer(s):
King Innovation – DryConn Direct Bury Lug Aqua

Specifications:
Max. Voltage: 50V
Temperature Rating: -45°F - 400°F
Measurements: See specification sheet for complete product measurements
Wire Range:

#14-6 Stranded copper - (.124" - .408" O.D.)
#14-10 Steel core tracer wire - (.124" - .408" O.D.)
Sealant: Dielectric Silicone Gel
Amperage not to exceed maximum temperature of the conductor

4.4.P.2 Tape Wrapping of Tracer Wire or Corrosion Wire Leads



SPLIT BOLT TAPING

1. Wrap all exposed tracer wire using 1" 3M Scotch 130C Linerless Rubber Splicing Tape making sure to seal all ends to prevent moisture penetration.
2. Wrap over rubber tape with 1” Scotch 33+ Vinyl Tape to cover and protect rubber tape. Extend wrap 2" on both sides of connector.
3. Wrap Scotch 33+ Vinyl Tape around tracer wire and pipe or service line a minimum of 3 wraps every 8' to 10' of pipe or service line to secure tracer wire to underground infrastructure.

4.4.P.3 Tracer Wire Ground Rod with Wire Lead



Approved Manufacturer:

- **Copperhead**

Materials: Magnesium

General: A grounding rod or 1-lb. magnesium anode must be placed at every dead end or stub of the tracer wire to provide the electrical network with a ground. The ground pulls electrical current emitted by a locating transmitter along the wire and enables detection of Water Mains and Service Lines.

Specifications: 1.5 lbs. drive-in magnesium ground rod with HDPE cap and 20 foot copper-clad steel wire with 30 mil HDPE Jacket.

4.4.Q Marking Tape

Trench Marking tape (Blue for Potable Water, Purple for Nonpotable Water)



Potable Water Marking Tape may be used when directed by Colorado Springs Utilities.



Nonpotable Marking Tape is required in all applications.

General: Marking tape is utilized in trenches as additional cautionary measure for buried water lines.

Specifications: Marking tape shall be non-traceable, poly-vinyl, 3 to 6 inches in width. The Potable Water marking tape shall be blue and shall be printed with "Caution Buried Potable Water Line Below" or "Caution Buried Colorado Springs Potable Water Line Below."

The Nonpotable Water marking tape shall be purple and shall be printed with "Caution Buried Nonpotable Water Line Below" or "Caution Buried Colorado Springs Nonpotable Water Line Below." At times it may be permissible to have the purple tape marked as "Reclaimed Water."

Installation: One tape shall be laid in place over the indicated length of Water Main at the top of the pipe zone approximately 1 foot above the buried pipe and a second tape shall be placed 2 feet below the proposed finished grade for the indicated length of the pipe.

For Non-Potable and Reclaimed DIP pipelines marking tape shall be installed on the top of the transmission pipe longitudinally and should be centered. The identification should be continuous in coverage on the pipe and should be fastened to each pipe length at 10 foot intervals. Tape attached to sections of pipe before the pipe is placed in the trench shall have flaps sufficient for continuous coverage. Other satisfactory means of securing the tape during backfill of the trench may be used if suitable for the work, as determined by Colorado Springs Utilities. Additional marking tape should also be placed 1 foot above the buried pipe and a second tape shall be placed 2 feet below the proposed finished grade for the indicated length of the pipe.

4.4.R Cathodic Protection

4.4.R.1 Coatings and Wraps

Polyethylene Encasement Material



Approved Manufacturer(s): N/A- Must meet Specifications V-Bio with corrosion prevention additive layer

General: Polyethylene encasement (Low Density AWWA Polywrap) is used to deter corrosion on metal pipe and fittings.

Specifications: The (low density) polyethylene film shall meet the following test requirements:

Tensile Strength 3600 PSI minimum (*ASTM D882*)
Elongation 800% minimum (*ASTM D882*)
Dielectric Strength 800 V/Mil thickness minimum (*ASTM D149*)
Thickness 8 mils minimum
Impact resistance: 600 g minimum (*ASTM D1709* Method B)
Propagation Tear Resistance: 2550 gf, min. in machine and transverse direction (*ASTM D1922*)

The virgin material used to manufacture linear low-density polyethylene film shall be in accordance with *ASTM D4976*, *ANSI A21.5/AWWA C105*. The polyethylene film shall be marked with the manufacturer's name, year of manufacture, *ANSI/AWWA* standard, film thickness, application range of nominal pipe diameter size (s), and warning label.

4.4.R.2 Wax Tape

Approved Manufacturer(s):



Trenton:
Wax Tape Primer Brown or White
Wax Tape
Poly-Ply

General: Wax Tape is a three-part system that is used to coat underground metal fittings.

Installation:
Primer Application Procedures: Wire brush and wipe the surface clean and as dry as possible. Apply Wax-Tape Primer by hand, rubbing and pressing the primer firmly onto the surface, especially if the surface is wet, cold, or rusty to displace any moisture and ensure adhesion to the surface. After application of the primer, #1 Wax-Tape may be applied.

Color	Brown
Pour point	100-115°F
Flash point	350°F minimum
Coverage (approximate)	1gal/100sf

Wax Tape Application Procedures: Wrap #1 Wax-Tape using a 1" overlap. On straight pipe apply slight tension to ensure contact with surface. On irregular surfaces allow slack so the tape can be molded into conformity. In either case, press and form the tape so there are no air pockets or voids under the tape. Also, press and smooth out the lap seams to ensure they are sealed. The tape does not require curing or drying time so it can be backfilled immediately.

Outer wrap: For below ground pipes that are 12” or larger, apply a Trenton Poly-Ply outer wrap. For aggressive soil conditions use a Trenton outer wrap or a plastic wrap for protection or select backfill should be considered. Wrap should have a thickness of 70-90 mils.

4.4.R.3 High Potential Magnesium Anodes

Approved Manufacturer(s): NA



General Information:
High-potential magnesium anode bagged, in sizes from 9, 17, 32 and 48 lbs. with a 50-foot lead wire.

High Potential – Chemical Composition
***ASTM B843* Industry Standard for MC high potential magnesium anodes**

Magnesium Alloy:	
Aluminum	0.010% maximum
Manganese Zinc	0.5 – 1.3%
Impurities:	
Silicon	0.05% maximum
Copper	0.02% maximum
Nickel	0.001% maximum
Iron	0.03% maximum
Other	0.05% maximum each
Magnesium:	Remainder

Tracer Wire Anode:



1 lb. anodes are to be placed on tracer wire at dead ends.

4.4.R.4 Zinc End Cap

Approved Manufacturer(s): NA



General: Zinc end caps shall be made from Special High Grade zinc conforming to *ASTM B6*, with suitable alloying additives for Type I anode. Composition of the anode alloy content shall conform to the limits prescribed as follows and shall be 6 oz:

Zinc End Cap

Aluminum	0.1 - 0.5 %
Manganese Zinc	0.5 – 1.3%
Cadmium	0.025 – 0.07 %
Iron	0.005 % maximum
Lead	0.006 % maximum
Copper	0.005 % maximum
Others (total)	0.10 % maximum
Zinc	Remainder

The zinc end caps shall be free of flash, burrs, cracks, blow holes, and surface slag, consistent with good commercial practice.

4.4.R.5 Test Stations

a) **Ground Level Tracer Wire Test Box**

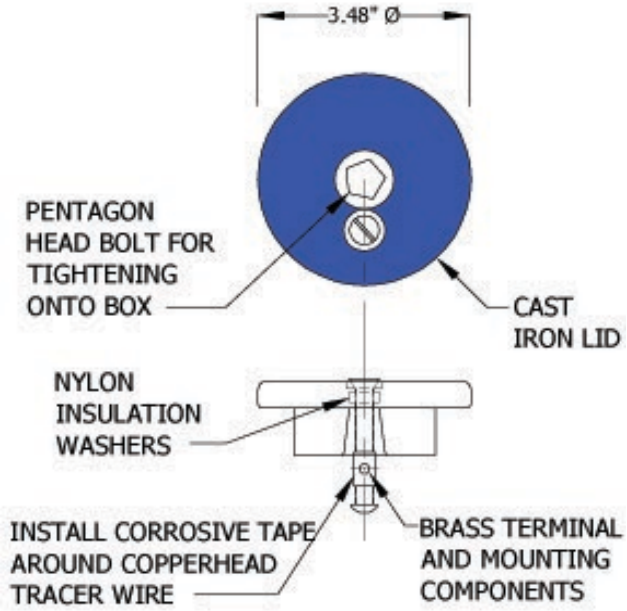
Approved Manufacturer(s):



Copperhead
Concrete/Driveway box – CD14*TP
Landscape Lite Duty box – LD14*TP

General: In-ground tracer wire test station box (landscaping and concrete).

Color. Lid will be Blue for Potable Water. The ground level test box shall be placed in conjunction with the installation of fire hydrants to attach the tracer wire.



TRACER BOX LID

b) **Pipeline CP Test Station**

Approved Manufacturer(s):

Maloney Phantom 72”
Supplied by Colorado Springs Utilities



General: The Maloney Combination Pipeline Marker and Test Station offers the versatility of a pipeline warning marker and a cathodic protection test station that is capable of:

- Pipe-to-soil potential measurements
- Measurements and/or restriction of anode current output
- Measurements of IR drop along the pipeline
- Tests for shorted casings and pipeline bondings
- Caps come in blue for Potable Water, green for wastewater or purple for Nonpotable Water and will be printed in white letters and shall be the same as the graphics in material specification 346-100-031. Contact the Water Standards Department for more information.

The cathodic protection Test Station is molded as part of the LineMRKR fitting. Test lead with 5 terminal connections are available with 1/4" x 20 NC x 1-1/2" silicone bronze machine screws with 2 nuts and washers, or highest quality non-corrosive 5-way hex-head binding post rated for 30 Ampere current capacity and 1000 Volt working voltage.

c) **Ground Level CP Test Station (Non-Roadway)**

Approved Manufacturer(s): Bingham and Taylor P525





General: The Water CP Test Station may not be used in roadways or street pavement. Each 5.25-inch lid shall be painted Blue and shall have "Water Test" cast into the Heavy Duty H20 rated lid. The body shall be 15 inches in height and made of high impact plastic. A 5-terminal test board shall be attached to the lid. This test box will be used in conjunction with Cathodic Protection Test points and systems.

d) **Ground Level CP Test Station (For Roadway)**

Approved Manufacturer(s):

- **Castings, Inc**.
- **D & L**
- **East Jordan Iron Works, Inc**
- **Star Pipe Products**
- **Tyler Union**
- **Sigma**







General: Ground level valve box with 5-terminal test board (purchased separately) to be used as a test station in the roadway and in street pavement. Gray iron valve box top section and lid rated for traffic service.

Size(s): Top Section (minimum 16") and 5-1/4" Lid with 2" skirt

Materials: Heavy duty classification cast or gray iron. Use of an aluminum alloy as a casting material is not acceptable. Test board should be made from white plastic and feature 5 terminals.

Specifications: The top section shall be without a flange. The lid shall be painted Blue and the text "Water Test" shall be cast on the top surface. Gray iron castings shall be manufactured from iron conforming to *ASTM48* Class 35B (and marked) for Gray iron and to the *ASTM A536* grade 80-55-06 for ductile iron. Castings shall also meet *Federal Specification A-A60005 (formerly RR-F-621E)*. Castings shall be of uniform quality, free from sand holes, gas holes, shrinkage, cracks, and other surface defects. Casting shall be reasonably smooth and well cleaned by shot blasting. Surfaces of the castings shall be free from burned-on sand and shall be reasonably smooth. Runners, risers, fins, and other cast-on pieces shall be removed from the castings and such areas ground smooth. All castings shall fit together properly and be fully interchangeable. All castings shall be marked in accordance with all applicable laws and/or regulations.

4.4.R.6 Flange Isolation Sleeves and Flanges





General: Flange insulation Sleeves and Flanges are used as a means in controlling losses due to corrosion. They can be used to increase the effectiveness of cathodic protection systems and confine or eliminate electrolytic corrosion. Flange Insulation Kits should be obtained in ANSI Class 150 or 300 depending on the Flange Configuration needed and shall include Insulating Sleeves and GRE/ZPS Washer sets. Isolation Flange Gaskets are also used to aid in corrosion losses.

Specifications: Sleeves shall have Compressive strength: 18,000psi, Dielectric strength: 1,200 volts/mil (short time), Operating temperature: -30° F to +180° F, Metal Washers are to be manufactured of 1/8” thick hot-rolled steel. Gaskets shall have Compressive strength: 18,000psi, Dielectric strength: 690 volts/mil (short time, Water Absorption: 0.22 %, Flexural Strength: LW 66,000 psi / CW 60,000 psi (413,685 kPa), Hardness Rockwell "M": 99, Tensile Strength: LW 45,000 psi / CW 39,000 psi (310,264 kPa), Shear Strength: 19,000 psi (151,684 kPa), Operating temperature: -40° F to +212° F.

4.4.S Controlled Low Strength Materials (CLSM) (a.k.a Flow Fill/Flash fill)

General Information: When Construction includes a street cut which requires the excavation and rapid backfill of the trench for the installation or repair of the roadway then CLSM may be required per the *City of Colorado Springs Standard Specifications Manual Section 206*. This includes utilizing temporary pavement patching materials, and final permanent pavement surfaces. Utilizing CLSM for the backfill material, as an alternative to traditional compacted soil, provides the advantage of being a self-compacting material with fast curing properties that will allow quick restoration of traffic access.

Specifications: CLSM must meet the requirements of City of Colorado Springs Standard Specification Manual section 206 and approved addenda.

Construction: When CLSM is to be utilized in Water/Wastewater Main excavations then approved bedding materials must be used to a minimum depth of 12 inches above the top of the pipe to ensure that the increased heat from the curing of the CLSM material is dissipated and will not damage Water/Wastewater Main materials. The use of CLSM will be determined by the City of Colorado Springs. Colorado Springs Utilities must approve all use of CLSM around pipes, Vaults, manholes, utility appurtenances, and Structures.

4.5 Water Service Line

4.5.A Copper Service Line Pipe and Fittings

4.5.A.1 Copper Pipe (Type K)

Approved Manufacturer(s): Cerro



General: All copper Water Service Lines shall be type K soft copper tubing and shall meet *ASTM B88* and *NSF 61*.

Sizes: ¾, 1/, 1-1/2, 2- inch CTS Tubing

4.5.A.2 Corporation Stop (Copper Connection)



Approved Manufacturer(s):

- **Cambridge Brass** 301NL-A*C*
- **Ford** FB600-***NL
- **Mueller** B-25000N
- **AY McDonald** 74701B

*is where size code is placed

General: Corporation Stop shall be used to tap at the Water Main for a service connection. Corporation Stops for copper service lines shall be Ball Type CC x Flare in copper tubing size (CTS).

Sizes: ¾,"1", 1 ½", 2"

Materials: No Lead Brass

Specifications: Ball Corp with CC Thread x Flare Outlet (300 psi – Maximum working pressure) quarter turn open/close, Ball Type, "No-Lead Brass", rated to 300 PSI. Fittings and valves to conform to *Federal Public Law 111-380*, effective date 1-04-2014.

Inlet shall be an AWWA taper CC thread. Outlet shall be a Copper Flare straight connection.

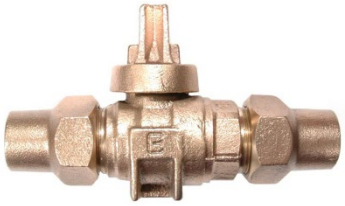
Fitting shall be manufactured and tested to *ANSI/AWWA C800* and *ASTM B584*.
Brass Components shall be constructed of *UNS* Copper Alloy No. C89520 or C89833 for chemical and mechanical requirements of the current standards.

All fittings and valves shall have an identifying mark indicating that it is made of "no-lead" brass alloy, e.g., "NL"



Corrosion Protection: For Corrosion Protection on all fittings, see Section 2.6.H.

4.5.A.3 Curb Stop (Copper Connection)



Approved Manufacturer(s):

- **Cambridge Brass** 202NL-C*C*
- **Ford** B22-***NL
- **Mueller** B-25204N
- **AY McDonald** 76100

*is where size code is placed

General: Curb Stop shall be used as a point of access at the property line of Premises. Curb Stops for copper service lines shall be Ball Type Flare x Flare in copper tube sizing (CTS).

Sizes: ¾,"1", 1 ½", 2"

Materials: No Lead Brass

Specifications: Curb Stop shall be Flare x Flare, quarter turn open/close, Ball Type, "No-Lead Brass," rated to 300 PSI. Fittings and valves to conform to *Federal Public Law 111-380*, effective date 1-04-2014.

Inlet shall be an AWWA copper flare. Outlet shall be a copper flare straight connection.

Fitting shall be manufactured and tested to *ANSI/AWWA C800* and *ASTM B584*.
Brass Components shall be constructed of *UNS* Copper Alloy No. C89520 or C89833 for chemical and mechanical requirements of the current standards.

All fittings and valves shall have an identifying mark indicating that it is made of "no-lead" brass alloy, e.g., "NL"



Corrosion Protection: For Corrosion Protection on all fittings, see Section 2.6.H.

4.5.A.4 Copper Flare Couplings

Flare x Flare Coupling (Copper Connection)



Approved Manufacturer(s):

- **Cambridge Brass** 118NL-C*C*
- **Ford** C22-**-NL
- **Mueller** H-15400N
- **AY McDonald** 74758

*is where size code is placed

General: Coupling shall be used only when the length of the service line exceeds the length of a new pipe coil or in the case of an emergency repair. Coupling connections shall be copper tube sizing (CTS).

Sizes: ¾,"1", 1 ½", 2"

Materials: No Lead Brass

Specifications: Coupling shall be Flare x Flare, "No-Lead Brass," rated to 300 PSI. Fittings and valves to conform to *Federal Public Law 111-380*, effective date 1-04-2014.

Inlet shall be an AWWA copper flare. Outlet shall be a copper flare straight connection.

Fitting shall be manufactured and tested to *ANSI/AWWA C800* and *ASTM B584*.
Brass Components shall be constructed of *UNS* Copper Alloy No. C89520 or C89833 for chemical and mechanical requirements of the current standards.

All fittings and valves shall have an identifying mark indicating that it is made of "no-lead" brass alloy, e.g., "NL"



Corrosion Protection: For Corrosion Protection on all fittings, see Section 2.6.H.

4.5.B HDPE CTS Service Line Pipe and Service Fittings

4.5.B.1 HDPE Service Line Pipe

Approved Manufacturer(s):





- **Centennial Plastics** CenCore
- **Cresline** CE Blue
- **CP Chem Driscoplex** 5100 Ultraline
- **JM Eagle Manufacturing** Pure-Core 4500
- **ADS** PolyFlex
- **Endot** Endopure/EndoTrace

**All HDPE Service line pipe must be PE 4710 Compliant

General: HDPE Water Service Line is used in place of copper tubing.

Sizes: 1, 1-1/2, 2-inch CTS sized pipe

Material: Polyethylene HDPE DR9 PE4710 Copper Tubing Size (CTS) Service Line pipe

Specifications: Polyethylene CTS Service Lines shall be manufactured in accordance with the current versions of:

- *AWWA C901*
- *ASTM D2737*
- *ASTM D3350*
- *ASTM D4976*
- *ASTM D3261*
- *NSF 61*

Marking: HDPE, DR9, CTS (Copper Tubing Size), 250 PSI, PE4710, *AWWA C901 CC3, ASTM D2737/3350, NSF61*.

Color(s):
Potable Water: Black with Blue Stripe/Lettering or Blue with White Lettering
Nonpotable Water: Black with Purple Stripe/Lettering or Purple for Nonpotable Water

a. HDPE Pipe Materials.

   Black PE materials used for the manufacture of polyethylene pipe and fittings shall be PE 4710 high density polyethylene meeting *ASTM D3350* cell classification 445474C. The material shall be listed and approved for Potable Water in accordance with *NSF 61*. The manufacturer shall certify that the materials used to manufacture PE CTS Service Line pipe meet these requirements. Must also include oxidative resistance classification of CC3.

b. Potable Water Tubing - PE4710 Copper Tube Size HDPE to ASTM D2737

The minimum size of a HDPE Service Line, per Pikes Peak Regional Building Department, is 1"; this is because the internal diameter of a ¾" HDPE pipe is not the same as the internal diameter of a ¾" copper pipe.

Pressure Class	Pipe Size (inch)	Minimum Wall (inch)	O.D. (inch)	Approximate I.D. (inch)	Typical Type "K" copper I.D. (inch)
250	1"	0.125	1.125	0.860	0.995
	1 1/2"	0.181	1.625	1.241	1.481
	2"	0.236	2.125	1.625	1.959

Flow capacities of HDPE CTS pipe varies with the inside diameter of pipe, pressure source, length of pipe connected to the Structure, height, and number of fixtures within the building. It may be necessary to up-size the service line to a larger size to get the necessary flow capacity.

Connections: No splice connections are allowed in the service line from the Corporation Stop to Curb Stop and from the Curb Stop to the meter set. If a joint must be made on a new HDPE service line, then the joint must be butt or socket fused.

Note: HDPE Service Line Pipe must be laid Straight with no bends for 12 inches after a fitting with a Stiffener.

For PE Service Line and Building Entry see Detail Drawings B4-2, B1-4, B4-3, and B4-5.

4.5.B.2 HDPE Service Line Stiffener



General: Stainless steel CTS DR9 inserts are required at all HDPE service line connections to fittings and valves.

Note: HDPE Service Line Pipe must be laid Straight with no bends for 12 inches after a fitting/valve with a Stiffener.

4.5.B.3 Corporation Stop (HDPE Connection)

Approved Manufacturer(s):
*is where size code is placed

CC thread x Pack Joint



Ford FB1000-**-NL
Cambridge Brass 301NL-A*B*
AY McDonald 74701B-22

CC thread x Grip Joint



Ford FB1000-**-G-NL
Cambridge Brass 301NL-A*GJ*
AY McDonald 74701BG

CC thread x Quick Joint



Ford FB1000-**-Q-NL
Cambridge Brass 301NL- A*H*
AY McDonald 74701BQ
Mueller B-25008N

Images above are for general reference only and may vary by manufacturer.

General: Corporation Stops for HDPE shall be Ball Type CC by compression in copper tube sizing (CTS).

Sizes: 1", 1 ½", 2"

Materials: No Lead Brass

Specifications: Corp Stops for HDPE shall meet the following:

1. Full Port, Brass, 300 psi, CTS, AWWA taper CC thread to connect to the main and a compression end to connect to the HDPE service line.
2. Manufactured and tested to the current *ANSI/AWWA C800* and *ASTM B62* and *B584.*
3. Brass Components to be constructed of *UNS* Copper Alloy No. C83600-85-5-5-5. for chemical and mechanical requirements of current standards.
4. Lead Free in accordance with the *Safe Drinking Water Act* as amended by the *Federal Reduction of Lead in Drinking Water Act 111-380*, effective date 1-04-2014.
5. *NSF 61* certified.

All fittings and valves shall have an identifying mark indicating that it is made of "no-lead" brass alloy, e.g., "NL"



Corrosion Protection: For Corrosion Protection on all fittings, see Section 2.6.H.

4.5.B.4 Curb Stop (HDPE Connection)

Approved Manufacturer(s):
*is where size code is placed

Pack Joint x Pack Joint



Ford B44-**-NL
Cambridge Brass 202NL-B*B*
AY McDonald 76100-22
Legend T-5300NL

Grip Joint x Grip Joint



Ford B44-**-G-NL
Cambridge Brass 202NL-GJ*GJ*
AY McDonald 76100G

Quick Joint x Quick Joint



Ford B44-**-Q-NL
Cambridge Brass 202NL- H*H*
AY McDonald 76100Q
Mueller B-25209N

Images above are for general reference only and may vary by manufacturer.

General: Curb Stops for HDPE shall be Ball Type compression by compression in copper tube sizing (CTS).

Sizes: 1", 1 ½", 2"

Materials: No Lead Brass

Specifications: Curb Stops for HDPE shall meet the following:

1. Full Port, Brass, 300 psi, CTS, Compression by Compression.
2. Manufactured and tested to the current *ANSI/AWWA C800* and *ASTM B62* and *B584.*
3. Brass Components to be constructed of *UNS* Copper Alloy No. C83600-85-5-5-5 for chemical and mechanical requirements of current standards.
4. Lead Free in accordance with the *Safe Drinking Water Act* as amended by the *Federal Reduction of Lead in Drinking Water Act 111-380*, effective date 1-04-2014.
5. *NSF 61* certified.

All fittings and valves shall have an identifying mark indicating that it is made of "no-lead" brass alloy, e.g., "NL"



Corrosion Protection: For Corrosion Protection on all fittings, see Section 2.6.H.

4.5.B.5 Brass Service Line Couplings for HDPE Transition to Copper or HDPE Repair

Approved Manufacturer(s):
*is where size code is placed

Pack Joint x Pack Joint



Ford C44-**-NL
Cambridge Brass 118NL-B*B*
AY McDonald 74758-22
Legend T-4301NL

Grip Joint x Grip Joint



Ford C44-**-G-NL
Cambridge Brass 118NL-GJ*GJ*
AY McDonald 74758G

Quick Joint x Quick Joint



Ford C44-**-Q-NL
Cambridge Brass 118NL-H*H*
AY McDonald 74758Q
Mueller H-15403N

Ranger x Ranger



Cambridge Brass 119NL-E*E*
AY McDonald 74758-11

MNPT x Pack Joint



Ford C84-**-NL
Cambridge Brass 117NL-B*M*
AY McDonald 74753-22

Female Copper Flare Thread Adaptor x Grip Joint Adaptor



Cambridge Brass 117NL-GJ*P*
AY McDonald 74755G

Compression to Copper Flare Insert



Cambridge Brass 85NL-*
AY McDonald 74692

Quick Joint 1”x3/4” Reducing Adaptor



AY McDonald 74692Q

Images above are for general reference only and may vary by manufacturer.

NOTE: A solid sleeve stiffener is required for use on HDPE whenever inserted into a compression fitting. Copper Tubing must be re-rounded and deburred before inserted into a compression fitting.

General: Transition couplings are to be used to transition from HDPE service line material inside the foundation to type K copper service line before the meter configuration or at the curb stop. Transition couplings must be used immediately at, but not more than 3 feet from, the curb stop or the meter. Compression repair couplings may be used for repairs only on HDPE pipe. Couplings are not allowed for HDPE to HDPE connections on new Water Service Lines. New HDPE service lines must be butt or socket fused.

Sizes: ¾," 1", 1 ½", 2"

Specifications: Transition couplings shall be compression by compression in copper tube sizing (CTS) and shall be ordered to fit both Type K Copper and HDPE DR9 CTS.

Couplings shall be pressure rated to the pressure rating of the pipe material.

Couplings shall be manufactured in accordance with *ANSI/AWWA C800*.
Brass components shall conform to *ASTM B62* and *ASTM B584*, *UNS* C83600-85-5-5-5. Couplings shall be Lead Free in accordance with the *Safe Drinking Water Act* as amended by the *Federal Reduction of Lead in Drinking Water Act 111-380*. Coupling shall be NSF 61 certified.

Compression couplings listed above are compliant with these Water LESS and Colorado Plumbing Code, as adopted in the Rules and Regulations of the Colorado State Plumbing Board, 3 CCR 720-1..

All fittings and valves shall have an identifying mark indicating that it is made of "no-lead" brass alloy, e.g., "NL"

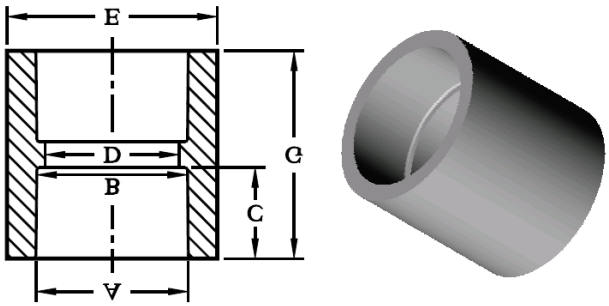


Corrosion Protection: For Corrosion Protection on all fittings, see Section 2.6.H.

4.5.B.6 HDPE Fusion Service Line Repair

a) **Socket Fusion (HDPE Only)**

Approved Manufacturer(s):



- **Georg Fisher Central Plastics**
- **JM Eagle**
- **Performance Pipe**

General: HDPE Socket Fusion is only currently available on 1 inch CTS DR HDPE Service Line Tubing. Socket Fusion is only allowed in a repair situation.

Size(s): 1 inch CTS DR9 HDPE

Nominal Size	A Diameter	B Diameter	C Depth	D I.D.	E O.D.	G O.A.L.
1" CTS	1.075	1.070	.98	.966	1.466	2.20

Specifications: Socket Fusion Couplings shall be 1" in copper tube sizing (CTS), couplings shall be molded from a black high-density pre-blended virgin resin in accordance with the material Specifications listed in *ASTM D3350* with a PPI designation of PE3408/4710. All Socket Fusion Fittings shall be tested and meet the requirements of *ASTM D2683* and are compatible for heat fusion with any pipe and or fitting manufactured form a like or similar resin. Coupling shall be *NSF 61* compliant.

Construction: Socket Fusion Couplings shall be installed with the appropriate heating tool made specifically for 1" CTS couplings and pipe. Installation shall be made in accordance to *ASTM F2620*. The 1" CTS DR9 HDPE pipe will need to be Chamfered cleaned if all burrs and shavings, have all oils and dirt removed and a cold ring applied for re-rounding of the pipe and provide a stopping point for proper insertion of the pipe into the heating tool and coupling during the fusion process.

If the service line pipe needs to be squeezed off to stop the flow of water to allow for the socket fusion then the appropriate rounded line crimping tool needs to be used. Once the repair is complete the service line must be marked with a cross pattern of black tape to mark where the service line was squeezed in accordance to *ASTM F2620*.

b) **HDPE Service Line Pipe Squeeze Off Tool**

Examples of Squeeze Off Tools







General: Squeeze off tools shall have rounded barrels so that damage is not caused to the HDPE Service Line. Proper squeeze off procedures shall be done in accordance with *ASTM F1734/1041 and 1563*. Caution shall be taken to not over squeeze the pipe to cause cracking and damage to the pipe. Any time a Service Line is squeezed to stop the flow of water for the repair of the Service Line pipe, then the pipe shall be marked with black tape wrapped in a figure 8 pattern. This marking of the pipe is to make aware to the Contractor that the pipe had previously been squeezed at that point and as an indicator that the pipe cannot be re-squeezed at that point.

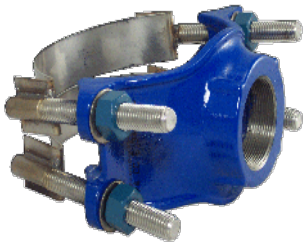
4.5.C Tapping Connections

4.5.C.1 Tapping Saddle (Copper)

Approved Manufacturer(s):



DIP saddle connection with bales



PVC saddle connection with bands

For DIP Pipe

- **Mueller:** DR 2 A for DIP (4” -16”) – Double bales
- **Smith-Blair:** Style 313 for DIP (4” – 18”) – Double bales Style 366 for DIP (20” – 36”) – Triple bales
- **Ford:** F202E for DIP (4” – 30”) – Double bales
- **JCM:** JCM 408 Coated Saddle for DIP (4” – 24”) – Double
- **A.Y. McDonald**: 4825A DIP (4” – 12”) – Double bales

For PVC Pipe

- **Mueller:** DR 2 S for PVC (4” – 24”) – Double bands
- **Smith-Blair:** Style 317 for PVC (4” – 24”) – Double bands
- **Ford** FCD 202: for PVC (4” – 30”) – Double bands
- **JCM:** JCM 406 Coated Saddle for PVC (4” – 24”) – Double bands
- **A.Y. McDonald:** 4855A for PVC (4” – 12”) – Double bands

General: Saddle connections shall be used to tap C900 PVC, Steel, Cast and Ductile Iron Pipe for 1 ½" and 2" type K copper service taps only

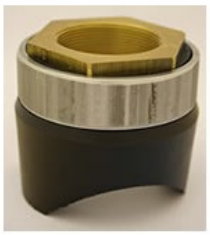
Pressure Class: The saddle shall be rated to a Working Pressure of 300 psi.

Material: Cast or Ductile Iron

Specifications: The body shall be made of Ductile Iron conforming to *ASTM A536*. The inlet shall be an AWWA taper ("CC") thread. The body shall be coated with fusion bonded flexi epoxy or nylon.

Saddles shall meet or exceed *ASTM A536*, *B633* and *A563*. Saddle shall meet *AWWA C800* and be *NSF 61* certified. PVC saddle connections shall have 2 stainless steel straps. DIP saddle connections shall have 2 bales.

4.5.C.2 Tapping Saddle (HDPE)



Approved Manufacturer(s):
Poly-Cam - Series 415 - Nominal Pipe size 6" – 24" (DIPS), Branch outlet size 1", 1.5" to 2" CC thread (AWWA thread) DR 9 pipe rating, Working Pressure 230 psi

HDPE Sidewall fusion tapping saddle

General: All Taps for Water Service to be made on a HDPE main shall be accomplished with a HDPE Sidewall fusion tapping saddle.

Specifications: Sidewall fusion fittings shall meet or exceed the requirements of:

- NSF 61
- Be manufactured of PE4710 according to *ASTM D3350* (Black) Cell Classification 445574C
- Female threaded insert of Brass alloy manufactured in accordance to *AWWA C360* and *C800* and conforms with "Lead Free Brass", *Federal Public Law 111-380*, effective date 1-04-2014
- Stainless compression ring Grade type 304 or 316

4.5.C.3 Tapping Sleeve

Tapping Sleeves.

Approved Manufacturer(s):



- **JCM Industries**
  JCM 452 Flanged Outlet
  JCM 459 MJ Outlet
  NOTE: 250 PSI Rating must be requested

For taps 4" and greater only with the approval of Colorado Springs Utilities.

General: Water Service Lines 4" and greater in size shall be connected to the existing Water Distribution System with a tee and three valves per Section 2.6.C.1. At the discretion of Colorado Springs Utilities tapping sleeves may be used where a Water Distribution System shut down is not feasible. Tapping of the existing Water Distribution Main shall be done by Colorado Springs Utilities.

Materials:

Body	18-8 Type 304 Stainless Steel sleeve
Outlet	Flanged outlet- CF8 Cast Stainless Steel 18-8 Type 304 with ANSI 150lb. Drilling recessed for Tapping Valve per *MSS-SP 60*.
Bolts	304 Stainless Steel.
Working Pressure	250 PSI Minimum rated.
Gasket	Gasket will be compounded for use in water applications.
Flanged outlet	Meets or exceeds *AWWA C111/ANSI 21.11*

4.5.D Stop Box

Curb Stop Box

Approved Manufacturer(s):



- **Tyler** 6500 Series
- **Star**
- **Castings Inc.**
- **Mueller** H-10374

General: A Curb Stop box shall be placed over all Curb Stops 2 inches and less for operation of the Curb Stop.

Size(s): 2-1/2 inch wide, 30 inch Top section, 39 inch Bottom section, 30 inch Extension

Material: Grey iron casting

Specifications: Grey iron castings shall be manufactured from iron conforming to *ASTM A48* Class 35B for Grey iron and to the *ASTM A536*-84 grade 80-55-06 for ductile iron. Castings shall also meet *Federal Specification A-A60005 (formerly RR-F-621E)*. Curb Stop box parts shall be made of gray cast iron; the use of an aluminum alloy as a casting material is not acceptable.

4.5.E Meter Loop Installation

4.5.E.1 Frost Proof Meter Pits

Approved Manufacturer(s):

For ¾-1 inch meters



- **DFW Plastics, Inc** -24" Dia. (Rotec Series – DFW-2436)
- **Carson Industries** (Mid-States Plastics, Inc) 24" Dia. (B Series)

General Information:
The only pit acceptable to Colorado Springs Utilities for 5/8-inch to 1-inch meters is a plastic pit, 24-inches inside diameter by approximately 36-inches in height, with a frost-proof cover.

4.5.E.2 Meter Pit Covers and Lids

Approved Manufacturer(s):



24 inch

Metal Meter Pit Covers W/lid:
Manufacturer Model

- **Ford** W3HT
- **Mueller** H-10810-09
- **Castings Inc** CI7020

Composite Meter Pit lid (only):
Manufacturer

- **GMI Composite Inc**.
  1313-004 Black
  1313-305 Lavender (Nonpotable)

Aluminum Meter Cover W/lid:
Manufacturer

- **Castings Inc**.

M-70-20AL Aluminum Frost proof
M-70-24AL Aluminum Frost proof

General:
Pit lid shall be nonmetallic in nature and shall be made of a polymer Construction, cast iron or aluminum. Cover and lid shall be tested in accordance to the procedures outlined in *AASHTO M306*.

Pit cover and lids shall be certified to *H-20* loading and be approved for use in with the current Colorado Springs Utilities AMI program. Cover lid to include attachment for transmitter unit beneath the lid and a pentagon bolt lock with a worm screw assembly. The AMI transmitter ring shall be attached under lid with stainless steel screws. Lid shall be compatible with similar lid and covers used in the Colorado Springs Utilities Water Distribution System.

4.5.E.3 Copper Setter and Yoke

Approved Manufacturer(s):



- **A.Y. McDonald**
- **Ford Meter Box Company**
- **Mueller**

General: Copper setters shall be used in outside Meter Pits for ¾" and 1" meters only. The ¾" and 1" yokes can be installed in a 20" diameter pit. It is recommended by the manufacturer, that a 2" gap be maintained between the sidewall of the pit and the valve and meter to avoid freezing.

Size: ¾" and 1"

Materials: Copper and Brass

Specifications: Yolks shall be vertical in and out, manufactured in accordance with ANSI/AWWA C800. Brass components shall conform to *ASTM B62* and *ASTM B584*. Fittings and valves to conform to *Federal Public Law 111-380*, effective date 1-04-2014.

Copper tubing shall be made in compliance with *ASTM B75* or *B88*. Connections to the tandem coppersetter shall be flared or threaded. Solder joints shall be lead free. Refer to Detail B4-2 and B4-2A.

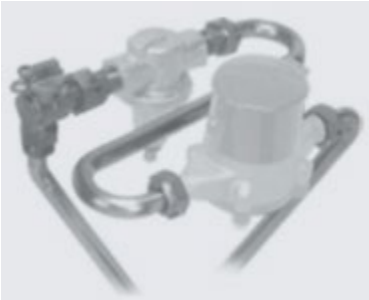
All fittings and valves shall have an identifying mark indicating that it is made of "Lead Free" brass alloy, e.g., "NL"



COLORADO SPRINGS UTILITIES WILL SUPPLY THE WATER METER

4.5.E.4 Tandem Copper Setter

Approved Manufacturer(s):



- **A.Y. McDonald**
- **Ford Meter Box Company**
- **Cambridge Brass**

General Information:
Tandem copper setters shall be used in outside Meter Pits for ¾" and 1" meters only. The ¾" and 1" tandem copper setter and yokes can be installed in a 20" diameter pit. It is recommended by the manufacturer, that a 2" gap be maintained between the sidewall of the pit and the valve and meter to avoid freezing.

Materials: Copper and Brass

Specifications: Tandem copper setters shall be vertical in and out manufactured in accordance with *ANSI/AWWA C800*. Brass components shall conform to *ASTM B62* and *ASTM B584*. Fittings and valves shall be "Lead Free Brass" and conform to *Federal Public Law 111-380*, effective date 1-04-2014. Connections to the tandem coppersetter shall be flared or threaded. No Backflow is required in the tandem coppersetter.

Copper tubing shall be made in compliance with *ASTM B75* or *B88*. Solder joints shall be lead free. Refer to Detail B4-2 and B4-2A.

All fittings and valves shall have an identifying mark indicating that it is made of "no-lead" brass alloy, e.g., "NL"



COLORADO SPRINGS UTILITIES WILL SUPPLY THE WATER METER

4.5.E.5 Pressure Reducing Valve (Internal meter configuration)

Approved Manufacturer(s):



- **WATTS,** LF25AUB-Z3 (or equivalent)

General: Pressure reducing valves shall be installed before the meter to reduce the pressure and protect the plumbing system. Design requirements shall be in conformance with Section 2.7.K.

Pressure Class: Pressure reducing valves shall be rated to a minimum pressure of 300 psi and shall be capable of reducing pressure to 25-75 psi.

Size(s): ¾”-2”

Materials: Brass

Specifications: Pressure reducing valves shall meet the requirements of *ASSE 1003*, the *International Plumbing Code* and *NSF 61*. Fittings and valves shall be “Lead Free Brass” and conform to *Federal Public Law 111-380*, effective date 1-04-2014.

It is recommended that pressure reducing valves have a strainer.

All fittings and valves shall have an identifying mark indicating that it is made of “no-lead” brass alloy, e.g., “NL”



4.5.E.6 Water Meter

COLORADO SPRINGS UTILITIES WILL SUPPLY THE WATER METER

Acceptance testing for new water meters:

a) All new water meters received by Colorado Springs Utilities are to be certified and tested by the manufacture for accuracy. Each meter shall be furnished with a tag attached to the meter displaying the results of the certified accuracy tests performed by the manufacturer.

b) Colorado Springs Utilities tests all new commercial and industrial water meters to verify accuracy. Commercial and industrial water meters (1 ½" and above) must be ± 3 % accurate to pass the acceptance testing.

c) Colorado Springs Utilities performs a sample test of 1% of all new Single-Family Residential meters to verify accuracy. Single-Family-Residential meters (5/8" through 1") must be ± 3 % accurate to pass the acceptance testing.

- Colorado Springs Utilities performs "As Found" tests on all removed meters. Meters must be ± 3% to pass the "As Found" accuracy testing.

- All rebuilt or repaired water meters will follow the same accuracy limits as denoted in b and c before being placed into service by Colorado Springs Utilities.

4.5.E.7 Ball Valve for Meter Assembly

Approved Manufacturer(s): N/A



General: Ball Valve used with meter assembly

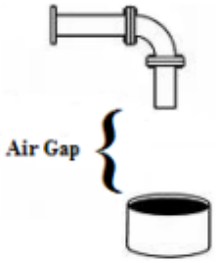
Pressure Class: Ball valves shall be rated to a minimum pressure of 250 psi

Specifications: Ball valves shall be approved per the *International Plumbing Code* and manufactured with "Lead Free Brass" in compliance with *Safe Drinking Water Act, Federal Public Law 111-380*, effective date 1-04-2014. Valve shall meet the requirements of *NSF 61*.
All fittings and valves shall have an identifying mark indicating that it is made of "no-lead" brass alloy, e.g., "NL"



4.5.F Backflow Prevention Assemblies and Methods

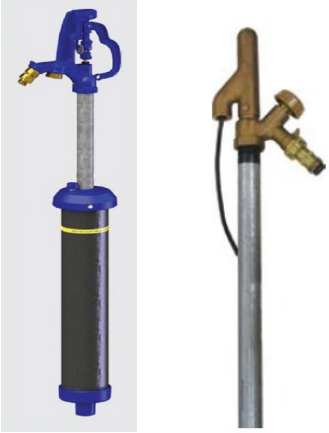
All Brass Components used for Potable Water applications shall be Lead Free in accordance with the *Safe Drinking Water Act* as amended by the *Federal Reduction of Lead in Drinking Water Act 111-380,* and shall be *NSF 61* certified. The Approved Backflow Prevention Assembly must also be approved by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California.

Device, Assembly or Method	Degree of Hazard	Type of Cross Connection	Continuous Line Pressure	Containment	Isolation	Installation Requirements
Approved Air Gap 	Hi Hazards Low Hazards Non-hazardous Nuisance	Direct	Allowed	Approved	Approved	In accordance with ASME A112.1.2
Reduced Pressure Assembly (RP) 	Hi Hazards Low Hazards Non-hazardous Nuisance	Indirect and Direct	Allowed	Approved	Approved	**Oriented in accordance with USC listing.** See schematics for installation and clearance requirements. Pit, Vault or installations where submersion may be possible is prohibited. Detector assemblies of all types are prohibited.
Double Check Valve Assembly (DC) 	Low Hazards Non-hazardous Nuisance	Direct	Allowed	Approved	Approved	**Oriented in accordance with USC listing.** See schematics for installation and clearance requirements. Pit, Vault or installations where submersion may be possible is prohibited. Detector assemblies of all types are prohibited.
Direct - Application subject to backpressure and back siphonage.						

4.5.G Yard Hydrants

4.5.G.1 Potable Sanitary, Freeze-less

Approved Manufacturer(s):



- **Woodford**, Models S3 or H34
- **(**or Sanitary Yard Hydrant equivalent with Colorado Springs Utilities Approval)

General: A Sanitary Yard Hydrant must be used for Potable Water Use, typically in an RV or Mobile Home Park where the yard hydrant is being used to provide Potable Water to Structures without permanent foundations. A Sanitary Yard Hydrant shall employ a reservoir below the frostline to contain water.

Pressure Class: Varies per Manufacturer and Model, verify Manufacturer Specifications for maximum pressure rating, as an additional pressure regulator may be required for each yard hydrant if system pressure is too high. Pressure is generally addressed for service lines with the main pressure regulator installed prior to the service line water meter.

Specifications: Sanitary Yard Hydrants shall be freeze-less and employ a reservoir below the frostline to contain water. The Sanitary Yard Hydrant shall be completely sealed to prevent surface and ground water from entering the reservoir or service line and shall not have a stop and waste valve. The Sanitary Yard Hydrant may include an electrical heating element. The Sanitary Yard Hydrant must be ASSE 1052 Approved and listed by IAMPO, must be Field testable and shall automatically drain when a hose is detached. The Sanitary Yard Hydrant shall include a hose connection Backflow preventer. The Sanitary Yard Hydrant shall have a minimum 5 foot bury depth. The Sanitary Yard Hydrant is to be installed according to manufacturer's recommendations.

Construction: The Sanitary Yard Hydrant shall be placed out of harm's way and may require protection by placing bollards around it. The Sanitary Yard Hydrant shall be placed at a height of 36 inches above finished grade, and a minimum of 5' from a sanitary sewer drain.

4.5.G.2 Non-Potable, Frost Proof

Approved Manufacturer(s):



- **Woodford**, Models Y43-2
- **(**or Non-Potable Yard Hydrant equivalent with Colorado Springs Utilities Approval)

General: A Non-Potable Yard Hydrant may only be used for irrigation purposes, typically used for landscape or Community Garden. A Sanitary Yard Hydrant shall employ a stop and waste valve and must have a Backflow preventer installed prior to the yard hydrant as in Section 4.5.F.

Pressure Class: Varies per Manufacturer and Model, verify Manufacturer Specifications for maximum pressure rating, as an additional pressure regulator may be required for each yard hydrant if system pressure is too high. Pressure is generally addressed for service lines with the main pressure regulator installed prior to the service line water meter.

Specifications: Non-Potable Yard Hydrants shall be frost proof and will include a stop and waste valve for draining. Non-Potable Yard Hydrant may include an electrical heating element, must be ASSE 1052 Approved and listed by IAMPO and must be field testable and shall automatically drain when a hose is detached. The Non-Potable Yard Hydrant shall include a hose connection Backflow preventer. The Non-Potable Yard Hydrant shall have a minimum 5 foot bury depth. All Non-Potable Yard Hydrants shall have signage to caution Users that the water is non-potable do not drink.

Construction: The Yard Hydrant shall be placed out of harm's way and may require protection by placing bollards around it. The Yard Hydrant shall be placed at a minimum height of 36 inches above finished grade. All Non-Potable Yard Hydrants shall have signage to caution Users that the water is non-potable do not drink.











4.6 Miscellaneous

4.6.A Repair Clamp (Full Circle)

Approved Manufacturer(s):





- **JCM Industries 131 or 132**

General: Full circle repair clamps may be used for Private Water Main leaks and by Colorado Springs Utilities on Public Water Main Leaks for a temporary repair. Repair clamps may not be used in new Construction or on Owner/Developer owned Water Mains still under a 2 year warranty.

Material: All repair clamps shall be made of stainless steel designed for lightweight and easy handling of all leak conditions and have 360-degree gasket coverage.

Working Pressure: Clamp width should equal or exceed pipe diameter for higher 250 psi working pressures.

Specifications:

Panel/Band	Type 304 (18-8) Stainless Steel per *ASTM A240*.
Gasket	Gridded virgin Styrene Butadene Rubber (SBR) per *ASTM D2000* compounded and suitable for Potable Water within a temperature range of 150° F constant, 180° F intermittent. 1/4" thick Nitrile (Buna-N, NBR), Chek-0-Seal with multi o-ring sealing ribs from 100% new rubber may be substituted.
Armor/Bridge Plate	Type 304 (18-8) Stainless Steel per *ASTM A240*, Vulcanized and recessed into the gasket to ensure uniform compression against the pipe.
Bolts, Hex Nuts & Washers	Bolts & Hex Nuts are Type 304 (18-8) Stainless Steel per *ASTM A193* and *A194*.
Lugs	CF- 8 Cast Stainless Steel Type 304 (18-8) Stainless Steel per *ASTM A240*
Sidebars	Type 304 (18-8) Heavy Gauge Stainless Steel, Tungsten Inert Gas (TIG) welded to form strong permanent fusion with the repair clamp band.
Passivated	All welds shall be fully passivated by means of a chemical technique which restores the corrosion resistant characteristics of the stainless steel.
Manufacturers Recommendations	Repair Clamps are not recommended for use in joining plain end pressure pipe.

4.6.B Pipeline Utility ID Post and Labels

Approved Manufacturer(s):

Utility Marker Post:



- **Rhino Marking & Protection Systems**
- **Carsonite**
- **Electromark**

General: Post is used to mark cross country water lines
Size(s): 66" length
Material: Carsonite Fiberglass
Specification: Fiberglass Utility marker post – 66" length, 4" wide – 3-rail post, blank

Color: **Blue** post and label for Water lines.
Purple post and label for Nonpotable water lines.

4.6.C Post Labels



General: Line markers are to be installed with Colorado Springs Utilities decal and telephone number.

Line marker post labels for water and Nonpotable are available for pick-up from Colorado Springs Utilities LYSC warehouse.

4.6.D Pipeline Disinfection

Calcium Hypochlorite

Approved Manufacturer(s):



Arch Chemicals-Dry Tech, Freestyle
Harcos Chemicals-Freestyle

General: All pipeline disinfection products must be *NSF/ANSI 60* approved and registered with the *USEPA*.

Specification: Calcium hypochlorite will have available chlorine level of 65 to 70 percent, in a granule form, substantially free of lumps and shall not contain any dirt or other foreign material. Calcium hypochlorite's must be certified in accordance with the current *ANSI/AWWA B300* and *NSF/ANSI 60* and be listed on the *NSF Drinking Water Treatment Chemicals-Health Effects* site. All containers shall be marked in accordance with *ANSI/AWWA B300* showing the *NSF* approval and *USEPA* registration numbers.
Caution: Do not use calcium hypochlorite intended for swimming pool disinfection, as this material has been sequestered and is extremely difficult to eliminate form the pipe after the desired contact time has been achieved



4.6.E Pipeline Insulation

Approved Manufacturer(s):

Pitsburg Corning - Foamglas
Urecon - Foamglas
Urecon -Polyisocyanurate Foam half shells





General:

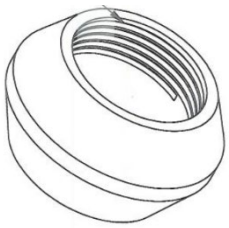
FOAMGLAS® pipe and block insulation is a lightweight, rigid insulating material composed of millions of completely sealed glass cells, each an insulating space. Closed-cell Structure provides an unmatched combination of physical properties, it is impermeable to moisture in any form, cannot burn and it is non-combustible. Foamglas pipe insulation is used most frequently in applications involving process piping, tanks, vessels, and equipment which are most commonly used by the gas processing, refining, petrochemical, and specialty chemical industries. Temperatures from -450°F to +900°F (-268°C to +482°C). Manufactured to Project Specifications, 3 inch thickness minimum. Must include a Stainless Steel outer Wrap to secure the Foamglas insulation.

Rigid polyisocyanurate or polyurethane foam half shells, with a fully bonded polymer protective coating on all exterior and interior surfaces, including ends, is the best application. The product shall be manufactured in accordance with ISO 9001 Standards or approved equal. Must include a Stainless Steel Outer Wrap to secure the foam half shells.

Rigid polyisocyanurate or polyurethane foam	
Density	*ASTM D1622*, 32 kg/m³ *(2.0 lbs/ft³)*.
Compressive strength	*ASTM D1621*, 124 to 186 kPa (18 to 27 lbs/in²).
Closed cell content	*ASTM D1621*, 90%, minimum
Water absorption	*ASTM C272*, 2.0% by volume
K factor	*ASTM C5180.,* 0.027 W/m°C (0.19 Btu • in/ft² • hr • °F
Thickness	2 in

Polymer coating, Urecon BL-70-20EP	Two component high density polyurethane coating, black in color.
Density	1170 kg/m³ *(73 lbs/ft³)*
Durometer	D scale 60
Tensile strength	11.10 MPa *(1610 lbs/in²)*
Tear strength	26.5 N/mm *(151 lbs/in)*
Thickness	1.78 mm *(70 mils)* outside surfaces, 0.51 mm *(20 mils)* inside surfaces

4.6.F Steel Pipe - Coupler - 0.75, 1, 2 and 2.5 inch Taps



Thredolet® must be approved by the Engineer and Colorado Springs Utilities Mainline Inspectors.

General: A Thredolet® coupler shall be used for tapping Steel pipe for the placement of an air release valve system in a Water Vault. The Thredolet® shall be tapered to allow it to be welded to the Steel Pipe, shall be manufactured of Carbon Steel, and shall include 14 NPT threading on the inside port for the 0.75 inch size, 11.5 NPT threading for the 1 and 2 inch sizes, and 8 NPT threading for the 2.5 inch size.

4.7 Nonpotable Irrigation Pipelines

General: Nonpotable Water Service Lines shall meet the material requirements as specified above for the Water Service Line and meter loop. After the meter loop and Backflow Prevention Assembly the irrigation main and laterals shall meet the following material Specifications based on irrigation system pressures.

Material: Landscape irrigation mains and laterals smaller than 2 inches in size shall be PVC purple pipe or copper with tape, of appropriate pressure class, or of materials approved by Colorado Springs Utilities Water/Wastewater Standards.

All 2 1/2inch and larger Nonpotable irrigation mains and lateral lines shall be one of the following materials:

- PVC pipe shall be purple *ASTM D1785* PVC 1120 compound Schedule 40 and 80 pipes, of appropriate pressure class.
- High Density Polyethylene Pipe piping shall be black with purple stripe of appropriate pressure class.
- Soft Copper Tubing to *ASTM B88* Type K with purple tape
- Ductile Iron pipe and fittings shall meet the requirements of ANSI/AWWA C151/A21.51 with purple identification tape or purple vinyl wrap as described in Section 8.13.A.

Golf Course Applications Only.

Fittings shall be Ductile Iron fittings (IPS), slanted, deep bell, gasketed style made in accordance with *ASTM A536*, Grade 65-45-12 manufactured for Golf Course Irrigation systems, commercial turf irrigation and rural Water Systems as outlined in Section 8.10.C.1.

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CHAPTER 5

Construction Practices

5.1 General

The purpose of Chapter 5 of these *Water Line Extension & Service Standards* (*Water LESS*) is to set forth the criteria to be used when constructing both Public and Private Water Systems and Water Service Lines to serve a proposed or an existing development. The Owner/Developer is responsible for hiring a qualified Contractor who will construct the Water Main and Service Lines based on Approved Construction Plans and these *Water LESS*. The Owner/Developer is ultimately responsible for all requirements identified in these *Water LESS*. Colorado Springs Utilities will inspect the Construction of the Water Main and Water Service Lines to ensure it meets these criteria and the Approved Construction Plans.

5.2 New Construction Procedures

Following approval of the Construction Plan(s), the Owner/Developer may proceed with Construction. The Owner/Developer and their Contractor shall observe the following:

- Construction shall commence within 1 year of the approval date shown on the plans or the plans must be resubmitted for review and approval (all approval signatures must be re-signed). If Construction is halted for more than 6 months, plans must be resubmitted for review and approval. Plans must show all phases of the Project to be constructed upon submittal; any deviation from the original Approved Construction Plan will need to be re-approved by Colorado Springs Utilities.
- Water Mains 16 inch and greater shall be modeled for shutdown (if applicable) by Colorado Springs Utilities to determine system impact prior to Construction, per Section 2.6.C.2.
- The Contractor is responsible for obtaining and complying with all required licenses, permits, notices, and plans in accordance with all federal, state, and local Authorities Having Jurisdiction. Upon request, the Contractor shall provide Colorado Springs Utilities with a copy of all approved permits, notices, and plans prior to the start of Construction.
- Special conditions that involve another Authority Having Jurisdiction, such as crossing a railroad, highway, wetland, forest, wildlife, or waterway, the Fountain Mutual Irrigation Co. irrigation ditch (within the City of Colorado Springs) may exist. All conditions of the other Authority Having Jurisdiction must be satisfied. The Contractor shall be responsible for contacting any relevant Authorities Having Jurisdiction prior to start of Construction. Should a conflict in the plans and Specifications occur between Colorado Springs Utilities and the other agency, the more stringent Specifications yielding a higher degree of integrity shall prevail.
- All necessary Easements shall be obtained prior to the start of Construction.
- The Contractor is responsible for developing adequate provisions to notify Customers who may experience outages. Customers shall be notified by Colorado Springs Utilities a minimum of 24 hours in advance of service shutdown. Shutdowns shall be kept to a minimum to minimize impact to Customers. See Section 5.12.C.
- After receipt of plans by the Colorado Springs Utilities Inspections' Office and verification that necessary requirements are met and approved by Colorado Springs Utilities, the Contractor shall give at least 2 working days (excluding weekends and holidays) notice to the Colorado Springs Utilities Inspection Section, prior to beginning Construction. Construction shall not commence sooner than 2 working days after receipt

of Approved Construction Plans to the Colorado Springs Utilities Inspections office, nor prior to the arrival of a Colorado Springs Utilities Inspector at the Site. The Contractor shall be on site and available to the responding Colorado Springs Utilities Inspector.

5.3 Applicability of Standards to Repairs

Repairs to Private Water Mains, Public Water Mains still under warranty, existing Water Mains damaged as a result of Construction, and Water Service Lines are subject to these *Water LESS* and shall be inspected by Colorado Springs Utilities. Colorado Springs Utilities shall be notified of any repairs immediately. Reference Sections 5.13.C.8 and 5.21.J for repair procedures.

5.4 Safety & Health

Colorado Springs Utilities expects every Contractor to comply fully with all applicable federal, regional, and local safety & health regulations. Additionally, Contractors hired by Colorado Springs Utilities shall comply with the requirements of their contract with Colorado Springs Utilities. In the event multiple standards apply, the requirements of the most stringent standard shall prevail. Requirements set forth in the *29CFR1926* (OSHA Construction) and/or *29CFR 1910* (OSHA General Industry) standards shall be considered the minimum acceptable safety standards.

5.4.A Contractor Responsibilities

The Contractor shall be solely responsible for initiating, maintaining, and ensuring the safety of all parties involved with, and/or affected by their activities. The Contractor shall comply with all applicable OSHA regulations relating to the safety of persons and/or property, or to the protection of persons and/or property from damage, injury, or loss; and shall implement and maintain all necessary safeguards for such safety and protection. The Contractor shall notify the owners of adjacent property and other utility owners when execution of Construction may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the work, or anyone for whose acts any of them may be liable, shall be remedied by the Contractor.

The Contractor shall provide both a safe access route to, and a safe environment within, the area where Colorado Springs Utilities employees must perform their respective duties.

Additionally, the Contractor shall provide the necessary protection to prevent damage or loss to other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, Structures, utility infrastructure, and appurtenances not designated for removal, relocation, or replacement in the course of Construction.

5.4.B Safety Representative

The Contractor shall designate a qualified and experienced safety representative as a Competent Person, at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs. The Competent Person shall ensure all excavations conform to

standard industry (OSHA) practices for the protection of personnel and prevention of cave-in hazards.

5.4.C Hazard Communication Programs

The Contractor shall be responsible for coordinating any exchange of safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with applicable regulations.

5.4.D Emergencies

In emergencies affecting the safety or protection of persons, the Construction, or property at the Site or adjacent thereto, the Contractor is obligated to act to prevent threatened damage, injury, or loss.

5.4.E Traffic Control and Public Access

Traffic control and Public access shall be coordinated with and in accordance with, the regulations of the appropriate Authority Having Jurisdiction. These may include, but are not limited to, the following entities:

- The City of Colorado Springs - Traffic Department
- El Paso County - Traffic Division
- State of Colorado - Department of Transportation

Barricades, detours, and signage shall be designed and installed in accordance with the *Manual of Uniform Traffic Control Devices* (*MUTCD*). Barricades and other devices shall be used to keep both the Public and the workers from risk of damage, injury, or loss.

5.4.F Safety of Colorado Springs Utilities Employees and Construction Site

Colorado Springs Utilities reserves the right to refuse performance of any requested or required activity in an area that it deems to be unsafe or has any unsafe utility construction activities being performed; performance of the requested or required activity will not commence until the Contractor has addressed the safety concern(s). In the event the Contractor contests the safety concern, the Colorado Springs Utilities Safety and Health Department and/or OSHA will be consulted to make a final determination about the concern(s).

5.5 Surveying and Construction Staking

5.5.A General

All control points, hubs and stakes shall be set by a Professional Land Surveyor licensed to practice in the State of Colorado, or their authorized representative, and reviewed by the Inspector. Review of the staked alignment and elevations by the Inspector does not relieve the Owner/Developer from the responsibility for staking or installation errors. Street Right-of-Way, Public utility Easement, and/or property lines, and offset hubs and stakes must be set and in visible evidence before Construction can proceed. Property corner stakes at street intersections and lot corner points must be in place and visible during Construction to provide the Inspector a reference for checking Record Drawing measurements.

Normal practice is to set offset hubs and stakes 5 feet to 20 feet off the centerline of the proposed facilities. Offset stakes must be marked with an identification of the item being staked. Centerline hubs and stakes may be used in addition to the offset hubs and stakes; however, they may not be set in place of the offset hubs and stakes.

All hubs and stakes shall be flagged to increase their visibility. Staking shall be scheduled to ensure continual work progress. Any replacement of hubs or stakes shall be at the expense of the Contractor.

5.5.B Water Mains

For Water Mains and Water Service Lines 4 inches in diameter and greater, the following shall be identified with offset hubs and stakes with stationing per the Approved Construction Plans

- Water Main centerline (a maximum distance of 50 feet apart on straight lines and 25 feet apart on curves),
- grade to the pipe flow line elevation,
- points of curvature (P.C.) and points of tangency (P.T.) of curves,
- valves, tees, crosses, and couplings,
- horizontal and vertical bends (identified with two hubs and stakes to triangulate the location of the bend),
- fire hydrants (identified with two hubs and stakes to triangulate the location of the fire hydrant),
- fire hydrant traffic flange (4 inches above the finish grade unless otherwise recommended by the hydrant manufacturer),
- Vault corners and
- any other appurtenance necessary for Construction as identified by the Inspector.

5.5.C Water Service Lines

For Water Service Lines 2 inches in diameter and less, the following shall be identified with offset hubs and stakes per the approved Utility Service Plans:

- Water Service Line tap,
- Curb Stop,
- outside meter Pit,
- location of Approved Backflow Prevention Assembly or Method,
- Water Service Line location where it enters the Structure to be served (Commercial Water Service Lines only) and
- any other appurtenance necessary for Construction as identified by the Inspector.

5.6 Colorado Springs Utilities Resources/Personnel

All work for both Public and Private Water Mains and Service Lines, including new installation, replacement, retrofits, relocations, or repairs of existing facilities shall be inspected by a Colorado Springs Utilities' personnel who shall have the authority to halt Construction if, in their opinion, these standard Construction practices are not being followed. Whenever any portion of these *Water LESS* is violated, Colorado Springs Utilities shall order further Construction to cease until all deficiencies, including the removal of non-compliant completed work, are corrected. The Inspector may require the Design Engineer to re-submit the Approved Construction Plans to address any conflicts between Construction, these *Water LESS* and the Approved Plans.

All materials used shall be subject to the inspection and approval of the Inspector. The Inspector has the right to perform any testing deemed necessary to ensure compliance of the material with these *Water LESS*. No material shall be used before being inspected and approved by the Inspector. Failure or neglect on the part of the Inspector to condemn or reject non-compliant materials or Construction, shall not be construed to imply their acceptance should non-compliance become evident at any time prior to completion of a 2 year warranty period. Materials rejected by the Inspector shall be immediately removed from the job Site.

5.6.A Colorado Springs Utility Personnel Overtime

Overtime work shall be defined as work performed on Saturdays, Sundays, and Colorado Springs Utilities observed holidays [Per *City Code § 1.1.105 (B)*] or on weekdays before or after the Inspector's regularly scheduled 8-hour workday.

All overtime work performed shall be subject to charges by Colorado Springs Utilities. All overtime inspection work performed as a result of work being carried on by the Contractor will be charged to the Contractor at 1.5 times the normal rate for Inspectors, with double time charged after 16 consecutive hours, on Sundays, and on Colorado Springs Utilities' observed holidays. Inspectors working 2 or more hours continuously after the end of the normal workday (without advance notice), and every 6 hours thereafter will be compensated for a meal. Meals shall be paid every 6 hours on the weekends and on holidays where overtime is scheduled less than 12 hours in advance. The Inspector may charge for 1 hour of work in lieu of a meal.

Equipment used for overtime work will be subject to charges at straight time. The equipment usually includes the Inspectors' vehicles.

All overtime worked by the Colorado Springs Utilities' Personnel shall be authorized in writing by the Contractor on forms available from the Inspector.

Colorado Springs Utilities observed Holidays include the following:
New Year's Day, Martin Luther King Jr. Day, President's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the day following Thanksgiving Day, and Christmas Day.

Colorado Springs Utilities reserves the right to change this holiday schedule as needed based on operational requirements. Holidays that fall on Saturday will be observed on the preceding Friday, and holidays that fall on Sunday will be observed on the following Monday.

5.7 Temporary Hydrant Meter

5.7.A Permit Required

Use of fire hydrants, other than by CSFD or Colorado Springs Utilities Water Services Division, requires a *Temporary Water Service (Fire Hydrant Use) Permit*, and adherence to all terms and conditions of the permit and associated requirements. Permit availability for this use is subject to Colorado Springs Utilities discretion and the prevailing Stage of the Water Shortage Ordinance. Permits may be obtained from Colorado Springs Utilities Customer Contract Administration (719) 668-8111 or at cca@csu.org. Colorado Springs Utilities will designate the fire hydrant(s), which shall be used by the Customer. The permit must be visibly displayed while the fire

hydrant is in use or readily available at the request of Colorado Springs Utilities personnel.

5.7.B Backflow Prevention

A RP shall be installed on all hydrant connections. The RP shall be certified before use and the certification shall not expire before the permit expires.

5.7.C Certification and Testing of Meters and RPs

Temporary meters and RPs are available for rent from the Colorado Springs Utilities Meter Shop (719-668-7240), or Customers may use their own temporary meter and RP. Customer-owned temporary meters shall be certified by the Colorado Springs Utilities Meter Shop prior to use. Customer-owned RPs shall be tested by a licensed third-party Certified Cross-Connection Control Technician prior to use. RP certifications and meter test results for Customer owned equipment shall be provided to Colorado Springs Utilities at the time of Permit application. Customer must return to the meter shop for a final read to close the permit, including Customer owned meters.

5.7.D Installation

See Detail Drawing A5-5.

5.8 Sub Grade Completion Prior to Excavation

In new development, excavation for the Water Main shall not begin until the Contractor is within 7 inches of final grade.

Road Construction shall be to at least the sub grade stage prior to excavation of the Water Main trench. Sub grade elevation is defined as an elevation, which lies approximately 7 inches below the finished street grade. The road surface shall be smooth, clear of debris and free from deep holes, ruts and large rocks which may hamper main installation.

5.9 Excavation & Trenching

This section sets forth the requirements for excavation and trenching operations it is not intended to outline or review excavation and trenching safety.

5.9.A Locates

The Contractor is responsible for calling the Utility Notification Center of Colorado (UNCC) at 811 for locations of Utility infrastructure prior to excavation. Excavation may commence only after location documentation is received.



Figure 5-1: Uniform Color Code for Underground Utilities

Colorado Springs Utilities' locators are not responsible for locating Private Water Mains or Private Water or Wastewater Service Lines. Colorado Springs Utilities cannot guarantee the accuracy of underground utility infrastructure and Structures as shown on plans. Colorado Springs Utilities will not be responsible for any damage to utility infrastructure unless inaccurately located.

The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground utility infrastructure both known and unknown, may be determined, and shall be held responsible for the repair of such Structures when broken or otherwise damaged. The Contractor may be required to notify Colorado Springs Utilities prior to excavation around its infrastructure.

5.9.B Exploratory Excavation

Whenever, in the opinion of the Colorado Springs Utilities, it is necessary to explore and excavate to determine the location of underground utility infrastructure that may interfere with Construction, the Contractor shall make the explorations and excavations for such purposes at the Contractor's expense.

5.9.C Excavation to Line and Grade

All excavations shall be made to the lines and grades as established by the Approved Water Construction Plans and these *Water LESS*. Pipe trenches shall be excavated to the depth required to provide a uniform and continuous bearing and support for the pipe on solid undisturbed ground at every point between bell holes. Bell holes shall be provided at each pipe joint to permit the joint to be made properly. Any part of the bottom of the trench excavated below the specified grade shall be corrected with approved material and thoroughly compacted in accordance with these *Water LESS*. The finished line and grade of the trench shall be prepared accurately.

Deviation from line and grade may be allowed when approved by the Inspector, in accordance with these *Water LESS*, and shall be coordinated by the Contractor with the Owner/Developer and Design Engineer.

5.9.D Excavation & Trenching

Construction shall be planned to minimize the duration any excavation or trench must remain open. Trenches should only be excavated a distance far enough ahead of the pipe installation as required to expedite Construction. The Inspector may limit the length of open trench based on Site conditions, environmental conditions, and potential safety concerns. Excavations that are located in or near a waterway, channel or within a known or suspected landfill, must be evaluated for potential man-made debris or Asbestos containing materials (ACMs) prior to any soil disturbance. Asbestos removal shall be done in accordance with Section 5.10.B

5.9.D.1 Pavement and Road Surfaces

The Contractor shall obtain the necessary permits and remove pavement and road surfaces as part of the trench excavation. The width of pavement removed shall be kept to a minimum, while meeting the requirements of the Authority Having Jurisdiction. All existing asphalt or concrete surfacing should be cut vertically in a straight line. This material shall not be used in any fill or backfill of the trench and must be properly disposed of in accordance with all applicable regulations.

5.9.D.2 City Parks and Trails

For areas of excavation in and around City Parks and trails, see protection requirements in Park Standard Specifications.

5.9.D.3 Trench Width

Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least 6 inches below and on each side of all pipe, fire hydrants, valves, fittings, and appurtenances.

The minimum bottom of trench width shall be excavated to allow for the placement of pipe and proper compaction of the pipe embedment zone.

5.9.D.4 Trench Stability

The trench shall be dug under the direction of a Competent Person; the Competent Person is responsible to ensure the stability of the trench, and nearby surface encumbrances. The use of shoring or shielding may be required to limit the size of the excavation or the width of the trench, to protect workers, to protect existing and/or new infrastructure, and/or to provide stability to adjacent surface encumbrances

All excavation and trenching support is the sole responsibility of the Contractor. The presence of a Colorado Springs Utilities employee in no way implies approval of excavation and/or trench support methods utilized. Colorado Springs Utilities reserves the right to refuse performance of any requested or required activity in or around any excavation or trench they deem to be unsafe.

5.9.D.5 Excavated Material

All excavated material shall be piled and equipment placed and used in a manner that will not endanger Construction and that will avoid obstructing traffic. Hydrants, Vault covers, manholes, valve boxes, and other utility

infrastructure controls shall be left unobstructed and accessible during Construction.

5.9.D.6 Frost

No pipe or appurtenance shall be installed upon the bottom of the trench into which frost has penetrated, or at any time when the Inspector deems there is danger of ice formation or frost penetration at the bottom of the excavation. No pipe or appurtenance shall be installed unless backfilling can be completed before the formation of ice and frost.

5.9.E Excavation for Structures

Except as otherwise dictated by Construction conditions, the excavation shall be of such dimensions as to allow for the proper installation and removal of concrete forms, placement of precast Structures, and to permit the Construction of the necessary pipe connections. Care shall be taken to ensure that the excavation does not extend below established grades. Should an area be "over excavated," the excavated area shall be filled in with approved material deposited in horizontal lifts not more than 6 inches in thickness and compacted in accordance with these *Water LESS*.

5.9.F Excavation in Poor Soil

If the bottom of the excavation is found to be unstable material that, in the opinion of the Inspector, cannot satisfactorily support the pipe or Structure, the Contractor shall further excavate and remove such unsuitable material to the width and depth specified by the Inspector. It must be removed and replaced with an approved material, which will support the pipe or Structure properly. The Contractor may be required to construct a special foundation or support for the pipe or Structure, consisting of pilings, or other materials.

5.9.G Protection of Existing Structures and Utilities

Adequate protection, temporary support, and maintenance of all underground Structures and surface encumbrances, utilities and other obstructions encountered in the progress of Construction shall be furnished by the Contractor at their expense. Any Structures, utility infrastructure or obstructions disturbed or damaged shall be restored or replaced at the direction of the Inspector at the Contractor's expense.

5.9.H Surplus Excavation Material

All surplus excavation material shall be removed from the job Site and disposed of properly.

5.9.I Blasting

In general, blasting will be allowed in order to expedite Construction if a permit by the local Authority Having Jurisdiction is granted and a copy is presented to Colorado Springs Utilities. All explosives and appurtenances shall be transported, handled, stored, and used in accordance with the laws of the local, state, and federal governments, as applicable.

The Contractor shall control all blasting so as not to damage any existing Structure or facility. The protection of life and property and all liability for blasting shall be placed solely on the person or persons conducting the blasting operation. The Inspector shall fix the hours of blasting in accordance with the permit of the local

Authority Having Jurisdiction. At least 3 working days in advance of blasting, the Contractor must notify owners or occupants of nearby Structures or facilities that are within a minimum distance of 500 feet. The notice shall be in writing and state the date, the time of blasting, and who is responsible for the blasting. The Contractor shall notify Colorado Springs Utilities of any blasting at least 2 working days in advance. Such notice shall be in writing. The Contractor shall notify the local Fire Department 3 working days in advance of any blasting.

The Contractor shall control blasting to avoid making any excavation unduly large or irregular and so as not to shatter the rock on the bottom or sides of any excavation or surface upon or against which concrete is to be placed. If, in the opinion of Colorado Springs Utilities, blasting is liable to damage foundations or supports, concrete, other utilities or Structures, all blasting shall be terminated and the Contractor shall continue excavation by jack hammering, barring, wedging, or other methods.

5.9.J Dewatering

All pipe trenches and structural excavations shall be kept free from water during pipe laying and other related work.

The excavation shall be dewatered so that any water is below the pipe invert. Care shall be taken to prevent water, dirt, and other material from entering the pipeline.

Whenever uncontaminated Groundwater is encountered in an excavation and needs to be discharged, it may be discharged to land in accordance to the *Low Risk Discharge Guidance for Discharges of Uncontaminated Groundwater to Land* from CDPHE Water Quality Control Division (Division). If the Groundwater is to be discharged to surface water, a certification under the *Construction Dewatering (CDW) General Permit* is required from the Division before discharge can occur. If the Site is covered by a *Permit for Discharge of Stormwater Associated with Construction* permit and the conditions in I.C.3.c of the permit are met, uncontaminated Groundwater may be discharged to land provided it is identified in the permit

If the discharge will be injected into the ground via an injection well, this would not require a *CDW Permit* from the Division, as the EPA would have regulatory authority. Reference *EPA Region 8 – Underground Injection Control (UIC) Program* for permitting information. Additionally, a *Dewatering Well* permit for both the withdrawal well and the injection well will be required from the Colorado Division of Water Resources.

If contaminated Groundwater is present that will be discharged to Groundwater or surface waters, the Division may require sampling of parameters reflective of the Groundwater contamination prior to issuing the permit. Either a *Remediation Activities Discharging to Surface Water Permit* or a *Remediation Activities Discharging to Ground Water Permit* may be required by the Division to manage contaminated waters. Contaminated Groundwater may be assessed for disposal at a Certified Centralized Wastewater Treatment Facility.

If contaminated soils or hazardous materials are identified in the *Geotechnical Hazards Study*, the Design Engineer shall identify their location and incorporate

mitigation requirements into the Contract Documents including proper disposal at a permitted disposal facility approved by the EVS.

Additional information for contaminated soils can be found at the following websites:

- Brownfield Sites:
  https://www.colorado.gov/pacific/cdphe/brownfields
  https://www.colorado.gov/pacific/ops/PetroleumMaps
- Site Contamination:
  https://www.colorado.gov/pacific/cdphe/hm
- Oil and Public Safety for Leaking Underground Storage Tanks:
  https://data.colorado.gov/Environment/Open-OPS-Petroleum-Release-Events-in-Colorado/v5ut-qgp7
  https://www.colorado.gov/pacific/ops/PetroleumMaps
- Voluntary Clean-Up Sites:
  https://www.colorado.gov/pacific/cdphe/voluntary-cleanup
- National Priority List:
  https://www.epa.gov/superfund/superfund-national-priorities-list-npl

Please note this is not a comprehensive list of all known Groundwater contamination, but is meant to help start the process.

A copy of all dewatering permits or approvals from the Division shall be presented to the Colorado Springs Utilities Inspector prior to dewatering activities.
The Contractor shall not allow water to rise until any concrete has set and the forms have been removed. The Contractor shall not allow water to rise unequally against unsupported structural walls.

5.10 Removal or Abandonment of Existing Main

Water Mains shall be removed or abandoned as indicated on the Approved Construction Plan and in accordance with Section 2.6.F.4 of these *Water LESS*. Materials to be removed from the Site may be re-used as a part of the new Construction (i.e., fire hydrants) at the discretion of the Inspector.

5.10.A Salvageable Materials Procedure

The following procedure only applies to metal pipe and appurtenances. PVC and HDPE pipe are not deemed to be salvageable and cannot be reused.

The Inspector shall determine if materials are salvageable. When a Contractor is removing a Public Water Main and will not be reusing the pipe or appurtenances on the current Project, then the salvageable materials may be required to be returned to Colorado Springs Utilities. These materials shall be taken to the Gravel Production yard at 3890 S. US Highway 85/87. The Inspector will call the Gravel Production (GVP) Supervisor at 719-668-7622, 2 working days in advance to make arrangements for the Contractor to deliver the materials to the GVP Yard. Hours for delivery are 7:30 am to 3:00 pm Monday through Friday, excluding holidays. The Contractor shall clean the pipe or appurtenance of dirt, debris, concrete, and asphalt. No trench excavation material is to be taken to the GVP Yard. There will be a metal recycle container at the GVP Yard for placement of these materials. When the materials are delivered, the GVP yard attendant will direct the Contractor where to place the materials either in the metal recycle container or near the container in case

the materials need to be broken up to fit into the container. The Contractor shall be responsible for all costs associated with removing, cleaning, and delivering the salvageable materials to the GVP yard.

5.10.B Asbestos Material

If any suspected Asbestos-containing materials (ACM) are encountered on Colorado Springs Utilities Water Mains, appurtenances, or Service Lines during Construction, the Contractor shall not disturb the material and shall be responsible for immediately contacting the Colorado Springs Utilities Project Manager or Inspector and Colorado Springs Utilities' Environmental Services, Operations Environmental Support (EVS/OES) to assist in the proper handling of ACM.

Whenever possible, Colorado Springs Utilities requires that ACM be removed from its Collection and Distribution Systems. A State of Colorado Certified abatement Contractor must conduct all Asbestos abatement. A list of approved abatement Contractors may be obtained from, EVS/OES.. Replacement of the ACM shall be completed with acceptable materials as defined in these *Water LESS*.

The possible types of Asbestos-containing materials that may be encountered include Asbestos-cement (transite pipe), tar or felt/tar coated steel pipe, Asbestos-containing wrap on steel pipe, and Asbestos gasket material, usually gray or black in color.

All steel Water Mains coated with either gray or black tar, or felt tar or with pipe wrap other than plastic that may contain Asbestos must be treated as ACM unless testing shows otherwise. The Contractor may contact Colorado Springs Utilities EVS/OES. to collect suspect coating or gasket samples for determination of Asbestos content. If results indicate the material does not contain Asbestos, the Contractor may proceed with normal pipe repair/removal.

All ACM abatement must be managed by the Contractor and their abatement Contractor on behalf of Colorado Springs Utilities in accordance with federal and state Standards including the following:

- *Colorado Air Regulation No. 8, Part B – Control of Hazardous Air Pollutants 5 CCR 1001-10*
- *40 CFR Sec. 61, Subpart M - National Emission Standard for Asbestos*
- *40 CFR Sec. 763, Subpart G - Asbestos Worker Protection*
- *OSHA-29 CFR 1910.1001-General Industry Standards-Asbestos*
- *OSHA-29 CFR 1926.1101-Construction Standards-Asbestos*
- *CDPHE Hazardous Materials and Waste Management Division Regulations Pertaining to Solid Waste Sites and Facilities 6CCR 1007-2, Part 1 Section 5 Asbestos Waste Management*

ACM abatement shall be accomplished without rendering the material friable and making the Asbestos airborne. Power equipment that may cause ACM to become friable shall not be used to remove coating or wrap which may contain Asbestos. The minimum amount of coating that may contain Asbestos should be removed when installing a repair clamp, welding of a repair plate to the leak, or removal of the section of pipe.

For regulated materials (transite pipe, gaskets and coatings that are friable) the CDPHE, Air Pollution Control Division must be notified of ACM removal greater than 260 linear feet or a volume equivalent to a 55-gallon drum. A permit is also required from CDPHE for abatement/removal when the material may be rendered friable. Additional notification is required if an Asbestos release occurs. (*Regulation 8 III.E.1 Notices*)

For all Projects requiring disposal of ACM-contaminated media (e.g., soil, water), the Contractor/Developer or their abatement/removal Contractor must contact Colorado Springs Utilities EVS/OES. for management assistance.

All ACM waste must be disposed using a Special Waste Manifest to either Waste Management, Inc.'s Colorado Springs Landfill (preferred location) or Denver Arapahoe Disposal Site for friable or non-friable ACM.

The Contractor/Developer or their abatement Contractor must provide Colorado Springs Utilities with copies of all records regarding Asbestos abatement including notifications, permits, CDPHE correspondence, air monitoring and exposure assessments, and waste disposal manifests/shipment records.

The Contractor/Developer and the abatement Contractor will be held responsible for cleanup of any ACM released to the environment from failure to follow proper abatement techniques and failure to comply with the above regulations.

5.11 Pipe Bedding

5.11.A Installation of Bedding

After completion of the trench excavation and proper preparation of the foundation, a minimum of 6 inches of bedding material shall be placed on the trench bottom for support under the pipe. Bell holes shall be dug deep enough to provide a minimum of 2 inches of clearance between the bell and bedding material. All pipes shall be installed in such a manner as to ensure full support of the pipe barrel over its entire length. After the pipe is adjusted for line and grade, and the joint is made, the bedding material shall be carefully placed and tamped under the haunches of the pipe and in the previously dug bell holes.

Tamping is defined as the act of placing bedding material under the haunches of the pipe, paying particular attention to voids, bell hole, and sling holes. The purpose of tamping is to ensure uniform support for the pipe.

For all pipes, the limits of bedding shall be from 6 inches below the bottom of the pipe to 12 inches above the top of the pipe. Tamping of bedding is required. Tamped lifts shall not exceed 6 inches. Bedding shall be tamped to provide a firm base for backfill. Backfill shall be installed per the City of Colorado Springs Standard Specifications or the Specifications of the Authority Having Jurisdiction.

5.11.B Bedding Material

If approved by the Inspector, bedding material may be comprised of on-site excavated material provided that large rocks, boulders, and stones greater than 3/8 inch have

been removed. The material shall be capable of supporting the weight of the pipe, fittings, and other appurtenances.

If the on-site material is deemed unsuitable by the Inspector, the Contractor shall import suitable bedding. Imported bedding material shall be a clean non-corrosive, well-graded sand as defined by the Unified Soil Classification System and the criteria outlined below or other approved material as determined by the Inspector. Materials derived from recycled concrete and poorly or uniformly graded materials (i.e., pea gravel) will not be allowed.

For a sand to be classified as well graded, the following criteria must be met:

$Cu \geq 6$ & $1 < Cc < 3$, where:

Cu is defined as the coefficient of uniformity and is calculated using the following equation:

$$C_u = \frac{D_{60}}{D_{10}}$$

where D60 is the grain diameter at 60% passing, and D10 is the grain diameter at 10% passing

The coefficient of curvature, Cc is a shape parameter and is calculated using the following equation:

$$C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

where D60 is the grain diameter at 60% passing, D30 is the grain diameter at 30% passing, and D10 is the grain diameter at 10% passing.

Once the coefficient of uniformity and the coefficient of curvature have been calculated, they will be compared to gradation limits when tested by means of laboratory sieves.

The well-graded sand shall generally have the gradation limits outlined in Table 5-1.

Table 5-1: Gradation Limits for Well-Graded Sand

WELL-GRADED SAND	
Sieve Size	Total Percent Passing by Weight
3/8 Inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

If approved by Colorado Springs Utilities, fines from the trench wall and soil pile may be used to provide uniform support for the pipe. No rock or stone larger than 3/8 inch, or any other detrimental substance including but not limited to trash, frost, or clay shall be placed closer to the pipe than 6 inches. Colorado Springs Utilities reserves the right to require the use of imported bedding material at any time.

5.12 Water Main Connections to Colorado Springs Utilities System

5.12.A Connections

Connections to Colorado Springs Utilities Water Main shall be made in accordance with the Approved Construction Plans and Section 2.6.C. Connections to Colorado Springs Utilities system shall be accomplished in a neat and professional manner. An Inspector shall be present at all times during the Construction of the connection.

There is only one nominal dimension of the spigot outside diameter and the bell inside diameter for each size of ductile iron push-on joint pipe. Connections to existing Asbestos pipe and other odd diameter pipe shall be made with an approved transition coupling.

5.12.B Operation of Valves

It may be necessary to operate existing valves when connecting to the Water Distribution System. Only Colorado Springs Utilities personnel shall operate valves on the existing Water Distribution System owned by Colorado Springs Utilities. The Contractor shall give the Inspector 2 working days' notice to arrange for the operation of valves after the valves have been identified, raised, cleaned, and inspected per Section 2.6.C.1. Colorado Springs Utilities does not guarantee water tightness of valves on existing facilities. If existing valves leak, Colorado Springs Utilities will assist in reducing the influx of water, but the Contractor must use approved methods at his own disposal to work with the resulting leakage. Colorado Springs Utilities is not liable for any damages (financial or otherwise) that the Contractor sustains as a result of lost time due to leaking valves.

5.12.C Interruption of Service

Installation of a connection that will require closing valves may cause an interruption of Water Service to existing Colorado Springs Utilities' Customers.

The Contractor will be responsible for furnishing Colorado Springs Utilities with all necessary information as to the date and time the interruption will begin and the total time required for restoring Water Service. For Potable Water Service interruptions, the Inspector will coordinate and will arrange for all notifications to Single-Family-Residential and Commercial Customers and the AHJ Fire Department 24 hours in advance of the shutdown. A description of the boundaries of the affected area and the location of all fire hydrants in that area shall be provided to the Fire Department.

A normal Water Service interruption shall be a maximum of 8 hours. If the interruption will be greater than 8 hours, the work shall be done in a manner to minimize the inconvenience to Customers, such as working at night in a continuous operation until service is restored. Connections, which require interruption longer than 8 hours, shall be subject to review by Colorado Springs Utilities to establish appropriate timing of the connection. The Contractor shall be responsible for evaluating and identifying operational and Customer impacts resulting from an interruption and taking the appropriate measures to minimize these identified impacts. The Contractor may be responsible for incurred Customer damages for outages that go longer than expected.

If, in the process of installing a connection, there is a Customer that cannot be out of water, appropriate means shall be taken to provide and convey water. The water source and means of conveyance shall be provided by the Contractor and approved by Colorado Springs Utilities.

Temporary water connections are allowed. The Contactor shall be responsible for the Construction and disinfection of the temporary connection per Section 5.19. All temporary connections shall be reviewed and approved by Colorado Springs Utilities.

Where connecting tees and crosses, the Contractor shall be required to restore the Water System after connection. A temporary plug and blow off valve assembly may be installed on the extension ends of the tee or cross to enable Flushing and disinfection of the connection prior to the Construction of the proposed Water Main.

5.13 Pipe and Fittings

5.13.A Hauling, Handling, and Storage of Materials

All material handling equipment and material handling methods shall be in accordance with the manufacturer's recommendations.

The Contractor shall be responsible for the safe storage of materials until they have been incorporated in the Project. Stored materials shall be kept safe from damage and contamination.

All materials shall be handled so that the coating and lining are not damaged. If, however, any part of the coating or lining is damaged, the replacement or repair of the damaged materials shall be done to the satisfaction of Colorado Springs Utilities Inspector.

The Contractor shall be responsible for all materials furnished and shall replace at their expense all such materials found defective or damaged in handling after delivery

by the manufacturer. This shall include the furnishing of all materials and labor required for the replacement of installed materials discovered defective prior to preliminary or final acceptance of the Construction.

Materials furnished by Colorado Springs Utilities shall be loaded onto or into the Contractor's vehicle(s) by Colorado Springs Utilities. Upon final loading and acceptance by the Contractor or his representative, the Contractor shall be totally responsible for such materials from the time the materials leave Colorado Springs Utilities supply area until installation is complete and final acceptance made. The Contractor shall return any unused or excess materials to Colorado Springs Utilities.

Any material furnished by Colorado Springs Utilities which is transported to the job Site by the Contractor and later determined defective, through no fault of the Contractor, shall be returned to the Colorado Springs Utilities supply area by the Contractor and exchanged for new or undamaged materials.

All materials shall be picked up at or returned to the designated Colorado Springs Utilities' warehouse or storage facility between the hours of 8:00 AM and 3:00 PM, Monday through Friday, excluding holidays.

5.13.B Inspection of Materials

All material used within the Water System shall be in conformance with CHAPTER 4 Approved Materials. Materials not approved for use shall be immediately removed from the Site.

All materials furnished shall be new and undamaged. Everything necessary to complete all installations in accordance with the standards of Colorado Springs Utilities shall be furnished and installed whether shown on Approved Construction Plans or not.

Acceptance of materials, or the waiving of inspection thereof, shall in no way relieve the Contractor of the responsibility for furnishing materials meeting the requirements of these *Water LESS*.

Each pipe or fitting shall be thoroughly examined for cracks and other defects before installation. Any observed gouge or scratch that extends 10 percent or more into the pipe side wall thickness shall be rejected. PVC pipe, more than 1 year old from the date of manufacture, as indicated on the print line, may be rejected at the discretion of the Inspector. Bell ends and spigot ends are to be examined with particular care. Defective pipe or fittings shall be laid aside for inspection by the Inspector who will prescribe corrective repairs or rejection. Rejected materials shall be removed from the job Site immediately.

5.13.C Installation of Pipe

5.13.C.1 Sanitary Requirements

The Contractor shall prevent contamination (e.g., ground water, storm water, animals, insects, etc.) from entering the Potable Water Distribution System and Water Service Lines. Precautions shall be taken to protect the interior of pipes, fittings, and valves against contamination during installation. All Water Main installations shall follow the standards

recognized by the American Water Works Association (AWWA) Best Management Practices which include but are not limited to the following:

- It is the responsibility of the Contractor to inspect the pipe to ensure it is clean and dry prior to transportation and staging
- All pipes staged on Construction sites shall be placed off the ground and all pipe ends shall be sealed or capped with waterproof caps or plugs to prevent contamination.
- Protect the pipe along the trench by keeping the ends sealed until installation
- Every precaution shall be taken to prevent contamination of any appurtenances associated with pipe installation
- The pipe section shall remain sealed until it is ready for connection; this will prevent the flow of any water in the trench from entering the pipe
- Prior to filling the pipeline, the pipe shall be clean and free of debris

5.13.C.2 Lowering of Material into the Trench

Proper equipment and tools as specified by the manufacturer of the material shall be provided and used by the Contractor when unloading and lowering materials into trenches.

If damage occurs to any pipe, fitting, valves, hydrants or Water Main appurtenances during handling, the damage shall be immediately brought to the attention of the Inspector. The Inspector shall have the discretion to require removal and inspection of any material believed to be damaged or defective at any time during Construction. The Inspector shall prescribe corrective repairs or rejection of the damaged items.

5.13.C.3 Laying of Pipe

All lumps, blisters and excess coatings shall be removed from the bell-and-spigot end of each DIP pipe and fitting, and the outside of the spigot and the inside of the bell shall be brushed and wiped clean, dry, and free from oil and grease before the pipe or fitting is installed. A similar inspection process shall be performed for both PVC and HDPE pipe.

As each length of pipe is placed in the trench, it shall be brought to correct line and grade. The pipe shall be secured in place with approved backfill material and tamped. No blocking shall be left at any point under the pipeline.

5.13.C.4 Slip Joint Ductile Iron Pipe

The rubber gasket shall be flexed in such a manner so to insert and seat correctly into the gasket recess of the bell socket. Since different brands of pipe require different types of gaskets, the Contractor shall exercise caution to ensure that the correct type of gasket is used and installed correctly.

A thin film of approved gasket lubricant shall be applied to both the inside face of the gasket and the spigot end in accordance with the manufacturer’s recommendations.

The spigot end of the pipe shall be placed in the bell end with care to prevent the joint from contacting the ground. Pipe furnished without a depth mark on the spigot end shall be marked before assembly to ensure insertion to full depth of the joint. The pipe shall be kept in straight alignment and the joint shall be completed by pushing the pipe home with a slow, steady pressure, per industry standards. If the pipe is pushed home with a backhoe bucket, a wooden shield must be placed between the backhoe bucket and the end of the pipe. The spigot end of field-cut pipe lengths shall be filed or ground to resemble the spigot end of such pipe as manufactured. A new depth mark shall be measured and marked before assembly to ensure insertion to full depth of the joint.

Upon completion of joining slip joint pipe, an inspection shall be made to assure that the gasket is correctly aligned and not twisted or turned in the gasket recess of the bell socket.

Whenever it is necessary to deflect ductile iron slip joint pipe, the amount of deflection shall not exceed the maximum deflections specified by Colorado Springs Utilities. See Detail Drawing A4-1.

5.13.C.5 Mechanical Joint Ductile Iron Pipe

Lubrication of the joint and rubber gasket shall be done in accordance with the pipe and fitting manufacturer's Specifications. Because of the length of bevel, it is required that the bevel be removed, prior to installing into a mechanical joint fitting.

The gland shall be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket, or bell end. The rubber gasket shall be placed on the spigot end with the thick edge toward the gland.

The pipe shall be pushed in, until the spigot end fully penetrates the bell. The gasket shall then be pressed into place, within the bell, evenly around the entire joint. The gland shall be moved along the pipe into position for bolting. The bolts inserted and the nuts threaded finger-tight, then tightened with a torque limiting wrench. Torques for the various sizes of bolts shall be per the manufacturer's recommendations.

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure on all parts of the gland.

5.13.C.6 Slip Joint PVC Pipe

Lubrication of the spigot and rubber gasket shall be done in accordance with the pipe manufacturer's Specifications. Care shall be taken that only the correct rubber gasket, compatible with the annular groove of the bell, is used. Insertion of the gasket in the annular groove of the bell or coupling must be in accordance with the manufacturer's recommendations. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint. The spigot end of field cut pipe lengths shall be filed or ground to resemble the spigot

end of such pipe as manufactured. A new depth mark shall be measured and marked before assembly to assure insertion to full depth of the joint.

The spigot and bell or coupling shall be aligned and pushed until the reference line on the spigot is flush with the end of the bell or coupling. Pushing shall be done in a smooth, steady motion. Upon completion of joining the pipe, an inspection shall be made to assure that the gasket is correctly aligned and not twisted or turned in the gasket recess of the bell socket.

PVC pipe has reduced flexibility and impact resistance as temperatures approach and drop below freezing. Extra care should be used in handling and installing PVC pipe during cold weather.

5.13.C.7 Cutting and Fitting of Pipe

Pipe shall be cut, whenever necessary, to conform to location of fittings, line, or grade. All cuts shall be straight and true, and in a workmanlike manner so as to leave a smooth end without damaging the pipe or its cement lining. All burrs shall be removed from the ends of cut pipe, and the end lightly rasped or filed. For slip joint application the pipe shall be beveled in accordance with the manufacturer's recommendations (typically 15 degrees for PVC, 45 degrees for DIP). All cuts shall be in accordance with the manufacturer's recommendations with regard to "cut" and "do not cut" zones for the various materials and size of pipes. All tools used in cutting pipe shall meet manufacturer Specifications.

5.13.C.8 Repair to Existing Pipe Lines

Solid sleeve couplings with mechanical joint restraints are to be utilized when making repairs to 4 inch and larger Water Mains, Service Lines, and hydrant laterals. The use of repair clamps will be at the discretion of the Inspector.

A 17 lbs. high potential anode shall be attached to all DIP/steel pipe repairs, and/or metal appurtenances. Where a PVC repair is installed a 17 lbs. high potential anode shall be attached to the existing metal pipe on either side of the repair. Tracer wire shall be installed on top of PVC pipe repairs for locating purposes.

5.13.C.9 Joint Lubricant

Joint lubricant shall be per the pipe manufacturer's Specifications. Joint lubricant shall be non-toxic and water-soluble and meet current EPA and NSF Standards.

5.13.C.10 Pipe Alignment and Grade

In laying pipe, the intent is to lay to finished line and grade within a tolerance of 3 inches plus or minus. Pipe, fittings, valves and hydrants shall be installed at staked locations and elevations. Spigots shall be centered in bells, and all valve and hydrant stems shall be plumb. Pipe shall be laid with the bell ends facing in the direction of laying unless directed otherwise by Colorado Springs Utilities. Where pipe is to be installed on a grade of 5

percent or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe upgrade.

When laying pipe on curves, the intent is to lay to the staked alignment. The pipe shall be kept in alignment by placing bends, deflecting the pipe, or placing high-deflection couplings on the curve as shown on the Approved Construction Plans.

For Ductile Iron Pipe, deflections may be achieved at slip joints per Detail Drawing A4-1. No deflection is allowed past 80 percent of the manufacturer's recommendation. Deflection of the joints is not allowed with slip joint PVC pipe. Deflections on PVC pipe shall be achieved with high deflection couplings per Detail Drawing A4-1. Full lengths of pipe should be used when utilizing high deflection couplings. Short lengths may be used as necessary to accomplish the curvature at the discretion of the Inspector. Lengths shall be a minimum of 5 feet. Bends shall be used whenever individual deflections exceed those allowed per Detail Drawing A4-1.

All pipes shall be installed to the depth shown on the Approved Construction Plans and Section 2.6.G.1. If difficulties arise when crossing obstructions and where specifically approved by Colorado Springs Utilities, a water line lowering or grade break may be required. See Detail Drawings A7-1 and A7-2.

Any changes in alignment and grade must be authorized by the Inspector and coordinated with the Contractor, Design Engineer and noted on the Construction and Record Drawings.

5.13.C.11 Fire Service Lines 4 inches and Greater

All Fire Service Lines shall be constructed in accordance with these Construction Standards, Detail Drawings B 2-5, Section 2.7.E.2, and the Approved Construction Plans.

Fire Service Lines shall be staked in the field for line and grade prior to Construction, including but not limited to bends, fittings, and valves. Any deviation from the approved design, specifically the addition of bends or an increase in the degree of bends, shall require a re-submittal by the Design Engineer and review and approval by Colorado Springs Utilities and Colorado Springs Fire Department.

Fire lines should enter the building perpendicular to the outside wall whenever possible, and should never be underground for more than 3 feet inside the building.

All Fire Service Lines shall be hydro-statically tested from point of connection at the main to point of connection to the sprinkler system at 200 psi, or 50 psi above static pressure for a minimum of 2 hours. This test is best performed before completely backfilling so that all joints are exposed.

The Fire Service Line is to be flushed at a velocity of 10 feet per second, or whatever is available for fire flow Flushing of Fire Service Lines, shall meet the requirements of NFPA and shall be witnessed by the Colorado Springs Fire Department.

5.13.C.12 Bridging and Encasement

Bridging and encasement may be required at the discretion of the Inspector with coordination and design by the Design Engineer.

5.13.C.13 Casing Pipe

Whenever it is necessary to provide a casing for the Water Main, the Water Main shall not be inserted into the casing without providing casing spacers for the Water Main. Casing size, length, type, and side wall thickness will be per the Approved Construction Plans. See Section 2.6.G and Detail Drawings A7-3 and A7-4.

Casing spacers shall be spaced a maximum of 8 feet apart along the length of the carrier pipe with one casing spacer 2 feet on each side of a pipe joint and 2 feet from the end of the casing and the rest evenly spaced. Reference Detail Drawing A7-4. Casing spacers shall be cathodically protected per Section 2.6.H.

Casing pipe shall be installed at a 0% slope.

5.13.C.14 Crossings and Lowerings

No taps or intersection fittings shall be permitted within a Water Main lowering section from one Isolation Valve to the other Isolation Valve as shown in the Water Main Detail Drawings A7-1 and A7-2.

With the installation of a half lowering or grade break section, taps or intersection fittings may be installed a minimum of 10 feet from the outside edge of the utility infrastructure.

5.13.D Installation of Fittings and Appurtenances

All fittings shall be installed per the manufacturer's Specifications and these *Water LESS*. All pipe fittings shall be mechanical joint, flanged, and/or plain end in compliance with these *Water LESS*. Mechanical joint restraints shall be used for restraining bends, reducing couplings, tees, crosses, solid sleeves, offsets, anchor pipe, valves, and hydrants. Plain ends may be used for reducing coupling. See Detail Drawing A4-5.

All mechanical joint pipe restraints shall be incorporated in a follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Twist-off nuts, sized the same as tee-head bolts, shall be used to ensure proper actuating of restraining devices.

Beveled ends of pipe are not allowed in mechanical joint fittings.

The use of "wyes" and 90 degree bends in main extensions or Private Water Main Extensions is strictly prohibited except in special installations as directed by Colorado Springs Utilities.

5.13.D.1 Valves

Line valves are required as shown on the Approved Construction Plans and per Section 2.6.F.6 of these *Water LESS*. The Inspector may require the installation of additional valves not shown on the Approved Construction Plans, when determined necessary in the field, with the coordination of the Owner/Developer and/or the Design Engineer. Where necessary, the Inspector shall require the installation of additional line valves in order to avoid exposing Customers to high chlorine residual during disinfection of pipelines. See Detail Drawing A9-1.

A concrete reverse anchor is required to be set on one side of all line valves on the opposite side of the valve in the direction of flow. See Detail Drawing A4-5. The concrete reverse anchor for line valves requires two MJ restraints be installed within the concrete block. The MJ restraints shall be installed in opposite directions, facing each other within the concrete on DIP pipe. A single MJ application will provide proper restraint on PVC pipe. See Detail Drawing A4-8.

All valves must be opened RIGHT for Potable Water with a red operating nut. Valves shall be operated prior to installation to ensure good operating condition. Valves shall be installed in the open position. Valves shall be set and joined to the pipe per Section 5.13.D.1.

Valves shall be installed in such a manner that the valve stems and valve boxes are accessible and valve stems operable and plumb. If valves are installed greater than 6 feet in depth a false stem may be required to be installed on the operating nut. See Detail Drawing A9-2. Valves shall be operated after installation and pressurization to ensure proper function both before preliminary acceptance and final acceptance.

All butterfly valves shall be buried horizontal with the valve shaft horizontal and the operating nut shaft vertical.

5.13.D.2 Valve Boxes

a) Installation

All buried valves shall be provided with a 6 inch cast iron valve box, slip type. The valve box shall be of a design, which will not transmit shock or stress to the valve and shall have enough extension capability to be raised to final street grade. The valve box shall be centered and plumb over the operating nut of the valve, with the box cover set to the required elevation. Before placement of final paving and after the placement of base course, the Inspector shall inspect to ensure proper elevation of the water valve box. Prior to paving any street, the Contractor shall be responsible for locating, repairing, or replacing, cleaning, and raising all valve boxes to the finish street surface as shown on Detail Drawing A9-1. The Contractor shall

ensure that valve boxes are plumb and raised to the finished street surface no later than 30 days after paving.

b) Inspection

Prior to paving a street with a newly constructed Water Main within the Right-of-Way, a final inspection is required by the Inspector. Inspections should be requested 2 working days in advance of paving. A copy of the paving letter must be available at the inspection Site for proper validation.

c) Debris Caps

All valves boxes shall be fitted with a debris cap. Lock out tag out debris caps may be required at the direction of Colorado Springs Utilities per Section 2.6.D.3.

5.13.D.3 Fire Hydrants

Fire hydrants shall be installed per the Approved Construction Plans and Section 2.6.F.8. Any relocation or addition of fittings on Fire Hydrant Laterals may require re-submittal to Colorado Springs Utilities and CSFD. Under no circumstances shall any size or manner of tap be made on a fire hydrant branch line between the hydrant and the hydrant valve.

Both Public and Private fire hydrants shall be installed in accordance with these *Water LESS* and shall be inspected and approved by a Colorado Springs Utilities Inspector.

a) Installation

All hydrants shall stand plumb and be installed as indicated per Detail Drawings A5-1 through A5-6. Fire Hydrant Laterals greater than 20 feet in length or having more than one joint in the lateral shall be restrained.

When a fire hydrant is designed deeper than the required maximum of 6 feet and approved by Colorado Springs Utilities, the maximum allowed depth of a fire hydrant from shoe to flange is 8-1/2 feet deep, accomplished utilizing a 6-1/2foot hydrant with a 2 foot riser extension. It will be the Contractor's responsibility to set the safety flange at the proper elevation.

Tapered square nuts shall be installed on all fire hydrants per Section 4.4.K. The Contractor shall use a hydrant wrench with a tapered square box designed specifically for Colorado Springs Utilities fire hydrants to operate the fire hydrant. The use of any other wrench may result in fines and hydrant repair costs to be paid by the Contractor.

Bollards shall be installed at locations shown on the Approved Construction Plans or at the direction of the Inspector. Bollards shall be installed per Detail Drawing A5-4.

b) Anchorage

The bottom of the hydrant shoe shall be supported with 18 inch x 18 inch x 4 inch precast concrete paver stones placed below and behind the shoe. The shoe of each hydrant shall be well braced against the unexcavated earth at the end of the trench with a poured in place concrete thrust block. The

hydrant shall be restrained to the hydrant valve and the hydrant valve restrained to the tee with anchor pipe, mechanical joint pipe restraints or slip joint restraints as shown on Detail Drawing A5-3.

When a fire hydrant is installed at the termination point of a main extension, then a concrete reverse anchor will be required for the fire hydrant valve and the fire hydrant shall be secured to the valve as described above. Additional concrete reverse anchors may be required at the direction of the Inspector.

c) Cathodic Protection

All ductile iron pipe and fittings, from finished ground level on the hydrant barrel up to and including the tee, shall be encased in polyethylene wrap (NOTE: Do not wrap weep hole). Any electrically discontinuous pipe or fittings shall be bonded per Section 2.6.H. A minimum 17 lbs. anode shall be installed on the hydrant. A test station shall be installed with every fire hydrant as shown in Detail Drawing A5-3.

d) Drainage

Wherever a hydrant is set, drainage shall be provided at the base of the hydrant by placing rock from the bottom of the trench, to at least 12 inches above the top of the shoe of the hydrant, and to a distance of 6 inches over the weep hole. The weep hole plug shall be removed prior to placing rock. The minimum distance from the bottom of the trench to the bottom of the hydrant shoe shall be 4 inches. The minimum quantity of rock placed shall be 1/3 cubic yard. The rock shall be a well-graded gravel, cobble, or crushed rock, free of dirt. Crushed concrete shall not be used. The Contractor shall surround the drain rock with an impermeable liner to prohibit the infiltration of smaller particles into the drain bed. Reference Detail Drawing A5-3.

e) Color Coding

The Contractor shall paint the fire hydrants according to the following:

- For Fire Hydrant Color Coding, see Section 4.4.K.1.
- The Inspector shall number the fire hydrants.

f) Fire Hydrants Not Yet In Service

Newly installed fire hydrants that are not yet in service must be equipped with Out of Service Rings, as detailed in Section 4.4.K.2. These rings shall be provided by Colorado Springs Utilities and remain installed until the corresponding Water Main is charged and the fire hydrant is officially in service.

5.13.D.4 Temporary Blow Off Valves, and Water Quality Devices

The Contractor shall furnish, and install temporary blow-off valves and flushing assemblies at locations shown on the Approved Construction Plans and per Section 2.6.F.10. See Detail Drawings A2-4 thru A2-8.

In order to prevent the transmission of traffic loads to the discharge piping, the Contractor shall ensure that the discharge piping is centered in the valve box.

The Contractor shall surround the drain port with a sufficient amount of crushed rock/gravel to provide an adequate drainage area to flow away from the shoe.

Temporary blow off and flushing assemblies shall not daylight into an open drain, ditch, creek, or waters of the state unless approved by Colorado Springs Utilities and the CDPHE.

5.14 Concrete Thrust Reaction Blocks, Restrained Joints, and Concrete Reverse Anchors

The Contractor shall be responsible for verifying soil conditions prior to the placement of any concrete thrust reaction blocks (CTRBs), restrained joints, or concrete reverse anchors (CRAs). If Site conditions vary from the approved plans, the Design Engineer shall be required to re-design any CTRBs, restrained joints, or CRAs. Additional CRAs may be required at the discretion of the Colorado Springs Utilities Inspector.

5.14.A Installation

During installation, care shall be taken not to block outlets or to cover bolts, nuts, clamps, or other fittings or to make them inaccessible. See Detail Drawings A4-2, A4-3, A4-7, and A4-8. Bearing surface areas are minimum areas to bear against the undisturbed trench wall. If, in the opinion of the Inspector, the soil bearing capacity is not sufficient to provide adequate restraint based on minimum bearing areas, then the minimum bearing area shall be increased to a size that will ensure adequate restraint. In every instance, the CTRB or CRA shall bear against undisturbed earth.

All debris, water and ice shall be removed from the place to be occupied by the concrete. Concrete shall not be placed on frozen subgrade. All concrete shall be placed in the presence of the Inspector unless inspection has been waived prior to the placement.

When it is impossible, due to over excavation or other cause, to place a thrust block or anchor against undisturbed earth, restrained joint pipe shall be required per Detail Drawing A4-4 to anchor the fittings to the main.

Ductile iron tie lugs may be used to tie back mechanical joint fittings, pipe, and valves with threaded rods to a CRA where additional thrust restraint is required. Rods shall be cathodically protected per Section 2.6.H.2.

5.14.B Form Work for Thrust Blocks and Anchors

All forming for concrete thrust blocks and reverse anchors will be done by bulk heading around the shape of the thrust block or anchor with burlap or reinforced paper sacks filled with sand or earth. Sacks shall be of a size easily handled when filled, and shall be left in place in the trench. Wood forms may be used in some cases; however, all wood will be removed before backfilling. No horizontal struts or braces required for trench shoring shall remain in the concrete thrust blocks. Prior to placing concrete, the forms and ditch bank shall be inspected and approved by the Inspector.

5.14.C Concrete and Curing Time

Thrust blocks shall be concrete with no less than 1 part cement to 2-1/2 parts sand and 5 parts stone, and having a compressive strength of not less than 3,000 PSI after 28 days.

Minimum curing time for concrete thrust blocks shall be 18 hours for blocks containing more than 2 cubic yards but less than 6 cubic yards , and 2 working days for blocks containing more than 6 cubic yards but less than 12 cubic yards. Thrust blocks containing more than 12 cubic yards will be cured as directed by the Inspector.

No Water Main will be charged or pressurized without the approval of the Inspector. All thrust blocks and anchors must meet the minimum curing time unless, under certain circumstances, the Inspector may elect to shorten or extend the time of curing.

5.14.D Compaction of Fill over Thrust Blocks and Anchors

Backfill may be placed over thrust blocks and anchors once the surface has set sufficiently to resist the weight of the backfill. However, no tamping or compacting shall be allowed above the thrust block or anchor for a minimum of 36 hours after placement or as directed by the Inspector.

5.15 Structures and Vaults

Precast and poured-in-place Vaults shall be made waterproof after installation or Construction by use of sealants, epoxies, or other approved methods.

Colorado Springs Utilities may require installation of a precast Vault(s) when weather or field conditions warrant. Vaults should be placed where minimal or no Groundwater is known or suspected to be present that may infiltrate into the Vault or shall be made water tight to prevent infiltration. Placement of Vaults within areas where Groundwater or Groundwater mixed with stormwater is known or suspected to be present will require a *Discharges Associated with Subterranean Dewatering or Well Development General Permit* from CDPHE if the water will be discharged to Groundwater or surface waters. This permit will require a minimum of one year of monthly monitoring and reporting to CDPHE. After which, the monitoring would be assessed for a reduced schedule or terminated. Uncontaminated Groundwater or Groundwater mixed with stormwater from a Vault may be discharged to land in accordance with the conditions outlined in the CDPHE *Low Risk Discharge Guidance for Discharges of Uncontaminated Groundwater to Land.*

Steel reinforcement and concrete shall conform to Section 4.4.M. All Specifications regarding reinforcing bar placement, size, clearances, measurements, etc., shall be strictly followed. All concrete shall be placed at temperatures of not less than 40 degrees Fahrenheit and maintained at this temperature for at least 7 days. Artificial heating and coverings shall be provided when necessary.

All manhole rings, covers, and ladder rungs need to be placed so that the center of the rung is in line with the center of the manhole opening. Pipe arches, sleeves, etc., shall conform to Detail Drawings A6-7. All Vaults shall be installed with two air vent pipes located behind the curb line, to allow air to circulate in and out of the Vault. Vent pipes shall be installed on opposing sides of the Vault to maximize the air circulation within the Vault. See Detail Drawing A6-1 for vent piping schematic (roof and floor location). The color code of the vent pipes shall be blue for Potable Water and purple for Nonpotable Water. The sump hole shown

in the Detail Drawings is to be located at the lowest point in the floor of the Vault to allow for drainage. The Contractor shall be responsible for cleaning the Vault/Pit at the end of the job of all debris (i.e., loose materials, water, mud, etc.).

The Inspector shall be notified when reinforcing bar is in place prior to pouring any concrete. Failure to obtain approval of reinforcing bar placement shall be cause for non-acceptance of a poured-in-place installation.

Field control tests shall be performed by qualified personnel in the presence of the Inspector, when determined necessary by Colorado Springs Utilities. Tests may include slump tests, air content tests, and compression test cylinders. Acceptable curing and temperature control shall be achieved and maintained by the Contractor.

5.16 Tracer Wire

Colorado State Regulations require all Underground Facilities to be electronically locatable. Tracer wire shall be installed on all PVC, HDPE, and DIP Water Mains and all Service Lines. Insulated tracer wire shall be taped every 10 feet to the top of the pipe. Do not weld tracer wire to DIP mains. A Ground (either a 1.5lb ground rod or a 1-pound high potential magnesium anode) is to be placed on tracer wire at every wire dead end and stub. For long runs of pipe, a Ground shall be attached to each end of the tracer wire. Where new pipe is connected to existing pipe, the new tracer wire shall be connected to the existing tracer wire and a Ground should be installed at the end of the new tracer wire. At depths greater than 20 feet, pipe may require an alternative locating method at the discretion of Colorado Springs Utilities.

For Water Mains, tracer wire shall be brought above ground and connected in a test station at each fire hydrant per Detail Drawing A5-3. At a minimum, tracer wires shall be accessible every 1000 feet.

Tracer wire should be as continuous as possible. Where splicing or connections are necessary, tracer wire must be connected following an approved, electrically continuous, watertight method. See Section 4.4.P.1. All exposed tracer wire must be made watertight by taping with Scotch Linerless Rubber Splicing Tape to seal out moisture and then sealing the rubber tape with Scotch Super 33+ Vinyl Electrical tape. See Section 4.4.P.2.

Prior to final acceptance, all new tracer wire installations shall be located by Colorado Springs Utilities using typical low frequency (512 Hz) line tracing equipment. This verification shall be performed prior to preliminary acceptance and, if required at the discretion of Colorado Springs Utilities, again prior to final acceptance of the Project. Continuity testing in lieu of actual line tracing shall not be accepted. Any deficiencies shall be addressed by the Contractor prior to final acceptance. Testing shall be noted on the Record Drawings by the Colorado Springs Utilities Inspector.

Time and Materials shall be charged to the Contractor or the Owner/Developer for expenses incurred by Colorado Springs Utilities if more than 1 tracer wire inspection is required to be scheduled per pipe extent.

5.17 Cathodic Protection

5.17.A Coatings and Wraps

All metallic pipe, fittings and appurtenances shall be coated or wrapped per the Approved Construction Plans, the manufacturer's Specifications and Section 2.6.H.1.

Where polyethylene tubing is specified, it shall be installed per Detail Drawing A8-1 and the following:

- Clean all dirt and debris from the surface of the pipe. Dry the pipe.
- Cut tubing 2 feet longer than the pipe, slip over the spigot end of the pipe and bunch the tubing so that it will not be damaged when lowering the pipe into the trench.
- Dig bell holes at joint locations, lower the pipe into the trench, and make up the joint.
- Slip the tubing around the entire length of the pipe and overlap the tubing 1 foot past the joint and tape the tubing tightly in place.
- Pull the tubing from the next pipe section over the joint and overlap 1 foot past the joint tape as noted above.
- Tubing shall be secured by wrapping tape around the pipe every 2 feet.
- Cuts, tears, punctures, or other damage to the tubing shall be repaired with tape or a short length of tubing.

Where fittings are wrapped with polyethylene, the tubing may be cut to fit and slipped under the body of the fitting. The seams shall be made by bringing the edges of the polyethylene together over the top of the fitting, folding them over twice, and taping them. The polyethylene shall extend beyond the fitting a minimum of 1 foot.

5.17.B Protection of Bolts and Rods

Bolts shall be protected from corrosion by one of the following methods:

1. Wax tape
   - Wire brush and scrape the bolt free of dirt, loose coating, and loose rust.
   - Apply a film of wax tape primer making sure to cover the bolt completely. Press the primer to displace moisture and air.
   - Wrap the wax tape around the bolt with a 1 inch overlap. Mold the tape so there are no air pockets or voids under the tape. Press the lap seam to ensure it is sealed.
   - Apply plastic outer wrap.
2. Zinc anodes
   - Screw anode on the bolt end ensuring it is tight to the bolt.
3. Coated bolts
   - Install bolts per the manufacturer's recommendations taking care not to damage the coating.

All rods shall be protected from corrosion with either a coating, zinc end caps, wax tape, or by encasing them in 3-inch polyethylene tubing and securing with tape as above. Where the rods are in contact with concrete they shall be coated. See Detail Drawing A8-13.

5.17.C Insulating from Concrete

Areas of metal pipe and appurtenances which are to be in contact with concrete thrust blocks, bridging blocks, anchors or encasement shall be protected against corrosion with polyethylene tubing or other protection as approved by the Inspector.

5.17.D Holiday Testing and Detection (Jeeping) for Coated Pipe

Holiday testing on coated steel pipe will be performed both at the manufacturing facility and in the field just before pipe installation. Proper equipment and voltage levels recommended by the manufacturer for the specific coating and thickness being tested will be used. The equipment will be in proper working order, properly grounded and all manufacturer recommendations followed. Testing will be in accordance with *AWWA C209 Section 5.2* Required repairs shall be made in accordance with the manufacturer's recommendations.

5.17.E Bonding Joints

All 4 inch and larger ductile iron pipelines requiring cathodic protection shall be bonded at every joint and fitting (except at Insulating Joints). Coated copper wires or a bonding strap for cathodic protection shall be thermite welded to DIP at each joint and fitting, per Table 1 in Detail Drawing A8-1. The size of the wire and the weld shall be per the Approved Construction Plans, manufacturers' recommendations, and Detail Drawing A8-1 and A8-2. The following steps shall be taken to electrically bond DIP pipe joints:

- Remove any external coating on the pipe by lightly grinding the area to bright metal using an abrasive wheel grinder.
- Position the bonding wire or strap at the weld location.
- Complete the weld with the proper mold and weld charge size.
- Inspect and clean the weld connection.
- Protect the connection and exposed metal with a primerless handicap The Contractor shall furnish all material required for bonding. In certain circumstances straps may be required by Colorado Springs Utilities in place of wire to bond joints.
- Some DIP pipe is now manufactured with bonding straps attached. Bonding connection shall be done according to Manufacturer Specifications.

5.17.F Insulating Joint

Insulating joints shall be installed per the Approved Construction Plans, Section 2.6.H.4 of these *Water LESS*, and Detail Drawing A8-3. Special care shall be exercised during the installation of these joints to prevent electrical continuity across the joints.

The joints shall be tested for electrical continuity after installation. If the joint does not provide electrical isolation, it shall be rejected and will need to be repaired or replaced at the Contractor's expense.

5.17.G Galvanic Anodes

Anodes shall be high potential magnesium and shall be supplied and installed by the Contractor in conformance with Detail Drawing A8-2.

Anodes shall be inspected to ensure that bentonite material surrounds the anode. The cloth containing the anode and bentonite mixture shall be intact, and any torn anode bags shall be rejected. Anodes are to be kept dry until installed. The lead wire must be securely connected to the anode and should be inspected to ensure that it is not damaged. The anode should be placed as far from the pipe and other anodes as possible. Anodes should be backfilled with compacted native soil, not sand, pea gravel, or CLSM. Care should be exercised so that lead wires and connections are not damaged during backfill operations. Lead wires shall have sufficient slack to avoid strain. Wires shall be connected via a thermite weld per the manufacturer's recommendations. Copper sleeves shall be used for #10 AWG and smaller wires. Any exposed metal shall be coated or wrapped with Scotch Linerless Rubber Splicing Tape to seal out moisture and then coated with Scotch Super 33+ Vinyl Electrical tape to seal the rubber tape. See Section 4.4.P.2.

5.17.H Impressed Current Systems

Impressed current systems shall be installed in conformance with the Design Engineer's Drawings and Specifications. Anodes shall be inspected for material and size, length of lead wire, and end cap. Care should. exercised to avoid cracking or damaging anodes during installation and handling. Lead wires shall be carefully inspected to detect defects in insulation. Care should be taken to avoid damaging the insulation on the wire. Defects in insulation must be repaired or the anode rejected. Rectifiers shall be tested after installation for proper lead wire connection and function prior to the Inspector's approval.

5.17.I Test Stations

Cathodic Protection test stations shall be installed per Section 2.6.H.7, and Detail Drawings A8-4 through A8-8. Colorado Springs Utilities shall provide the test stations, and the Contractor shall install the test stations. Test stations shall be tested prior to final acceptance to ensure proper functioning. Lead wires shall be labeled to identify where they are connected.

5.18 Backfill and Compaction

Backfill and compaction shall meet the requirements as stated in the City of Colorado Springs Standard Specification Manual and approved addenda. The trench shall be backfilled to finished grade as shown on the Approved Construction Plans. No section of Water Main, Water Main appurtenance or Water Main Structure shall be backfilled until the Inspector has examined and approved that section of the installation.

Wet, soft, or frozen material, asphalt and concrete chunks, cinders, ashes, refuse, plant or organic material, boulders, rocks, or other deleterious substances shall not be used for backfill. If the excavated material is not suitable for backfill, as determined by the Inspector, suitable material shall be hauled in and utilized, and the rejected material hauled away and disposed.

No backfilling will be allowed in freezing weather except by permission of the Inspector. No additional backfill will be allowed over any frozen material already in the trench.

Water required for backfill and compaction operations may be furnished from a designated fire hydrant subject to permitting and installation requirements described in Section 5.7.

Backfill shall be consolidated and/or compacted by vibrating, tamping or a combination thereof, in accordance with City of Colorado Springs Standard Specifications Manual section 200 and to the satisfaction of Colorado Springs Utilities.

Compaction test frequency shall be in accordance with City of Colorado Springs Standard Specifications Manual section 200. Colorado Springs Utilities has the discretion to require additional compaction tests.

Satisfactory compaction reports shall be submitted to the Inspector prior to the completion of the Project. Railroad, airport and other Private or special situations will require investigation and research to determine specific requirements.

Compaction and testing of utility trench backfill will not be required if material meeting the CLSM Specification in Section 4.4.S is used. The Inspector may require flow fill where cross contamination or compaction issues exist.

The methods of compaction shall be sufficient to attain the required density in accordance with these *Water LESS*. Performance of the compacted trench shall be the responsibility of the Contractor and any failure, as defined by Colorado Springs Utilities, which occurs within 2 years following the completion of Construction shall be corrected at the expense of the Contractor.

The method of testing the compacted material shall be the responsibility of the Professional Engineer certifying the results. The Professional Engineer shall be responsible for the validity of all test results.

Fly ash or "Flash fill" materials used in Public ROWs or in off-site applications i.e., under Structures must be in accordance with Section 4.4.S.

5.18.A Systems Installed within City Right-Of-Way

In-place density testing shall be performed in accordance with the latest versions of the City of Colorado Springs Engineering Criteria Manual, Standard Specification and Subdivision Policy Manual. Prior to final acceptance of the utilities, the developer shall receive probationary acceptance of the right-of-way and the Utilities' Inspector shall perform a visual inspection of utility trenches. If settlement is observed, the Utilities' Inspector shall notify the City of potential trench failure. The Owner shall be responsible for correcting any compaction deficiencies as determined by the Utilities' Inspector and the City prior to receiving final acceptance. The Utilities' Inspector shall coordinate with the City to ensure that probationary acceptance and geotechnical documentation has been approved and recorded by the City.

5.18.B Systems installed outside of City Right-Of-Way:

Within areas outside of the City Right-Of-Way, including utility easements, railroad right-of-way, airport property, and other private property, or special situations; passing in-place density testing reports, in accordance with the latest versions of the LESS, shall be reviewed and sealed by a licensed Professional Engineer in the State of Colorado. Signed and sealed compaction reports shall be submitted to the Utilities' Inspector for utility trenches prior to preliminary acceptance. The Utilities Inspector will record the approved compaction reports in Utilities project files.

Prior to final acceptance, the Utilities' Inspector shall perform a visual inspection of utility trenches. If settlement is observed, the Utilities' Inspector shall notify the Owner of observed deficiencies. The Owner shall be responsible for correcting any compaction deficiencies as determined by the Utilities' Inspector prior to receiving final acceptance.

5.19 Hydrostatic Testing Disinfection Procedures

Hydrostatic testing shall be completed as directed by the CSFD and may be required on a case by case basis at the discretion of Colorado Springs Utilities. All hydrostatic testing on newly installed or repaired Potable Water pipeline and associated appurtenances shall be performed prior to disinfection activities unless otherwise arranged with onsite Colorado Springs Utilities personnel. Disinfection may be performed concurrently or prior to hydrostatic testing at the discretion of Colorado Springs Utilities.

Hydrostatic testing shall be performed by an independent Contractor who is responsible for providing any pumps, temporary piping, RP and associated appurtenances needed to carry Potable Water to the section of pipeline being pressure tested, disinfected, and flushed. The water source, pumps, piping and all equipment used for the purpose of hydrostatic testing shall be cleaned and disinfected using the swab method as defined in Section 5.20 before any connections are made to the Potable Water System.

Hydrostatic testing, disinfection discharges and flushing, and other associated discharges on Potable Water Mains and Systems shall be managed in accordance with the CDPHE *Low Risk Discharge Guidance for Discharges of Potable Water*. If an activity does not meet the requirements of the guidance, an alternative disposal method must be utilized.

5.20 Disinfection

All Water Main Extensions and Private Water Main Extensions shall be chlorinated in accordance with *ANSI/AWWA C651 Disinfecting Water Mains*. The chlorination method used for main disinfection shall be approved by Colorado Springs Utilities as outlined in this section.

It shall be the Inspector's responsibility to notify Colorado Springs Utilities, Laboratory Services Water Quality two business days in advance of the disinfection date. The Inspector, Contractor, and Water Quality personnel shall be present during all disinfection activities.

An acceptable bacteriological sample(s) result shall be verified prior to the line extension being placed in service or the installation of any service taps. If the Contractor fails to meet the following criteria or the Sanitary Requirements outlined in Section 5.13.C.1, the disinfection procedure may need to be repeated.

Colorado Springs Utilities will perform all flushing and sampling procedures to obtain passing bacteriological results. If representative passing results are not obtained after initial and/or follow-up recollect events, in conjunction with contractor efforts to clean pipes and/or appurtenances, Colorado Springs Utilities will inject the compromised infrastructure with an onsite generated chlorine solution. At this point, Colorado Springs Utilities will bill the contractor for personnel labor, time, and material for the injection event in accordance with Utilities Rules and Regulations.

If the injection event fails to mitigate the compromised infrastructure, the contractor will need to remove and replace the affected pipe and fittings and replace it with new pipe and fittings. Colorado Springs Utilities will charge the contractor for personnel labor, time and material for all successive flushes and sampling events following the injection event in accordance with Utilities Rules and Regulations.

5.20.A Water Mains 12 inch or smaller

The Contractor shall provide Calcium Hypochlorite granules with a 65 to 70 percent level of chlorine to be used for disinfection of Water Mains of 12 inch in diameter or less. Calcium Hypochlorite shall be NSF 60 approved and USEPA registered for use in Potable Water systems as specified in Section 4.6.D. Tablets shall not be used for disinfection. The granules shall be placed inside each joint of pipe as the pipe is installed in the trench. Common dosing rates to reach 150 mg/L per 20-foot stick of pipe is noted in Table 5-2. For special circumstances or alternate dosing, please contact Water Quality Assurance. Once the chlorine is placed in the pipe, the Contractor shall provide labor, materials, and an acceptable plan to transmit and contain water discharged during flushing.

Table 5-2: Common Dosing Rates to Reach 150 mg/L per 20 foot Stick of Pipe

Pipe Diameter	Ounces Needed	Common Unit
4	0.4	¾ Tbs
6	0.9	1 ½ Tbs
8	1.5	2 ½ Tbs
12	3.5	3/8 Cup

The main shall be filled with water at a rate to ensure that the water within the main will create a chlorine solution throughout the length of the pipe. The fill rate shall not exceed 1 foot/second. Precautions shall be taken to ensure that air pockets are eliminated.

Chlorinated water shall come into contact with the entirety of the pipe interior for a period of 18-24 hours, and shall maintain a minimum concentration of 50 mg/L at the end of the disinfection period.

5.20.B Water Mains Larger than 12 inch

Colorado Springs Utilities shall disinfect all pipelines larger than 12 inch provided that the Contractor shall excavate the tapping holes, pay for all required appurtenances and provide labor, material and an acceptable plan to transmit and contain water discharged during Flushing.

All disinfections shall be evaluated on a case-by-case basis and additional appurtenances may be required for chlorine injection and air relief at the expense of the Contactor.

Colorado Springs Utilities employs several different disinfection protocols for mains larger than 12 inch. Water Quality Assurance personnel will work with the Inspector and the Contractor to determine which method is most appropriate.

5.20.C Dewatering Requirement for Highly Chlorinated Flush Water Discharges.

Colorado Springs Utilities shall determine if the discharge can be made such that the chlorine will dissipate prior to reaching a predetermined Point of Compliance. All line disinfection discharges will be evaluated, planned, and approved by Colorado Springs Utilities prior to any activity. Discharge must be in accordance with any applicable CDPHE permits or guidance documents for discharges of Potable Water from the Potable Water Distribution System authorizing such dewatering discharges.

The pipeline shall be thoroughly flushed to remove the heavily chlorinated water and any sedimentation until water clarity and line chlorine residual have been achieved. Discharges of chlorinated water from blow-off assemblies or other appurtenances shall be contained or discharged in a manner approved by Colorado Springs Utilities.

De-chlorination Discharge Options:

- On-site containment, which is not connected to the storm sewer system or any surface waters
- Chemical de-chlorination treatment with approved Best Management Practices (BMP) placement and an acceptable discharge plan
- Tanker off-site for proper treatment and disposal
- Discharge to sanitary sewer, with prior approval from Colorado Springs Utilities

A Point of Compliance (POC) is typically located after the point of discharge (or de-chlorination) and prior to entering or converging with state waters. Construction Sites along roadways will generally have a POCs located upstream or before the discharge water enters a storm drain.

De-chlorination treatment at the point of discharge may be required to meet the chlorine reduction requirements. Water discharge at the POC shall be free of known pollutants such as; Total Chlorine Residual (TCR), sedimentation or Total Suspended Solids (TSS), oil and grease, Construction debris, etc. Disinfection discharges to surface waters may require additional sampling, testing, and reporting per CDPHE water discharge guidance or permits, and/or any applicable Colorado Springs Utilities' supplementing procedures or Best Management Practices (BMPs). Consult and coordinate with Colorado Springs Utilities, Laboratory Services Water Quality for sampling and reporting.

Discharge volumes and permit requirements, if applicable, may generate additional monitoring parameters as determined by CDPHE and Colorado Springs Utilities. BMPs shall be in place to minimize erosion and to prohibit pollutants from entering State waters.

Chlorine is considered a pollutant and shall not be introduced into any waters of the state. Any discharge to waters of the state is not permitted to have a TCR.

Sediment is considered a pollutant. TSS analysis measures the amount of particulate suspended solids in discharged waters. This test will be performed for discharges exceeding permit volume maximums or as determined by Colorado Springs Utilities.

All water discharges will be monitored for pH. A water discharge with a pH reading of less than 6.5 SU or more than 9.0 SU is considered a pollutant and shall not be introduced into any waters of the state.

A minimum of 3.0 ft/sec flushing velocity is required throughout the duration of the entire flush. Mainline Flushing consists of displacing approximately 3 times the volume of water contained in the new main or until highly chlorinated water and sediment has been discharged and clarity has been achieved. Contractors shall supply a temporary retention pond or tanker truck sized to hold 6 times the volume of water contained in the new main. Other methodologies may be considered by Colorado Springs Utilities on a case by case basis. All Potable Water Mains which have been successfully disinfected and bacteriological requirements achieved shall be placed in service immediately.

Potable Water Mains isolated for more than 3 days shall be evaluated and a determination will be made by Colorado Springs Utilities as to whether re-disinfection is required.

5.21 Water Service Lines

5.21.A Acceptance and Release for Taps

A new Water Main shall be accepted by Colorado Springs Utilities and released for taps when:

- The Water Main and all appurtenances have been installed to the satisfaction of the Inspector and all pertinent notes and measurements have been made.
- Disinfection has been completed and the main has been flushed and charged.

5.21.B Application for Taps

Water Service permit fees must be paid before any water taps will be made. The size of the service taps shall be in accordance with the Approved Construction Plans if applicable. Development charges shall be paid prior to any User connection to a water tap.

Any relocation, upsizing or downsizing of water taps and repairs to existing Water Service Lines are subject to a Water Service permit fee. Repairs to existing Water Service Lines between the Corporation Stop and Curb Stop shall be made by Colorado Springs Utilities.

In the event of a risk to Public health and safety, including non-compliant water taps, Colorado Springs Utilities will repair and assess billable charges to the Contractor.

Application, payment, and scheduling shall be conducted at the Utilities Development Services Office, 2880 International Circle, Colorado Springs, CO 80910. Permits for taps shall only be issued to a licensed Excavator or Master Plumber as defined in the *City Code § 12.4.201*, as amended. Tapping permits must be applied and paid for at least 72 hours prior to tapping.

5.21.C Responsibility for Tapping Water Mains

All service taps on Water Mains within the Colorado Springs Utilities' Water Distribution System shall be tapped per the following (Reference *Utilities Rules and Regulations -Water Section– 46*):

- Colorado Springs Utilities shall supply ¾ inch through 2 inch corporation taps and Curb Stops (not including the stop box), and shall perform the tap for all existing Colorado Springs Utilities-owned and maintained Water Distribution Mains.
- The Contractor shall be responsible for all costs involving the installation of the tap on the main, supplying materials, equipment, and appurtenances for the installation of service taps (3/4 inch through 2 inch) on new Water Distribution Mains currently being constructed and not out of warranty.
- The Contractor shall be responsible for all labor and costs, including: materials, equipment and appurtenances, associated with the installation of water taps on all Private Water Mains.
- Colorado Springs Utilities shall install all Tap Connections 4 inches and greater, per the Water Rules and Regulations unless otherwise approved by Colorado Springs Utilities.

5.21.D Excavation for Water Taps

The Contractor shall contact the Colorado Springs Utilities, Inspector's Office, LYSC, 1521 Hancock Expressway, Colorado Springs, CO 80903 2 working days prior to excavation. No service taps shall be made unless property corners are clearly marked so measurements of tap and stop box locations can be made at the time of tapping. Excavation is the responsibility of the Contractor and shall be done in accordance the following:

- The Contractor is responsible to provide safe access to and a safe excavation for Colorado Springs Utilities employees to complete the requested work. As dictated by OSHA (29CFR1926) and/or any other Authority Having Jurisdiction, the Contractor shall provide protection for employees required to work in excavations/trenches by the use of shielding, shoring, or sloping. If the depth exceeds four (4) feet, an access ladder, ramp, or stairs must be provided.
- Barricading of tapping excavations is the responsibility of the Contractor and shall be in accordance with requirements set forth by the Authority Having Jurisdiction. For work in Colorado Springs, refer to the Barricading and Detour Manual of the City of Colorado Springs. Barricading shall be in accordance with Construction, installation, and repair of rights-of-way openings for sub-surface utilities for work within El Paso County and in accordance with Colorado State Highway Department of Transportation standards and regulations for work within state highway rights-of-way.
- Backfilling and compaction of tapping excavations are the responsibility of the Contractor and shall meet the requirements of Section 5.18.

5.21.E Tapping Procedures for Ductile Iron and PVC Pipe

Taps on the Colorado Springs Utilities' system shall be accomplished in a neat and professional manner. An Inspector shall be present at all times during the tapping process. The tap is subject to approval by the Inspector.

Type K copper service taps for PVC pipe shall be installed per *AWWA Manual M23 – PVC Pipe Design and Installation – Chapter 9* and the *Unibell Tapping Guide for PVC Pressure Pipe*. Type K copper service taps for DIP pipe shall be installed per *AWWA Manual M41 Ductile-Iron Pipe and Fittings* and *DIPRA's Installation Guide for Ductile Iron Pipe*. Reference Section 6.7.B of these *Water LESS* for HDPE pipe tapping requirements. Tapping procedures shall comply with the following requirements:

- PVC and DIP pipe shall be direct tapped for ¾ inch & 1 inch Water Service Lines. Direct taps shall be at a 45 degree angle from the vertical.
- PVC and DIP pipe shall be saddle tapped for 1-1/2 inch and 2 inch Water Service Lines. Saddle taps shall be at a 90 degree angle from the vertical.
- PVC direct wet taps shall be made between the recommended temperature limits of 32°F (0°C) to 90°F (32°C).
- Only 6 inch through 16 inch PVC pipe can be direct tapped. PVC Water mains greater than 16 inches in diameter shall be saddle tapped.
- Saddles taps shall be installed according to pipe manufacturer's recommendations (Do not over tighten).
- Saddle taps and direct taps shall be cathodically protected per Detail Drawing A8-10.
- Direct and Saddle Tap Placement
  - Tap no closer than 24 inches from both the back of the bell and the spigot line.
  - Stagger multiple taps and keep them at least 18 inches apart lengthwise or 36 inches on the same side of the pipe.
  - Do not tap discolored PVC pipe.

Table 5-3: Water Tapping Inspection Appointment Return Trip Criteria

Length of time to appointment date:	3 weeks to 4 business days prior to scheduled appointment date	1 business day prior to scheduled appointment date or scheduled appointment date	Re-Scheduled appointment date
Fee charged:	Cancel anytime No fee charged One Free Return trip fee not used up	Cancel anytime = Use up one free return trip, Next cancellation will be charged	Cancel anytime = Return trip fee applies per *Utilities Rules and Regulations*

Re-Inspection: If the water tap fails to pass inspection, the Inspector will immediately notify the Contractor of the deficiencies needing correction. All deficiencies must be corrected/remedied before a re-inspection may be requested and scheduled. Colorado Springs Utilities will schedule the re-inspection with the Contractor as appropriate.

If the Contractor is suspected to have performed an illegal, unapproved water tap into the Colorado Springs Utilities' system or any Private Water System (not behind a Master Meter connection) the tap shall be investigated and the Contractor may be fined in accordance with *City Code §1.1.201 & 12.4.607* and *Utilities' Rules and Regulations*.

5.21.F Tapping Asbestos Pipe

When tapping Asbestos water pipe for service connections, the Water Main shall be under pressure and the material shall be kept wet at all times. The pipe shall be tapped using a stainless steel repair clamp with a brass bushing specific to the tap size. The tap shall be made through the Corporation Stop according to the saddle tapping procedure.

To minimize the fouling of valves, pressure reducing valves, water meters and other appurtenances with Asbestos chips and the unnecessary addition of Asbestos to drinking water, provisions shall be made for downstream Flushing including the use of tapping equipment with positive purge or blow-off features. All Asbestos removal must be in accordance with Section 5.10.A.

The appropriate safety equipment shall be utilized at all times when tapping Asbestos pipe.

5.21.G New Water Service Lines

5.21.G.1 Inspection

All Water Service Lines (fire, Potable and Nonpotable including irrigation) shall be inspected by Colorado Springs Utilities. The inspection shall include the Water Service Line from the corporation to the Curb Stop, from the Curb Stop to the Structure, an inspection of the meter installation including the Backflow prevention assembly, and any Water Services that extend underground from one Structure to another.

Residential Customers requiring inspection of Water Service Lines shall contact Colorado Springs Utilities Inspections (See Scheduling Service Line Inspections in Section 1.14) before 9:00am the day the inspection is required. A reinspection/return trip fee may be assessed per *URRs Section 33*.

Water Service Line material and size changes shall be made per Section 2.7.C.

5.21.G.2 Installation

When direct tapping the Water Main, an expansion loop must be left in the Water Service Line to allow for expansion and contraction of ¾ inch and 1 inch copper services, see Detail Drawing B1-1. If an existing tap has been abandoned in place per Section 2.7.H it shall not be used for the Water Service Line, a new tap shall be made.

Copper Water Service Lines shall use flared or compression joints between the main and the Curb Stop, no sweat, or welded joints shall be allowed. Flared copper joints are preferred. Between the stop box and Structure, flared joints or silver wire or rods for brazing joints with the consistency of a dull grey finish in color may be used conforming to *ASTM B 32. (IPC 605)* No joints shall be placed under a vertical foundation wall or footer.

Water Service Lines 4 inches and greater must be installed in accordance with Sections 5.12 thru 5.19 and all other applicable Water Service Line installation Standards contained in this Section.

5.21.G.3 Crossing Other Utilities

Utility crossings shall be constructed per the Approved Construction Plans and Section 2.7.G.2.

Where a casing pipe is required, the ends shall be sealed to prevent the infiltration of debris and Groundwater. Refer to Section 2.7.G.2 for the casing pipe requirements.

Where the Water Service Line crosses another utility and less than 18 inches of clearance is maintained, the Water Service Line shall be backfilled with well graded sand or flow fill at the discretion of the Inspector.

5.21.G.4 Curb Stop and Stop Box

Stop boxes shall be located per the Approved Construction Plans and Section 2.7.F.4. The stop box shall be centered over the Curb Stop and shall be plumb. The Contractor shall "tag" stop box lids with service addresses where multiple boxes are located in close proximity to one another using permanently affixed (bolted or screwed to lid) brass tags. (Reference Detail Drawing B2-4)

5.21.H Fire Service Lines 2 Inches and Smaller

- All Fire Service Lines shall meet the same requirements as Water Service Lines for material and installation Standards. Fire Service Lines shall not be tapped from a Non Potable Water Main.

- Single-Family-Residential Water Service Lines for fire suppression installations must have plans approved by the Colorado Springs Fire Department and shall be constructed of a minimum of 1 inch copper or 1 ½ inch HDPE.
- Hydrostatic testing of Fire Service Lines shall meet the requirements of *NFPA-13, 13D, 13R* and shall be witnessed by the Colorado Springs Fire Department.

5.21.I Warranty

The Contractor shall be responsible for the Curb Stop and stop box ends until 2 years after closing of the property and the final approval by the Inspector. After the warranty time period has ended, Colorado Springs Utilities will assume responsibility for repair and maintenance of the Curb Stop and stop box.

5.21.J Repair or Replacement of Water Service Lines

Water Service Line repairs and replacements shall be made with Colorado Springs Utilities approved materials in accordance with these *Water LESS*. All repairs and replacements require a Water Service Line Permit and shall be inspected by Colorado Springs Utilities. The Contractor performing the repair shall be on site and available to the responding Colorado Springs Utilities Inspector. Repair clamps are not permitted on Water Service Line Repairs. Mechanical fittings may be used on repairs with the Inspector's approval. The Inspector may require a Utility Service Plan to be submitted to Colorado Springs Utilities for Commercial applications at their discretion, see CHAPTER 3 Submittal Requirements for Utility Service Plan requirements.

5.21.J.1 Galvanized Lines

Where repairing galvanized Water Service Lines approved materials specific for galvanized services shall be used.

Where an existing Public Water Main is being replaced and the Water Service Lines are galvanized, Colorado Springs Utilities shall replace the Water Service Lines with type "K" copper or HDPE from the Water Main to the Curb Stop located on or near the property line and the Curb Stop and stop box. Where an existing Private Water Main is being replaced, the galvanized Water Service Lines shall be replaced as described above by the Owner of the Private Water Main.

Where the Water Service Line is galvanized the property Owner shall be responsible for replacing the Water Service Line with approved materials from the Curb Stop to the water meter and/or the Premises to be served.

5.21.J.2 Repair Due to Leaks

a) Colorado Springs Utilities Responsibilities

Colorado Springs Utilities will maintain that portion of the property owner's Water Service Line in the Right-of-Way or Public utility Easement between the Water Main and the Curb Stop, if the Curb Stop is located on or near the Right-of-Way or Public utility Easement line, in accordance with *City Code § 12.4.410*. Colorado Springs Utilities maintenance will include repairs with backfill and restoration of property, except when leaks and/or damage are caused by persons other than Colorado Springs Utilities

employees. This does not include any Curb Stops or valves on Private Water Mains or Service Lines which are the responsibility of the property owner.

Colorado Springs Utilities will replace all Curb Stops that are damaged by Colorado Springs Utilities during any maintenance or installation work. This includes any stop box and/or Curb Stop that is damaged during the exchange of a meter or a shut off by Colorado Springs Utilities.

Colorado Springs Utilities will raise or lower all stop boxes as needed or requested for existing Colorado Springs Utilities' Customers.

b) Property Owner's Responsibilities

The property Owner shall maintain that portion of the Water Service Line outside of the Right-of-Way or Public utility Easement between the Curb Stop and the property, building, establishment, or Premises to be served, if the Curb Stop is located on or near the Right-of-Way or Public utility Easement line, in accordance with *City Code § 12.4.410*. It shall be the responsibility of the property Owner to initiate repairs on any and all service line leaks within the Premises to prevent the waste of water per *City Code § 12.4.410*.

The property Owner is responsible for all damages that may occur to other property, real or personal, including property of the City that were caused by failure to repair and maintain the Water Service Line.

The property Owner shall replace or repair any Curb Stop or stop box that is damaged as a result of their or their Contractor's operation and maintenance of the Water Service Line from the Curb Stop to and within the property being served.

5.21.K Abandonment or Removal of Existing Corporation Stops

See Section 2.7.H.

5.21.L Demolition or Remodel of Property

See Section 2.7.I.

5.21.M Tracer Wire

Colorado State Regulations require all Underground Facilities to be electronically locatable. When a service line is installed from the property line valve to the building, Colorado Springs Utilities requires a tracer wire to be used to locate the pipe. The wire shall be taped to the top of the pipe every 2 feet and extended to the Structure for the purpose of locating the service. See Detail Drawing B1-4.

For Water Service Lines, tracer wire shall be brought above ground and wrapped around the Wastewater Service Line Clean-Outs. Alternatively, Water Service Line tracer wire may be connected to a test station as described for Water Mains in Section 5.16.

Tracer wire should be as continuous as possible. Where splicing or connections are necessary, tracer wire must be connected following an approved, electrically continuous, watertight method. See Section 4.4.P.1. All exposed tracer wire must be

made watertight by taping with Scotch Linerless Rubber Splicing Tape to seal out moisture and then sealing the rubber tape with Scotch Super 33+ Vinyl Electrical tape. See Section 4.4.P.3.
See Section 5.16 for locating requirements.

5.21.N Pressure Reducing Valve

The Contractor shall provide and install the pressure reducing valve per Section 2.7.K and Detail Drawing B4-1 through B4-8 of these *Water LESS*.

Where an existing Water Service, meter loop or pressure reducing valve are repaired or replaced, the Owner of the property shall be responsible to ensure that the pressure reducing valve be located in front of the proposed meter location.

5.21.O Water Meters

5.21.O.1 Installation

The Contractor shall be responsible for installing the meter loop. Colorado Springs Utilities shall install the water meter.

5.21.O.2 AMI

All water meters will be AMI (Advanced Metering Infrastructure) compatible with the current Colorado Springs Utilities' operating system. For water meter installations inside the building, the Contractor shall provide and install a four or five conductor wire interconnecting cable between the meter and the remote reader as shown on Detail Drawings B4-1 through B4-8 . The cable used shall be four or five conductor, solid No. 18-22 gauge wire. The cable cannot be spliced and a minimum of 24 inches of extra cable must be left at the meter loop and at the proposed remote reader location for connection by Colorado Springs Utilities. An 8 inch by 8 inch flat surface shall be provided for installation of the remote reader. A 12 inch clearance shall be maintained from any external wall protrusions (i.e., roof leader, chimney, antennae etc.) and the remote read. The installed wire shall be tested for electrical continuity at the time of installation. If the cable is to be installed in concrete or masonry walls, electrical conduit must be installed in advance of the cable installation.

5.21.O.3 Water Meter Pits and Vaults

The Contractor shall be responsible for installing the meter Pit or Vault. Meter Pits may be used for ¾ inch and 1 inch Water Service Lines only. Water Service Lines 1 ½ inches and greater require installation of a meter Vault.

The Meter Pit or Vault shall be located on or near the property line. If a problem arises at this location, prior to or during installation, the location of the meter Pit or Vault shall be changed at the discretion of the Inspector. Placement of the Pit or Vault must comply with Section 5.15 in regards to Groundwater or stormwater.

Grade rings shall be used to raise the Meter Pit or Vault cover to match the proposed elevation or slope in a driveway or landscape area application. A

12-inch wide metal ladder shall be installed securely to the wall of Vaults. No wooden ladders will be accepted.

There shall be no form of a reducer inside the Meter Vault and/or Meter Pit. All pipes coming into any Meter Vault and/or Meter Pit 3 inch or larger shall be flange pipe only and shall be reverse anchored to the outside of the Meter Vault or Pit. Refer to Detail Drawings B3-1 through B3-5.

a) Single-Family-Residential Meter Pit

The Water Service Line shall be constructed of type K copper from the Curb Stop to the outside Meter Pit. Transition to HDPE may be made with an approved coupling on the outlet side of the meter inside the Meter Pit (3/4 inch and 1 inch only). See Detail Drawing B4-2.

b) Non Single-Family-Residential Meter Pit

The Water Service Line shall be constructed of type K copper or HDPE from the Curb Stop to the outside Meter Pit. If HDPE is used, transition to type K copper with an approved coupling must be made inside the Meter Pit. Type K copper must continue through the outside Meter Pit and through the Backflow Prevention Assembly. A transition to HDPE is allowed on the outlet side of the Backflow Prevention Assembly within the outside enclosure. See Detail Drawings B4-2A, B4-9 and B4-10.

No mechanical restrained joint pipe shall be installed in the Water Service Line closer than 4 feet from either side of the Meter Vault. Neither plastic pipe nor plastic fittings shall be used inside the meter Vault or closer than 5 feet from either side of the Meter Vault. See Detail Drawings B3-1 through B3-5. Any Vault openings shall be grouted with non-shrink grout.

After the initial warranty period expires, Meter Pits shall be maintained by the property Owner in compliance with the requirements of the Colorado Springs Utilities.

5.21.P Backflow Prevention

Approved Backflow Prevention Assemblies and Methods shall be installed per the Approved Construction Plan and Section 2.7.N and Detail Drawings B4-1 through B4-22 and B1-3 through B1-10 of these *Water LESS*.

5.21.P.1 Installation

All installations shall conform to the design requirements specified in Section 2.7.N. Additional insulation may not be applied directly to the Approved Backflow Prevention Assembly or Method. Use of temporary mechanical joints or quick connection type fittings is not permitted unless otherwise approved with these LESS. Whenever additional support is required for an Approved Backflow Prevention Assembly or Method, the support must be independent of all plumbing and piping systems and must not interfere with the operation or maintenance of the assembly.

Requirements for the Reduced Pressure Principle Backflow Prevention Assemblies (RP)

- An RP is only approved in the horizontal orientation unless certified for vertical use by its listing with the *Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California (USC – FCCCHR)*
- The installation height of the RP shall be measured vertically from the lowest point of the relief valve to the prevailing grade and shall conform to all design requirements listed in Section 2.7.N. Particular attention must be given to the RP to ensure a proper Air Gap is maintained at the relief valve. An Air Gap shall be maintained per Detail Drawings B4-1 through B4-22 and B1-3 through B1-10

5.21.P.2 Inspection and Testing Requirements

Only a Certified Cross-Connection Control Technician, certified in accordance with the requirements of the CDPHE, may test an Approved Backflow Prevention Assembly. The following inspection and testing requirements and schedule shall be applied to all Approved Backflow Prevention Assemblies and Methods:

- Colorado Springs Utilities shall have final approval authority for all Approved Backflow Prevention Assemblies and Methods.
- Installation Inspection and Testing: All Approved Backflow Prevention Assemblies and Methods must be inspected by Colorado Springs Utilities after installation. All Approved Backflow Prevention Assemblies shall be tested by the applicant within five (5) days of installation and records of the test results shall be submitted to Colorado Springs Utilities' Backflow prevention program within five (5) days of the test or inspection. If the test is not completed and/or records of the test are not submitted to Colorado Springs Utilities within the timeframe listed above or failed test results are submitted, Water Service to the Premises shall be suspended until passing test results are provided.
- Testing: All Approved Backflow Prevention Assemblies shall be tested upon installation and annually thereafter.
- Inspection: All Approved Backflow Prevention Methods shall be inspected upon installation and annually thereafter by Colorado Springs Utilities.

5.22 Pipe Line Markers

Utility line markers are to be used on all cross-country Water Mains and on Water Mains where development has not yet been established to locate the existing/proposed Water Main. Marker posts are to be placed at valve locations and horizontal pipe deflections or as designated by the Inspector. Spacing for marker posts shall be a maximum of 250 feet. Line markers are to be installed with Colorado Springs Utilities' decal and telephone number.

5.23 Surface Restoration and Maintenance

5.23.A Cleanup

Upon completion of Construction, all debris, excess materials, temporary Structures, and equipment shall be removed from the Construction Site. The Site shall be cleaned and restored to the satisfaction of the Authority Having Jurisdiction. Disturbed areas shall be seeded or otherwise protected to control erosion as specified by the Authority

Having Jurisdiction. Seeded areas will be maintained to control noxious weeds until acceptable stabilization is achieved, as determined by Colorado Springs Utilities.

5.23.B Surfaced Areas

The Contractor shall restore all pavement, sidewalks, curbing, gutters, or other surface Structures removed or disturbed as part of the work to a condition meeting the standards of the Authority Having Jurisdiction, and shall furnish all incidental labor and material.

All streets shall be restored in accordance with the regulations and requirements of the Authority Having Jurisdiction over the street, roadway, or Right-of-Way.

No permanent pavement shall be restored until, in the opinion of Colorado Springs Utilities or the Authority Having Jurisdiction, the condition of backfill is capable of properly support the pavement. See Section 5.18 of these *Water LESS* for backfill and compaction of backfill.

For areas of Construction in and around City Parks and trails, see protection requirements in Park Standard Specifications.

5.23.B.1 Un-surfaced Areas

The Owner/Developer shall be responsible to provide restoration and landscaping adequate to prevent erosion caused by surface runoff. Landscaping and restoration Construction shall be designed in such a manner that minimal future maintenance will be required, and maintained until acceptable stabilization is achieved, as determined by Colorado Springs Utilities.

Access drives shall be constructed per the Approved Construction Plans, see Detail Drawing A3-11 and Section 2.6.F.3 of these *Water LESS*.

5.23.B.2 Damaged Surfaces and Property

If any pavement, street, shrubbery, sod, rock, fences, poles or other property and surface Structures have been damaged, removed or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the Authority Having Jurisdiction or the specific directions of Colorado Springs Utilities, or through failure to employ usual and reasonable safeguards, such property and surface Structures shall be replaced or repaired, to the original condition, at the expense of the Contractor.

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CHAPTER 6

High Density Polyethylene Pipe and Trenchless Technologies

6.1 General

The purpose of Chapter 6 is to provide the criteria to be used when designing and constructing the Water System where High Density Polyethylene Pipe (HDPE) and/or Trenchless Technologies will be utilized. All Construction Plans for HDPE and Trenchless Technologies shall be in accordance with criteria specified in these *Water LESS*. Additional information regarding HDPE and Trenchless Technologies design and Construction may be found in *AWWA Manual M55, PE Pipe Design and Installation, and the Plastics Pipe Institute (PPI), www.plasticpipe.org*.

6.2 HDPE Water Main Planning

This section covers the requirements for DIPS DR9 PE4710 HDPE piping for Potable Water Distribution and Transmission Mains. HDPE pipe is typically used where directional drilling is needed for placement of Water Distribution, or Transmission Mains with no Water Service connections. HDPE may be required at the discretion of Colorado Springs Utilities where the Water Main will be constructed:

- in boring applications,
- in areas of high pressure (greater than 180 psi and less than 200 psi. Where pressure may exceed 200 psi, use of HDPE will be reviewed on a case by case basis)
- in highly corrosive soils,
- in Traditional Neighborhood Development,
- and in areas with known soil movement.

6.2.A HDPE Planning

Planning and responsibility of a HDPE Water Main System Extension shall be in accordance with Section 2.5. It is highly recommended that when a HDPE Water Main is being proposed, the Design Engineer and Contractor be experienced with HDPE to execute the planning, design, and Construction of the Project, ensuring that a quality Water System Extension is obtained. Geotechnical research is required for Construction of HDPE Water Mains in open cut or directional drilling applications. See Trenchless Technology Applications beginning with Section 6.8.

6.2.B Sizing of HDPE Water Mains

When sizing a HDPE Water Main, the Sizing of Water Mains/Hydraulic Analysis and Fire Flow Requirements in Section 2.5.A will apply. Upsizing the proposed Water Main may be required due to the smaller internal diameter of DR9 HDPE pipe. HDPE Water Distribution Mains shall be a minimum of 8 inch DIPS in diameter.

6.2.C HDPE Connection Requirements

When designing HDPE Water Mains, attention must be paid to the connections made to the existing Colorado Springs Utilities Water Distribution System. All fitting assemblies throughout the Project shall be detailed on the Construction Plan.

HDPE connections to an existing PVC or DIP Water Main shall be accomplished in accordance with Section 2.6.C of these *Water LESS* utilizing approved mechanical joint materials and fittings, in nominal sizes. Design and Construction for connections 16” and larger will be reviewed on a case by case basis. The Design

Engineer must specify the method of connection to the Water Distribution System on the Construction Plans. For approved connection configurations, see Detail Drawings A10-1 through A10-9. See Section 2.6.C Connection Requirements and Section 5.10 Water Main Connections to Colorado Springs Utilities System, for additional connection requirements for Water Mains.

6.3 HDPE Site/Horizontal Design Criteria

When designing a HDPE system, the Design Engineer shall allow enough room or footprint for equipment and assembly of the HDPE pipe and all appurtenances.

6.3.A HDPE System Materials

HDPE expansion and contraction must be accounted for in the design and Construction of the Water System. HDPE materials will expand and contract until placed in the trench and stabilized with ambient ground temperatures and constant water pressure.

HDPE piping shall not be installed in soils where contamination incompatible with HDPE exists.

6.3.A.1 Expansion and Contraction

The Design Engineer shall use the coefficients of linear thermal expansion/contraction in Table 6-1 for calculations unless specific documentation is submitted and approved for a project.

Table 6-1: Coefficients of Linear Thermal Expansion/Contraction

Piping Material (Plastic Pipe Pressure Grades Identified by Parenthesis) (1)	Coefficient of Linear Thermal Expansion, ASTM D696 (in/in x°F)	Resultant Pipe Expansion (inches/100 feet x 10°F)
Steel	6.7×10^{-6}	.08
Cast Iron	5.9×10^{-6}	.07
Copper	9.3×10^{-6}	.11
PE, Medium Density (PE 2406)	9.0×10^{-5}	1.10
PE, High Density (PE 3408, 4710)	9.0×10^{-5}	1.10
PEX (PEX 0006)	9.0×10^{-5}	1.20
PVC, 12454 & 12364	3.0×10^{-5}	.36
PVC, Unmodified (PVC 1120 & 1220)	3.5×10^{-5}	.42

For calculation of expansion/contraction due to pressurizing the pipe, the Design Engineer shall use a Poisson Ratio of 0.45 as recommended by the *Plastics Pipe Institute Handbook of Polyethylene Pipe.*

6.3.A.2 Pressure Requirements

Colorado Springs Utilities has established minimum design safety factors for system piping in Table 2-2. All HDPE pipes shall conform to the material Specifications, and shall be installed and tested in accordance with the current version of ANSI/AWWA Standards HDPE pipe.

6.3.A.3 Polyethylene HDPE Pipe

For all information regarding approved HDPE pipe and materials see the Section 4.4.B.6 Approved Materials.

6.3.B Concrete Reverse Anchors for HDPE

When HDPE piping is connected to unrestrained mechanical couplings or bell and spigot joints, thermal expansion/contraction and the Poisson effect can cause pullout of the HDPE pipe from PVC or DIP joints in the transition area.

To prevent this pullout, protection shall be provided by installing a Concrete Reverse Anchor (CRA) with a wall anchor on the HDPE main at the following locations:

- At the transition to PVC and DIP slip joint pipe
- Fire hydrant laterals greater than 20 feet in length (see Section 6.3.C)
- Dead ends
- The upstream side of in-line valves

See Detail Drawings A10-1 through A10-9 for placement details. The Design Engineer shall show the method of restraint and the location and size of CRA on the Construction Plans. CRAs shall be designed in accordance with Section 2.6.F.7 Concrete Thrust Reaction Blocks, Concrete Reverse Anchors and Mechanical Joint Restraints of this *Water LESS* and Detail Drawing A4-8, also see *AWWA Manual M55* for more information regarding pullout prevention. CRAs shall be poured and cured prior to thrust forces being realized at the joint.

Where the HDPE pipe slope is 10 % or greater, a CRA with a wall anchor fitting is required within 10 feet of the Fitting before the top of the slope and 10 feet from the fitting after the bottom of the slope.

6.3.C HDPE Fire Hydrant Lateral Criteria

Design and Construction of fire hydrants shall be in accordance with Sections 2.6.F.8 and 5.13.D.3 of these *Water LESS* except for the following:

Connections to HDPE mains for Fire Hydrant Laterals shall be accomplished with a cut in tee, valves, and wall anchor. The hydrant lateral may be constructed of approved Water Main pipe material with the following requirements:

- When the hydrant lateral pipe is constructed of HDPE pipe, a minimum nominal diameter of 8 inch DIPS DR9 PE4710 HDPE pipe must be utilized with an 8 inch hydrant valve.
- When the hydrant lateral is greater than 20 feet in length a CRA with wall anchors will be required, a minimum of 5 feet and maximum 10 feet from the hydrant shoe.
- An 8 inch by 6 inch DR9 HDPE reducer with a DR9 HDPE 6 inch MJ Adaptor shall be fused onto the HDPE hydrant lateral so that the hydrant can be bolted onto the lateral with usual hydrant placement, blocking and restraints, as illustrated in Detail Drawing A10-9.

6.3.D Bends and Deflection

HDPE pipe may be cold field bent without affecting the working pressure rating of the pipe. The minimum cold bend radius for DR9 HDPE pipe installed in an open cut trench is 20 times the pipe OD. When a fitting or flange is present or is to be installed near or in the radius then the minimum radius is 100 times the pipe OD for a distance of 5 times the pipe diameter on either side of the fitting location. Due to the flexibility of HDPE pipe, actual manufactured pipe bends may not be needed in some situations. If a radius is less than the minimum allowable bending radius for HDPE pipe, then a standard pipeline fabricated bend 22-1/2° or 45° bend is required. DIP material bends can also be used with HDPE pipe and HDPE MJ adapter fittings.

6.3.E Blow Offs

All temporary dead-ends on new HDPE mains will be reviewed on a case by case basis.

6.3.F Vaults

Transition from HDPE to steel or ductile iron pipe shall be made a minimum of 10 feet from either side of the Vault. Piping and fittings in the Vault shall not be constructed of HDPE.

6.4 HDPE Vertical Design

HDPE Water Main System plan and profile Construction Plan criteria information follows in this section. This section is to be read in conjunction and applied with CHAPTER 2 Development and Design of Water Systems of this *Water LESS*.

6.4.A Plan and Profile Requirements and Depth of Bury

All HDPE Water Mains and Service Lines greater than 6 inch shall have both plan and profiles submitted as part of the Water Construction Plan set. In addition, all HDPE Construction Plans will be in compliance with Section 2.6.G.1 Depth of Bury of these *Water LESS*.

Per *AWWA M-55* Maximum burial depth for DR9 HDPE pipes requiring no calculations is 25 feet. For depths greater than 25 feet refer to *AWWA M55 or PPI* for design calculations that must be submitted for review by Colorado Springs Utilities.

6.4.B Crossings

This section shall be read in conjunction with Section 2.6.G.

6.4.B.1 Utilities

When crossing another utility or service line, minimum vertical separation is required to be maintained, refer to Sections 2.6.F and 2.6.G. In the event that a water lowering may be required to meet the vertical separation criteria the lowering can be accomplished with a bore or with HDPE fittings fused in place.

Where the Water Main crosses a Wastewater Main, Nonpotable Water Main, or Storm Sewer and the vertical separation criteria cannot be met the Water Main shall be constructed of HDPE with no fittings located within 9 feet of the centerline of the crossing.

Where an HDPE Water Main crosses under another utility 30 inches or greater in size, the Water Main may need to be engineered for a boring application or another Construction alternative.

Generally, a casing is not used with a HDPE lowering. However, if the HDPE pipe is to be installed in a casing pipe, care must be taken to ensure that the HDPE pipe entering and exiting a rigid (non-PE) casing is not subjected to shear or bending loads.

If the HDPE Water Main crosses over or under another utility infrastructure, bridging and anchoring of the upper utility infrastructure may be required. Refer to Section 2.6.G and Detail Drawing A7-5.

6.4.B.2 Drainageways

When crossing under any drainage channel the HDPE Water Main shall be designed as a Trenchless application with a minimum 7 foot separation from the existing or proposed channel flow line, whichever is greater, to the top of the HDPE pipe.

6.4.B.3 Bridges

Use of HDPE on a bridge or an aerial crossing is not allowed.

6.4.B.4 Major Roadways and Railways

Installation of HDPE Water Mains across Rights-of-Way or Easements, such as major roadways, railroads, irrigation channels etc. may require casing pipes or a Trenchless application as determined by Colorado Springs Utilities and the agency granting permission to cross. The type of casing material and its properties or the boring design shall be reviewed by the agency granting permission to cross with the approval of Colorado Springs Utilities. In the absence of casing Specifications refer to Detail Drawing A7-3 and A7-4 for design and Construction of the casing.

6.4.B.5 Traffic Calming Devices, Medians and Above-Ground Structures

Colorado Springs Utilities shall review and approve any plans where the existing or proposed HDPE Water Main crosses traffic calming devices such as roundabouts, Refer to Section 2.6.G.6.

Generally, when HDPE is used under a traffic calming device, a casing pipe is not required. Refer to Section 6.8.

6.4.B.6 Galvanic Anodes with HDPE Installations

All metallic fittings and appurtenances (valves, hydrants, bends, crosses, tees, etc.) shall be installed with one high potential magnesium anode bonded to the metal. Where fittings are electrically continuous, a minimum of one anode may be installed to protect all the fittings. Anode sizes shall be a minimum of 9 lbs for individual fittings and 17 lbs for hydrants, temporary blow off valve assemblies, bridging supports, and bonded fittings, based on the average soil resistivity in Colorado Springs and a design life of 25 years for the anode.

6.5 HDPE Water Service Line Design

The design of HDPE Water Service Lines shall be done in conjunction with Section 2.6.H.10. In general HDPE Water Service Lines shall be upsized one nominal pipe size from type K copper sizing.

6.5.A HDPE Water Taps and Service Line, Sizing and Material

HDPE Service Line taps and sizes include 1inch, 1-1/2 inch, and 2 inch. The minimum CTS DR9 PE4710 HDPE Service Line size is 1 inch. The maximum size of an HDPE service line and tap is 2 inch. Water Service Line connections on HDPE Water Mains shall be accomplished by applying a HDPE Sidewall fusion tapping saddle to the main See Section 4.5.C.2 for additional information.

Table 6-2: HDPE 4710 CTS Pipe Size Compared to Copper Type "K" Tube Size

Pressure Class	Pipe Size (inch)	Minimum Wall (inch)	O.D. (inch)	Approximate I.D. (inch)	Typical Type "K" copper I.D. (inch)
250	1"	0.125	1.125	0.860	0.995
	1 1/2"	0.181	1.625	1.241	1.481
	2"	0.236	2.125	1.625	1.959

Flow capacity of HDPE CTS pipe varies with the inside diameter of pipe, pressure source, length of pipe connection to the Structure, elevation differences, and number of fixtures within the building. It may be necessary to up-size the Water Service Line to a larger size to meet the necessary flow capacity, See Table 6-2. The Water Service Line shall be the same size from the Corporation Stop to the Curb Stop or Secondary Valve. If necessary, the size of the Water Service Line may be increased or reduced from the Curb Stop or Secondary Valve to the meter and/or Approved Backflow Prevention Assembly or Method if applicable per Section 2.7.C.

Where HDPE is used between the Curb Stop and the inside meter, transition to copper shall be made at a transition coupling inside the building. Copper shall then be used until 5 feet after the outlet valve of the meter and/or Approved Backflow Prevention Assembly , or five feet after the downstream side of an Approved Backflow Prevention Method as applicable, See Detail Drawing B1-4 and B4-3. For outside Meter Pits (3/4 inch and 1inch meters) the Water Service Line shall be copper from the Curb Stop to the tandem copper meter setter, transition to HDPE shall be made inside the pit after the tandem copper meter setter. For outside meter Vaults (meters 1 ½ inch and greater) the Water Service Line shall be copper from the Curb Stop/Secondary Valve to the meter continuing to a point 5 feet outside the meter Vault. Transition to HDPE may be made after the Approved Backflow Prevention Assembly in an above ground lockable enclosure or in a separate Vault. In no case shall the transition coupling be buried.

6.5.A.1 Sizing of HDPE Single-Family-Residential Water Service Lines

Typical Single-Family-Residential HDPE Water Service can be accomplished with a 1 inch CTS DR9 HDPE PE4710 Water Service Line. See Section 2.7.C for sizing of Water Service Lines and Fire Lines.

6.5.A.2 Sizing of HDPE Commercial Water Service Lines

HDPE Water Service Lines shall be sized per Section 2.7.C for sizing of Commercial Water Service Lines. If the Mechanical Engineer has determined that the Water Service Line sizing is larger than 2 inches, then an alternate approved material for the Water Service Line must be used.

6.5.B HDPE Water Service Line Horizontal Design Criteria

6.5.B.1 Single-Family Residential HDPE Water Service Line Horizontal Design Criteria

When designing Single-Family-Residential HDPE Water Service Lines refer to the information listed in Section 2.7.F Single-Family-Residential Water Service Line Horizontal Design Criteria for Easement and Water Service Line alignment into the lot. The HDPE Water Service Line must extend from the Curb Stop into the foundation and up through the lowest level floor. The HDPE Water Service Line may not be terminated in a crawl space, and must be extended a minimum of 6 inches above the floor to allow for bracing and transition to the meter loop assembly. All HDPE Water Service Lines shall have a tracer wire from the corporation tap in the main to the Curb Stop and from the Curb Stop to follow Water Service Line to the outside of the foundation and is to be terminated in a test station box. See Detail Drawing B1-4 and Section 6.7.D Tracer Wire.

6.5.B.2 HDPE Commercial Water Service Line Horizontal Design

Horizontal separation between the HDPE Water Service Line and other utility infrastructure shall meet the requirements as stated in Section 2.6.F Separation Criteria and in accordance with Section 2.7.F.2 Commercial Water Service Line Horizontal Design.

6.5.C HDPE Separation Design Alternatives

Horizontal and vertical separation between the Water Service Line and other utility mains shall meet the requirements as stated in Section 2.7.F.3 Separation Design Alternatives.

6.5.D HDPE Curb Stop and Stop Box

All HDPE Water Service Lines shall comply with Section 2.7.F.4 Curb Stop and Stop Box.

6.5.E HDPE Water Service Line Vertical Design Criteria and Depth of Bury

All HDPE Water Service Lines and Curb Stops shall be in compliance with Section 2.7.G.1 Water Service Line Vertical Design Criteria of this *Water LESS*.

6.5.F Water Metering on HDPE Water Service Lines

Metering of HDPE Water Service Lines shall be in compliance with Section 2.7.L Water Meters of this *Water LESS*.

If a Meter is to be placed in a Meter Pit or Vault then it shall be installed in accordance with Detail Drawings B4-2 or B4-2A, B3-1, B3-2, B3-3, B3-4 and B3-5.

6.6 HDPE Construction

This section shall be read in conjunction with CHAPTER 5 Construction Practices in regards to HDPE Water Mains. View CHAPTER 4 Approved Materials for approved pipe and fittings allowed to be used for HDPE mains and Water Service Line Construction.

6.6.A Fusion Qualification

The Contractor shall ensure that persons making heat fusion joints have received training in the manufacturer's recommended procedure for the size of installation in accordance with *ASTM F2620 and Plastic Pipe Institute (PPI) TR-33*. A copy of this training card/qualification for said persons shall be available for inspection by the Inspector. The Contractor shall maintain records of trained personnel, and shall certify that training was received within twelve (12) months before commencing Construction. Only a qualified operator shall be permitted to weld, fuse, and install HDPE pipe. Training shall comply with *ASTM F3190, Standard Practice for Heat Fusion Equipment (HFE) Operator Qualification on Polyethylene (PE) and Polyamide (PA) Pipe and Fittings*.

6.6.B Fusion Records

Electronic print-out records of appropriate butt fusion details shall be kept on pipe fusions for all HDPE mains. Copies of the data logger information and drawing showing locations shall be submitted to Colorado Springs Utilities for review and recordation purposes before final approval of the job. The minimum typical information to be given is illustrated in Figure 6-1. (Output may vary with recording device).

Each fusion on the pipe and fittings is to be labeled and marked with a contrasting permanent color marker detailing: Company name, fusion technician's initials or stamp in the bead, date of the fusion and Construction Project number, and joint number to correspond with the fusion data log record.



DataLogger VAULT

McElroy Joint Report

Reference Number 390239

Job Details

Owner Account	CSUDL5
Joint Number	7
Joint Time	2016-07-22 09:15:54 UTC
Job	Fillmore Hill
Operator	cballinger
Notes	Fillmore Hill Pipeline

Fusion Machine

Machine Name	jhoughton
Machine Model	#618 HF
Piston Area	11.78 in²

Pipe Specifications

Pipe Material	PE4710
Pipe Size	12 " DIPS
Wall Thickness	DR 9

Pressures

Drag Pressure	57 psi		
		Interfacial	Gauge
Bead-up		75 psi	401 psi
Heat Soak			57 psi
Fuse		75 psi	401 psi
Cool			
Using Fitting Recommended Force	Yes		

Fusion Type

Fusion Type	Butt Fusion		
Fusion Specification	ASTM F2620		
Specification Parameters:			
Bead Size		3/8"	
Heat/Soak Time		396 seconds	
Fuse Time		967 seconds	
Open/Close Time		20 seconds	
Specification Pressures:		Minimum	Maximum
Bead-up		332 psi	470 psi
Heat Soak		0 psi	57 psi
Fuse		332 psi	470 psi
Cool		0 psi	0 psi

External Heater Temperatures

Location:	One	Two	Three	Four
Side A				
Side B				

GPS Location

Coordinates:	Latitude	Longitude	Time Recorded
	38°52'34.7"N	104°50'36.3"W	2016-07-22 15:21:23 UTC

Logged Data Summary

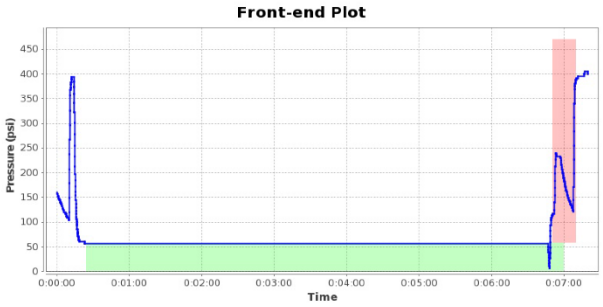
Number of Data Points	286
Total Fusion Time	0:23:16 (h:mm:ss)
Maximum Recorded Pressure	404 psi

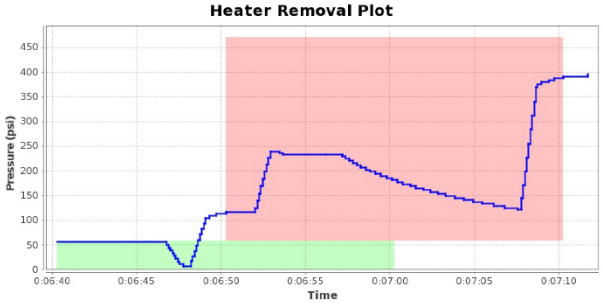
Device Information

DataLogger Serial Number	MDL5-0907
Calibration Date	2015-11-09
Firmware Version	v5.1
Software Version	v1.1.2
Software Product Name	DL5m

Data Source

File Name	\My Documents\Joint Reports\DL5 2016-07-22 09-15-54 Joint 7 Job Fillmore Hill by cballinger.DL5
Upload Time	2016-07-22 16:26:43 UTC





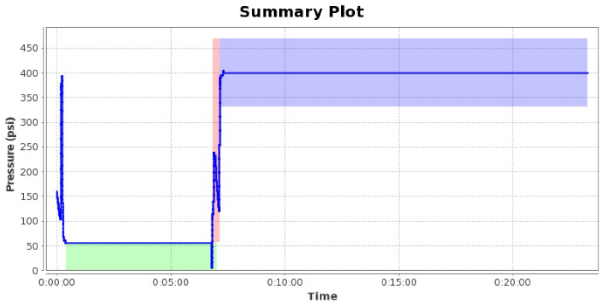


Figure 6-1: Example of a Heat Fusion Joint Record (typical output for a McElroy Data Logger)

6.6.C Inspections

All Construction shall be inspected by an Inspector with the authority to halt Construction if, these *Water LESS* are not met. Whenever any portion of these *Water LESS* is violated, Colorado Springs Utilities may order further Construction to cease until all deficiencies are corrected.

6.6.D Tracer Wire

Tracer wire shall be installed on all Water Mains and Water Service Lines. (Reference Section 0 for tracer wire materials and Section 5.16 of these *Water LESS* for installation and testing.)

In a boring application, 4 individual tracer wires shall be pulled in along with the pipe with a minimum of 2 unique connection points to aid in avoiding sharp obstacles which may break the wire. In the event that all tracer wires are broken during the pipe pull, then the Contractor shall separately install a parallel HDPE tubing to place a new tracer wire approximately 3 to 4 feet above the HDPE pipe. If additional tracer wires need to be placed, potholes every 50 feet will be needed to verify the location of the tubing and wire are located above the HDPE Water Main. Additional information will need to be referenced on the record Construction Plan so that future locates can be made aware of the difference in depth and location to the actual Water Main placed.

6.6.E Trench Placement of Pipe

HDPE pipe shall not be dragged over the ground as it may be susceptible to damage from sharp objects. Ropes, fabric, or rubber protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped, or placed onto rocky or unprepared ground. Slings for handling the pipeline shall not be positioned at butt-fused joints. Sections of the pipes with cuts and gouges exceeding 10 % of the pipe wall thickness or kinked sections shall be removed and the ends rejoined. The open ends of all sections of joined and/or installed pipe (not in service) shall be plugged at night to prevent animals or foreign material from entering the pipeline or pipe section.

Waterproof nightcaps of approved design shall be used to prevent the entrance of any type of natural precipitation into the pipe. The practice of stuffing cloth or paper in the open ends of the pipe is unacceptable.

When the HDPE pipe has been placed in the trench and backfilled, the Contractor shall leave the two end sections exposed to allow for any expansion or contraction of the pipe. After a period of 48 hours or once the pipe has reached ambient temperature of the existing (trench) ground, the end sections can then be connected to the fitting or existing pipe. HDPE should not be installed where temperatures drop below 40 degrees Fahrenheit.

6.6.F Heat Fusion Joining

Joints between plain end pipes and fittings shall be made by butt fusion. The butt fusion shall be made in accordance with the pipe and fitting manufacturers' recommendations (*reference PPI TR-33*). HDPE branch connections to the Water Main shall be made with a tee or cross of fabricated/molded fittings.

6.6.G Bead Removal from HDPE Pipe

All internal beads and some external beads around HDPE fittings shall be removed unless otherwise specified, after the allowable cooling time for bead removal using a suitable bead removing tool specified for HDPE pipe. The bead removal tool shall not induce any slits, gouges, or defects in the pipe wall, as recommended by the manufacturer. The minimum length of pipe allowed to be fused is 30 feet. When mating up to a fitting configuration a shorter HDPE pipe pup may be used. Excessive fusions in the HDPE Water Main may increase the disinfection contact time for the pipeline to pass, see Section 6.6..

6.6.H Electro Fusion Fittings and Couplings

Electro fusion fittings and couplings are not permitted for use in the Colorado Springs Utilities systems.

6.6.I Stainless Steel HDPE Stiffener Insert for HDPE Pipe

A stainless steel stiffener shall be installed and used whenever the plain end of a HDPE pipe is to be placed into a mechanical fitting. The connection shall be restrained to prevent pullout during thermal expansion and contraction of the pipe see Section 6.3.B.

6.6.J Disinfection of HDPE Pipe

All Water Main Extensions shall be chlorinated in accordance with *ANSI/AWWA C651 Disinfecting Water Mains*. The chlorination method used for main disinfection shall be approved by Colorado Springs Utilities as outlined in Section 5.20.

All HDPE Water Mains shall use the chlorine solution injection method. The Contractor must provide an injection tap or suitable hydrant with the proper isolation valves for disinfection as well as a suitable flush point. Colorado Springs Utilities shall disinfect HDPE Water Mains at no charge to the Contractor, with the exception that the Contractor shall excavate the tapping holes, pay for all required appurtenances and provide labor, material and an acceptable plan to transmit and contain water discharged during flushing, and have a representative present during the disinfection procedure.

All disinfections shall be evaluated on a case-by-case basis and additional appurtenances may be required for chlorine injection and air relief at the expense of the contactor. It shall be the Contractor's responsibility to notify Colorado Springs Utilities, Laboratory Services Water Quality 3 working days in advance of the disinfection date.

NOTE: All HDPE Water Mains must have a minimum contact time of 48 hours – they may be flushed the morning of the second day after disinfection.

6.7 HDPE Water Service Line Construction – All New and Replacement HDPE Water Service Lines

Typical Construction for HDPE service lines is done by excavation or trenching. Colorado Springs Utilities will require pre-approval for any micro tunneling, pipe bursting or directional boring installations for HDPE Water Service connections, see Section 6.8 on Trenchless Technology Applications.

6.7.A HDPE Qualification

The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure for the size of installation in accordance with *ASTM F2620 and Plastic Pipe Institute (PPI) TR-33*. A copy of this training card/qualification for said person shall be available, for inspection by the Colorado Springs Inspector, if required. The Contractor shall maintain records of trained personnel, and shall certify that training was received within twelve months before commencing Construction. Only a qualified operator shall be permitted to fuse and install HDPE Water Service Line pipe.

For socket fusion applications the Contractor shall ensure that persons doing socket fusion joints have received training in all recommended procedures in accordance with ASTM F2620 and have the socket fusion endorsement on their qualification card. A copy of the qualification card and a socket fusion sample must be submitted to Water/Wastewater Standards, 1521 Hancock Expressway, Colorado Springs, CO, before any fusion operator is allowed to install a socket fusion coupling. Contact Water/Wastewater Standards regarding socket fusion procedures and sample submissions.

6.7.B HDPE Service Line Tapping

All HDPE Service Taps off of a HDPE Water Main shall be accomplished utilizing a side wall fusion tapping saddle connection, it shall be the same size of tap as proposed Water Service Line material, for 1 inch, 1-1/2 inch and 2 inch taps, and shall be at a ninety (90°) degree angle from the vertical (i.e., 3 or 9 o'clock position), see Detail Drawing B1-1. No reducing couplings or additional fittings are allowed at the Corporation Stop. The brass Corporation Stop shall be wrapped to prevent corrosion.

6.7.C HDPE Water Service Line Installation

The HDPE Water Service Line shall be installed horizontally in a "snake-like" laying configuration to allow for both expansion/contraction movement of the pipe in the trench. The HDPE Water Service Line shall consist of 1 piece of continuous pipe from the Corporation Stop to the Curb Stop/Secondary Valve, no fittings or connections are allowed. The Curb Stop/Secondary Valve may not be placed under concrete or paved driveway areas. If the Water Service Line needs to be extended to accommodate moving the Curb Stop/Secondary Valve out of a concrete or paved area, only butt fusion or socket fusion additions to the Water Service Line may be used. If the Service line pipe has incurred cuts or gouges exceeding 10 % of the pipe wall thickness or kinked sections, it shall be entirely removed and replaced with new pipe. The open ends of all installed service line pipe (not in service) shall be plugged at night to prevent animals or foreign material from entering the service line pipe section.

HDPE Water Service Lines shall not be in direct contact with concrete. A casing pipe is required at the location where HDPE pipe penetrates the foundation or concrete wall of a building, see Detail Drawing B1-5.

6.7.D Water Service Line Tracer Wire

Colorado Springs Utilities requires No. 10 Solid Copper or No. 12 copper clad steel (boring and direct bury applications) insulated tracer wire to be used to locate the

pipe. Tracer wire shall be taped to the top of the HDPE pipe on all Water Service Lines at every 2 feet. Wire connections shall be waxed taped for corrosion protection, Reference Section 5.21.M of these *Water LESS*.

6.7.E Stainless Steel CTS Stiffener

Inserts are required at all HDPE connections to fittings, see Section 4.5.B. HDPE Service Line Pipe must be laid Straight with no bends for 12 inches after the fitting.

6.7.F Repair of HDPE Water Service Lines

The Contractor shall ensure that persons making heat fusion joints have received training and are certified as per Section 6.7.A HDPE Certification.

Repair to HDPE buried Potable Water pressure pipes shall be in accordance with general guidelines in *ASTM F2620, PPI Handbook of Polyethylene Pipe Chapter* 15. Colorado Springs Utilities recommends that repairs on Service Lines be made by butt or socket fusion. Mechanical couplings are allowed with the approval of Colorado Springs Utilities. Reference Approved Manufacturer's heat fusion joining procedures and *PPI TR-33 - Table* 2.

Squeeze off of the HDPE Water Service Line is allowed utilizing rounded bars to squeeze the Service Line pipe when a repair is needed. Caution shall be taken to avoid over squeezing of the pipe to ensure that damage is not caused to the pipe. The HDPE Service Line pipe shall be marked with a black tape applied in a figure 8 pattern in accordance to ASTM F1734 to mark where the pipe has been squeezed off previously in the event that a subsequent repair is needed. See Section 4.5.B.6 b for types of squeeze off tools.

6.7.G Water Service Line Transition and Repair Fittings

No splice connections are allowed between the Corporation Stop (tap) and the Curb Stop and from the Curb Stop to the meter set on new Construction of Water Service Lines (See Detail Drawings B1-4 and B4-3). Also see Section 4.5.B.6 b Approved Materials for approved HDPE transition and repair couplings. Repair couplings and socket fusion are only to be used to re-establish a damaged HDPE Water Service Line.

6.8 Trenchless Technology Applications

The purpose of this section is to provide the criteria to be used when designing the layout and Construction details of the Water System utilizing Trenchless Technology applications (Trenchless).

Horizontal Directional Drilling (HDD), Boring by Tunnel Bore Method (TBM) or Guided Bore Method (GBM), Auger Bore Method (ABM) and Pipe Bursting as well as Pipe Lining are considered Trenchless Construction methods. The Owner/Developer will be responsible for hiring an experienced Design Engineer, Contractor, and Geotechnical Engineer as required to design and construct a Water Main utilizing these methods of Construction. The Design Engineer should coordinate with the Contractor and the Geotechnical Engineer to develop the Construction Plan. Colorado Springs Utilities recommends professionals experienced in working with Trenchless methods to streamline the planning, design, and Construction of the Project and to ensure that a quality Water System Extension is obtained.

Additional reference information regarding Specifications Codes and Standards of Trenchless design and Construction may be found in:

- *AWWA Manual M55*
- *ASTM F1962*
- *PE Pipe Design and Installation, Plastics Pipe Institute (PPI), www.plasticpipe.org*
- *Trenchless Technology Pipeline and Utility Design, Construction, and Renewal, WEF Press*
- *Horizontal Directional Drilling Good Practices Guidelines, HDD Consortium*

6.8.A Trenchless Planning and Design

This section addresses a wide range of information and precautions necessary to ensure that a proper Trenchless design is adequately addressed.

6.8.A.1 Geotechnical Requirements

The Design Engineer shall obtain a geotechnical analysis report to determine constructability and feasibility of the project. Core sample locations shall be determined by the Design Engineer, Geotechnical Engineer, and the Contractor. A minimum of 3 core samples shall be collected for every 1,000 feet of the project, or as determined by the Design Engineer. A minimum of one core sample shall be collected at the deepest projected point of a bore or tunnel. All core samples shall be located a minimum of 25 feet off of the bore or tunnel alignment with the exception of pipe bursting where the core samples may be located on the center line of the Water Main alignment. For Projects 200 feet in length or less, the necessity and number of core samples will be determined by the Design Engineer, Geotechnical Engineer, and the Contractor. Colorado Springs Utilities may require additional core samples as needed for information.

6.8.A.2 Horizontal Directional Drilling (HDD) Site Design Criteria

This section covers installation of underground utility infrastructure using the directional boring (horizontal directional drilling, HDD) method of installation, also commonly referred to as guided horizontal boring. The Design Engineer shall consider equipment, materials, protection of existing Utilities infrastructure, environmental protection, and restoration.

All HDD Construction Plans shall have a plan and profile drawing detailing all existing Utilities Infrastructure within the scope of the Project to identify potential conflicts (applies to all Trenchless applications). The profile must show depth, curvature of the pipe and separation from all existing utility infrastructure, Structures, and obstacles.

The Construction Plan shall also include, at a minimum:

- entry and exit pits
- size, capacity, and arrangement of Trenchless equipment
- layout of carrier pipe
- layout of any proposed Construction staging areas.

The Design Engineer shall design the Project for the largest drill needed to complete the bore to ensure that the minimum separation requirements are maintained.

6.8.A.3 Pipe Bursting Design Criteria

Pipe bursting is a Trenchless method of replacing buried Water Mains without the need for a traditional Construction trench. Launching and receiving pits allow new Water Main to be pulled in place through the existing Water Main with a bursting head. The Design Engineer shall design the Project from valve to valve and shall include allowance for the expansion of materials and soil due to the insertion of the new Water Main.

The Construction Plans shall include at a minimum:

- a plan and profile drawing showing the dimensions of the launching and receiving pits,
- proposed line replacement,
- area needed for the layout of the pipe prior to pipe bursting
- identification of all existing utilities within the scope of the project
- depth of the pipe, and separation from all existing utilities, Structures, and obstacles.

6.8.A.4 Micro Tunneling Boring Method (MTBM)

Micro tunneling is a digging technique used to construct small tunnels. These small diameter tunnels make it impossible to have an operator in the machine itself. Instead, the micro tunnel boring machine (MTBM) must be operated remotely.

The Design Engineer should coordinate with the Contractor to plan and design the project. The same design plan and profile requirements for HDD Construction Plans will apply to micro tunneling, see Section 6.8.A.2 . Due to the uniqueness of this application all Construction Plans submitted by the Design Engineer to Colorado Springs Utilities for approval will be reviewed on a case by case basis to determine that all design requirements are included.

6.8.A.5 Tunneling Boring Method (TBM)

Tunneling Boring Method (TBM) is a method used for Construction of large tunnels. The footprint area for these types of Projects will be unique to each Project for entry and exit pits as well as tunnel alignment. The Design Engineer should coordinate with the Contractor to plan and execute the project. Construction Plans submitted to Colorado Springs Utilities for approval will be reviewed on a case by case basis.

6.8.A.6 Guided Boring Method (GBM)

Guided boring (GBM) can be used for the Trenchless installation of new pipelines or casings.

The Design Engineer will need to have a precise Construction Plan alignment to be utilized with the GBM project. The Design Engineer should

understand the equipment parameters to be able to stay within the design constraints. The same design criteria will be required for the Construction Plan as is needed for a HDD project, see Section 6.8.A.2.

6.8.A.7 Auger Boring Method (ABM)

Auger Boring, also known as jack and boring, is a Trenchless method for installation of casing pipes. The bore is formed from a launch pit by means of a rotating cutting head. The soil is removed back to the launch pit by helical auger flight sections and the steel casing is advanced forward into place. The rotating head is pushed ahead by an auger boring machine, traveling on tracks, and is typically a dry method for installing steel casings. This method offers limited steering capabilities and is used when precise accuracy is not crucial. The advantages of this system are that it causes little or no surface disruption and the spoil is removed by augers. The Design Engineer will need to have a detailed Construction Plan alignment to be utilized with the ABM Project with no room for changes in the alignment. This method can only be used when there is no other utility infrastructure, Structures, or obstacles in the planned drill path.

6.9 Pipe Rehabilitation

Water Main rehabilitation will be reviewed on a case by case basis depending on the conditions of the pipe, the likely potential to either encounter or generate regulated Asbestos-containing materials (RACM), and the requirements of the Water Distribution System. Asbestos-containing Water Mains shall either be managed in accordance with Section 5.9.B, or may be abandoned in place and documented on the Construction Plan and in the Colorado Springs Utilities infrastructure mapping system by the Colorado Springs Utilities Inspector. The Contractor is responsible for proper and accurate installation of the new pipe regardless of the methods proposed.

6.9.A Cured in Place Pipe

Cured in Place Pipe (CIPP) is currently not allowed for use in the Water Distribution System.

6.9.B Sliplining

Sliplining is completed by installing a smaller, "carrier pipe" into a larger "host pipe", using the host pipe as the path to install a new structurally sound pipeline. The new pipe is not always snug to the host pipe which requires the sliplining materials to be structural by itself. Grouting the annular space between the two pipes can be done also, and sealing the ends before connection to the system is required. Some materials utilized in this process are dependent on the integrity of the host pipe which will reflect on the performance of the liner. Cleaning and CCTV assessment of the host pipe is required prior to placement of a slipliner. Sliplining can be used restore structural integrity to an existing pipe. Sliplining can occur in any size pipe given appropriate access and a new pipe small or large enough to install. Sliplining will need to be designed from valve to valve and where there are no bends or Water Service Lines attached to the pipe. Sliplining Projects will be reviewed on a case by case basis.

6.10 Material

Specifications on all materials proposed for placement must comply with this *Water LESS*; see CHAPTER 4 Approved Materials.

6.11 Construction Plan Submittals

The Design Engineer shall submit to Colorado Springs Utilities copies of the Construction Plan and geotechnical report for Construction approval. The geotechnical report shall include the subsurface conditions that may impact Construction and recommendations for mitigating any geotechnical hazards. If the subsurface conditions are known to the Contractor by previous work or geotechnical studies done in the immediate area, the information shall be recorded in the geotechnical report along with any additional geotechnical studies performed by the Contractor. The Construction Plan Submittal shall comply with CHAPTER 3 Submittal Requirements including the following:

- Geotechnical Information
- The projected path of the bore or tunnel
- Proposed Trenchless Method
- Plan and Profile Drawings
- Proposed Materials

6.12 Trenchless Construction

Colorado Springs Utilities' approval of any aspect of any Trenchless operation covered by this *Water LESS*, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the Construction.

Line and grade accuracy tolerances when constructing any Trenchless method Project shall be plus or minus 3 inches. Accuracy may be impacted by the environment, ground conditions, conflicting utilities, and depth, which may affect the connection between the transmitter and receiver for locating and tracking the drill path. The Design Engineer shall be aware of the accuracy of the method and equipment selected to address any potential separation concerns. Where extreme accuracy is demanded, alternate tooling can be used to increase accuracy, i.e., cable transmitter. During Construction, all separation criteria from other utilities shall be maintained (See Section 2.6.F.2).

The Contractor shall notify Colorado Springs Utilities 48 hours in advance prior to the start of Construction. All Trenchless Construction shall be in compliance with CHAPTER 5 Construction Practices and include the following:

The Contractor shall develop the following Plans. All of these plans shall be made available to Colorado Springs Utilities upon request:

6.12.A Construction Work Plan

The Construction Work Plan should include the noise reduction program, solids control plant, pilot hole drilling procedure, the reaming operation, and the pullback procedure as well as document the planning required to successfully complete the project. Site Groundwater level and management of Groundwater during drill activities will need to be addressed and possibly permitted, if determined necessary.

6.12.B Equipment Plan

The Contractor shall list Specifications, and calibration documentation on all equipment to be used and ensure that the equipment will be adequate to complete the

project. The Contractor will need to plan for the footprint and layout of all of the equipment and materials to be used and placed during Construction. Guidance system documentation and calibration records shall be dated within the last 24 months.

6.12.C Drilling Fluid Plan

The Contractor shall prepare a plan which addresses the drill fluid to be used based on the Geotechnical Report. The plan shall include copies of the Safety Data Sheets of all products, chemicals, slickeners, binding agents, etc. of the drill fluids. The plan shall include the process for handling the fluid during Construction, and the disposal plan which shall comply with all federal, state, and local environmental regulations. Colorado Springs Utilities may require a New Chemical Review, as necessary.

6.12.D Inadvertent Fluid Release (IFR) Plan

The Contractor shall prepare an action plan in case of an IFR in addition to the Drilling Fluid Plan. The IFR must contain measures and procedures outlining how the Contractor/crew will access the spill area, necessary equipment for cleanup, submittals and emergency notification contacts, containment and clean up procedures in compliance with all federal, state, and local environmental regulations. This plan should also address restoration of the land or property affected and any alteration in native grade or settling, created by the Trenchless process.

6.12.E Other Permits as Necessary

The Contractor is responsible for complying with all applicable state, federal and local environmental regulations and shall obtain all permits necessary to complete Construction.

6.12.F Personnel Qualifications

Documentation of training and relevant experience of personnel shall be kept on Site and a qualified operator designated by the Contractor.

The Contractor shall be trained by the respective manufacturer of the equipment in the use of that equipment. The Contractor shall provide certification that the Contractor has been trained and is proficient in the use of the equipment. Only the Contractor's employees who are trained and certified shall be allowed to operate the equipment during the project.

The Contractor shall submit a list of completed Projects demonstrating experience in performing the type of Trenchless Construction proposed for the project. The list shall include the Owner of the project, Engineer, addresses, phone numbers, and dates that said Projects were completed. The list shall be submitted to the Design Engineer and Owner/Developer. These reference documents must also be available for review if requested by Colorado Springs Utilities.

6.13 Drill Path Survey

The entire drill path shall be accurately surveyed and staked by a Surveyor licensed by the State of Colorado. Staking shall be done in accordance with Section 5.3.

6.14 Inspections

The Contractor shall notify the Colorado Springs Utilities Inspector when Construction begins each day. If the Inspector is not on-site, the Contractor shall keep the Inspector advised of all concerns and issues that arise.

6.15 Locates and Visual Verification

All Utilities shall be located prior to the start of Construction per Section 5.9.A. Colorado Springs Utilities reserves the right to require the Contractor to expose Utility crossings to verify and monitor required separations.

6.16 Tracer Wire

A total of 4 individual tracer wires must be placed with all pipe materials and shall be rated for boring applications, refer to Section 6.6..

6.17 Pipe Placement

The Water Main shall not be dragged on the ground during pull back operations. Pipe rollers or equivalent pipe support equipment must be used. Any damaged pipe will be rejected per Section 6.21. During pull in of pipe for placement, pipe ends must be secured to prevent drilling fluids from entering the pipe.

6.17.A Concrete Thrust Blocks and Anchors

Shall be applied as in Section 2.6.F.7.

6.17.B Deflection

Allowable pipe deflections shall not exceed the pipe manufacturer's recommendations and the recommended capability of the equipment utilized for the project. Refer to Section 6.3.D .

6.17.C Bends

If additional DIP fittings are required they shall be placed according to Section 5.13.D.

6.18 Pipe Bursting Construction Requirements

- Pipe bursting methods employed on Asbestos-containing pipeline will result in the generation of RACM and are therefore prohibited.
- It is the responsibility of the Contractor to obtain all available records, and CCTV the line to locate all fittings on the existing pipeline before pipe bursting occurs.
- The Contractor is responsible for protecting and maintaining separation of all nearby Utilities and Structures which will need to be located and exposed if they are within the expansion corridor of the pipe burst. The Inspector shall be on Site when the bore crosses existing Colorado Springs Utilities facilities.
- The Trenchless Project must avoid heaving of the ground and shall leave no voids.

6.19 Trenchless Copper Water Service Line Installation

Water Service Lines may be placed by HDD application. The Contractor shall limit the amount of force used during installation to insure there is no damage to the Water Service Line pipe. When copper tubing is being placed and more than 1 coil length is needed, a flare by flare coupling shall be used to add additional pipe length. The coupling must be exposed after the tubing is in place to verify that there is no damage to the tubing or coupling and that there are no leaks during pressure testing. For HDPE Water Service Line information see Section 6.7.

6.20 Record Keeping

The Contractor shall maintain a daily Project log of Construction operations which shall be provided to Colorado Springs Utilities upon request. Compaction reports shall be kept and filed as required. Record Drawings shall be certified as to accuracy by the Design Engineer.

The Qualified Operator shall record and keep a bore log and pull back log and shall submit this information to the Inspector. Bore depths shall be recorded on the Record Drawings at defined station points on the Construction Plan or in increments of drill rod length. The Qualified Operator shall keep and maintain the calibration record of the locating equipment.

6.21 Site Restoration

Following the Trenchless Construction and demobilization, the Contractor shall restore the work-site per Section 5.23. All excavations shall be backfilled and compacted to the required density per Section 5.18. All Construction debris and materials shall be disposed of by the Contractor.

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CHAPTER 7

Pump Stations

7.1 General

The purpose of Chapter 7 of these *Water Line Extension & Service Standards* (*Water LESS*) is to set forth minimum criteria for design and Construction of unstaffed pump station facilities for Raw, Potable, and Nonpotable Water.

7.2 Cost Responsibilities

7.2.A Design And Construction

The responsibility for permitting, designing, and constructing Pump Stations shall be in accordance with Utilities Rules and Regulations. Colorado Springs Utilities may elect to design, permit, and construct the Pump Station and if necessary, enter into an agreement with the developer to establish responsibilities and schedule.

The responsible party shall identify a qualified Design Engineer who will design and prepare Construction Plans and Specifications for the proposed Pump Station as well as all documents necessary to receive approval from all required agencies. Colorado Springs Utilities will review the Design Engineer's reports and Construction Plans to ensure that they meet the requirements of these Water LESS.

The responsibility of the cost and acquisition of the necessary land, and easements; and cost of, design, permitting, and construction of Pump station shall be in accordance with Colorado Springs Utilities Rules and Regulations.

7.2.B Cost Recovery

Where it appears that more area or land(s) may be served by the Pump Station than what is required to serve the initial development, Colorado Springs Utilities may require a greater pumping capacity than what is necessary to serve the initial development. Where greater capacity is required, Colorado Springs Utilities may establish a Recovery Agreement with the Owner/Developer to assist in the collection of a pro rata share of the actual cost of such facilities from future connections to such facilities at the time of connection to the system and will refund such share of the cost to the Owner/Developer.

Utilities may require a greater pumping capacity than necessary to service the initial development in accordance with Utilities long range plans. If the construction of the pump station meets Utilities long range plans then Utilities will establish a Recovery Agreement to assist in the collection of a pro rata share of the actual cost of such facilities from the property Owner or developer of the Premise served by such facilities at the time of connection to the system and will refund such share of the cost to the property Owner or developer as funds become available. Cost recovery may include future connection to the system if applicable.

See Colorado Springs Utilities Rules and Regulations for additional details regarding Recovery Agreements.

7.2.B.1 Advance Cost Recovery or Participation

Where Colorado Springs Utilities has identified a future need for pump station Construction, improvement, or expansion to provide or continue service to an area, including areas that are provided interim service that require pump station facilities in the future, Colorado Springs Utilities may prepare an advance Recovery Agreement to collect a proportional share of the cost to construct a pump station to serve that area. Any Owners/Developers requesting interim service will be required to pay the advance Recovery Agreement charge at the time-of-service contract prior to the provision of service. See Colorado Springs Utilities Rules and Regulations for additional details.

7.2.C Operations and Maintenance

Colorado Springs Utilities will assume responsibility for ownership, operation, and maintenance of the pump station following final completion, commissioning, startup, and acceptance. A two-year warranty is required for all construction to begin after Pump Station commissioning is complete.

7.3 Planning

Pump station projects require compliance with the City of Colorado Springs Land Use Review process. Colorado Springs Utilities shall notify the Owner/Developer if a Pump station is required for their development as part of this process. The Owner/Developer shall be responsible for indicating the location of the proposed Pump station on their Land Use Review plans and Plats; the Design Engineer shall be responsible for zoning the pump station property and be responsible for the Development Plan.

7.3.A Finished Water System Plan

Colorado Springs Utilities shall be responsible for drafting and periodically updating the Finished Water Master Plan that identifies conceptual system layouts for future water transmission mains, distribution mains, tanks, and pump stations based on anticipated land use, pressure zones, and prevailing topography.

7.3.B Pump Station Siting and Water Main Alignment

The proposed pump station site and water main alignment shall be reviewed during the Land Use Review process and shall be compatible with the current Finished Water System Plan. A Hydraulic Analysis Report may be performed by Colorado Springs Utilities to determine the most suitable location and alignment for the pump station and water mains to serve the proposed development and any future development the pump station may be required to serve.

7.3.C Pump Station and Water Main Sizing

Colorado Springs Utilities shall determine the preliminary size of the proposed pump station and associated water main in accordance with the current Finished Water Master Plan and Hydraulic Analysis Report.

7.3.D Public Planning Process

The Design Engineer shall coordinate with the Owner/Developer for executing the planning process requirements. For Projects within the El Paso County, the City of Colorado Springs City Planning Department or El Paso County Planning Commission will determine if Public hearings, neighborhood meetings, or

notifications, including property postings, are required. For Projects outside El Paso County, the Public planning process shall conform to applicable requirements of the Authority Having Jurisdiction.

7.3.E Other Documents

Other documents may be required as part of the Land Use Review Process based on the individual project and City of Colorado Springs requirements. Any additional documents and/or plans shall be the responsibility of the Design Engineer.

7.4 Land Entitlements and Easements

Property and Public Utility Easement boundaries and dimensions for the pump station and associated water main alignment shall be identified by Colorado Springs Utilities during the Land Use Review process. The Owner/Developer shall be responsible for easement acquisition/dedication, and the Design Engineer shall be responsible for executing transfers of property, in accordance with section 7.4.A.

7.4.A Easements and Property Titles

For transfer of property title to Colorado Springs Utilities, refer to *The City of Colorado Springs Procedure Manual for the Acquisition and Disposition of Real Property Interests*, available at www.coloradosprings.gov. Easements that Colorado Springs Utilities acquires must be acquired in accordance with Quality By Design (QBD) document *WSD-00011, "Utility Easement Acquisition Instructions"* accessible through Colorado Springs Utilities Project Managers.

7.4.B Environmental Assessments, Surveys and Clearances

Environmental Assessments and/or Environmental Reviews will be required as a preliminary investigation to determine if a particular parcel of real property is subject to recognized environmental conditions. Surveys and findings shall be documented by the Design Engineer.

7.4.B.1 Cultural

In the effort to identify historic properties of all types (buildings, Structures, objects, districts, and Sites) including the area of potential effect, it may be prudent to investigate as to whether the proposed property has recordable cultural, paleontological, and/or archeological value protected under the State Historical Preservation Office (SHPO).

7.4.B.2 Endangered and Threatened Species

To ensure compliance with the *Endangered Species Act*, all properties selected for pump station location must be surveyed prior to Construction disturbance to determine if there are potential effects to listed plants and/or animals. Any potential impacts must be avoided, minimized, or mitigated.

7.4.B.3 Migratory Birds

To ensure compliance with the *Migratory Bird Treaty Act*, all properties selected for pump station location must be surveyed prior to Construction disturbance to ensure protection of migratory birds and nests. If any active nests for protected birds are located, Construction may be delayed or modified to protect migratory birds.

7.4.B.4 Other Environmental Assessments

Other environmental assessments can include but are not limited to:

- Contaminated soils and Groundwater characterizations studies,
- Phase I and II assessments for Recognized Environmental Conditions (RECs)), and Limited Environmental Reviews for potential environmental concerns typically for Easement acquisition,
- Geotechnical Assessments to determine soil types, compaction etc., and
- HEC-RAS studies to determine floodplain elevations and potential degradation.

7.5 Permitting

It is highly recommended that permit planning start as early as possible. The Design Engineer shall identify all required permits early in the design process, prepare and submit permit application packages, and comply with any follow-up requests for additional information or clarification of permit submittals. The Design Engineer shall prepare plans and studies required for permits, as necessary. Key permitting agencies for design and Construction are included, but not limited to, the list in Section 7.9 at the end of this Chapter.

7.5.A General Permit Procedures

The Design Engineer will obtain the required permits for the pump station design. Colorado Springs Utilities shall retain the original permit files. The Design Engineer shall ensure that permits and approvals required during construction are described in the final Contract Documents for bidding purposes.

The Contractor shall obtain construction related permits required for the pump station construction and shall furnish copies of executed permits and compliance inspection reports to Colorado Springs Utilities within 14 Days of receipt. The Contractor shall inform the Design Engineer of any conflicts between the permit requirements and the Contract Documents. The Contractor shall maintain a readily available portfolio of all required permits, drawings, approved plans, agreements, and compliance inspection reports onsite during the construction period. The Contractor shall coordinate as necessary to clarify permit requirements. Unless the permitted activity is specifically limited, permits obtained shall cover the entire work.

7.5.B Permits Initiated by Colorado Springs Utilities and Contractor Obtained

Some permit applications may be initiated by Colorado Springs Utilities during the design phase and transferred to the Contractor who will be responsible for obtaining the final permits. Colorado Springs Utilities does not guarantee the accuracy of the permit applications, requirements, and/or fees. The Contractor shall complete the permit applications and submit to the permitting agency.

7.6 Design Criteria for Pump Stations

The following design criteria shall be applied to Pump Stations and their associated water mains.

In general, pump stations shall be designed in accordance with Hydraulic Institute (HI) Standards, Colorado Springs Utilities' Specifications, and Colorado Springs Utilities' Finished Water System Plan.

7.6.A Preliminary Design Report

The purpose of the *Preliminary Design Report* is to develop alternatives, recommend a preferred alternative, establish the preliminary design, and finalize the design criteria.

The *Preliminary Design Report* submitted by the Design Engineer shall:

- Locate potential pump station sites and recommend a preferred site
- Review, evaluate, and incorporate existing reports with respect to the proposed Project
- Identify potential permits, clearances, surveys, and agreements for the Project and required lead times
- Document adjoining parcels, rights-of-way, Easements, above and below ground utilities, walls, drainages (natural and engineered), fences, wells, and existing Structures
- Present preliminary geotechnical findings and evaluations
- Present analysis meeting City's Streamside and Hillside (and other) Overlay requirements specific to the Project as applicable
- Include a corrosion study based on field and laboratory tests and recommend cathodic protection for the pump station and its appurtenances
- Show a preliminary Site layout including the pump station, process piping, yard piping, electric conduit, telecommunication conduit, chemical feed, sewer pipe, storm pipe, Vaults, appurtenances, backup generator, and any water storage tanks as applicable
- Identify alternative layouts of the pump station's interior with a recommended layout
- Indicate operating conditions, maximum and minimum flow capacity of the pump station, the number and type of pumping units, and their performance characteristics such as design pump head range, number of stages, efficiency, and pump motor speed, source of water to the pump station and a hydraulic grade line for the system
- Prepare pump station sustainability evaluation to consider energy conservation, sustainable building materials, Site selection, etc.
- Present alternative analyses and rough-order-of-magnitude costs with recommended alternatives using Life Cycle Cost (LCC) Analysis , Net Present Value (NPV) or Internal Rate of Return (IRR) depending on the applicability for the Project
- Submit information on major equipment recommended for the pump station to include equipment access, relocations, and/or rotation for future operation and maintenance requirements
- Recommend containment methods and capacities for oil/petroleum/chemical containers, associated piping, and loading/unloading areas to prevent an overfill,

spill, and/or leak from entering a waterway, associated conveyance (i.e., storm drain), or sanitary sewer
- Recommend piping, structural, electrical, instrumentation, and control elements for new pump stations or modifications to existing pump stations
- If a chemical feed system is required, indicate the requirements for dosage, storage, and containment of chemicals
- Code review to establish building occupancy, mechanical, HVAC, electrical, structural, architectural and fire protection design criteria
- Include a preliminary drawing and Specification list

7.6.B Geotechnical Hazards Study

A geotechnical investigation for the selected pump station location and a corresponding *Geotechnical Hazards Study* should contain the following items except as modified by Colorado Springs Utilities:

- Geotechnical suitability for the proposed pump station facilities, including water storage tanks as applicable
- Potential effects extending into the Site from adjacent areas or from the Site into adjacent areas
- Allowable soil bearing capacities with respect to anticipated loadings at different pertinent depths and locations
- Recommendation of Site slope grading, cut and fill slopes, and any required stabilization efforts
- Foundation design criteria and recommendations
- Recommendations for excavations
- Shoring requirements and other Construction considerations
- Irrigation and drainage controls such as dewatering, surface, and subsurface drains
- Backfill Specifications and compaction recommendations for utilities, Structures, pavements, and slopes
- Corrosivity potential of the soil
- Recommendations for clearing/removal of deleterious materials such as canyon cleanout, over excavation, existing building foundations, pavements, debris, fills, designated trees, shrubs, roots, etc.
- Recommendation for abandonment of existing buried utilities as applicable
- Recommendations for reuse of onsite recyclable building material (i.e., asphalt, concrete, fabricated walls, insulation, etc.)
- Potential for Asbestos containing material to be located on site
- Other pertinent geotechnical information for the development of the site

7.6.C Basis of Design Report

The *Basis of Design Report* shall be a dynamic report throughout the design of the pump station. It must be updated and included with each submittal of the Contract Documents. The report shall not be limited to the design of the pumps, but shall encompass all pump station systems (civil, landscape, process, HVAC, plumbing, fire, structural, instrumentation and controls, communication, electrical etc.). The Design Engineer shall include all final studies, alternative analyses, cut sheets of equipment, and calculations used as the basis of the pump station design for Colorado Springs Utilities' future reference.

The *Basis of Design Report* shall include, but shall not be limited to:

- A hydrologic study to determine onsite and offsite runoff and associated impacts, assumptions and calculations for storm duration, return frequency, drainage area, and peak flows, as well as recommendations for addressing any impacts to ensure compliance with the standards established by the Authority Having Jurisdiction
- Design flow estimates consisting of present and future minimum, average, and maximum flows
- Calculation of net positive suction head available (NPSHa) and comparison to candidate pump net positive suction head required (NPSHr)
- System head curves, operating curves with operating points, efficiency curves, and NPSHr curves for candidate pumps
- Calculations to determine total dynamic head (TDH) for each pump, minimum and maximum capacity of pump station, pump head range, hydraulic grade line of the system, Hazen Williams C factor, determination of minimum pump (bowl) efficiency, pump brake horsepower, minimum pump motor efficiency, and motor speed
- Surge analysis of pumping system performed near the beginning of the design phase and validated at the end of the design phase, calculations used to size surge control equipment, open/closure rates of the pump control valves, and calculations used to determine location of air release and/or vacuum relief valves
- Calculations used to determine the material, size, and pressure class of piping, including assumptions for the design pressure, hoop stress, longitudinal forces, combined stresses, external pipe loads, and buckling and collapse analysis for the piping if performed
- Geotechnical laboratory and field test results and calculations used to design the cathodic protection system
- Potholing results from locating existing utility infrastructure
- Research and surveys performed in locating property and Easement lines
- Documentation and calculations for chemical feed pump selection, chemical dosing, storage volumes, and containment sizing
- Calculations and rationale for containment capacities relating to oil/petroleum containers
- Design calculations and Specifications for any installed oil/sand/water interceptors or separators
- Calculations verifying the motor starts per hour can meet demands and motor criteria
- Comparison and recommendation, which shall be based on operational needs and lifecycle costs, of constant speed pumps, soft starts, and variable frequency drives
- An architectural program documenting and supporting selections
- Calculations and loads used in the design of structural components, such as foundations, bridge cranes, roofs, and pump pedestals
- Calculations to size water storage tanks located on site, as applicable
- Pump control description with input from Colorado Spring Utilities Water Instrumentation and Control group

7.6.D Design Submittals and Contract Documents

The following criteria are minimum requirements for design submittals. A review meeting between the appropriate project representatives will be held following the completion of each design submittal.

7.6.D.1 Design Schedule and Budget

At the onset of the design, the Design Engineer shall submit an electronic copy of the overall design schedule showing the entire Project broken into sub-tasks with corresponding dates and milestones. The schedule shall be updated and submitted monthly. Due to Colorado Springs Utilities staffing availability, a more detailed 2 week look-ahead schedule shall be submitted on an as needed basis to ensure access to a requested facility or attendance of a particular staff member at critical events.

The Design Engineer shall also submit a budget and monthly cash flow estimate for the overall Project. The budget shall be cost-loaded corresponding to the schedule. The cash flow estimate shall be updated and submitted monthly for the duration of the Project.

7.6.D.2 Design and Contract Document Submittals

At a minimum, the Design Engineer shall prepare and submit the *Preliminary Design Report*, the current *Basis of Design Report*, Contract Documents, and a cost estimate at 30%, 60%, 90%, and final levels of completion. The submittal shall cover the subjects listed below in Section 7.6.E through 7.6.S. The appropriate project representatives will review each submittal and provide feedback to the Design Engineer.

The Design Engineer shall prepare and include the draft agenda and preliminary value engineering opportunities and risk register in the 30% submittal.

The final submittal shall be reviewed and approved before final Contract Documents are produced for bidding purposes.

Once the Contractor has been selected for the Project, the Design Engineer shall prepare final conformed Contract Documents issued for Construction.

7.6.D.3 Design Review and Value Engineering Workshop

The Design Engineer shall conduct a workshop with the appropriate project representatives to review the *Preliminary Design Report*, the current *Basis of Design Report*, and the value engineering opportunities submitted by the Design Engineer. This value engineering workshop shall be conducted following the 30% design submittal.

For value engineering opportunities presented during the workshop, the Design Engineer shall include a 40 year present worth life-cycle analysis of both capital and operation and maintenance costs to facilitate discussions of the opportunities. The Design Engineer shall also present advantages and disadvantages of each opportunity.

All value engineering opportunities, which would impact, alter, or differ from required and/or recommended applicable industry safety guides and/or Colorado Springs Utilities' *Water System Operations - Safe Design Guidelines*, shall be reviewed by the Project team and the Colorado Springs Utilities Safety and Health department prior to acceptance.

The Design Engineer shall prepare a technical memorandum summarizing the value engineering opportunities reviewed, evaluation results, and any value engineering opportunities accepted.

7.6.D.4 Commissioning and Startup Plan

Due to varying complexities of pump stations, the Design Engineer shall develop procedures in the Contract Documents for the testing, commissioning, and startup of the pump station that is appropriate for the complexity of the pump station. A technical memorandum shall be prepared at 60% design and finalized at 100% design to address commissioning and startup procedures.

7.6.E Health and Safety

The pump station shall meet all Colorado Springs Utilities and OSHA health and safety requirements. Adhere to the Colorado Springs Utilities' *Water System Operations - Safe Design Guidelines* by Colorado Springs Utilities for additional pump station safety requirements.

7.6.E.1 Operation and Maintenance

Consideration of operator safety includes the following:

- First-aid and safety equipment
- Positive floor drainage so that there is no standing water from leaking equipment or wash-down maintenance
- Nonslip floor finishes on all walking/working surfaces to include, but not limited to: floors, stairs, ladder rungs, ramps, bridging, catwalks, and work platforms
- Code mandated clearance around electrical equipment, such as transformers, switches, switchgears, and drives
- Process piping layout so that operator may walk completely around pumps and have adequate clear space for operation and maintenance
- Readily accessible equipment for operation and maintenance
- Platforms, ladders, or other alternative access systems as needed for safe access to equipment that must be located in hard to reach areas
- Chain wheels for valve hand wheels that are out of reach
- Lifting assistance for heavy items (see Section 7.6.J.3)
- Overhead pick points shall be located a sufficient distance above serviceable components to accommodate the use of appropriate lifting and rigging equipment
- Identify confined space areas as applicable

7.6.E.2 Noise Control

The Design Engineer shall use mitigation devices, systems, or programs to achieve compliance with state, OSHA, and local regulations established by Colorado Springs Utilities, and the Authority Having Jurisdiction regarding

noise limitations during Construction and pump station operation. Noise control shall mitigate the effect of noise on the surrounding properties as well as any individuals in or around the pump station during Construction or operation.

7.6.E.3 Hazardous Substances

A facility with regulated and/or other extremely hazardous substances subject to the *General Duty Clause* of the *Clean Air Act* is, among other things, responsible for:

- Using appropriate hazard assessment techniques to identify hazards which may result from releases
- Designing and maintaining a safe facility taking such steps as are necessary to prevent releases
- Minimizing the consequences of accidental releases

7.6.F Applicable Codes

For work in El Paso County, buildings associated with pump stations shall conform to all codes currently adopted by the Pikes Peak Regional Building Department. For work outside El Paso County, the design shall conform to local codes established by the Authority Having Jurisdiction. Where a local building code has not been adopted, the design shall conform to all codes currently adopted by the Pikes Peak Regional Building Department.

Because Colorado Springs Utilities will be the Owner of the pump station, the design of the pump station must comply with Colorado Springs Fire Department (CSFD) requirements. When the pump station is located outside of CSFD jurisdiction, it must meet the requirements of the Authority Having Jurisdiction and CSFD.

7.6.G Environmental Compliance

All pump station Projects shall be reviewed by Colorado Springs Utilities for compliance with the environmental requirements and design criteria of these *Water LESS.*

7.6.G.1 Chemical Review and Use

The Design Engineer shall adhere to the Colorado Springs Utilities Hazard Communication Program and New Chemical Review Program, as described in the *Safety and Health Program Manual*. Colorado Springs Utilities will review and approve any chemicals proposed for use within the Water System. Any chemicals or materials that come in contact with Potable Water, and Raw Water as applicable, shall be certified under the *National Sanitation Foundation (NSF)/ American National Standards Institute (ANSI) Standards 60 and 61*.

7.6.G.2 Existing Asbestos or Lead Materials

The Design Engineer shall inspect and/or test any existing item to be demolished for Asbestos and lead-based paint. If Asbestos or lead-based paints are present, the Design Engineer shall identify the location(s) and incorporate requirements into the Contract Documents to properly dispose of the waste. The Design Engineer shall ensure that a Certified Building Inspector inspects and samples any existing areas for Asbestos that may be

renovated or demolished as per CDPHE's *5 CCR 1001-10; Regulation No. 8 – Part B*. In addition, CDPHE's *5 CCR 1001-23; Regulation No. 19 – Part A* contains procedures and requirements for the accreditation of lead-based paint activities training programs, procedures and requirements for the certification of individuals and firms engaged in lead-based paint activities, and work practice standards for performing such activities. See CHAPTER 5 Construction Practices for additional information.

7.6.G.3 Contaminated Soils

If contaminated soils are identified in the *Geotechnical Hazards Study*, the Design Engineer shall identify location and incorporate mitigation requirements into the Contract Documents including the proper disposal of contaminated soils at a permitted disposal facility approved by the Environmental Services Department of Colorado Springs Utilities (EVS). The ground surface shall be inspected for evidence of hazardous material or petroleum product spills such as soil staining and unusual odors or colors. Refer to *QBD Document EVS-11804 Contaminated Soils Handling Procedure* for more information.

7.6.H Site Civil Engineering

7.6.H.1 Design Survey

A Project coordinate system shall be established, fully described, consistently used, and referenced on all Contract Documents. The design shall include a process for conversion from the local, ground distance coordinate system to the Colorado Springs Utilities' GIS coordinate system, which is the Colorado State Plane Coordinate system, Central Zone, North American Datum of 1983 (NAD 83/86), using the National Geodetic Vertical Datum of 1929 (NGVD 1929). This shall include a combined scale factor (grid and sea level) and northing/easting shift. All elements of the pump station shall be related to the grid and/or local control system.

7.6.H.2 Demolition

The Design Engineer shall indicate which items are to be demolished, salvaged, or abandoned in place.

7.6.H.3 Geotechnical Conditions and Earthwork

The *Geotechnical Hazards Study* findings shall be incorporated into the design and included in the Contract Documents as applicable. See Section 7.6.B for *Geotechnical Hazards Study* requirements.

7.6.H.4 Traffic Control

The Design Engineer shall:

- Develop a Construction traffic plan, as required, for Construction ingress and egress
- Develop a final traffic plan, as required, for final ingress and egress
- Indicate signage type and locations
- Comply with all Authorities Having Jurisdiction over the traffic design

The traffic plan shall, at a minimum, accommodate a WB-50 design vehicle entering the Site.

7.6.H.5 Access Road and Parking

The pump station Site shall have a paved access road from the nearest street to the truck bay of the pump station. If the Site is large enough, the access road shall be looped with 2 traffic lanes. The road shall, at a minimum, accommodate a WB-50 design vehicle such as a semi-trailer with 50-foot wheelbase and HS-20 loading. This allows for the delivery/pick-up of pumps, motors, other essential equipment, and access for fire fighting vehicles. If the pump station has pumping equipment components that require a larger vehicle, adjust the road design accordingly.

Road and parking design shall comply with City of Colorado Springs standards or the Authority Having Jurisdiction, as applicable. In Single-Family-Residential areas, the pump station access road may resemble a driveway. However, it shall still be designed for HS-20 loading.

7.6.H.6 Stormwater Quality

The pump station Project shall be designed in compliance with, and shall meet the requirements of, the following:

- Local government; i.e., City of Colorado Springs or similar Municipal Separate Storm Sewer System (MS4)
- Colorado Department of Public Health and Environment, Water Quality Control Division (CDPHE, WQCD)
- Federal and state anti-degradation policies
- The *Federal Clean Water Act*

7.6.H.7 Site Drainage and Landscaping

The Design Engineer shall refer to the City of Colorado Springs *Drainage Criteria Manual* and the Colorado Spring Utilities *Site Design Guidelines* for Site design and landscaping guidance. The Design Engineer shall:

- Situate the pump station finished floor a minimum of 1 foot above the 100-year flood elevation or as required by the authorized flood plains administrator
- Design positive slope grading for drainage swales, for access roads, and away from Structures
- Direct all storm water to a stormwater detention pond (when required) with the use of grading, swales, ditches, inlets, storm drains, culverts, or other approved means
- A storm water detention pond may not be designed to receive non-storm water influents or storm water that has been in contact with solid waste without approval by Colorado Springs Utilities
- Adhere to City, County, or other standards established by the Authority Having Jurisdiction, as applicable
- Include existing and future utility infrastructure in plans to ensure there are no conflicts with the proposed Site improvements

7.6.H.8 Vaults

Vaults shall be cast-in-place or precast concrete. They shall have removable panels for equipment access and a hatch for personnel access. A ladder, forced ventilation, or lighting may also be required. Placement of the Vault must comply with Section 5.15 in regards to Groundwater or Storm Water.

Vaults in a paved area, or within 5 feet of a paved area without curb and gutter, shall have a minimum rating of HS-20 loading.

7.6.H.9 Pump Station Bypass

In the event that the pump station is out of service, a bypass shall be available for connection to a Colorado Springs Utilities truck-mounted pump. The bypass shall consist of a pipeline from the low pressure side ending in a hydrant or connection pipe and a pipeline from the high pressure side ending in a hydrant or connection pipe. The 2 hydrants or connection pipes shall be within 20 feet of vehicle access and within 40 feet of each other, see Detail Drawing A6-12.

The hydrants or connection pipes shall have signage indicating "low pressure" and "high pressure" for the fire department's use during fires.

A fire hydrant may be used with pressures less than or equal to 250 psi. A connection pipe shall be used for pressures over 250 psi. If a connection pipe is used, include a blowoff to drain the pipe when not in use. The connection pipe shall be 4 ½-inch and compatible with the fire hose typically used to connect to the hydrant. See Detail Drawing A6-13.

Colorado Springs Utilities may choose, at its discretion, to waive the bypass requirement where the size of the bypass would be cost prohibitive.

7.6.I Security

The Colorado Springs Utilities Security Administrator maintains the *Physical Security Hardware Specifications*, which shall be incorporated as applicable for each pump station. At a minimum, the following security features are required:

7.6.I.1 Perimeter Fencing

If the pump station is protected with a fence, the fence shall be 7 feet tall chain link with an additional 1 foot of 3-strand barbed wire.

7.6.I.2 Vehicle Gate Entrance

If the pump station is protected with a fence, a vehicle gate entrance is required for access. Each vehicle each gate entrance shall have a high-low card reader for entry, intercom to speak to Security, Pan-Tilt-Zoom (PTZ) camera, door position switch located on the gate, exit loop instrument to open the gate during exit, safety loop to prevent the gate from closing until the path is clear, and a Knox Box for the fire department's entry.

7.6.I.3 Exterior Windows

Exterior windows of the buildings shall have shatter resistant film and glass break alarms.

7.6.I.4 Doors and Hatches

An iSTAR panel shall be included in the design for door control. The interior doors to the control room and communications room shall have card readers and door position switches. Truck bay and roll up doors shall have door position switches. Each exterior door shall have a door position switch mounted in the door frame, an intrusion alarm, and a request-to-exit style

door handle that meets emergency egress requirements. A card reader may be required, especially if there is no gate entrance.

Outdoor reservoirs shall have anti-pry locks and steel bars on each hatch and ladder access. Each hatch shall be fitted with a door position switch and an intrusion alarm.

7.6.I.5 Location of Cameras

At least 4 Pan-Tilt-Zoom (PTZ) cameras shall be mounted on the exterior of each building to provide 360-degree coverage of the pump station Site. Include at least 1 PTZ camera for each pump room, electrical room, and chemical room. A fixed security camera shall provide coverage of each exterior door. At least 4 PTZ cameras shall be mounted on above-ground storage reservoirs. Mount the cameras high enough to be out of pedestrian reach.

7.6.I.6 Lighting

The Site shall have sufficient light for the cameras to be functional at night. Lighting shall comply with the *Physical Security Hardware Specifications* and requirements of the Authority Having Jurisdiction.

7.6.I.7 Oil Containing Items

If the facility is required to comply with the Oil Pollution Prevention regulations described within *40 CFR Part 112*, to prevent discharges that could result from unauthorized access to oil containing items with a capacity equal to or greater than 55 gallons, the facility must:

- Secure and control access to the oil handling, processing, and storage areas
- Secure master flow and drain valves
- Prevent unauthorized access to starter controls on oil pumps
- Secure out-of-service and loading / unloading connections of oil pipelines
- Have appropriate security lighting to both prevent acts of vandalism and assist in the discovery of oil discharges

7.6.J Structural

Structural design shall address walls, roof, foundation, and other structural components of the building enclosure as well as pump supports and foundations. Reference applicable standards from the American Concrete Institute (ACI), the American Institute of Steel Construction (AISC), The Masonry Society (TMS), and others as needed for a complete and acceptable design.

7.6.J.1 Loads

Design loads, including, but not limited to, dead, live, hydraulic, soil, wind, impact, and seismic loads, shall be determined by applicable local codes and accepted engineering practice. Design loads for the Structure shall be evaluated and determined by the Design Engineer and Colorado Springs Utilities for each significant portion of the facility, but shall not be less than those specified by the local code or *ASCE 7, Minimum Design Loads for*

Buildings for the specific Site, building height, and applicable exposure category.

Where available, Site-specific data, such as wind gust or snow load data, may govern over minimum code values. The Design Engineer must evaluate and design against loads for floors and platforms that may differ from *ASCE 7* and local codes.

7.6.J.2 Structure and Equipment Foundations

Concrete shall have a minimum compressive strength of 4,000 psi and rebar shall have yield strength of 60 ksi.

The foundation shall be designed in accordance with the findings and design recommendations of the *Geotechnical Hazards Study* including, but not limited to, foundation type, allowable bearing pressure, subgrade modulus, and liquefaction potential.

The Design Engineer shall reference *ACI 350.4R, Design Considerations for Environmental Engineering Concrete Structures* for design guidance. Allowable deflections within the Structure shall be evaluated and determined by the Design Engineer and Colorado Springs Utilities for each significant portion of the facility.

The Design Engineer shall reference *ACI 351.3R, Foundations for Dynamic Equipment* for design guidance. Provide isolation joints as required to limit transmission of vibrations to other parts of the Structure.

Bolts that anchor equipment to concrete foundations need to be designed for shear and tension loads due to all loading combinations. Equipment anchors shall be designed in accordance with *ACI 318 Appendix D-Anchorage to Concrete* and shall be cast in place. The concrete base must provide adequate edge distance and depth for the anchors to be installed.

Individual pumps with a horsepower rating of 500 or more require a detailed Finite Element Analysis to estimate the natural frequency of the foundation system for the pumping equipment, as well as to evaluate dynamic vibration response. The Finite Element Analysis shall bear the seal of the Professional Engineer in responsible charge.

The ratio of natural frequency of the foundation system for the pumping equipment to the operating frequency of the equipment shall be below 0.5 "low-tuned" or above 1.5 "high-tuned." The ratio should remain outside of the range of 0.5 to 1.5 to minimize resonant vibrations and provide protection against structural and mechanical deterioration of the foundation and equipment. "High-tuned" foundations are preferable to "low-tuned" foundations. For additional information see Section 7.6.M.2 below.

7.6.J.3 Cranes and Hoists

The Design Engineer shall reference and incorporate the requirements of the Crane Manufacturers Association of America and the Hoist

Manufacturers Institute when designing cranes and hoists for the pump station.

Incorporate a permanent bridge crane and hoist able to lift the heaviest assembled pump, motor, equipment, or valve plus a 10% safety factor. Vertical, transverse, and longitudinal impact loads during operation of the crane and hoist shall be evaluated when determining structural loads. When the primary crane has a 5 ton capacity or more, a secondary jockey unit shall be installed with a capacity of 20% of the primary crane. The crane shall be integrated into the structural and architectural design as required.

If a permanent crane is not included in the design, roof hatches, or access spaces for removal of pumps and valves with a portable crane is required. If a permanent bridge crane cannot be used, other lifting devices, such as monorail hoists, jib cranes, trolleys, or lifting eye bolts must be considered for movement of heavy equipment. Lifting devices for heavy items shall also be integrated into the design of Vaults.

All cranes and lifting devices shall be load tested at their rated loads before final acceptance. If cranes or lifting devices are used for Construction to assist with Construction activities, they must be recertified prior to final acceptance.

Wireless remote controllers for the bridge cranes, trolleys, and hoists are required.

Adequate clear height inside the building shall be designed to allow for the largest piece of equipment to be moved through the pump station and loaded onto a truck bed. Adequate mobility and horizontal space shall also be designed to ensure the lifting device can reach and move the proper pieces of equipment.

7.6.K Architectural

7.6.K.1 Visual Aesthetics

Design shall incorporate Site-specific measures to minimize a Project's visual impacts. To the extent feasible, the design and location of above-ground Structures shall minimize potential visual effects and the permanent blockage of views from surrounding Public and Private perspectives.

A Project's visual impacts vary depending on the nature of the Project and the natural or aesthetic importance of the existing landscape. In general, aesthetic impacts shall be minimized through the following measures:

- Ensuring that architectural details incorporate materials that blend with the existing environment and Structures
- Incorporating surface painting or concrete staining and/or coloring to tint and match the colors of surrounding environments or Structures
- Incorporating cut-and-fill techniques that include rough and feathering cuts

- Using earthen berms, when appropriate, to reduce visual impact on viewsheds and adjacent communities
- Incorporating landscape elements such as large boulders and vegetative planting
- Limiting the use of artificial outdoor lighting to safety and security requirements and directing light toward objects requiring illumination

7.6.K.2 Architectural Program

The design of the pump station shall include an architectural program, developed in cooperation with the appropriate project representatives to facilitate discussion and document all decisions regarding various spaces within the pump station. The program may include some or all of the following spaces, depending on specific Site needs:

- Pump Room
- Electrical Room
- Control Room
- Communications Room
- HVAC Room
- Restroom
- Maintenance Area
- Battery Area/Room
- Chemical Area/Room
- Space for equipment dismantling, repair, etc.

7.6.K.3 Truck Bay and Rollup Door

A truck bay shall be incorporated in the design and sized to accommodate a service truck capable of carrying the largest single piece of pump station equipment. A roll-up door shall be included with sufficient clearance to remove and replace the largest single piece of pump station equipment. The design and layout of the truck bay and roll-up door shall allow lifting the equipment from operating position onto a service truck by use of the crane and hoist.

7.6.K.4 Roof Design

Roof drains shall be designed per the architectural requirements of the Project. The roof shall shed rain and snow away from the main entrances or doorways of the pump station. Roof shall hold photovoltaic cell panels, meeting City Standards.

7.6.K.5 Building Materials

Finishes shall be selected for long-term durability, appearance, economy, and sustainability. Finishes requiring minimal ongoing maintenance shall be given preference to those requiring periodic cleaning, waxing, or other maintenance activity.

Within pump rooms, wall finishes within 3 feet of the finished floor shall be resistant to damage from impact during pump maintenance activities or periodically wetted environments. Examples of acceptable material include reinforced concrete or concrete masonry units.

Interior partitions and wall finishes shall offer a moderate degree of impact resistance and be capable of low-cost field repairs over the life cycle of the building.

The selected roofing system shall be architecturally appropriate for the Site, and deliver an expected service life before replacement of no less than 30 years.

The building's exterior wall design and materials shall be architecturally and aesthetically appropriate for the Site, and deliver an expected service life before replacement of no less than 30 years.

7.6.K.6 Lighting

Electric lighting shall meet or exceed minimum efficiencies specified by the *Pikes Peak Regional Building Code* and the currently-adopted *International Energy Conservation Code*. For pump stations outside of El Paso County, the lighting shall meet or exceed the more stringent of the codes adopted by the Authority Having Jurisdiction or those specified above. Preference shall be given to high-efficiency lighting systems with minimal maintenance and environmental disposal requirements. Illumination shall be a minimum of:

- Control Area: 40 ft-candles
- Pump Room: 30 ft-candles
- Vaults: 20 ft-candles

Interior lighting shall be placed to minimize horizontal transmittance through glazing or other openings to the building exterior and to neighboring properties.

Where security considerations allow, daytime illumination shall be incorporated in the pump room, control room, and restrooms through the use of clerestory windows or other similar architectural elements. Penetrations through the roof shall be minimized.

Exterior lighting shall be provided by full cut-off ("dark sky") luminaires, placed to minimize glare into security cameras and to minimize light cast onto neighboring properties. Exterior illumination levels shall be limited to the illuminance levels required for the intended purpose as defined in the current edition of *The Lighting Handbook* published by the Illuminating Engineering Society (IES).

7.6.L Mechanical

7.6.L.1 HVAC

The Design Engineer shall:

- Observe design criteria pertinent to the Site altitude and ASHRAE weather data for Project location (summer 1% Dry Bulb temperature)
- Design for a maximum of 95º F in the summer and a minimum of 55º F in the winter in the pump room

- Design for a maximum of 85º F in the summer and a minimum of 50º F in the winter; maintaining less than 85% relative humidity, in the electrical room
- Design for a maximum of 74º F in the summer and a minimum of 70º F in the winter in the communication and/or control room
- Design ventilation to meet 6 air changes per hour based on the volume of pump room
- Design ventilation system to be operated via thermostatic control with Hand-Off-Auto switch
- Design all ventilation systems with a minimum of 30% efficient filters/filter media, including any louvers used for ventilation make-up air
- Equip all louvers/make-up air systems with motor actuated dampers controlled by the thermostatic call for ventilation
- Limit maximum ventilation fan noise load at 1 meter to 85 dBA
- Recommend whether to use mechanical cooling, based on the sensible load present in the space

7.6.L.2 Plumbing

The Design Engineer shall:

- Design a Potable Water Service Line to the Site (where available) with a Water Service meter for pump station Potable Water usage, see Section 2.6.H.10 for details
- Design minimum ¾-inch piping up to the second to last fixture
- Design emergency eye wash and shower equipment (with Potable Water) to meet OSHA requirements
- Recommend a means for Potable drinking water and eye wash stations where Potable Water is unavailable or cost prohibitive
- Design hose bibs inside and outside the facility so that all work areas can be washed down with a 50-foot hose
- Design each hose bib with a back flow preventer
- Design floor drains for wash-down per *International Plumbing Code* with all drains routed through an oil/water separator then to a sanitary sewer or an appropriate discharge as required by the Authority Having Jurisdiction
- Design a restroom within the pump station or, where a sanitary sewer connection is unavailable or cost prohibitive, an alternative restroom such as an incinerating toilet or septic system
- All piping subject to freezing shall be thermally insulated and/or heat traced

7.6.L.3 Cross Connections

Cross connections between Potable Water and Nonpotable Water, chemicals, or fluids used in mechanical and/or service processes of the pump station are prohibited. Refer to Section 2.7.N for more information regarding cross connection control.

7.6.M Pumps

Pumping Systems shall meet or exceed applicable guidelines and standards by the Hydraulic Institute (HI).

All pump materials and coatings shall be compatible with the service liquid to provide corrosion, wear, and cavitation resistance. All gaskets and elastomeric materials exposed to chloraminated or ozonated water shall be Teflon or equivalent material resistant to chloramines and ozone. Bronze and brass materials shall meet the requirements of the *Reduction of Lead in Drinking Water Act*.

7.6.M.1 Pump Operating and System Head Curves

The Design Engineer shall:

- Plot system head curve for initial and future conditions using friction factors for new and old pipe
- Determine the operating range of the pump along the system head curve
- Specify pump operating point (operating flow at the required head) with 5% margin to allow for loss of operating capacity from pump wear and increased pipe friction
- Select a pump that operates in an acceptable operating range of total dynamic head conditions
- Establish the estimated flow and head for which the pumps are expected to operate most of the time
- Not oversize the pump to the extent that the pump operates at a lower efficiency point during standard operation
- Specify acceptance performance test grade 1U per *ANSI/HI 14.6* to prevent over-sizing pumps
- Optimize pump efficiency by selecting the pumps so that their best efficiency is at/or near the operating point for which they are expected to operate most of the time
- If operating point is not located at the best efficiency point, locate it to the right of the best efficiency point
- Select motors to be non-overloading throughout the pump curve
- Avoid pumps with a “flat” curve or a “dip” located along the operating range of the pump curve where a small change in total dynamic head results in a large change in pump flow

7.6.M.2 Pump Vibration

Colorado Springs Utilities has a vibration monitoring program in place to monitor pump stations in the Water System. The Design Engineer shall dictate the acceptable vibration parameters for each pump type in the Contract Documents. Vibration maximum limits shall be equal to or less than the limits set by the standards of *ANSI/HI 9.6.4*, American Petroleum Institute in *API 610*, and International Organization for Standardization in *ISO 10816*. Parameters shall include displacement (measured in mils, peak to peak), velocity (measured in inches-per-second, peak), and acceleration (measured in g, peak). The data collected by Colorado Springs Utilities or its vibration consultant shall be in a format that can be uploaded into its SKF @ptitude Analyst database.

To minimize vibration and resonance, the Design Engineer shall design sufficient mass in the mounting pedestal.

Individual pumps with a horsepower rating of 500 or more, or pumps in remote locations, may require a continuous vibration monitoring system. SKF Multilog DMx shall be acceptable, no equals. The design shall indicate the number and location of vibration transducers on each pump and motor.

7.6.M.3 Cavitation

To prevent cavitation, the Design Engineer shall:

- Design suction and discharge configurations per HI standards
- Minimize air entrainment to the pump suction
- Design minimum upstream and downstream pipe lengths to meet the requirements set forth by the pump manufacturer and accepted practices
- Operate pumps within its preferred operating range (POR) for continuous operation and within allowable operating range (AOR) for intermittent operation
- Select a pump that operates within a stable operating range on its operating curves
- Use HI standards or requirements from the pump manufacturer for allowable margins between NPSH required and NPSH available and select a pump where NPSH available is greater than the NPSH required at maximum speed conditions

7.6.M.4 Pumping Unit Procurement

Pumping units, which include pumps, motors, starter, drive, and appurtenances, shall be furnished by a single Supplier responsible for manufacturing, factory testing, delivery, and assisting with field installation, field testing, and certification of the pumping units.

In certain applications Colorado Springs Utilities may require specific procurement requirements. In such instances these requirements will be detailed in the Contract Documents.

7.6.M.5 Horizontal Split Case Pumps

Horizontal split case pumps 500 horsepower and less shall have the features listed below. Horizontal split case pumps larger than 500 horsepower will have additional requirements.

- Acceptable manufacturers include Peerless, Aurora, Goulds, Fairbanks Nijhuis, or approved equal. Manufacturer shall be licensed to manufacture and distribute in the USA.
- Casing: Enclosed double suction, double volute, cast iron (or ductile iron when necessary to accommodate higher pressures). All water passages of cast iron and ductile iron material shall be fusion bonded epoxy coated with minimum thickness of 10-12 mils Dry Film Thickness (DFT).
- Impeller: Hand finished, statically and dynamically balanced to *ISO 1940,* balance quality grade G2.5 or better and keyed to shaft. Impeller shall be stainless steel, nickel aluminum bronze, or approved equal.

- Wearing Rings: For stainless steel impeller material use renewable wear rings made of Nitronic 60 on the casing and 316 stainless steel on the impeller. For bronze impeller, use hardened zero lead content bronze for both casing and impeller wear rings with a hardness number difference of at least 50 Brinnell Hardness (BHN) to prevent galling, or approved equal. Non-metallic wearing rings will be considered if they meet the requirements of NSF 61.
- Shaft: 17-4PH stainless steel, machined and ground, designed for total indicated runout not to exceed 0.002 inches measured at the mechanical seal journal.
- Shaft Sleeve: Type 316 stainless steel sealed to shaft to prevent leakage.
- Bearings: Heavy-duty grease lubricated ball type double row thrust bearings. Minimum L-10 life 100,000 hours per American Bearing Manufactures Association. Grease bearings are preferred.
- Mechanical Seals: Chesterton 442 Split Seals only, no substitutions. For Raw Water applications, include the EnviroSeal SpiralTrac by Chesterton.
- Shaft Coupling: Heavy-duty flexible type with safety guards designed in accordance with OSHA requirements. Falk gear couplings are preferred. Supply fixed coupling guard with mechanical attachment to base.
- Base: Heavy cast-iron or steel base, with integral rim or pan and drain. Grout material shall be non-shrink epoxy grout. Grout shall be applied between the underside of the pump base and the concrete foundation with coverage greater than 95%.
- Pump shall be hydrostatic tested to 150% of the maximum shut-off head for a minimum of 10 minutes.

7.6.M.6 Vertical Turbine Pumps

Vertical turbine pumps 500 horsepower and less shall have the features listed below. Vertical turbine pumps larger than 500 horsepower will have additional requirements.

- Acceptable manufacturers include Weir Floway, Sulzer, Fairbanks Nijhuis, Ebara, or approved equal. Manufacturer shall be licensed to manufacture and distribute in the USA.
- Barrel or Can: Steel with 10 to 12 mils DFT epoxy lining internally and externally. Concrete-encased where applicable. Designed to support the unit without vibration at any operating speed. Vortex suppression must be evaluated for each pump. Barrel or can shall be supplied by the pump manufacturer and shall be compliant with the most recent version of *ANSI/HI 9.8*.
- Column Pipe: Minimum Schedule 30 steel pipe with epoxy lining and coating.
- Discharge Head and Discharge Elbow: Fabricated steel with epoxy lining and coating.
- Bowls: Cast iron (or ductile iron when necessary to accommodate pressures) with minimum thickness of 10-12 mils DFT fusion bonded epoxy coated) water passages.

- Impellers: Enclosed, statically, and dynamically balanced to *ISO 1940* balance quality grade G2.5 or better. Impeller shall be cast bronze, stainless steel or approved equal.
- Shaft: 17-4PH or 416 stainless steel with maximum section lengths of 10 feet designed for total indicated runout not to exceed 0.002 inches over the ten foot length. Flanged connections are preferred between shaft sections.
- Shaft Couplings: Type 304 stainless steel. Coupling shall be threaded or keyed to shaft.
- Wearing Rings: For stainless steel impeller material use renewable wear rings made of Nitronic 60 on the bowls and 316 stainless steel on the impeller. For bronze impeller, use hardened zero lead content bronze for both casing and impeller wear rings with a hardness number difference of at least 50 Brinnell Hardness (BHN) to prevent galling, or approved equal. Non-metallic wearing rings will be considered if they meet the requirements of NSF 61.
- Mechanical Seals: Chesterton 442 Split Seals only, no substitutions. For Raw Water applications, include the EnviroSeal SpiralTrac by Chesterton to prevent solids from entering the seal cavity.
- Bearings: Heavy-duty grease lubricated ball type or angle contact roller bearings. Minimum L-10 life 100,000 hours per American Bearing Manufactures Association. Grease bearings are preferred.
- If hollow shaft is used, the pump motor coupling shall allow for adjustment of the pump impeller at the upper end of the motor. If solid shaft is used, the pump motor coupling shall allow for adjustment of the pump impeller at the adjusting nut located on top of the motor.
- The vertical turbine pump discharge head, sole plate, column, and cans shall be supplied by a single pump manufacturer as a package.

7.6.M.7 Standby and Fire Pumps

All pumping stations shall meet the firm capacity required with the largest pump out of service, excluding the fire pump.

Fire pumps shall be required in pump stations where water storage in the pressure zone and/or the regular pumping units are not sufficient for firefighting needs, which will be determined by Colorado Springs Utilities. Fire pumps shall meet NFPA requirements.

7.6.N Piping and Appurtenances

All material in contact with Potable Water shall comply with *NSF/ANSI Standard 61,* and the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division's *Design Criteria for Potable Water Systems*.

7.6.N.1 Process Piping Pipelines

This section covers process piping. For yard piping design, CHAPTER 2 Development and Design of Water Systems, CHAPTER 5 Construction Practices, and CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies requirements apply with the exceptions noted here:

The suction and discharge piping shall be sized for current and future flows. The manifolds shall be configured to accommodate future flows without having to take the pump station out of service when expansion is required. The pipe sizing and layout should minimize friction head loss and avoid air entrainment and siphoning. Piping lengths shall be short enough to remove pipe from the pump station using the crane or lifting equipment included in the design.

Exposed piping and appurtenances shall be coated in the appropriate color to indicate Raw Water, Potable Water, Reclaimed Water, building drain, sewerage, chemical piping, and others as applicable per CDPHE Water Quality Control Division's *Design Criteria for Potable Water Systems*. Flow direction shall be indicated on the piping.

The discharge piping shall be pressure rated for the greatest of:

- Maximum pump shut-off pressure
- Test pressure
- Surge pressure

The maximum pump shut-off pressure is defined as the pump shutoff head at maximum rated speed under zero flow conditions with the maximum possible pump suction pressure. The test pressure is defined as 1.25 times the maximum working pressure. Surge pressure is defined as the maximum resultant pressure generated by a power failure condition with all pumps operating at maximum rated speed (including the spare pump) under maximum flow conditions.

Piping under Structures shall be welded steel encased in concrete or controlled low-strength material (maximum compressive strength of 250 psi) for a minimum of 5 feet beyond the outside edge of the building footprint to avoid differential settlement around entry/exit piping. Use flexible joints as necessary to accommodate anticipated settlement. The steel piping shall be designed in accordance with *AWWA M11*. Coating of the pipes shall be consistent with the cathodic protection system in use. At no time shall rebar be in contact with any part of the piping.

Under special circumstances, a relief/bypass line may be required to recirculate discharge water to the suction manifold. This line can also be used to recirculate fire pump test flows. The bypass line shall include an Isolation Valve, a pressure relief valve by Cla-Val followed by a vacuum relief valve, flow meter, and Isolation Valve.

7.6.N.2 Flow Meters

The Design Engineer shall locate at least 1 magnetic flow meter for each transmission line leaving the pump station Site. Location of the flow meter shall be chosen to optimize accuracy according to the manufacturer's installation instructions. Select and size the flow meter to accurately measure the minimum and maximum flows through the pump station at initial and future conditions.

The flow meter shall be accessible for operations and maintenance. In case the flow meter must be removed for maintenance or replacement, design a bypass around the flow meter or a pipe spool piece to limit the amount of time that the station is out of service, see Detail Drawing A6-11.

7.6.N.3 Pressure Gauges and Pressure Transmitters

At a minimum, pressure gauges and instruments for transmitting pressures to SCADA shall be located at the:

- Suction and discharge sides of each pump
- Pump seal water line, when applicable
- Discharge header
- Upstream and downstream sides of a Raw Water strainer
- On a storage tank or reservoir for liquid level
- Chemical injection devices, as applicable

The Design Engineer shall specify a compound pressure gauge (combination vacuum and pressure) on the suction piping and a regular pressure gauge on the discharge pipe of each pump installed. Gauges shall be 4.5-inch diameter glycerin-filled. Gauges shall be mounted using flexible hose and tubing on a separate stand to dampen equipment mechanical vibration. Gauges shall have a built-in safety plug for blowout protection in an overpressure condition. Each gauge should include the following:

- Stainless steel nipple
- Corporation Stop
- Isolation ball valve
- Air release cock
- Stainless steel pulsation snubber

7.6.N.4 Air Release and Vacuum Relief Valves

Combination air release and vacuum relief valves (ARVs) shall be installed at high points in the process piping, yard piping, and other critical locations, see Detail Drawings A6-9 and A6-10.

Each pipeline train shall have at least 1 ARV sized for that pipeline's flow. Each ARV shall be equipped with a stainless steel nipple, Isolation Valve, and union to allow easy removal for maintenance.

Additional air release and/or vacuum relief valves shall be installed where determined to be necessary by surge analysis. See Section 4.4.I for acceptable manufacturers.

7.6.N.5 Drain Valves

Blow-offs shall be installed at low points of the yard piping and shall discharge to washes, storm drains, or roadways. See Detail Drawings A2-4 through A2-8.

The design shall include a capped ball valve on the suction and discharge side of each pump to drain pumps and check for residual pressure during maintenance prior to opening fittings. Stainless steel or brass materials are acceptable.

7.6.N.6 Pump Control Valves

Unless a VFD is used with the pump, each pipeline train shall have a pump discharge control valve that is coupled with the pump motor start and is equipped with a manual bypass that is pressure rated to accommodate the highest pressure expected in the system. Acceptable manufacturers of pump discharge control valves include Cla-Val or approved equal. The valve shall have a stainless steel seat. All opening and closing times shall be adjustable to accommodate the recommended times from the final surge analysis.

If a VFD is used with the pump, each pipeline train shall have a counter-weighted check valve.

7.6.N.7 Isolation Valves

Isolation Valves shall be designed for use under the highest pressure expected in the piping system. Each pipeline train shall have an inlet and discharge Isolation Valve with wheel operator. The valves shall isolate the train for removal of the pump and control valve without requiring shut down of the entire pump station.

The entire pump station shall have Isolation Valves located on the suction and discharge piping to isolate the pump station facility and buried manifolds for maintenance. The valves may be located inside the pump station on the suction and discharge manifolds or outside the pump station.

If a tank is located on the Site, its inlet and outlet piping shall have Isolation Valves to isolate the tank from the pump station and the distribution system.

Isolation Valves shall also be located where any system or piece of equipment requires bypassing.

7.6.N.8 Valve Actuators

Rotork actuators with limit switches shall be specified. If a valve is remotely actuated, it must also have a manual actuator. Because of maintenance difficulties, pneumatic valve actuators using air compressors shall not be used.

7.6.N.9 Surge Control

Surge control is required to mitigate hydraulic transients as recommended by the final surge analysis. Relief to other parts of the system shall be the preferred method of surge control.

7.6.N.10 Pipe Supports and Restraints

Construction Drawings shall indicate location, type, and size of pipe supports and restraints. Supports shall be designed and located such that no force or stress from the connected piping is exerted on the pumps. All piping joints and thrust restraints shall withstand the maximum anticipated surge

pressure. Pipe supports must be designed to minimize abrasion and corrosion and allow for expansion/contraction. Seismic supports shall be incorporated, as necessary.

7.6.N.11 Strainers and Filters

Strainers and filters shall be included in the design as necessary to protect all equipment and facilities within the pump station.

7.6.O Electrical, Instrumentation, and Controls

Colorado Springs Utilities Water Instrumentation and Control has developed *Standard Requirements for Instrumentation, Control, and Electrical (SRICE) for Pumping Stations*, which documents additional standards. The Design Engineer shall coordinate with Colorado Springs Utilities to develop Instrumentation and Controls Specifications for each lift station. This document is available upon request. Further, electrical standards are documented in the *Electric Line Extension and Service Standards* available at Colorado Springs Utilities' website (www.csu.org). In addition, the following design requirements described below shall apply to pump station design.

7.6.O.1 Electrical Area or Room

The electrical area, room, or equipment shall be elevated at least 4 inches above the pump room floor to provide positive drainage in the event of a pipe failure. If there is a separate electrical room, it shall have a window in the wall between the pump room and the electrical room for safety and to view pump operation. A 7-kW photovoltaic system shall be incorporated into the electrical design, meeting City requirements for new construction.

7.6.O.2 Electric Service Metering

An electric service meter shall be installed for pump station electric usage. Refer to Colorado Springs Utilities *Electric Line Extension and Service Standards* for pump station Sites within its service territory. If the pump station is located outside the Colorado Springs Utilities service territory, arrange for electric service with the appropriate electric service provider.

7.6.O.3 Pump Motors

The pump motor shall meet the following requirements:

- Acceptable pump motor manufacturers include Hyundai-Ideal, Nidec-USEM, ABB, Siemens, TECO, WEG, GE, or approved equal
- Energy efficiency shall meet or exceed the requirements for National Electrical Manufacturers Association (NEMA) premium efficient motors and the manufacturer shall submit a certified statement of motor efficiencies
- Nameplate horsepower shall exceed the maximum horsepower required by the pump under all operating conditions
- The motor specified should operate in a range within 90% to 100% of its rated power for best efficiency
- Maximum rotational speed shall be 1800 rpm
- Rated for 10 starts per hour

- Service factor of 1.15 at installed Site conditions for pumps with a horsepower rating of 500 or less, larger pumps will have a project-specific service factor
- Temperature rise that does not exceed Class B rise at full load under the installed Site conditions
- Underwriter's Laboratory (UL) or Factory Mutual (FM) rating
- Cast iron frame or welded heavy plate steel box frame Construction
- Copper windings shall be acceptable, aluminum windings shall not be acceptable
- Completely sealed insulation system consisting of Class F materials
- Heavy-duty 100,000 hour rated bearings
- If bearings are oil lubricated, incorporate a visual oil level indicator
- Condensate drain openings and breathers to allow removal of accumulated moisture from enclosures
- Lockout to keep motor from starting when pump is running in reverse or antireverse rotation ratchet
- Resistance Temperature Detectors (RTDs) shall be installed on all motors with a horsepower rating of 200 or more

7.6.O.4 Variable Frequency Drives and Soft Starters

The pump motor may be either constant speed or equipped with a soft start or variable frequency drive (VFD). The Design Engineer shall make a recommendation during the value engineering workshop based on operational needs, capital costs, and operational and maintenance costs. Colorado Springs Utilities prefers to use Allen Bradley-Rockwell Automation VFDs.

If the motor is VFD driven, the design shall include AEGIS® bearing protection rings, VFD rated cables, and a motor that is rated for inverter duty. Soft starts and VFDs shall have a manual bypass connection to allow manual motor start operation (full voltage and constant speed motor operation). They shall also be compatible with the motor selected.

VFDs shall vent to the exterior of the pump station and shall be screened to prevent rodent entry. Supplier shall ship VFDs with multi-axis accelerometer. Pumping unit Supplier shall submit shipping performance plan for approval prior to shipment and provide final accelerometer test reports to Colorado Springs Utilities for delivery acceptance.

7.6.O.5 Backup Power

For critical pump stations, as determined by Colorado Springs Utilities or another Authority Having Jurisdiction, secondary power or backup power generation is required.

The Design Engineer shall size the generator and engine based on emergency pump station loading and starting requirements, given the characteristics of the generator and engine. The generator shall be de-rated 3% for each 1,000 feet of elevation above 3,000 feet mean sea level. At a minimum, generators shall be sized for the largest pump or combination of

pumps capable of meeting average day flows and required ancillary equipment.

The backup generator and accessories shall be selected to comply with applicable noise ordinances established by the Authority Having Jurisdiction. Where adjacent to existing or future Residential properties, use a "hospital grade" muffler and size generator appropriately for increased exhaust backpressure.

The backup generator shall comply with applicable state and federal requirements.

Backup power generators shall be diesel powered. Generators shall be equipped with fuel to operate for 24 hours without refueling. Generator fuel tanks must be designed and permitted in accordance with the Colorado Department of Labor and Employment, Division of Oil and Public Safety's *Underground Storage Tanks and Aboveground Storage Tanks (7 CCR 1101-14)* and the local fire code.

If a backup generator is not included in the design, incorporate a transfer switch for connection of a portable generator.

The systems requiring uninterruptible power supply shall include, but not be limited to:

- Security systems
- SCADA
- Emergency Lighting
- Other critical systems as determined by Colorado Springs Utilities or the Authority Having Jurisdiction

7.6.O.6 Raceways

Conduit inside the pump station for electric, instrumentation and control wiring shall be no smaller than ¾-inch galvanized rigid steel conduit (GRC). It shall be installed and supported per *National Electric Code (NEC)* requirements. Schedule 40 PVC shall be used for underground duct banks or conduits through concrete.

7.6.O.7 Telecommunications

The telecommunication network and services developed for the pump station shall support supervisory control and data acquisition (SCADA), corporate computing devices, telephones, and physical security systems.

Physical network infrastructure may include copper cabling, fiber optic cabling, and wireless/radio links. Physical network infrastructure shall be owned and operated by Colorado Springs Utilities after acceptance of the Project.

Given that each pump station Project is unique, Colorado Springs Utilities Information Technology Services staff shall be consulted early in the design process to help identify specific telecommunication requirements.

7.6.P Chemical Systems

All chemical additives that come in contact with the Potable Water shall comply with *NSF/ANSI Standard 60* and Colorado Department of Public Health and Environment (CDPHE) regulations.

7.6.P.1 Post Chlorination Chemical Processes

In parts of the Potable Water Distribution System where low chlorine residual is possible, an injection point may be installed for calcium hypochlorite, sodium hypochlorite, or chlorine dioxide. Chlorine gas is prohibited at pump stations in the Potable Water Distribution System.

Within Raw Water pump stations, a potassium permanganate injection system could be installed to eliminate mussel growth and contamination. Other chemicals recommended for injection to the pumped water shall be considered on a case by case basis. Colorado Springs Utilities will review and approve any chemicals proposed for use within the Water System.

Each injection point shall have an active and a standby chemical feed pump. The chemical feed pumps, dosage amount, and number of injection points shall be designed based on the minimum and maximum flows through the pump station.

7.6.P.2 Chemical Storage

Chemical storage shall comply with federal, state, and local regulations established by the Authority Having Jurisdiction.

Calcium hypochlorite, sodium hypochlorite, or chlorine dioxide shall be stored in approved chemical storage containers appropriate for each disinfectant. Specific chemical hazards unique to each disinfectant shall be mitigated on an individual basis.

Storage of potassium permanganate shall be in compliance with the *International Building and Fire Codes* in regards to shared wall fire ratings, sprinkler systems, secondary containment, ventilation system, etc. Potassium permanganate is classified as a Class 2 oxidizer and a corrosive.

Size the stored capacity for approximately 1 month of the average chemical dose unless chemical shelf life dictates otherwise. Provisions shall be made for measuring the quantities of chemicals used.

7.6.P.3 Chemical Containment

Chemical storage, handling, and delivery areas shall have containment for accidental spills or overflows. Chemicals shall not enter the storm drain or sewer. Secondary containment of chemicals shall be in compliance with all applicable codes and regulations of the Authority Having Jurisdiction.

7.6.P.4 Water Quality and Chemical Analyzers

Colorado Springs Utilities will determine how each additive will be monitored and recorded.

7.6.Q Oil and Petroleum

Oil and petroleum storage shall comply with federal, state, and local regulations established by the Authority Having Jurisdiction. The following are additional items for general consideration:

- Compatibility of container, piping, and related components (elbows, couplings, unions, valves, fittings, epoxies) with the liquid stored and the conditions of storage
- Overfill prevention devices / alarms
- Separation and barriers with non-compatible or reactive materials / liquids
- Protection from vehicle impact, static build-up, and lightning
- Security of controls and valves, etc.
- Warning signage cautioning vehicles of aboveground piping
- Labeling of container and piping
- Ventilation of storage and use areas
- Proximity of eyewash stations and safety showers

7.6.Q.1 Oil and Petroleum Containment

Oil and petroleum containers, piping, and loading / unloading areas shall have containment to prevent an overfill, spill, and/or leak from entering a waterway, associated conveyance (i.e., storm drain), or sanitary drain. Containment capacities should consider fire suppression and precipitation.

7.6.R Water Storage

Water storage shall comply with CDPHE regulations and these additional requirements. Tanks in operation with pump stations shall have:

- Bypass piping and Isolation Valves to permit operation of the pump station while the tank is out of service
- A 10-foot wide minimum clear area around the tank for vehicular access and turnaround
- Sampling ports or hatches to test Water Quality per Colorado Springs Utilities and/or CDPHE requirements
- All water storage tanks shall have level indicating devices, type to be determined by Colorado Springs Utilities
- Chemical injection points, when required, shall be equipped with locking covers Hydropneumatic tanks shall be equipped with a Site glass on the tank

7.6.S Corrosion Protection

The Design Engineer shall assess the corrosivity of the Site and design a cathodic protection system appropriate for the protection of the above and below ground facilities.

7.7 Construction and Inspection of Pump Stations

Construction shall be in accordance with generally accepted construction practices in addition to the requirements in Chapter 5. Utilities shall inspect lift station and force main infrastructure based upon the design and construction specifications and the requirements of Chapter 5.

7.8 Pump Station Commissioning and Startup

Construction shall not be considered substantially complete until the commissioning and startup of the pump station is complete. Commissioning and startup shall include the following processes:

1. Factory Testing
2. Commissioning
3. Startup
4. Training

The Contractor shall submit a commissioning and startup plan, which finalizes the procedures outlined in the Contract Documents. The plan shall be a compilation of detailed factory and field testing plans, equipment, pump station, and system performance testing procedures, testing documentation forms, check lists, schedules, and all other information necessary to describe and document all of the commissioning and startup activities. Final test reports shall be submitted upon successful completion of each test.

7.8.A Factory Testing

Colorado Springs Utilities personnel shall witness all factory testing of individual pumps determined to be critically important. If the testing and startup schedule changes, Colorado Springs Utilities shall have at least 3 weeks' notice.

The Contractor or manufacturer must prepare a factory test plan for each item or system that is required to be factory tested. The plan shall include detailed step-by-step procedures describing how the test will be conducted and shall be delivered to Colorado Springs Utilities prior to testing. Test documentation and acceptance records shall be submitted upon successful completion of the testing.

7.8.A.1 Pumps

Factory pump tests shall be conducted in accordance with the latest issue of the Hydraulic Institute (HI) standards. Acceptance criteria shall be 1U as defined by the Hydraulic Institute Standards. The following specific tests and inspections shall be performed at a minimum:

- Hydrostatic test
- Hydraulic test with minimum of 7 readings between shutoff head and 110% of best efficiency point, recorded on data sheets as defined by HI, signed, dated, and certified
- Certified test logs and pump curves showing head/flow, bhp, efficiency, actual NPSH required curves
- Certification that the pump horsepower demand shall not exceed the rated motor horsepower beyond the 1.0 service rating at any point on the curve
- Certified factory power cost, when required
- Vibration measurements at all conditions tested during the factory tests

Calculated NPSH required may be accepted at the option of Colorado Springs Utilities. Actual NPSH required curves shall be within 10% of the published data as required by *API 610*. Pumps with actual NPSH required curves that do not meet this standard shall not be accepted. Pump curves shall be certified by a registered Professional Engineer or company officer.

Vibration levels shall comply with factory test requirements of HI standards.

If any pump tested fails to meet any Specification requirement it shall be modified until it meets all requirements. If any pump tested fails to meet the efficiency requirements of the Contract Documents and all reasonable attempts to correct the inefficiency are unsuccessful, the pump(s) shall be replaced with a unit(s) that meets the specified requirements.

7.8.A.2 Motors

Each motor shall be tested per National Electrical Manufacturers Association (NEMA) and ANSI standards to determine that it is free from mechanical and electrical defects. Pump manufacturer shall submit a certification to the Utility that the VFD and the motor are capable of starting and accelerating the pumping assembly throughout the operating range of the pump. The results of each test shall be submitted to Colorado Springs Utilities. Tests shall be performed in accordance with *Institute of Electrical and Electronics Engineers (IEEE) 112*, and include:

- Winding resistance
- Polarity of field coils
- High-potential test on field and armature
- Measurement of air gap
- Current balance at no load
- No-load field current check at normal voltage and frequency

Additional testing in accordance with IEEE includes:

- Tests to establish motor efficiencies, including the determination of I-R losses, core losses, friction and windage losses, and stray load losses
- Tests to establish winding temperature rise by the embedded detector method, including a zero power factor heat run or open and short circuit heat runs
- Tests to establish starting characteristics such as starting and accelerating torque and current by the reduced voltage method
- Noise test
- Vibration test
- Record ambient and bearing temperature measurements

7.8.A.3 Process Control and Instrumentation Systems (PCIS)

Before shipment, the complete PCIS system shall be assembled, connected, and all software loaded for a fully functional factory acceptance test of the integrated system.

7.8.B Commissioning

Commissioning will be referred to as installation and functional testing in the field. The Contractor must complete all commissioning and shall demonstrate satisfactory operation and performance, without causing excessive noise, cavitation, vibration, leakage, overheating, or other operational deficiencies.

Commissioning plans shall be developed for, but not limited to, the following systems:

- Pumps
- Motors
- Electrical/Instrumentation
- Chemical systems (if used)
- Cathodic protection equipment

The plan shall include detailed step-by-step procedures describing how the test will be conducted. For tests requiring water, the plan shall also include water management procedures, i.e., how the pumps and piping will be isolated and filled for each of the tests, and how the water will be disposed of after the test.

7.8.B.1 Pumps

Vibration testing on each pump shall be performed by the Contractor to verify the actual natural frequency of the installed pumping units. Start up, check, and operate each pumping unit and pumping units in combination over the entire operational range.

Pump performance shall be documented by obtaining concurrent readings, showing motor voltage, amperage, pump suction head, and pump discharge head for at least 4 pumping conditions, including the most extreme conditions that could be encountered. Each power lead to the motor shall be checked for proper current balance. All instrumentation necessary to conduct the testing, other than vibration testing, shall be provided by the pump Supplier or factory certified service technician.

7.8.B.2 Motors

For commissioning motors:

- Perform insulation resistance tests in accordance with manufacturer's instructions
- Perform a phase rotation test to ensure proper shaft direction with load uncoupled
- Check all connections with wiring diagram prior to energizing
- Inspect for unusual mechanical or electrical noise or signs of overheating during initial test run
- Measure running current and evaluate relative to load conditions and nameplate full load amperes

If any motor fails during performance testing, the Contractor or manufacturer may make minor repairs and retest. If the unit requires major disassembly to repair, or is inoperable, the motor shall be rejected and the Contractor shall replace it with a new motor. If a motor fails to perform to the level demonstrated at the factory, but is otherwise operable, the rejected motor shall remain in place until the replacement motor has been delivered to the pump station Site.

7.8.B.3 Electrical/Instrumentation

The electrical and/or instrumentation Subcontractor shall certify:

- Motor control logic that resides in motor control centers, control panels, and circuit boards furnished by the electrical and/or instrumentation Subcontractor has been calibrated and tested and is properly operating
- Control logic for equipment startup, shutdown, sequencing, interlocks, and emergency shutdown has been tested and is properly operating

In addition to demonstrating correct operation of instrumentation and control systems, Contractor shall demonstrate how the systems react and recover from abnormal conditions, such as equipment failure, operator error, communications error, power failure, process equipment failure, and high system loading conditions.

Commissioning shall not be considered complete until all repairs and adjustments have been made and each piece of equipment is fully operational.

At completion of commissioning, the manufacturer's representatives shall furnish written reports, signed and certifying that each piece of equipment:

- Has been properly installed, adjusted, aligned, and lubricated
- Is free of any stresses imposed by connecting piping or anchor bolts
- Is suitable for satisfactory full-time operation under full load conditions
- Operates within the allowable limits of vibration
- Controls, protective devices, instrumentation, and control panels furnished as part of the equipment package are properly installed, calibrated, and functioning
- Control logic for startup, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are properly functioning

7.8.C Startup

Startup is the testing of the entire system operating together and shall commence upon successful completion of commissioning tests and once Contractor has supplied all required safety equipment, such as safety chains, handrails, gratings, safety signs, fire extinguishers, etc.

To achieve substantial completion, the pump station must undergo a 7 Day system wide performance test unless specifically modified by written agreement. For the full duration of testing, the Contractor shall serve as an authorized representative of the manufacturer for all major equipment, to verify operation, calibration, and adjustments of the equipment.

If any major item fails or malfunctions during the 7 Day test, the item shall be repaired and the 7 Day test shall be re-started at time zero.

The testing shall include all possible operation scenarios, from routine to emergency conditions. Specific tests shall be performed to demonstrate, in both manual and automatic modes of operation, that all components and systems are functioning properly.

Following a successful performance test and following acceptance of the pump station, Colorado Springs Utilities will assume responsibility and ownership of the pump station. See Section 7.2.B for additional information.

7.8.D Training

Authorized representatives of the manufacturers shall provide operation and maintenance training and operation and maintenance manuals for each major piece of equipment. The training shall include demonstration on how to safely operate the equipment, maintain, and repair the equipment and systems. Training shall include troubleshooting common problems, removal, inspection, and cleaning of equipment.

7.9 Possible Permitting Requirements for Pump Stations

Table 7-1 shows a general list of known and possibly required permits and plan approvals for a pump station. Completeness of the list is not guaranteed. The absence of information shall not relieve the Design Engineer or Contractor of the responsibility for determining and verifying the extent of permits required and for obtaining applicable permits.

Table 7-1: General List of Known and Possible Permitting Requirements for Pump Stations

Pump Station Construction Permitting Requirements		
Agency Providing Permit	***Permit/Document Type***	***Permittee***
Federal Permit/Authorizations		
U.S. Forest Service, Bureau of Land Management, Bureau of Reclamation, National Park Service, U.S. Fish and Wildlife Service Military Installations	Special Use Permit	Developer/Owner/Contractor
	Right Of Way/Easement Acquisition	Developer/Owner/Contractor
	Timber Sales Contract	Developer/Owner
	Record of Decision	Developer/Owner
	Section 106 and Class III Cultural Resource Survey Concurrence	Developer/Owner
	Tribal Review and Concurrence (If Section 106 is required)	Developer/Owner
	Approval of: Biological Assessment, Biological Evaluation, Biological Report, Environmental Assessment, Environmental Impact Statement, Section 106 –Class III, Cultural Survey, Archeological/Paleontological Survey, Environmental Justice, vegetation survey, Site development plan approval, mitigation plans, Letter of consent Agreement, Memorandum Of Understanding and Memorandum Of Agreement.	Developer/Owner
	Annual Operating Plan/Forest Operating Plan	Developer/Owner/Contractor
	Long Term Occupancy Agreement	Developer/Owner
	Migratory Bird Treaty Act Survey	Developer/Owner/Contractor
	Prebles' Meadow Jumping Mouse Clearance	Developer/Owner/Contractor
	Endangered Species Act Section 7 or 10 Consultation concurrence (if required)	Developer/Owner/Contractor
	Fish and Wildlife Coordination Act Compliance	Developer/Owner/Contractor
U.S. Army Corps Of Engineers (USACE)	Section 404 Nationwide or Individual Dredge or Fill Permits, Wetland delineation	Developer/Owner/Contractor
EPA Region 8	NPDES Stormwater Permit/ SWPPP (If on Federal land)	Contractor
Federal Aviation Administration (FAA)	FAA Form 7460-1, Notice of Intent (OE notice), Record of Decision, and Authorization to Proceed Finding of No Significant Impact	Developer/Owner/Contractor
Environmental Protection Agency (EPA)	Oil Pollution Prevention Regulations (40 CFR Part 112) / Spill Prevention, Control, and Countermeasure (SPCC) Plan	Developer/Owner must comply; however, formal permit is not needed.

	"General Duty Clause" under the Clean Air Act - Section 112(r)(1)	Developer/Owner must comply; however, formal permit is not needed.
State Permit/Authorizations		
Colorado Department Of Transportation (CDOT)	Transportation Permit	Contractor
	Utility/Special Use Permit	Contractor
	State Highway Access Permit//Right of Way Permit	Contractor
Colorado Parks & Wildlife (CPW)	Wildlife Certification (SB40) (If working in CDOT/CPW jurisdiction Fish and Wildlife Management Plan Memorandum of Agreement/Understanding	Developer/Owner/Contractor
Colorado State Engineer's Office (SEO)	Well Permit (If required) (Review/approval from the Colorado Department of Water Resources may be required for new/modified water rights transfers and/or tracking)	Developer/Owner/Contractor
Colorado Department of Public Health & Environment (CDPHE), Air Quality Control Division (AQCD)	Air Pollution Emission Notice (APEN) and/or Construction Permit	Contractor
	Emergency Back-Up Diesel Generator Permit	Developer/Owner/Contractor
	Hazardous Waste Management Plan	Contractor
	Asbestos Abatement Certification, Certification of No Asbestos Containing Building Materials (ACBM) used, Management Plan,	Contractor
	Land Development /APEN for Project exceeding 1 ac and lasting >6 months, to include a Fugitive Dust Plan	Developer/Owner/Contractor
	Miscellaneous Permits: Demolition Sandblasting Hot Weld Spray painting Portable Transit Hot Mix Facility Fuel Use and Storage Tanks Generators, and Reciprocating Internal Combustion Engines	Contractor
Colorado Department of Public Health & Environment (CDPHE), Water Quality Control Division (WQCD)	Design/Location Plan Approval for the Construction of a Waterworks facility	Developer/Owner/Contractor
	Permit for Stormwater Discharges Associated with Construction Activity /Construction Stormwater Permit/Stormwater Management Plan (SWMP)	Contractor
	Construction Dewatering Permit	Contractor
	Hydrostatic testing on Potable Water systems, using raw or Potable Water may be managed in accordance with the *Low Risk Discharge Guidance for Discharges of Potable Water (2016)*	Contractor
	Clean Water Act, Section 401 Water Quality Certification	Developer/Owner
	Minimal Industrial Discharge Permit	Developer/Owner
Colorado Department Of Labor And Employment (CDLE) - Division Of Oil And Public Safety (OPS)	Storage Tank Permit(s), Inspections, & Registration (7 CCR 1101-14)	Developer/Owner/Contractor

Colorado Department of Public Health & Environment (CDPHE), Hazardous Materials & Waste Management Division (HMWMD)	Solid Waste Regulations - Section 9 - Waste Impoundments (6 CCR 1007-2).	Developer/Owner/Contractor
Local County Authorizations		
El Paso County (EPC): • **Development Services** • **Public Health** • **Other Counties should be considered**	Site/Location Approval Development Plan Approval	Developer/Owner
	Drainage Plan	Developer/Owner
	Construction Activity Air Permit	Contractor
	Erosion & Stormwater Quality Control Permit (ESQCP)/Stormwater Management Plan (SWMP)	Contractor
	Haul Route Plan	Contractor
	Building Erosion & Stormwater Quality Control Plan (BESQCP)	Developer/Owner
	Working within ROW Permit	Contractor
	Road Sign Permit	Developer/Owner/Contractor
	Special Transport Permit	Contractor
	Temporary Access Permit	Contractor
	On Site Wastewater System	Developer/Owner
El Paso County (EPC) cont.:	Traffic Plan	Contractor
	Electrical Permit	Contractor
	Permanent Driveway Permit	Contractor
	Temporary Driveway Permit	Contractor
	Special Transportation Permit	Contractor
	Common Use Agreement	Contractor
	Submittal of Design Drawings	Contractor
Pikes Peak Regional Building Department (PPRB)	Building Permit and others as required	Contractor
	Floodplain Development Permit (If in 100 Year Floodplain designation)	Developer/Owner
	Wrecking Permit	Contractor
Local Municipality Authorizations		
City of Colorado Springs, • **City Engineering** • **Land Use Review Division office** • **Real Estate Office** • **Other Cities/towns should be considered**	Approval of Location (if in City Jurisdiction	Developer/Owner/Contractor
	Land and/or Easement Acquisitions: Environmental Review or Audit per The City of Colorado Springs Procedure Manual for the Acquisition and Disposition of Real Property Interests	Developer/Owner
	Drainage Plan Approval	Developer/Owner
	Zoning Approval	Developer/Owner
	Grading and Erosion and Stormwater Quality Control Plan Approval /Stormwater Management Plan (SWMP)	Developer/Owner/Contractor
	Transportation Permit	Contractor
	Temporary Use Permit	Contractor
	Access Permit	Contractor
	Right of Way Construction Excavation Permit	Contractor
	Traffic Control Plan/Permit	Contractor
	Sub-Surface revocable Permit	Contractor
	Concrete Permit	Contractor
	Oversize loads Permit	Contractor

	Airport Overlay, Streamside Overlay, Hillside Overlay Review and Approval (If required)	Developer/Owner
City of Colorado Springs, Park & Recreation Department	Parks and Trails access permit	Contractor
City of Colorado Springs, Forester	Tree removal and/or trimming permit	Developer/Owner/Contractor
Fire Department	Notification and Permit	Contractor
	Temporary Installation of Fuel Storage Tanks with Secondary Containment	Contractor
	Development Plan Review and Approval	Developer/Owner
	Storage Tank Permitting	Developer/Owner
	Hazardous Materials Management Plan	Developer/Owner
	Master Plan Amendment	Developer/Owner
Utility Services	Utility Service Taps	Contractor
	Development Plan Review and Approval	Contractor
	Line and Crossing Agreement	Developer/Owner
	Water Utility Disinfection and Discharge Plan Temporary Authorization to Discharge	Contactor
Colorado Springs Utilities, Environment, Safety & Health **Colorado Springs Utilities, Environment, Safety & Health cont.**	Bulk Material, New Chemical or Product Review and Approval	Contractor
	Job Hazard Analysis and Site Specific Safety Plan	Contractor
	Facility Stormwater Management Plan Development	Developer/Owner
	Facility Spill Prevention Countermeasure Control Plan Review	Developer/Owner
	Master Plan Amendment	Developer/Owner
	Inadvertent Fluid Release Plan and Drilling Fluid Plan (as applicable to Trenchless Technologies)	Contractor
	Contractor Environmental Management Survey	Contractor
Other Agencies & Entities	Pipeline Encroachment Agreements and RPI	Developer/Owner
	Programmatic Agreements	Developer/Owner
	Memorandum of Understanding Agreements Memorandum of Agreement	Developer/Owner

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CHAPTER 8

Nonpotable Water

8.1 General

The purpose of Chapter 8 is to establish criteria for Nonpotable Water use and for designing and constructing Nonpotable Water Distribution Systems, Service Lines, and irrigation systems that are supplied with Nonpotable Water from Colorado Springs Utilities. These criteria are not intended for the design of Raw Water Transmission and Collection Systems.

8.2 Nonpotable Water

Colorado Springs Utilities' Nonpotable Water is defined as water that is not treated to approved drinking water standards and is not suitable, nor intended for human consumption (to include drinking, bathing, showering, cooking, dishwashing, or maintaining oral hygiene), but is produced and delivered to Users for irrigation, commercial and industrial uses. Nonpotable Water includes treated wastewater (Reclaimed Water), raw (untreated) Groundwater, and raw (untreated) surface water. The Design Engineer shall be responsible for assessing the Water Quality of the Nonpotable Water to ensure its suitability for the intended use.

8.2.A Authorized Uses

Nonpotable Water is authorized for:

a. Landscape irrigation of areas accessible to the Public including, but not limited to, parks, greenbelts, golf courses and common areas at residential building developments (condominiums and apartments), commercial/business parks, and other similar complexes
b. Non-resident controlled landscape irrigation at single family homes (i.e., Home Owners Associations)
c. Agricultural irrigation including non-food crop and silviculture, commercial food crop growing operation, and non-edible hemp irrigation
d. Industrial uses, including but not limited to, evaporative and non-evaporative industrial processes, wash water applications, and non-discharging Construction and road maintenance activities
e. Commercial uses, including zoo operations, commercial laundries, and automated vehicle washing
f. Other uses as approved on a case-by-case basis by Colorado Springs Utilities

8.2.B Non-Authorized Uses

Nonpotable Water is not authorized for:

a. Resident-Controlled Landscape Irrigation (excluding Privately owned and permitted wells)
b. Fire protection
c. Potable use
d. Other uses not specifically approved by Colorado Springs Utilities

8.3 Enforcement

Pursuant to *City Code § 12.4.1109*, Colorado Springs Utilities is authorized to take appropriate action, up to and including discontinuation of service, against any Reclaimed Water User who does not meet the requirements of these standards, CDPHE *Regulation No. 84*, or the User's *Notice of Authorization* (*NOA*).

8.4 Cost Responsibilities

Unless otherwise provided by written agreement with Colorado Springs Utilities, all potential Users of the Nonpotable Water System are responsible for all costs associated with acquiring and utilizing Nonpotable Water Service including, but not limited to engineering costs, Nonpotable Distribution Main extensions, pump stations, pressure regulating stations, materials, on-site material conversion costs, signage, and other costs and development charges associated with the requirements are outlined in these *Water LESS*, and *Utilities Rules and Regulations*.

8.5 Conditions of Use

Unless otherwise specified in these *Water LESS*, all Users of Nonpotable Water, regardless of water source, must adhere to the general and specific use management practices outlined in CDPHE *Regulation No. 84*.

8.5.A Operational Requirements for All Users

All Users of Nonpotable Water, regardless of water source shall adhere to the following additional operational requirements:

a. Operation of a User's Nonpotable Water System, including valves, outlets, couplers, sprinkler heads, pumps, hoses and commercial or industrial equipment, shall only be performed by personnel authorized by the User and trained in accordance with Section 8.5.E of these Water LESS. Implement measures to minimize direct contact of Nonpotable Water with the Public or nearby Public equipment such as occupied buildings, domestic drinking water facilities, facilities where food is being prepared for human consumption, playground equipment, domestic water wells and reservoirs, thoroughfares, and property and facilities not under the control of the User.
b. The User shall ensure that releases of Reclaimed Water to Water of the State from the approved Site or use do not occur.
c. Appropriate application rates must be determined.
    i. All sites must determine application rates and/or take additional measures to minimize ponding and runoff of Nonpotable Water from approved application areas.
    ii. Off-property transport of Nonpotable Water must be minimized.
    iii. Irrigation sites must confine spray and windblown spray to the designated use areas to minimize Public contact with Nonpotable Water
    iv. All other use sites including Construction sites utilizing Nonpotable Water must minimize off-property transport of airborne particulate matter from activities such as, but not limited to, grading and soil compaction.
d. All zoo operation sites utilizing Nonpotable Water must comply with the Animal Welfare Act and other zoo operation Federal and State regulations as applicable.
e. All commercial food crop growing operations must comply with any applicable requirements of the Food Safety Modernization Act, Produce Safety Rule, 21 CFR Part 112 as implemented by the State of Colorado.
f. Irrigation Users must schedule watering times during periods when Public facilities are not in use
g. Repair all leaks immediately
h. All Nonpotable Water tank trucks, hoses, meters, and Backflow devices must be dedicated for use on the Nonpotable Water system and labeled appropriately.

i. To ensure adequate system operation, a 2-inch Nonpotable Water meter or smaller must be used at any Nonpotable Water hydrant connection see Detail Drawing A5-5.
j. Implement other Public protection measures (i.e., locking hose bibs, segregating equipment, etc.) as determined and communicated by Colorado Springs Utilities
k. The User shall ensure that releases of reclaimed water to Waters of the State from the approved site or use do not occur.
l. Mark all Nonpotable appurtenances to differentiate from Potable Water as per Section 8.13.A.

8.5.B Public Notification

All Users shall provide notification to inform the Public that Nonpotable Water is being used and is not safe for drinking. The notification shall be posted in English and any other dominant language that may be spoken at a Site, as applicable, shall be on a sign of adequate size to be clearly read, but no smaller than 8.5"x11" and shall include the applicable language and be placed in the locations set forth below.

a. "NONPOTABLE WATER – DO NOT DRINK" shall be posted at Public entrances to areas where Nonpotable Water is used, boundaries of Nonpotable Water irrigated areas, around Nonpotable Water impoundments, on Nonpotable Water tanks or storage facilities, and on any portable equipment used to distribute Nonpotable Water.
b. Additional requirement for golf courses and cemeteries irrigating with Nonpotable Water: "NONPOTABLE WATER USED FOR IRRIGATION – DO NOT DRINK" shall be printed on golf score cards and cemetery Customer information items, such as plot maps.
c. Additional requirements for commercial food crop and non-edible hemp cultivation sites using Reclaimed Water. "RECLAIMED WATER – DO NOT DRINK" or "RECYCLED WATER – DO NOT DRINK" along with a graphic indicating not for consumption shall be posted throughout the site. Signage sizing, content and placing shall meet Regulation 84 Specifications.
d. Additional signage as determined by Colorado Springs Utilities.

8.5.C Backflow Prevention

Nonpotable Water Mains, Service Lines, and Irrigation Main and Lateral Lines will not be approved by Colorado Springs Utilities until the required Backflow Prevention measures have met the requirements specified by CHAPTER 8 Nonpotable Water of these *Water LESS*. A RP shall be required where a high hazard condition exists such as, but not limited to, chemicals, rust inhibitors or bodily fluids that could potentially be back siphoned into the domestic water supply or Nonpotable Water source. (*City Code § 12.4.1201, et seq.*)

For all Nonpotable Water User Sites, an Approved Backflow Prevention Assembly must be installed, at the User's expense, in accordance with CHAPTER 2 Development and Design of Water Systems of these *Water LESS* and at the following locations:

a. On every Potable Water Service Line also serving the Nonpotable Water User Site, in accordance with CHAPTER 2 Development and Design of Water Systems of these *Water LESS*.
b. For sites where a high hazard condition exists, on each Nonpotable Water Service Line within a User's Nonpotable Water System, immediately following the

meter, and in all cases, before the first branch line leading off the Nonpotable Water Service Line.

c. At the User's expense, all Approved Backflow Prevention Assemblies must be tested, and all Approved Backflow Prevention Methods must be inspected, upon installation and annually thereafter by a Certified Cross-Connection Control Technician.
d. The Certified Tester must use Nonpotable Water dedicated testing equipment when performing the testing.
e. Any Backflow Prevention Assembly or Method required by these Water LESS that does not meet all requirements specified herein shall be repaired or replaced at the User's expense. Any repair or replacement shall be made with an Approved Backflow Prevention Assembly or Method within 20 days of discovery. Only a person who is a Certified Cross-Connection Control Technician. is authorized to perform repairs or replacements.
f. Records of all tests, inspections, repair and/or replacement of an Approved Backflow Prevention Assembly or Method and a copy of the testers certification must be maintained by the User Site for no less than three years and be provided to Colorado Springs Utilities upon request.

8.5.D Water Conservation

All Nonpotable Water landscape irrigation Users shall comply with the City of Colorado Springs *Landscape Code and Policy Manual*, Colorado Springs Utilities Water Wise program as applicable and any other adopted shortage rules. For industrial and other Nonpotable Water uses, Colorado Springs Utilities may specify appropriate water conservation measures on a case-by-case basis.

8.5.E Training

At least one representative from each nonpotable User site must complete annual mandatory training offered by Colorado Springs Utilities. Colorado Springs Utilities will issue written notification of training availability to User site legal representatives/managers of record via email. Nonpotable Users which contract out the day-to-day operation of the Nonpotable Water System shall require at least one representative of the contracted company complete this annual training. To satisfy this part of the training requirements, each site representative and contract company representative will be required to attain a satisfactory score on a knowledge assessment.

Nonpotable user site staff must also complete annual training as outlined below.

a. Employees of Nonpotable Users with permanent Nonpotable Water use on a site, specifically supervisory, operations personnel, and contracted personnel who are responsible for day-to-day operation of the Nonpotable Water System on the Site, shall be trained on public health protection requirements, operational requirements, potential health hazards involved with contact or ingestion of Nonpotable Water, and associated proper hygiene procedures.
b. For sites with temporary or short-term Nonpotable Water use, such as those approved for non-discharging construction and road maintenance activities, all managers, workers, contractors, and others accessing the Sites shall be informed that Nonpotable Water is being used and personnel who may come in contact with Nonpotable Water shall receive training regarding safe practices and hygiene procedures associated with Nonpotable Water use.

c. For commercial food crop or non-edible hemp cultivation sites where Nonpotable Water is used, all persons accessing the site shall be informed that Nonpotable Water is being used. Any person who may come in contact with Nonpotable Water, soil irrigated with Nonpotable Water, or crops irrigated with Nonpotable Water shall be trained on operational requirements, potential health hazards involved with contact or ingestion of Nonpotable Water, and the additional potable water washing requirements for hands and harvested produce as outlined in CDPHE *Regulation No. 84*.

8.5.F Recordkeeping

All Nonpotable Water Users must maintain accurate records including but not limited to:

a. Site maps delineating areas where Nonpotable Water is used and for landscape, commercial food crop and non-edible hemp irrigation sites, the acreage irrigated with Nonpotable Water.
b. Site plans describing in detail the physical extent and nature of the portion of the Nonpotable Water system located on the User's property.
c. Records of all training as required by Section 8.5.E including date of training and trainee signatures indicating completion.
d. Records of all annual Backflow prevention assembly testing as required by Section 8.5.C including the test results and the tester certification.

Additional record keeping requirements for Reclaimed Water Users:

e. Maintain an accurate *User Plan to Comply* detailing current best management practices and other required information.
f. Reclaimed water landscape irrigation users must maintain a discharge monitoring log as required in Section 8.5.G.
g. Reclaimed water commercial food crop and non-edible hemp irrigation Users must maintain accurate maps showing locations of signs and hand washing stations throughout the site.
h. Landscape, commercial food crop, and non-edible hemp irrigation Users must record the total volume of Reclaimed Water used per calendar year.

All records must be maintained for a minimum of three years and be kept on-site or readily available for inspection upon the request of Colorado Springs Utilities or the CDPHE/WQCD.

8.5.G Discharge/Release Requirements

a. All Nonpotable Water Users having low point gravity drains or detention/storage ponds that require periodic system drainage shall not drain Nonpotable Water from their system into a waterway, tributary, storm, or sanitary sewer.
b. Any discharges of Nonpotable Water to a waterway, tributary, storm, or sanitary sewer must be reported immediately to Colorado Springs Utilities and the CDPHE/WQCD (when applicable).
c. The User shall also be responsible for any damage or spillage of Nonpotable Water to Private property or Public facilities. This includes the payment of any fines levied against the User for said damage or spillage and other requirements.
d. A discharge monitoring log must be maintained when Reclaimed Water is utilized for irrigation.

i. Irrigation systems with area drains internal to irrigated areas must track the volume of Nonpotable Water impacting the drain system.

ii. Any release of Reclaimed Water into Groundwater, to surface water or the storm drain system, not meeting the limitations set forth in the CDPHE/WQCD Policy 7 is considered a violation of *Regulation No. 84* and is subject to enforcement by the CDPHE/WQCD. The User shall be responsible for any assessed CDPHE/WQCD penalties or other corrective requirements.

8.5.H Additional Conditions for Reclaimed Water Users

All Users who have the potential to receive Reclaimed Water must adhere to the following additional requirements:

a. Users shall submit a *User Plan to Comply* to Colorado Springs Utilities and receive a *Notice of Authorization (NOA)* from the CDPHE/WQCD prior to receiving Nonpotable Water Service. Reclaimed Water Users must adhere to all terms, limitations, and conditions as outlined in their *User Plan to Comply*, *NOA*, and *Regulation No. 84*.

b. Annually by February 1st or an alternate date provided by Colorado Springs Utilities, Users shall submit a certification statement to Colorado Springs Utilities providing volume of Nonpotable Water used and affirming compliance with the conditions of use as outlined in the *NOA* and *Regulation No. 84*.

c. Any release of Reclaimed Water into Groundwater, to surface water or the storm drain system, not meeting the limitations set forth in the CDPHE/WQCD Policy 7 is considered a violation of *Regulation No. 84* and is subject to enforcement by the CDPHE/WQCD.

    i. Landscape and Irrigation sites only. WQCD Policy 7 exempts certain point source discharges (releases) that impact State Waters from reporting requirements. Landscape irrigation sites must implement measures to minimize Reclaimed Water releases from the approved site, including minimizing Reclaimed Water entering low point gravity drains within the turf area.

    ii. Reclaimed Water commercial food crop and non-edible hemp irrigation Sites must maintain, onsite, a manual or display describing Reclaimed Water, Site BMPs and irrigation practices to ensure irrigation at Agronomic Rate and to minimize ponding and runoff. The manual will be accessible to all individuals accessing the Site.

8.6 Public or Private Nonpotable Water System

Private ownership of the Nonpotable Water Main shall begin downstream of the Secondary Valve located at or near the property line of the premise served or at an alternate location determined by Colorado Springs Utilities. Colorado Springs Utilities shall own and maintain the Nonpotable Water Mains and Service Lines extending from Colorado Springs Utilities' Nonpotable Water Distribution System to the Secondary Valve.

All Nonpotable Mains and Service Lines constructed downstream of the Secondary Valve shall be the responsibility of the Owner to repair and maintain.

Colorado Springs Utilities' Nonpotable Water Customers are not allowed to re-deliver or sell Nonpotable Water to any other residential or non-residential entity. Exceptions may be allowed by Colorado Springs Utilities on a case by case basis provided that prior

authorization to do so is obtained through a written agreement administered by Colorado Springs Utilities Development Services and executed by all interested parties. A Notice of Private Nonpotable Water System is required where multiple parties own the Private Nonpotable Water System. A copy of this agreement can be found at www.csu.org.

8.7 Planning

8.7.A New Nonpotable Water Systems

a. The Owner/Developer shall be responsible for submitting an "Application for Nonpotable Water Availability" form to Colorado Springs Utilities. A copy of this form is available at www.csu.org for download.
b. After Colorado Springs Utilities issues a *Notice of Acceptance of Application for Availability*, the potential User must submit Nonpotable Water Construction Plans to Colorado Springs Utilities for approval as outlined in Section 3.1 of these *Water LESS*. The Nonpotable Water System shall not be installed or interconnected without the written approval of Colorado Springs Utilities. This shall include installations and interconnections of Customer owned Nonpotable Water Systems and equipment, including Nonpotable Water Service Lines, irrigation main lines, and irrigation lateral lines.

8.7.B Existing Systems

a. An Existing Nonpotable Water System shall not be extended, expanded, modified, or interconnected without the written approval of Colorado Springs Utilities. This shall include extensions, expansions, modifications, major repairs and interconnections of Customer owned Nonpotable Water Systems and equipment, including Nonpotable Water Service Lines, irrigation main lines, and irrigation lateral lines. The Customer/ Customer Contractor must submit Nonpotable Water Construction Plans to Colorado Springs Utilities for approval as outlined in Section 3.1 of these *Water LESS*. Prior approval is not required for routine system repairs or in-kind replacement of system appurtenances.

8.8 Nonpotable Distribution Mains

All Nonpotable Distribution Mains shall be sized large enough to provide for flows to the area served. Existing mains may be required to be upsized by the Owner/Developer/Customer to meet demands for a larger service area. Colorado Springs Utilities reserves the right to prescribe the size of mains in order to provide service for projected future needs. Available service pressure to serve Customers will be determined by Colorado Springs Utilities. If additional pressure is needed, the Owner/Developer/Customer will be required to design and install a booster pump station after the meter and Approved Backflow Prevention Assembly or Method. The booster pump station shall be owned and maintained by the Customer. It is also at Colorado Springs Utilities' discretion to require the Owner/Developer/Customer to install a storage tank or pond located at the Customers' Site, to meet peak demands. Nonpotable Water Main Design.

Nonpotable Water Mains shall be designed in accordance with Section 2.1 of these *Water LESS* with the following exceptions and additions. Nonpotable Water Main Extensions shall be designed and stamped by a Professional Engineer registered in the State of Colorado before being submitted to Colorado Springs Utilities for approval.

There shall be no connections between the Potable Water System and any piping containing Nonpotable Water.

8.8.A Nonpotable Water Main Isolation Valves

Isolation Valves shall be the same size as the Nonpotable Main or fitting it is adjacent to. Valves installed on Nonpotable Mains shall open to the left (counter-clockwise) with a black operating nut and a purple valve lid**.**

8.9 Nonpotable Water Service Line Design

Nonpotable Water Service Lines shall be designed in accordance with CHAPTER 2 Development and Design of Water Systems of these *Water LESS* with the following exceptions and additions. Nonpotable Water Service Lines, including irrigation mains and laterals, shall be designed by a Professional Engineer registered in the State of Colorado or a licensed landscape architect registered in the State of Colorado, a full member of the American Society of Landscape Architects (ASLA) or a Certified Irrigation Designer (CID) in good standing certified by the Irrigation Association. Detailed Construction Plans for new and replacement Nonpotable Water Service Lines shall be prepared in accordance with these *Water LESS*.

Nonpotable Water Service Lines, including irrigation mains and laterals that cross or extend into Right of Way (ROW) or Public Utility Easements shall be designed and stamped by a Professional Engineer registered in the State of Colorado before being submitted to Colorado Springs Utilities for approval. This does not apply to nonpotable Water Service Lines 2 inch diameter or less that directly extend into ROW and Public Utility Easements to tap into a main.

Colorado Springs Utilities reserves the right to require a Professional Engineer to design and stamp other Nonpotable Water Service Line extension designs if these extensions will impact the ability to maintain or access utility mains or services owned by Colorado Springs Utilities.

8.9.A Nonpotable Water Taps and Service Line Sizing

Nonpotable Water Taps and Service Lines shall be Type K Copper or HDPE for service lines less than 4 inches. Tap and service line sizes shall meet the requirements in Section 2.7.E. Colorado Springs Utilities, as a part of the tapping fee, shall supply taps, including both the Corporation and the Curb Stop. The Corporation Stop shall be installed by Colorado Springs Utilities and the Curb Stop shall be issued to the Contractor for installation. Nonpotable Water Service Lines 4 inch and greater shall be designed as a Nonpotable Water Main per Section 8.8. Contractor installing a tap on a newly installed Nonpotable system must have proper training, otherwise, Colorado Springs Utilities shall install the tap as part of the tapping fee.

8.9.B Crossings

Where a Nonpotable Water Service Line crosses another utility or any underground Structure the following requirements shall be met:

a. The Nonpotable Water Service Line shall pass under Potable Water Service Lines with a minimum of 18 inches of clearance.
b. The Nonpotable Water Service Line shall pass over Wastewater Mains and Service Lines with a minimum of 18 inches of clearance.

c. Where the Nonpotable Water Service Line passes under a Wastewater Main, Wastewater Service Line, or storm sewer pipe, it shall be encased in a casing pipe per Detail Drawing B1-7**.**
d. When a Nonpotable Water Service Line passes over a Potable Water Main or Water Service Line the Nonpotable Water Service Line must be in a casing pipe, approximately 9 feet each side of the pipeline being crossed, with a section of pipe to be centered over the pipe being crossed. Reference Detail Drawing A7-3.

8.9.C Strainers

Due to the presence of solids in the Nonpotable Water Distribution System, Colorado Springs Utilities strongly encourages all Nonpotable Water Users to install and maintain the appropriate screening or straining equipment to reduce or prevent solid debris from disrupting irrigation activities and achieve the best results on the Site. The strainer should be located before the pressure reducing valve and rated to a minimum working pressure of 250 psi. Colorado Springs Utilities may be contacted for guidance on screening equipment and proper installation.

8.9.D Water Meters

Nonpotable Water meters placed in service on January 1, 1999, and after shall be owned, supplied, installed, and maintained by Colorado Springs Utilities. Nonpotable Water meters installed and placed in service prior to January 1, 1999, may be owned and maintained by either the property Owner or Colorado Springs Utilities, depending upon the original service agreement at the time of installation.

All Nonpotable Water meters shall be designated to be used solely for Nonpotable Water applications.

Nonpotable Water meters shall not be installed within a building or Structure.

8.10 Irrigation Mains and Laterals

8.10.A General

Nonpotable Water Service Lines shall meet the material requirements as specified in Section 4.6.F of these *Water LESS* for the Water Service Line and meter loop. After the meter loop and Backflow Prevention Assembly the irrigation main and laterals shall meet the following material specifications based on irrigation system pressures

8.10.B Pipe Pressure Rating Requirements

All Nonpotable Irrigation Mains and Lateral fittings shall be designed to meet or exceed the design pressure provided by Colorado Springs Utilities. Design pressures for Nonpotable Irrigation Mains and Laterals should be designed, including control valves, for a minimum working pressure of 80 psi.

8.10.C Material Requirements

Landscape Irrigation Mains and Laterals less than 2 inches in diameter shall be PVC or Type K copper, of appropriate pressure class, or of materials approved by Colorado Springs Utilities.

All 2-1/2 inch and larger Nonpotable Irrigation Mains and Laterals shall be one of the following materials:

- PVC Schedule 40 and 80 pipes, of appropriate pressure class
- High Density Polyethylene Pipe of appropriate pressure class
- Type K Copper Tubing
- Ductile Iron Pipe and Fittings

All Nonpotable Irrigation Mains and Laterals shall be identified as Nonpotable Water per Section 8.13.A.

8.10.C.1 Golf Course Applications Only

Fittings shall be Ductile Iron, iron pipe sized, slanted, deep bell, gasket style made in accordance with *ASTM A-536,* Grade 65-45-12 manufactured for golf course irrigation systems, commercial turf irrigation and rural Water Systems as outlined in Section 4.6.F.

8.10.D Horizontal and Vertical Design

8.10.D.1 Horizontal Separations

a. The design should include a buffer between the spray zone and picnic areas, playground equipment, water fountains, hand/food crop washing stations, buildings, and areas not under control of the Nonpotable Water User.
b. The irrigation systems shall maintain a minimum clearance of 100 feet from any domestic water supply well.
c. Nonpotable Irrigation Mains and Laterals shall not be run or laid in the same trench as Potable Water Mains or Service Lines. A 10 foot horizontal separation shall be maintained between pressurized buried Nonpotable and Potable Water Mains and Service Lines. See Section 2.6.F.2

8.10.D.2 Depth of Bury

Nonpotable Irrigation Mains may be located close to the surface with depths varying from approximately 2 to 3 feet.

Nonpotable Irrigation Laterals may be located close to the surface with depths varying from approximately 1 foot to 1 foot 6 inches.

8.10.D.3 Crossings

Nonpotable Irrigation Mains and Laterals shall be located a minimum of 18 inches vertically from all other utility infrastructure. Nonpotable Irrigation Mains and Laterals installed above Potable Mains and Service Lines must be in a purple casing pipe for 9 feet on each side of the crossing (centered on utility crossing, per Detail Drawing A7-3). Laterals that do not remain pressurized between irrigation cycles may not require a casing pipe, at Colorado Springs Utilities discretion.

8.10.D.4 Public Safety

There shall be no hose bib connections accessible to the Public at any existing or new piping connected to the Nonpotable Water System in conformance with *International Plumbing Code*.

There shall be no drinking water outlets between the Potable Water supply and any piping containing Nonpotable Water, in conformance with *International Plumbing Code*.

8.11 Conversion of Potable and Nonpotable Water Mains and Service Lines

Construction Plans shall be submitted to Colorado Springs Utilities for review and approval where the Owner/Developer proposes the conversion of a Potable or Nonpotable Water System to a Nonpotable or Potable Water System respectively per the following sections.

8.11.A Interim Use of Potable Water

Where a Project is proposed within an area that does not have a Nonpotable Water Main but is planned for a Nonpotable Water Main Extension, the Owner/Developer may install a Water System according to these Nonpotable Water requirements in the anticipation of a future connection to the Nonpotable Water Distribution System.

Developments installing irrigation systems per these *Water LESS* can be connected to the Potable Water System, with the approval of Colorado Springs Utilities, on an interim basis until Nonpotable Water Mains are available within the area, at which point the irrigation system (at the owner's request) may be connected to the Nonpotable Water Main provided that, prior to connection of the irrigation system to the Nonpotable Water System, the Potable Water System connections are permanently disconnected in accordance with these *Water LESS* and inspected and approved by Colorado Springs Utilities.

8.11.B Converting from Potable Water to Nonpotable Water

All irrigation facilities converted from a Potable Water Supply to a Nonpotable Water Supply shall be retrofitted to conform to these *Water LESS*. The facilities to be converted shall be investigated in detail including review of any Record Drawings, preparation of required reports, and any necessary measures determined by Colorado Springs Utilities to conform to these *Water LESS*. Installation of an RP shall be required on any and all Potable Water Service Lines serving a proposed conversion property where both Potable and Nonpotable Service connections are maintained.

The Owner/Developer shall pay all necessary costs associated with converting the Water System and shall be responsible for the following:

a. Obtaining Record Drawings that identify both the horizontal and vertical location of the existing Potable Water System including connection points to the Public Water System
b. Disconnection of all Potable Water connections and uses (The converted system shall be disconnected from the Potable Water System and permanently capped. The caps on all ends of the Nonpotable portion of the converted Water System shall be purple in color.)
c. Potholing to document depth and location of crossing utilities (if necessary)
d. Replacement of all clockwise valves with Nonpotable counter-clockwise valves
e. Installation of a RP on any and all meter connections serving a proposed conversion property where both Potable and Nonpotable Water Service Line connections are maintained (with the approval of the Colorado Springs Utilities)
f. Placement of warning signs and labels in accordance with these *Water LESS*

g. Sleeving Nonpotable Water Main crossings over existing Potable Water Mains and Service Lines (Reference Detail Drawing A7-3)
h. Designation of the pipe as Nonpotable Water in accordance with Section 8.13 of these *Water LESS*
i. Removal of any and all "quick connects" from the newly Nonpotable to the Potable Water System unless otherwise instructed by Colorado Springs Utilities
j. Preparing Construction Plans and Specifications showing how the above requirements have been met, submitted per Section 8.12
k. Notification to all personnel involved regarding the Potable to Nonpotable Water System change, including Colorado Springs Utilities
l. Payment of all connection fees due per Colorado Springs Utilities Rules and Regulations *URR's*
m. For systems receiving Reclaimed Water, obtaining a CDPHE Notice of Authorization and submittal of required User information to Colorado Springs Utilities including legally responsible party contact information, Site address, and a *User Plan to Comply*.

8.11.C Converting from Nonpotable Water System to Potable Water System

Conversion of a Nonpotable Water Distribution System or Service Line to a Potable Water Distribution System or Service Line is not allowed by Colorado Springs Utilities. Because the supply was originally Nonpotable Water, the Water Distribution System and Service Line will always be considered Nonpotable and may not be used to distribute Potable Water for human consumption.

8.11.D Converting from Nonpotable Water Supply to Potable Water Supply

Conversion of an existing Water Distribution System, Service Line, or irrigation system dedicated to a Nonpotable Water Use from a Nonpotable Water Supply to a Potable Water Supply may be allowed on a case by case basis at the discretion of Colorado Springs Utilities. However, because the water supply was originally Nonpotable Water, the Water Distribution System, Service Line, and irrigation system will always be considered Nonpotable, must continue to be compliant with these Water LESS, and may not be used to distribute Potable Water for other uses than the approved nonpotable uses. The Owner/Developer shall be responsible for all costs necessary to meet Cross Connection control requirements to protect the Potable Water System as defined in *City Code § 12.4.1201 et seq*.

8.12 Plan Submittal

Nonpotable Water Construction Plans shall be submitted to Colorado Springs Utilities for review and approval prior to Construction per Section 3.1 with the following additional requirements:

8.12.A Additional Nonpotable Water Construction Plan Notes

1. Nonpotable Water shall only be utilized for Nonpotable Water purposes. It is neither suitable nor intended for human consumption.
2. All Nonpotable Water piping, valves, outlets and fixtures, and other appurtenances shall be color coded in conformance with the National Industrial Color Code (NICC) and Section 4.7 of these *Water LESS*.
3. All new buried distribution piping in the Nonpotable Water Distribution System shall be colored purple pipe and embossed or be stamped/marked "CAUTION-NONPOTABLE WATER DO NOT DRINK;" or be installed with purple

identification tape, or a purple polyethylene vinyl wrap, as approved by Colorado Springs Utilities.

4. All Nonpotable Water valves, outlets, Public entrances, and boundaries of areas irrigated with Nonpotable Water, and any portable equipment used to distribute Nonpotable Water shall be tagged or signed with the following words "NONPOTABLE WATER-DO NOT DRINK."
5. Valves shall be the same size as the Nonpotable Main/fitting. Valves installed on Nonpotable Water Mains shall open to the left (counter-clockwise) with a black operating nut and a purple valve lid**.**

8.12.B Additional Construction Plan Requirements for Irrigation Systems

A legend showing the pertinent data for materials used in the irrigation system shall be shown on the plans. The legend shall include a pipe schedule listing pipe sizes and materials of Construction, a listing of valve types and spray head configurations.

8.12.B.1 Sprinkler Head

The following information is required for each type of sprinkler head:

a. Manufacturer's name and model number
b. Sprinkler radius range (feet)
c. Sprinkler pattern

8.12.B.2 Valves

For each valve, the following information is required:

a. Controller station number
b. Flow through the valve (GPM)
c. Control valve size (inches)

8.13 Construction

8.13.A Nonpotable Water System Identification

All Nonpotable Water controllers, valves, outlets, fixtures, and other appurtenances shall be:

a. Tagged or signed with the following words: "NONPOTABLE WATER – DO NOT DRINK,"
b. Color-coded in conformance with the NICC (Pantone 512 or close equivalent), or
c. Marked in accordance with these *Water LESS*.

All above ground facilities shall be consistently color-coded purple per NICC and Section 4.7, or as otherwise approved by Colorado Springs Utilities, and be marked to suitably differentiate the Nonpotable Water System facilities from Potable Water and the Wastewater System.

Purple identification tape, or a purple polyethylene vinyl wrap with black printing, color to be per NICC and Section 4.6.F, as approved by Colorado Springs Utilities, shall be used on ductile iron pipe installation only.

Identification tape shall be prepared with white or black printing on purple background per Section 4.6.F, having the words: "CAUTION: NONPOTABLE WATER – DO NOT DRINK", or when pipe carries Reclaimed Water, "CAUTION

RECLAIMED WATER – DO NOT DRINK", or as otherwise approved by Colorado Springs Utilities. The overall width of the tape shall be at least 3 inches.

Identification tape shall be installed on the top of the transmission pipe longitudinally and should be centered. The identification should be continuous in coverage on the pipe and should be fastened to each pipe length at 10 foot intervals. Tape attached to sections of pipe before the pipe is placed in the trench shall have flaps sufficient for continuous coverage. Other satisfactory means of securing the tape during backfill of the trench may be used if suitable for the work, as determined by Colorado Springs Utilities.

Potable water piping that has been retrofitted for use in the Nonpotable Water System shall be marked with purple identification tape or polyethylene vinyl wrap as described above when possible.

8.13.B Pipeline Markers

When a Colorado Springs Utilities Nonpotable Water Distribution Main is to be installed outside of the Public street Right-of-Way and within an Easement, the limits of the Easement or Right-of-Way shall be marked with permanent monuments placed by a licensed surveyor. The pipeline route shall be marked with purple pipeline line markers provided by the Contractor and labeled with labels provided by Colorado Springs Utilities per Section 4.6.B.

The pipeline markers must be:

a. Placed at 250 foot intervals
b. Placed at changes in horizontal alignment
c. Constructed of carsonite or Colorado Springs Utilities approved material (see Section 4.6.B)
d. 66 inches in length
e. Designated with a purple post and label for Nonpotable Water Mains, Colorado Springs Utilities labels shall be obtained from a Colorado Springs Utilities warehouse or a Colorado Springs Utilities Approved Manufacturer
f. Installed per the manufacturer's Specifications

8.14 Separate Raw Water Systems for Nonpotable Use

This section applies to Nonpotable Water Users whose supply is from a Customer drilled and maintained well or a Customer maintained surface water connection where Colorado Springs Utilities owns the water right. These Water Systems shall be reviewed and approved by Colorado Springs Utilities on a case by case basis prior to Construction or establishment of use.

8.14.A Stand Alone Surface Water Systems

For a Customer owned stand alone Nonpotable Raw Water System, the Owner assumes all responsibility and liability for proper operation, maintenance, and use of the Water System. Stand alone Nonpotable Raw Water Systems, shall conform to all applicable sections of these *Water LESS*.

8.14.B Customer Drilled and Maintained Wells

8.14.B.1 General

This section applies to the Nonpotable use of Groundwater as defined by these *Water LESS*.

All new uses of Groundwater within the City of Colorado Springs must be authorized by Colorado Springs Utilities and approved through the "Application for Nonpotable Water Availability" form in available at www.csu.org. The service provided by Colorado Springs Utilities under the "Miscellaneous Service – Augmentation Tariff" is the legal framework for a Customer to develop and use Groundwater on their own property for their own use according to the terms of the *Colorado Springs Blanket Augmentation Plan* as decreed by the Division 2 Water Court in *Case No. D2-89CW36*. Because of the legal limitations of this court decree, all Groundwater available from Colorado Springs Utilities under this Tariff are strictly limited in location. All wells and all Groundwater use must be located both within the Colorado Springs Corporate boundary and the *Colorado Springs Augmentation Plan* area, without exception. Inclusion within one boundary does not guarantee inclusion within the other. Colorado Springs Utilities will determine the availability of service at any location.

The requirements of these *Water LESS* regarding Nonpotable Water Service shall generally apply to Customer Drilled and Maintained Wells.

8.14.B.2 Responsibility for Well Installations

The Customer shall own all pumps, control equipment, and piping. The well permit, augmentation plan, water rights, and meter shall be owned by Colorado Springs Utilities. The Customer is responsible for meeting all applicable well installation and Water Quality Requirements.

a) Customer Responsibilities

i. The Customer shall be responsible for the engineering studies to determine the size, feasibility, location on the Customer's property, and appropriate aquifer to be tapped.

ii. The Customer shall also be responsible for the installation, operation, and maintenance of the proposed well. Previously existing wells may be included in the Colorado Springs Utilities Augmentation Plan on a case-by-case basis.

iii. The Customer shall also be responsible for the cost of all equipment, Construction, installation, operation, and permitting.

b) Colorado Springs Utilities Responsibilities

i. Colorado Springs Utilities shall obtain well permits for the Customer-proposed well installations when it is determined that the proposed Project meets the minimum requirements of *Colorado Water Law, City Council Resolution 233-86*, and other applicable policies, standards, and regulations. At no time does Colorado Springs Utilities guarantee the feasibility or production

of a proposed well, and is not responsible for wells which do not meet the Customer's needs.

ii. Colorado Springs Utilities will be responsible for the augmentation, related accounting, and meter verification required to comply with the State Engineer's rules and regulations.

8.14.B.3 Permits

Colorado Springs Utilities shall obtain all required well permits from the State Engineer. The Contractor and the Owner/Developer shall be responsible for obtaining all other permits or approvals as required by local, county, state, or federal agencies. Such permits and approvals may include but not be limited to excavation permits, Colorado Department of Transportation or railroad permits, Site approval, building permits, and U.S. Army Corps of Engineers 404 permits.

8.14.B.4 Well Drilling and Construction

All wells shall be drilled and constructed by a licensed driller, in accordance with the State Engineer's rules and regulations regarding well Construction and pump installation. Well drillers shall be licensed through the State Board of Examiners of Water Well Construction and Pump Installation Contractors through the Office of the State Engineer.

8.14.B.5 Well Completion

After the licensed driller has completed installation of the well, the completion report, well log, the well Construction and test report, the pump installation and test report, and all other related engineering reports shall be submitted by the licensed driller to the State Engineer. Copies of the reports shall also be submitted to Colorado Springs Utilities.

8.14.B.6 Well Metering and Verification

All well installations must include a totalizing flow meter, Meter Pit, and appropriate plumbing as described in Section 2.7.L. The meter will be supplied, installed, and tested by Colorado Springs Utilities following verification that the Meter Pit and plumbing is accurately in place and inspected before any Groundwater is pumped for beneficial us. Inspection of the Meter Pit and plumbing shall be performed by Colorado Springs Utilities in accordance with these *Water LESS*. No Groundwater shall be pumped by the Customer until the meter installation is properly verified, except for the purposes of initial well and pump testing. By Colorado State Law under the *Amendments to Rules Governing the Measurement of Tributary Groundwater Diversions Located in the Arkansas River Basin*, no water may be pumped for beneficial use until such meter testing has been performed. Colorado Springs Utilities shall retest the meter for verification of accuracy every 4 years and each time the meter is serviced, swapped out, or otherwise altered, as required by law.

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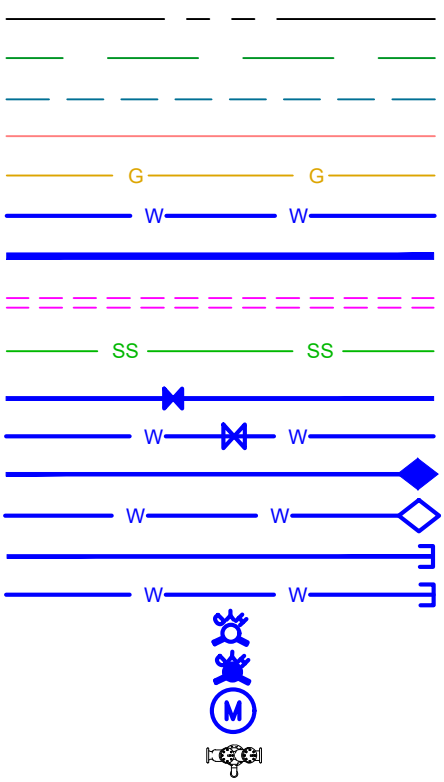
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B2-3	SINGLE–FAMILY RESIDENTIAL STREET CURB STOP LOCATION
B2-4	MULTI–FAMILY RESIDENTIAL PREMISES UTILITY SERVICE OPTION #1
B2-5	MULTI–FAMILY RESIDENTIAL PREMISES UTILITY SERVICE OPTION #2
B2-6	FIRE AND DOMESTIC WATER SERVICE PLAN FOR A NON–SINGLE–FAMILY RESIDENTIAL BUILDING
B2-7	TYPICAL COMMON SERVICE TRENCH SECTION
B2-8	SINGLE–FAMILY RESIDENTIAL WITH DETACHED ADU – OPTION 1
B2-9	SINGLE–FAMILY RESIDENTIAL WITH DETACHED ADU – OPTION 2
SECT B3	METER VAULTS
B3-1	STANDARD ROUND PRE–CAST VAULT FOR 1–1/2" AND 2" METERS
B3-2	PRE–CAST CONCRETE VAULT FOR 3" THRU 10" METERS W/BYPASS
B3-3	CAST IN PLACE CONCRETE VAULT FOR 8" AND 10" METERS
B3-4	CAST IN PLACE CONCRETE VAULT FOR 8" AND 10" METERS
B3-5	CONCRETE VAULT FOR 3", 4" AND 6" METERS

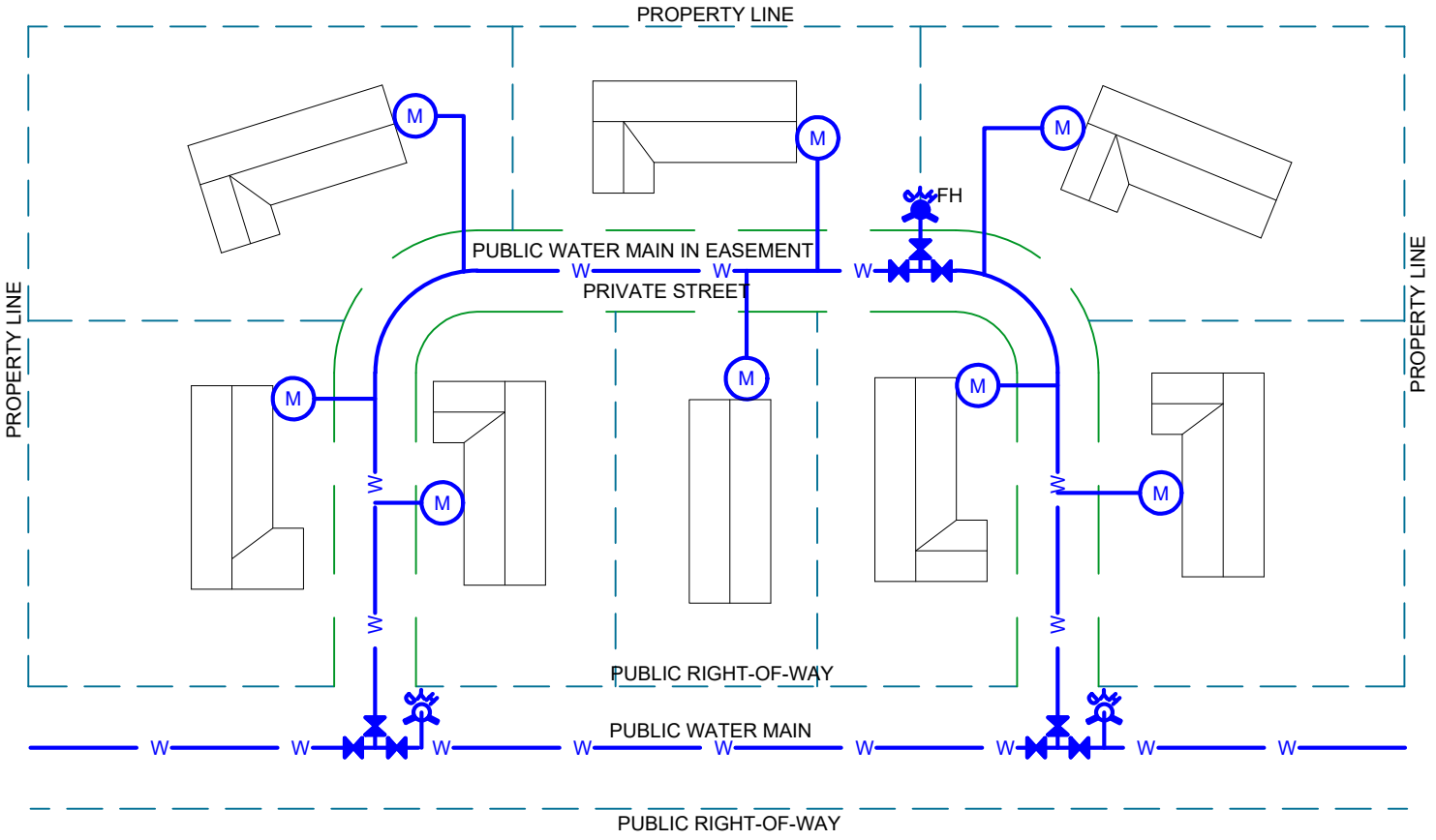
SHEET NO.	SHEET TITLE
SECT B4	METER DETAILS
B4-1	TYPICAL INSTALLATION FOR 3/4" THRU 1" METERS INSIDE SINGLE-FAMILY-RESIDENTIAL CONNECTION COPPER SERVICE
B4-2	3/4" THRU 1" OUTSIDE METER FOR SINGLE-FAMILY-RESIDENTIAL CONNECTIONS TYPE "K" COPPER AND HDPE SERVICE
B4-2A	3/4" THRU 1" OUTSIDE METER FOR NON SINGLE-FAMILY-RESIDENTIAL CONNECTIONS TYPE "K" COPPER AND HDPE SERVICE
B4-3	TYPICAL INSTALLATION FOR 3/4" THRU 1" METERS INSIDE SINGLE-FAMILY-RESIDENTIAL CONNECTION HDPE SERVICE
B4-4	TYPICAL INSTALLATION FOR 3/4" THRU 1" METERS INSIDE NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION COPPER SERVICE
B4-5	TYPICAL INSTALLATION FOR 3/4" THRU 1" METERS INSIDE NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION HDPE SERVICE
B4-6	METER BY-PASS PLAN AND ELEVATION FOR NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION METERS 1-1/2" THRU 6" ALTERNATIVE #1
B4-7	METER BY-PASS PLAN AND ELEVATION FOR NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION METERS 1-1/2" THRU 6" ALTERNATIVE #2
B4-8	TYPICAL INSTALLATION FOR 1-1/2" THRU 6" METERS INSIDE BUILDING
B4-9	TYPICAL NON-SINGLE-FAMILY RESIDENTIAL OUTDOOR WATER METER AND BACKFLOW PREVENTION ASSEMBLY
B4-10	TYPICAL NON-SINGLE-FAMILY RESIDENTIAL OUTDOOR WATER METER AND REMOVABLE BACKFLOW PREVENTION ASSEMBLY FOR IRRIGATION SYSTEMS
B4-11	REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY FIRE SUPPRESSION SYSTEMS
B4-12	VERTICAL UP/VERTICAL UP BACKFLOW PREVENTION ASSEMBLY
B4-13	TYPICAL CLEARANCE FOR BACKFLOW PREVENTION ASSEMBLY
B4-13A	TYPICAL METER AND BACKFLOW PREVENTION ASSEMBLY LAYOUT FOR STANDALONE NFPA 13D SYSTEMS
B4-14	SCHEMATIC DETAIL OF IRRIGATION AND CONSUMPTIVE USE SUB-METER INSTALLATION
B4-15	SCHEMATIC DETAIL OF IRRIGATION AND CONSUMPTIVE USE SUB-METER INSTALLATION
B4-16	MINIMUM METER CLEARANCES ALLOWABLE CONFIGURATION 1
B4-17	MINIMUM METER CLEARANCES ALLOWABLE CONFIGURATION 2
B4-18	MINIMUM METER CLEARANCES ALLOWABLE CONFIGURATION 3
B4-19	MINIMUM METER CLEARANCES ALLOWABLE CONFIGURATION 4
B4-20	MINIMUM METER CLEARANCES ALLOWABLE CONFIGURATION 5
B4-21	MINIMUM METER CLEARANCES ALLOWABLE CONFIGURATION 6
B4-22	MINIMUM METER CLEARANCES ALLOWABLE CONFIGURATION 7

NOTE: ALL DETAIL DRAWINGS NOT TO SCALE (NTS) UNLESS OTHERWISE NOTED.

LEGEND



DEVELOPER PHASE LINE
EASEMENT LINE
EXISTING ROW/PROPERTY LINE
EXISTING CURB LINE
EXISTING GAS MAIN
EXISTING WATER
PROPOSED WATER
EXISTING NON POTABLE WATER
EXISTING SEWER
VALVE (PROPOSED)
VALVE (EXISTING)
BLOWOFF (PROPOSED)
BLOWOFF (EXISTING)
PLUG (PROPOSED)
PLUG (EXISTING)
EXISTING FIRE HYDRANT
PROPOSED FIRE HYDRANT
EXISTING/PROPOSED METER PIT
BACKFLOW PREVENTION ASSEMBLY (BFP)



NOTE:

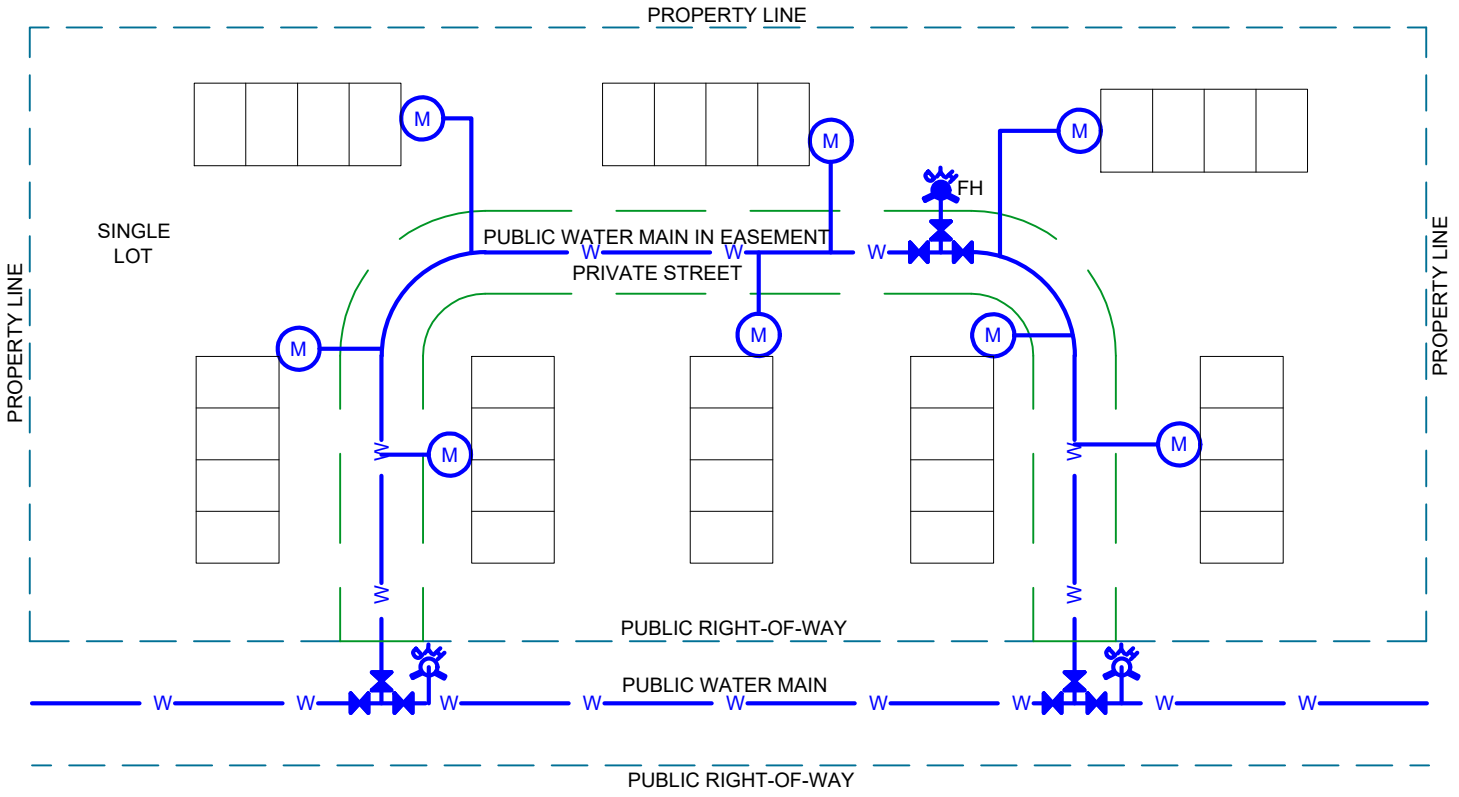
1. SINGLE-FAMILY RESIDENTIAL CONNECTION SUBDIVISIONS SHALL HAVE PUBLIC WATER MAINS EITHER IN A RIGHT OF WAY OR EASEMENT AS DESCRIBED IN SECTION 2.3.
2. PRIVATE WATER MAINS, CONSECUTIVE SYSTEMS, OR MASTER METERED SYSTEMS ARE NOT ALLOWED.
3. FOR EASEMENT WIDTHS SEE SECTION 2.6.E.

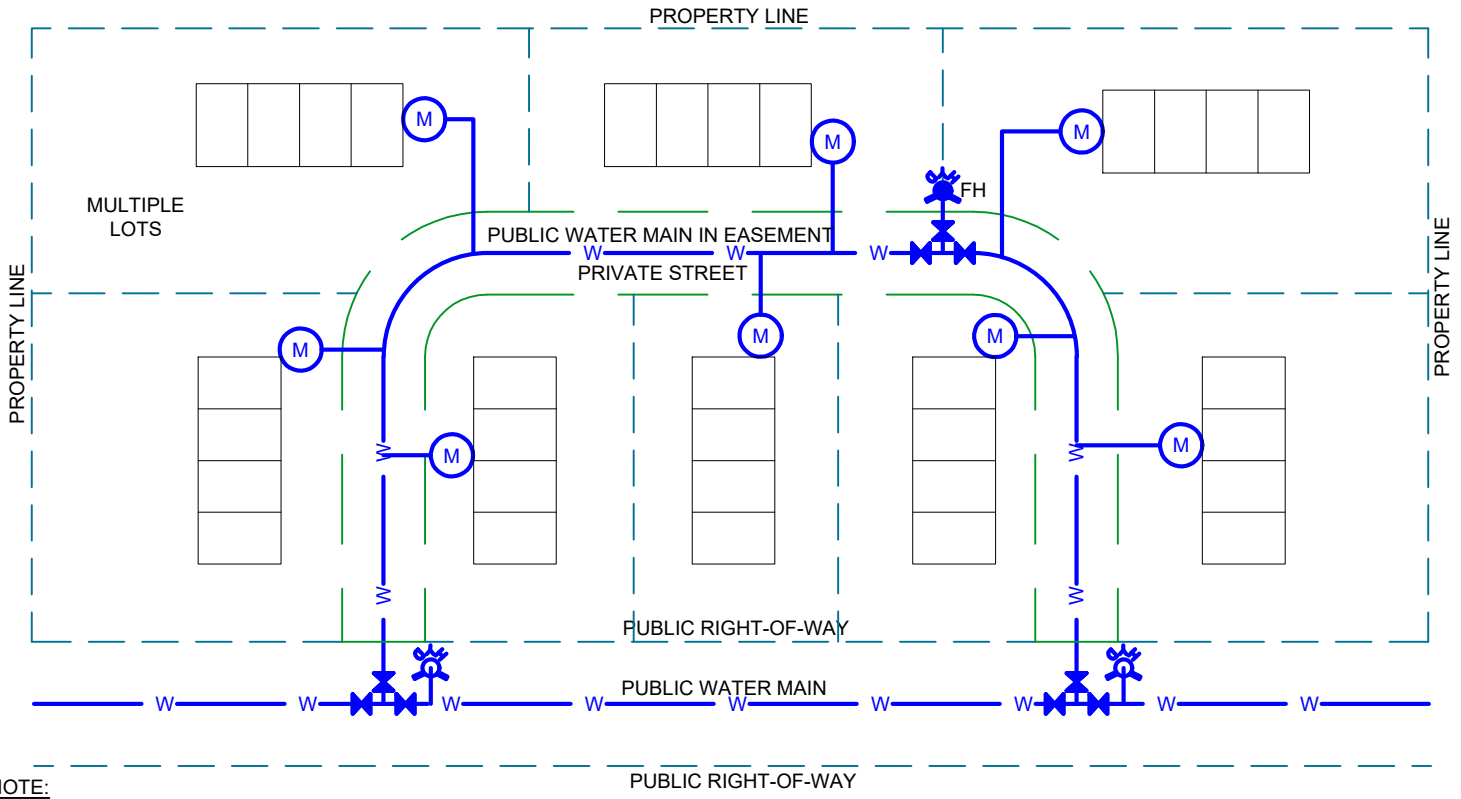
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SINGLE-FAMILY RESIDENTIAL CONNECTIONS PUBLIC WATER SYSTEM IN AN EASEMENT ON PRIVATE PROPERTY

A1-1

DATED 10/2020





NOTE:

1. MULTI-FAMILY/NON-SINGLE FAMILY RESIDENTIAL CONNECTIONS ON A SINGLE PLATTED LOT ARE ALLOWED THE INSTALLATION OF PUBLIC WATER MAIN EITHER IN A RIGHT OF WAY OR EASEMENT AS DESCRIBED IN SECTION 2.3.
2. FOR EASEMENT WIDTHS SEE SECTION 2.6.E.
3. MULTI-FAMILY/NON-SINGLE FAMILY RESIDENTIAL CONNECTIONS SHALL INSTALL A BACKFLOW PREVENTION ASSEMBLY PER SECTION 2.7.N.

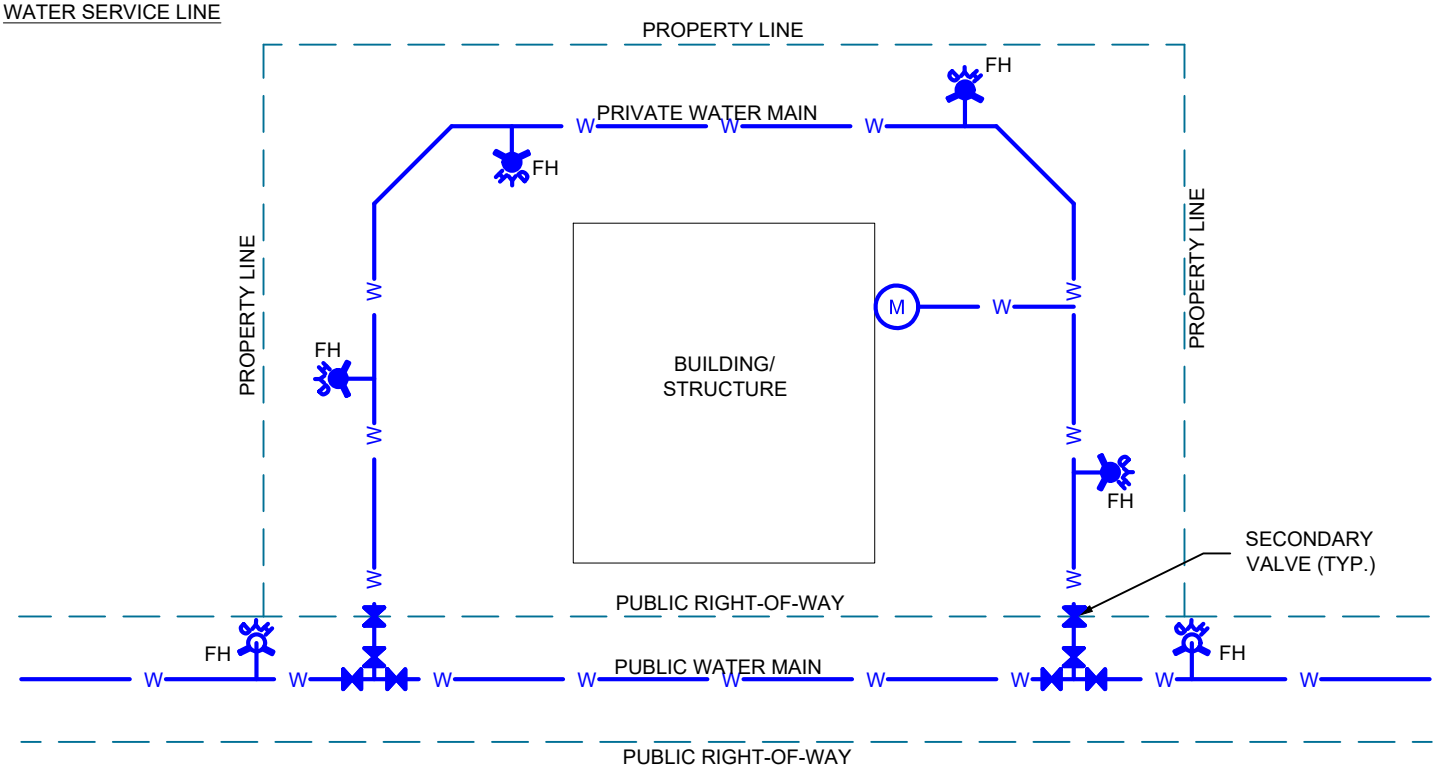
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MULTI-FAMILY CONNECTIONS/NON-SINGLE FAMILY RESIDENTIAL PUBLIC WATER SYSTEM IN AN EASEMENT ON PRIVATE PROPERTY

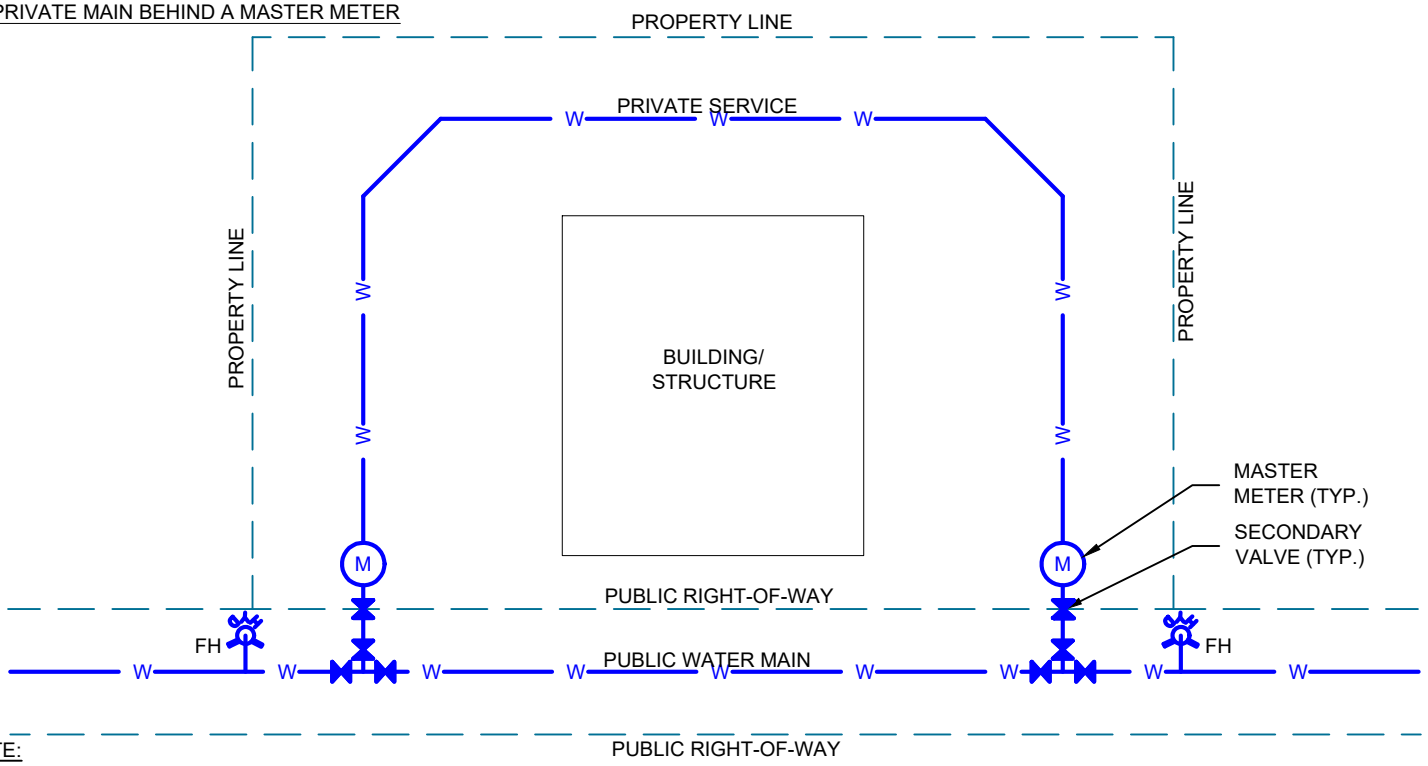
A1-2

DATED 10/2020

WATER SERVICE LINE



PRIVATE MAIN BEHIND A MASTER METER



NOTE:

1. PRIVATE WATER MAINS BEHIND A MASTER METER ARE ALLOWED BUT NOT RECOMMENDED DUE TO FIRE FLOW AND BACKFLOW PREVENTION WATER METER REQUIREMENTS AND OWNERSHIP RESPONSIBILITIES.
2. BACKFLOW PREVENTION ASSEMBLY IS REQUIRED TO BE LOCATED AFTER MASTER METERED SYSTEM AND BEFORE FIRST BRANCH SERVICE LINE. SEE DETAIL DRAWING B4-9.
3. NON-SINGLE-FAMILY RESIDENTIAL CONNECTIONS REQUIRE THE INSTALLATION OF AN RP BACKFLOW PREVENTION ASSEMBLY SEE SECTION 2.7.N.
4. FOR EASEMENT WIDTHS SEE SECTION 2.6.E.
5. FIRE HYDRANTS ARE NOT ALLOWED AFTER THE MASTER METER.

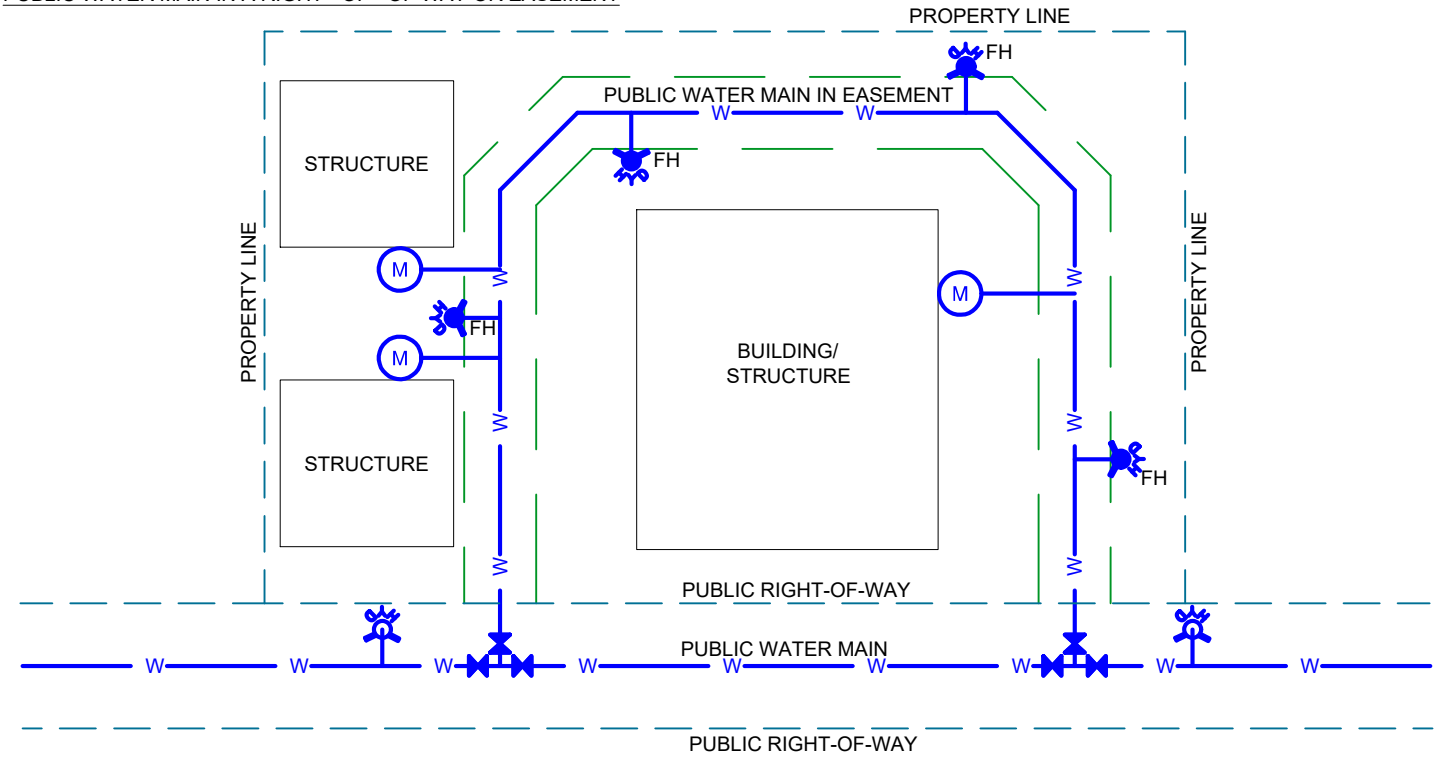
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NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION AND APARTMENTS ONE PLATTED LOT AND ONE BUILDING RECEIVING SERVICE

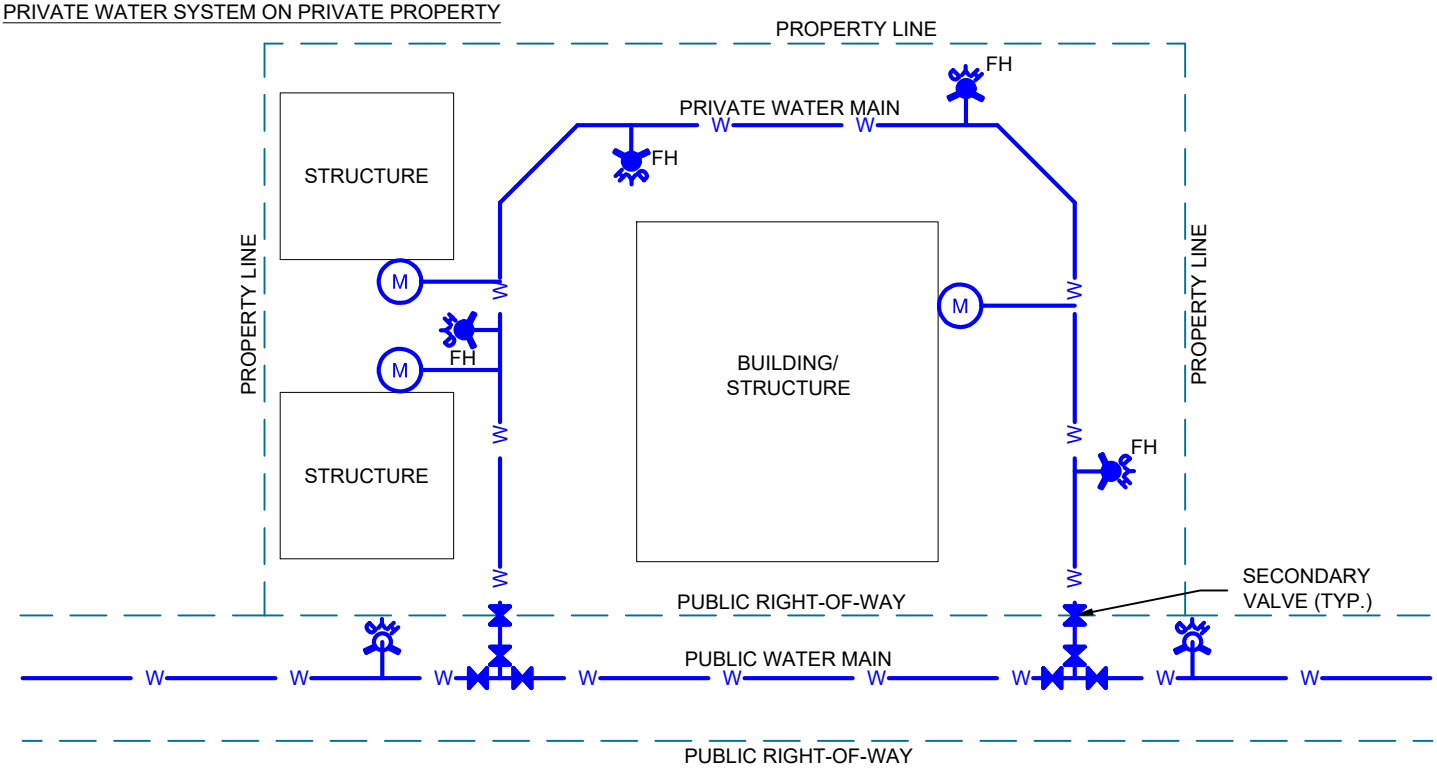
A1-3

DATED 10/2020

PUBLIC WATER MAIN IN A RIGHT - OF - OF WAY OR EASEMENT



PRIVATE WATER SYSTEM ON PRIVATE PROPERTY



NOTE:

1. NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION AND APARTMENTS ONE PLATTED LOT WITH MULTIPLE BUILDINGS/STRUCTURES HAS THE OPTION OF A PUBLIC WATER MAIN EITHER IN A RIGHT OF WAY OR EASEMENT AS DESCRIBED IN SECTION 2.3.
2. FOR EASEMENT WIDTHS SEE SECTION 2.6.E.
3. NON-SINGLE-FAMILY RESIDENTIAL CONNECTIONS REQUIRE THE INSTALLATION OF AN RP BACKFLOW PREVENTION ASSEMBLY SEE SECTION 2.7.N.

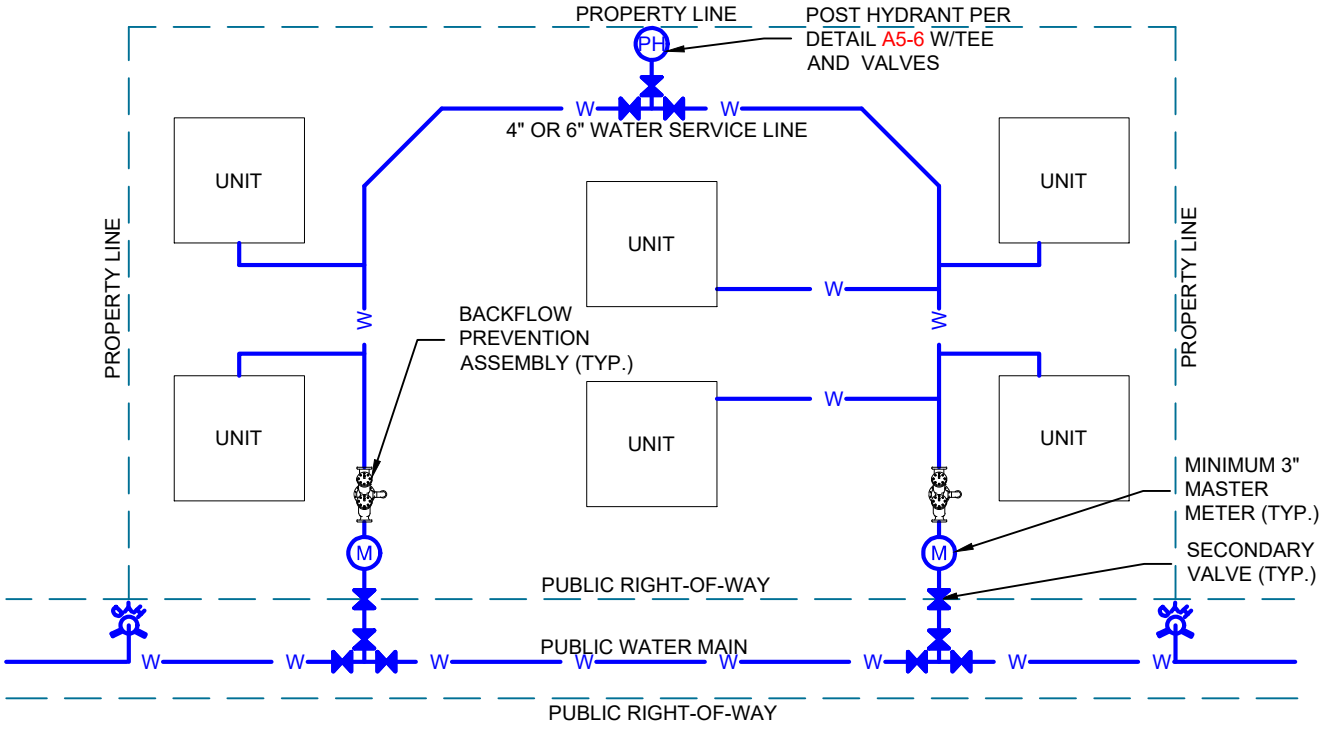
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NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION AND APARTMENTS ONE PLATTED LOT WITH MULTIPLE BUILDINGS RECEIVING INDIVIDUAL WATER SERVICE

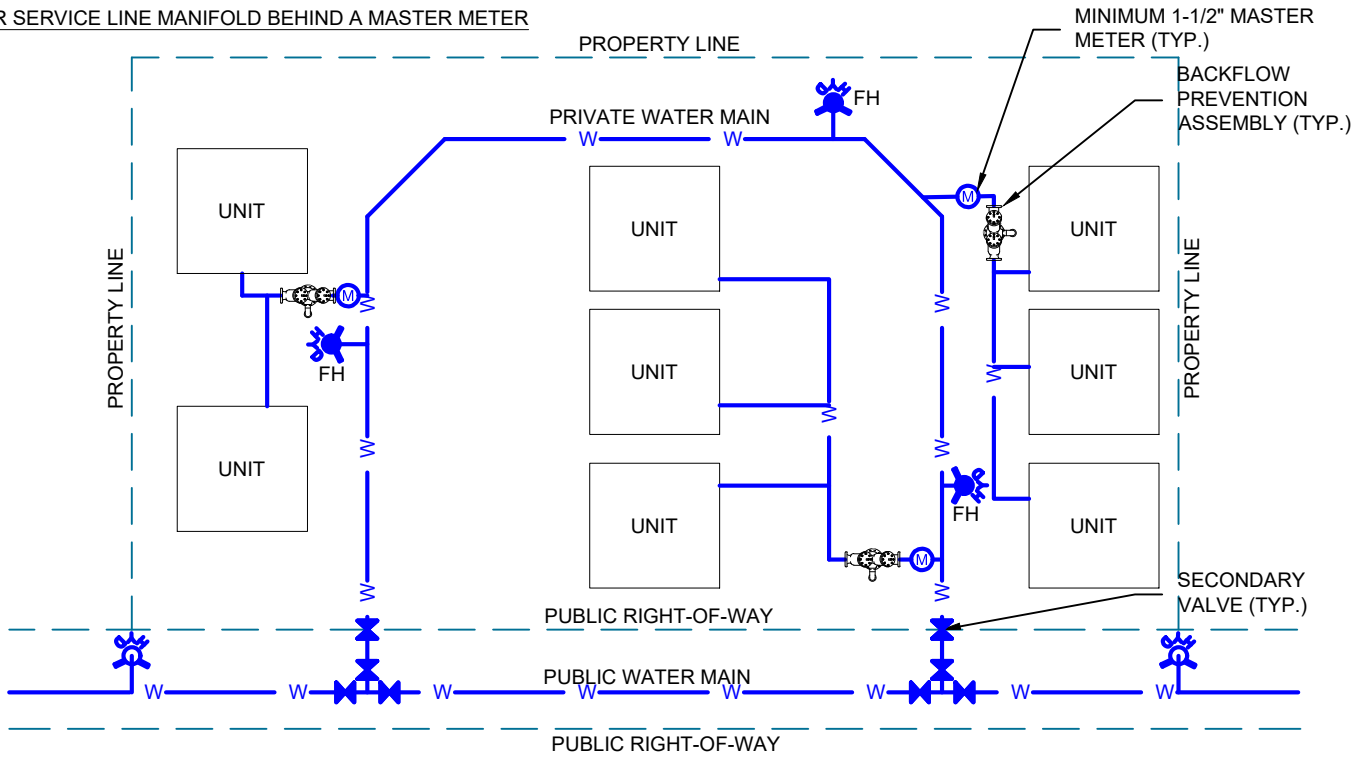
A1-4

DATED 10/2020

WATER SERVICE LINE SERVING MULTIPLE UNITS BEHIND A MASTER METER



WATER SERVICE LINE MANIFOLD BEHIND A MASTER METER



NOTE:

1. BACKFLOW PREVENTION ASSEMBLY IS REQUIRED TO BE LOCATED AFTER MASTER METERED SYSTEM AND BEFORE FIRST BRANCH SERVICE LINE. SEE DETAIL DRAWING B4-9.
2. NON-SINGLE-FAMILY RESIDENTIAL CONNECTIONS REQUIRE THE INSTALLATION OF AN RP BACKFLOW PREVENTION ASSEMBLY SEE SECTION 2.7.N.
3. INDIVIDUAL WATER SERVICE LINES SHALL HAVE INDIVIDUAL CURB STOPS INSTALLED.
4. FOR 2 INCH MANIFOLD, SEE DETAIL DRAWING A1-7.
5. CURB STOPS SHALL BE LOCATED AT THE OUTSIDE EDGE OF THE ACCESS ROAD IN A LANDSCAPED AREA AND SHALL BE LABELED WITH THE UNIT NUMBER. WHERE LANDSCAPED AREA IS NOT AVAILABLE, THE CURB STOP SHALL BE LOCATED IN A TRAFFIC RATED LID. CURB STOPS SHALL BE LOCATED A MINIMUM OF 6 FEET FROM ANY UNIT.
6. COMMERCIAL METER SIZING FORM MUST BE COMPLETED FOR EACH METER. MINIMUM OF 1" METER ALLOWED FOR MANIFOLD SYSTEM.

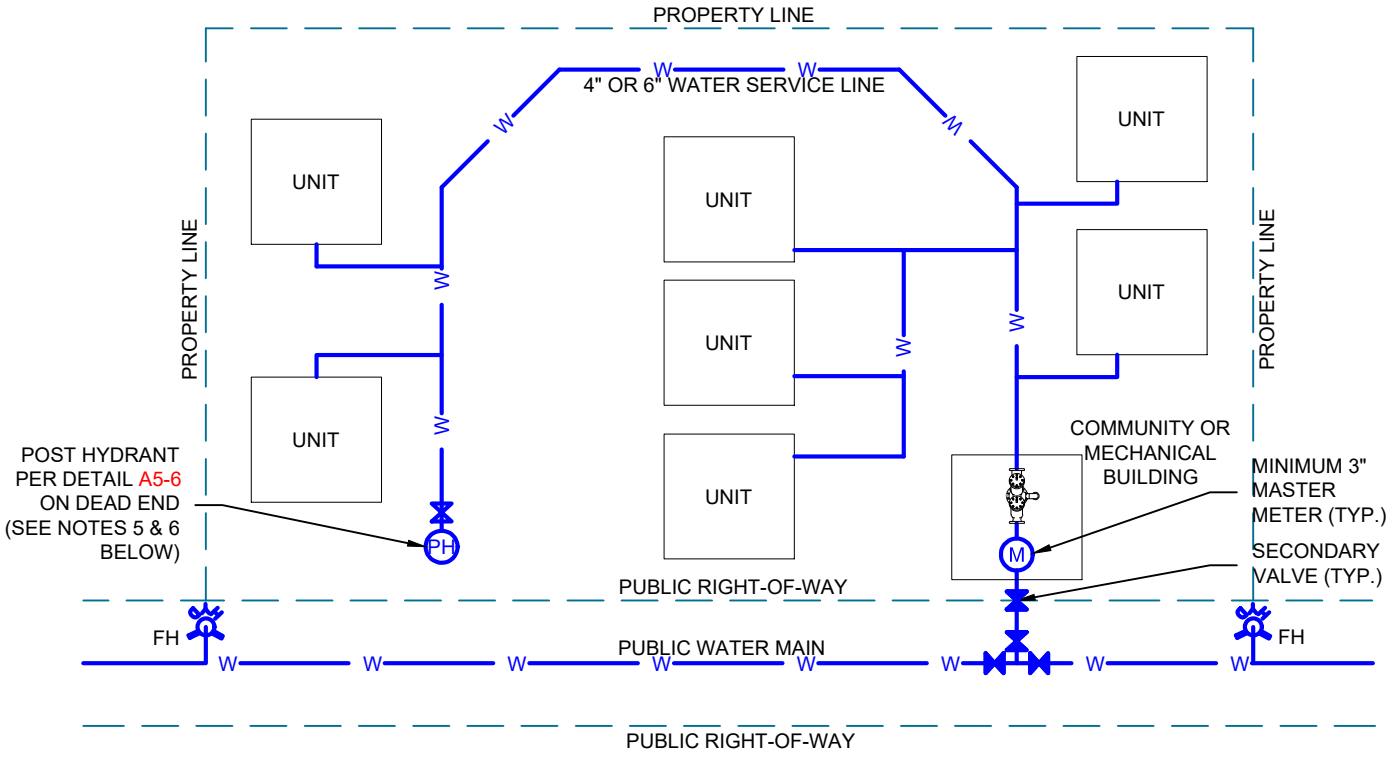
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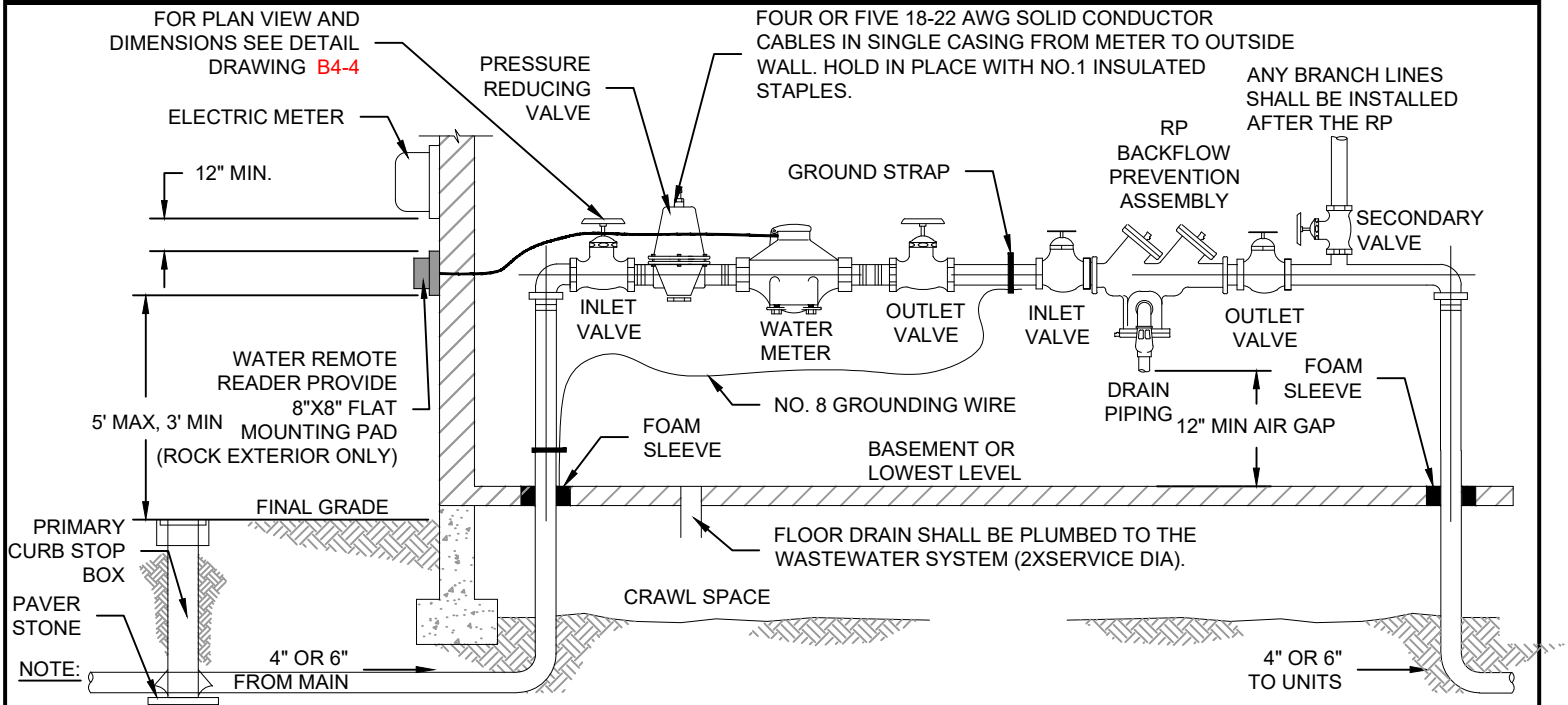
NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION ONE PLATTED LOT WITH MULTIPLE UNITS SERVED BEHIND A MASTER METER

A1-5

DATED 10/2020

WATER SERVICE LINE SERVING MULTIPLE UNITS BEHIND A MASTER METER INSIDE A COMMUNITY OR MECHANICAL BUILDING





1. BACKFLOW PREVENTION ASSEMBLY IS REQUIRED TO BE LOCATED AFTER MASTER METER AND BEFORE FIRST BRANCH SERVICE LINE. SEE DETAIL DRAWING B4-9.
2. NON-SINGLE-FAMILY RESIDENTIAL CONNECTIONS REQUIRE THE INSTALLATION OF AN RP BACKFLOW PREVENTION ASSEMBLY SEE SECTION 2.7.N.
3. INDIVIDUAL WATER SERVICE LINES SHALL HAVE INDIVIDUAL CURB STOPS INSTALLED.
4. FOR 2 INCH MANIFOLD, SEE DETAIL DRAWING A1-7.
5. CURB STOPS SHALL BE LOCATED AT THE OUTSIDE EDGE OF THE ACCESS ROAD IN A LANDSCAPED AREA AND SHALL BE LABELED WITH THE UNIT NUMBER. WHERE LANDSCAPED AREA IS NOT AVAILABLE, THE CURB STOP SHALL BE LOCATED IN A TRAFFIC RATED LID. CURB STOPS SHALL BE LOCATED A MINIMUM OF 6 FEET FROM ANY UNIT.
6. THIS DETAIL MAY BE USED WITH OR WITHOUT A SERVICE LINE MANIFOLD. IF MORE THAN 50 UNITS, A SECOND CONNECTION TO THE PUBLIC WATER MAIN SHALL BE REQUIRED WITH A SECOND METER AND BACKFLOW PREVENTION ASSEMBLY.
7. A POST HYDRANT PER DETAIL DRAWING A5-6 SHALL BE INSTALLED AT THE DEAD END WHERE A SECOND CONNECTION TO THE PUBLIC WATER MAIN IS NOT REQUIRED.

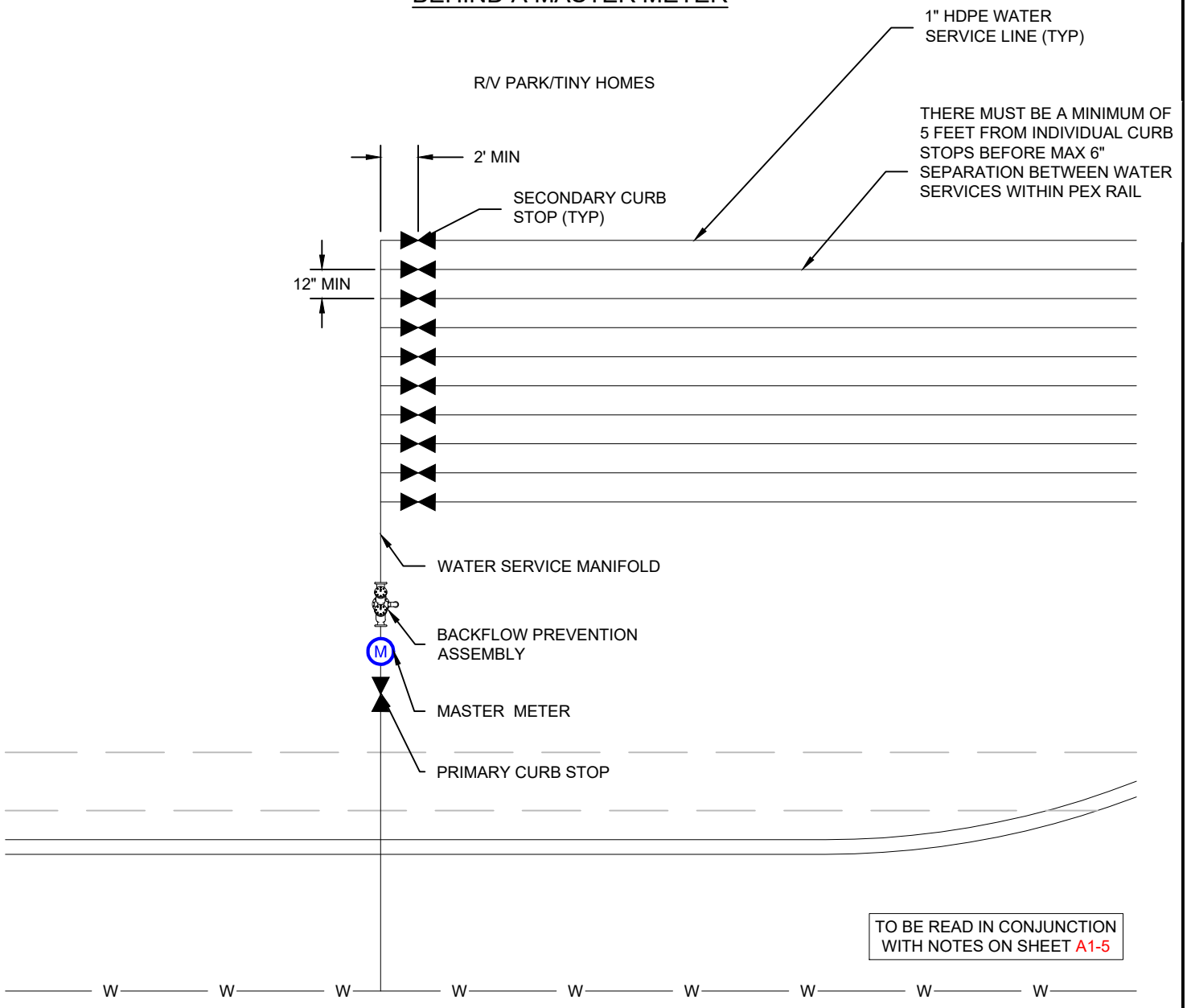
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NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION (RV PARKS,TINY HOMES) ONE PLATTED LOT WITH MULTIPLE UNITS SERVED BEHIND A MASTER METER INSIDE A COMMUNITY OR MECHANICAL BUILDING

A1-6

DATED 10/2020

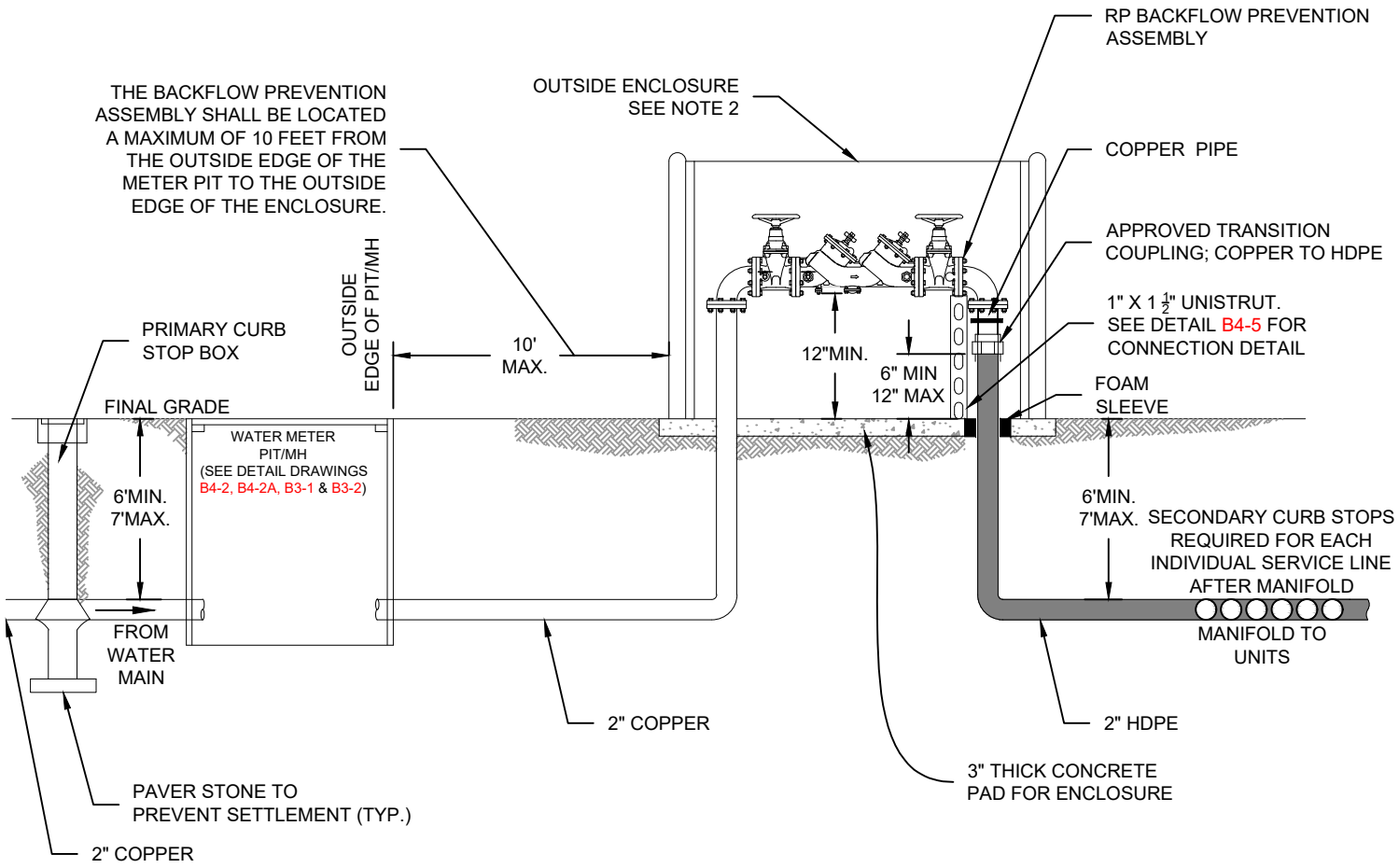
2 INCH WATER SERVICE LINE MANIFOLD BEHIND A MASTER METER



NOTES:

1. A MAXIMUM NUMBER OF 10 UNITS MAY BE SERVED FROM A SINGLE MAINIFOLD.
2. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND GAS OR ELECTRIC SERVICE LINE MUST BE 3 FEET.
3. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND THE WASTEWATER MAIN SHALL BE 10 FEET.
4. THE WATER SERVICE LINE SHALL BE COPPER FROM THE PRIMARY CURB STOP TO THE METER LOOP.
5. THE WATER SERVICE LINE AND MANIFOLD SHALL BE THE SAME AND SHALL BE SIZED BY THE DESIGN ENGINEER FOR PEAK DAY DEMAND.
6. THE WATER SERVICE LINES AND MANIFOLD SHALL BE A MAXIMUM DIAMETER OF 2 INCHES.
7. THE PRIMARY CURB STOP SHALL BE LOCATED A MINIMUM OF 2 FEET FROM THE BACK OF CURB, EDGE OF ASPHALT AND CLOSEST EDGE OF THE JOINT TRENCH.
8. SECONDARY CURB STOP SHALL BE LOCATED A MINIMUM OF 9 FEET FROM THE BUILDING FOUNDATION; IF BUILDING HAS A 3 FOOT MINIMUM CUTOFF WALL, SECONDARY CURB STOP MAY BE A MINIMUM OF 6 FEET FROM FOUNDATION.
9. WATER SERVICES LINES IN THE COMMON TRENCH SHALL BE SEPARATED BY A MAXIMUM HORIZONTAL DISTANCE OF 6 INCHES.
10. HDPE SERVICE LINES WITHIN THE JOINT TRENCH SHALL BE SECURED EVERY 10 FEET TO ENSURE SEPARATION OF SERVICES.
11. MANIFOLD AND SERVICE LINE JOINT TRENCH SHALL BE EMBEDDED WITH WELL GRADED SAND A MINIMUM OF 4 INCHES BELOW AND 6 INCHES ABOVE THE WATER SERVICE LINE OUTER DIAMETER.
12. CURB STOP LIDS SHALL BE MARKED WITH UNIT ADDRESS.
13. SEE ELECTRIC LINE EXTENSION AND SERVICE STANDARDS APPENDIX F, STANDARD 18-302 FOR CLEARANCES BETWEEN WATER SERVICE LINE MANIFOLD AND ELECTRIC TRANSFORMERS AND VAULTS.

2 INCH WATER SERVICE LINE ONLY



NOTES:

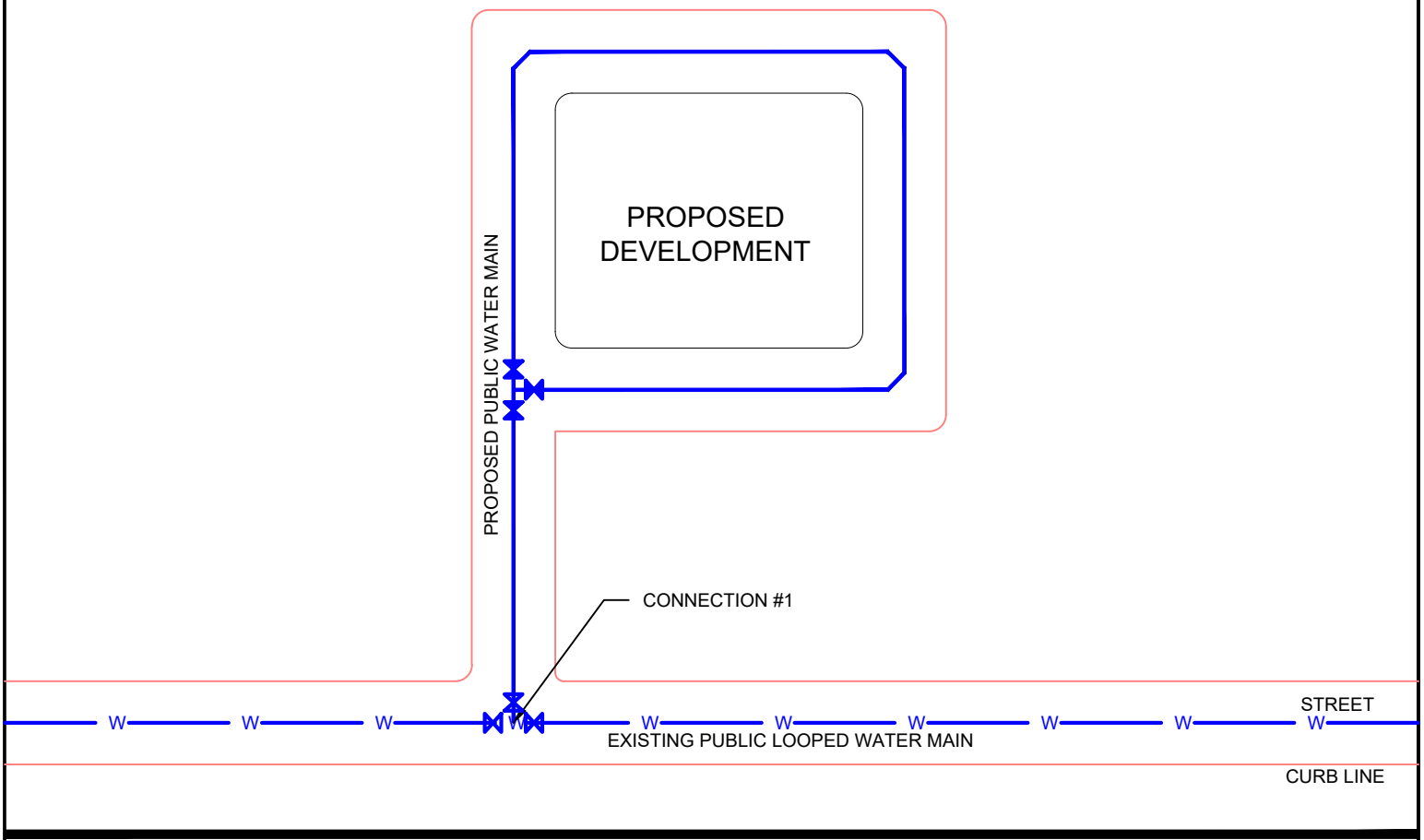
1. REFERENCE SECTION 2.7.N FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS.
2. OUTDOOR ENCLOSURES SHALL BE HEATED AND CONSTRUCTED PER ASSE STANDARD No.1060 TYPE I.
3. NO DRAIN VALVES SHALL BE LOCATED BEFORE THE APPROVED BACKFLOW PREVENTION ASSEMBLY.
4. THE APPROVED BACKFLOW PREVENTION ASSEMBLY SHALL BE SOLDERED OR FLANGED ONLY.
5. THE BACKFLOW PREVENTION ASSEMBLY SHALL BE ON AN APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY.
6. THE DISTANCE BETWEEN THE COPPER TO HDPE TRANSITION COUPLING AND THE FINAL GRADE WILL BE A MINIMUM OF 6 INCHES AND A MAXIMUM OF 12 INCHES.
7. FOR METER AND BACKFLOW BUILDINGS, PLEASE SEE DETAIL DRAWING A1-6.

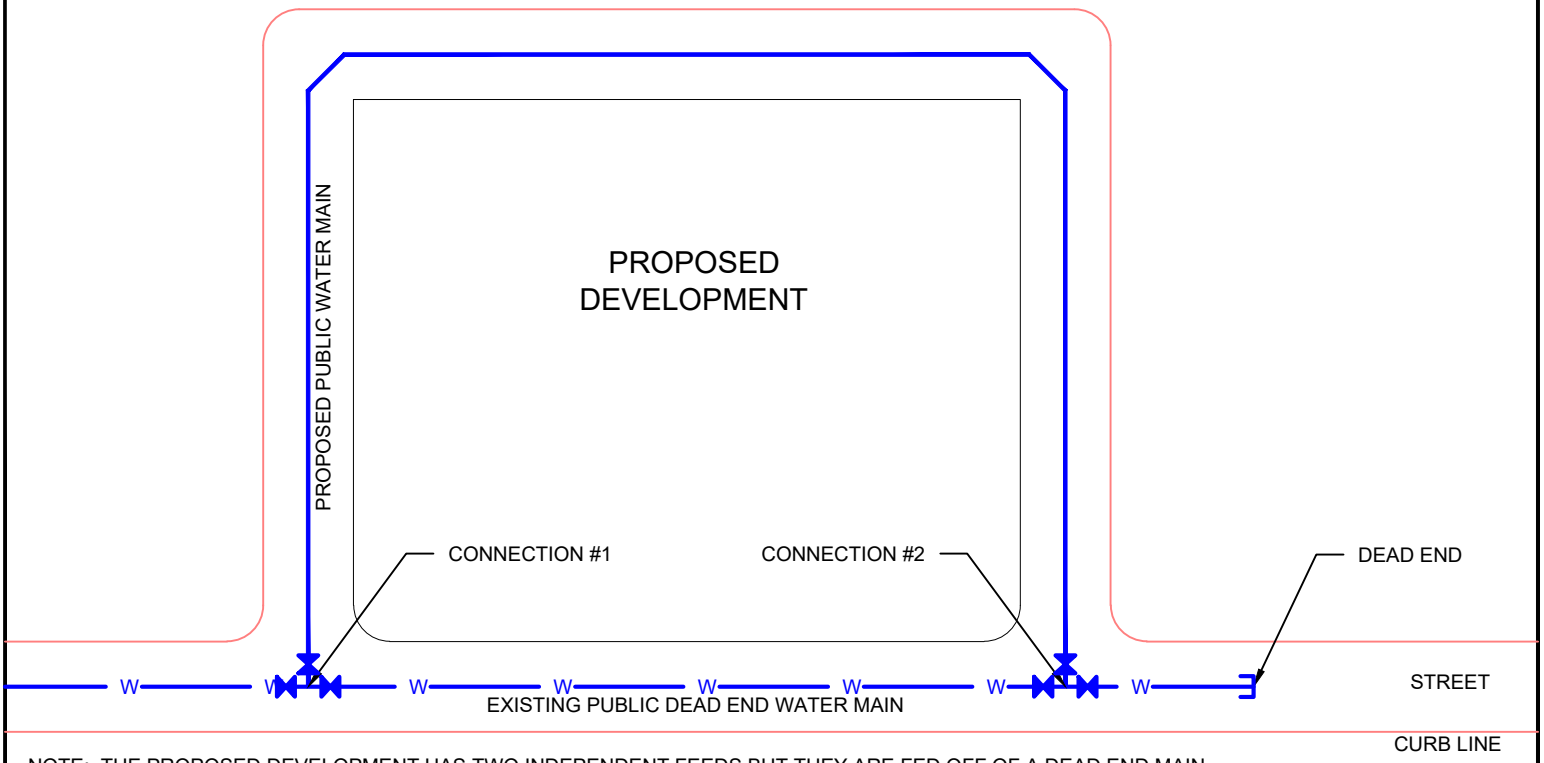
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NON-SINGLE-FAMILY RESIDENTIAL OUTDOOR WATER MASTER METER AND BACKFLOW PREVENTION ASSEMBLY BEFORE WATER SERVICE LINE MANIFOLD

A1-8

DATED 10/2020





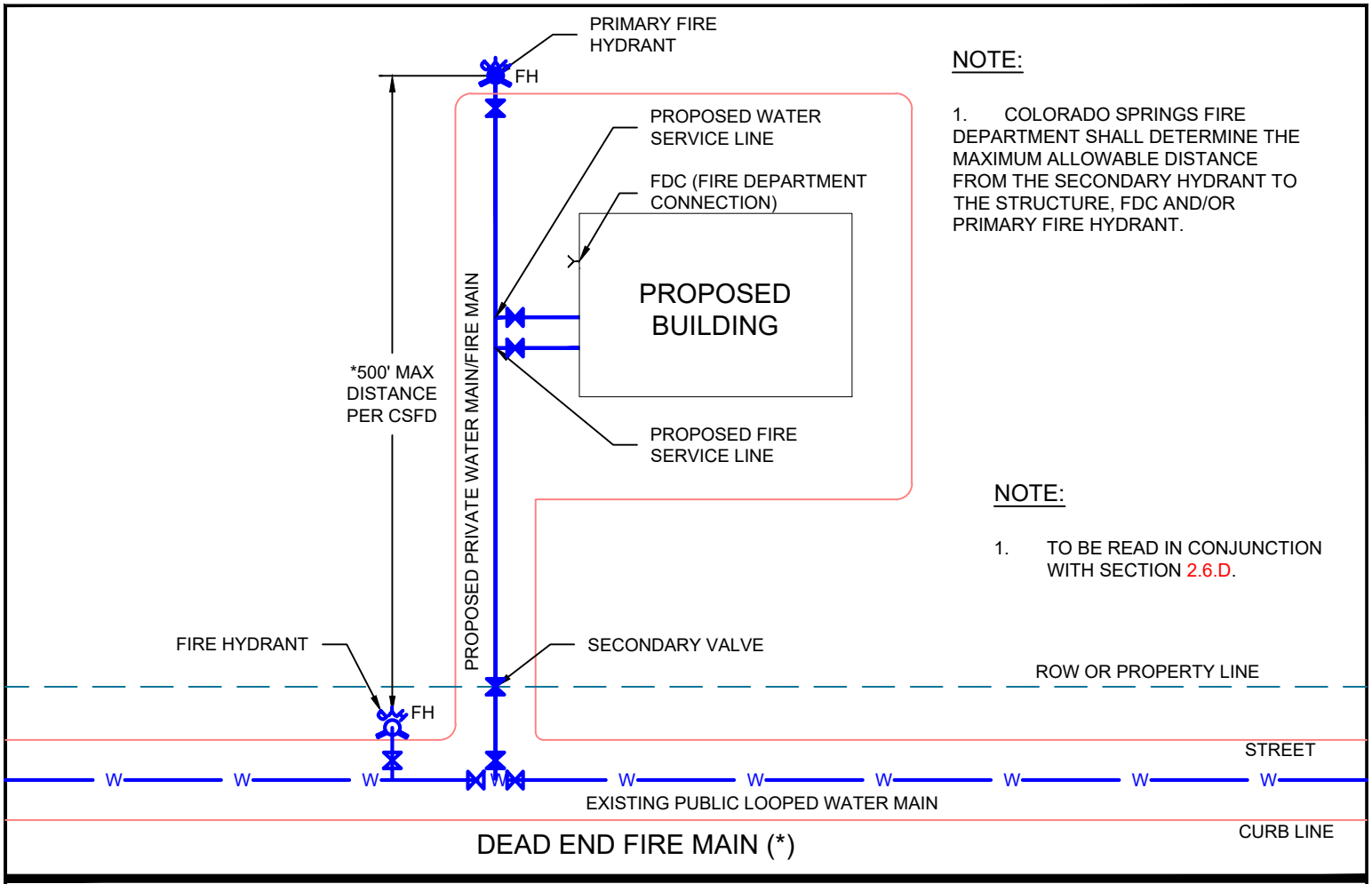
NOTE: THE PROPOSED DEVELOPMENT HAS TWO INDEPENDENT FEEDS BUT THEY ARE FED OFF OF A DEAD END MAIN.

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EXAMPLES OF DEAD END MAINS

A2-1

DATED 03/2014



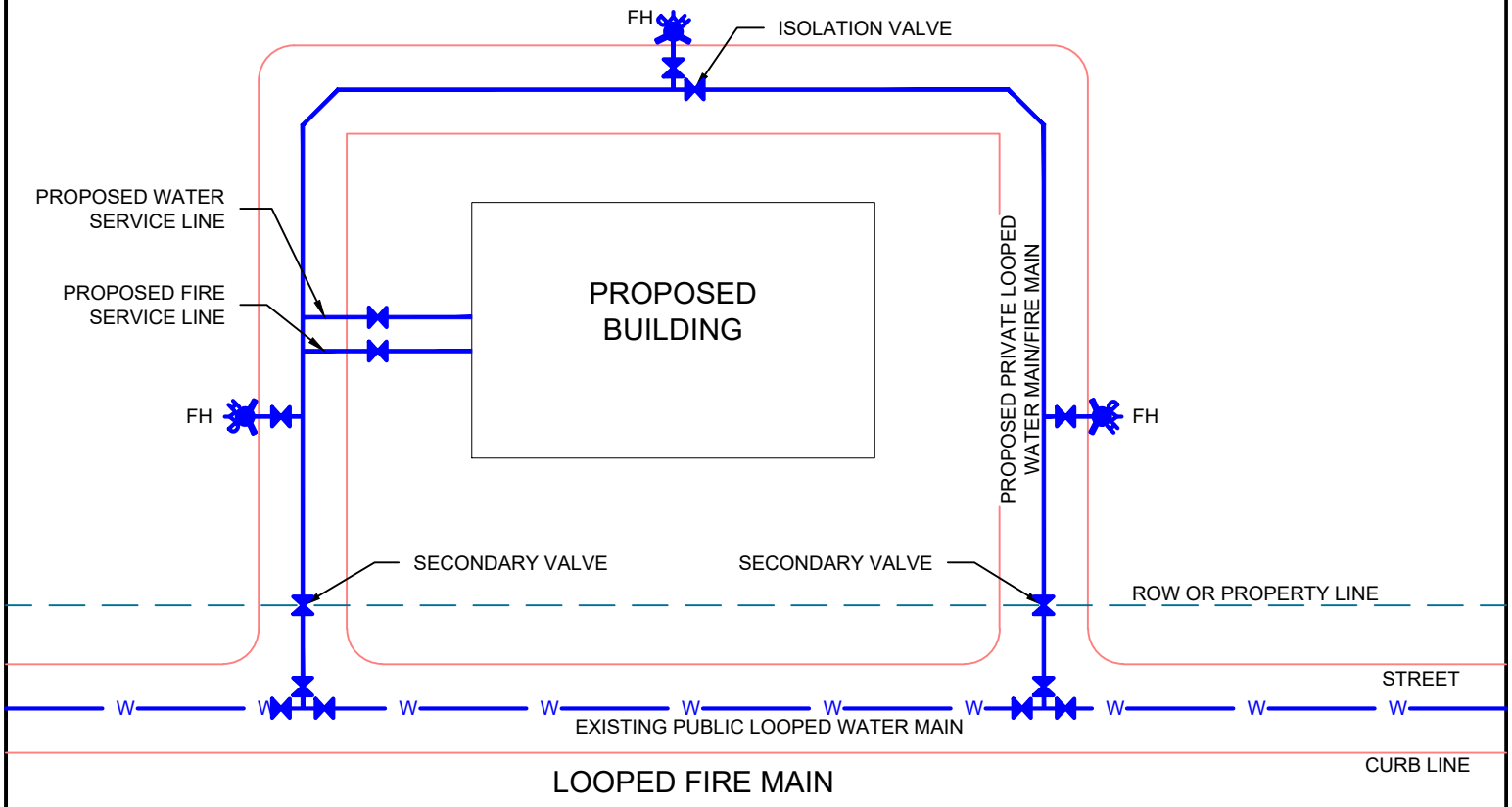
NOTE:

1. COLORADO SPRINGS FIRE DEPARTMENT SHALL DETERMINE THE MAXIMUM ALLOWABLE DISTANCE FROM THE SECONDARY HYDRANT TO THE STRUCTURE, FDC AND/OR PRIMARY FIRE HYDRANT.

NOTE:

1. TO BE READ IN CONJUNCTION WITH SECTION 2.6.D.

DEAD END FIRE MAIN (*)



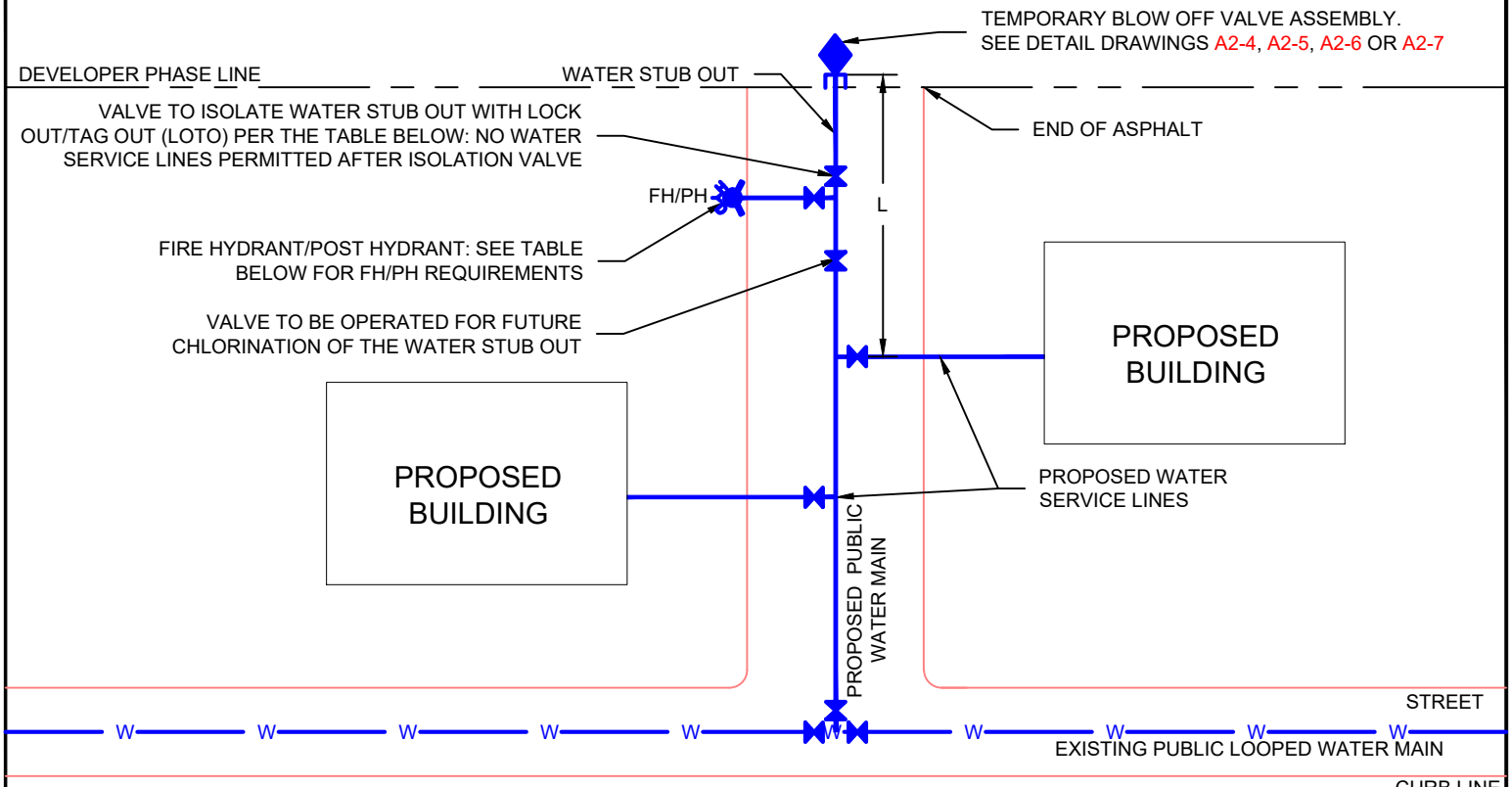
LOOPED FIRE MAIN

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EXAMPLES OF FIRE MAINS

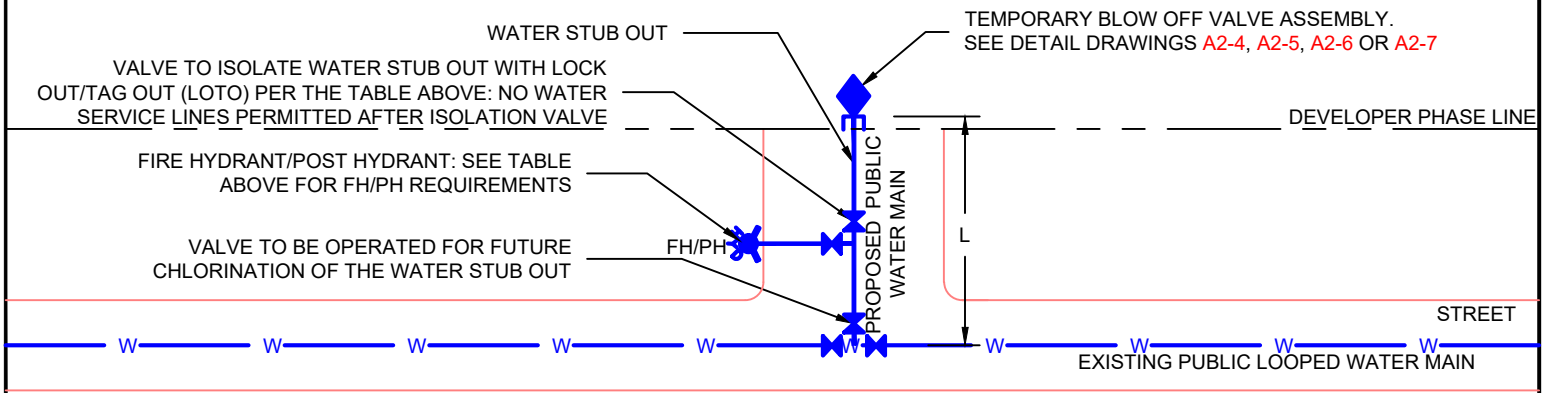
A2-2

DATED 03/2014



EXAMPLE 1 = WATER STUB OUTS; WITH WATER SERVICES

BLOW-OFF AND FIRE HYDRANT REQUIREMENTS			
LENGTH (L) OF TEMPORARY DEAD END MAIN (FEET)	TEMPORARY BLOW-OFF REQUIRED AT END OF MAIN	FIRE HYDRANT/POST HYDRANT REQUIRED NEAR END OF MAIN	LOCK OUT/TAG OUT REQUIRED
L ≤ 400' FOR 8" ≤ 200' FOR 12"	YES	NO	YES
L > 400' FOR 8" > 200' FOR 12"	YES	YES	YES
ANY LENGTH FOR 16" AND GREATER	YES	YES	YES



EXAMPLE 2 = WATER STUB OUTS; W/NO WATER SERVICES

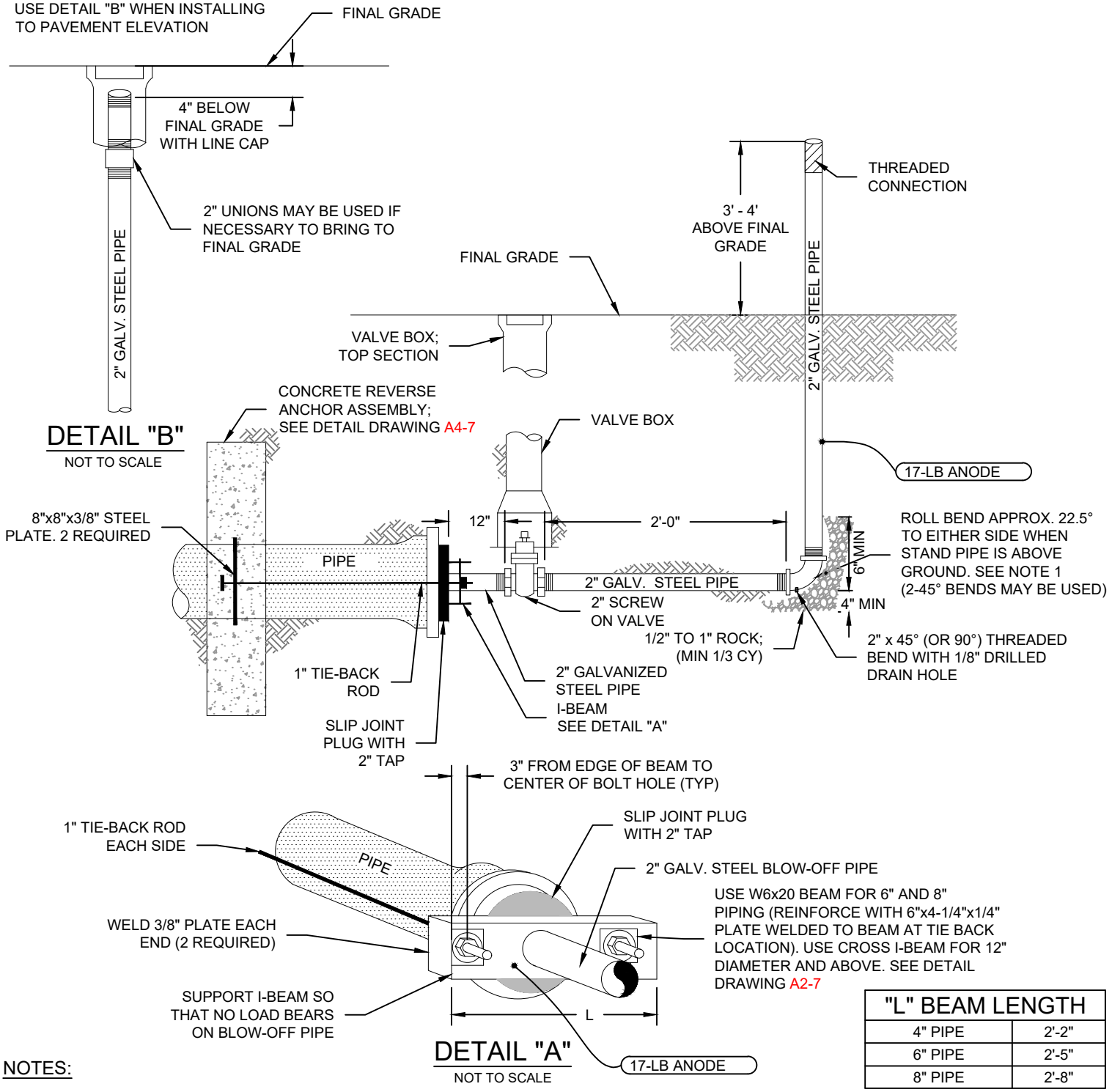
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WATER STUB OUTS

A2-3

DATED 03/2014

NOTE:
USE DETAIL "B" WHEN INSTALLING TO PAVEMENT ELEVATION



DETAIL "B"
NOT TO SCALE

DETAIL "A"
NOT TO SCALE

"L" BEAM LENGTH	
4" PIPE	2'-2"
6" PIPE	2'-5"
8" PIPE	2'-8"

NOTES:

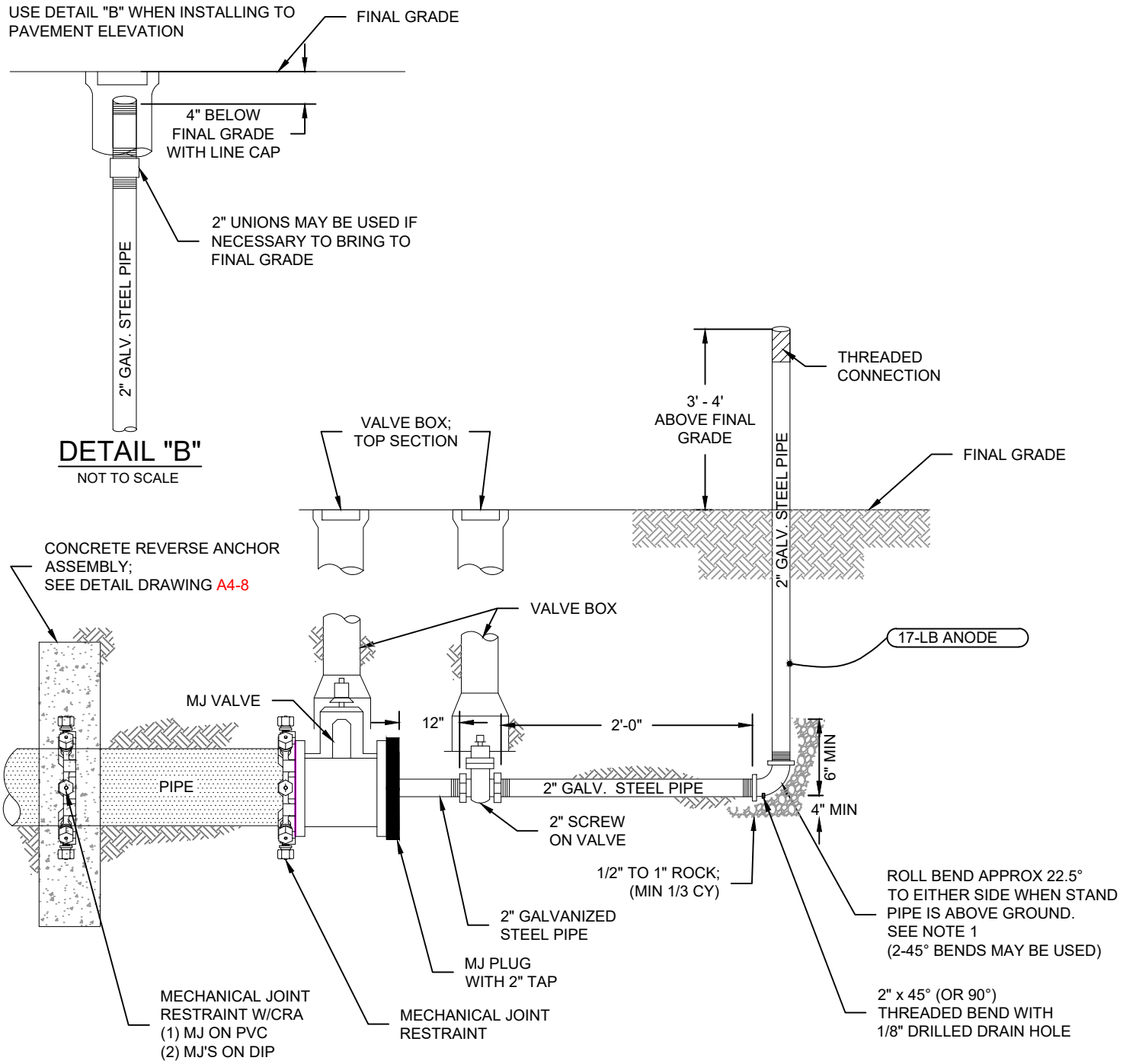
1. IF APPROPRIATE LOCATION FOR DISCHARGED WATER CANNOT BE REACHED BY ROLLING THE BEND ADDITIONAL BENDS MAY BE REQUIRED BY THE COLORADO SPRINGS UTILITIES INSPECTOR.
2. COAT TIE RODS, BEAM AND GALVANIZED STEEL PIPE. SEE DETAIL DRAWING A8-11.
3. ENTIRE BLOW-OFF ASSEMBLY MUST BE ADEQUATELY SUPPORTED, CONCRETE PAVER STONES MAY BE REQUIRED.
4. PIPE DOPE APPROVED FOR USE IN POTABLE WATER SYSTEMS MUST BE USED ON ALL THREADED FITTINGS.
5. TEMPORARY BLOW-OFF VALVE ASSEMBLIES SHALL BE INSPECTED BY THE COLORADO SPRINGS UTILITIES INSPECTOR PRIOR TO BACKFILL. BACKFILL COMPACTION TO BE SAME AS PIPE COMPACTION SPECIFICATIONS.
6. 2" GALVANIZED PIPE MUST BE RATED TO 250 PSI AND CONFORM TO NSF-61 SPECIFICATIONS.
7. THERE SHALL BE NO SERVICE LINES CONNECTED BETWEEN THE LAST ISOLATION VALVE AND THE TEMPORARY BLOW-OFF ASSEMBLY.
8. TIE BACK RODS SHALL BE A MINIMUM ASTM A307 GRADE A STEEL WITH MINIMUM ASTM A-36 NUTS. STEEL BEAMS SHALL BE ASTM A992 GD 50.
9. ALL HOLES IN STEEL SHALL BE OVERSIZED HOLES.

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TEMPORARY BLOW-OFF ASSEMBLIES- 4", 6" & 8" MAINS WITH SLIP JOINT PLUG

A2-4

DATED 03/2014



NOTES:

1. IF APPROPRIATE LOCATION FOR DISCHARGED WATER CANNOT BE REACHED BY ROLLING THE BEND ADDITIONAL BENDS MAY BE REQUIRED BY THE COLORADO SPRINGS UTILITIES INSPECTOR.
2. COAT TIE RODS, BEAM AND GALVANIZED STEEL PIPE. SEE DETAIL DRAWING A8-11.
3. ENTIRE BLOW-OFF ASSEMBLY MUST BE ADEQUATELY SUPPORTED, CONCRETE PAVER STONES MAY BE REQUIRED.
4. PIPE DOPE APPROVED FOR USE IN POTABLE WATER SYSTEMS MUST BE USED ON ALL THREADED FITTINGS.
5. TEMPORARY BLOW-OFF VALVE ASSEMBLIES SHALL BE INSPECTED BY THE COLORADO SPRINGS UTILITIES INSPECTOR PRIOR TO BACKFILL. BACKFILL COMPACTION TO BE SAME AS AS PIPE COMPACTION SPECIFICATIONS.
6. 2" GALVANIZED PIPE MUST BE RATED TO 250 PSI AND CONFORM TO NSF-61 SPECIFICATIONS.
7 THE COLORADO SPRINGS UTILITIES INSPECTOR MAY REQUIRE TIE-BACK RODS IN ADDITION TO THE MJ RESTRAINTS DEPENDING ON FIELD CONDITIONS AND SYSTEM PRESSURES. SEE TIE-BACK ROD DETAIL DRAWING A2-4.

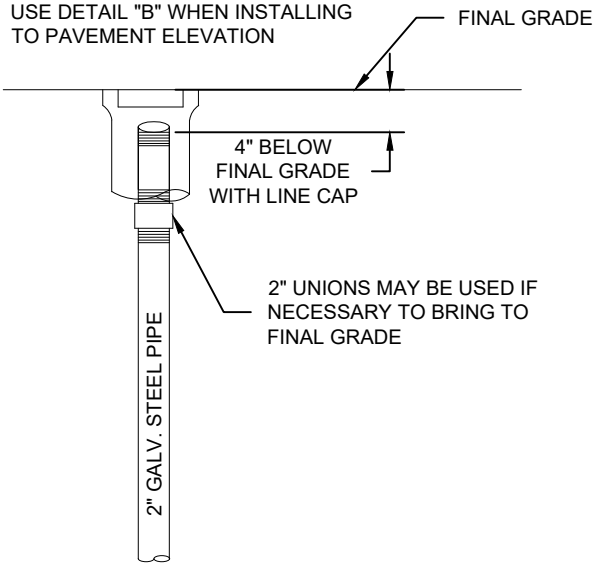
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TEMPORARY BLOW-OFF ASSEMBLIES- 4", 6" & 8" MAINS WITH MECHANICAL JOINT PLUG

A2-5

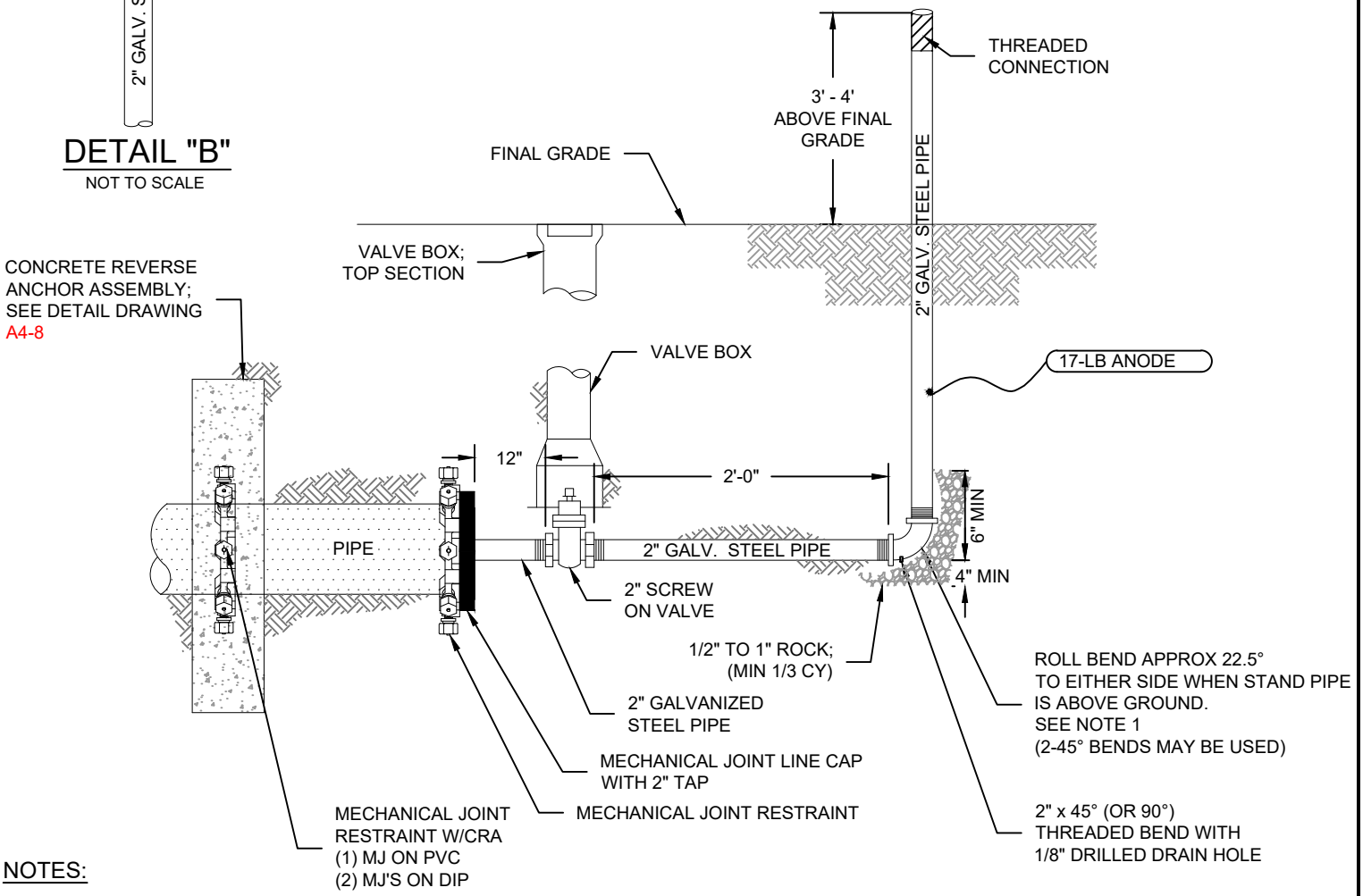
DATED 07/2025

NOTE:
USE DETAIL "B" WHEN INSTALLING TO PAVEMENT ELEVATION



DETAIL "B"

NOT TO SCALE



NOTES:

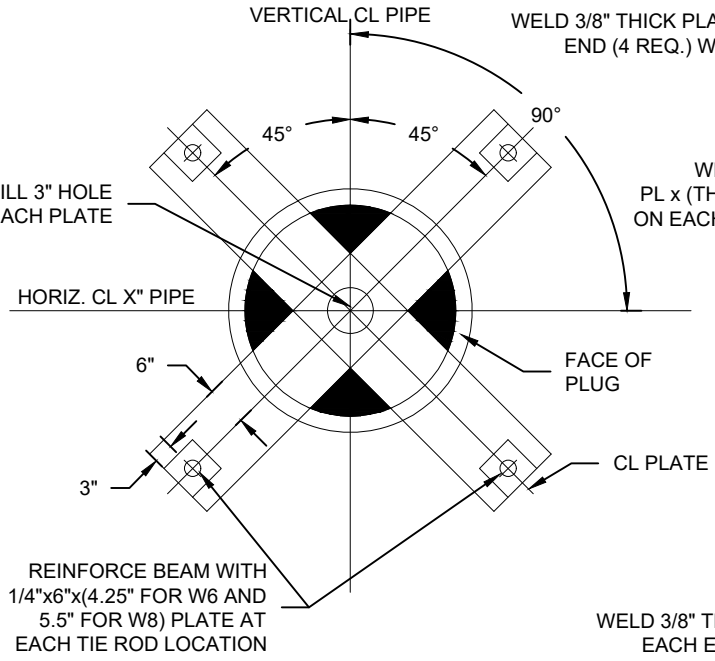
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2. COAT TIE RODS, BEAM AND GALVANIZED STEEL PIPE. SEE DETAIL DRAWING A8-11.
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7 THE COLORADO SPRINGS UTILITIES INSPECTOR MAY REQUIRE TIE-BACK RODS IN ADDITION TO THE MJ RESTRAINTS DEPENDING ON FIELD CONDITIONS AND SYSTEM PRESSURES. SEE TIE-BACK ROD DETAIL DRAWING A2-4. IF THE MJ RESTRAINT CONFLICTS WITH THE PLATES FOR THE TIE RODS IN THE REVERSE ANCHOR, SUBMIT AN INDEPENDENT DESIGN TO MODIFY THE CROSS BEAM DESIGN AND TIE BACK ROD CONNECTIONS.
8. THERE SHALL BE NO SERVICE LINES CONNECTED BETWEEN THE LAST ISOLATION VALVE AND THE TEMPORARY BLOW-OFF ASSEMBLY.

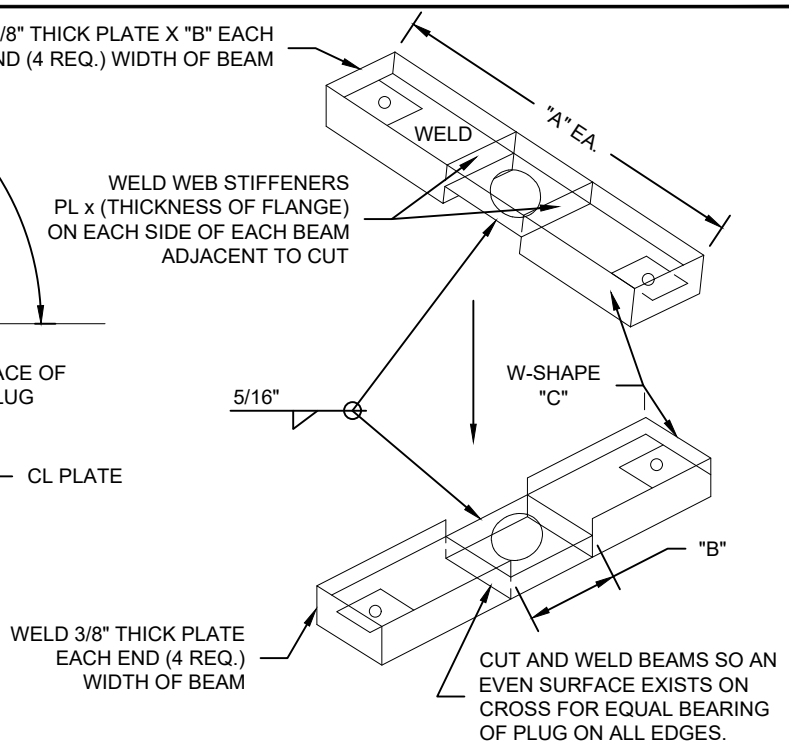
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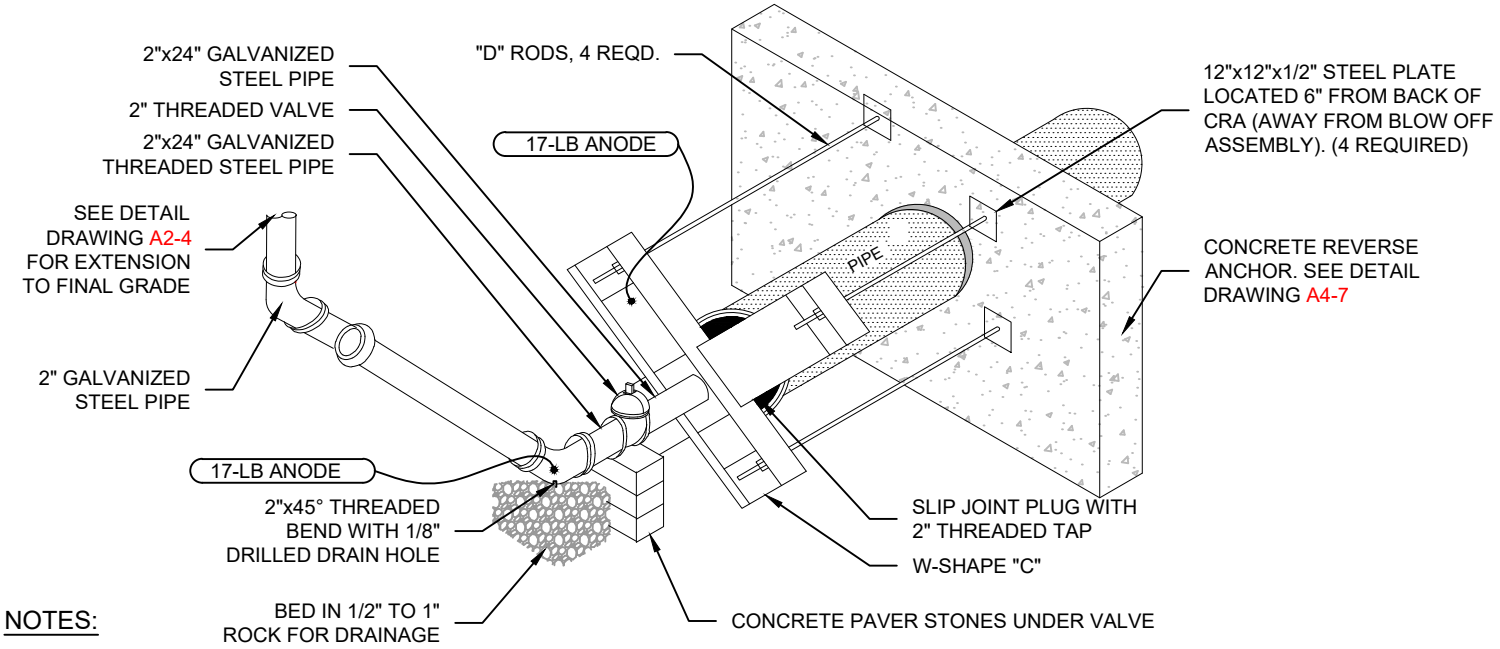
TEMPORARY BLOW-OFF ASSEMBLIES- 4", 6" & 8" MAINS WITH MECHANICAL JOINT LINE CAP

A2-6

DATED 02/2025







NOTES:

1. REFER TO DETAIL DRAWING A2-8 FOR ALL DIMENSIONS AND SIZES FOR BLOW-OFF ASSEMBLY.
2. IF APPROPRIATE LOCATION FOR DISCHARGED WATER CANNOT BE REACHED BY ROLLING THE BEND ADDITIONAL BENDS MAY BE REQUIRED BY THE COLORADO SPRINGS UTILITIES INSPECTOR.
3. COAT TIE RODS, BEAMS AND GALVANIZED STEEL PIPE. SEE DETAIL DRAWING A8-11.
4. ENTIRE BLOW-OFF ASSEMBLY MUST BE ADEQUATELY SUPPORTED, CONCRETE PAVER STONES MAY BE REQUIRED.
5. PIPE DOPE APPROVED FOR USE IN POTABLE WATER SYSTEMS MUST BE USED ON ALL THREADED FITTINGS.
6. TEMPORARY BLOW-OFF VALVE ASSEMBLIES SHALL BE INSPECTED BY THE COLORADO SPRINGS UTILITIES INSPECTOR PRIOR TO BACKFILL. BACKFILL COMPACTION TO BE SAME AS AS PIPE COMPACTION SPECIFICATIONS.
7. ALL BLOW OFF PIPING IS 2" GALVANIZED PIPE AND MUST BE RATED TO 250 PSI AND CONFORM TO NSF-61 SPECIFICATIONS. ALL BLOW OFF PIPING LARGER THAN 2" MUST BE SPECIFIED AND APPROVED BY COLORADO SPRINGS UTILITIES.
8. SEE DETAIL DRAWINGS A2-5 AND A2-6 FOR MECHANICAL JOINT PLUG OR LINE CAP PIPE TERMINATION.
9. ALL HOLES IN STEEL SHALL BE OVERSIZED HOLES.
10. THERE SHALL BE NO SERVICE LINES CONNECTED BETWEEN THE LAST ISOLATION VALVE AND THE TEMPORARY BLOW-OFF ASSEMBLY.
11. MAINS GREATER THAN 16" SHALL BE DESIGNED BY THE DESIGN ENGINEER AND REVIEWED AND APPROVED BY COLORADO SPRINGS UTILITIES. LARGER SIZED BLOW-OFFS OR A HYDRANT ASSEMBLY MAY BE REQUIRED ON THESE MAINS AT COLORADO SPRINGS UTILITIES' DISCRETION.

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TEMPORARY BLOW-OFF ASSEMBLIES- 12" AND GREATER MAINS WITH SJ PLUGS

A2-7

DATED 07/2022

TEMPORARY BLOW-OFF ASSEMBLY SIZING
FOR 12" AND GREATER PIPE

DIMENSIONS FROM DETAIL DRAWING A2-7							
MAIN PIPE DIA. (IN.)	STATIC PRESSURE RANGE (P.S.I.)	"A" (IN)	"B" (IN)	"C" (W-SHAPE)	"D" ROD SIZE (IN)	BLOW-OFF PIPE SIZE (IN)	NUMBER OF RODS REQUIRED
12	100 101-150 151-200 201-250	36 36 36 36	6" 6-1/4" 6-1/4" 8"	W6 x 16 W6 x 20 W6 x 20 W8 x 28	5/8 3/4 7/8 1	2 2 2 2	4
16	100 101-150 151-200 201-250	40 40 40 40	6" 8" 8" 8-1/8"	W6 x 20 W8 x 28 W8 x 35 W8 x 40	7/8 1 1-1/8 1-1/4	2 2 2 2	4

NOTES:

1. ALL W-SHAPES SHALL BE FABRICATED FROM ASTM A992 GD 50.
2. ALL RODS SHALL BE MIN. GRADE A307 .
3. A 50% SURGE FACTOR HAS BEEN INCLUDED IN DESIGN.
4. THE DESIGN ENGINEER SHALL DESIGN THE BLOW-OFF ASSEMBLY FOR SIZES AND PRESSURES GREATER THAN THOSE SHOWN IN THE TABLE. DESIGN CALCULATIONS MUST BE SUBMITTED TO COLORADO SPRINGS UTILITIES FOR REVIEW.

NOTES FOR APPLYING STREET CROSS SECTION TEMPLATES

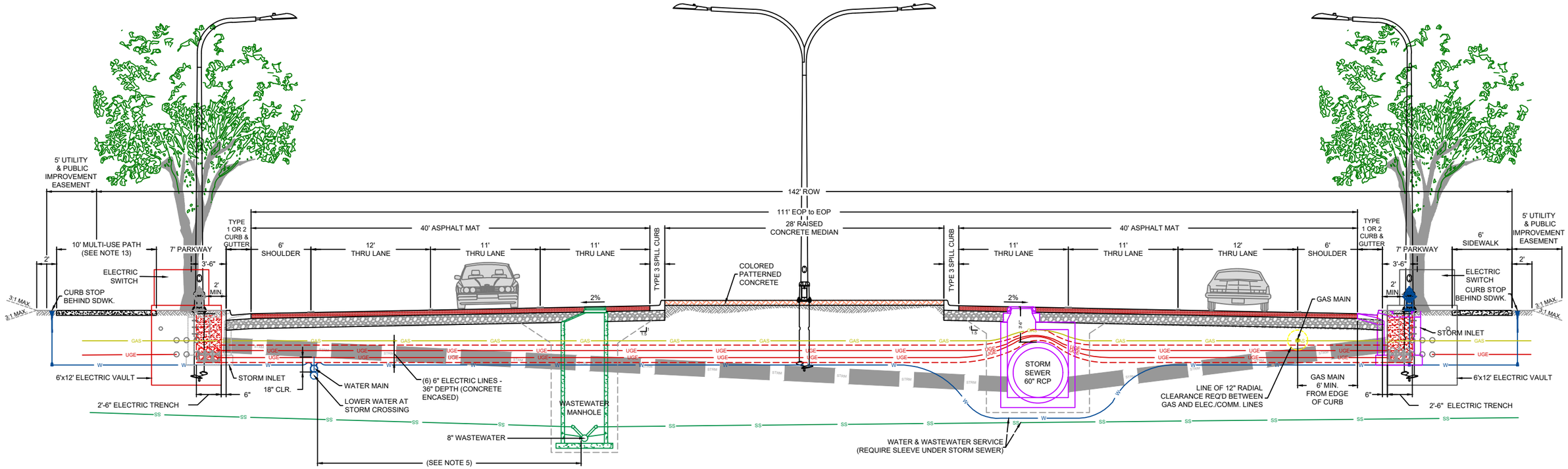
DETAIL DRAWINGS A3-2 THROUGH A3-10 ARE INTENDED TO GIVE THE DEVELOPMENT COMMUNITY ADDITIONAL DESIGN OPTIONS TO ASSIST IN CONSTRUCTING MAINTAINABLE STREETS AND UTILITIES. THESE DRAWINGS ARE MEANT TO BE USED IN CONJUNCTION WITH THE LATEST VERSION OF THE CITY OF COLORADO SPRINGS TRAFFIC DESIGN MANUAL AND REPRESENT LAYOUTS THAT CAN BE APPROVED IF DESIGNED AS SHOWN ON THESE DRAWINGS. VARIATIONS FROM THESE SECTIONS FOR UTILITY MAIN SIZE OR HORIZONTAL AND/OR VERTICAL LOCATION WILL BE REVIEWED AND APPROVED BY COLORADO SPRINGS UTILITIES ON A CASE BY CASE BASIS. THE FOLLOWING ABBREVIATIONS APPLY TO ALL DRAWINGS: W=WATER WW= WASTEWATER.

PHILOSOPHIES IN INTERPRETING THE DRAWINGS:

1. THE DEPTH OF THE WW LINE WILL VARY AND WILL NOT BE INSTALLED EXACTLY AT THE DEPTH SHOWN IN THE DRAWINGS.
2. FOR A TYPICAL REPAIR, SHORING SHOWN ON THE DRAWINGS IS ASSUMED TO BE 8 FEET IN WIDTH AND LOCATED 4 FEET FROM THE TOP OF THE PAVEMENT TO ALLOW CROSSING OF GAS AND ELECTRIC SERVICES AND MAINS. A 6 INCH OVER DIG IS ASSUMED ON EITHER SIDE OF THE SHORING.
3. STORM SEWER MATERIALS SHALL CONFORM TO THE CITY OF COLORADO SPRINGS STANDARDS AND SPECIFICATIONS.
4. STORM SEWER SIZES OVER 48 INCHES WILL NEED TO BE REVIEWED BY COLORADO SPRINGS UTILITIES SO THE IMPACT ON THE DESIGN OF ELECTRIC CROSSINGS CAN BE PROPERLY COORDINATED WITH COLORADO SPRINGS UTILITIES FIELD ENGINEERING.
5. SHORING TO BE DESIGNED BY A LICENSED PROFESSIONAL ENGINEER AND INSPECTED BY A COMPETENT PERSON IN ACCORDANCE WITH OSHA REQUIREMENTS.

THE CROSS SECTIONS SHOW ACCEPTABLE DESIGNS FOR UTILITY LOCATIONS IN THE STREETS. THESE STREET CROSS SECTIONS DO NOT MEET EVERY REQUIREMENT OF THE APPLICABLE COLORADO SPRINGS UTILITIES LESS, BUT WILL BE ACCEPTABLE IF CONSTRUCTED IN THE CORRIDORS SHOWN IN THE ATTACHED DRAWINGS. IN USING THE DRAWINGS, THE FOLLOWING LOGIC SHOULD BE APPLIED WHEN USING THE CROSS SECTION TEMPLATES:

A. CARE MUST BE TAKEN TO ENSURE THE HYDRANT VALVE BOX IS INSTALLED OUTSIDE THE CONCRETE CURB AND GUTTER PAN AND MAY REQUIRE THE USE OF AN ANCHOR TEE TO ELIMINATE THE 30 INCH SPACER PIPE.
B. THE WW LINE SHALL NOT BE INSTALLED DEEPER THAN 20 FEET, UNLESS SPECIAL CIRCUMSTANCES EXIST. THOSE DESIGNS WILL REQUIRE A MORE DETAILED REVIEW AND SPECIFIC APPROVAL BY COLORADO SPRINGS UTILITIES.
C. THE PREFERRED LOCATION OF THE STORM SEWER MAIN IS SHOWN ON THE DRAWINGS BUT THE LOCATION MAY VARY DEPENDING ON MULTIPLE DESIGN FACTORS. THE FINAL LOCATION OF THE STORM SEWER MAIN WILL BE APPROVED BY CITY ENGINEERING.



NOTES:

1. STREET LIGHTS, FIRE HYDRANTS, TREES, STORM INLETS AND MANHOLES WILL BE SPACED AT SEPARATE DISTANCES ALONG THE STREET AND ARE TYPICALLY NOT LOCATED NEXT TO EACH OTHER AS SHOWN ON THIS PROFILE.
2. WATER AND WASTEWATER WILL TYPICALLY BE LOCATED ON THE NORTH OR EAST SIDE OF THE ROADWAY AND STORM SEWER AND GAS WILL TYPICALLY BE LOCATED ON THE SOUTH OR WEST SIDE OF THE ROADWAY.
3. SEE TYPICAL PARALLEL (SEPARATE TRENCHES) AND CROSSING CLEARANCE MATRIX FOR COLORADO SPRINGS UNDERGROUND UTILITIES.
4. ALL DEPTH DIMENSIONS ARE FROM FINISHED GRADE TO TOP OF PIPE.
5. HDPE PIPE SHALL BE USED FOR WATER MAIN IF SEPARATION FROM THE STORM SEWER/WASTEWATER IS BETWEEN 5-FEET TO 10-FEET. IN NO CASE SHALL THERE BE NO LESS THAN 5-FEET OF SEPARATION BETWEEN THE WATER MAIN AND OTHER WET UTILITIES.
6. WHEN SEPARATION BETWEEN WASTEWATER AND STORM SEWER IS BETWEEN 5 TO 10-FEET, SECONDARY CONTAINMENT WILL BE REQUIRED.
7. SEPARATION REQUIREMENT FROM EXISTING UTILITIES ARE OUTLINED IN THE CSU LINE EXTENSION STANDARDS.
8. MANHOLE LIDS SHALL BE CENTERED IN THE LANE, WHEN IN A TRAVEL LANE.
9. ALL VALVE BOX COVERS AND MANHOLE LIDS SHALL BE FLUSH TO FINISHED ASPHALT SURFACE.
10. SIDEWALKS AND MULTI-USE TRAILS SHALL BE FREE OF OBSTRUCTIONS (E.G. VAULTS, RISERS), AND SHALL MEANDER AROUND OBSTACLES.
11. ABOVE GROUND UTILITY EQUIPMENT SHALL NOT BE LOCATED WITHIN THE SIGHT DISTANCE OF A CORNER PER CITY OF COLORADO SPRINGS TRAFFIC CRITERIA MANUAL.
12. A MINIMUM SETBACK OF 15-FEET FROM BACK OF CURB TO STRUCTURE IS REQUIRED TO MEET CSU'S SEPARATION REQUIREMENT BETWEEN STRUCTURES AND UTILITIES. FOR SETBACKS LESS THAN 15', SEE THE DEVELOPMENT PLAN REQUIREMENTS IN THE LESS.
13. SEPARATION REQUIREMENTS BETWEEN TREES AND UTILITIES SHALL COMPLY WITH ALL UTILITY LESS.
14. ALL PRIVATE TELECOMMUNICATION SHALL BE INSTALLED PER CITY OF COLORADO SPRINGS ENGINEERING REQUIREMENTS AND SHALL MEET TYPICAL PARALLEL CLEARANCES (SEPARATE TRENCHES) AND CROSSING CLEARANCE MATRIX FOR COLORADO SPRINGS UNDERGROUND UTILITIES.

LINE LEGEND

UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
GAS	GAS	MIN. 30"
UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

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PRINCIPAL ARTERIAL TYPE 2 (6 LANES) CROSS SECTION

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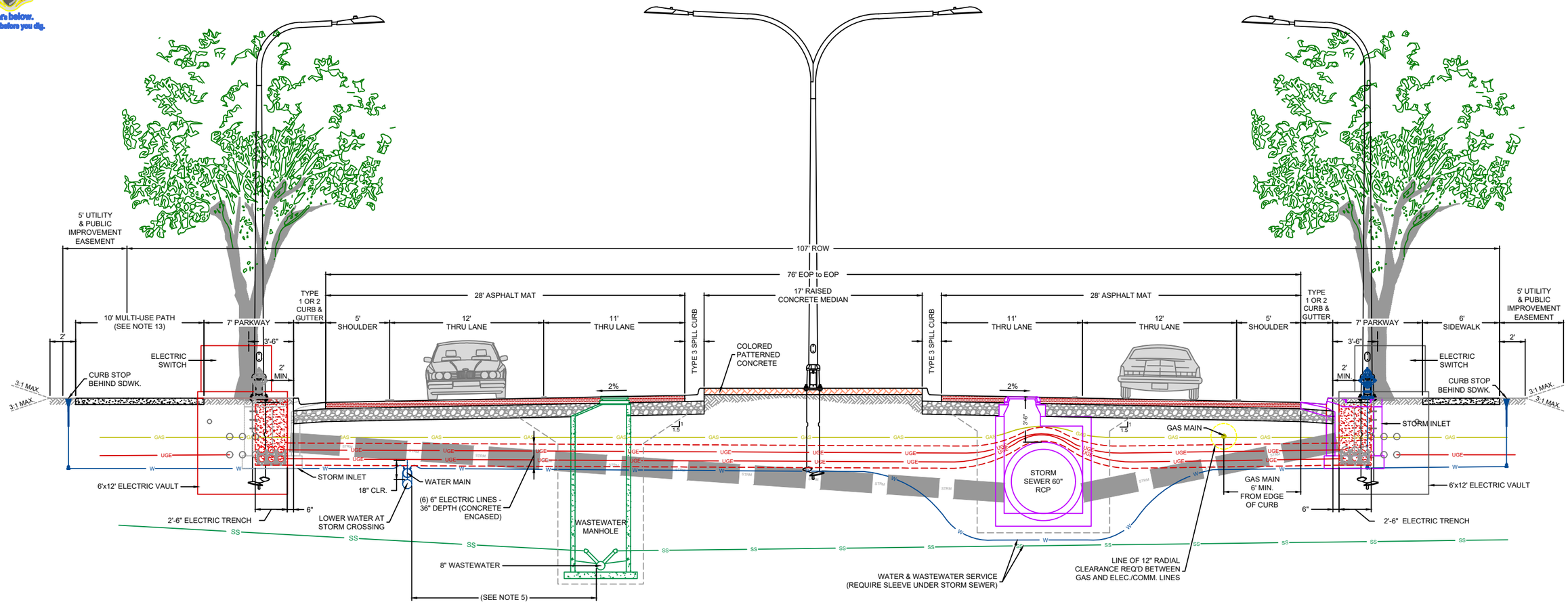
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-2

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATER\WLESS\WATERWLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-2



NOTES:

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LINE LEGEND

UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
GAS	GAS	MIN. 30"
UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

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PRINCIPAL ARTERIAL
TYPE 1 (4 LANES)
CROSS SECTION

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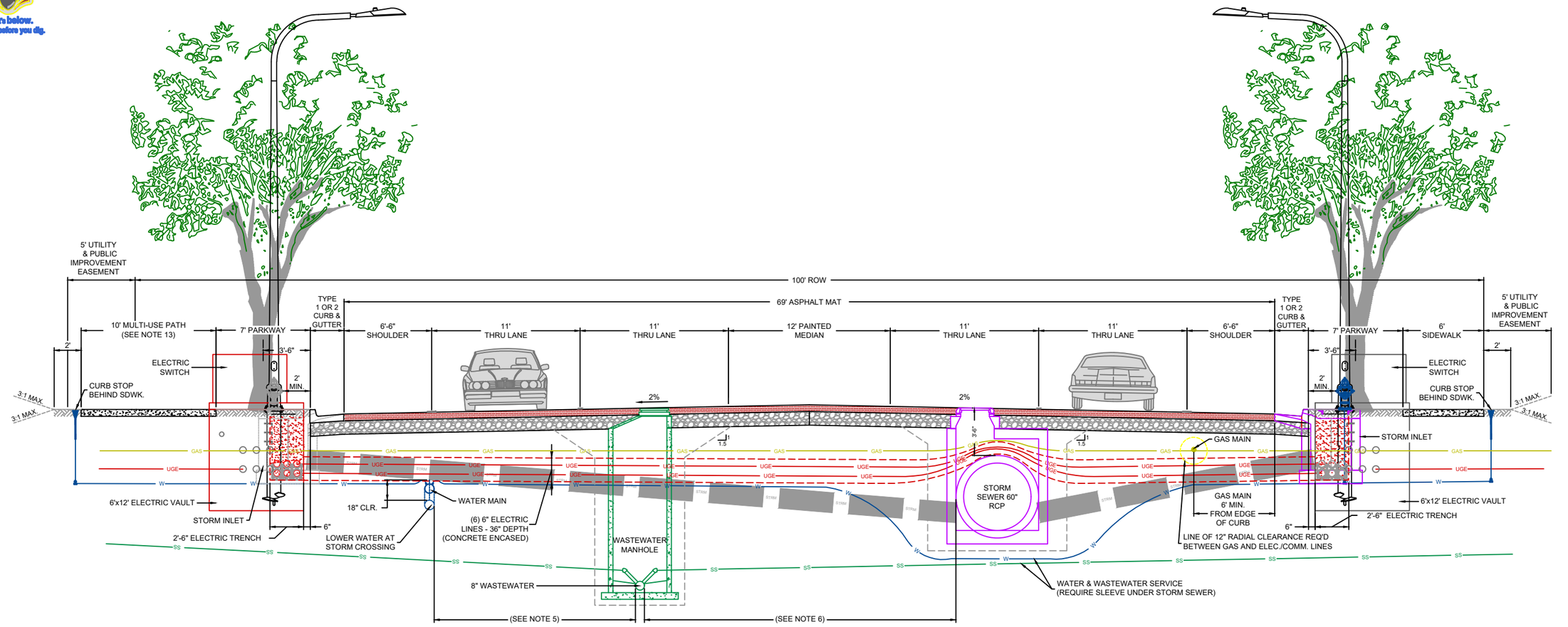
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-2

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATERWLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-3



NOTES:

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LINE LEGEND

UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
GAS	GAS	MIN. 30"
UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

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MINOR ARTERIAL
CROSS SECTION

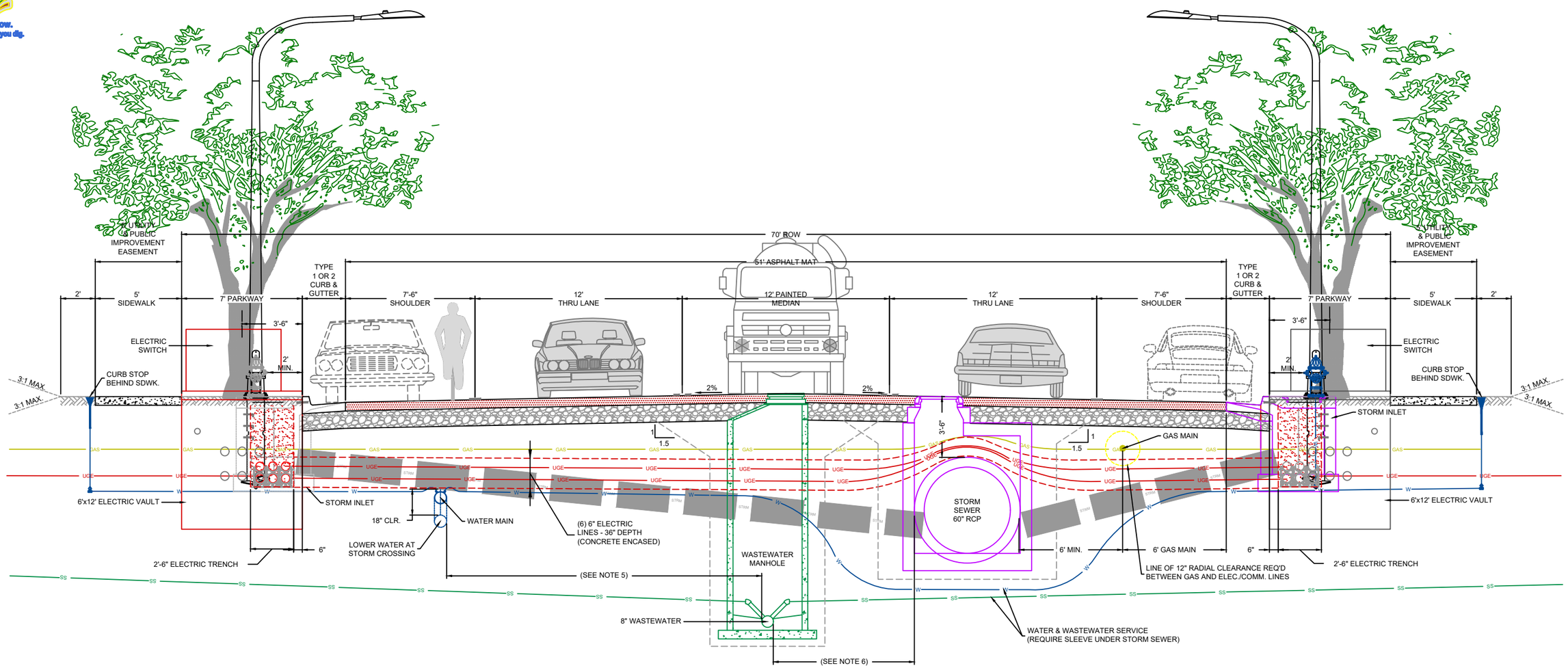
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A3-4
DATED: 11/2025

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User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026\ VERSION\01 - WATERWLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-4



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LINE LEGEND

UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
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UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

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INDUSTRIAL/ MAJOR COLLECTOR CROSS SECTION

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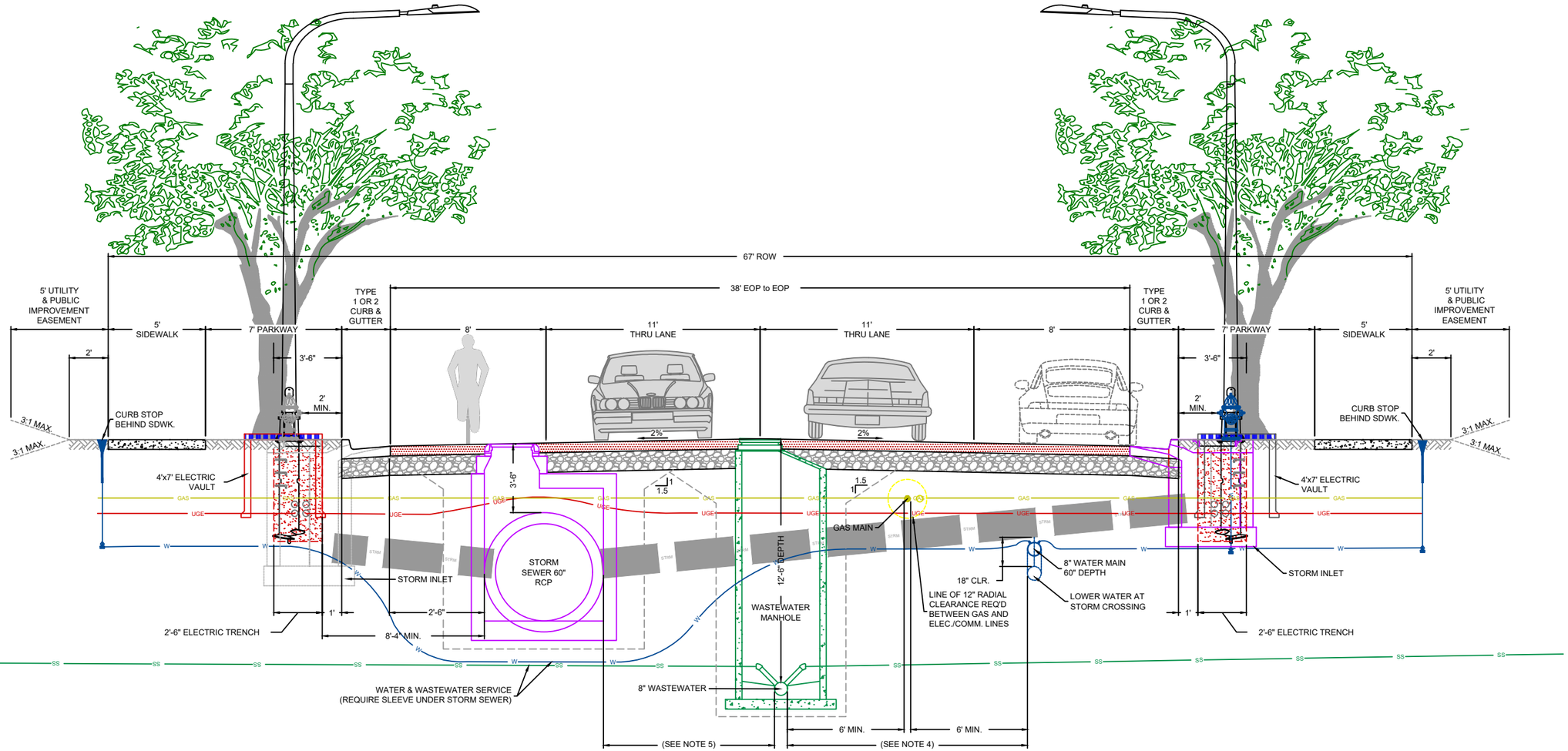
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-5

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATERWLESS DETAILS\STREET T SECTIONS.DWG - Layout: A3-5



NOTES:

1. STREET LIGHTS, FIRE HYDRANTS, TREES, STORM INLETS AND MANHOLES WILL BE SPACED AT SEPARATE DISTANCES ALONG THE STREET AND ARE TYPICALLY NOT LOCATED NEXT TO EACH OTHER AS SHOWN ON THIS PROFILE.
2. SEE TYPICAL PARALLEL (SEPARATE TRENCHES) AND CROSSING CLEARANCE MATRIX FOR COLORADO SPRINGS UNDERGROUND UTILITIES.
3. ALL DEPTH DIMENSIONS ARE FROM FINISHED GRADE TO TOP OF PIPE.
4. HDPE PIPE SHALL BE USED FOR WATER MAIN IF SEPARATION FROM THE STORM SEWER/WASTEWATER IS BETWEEN 5-FEET TO 10-FEET. IN NO CASE SHALL THERE BE NO LESS THAN 5-FEET OF SEPARATION BETWEEN THE WATER MAIN AND OTHER WET UTILITIES.
5. WHEN SEPARATION BETWEEN WASTEWATER AND STORM SEWER IS BETWEEN 5 TO 10-FEET, SECONDARY CONTAINMENT WILL BE REQUIRED.
6. SEPARATION REQUIREMENT FROM EXISTING UTILITIES ARE OUTLINED IN THE CSU LINE EXTENSION STANDARDS.
7. MANHOLE LIDS SHALL BE CENTERED IN THE LANE, WHEN IN A TRAVEL LANE.
8. ALL VALVE BOX COVERS AND MANHOLE LIDS SHALL BE FLUSH TO FINISHED ASPHALT SURFACE.
9. SEPARATION REQUIREMENTS BETWEEN TREES AND UTILITIES SHALL COMPLY WITH ALL UTILITY LESS.
10. SIDEWALKS SHALL BE FREE OF OBSTRUCTIONS (E.G. VAULTS, RISERS), AND SHALL MEANDER AROUND OBSTACLES.
11. ABOVE GROUND UTILITY EQUIPMENT SHALL NOT BE LOCATED WITHIN THE SIGHT DISTANCE OF A CORNER PER CITY OF COLORADO SPRINGS TRAFFIC CRITERIA MANUAL.
12. A MINIMUM SETBACK OF 15-FEET FROM BACK OF CURB TO STRUCTURE IS REQUIRED TO MEET CSU'S SEPARATION REQUIREMENT BETWEEN STRUCTURES AND UTILITIES. FOR SETBACKS LESS THAN 15', SEE THE DEVELOPMENT PLAN REQUIREMENTS IN THE LESS.
13. ALL PRIVATE TELECOMMUNICATION SHALL BE INSTALLED PER CITY OF COLORADO SPRINGS ENGINEERING REQUIREMENTS AND SHALL MEET TYPICAL PARALLEL CLEARANCES (SEPARATE TRENCHES) AND CROSSING CLEARANCE MATRIX FOR COLORADO SPRINGS UNDERGROUND UTILITIES.

LINE LEGEND

UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
GAS	GAS	MIN. 30"
UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

Colorado Springs Utilities
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COLLECTOR
(w/ GAS IN STREET)
CROSS SECTION

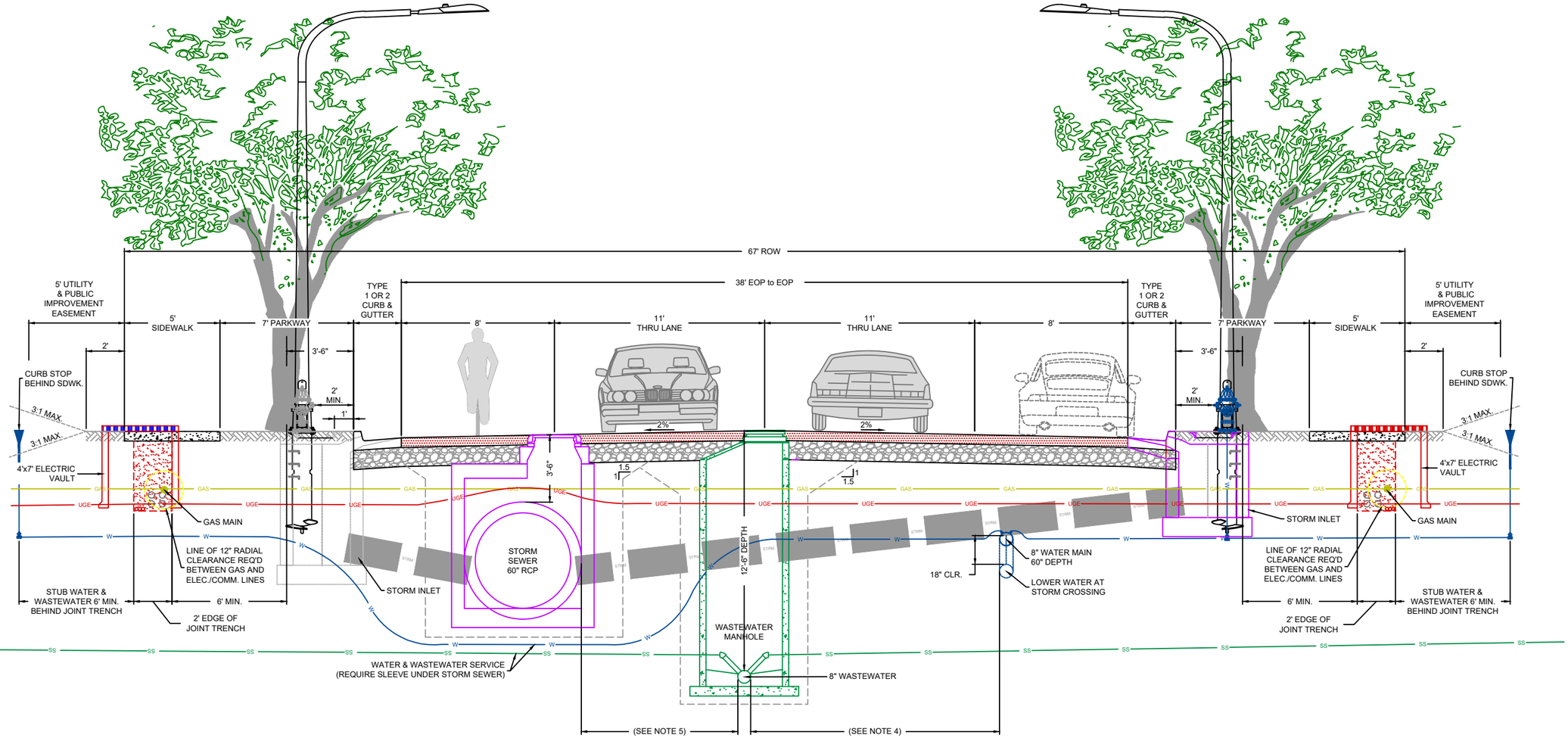
APPROVED:

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-6
DATED: 11/2025

811 Know what's below. Call before you dig.

User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATERWLESS DETAILS\STREET T SECTIONS.DWG - Layout: A3-6



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9. SEPARATION REQUIREMENTS BETWEEN TREES AND UTILITIES SHALL COMPLY WITH ALL UTILITY LESS.
10. SIDEWALKS SHALL BE FREE OF OBSTRUCTIONS (E.G. VAULTS, RISERS), AND SHALL MEANDER AROUND OBSTACLES.
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LINE LEGEND

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WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

Colorado Springs Utilities
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COLLECTOR w/ JOINT TRENCH UNDER SIDEWALK CROSS SECTION

APPROVED:

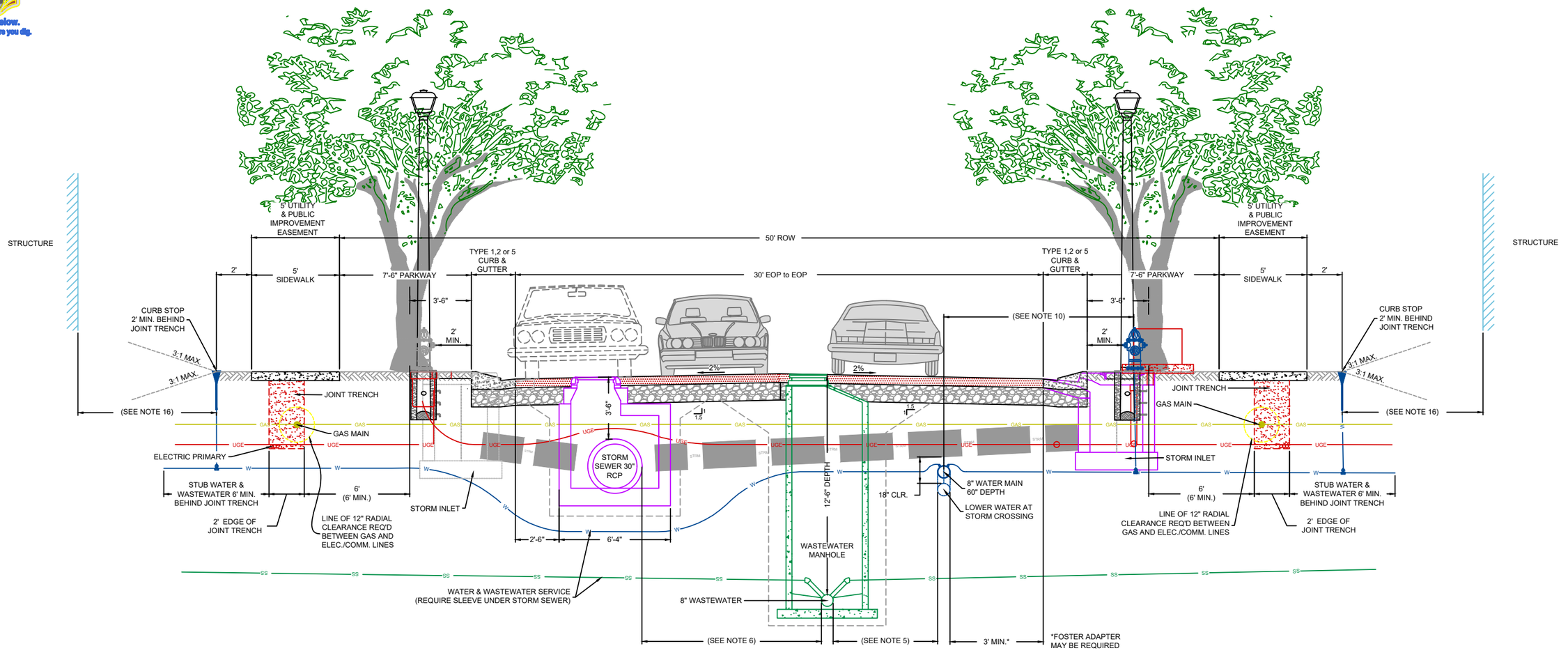
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-7

DATED: 11/2025

811 Know what's below. Call before you dig.

User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATER\WLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-7



NOTES:

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LINE LEGEND

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UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

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RESIDENTIAL
(LOCAL) (>20 LOTS)
DETACHED SIDEWALK
CROSS SECTION

APPROVED:

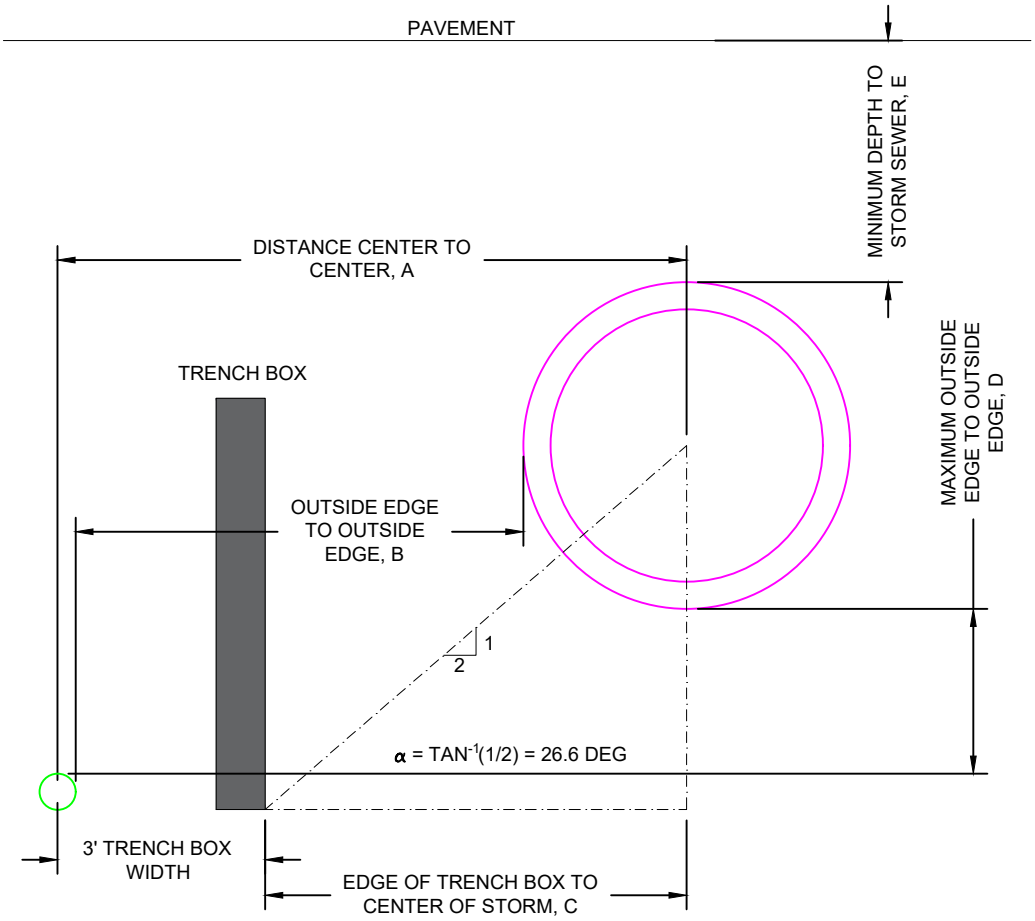
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-8

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATER\WLESS\1 WATERWLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-8



ANGLE OF REPOSE WITH TRENCH BOX FOR REPAIRS AND MAINTENANCE OF WASTEWATER MAIN

Angle of Repose Analysis (2:1 Slope, 26.6 Degrees)					
Storm Sewer Diameter (inches)		12	18	24	30
Wastewater Diameter (inches)		8	8	8	8
A	Horizontal Separation Center to Center	11' -3"	10' -11"	10' -9"	10' -6"
B	Horizontal Separation Outside Edge to Outside Edge	10' -5"	9' -10"	9' -5"	8' -10"
C	Trench Box to Center of Storm Sewer	8' -3"	7' -11"	7' -9"	7' -6"
D	Maximum Vertical Separation Outside Edge to Outside Edge	2' -11"	2' -7"	2' -3"	1' -10"
E	Minimum Depth to Storm Sewer (WW 12 ft Deep)	7' -5"	7' -4"	7' -2"	7' -1"
E	Minimum Depth to Storm Sewer (WW 10 ft Deep)	5' -5"	5' -4"	5' -2"	5' -1"

NOTES:

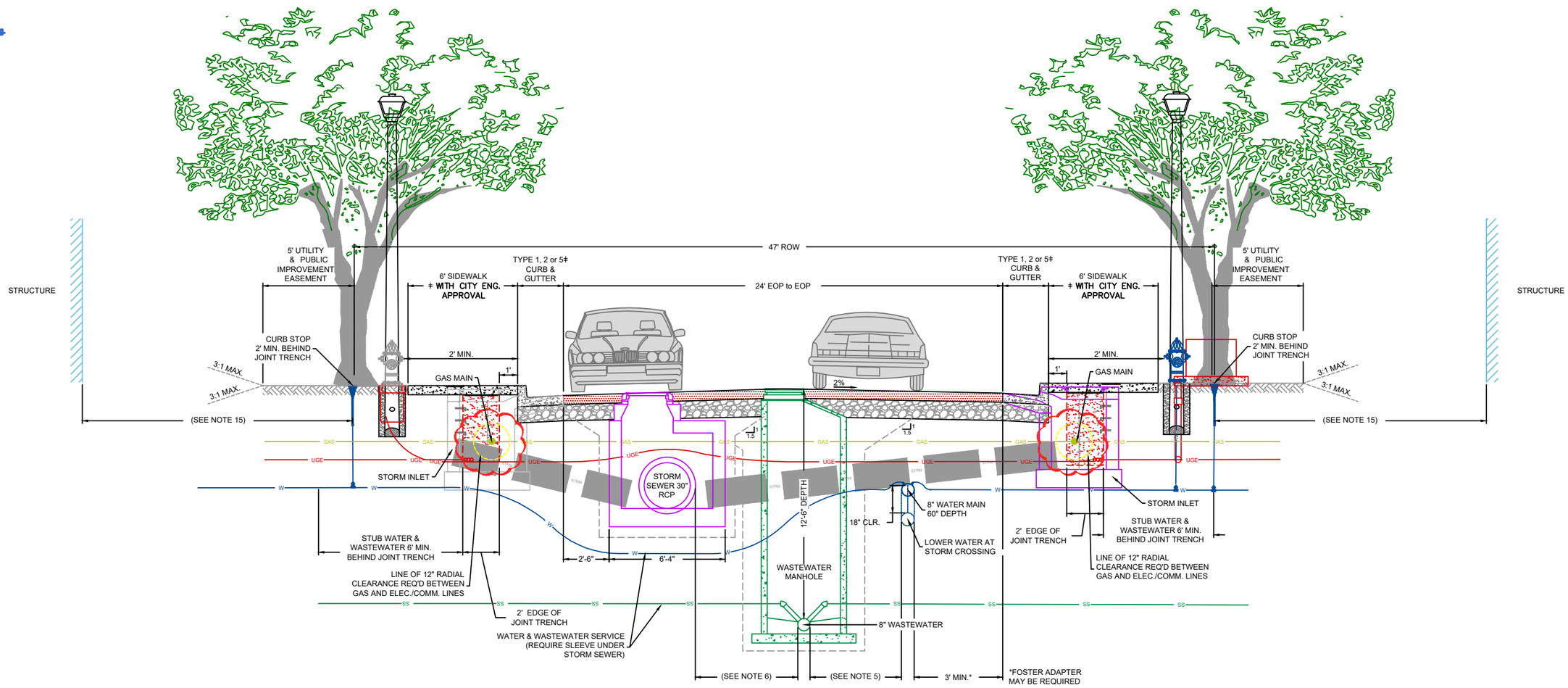
1. THIS DRAWING SHALL ONLY BE USED WITH DETAIL DRAWING A3-8 (RESIDENTIAL (LOCAL, >20 LOTS) DETACHED SIDEWALK STREET SECTION). THIS ANALYSIS DOES NOT APPLY TO ANY OTHER STREET SECTION DRAWINGS.
2. THE MINIMUM DISTANCE FROM OUTSIDE EDGE OF WASTEWATER TO OUTSIDE EDGE OF STORM SEWER IS 8 FT IF THE ANGLE OF REPOSE ANALYSIS IS USED ABOVE. FOR HORIZONTAL SEPARATIONS LESS THAN 8 FT, SECONDARY CONTAINMENT SHALL BE USED.
3. FOR CROSS SLOPES LESS STEEP THAN 2:1, A GEOTECHNICAL ENGINEER SHALL PROVIDE A RECOMMENDATION ON THE ALLOWABLE VERTICAL AND HORIZONTAL DISTANCES PERMITTED BETWEEN STORM SEWER AND WASTEWATER TO ENSURE THE STORM SEWER IS NOT UNDERMINED WHEN EXCAVATING THE WASTEWATER MAIN.

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ANGLE OF REPOSE ANALYSIS - RESIDENTIAL (LOCAL) (>20 LOTS) DETACHED SIDEWALK CROSS SECTION

A3-8B

DATED 11/2022



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LINE LEGEND

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UNDERGROUND ELECTRIC	UGE	MIN. 42"
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WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

Colorado Springs Utilities
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MINOR RESIDENTIAL
(LOCAL) (<21 LOTS)
ATTACHED SIDEWALKS
CROSS SECTION

APPROVED:

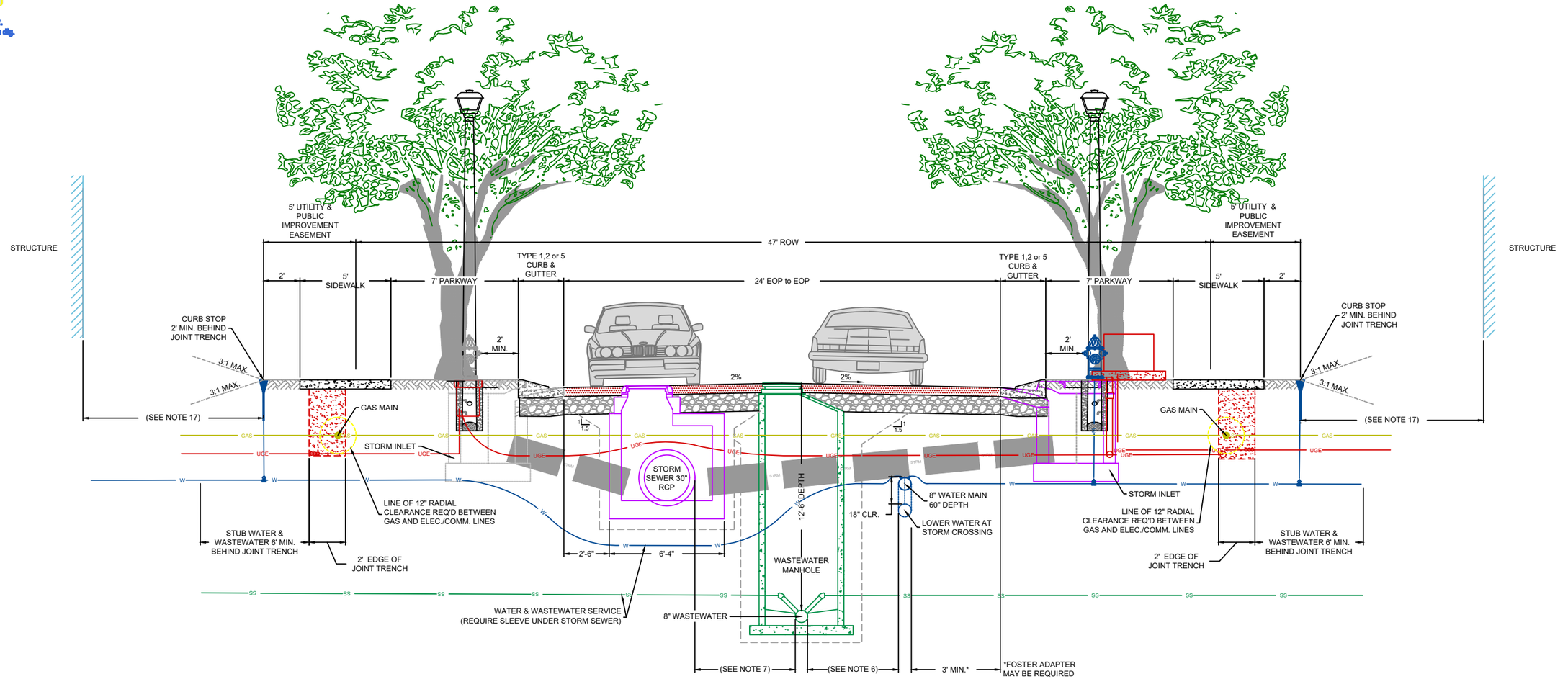
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-9

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATERWLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-9



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5. FIRE HYDRANTS REQUIRE A 5-FOOT MINIMUM RADIAL CLEARANCE FROM ANY STRUCTURE.
6. HDPE PIPE SHALL BE USED FOR WATER MAIN IF SEPARATION FROM THE STORM SEWER/WASTEWATER IS BETWEEN 5-FEET TO 10-FEET (BETWEEN OUTSIDE EDGE OF PIPES). IN NO CASE SHALL THERE BE NO LESS THAN 5-FEET OF SEPARATION BETWEEN THE WATER MAIN AND OTHER WET UTILITIES
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STORM SEWER/STRUCTURES	STRM	PER DCM

Colorado Springs Utilities
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MINOR RESIDENTIAL (LOCAL) (<21 LOTS) DETACHED SIDEWALKS CROSS SECTION

APPROVED:

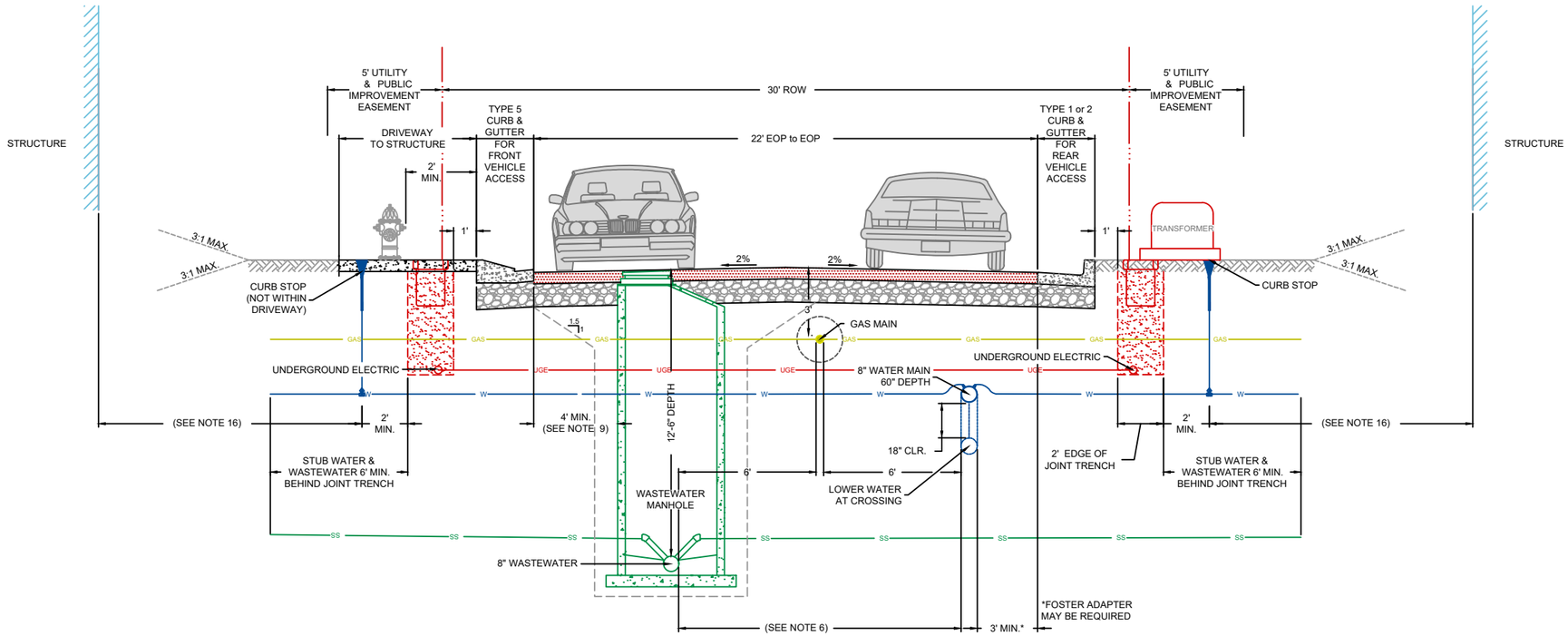
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-9B

DATED: 11/2025

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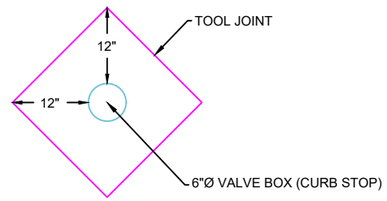
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NOTES:

THIS CROSS SECTION MAY ONLY BE USED IF THE FOLLOWING REQUIREMENTS ARE MET:

1. PAVEMENT SECTION SHALL BE PER APPROVED PAVEMENT DESIGN REPORT.
2. FIRE HYDRANTS AND MANHOLES WILL BE SPACED AT SEPARATE DISTANCES ALONG THE STREET AND ARE TYPICALLY NOT LOCATED NEXT TO EACH OTHER AS SHOWN ON THIS PROFILE.
3. STREET LIGHTS ARE NOT PERMITTED.
4. SEE LESS TYPICAL PARALLEL (SEPARATE TRENCHES) AND CROSSING CLEARANCE MATRIX FOR COLORADO SPRINGS UNDERGROUND UTILITIES.
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7. SEPARATION REQUIREMENTS FROM EXISTING UTILITIES ARE OUTLINED IN THE CSU EXTENSION LINE STANDARDS.
8. STORMWATER INFRASTRUCTURE IS NOT PERMITTED IN THE RIGHT-OF-WAY.
9. A MINIMUM SEPARATION DISTANCE OF 4-FEET IS REQUIRED FROM OUTSIDE EDGE OF WASTEWATER MANHOLE TO EDGE OF CURB AND GUTTER.
9. MANHOLE LIDS SHALL BE CENTERED IN THE LANE, WHEN IN A TRAVEL LANE.
10. ALL VALVE BOX COVERS AND MANHOLE LIDS SHALL BE FLUSH TO FINISHED ASPHALT SURFACE.
11. CURB STOP MUST HAVE A MINIMUM OF 9-FEET HORIZONTAL SEPARATION FROM STRUCTURE RECEIVING SERVICE. IF THE 9-FOOT SEPARATION CAN NOT BE MET, A 6-FOOT MINIMUM IS ALLOWED IF THE STRUCTURE HAS A MINIMUM 3-FOOT BELOW FINISHED GRADE FOUNDATION WALL.
12. CURB STOP LOCATED WITHIN THE DRIVEWAY SHALL BE APPROVED BY CSU; VALVE COVER SHALL BE TRAFFIC RATED AND INSTALLED PER DETAIL (SEE RIGHT).
13. TREES ARE NOT PERMITTED IN STREET SECTION.
14. ABOVE GROUND UTILITY EQUIPMENT SHALL NOT BE LOCATED WITHIN THE SIGHT DISTANCE OF A CORNER PER CITY OF COLORADO SPRINGS TRAFFIC CRITERIA MANUAL.
15. A MINIMUM SETBACK OF 15-FEET FROM BACK OF CURB TO STRUCTURE IS REQUIRED TO MEET CSU'S SEPARATION REQUIREMENT BETWEEN STRUCTURES AND UTILITIES. FOR SETBACKS LESS THAN 15', SEE THE DEVELOPMENT PLAN REQUIREMENTS IN THE LESS.
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CURB STOP IN DRIVEWAY DETAIL

LINE LEGEND		
UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
GAS	GAS	MIN. 30"
UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

Colorado Springs Utilities
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HIGH DENSITY SINGLE-FAMILY RESIDENTIAL CROSS SECTION

APPROVED:

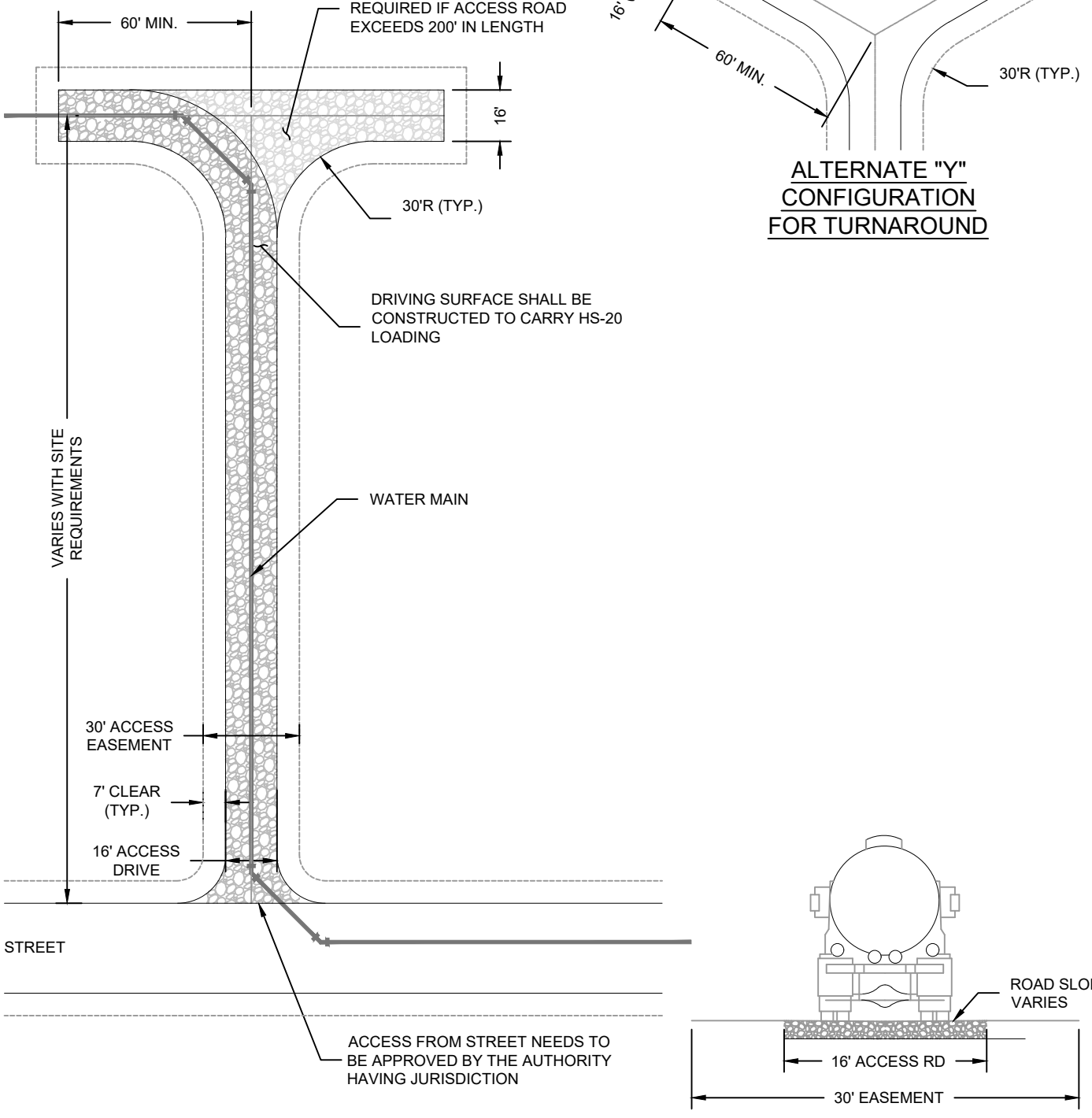
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-10

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 10, 2025 - 5:50pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATER\WLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-10



ALTERNATE "Y" CONFIGURATION FOR TURNAROUND

TYPICAL ACCESS ROAD CROSS SECTION

Colorado Springs Utilities
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TYPICAL ACCESS

A3-11

DATED 06/2015

DESIGN GUIDELINES FOR PRIVATE STREET WITH PUBLIC UTILITIES

MANDATORY DESIGN REQUIREMENTS:

1. ALL DRIVE AISLES AND UTILITY INSTALLATIONS SHALL BE IN ACCORDANCE WITH CITY SPECIFICATIONS AND THE COLORADO SPRINGS UTILITIES' LINE EXTENSION & SERVICE STANDARDS.
2. THE GAS MAIN MAY BE CENTERED IN THE DRIVE AISLE AS DIRECTED BY COLORADO SPRINGS UTILITIES FIELD ENGINEERS.
3. ELECTRIC CONDUIT IS REQUIRED FOR ALL SECONDARY SERVICE CONDUCTORS. THE DEVELOPER/CONTRACTOR SHALL PROVIDE AND INSTALL THE SECONDARY SERVICES WITH THE APPROVAL AND INSPECTION BY COLORADO SPRINGS UTILITIES FIELD ENGINEERS.
4. ADEQUATE SPACE FOR TRANSFORMERS SHALL BE PROVIDED OUTSIDE THE DRIVE AISLE AND THE LOCATION OF THE TRANSFORMER MUST BE APPROVED BY COLORADO SPRINGS UTILITIES FIELD ENGINEERS. BOLLARDS MAY BE REQUIRED FOR THE PROTECTION OF ELECTRICAL EQUIPMENT AND/OR TRANSFORMERS. REFERENCE THE ELECTRIC LINE EXTENSION & SERVICE STANDARDS APPENDIX F STANDARD 15-2 AND 18-302.
5. BOLLARDS ARE REQUIRED FOR THE PROTECTION OF GAS METERS. REFERENCE THE GAS LINE EXTENSION & SERVICE STANDARDS FIGURE 10.

WASTEWATER:

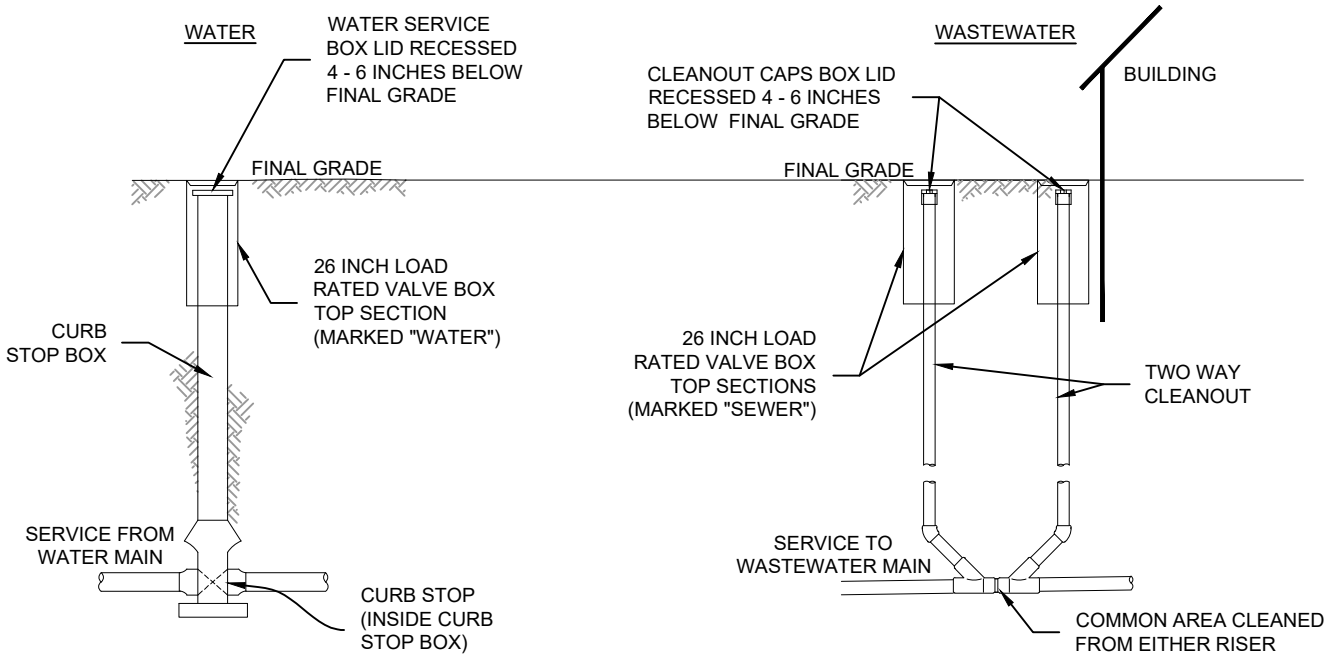
1. THE DIAMETER OF THE WASTEWATER MAIN SHALL NOT BE GREATER THAN 8 INCHES.
2. THE MAXIMUM DEPTH OF THE WASTEWATER MAIN SHALL NOT BE GREATER THAN 14 FEET MEASURED FROM FINAL GRADE (PAVEMENT) TO THE WASTEWATER PIPE INVERT.
3. COLORADO SPRINGS UTILITIES-APPROVED, LOAD-RATED, SLIP TYPE VALVE BOX TOP SECTIONS ARE REQUIRED OVER STANDARD WASTEWATER SERVICE LINE CLEANOUTS. VALVE BOX TOPS TO BE MARKED WITH "SEWER". CLEANOUT LIDS SHALL BE RECESSED 4 TO 6 INCHES BELOW FINAL GRADE. SEE DETAIL BELOW.

WATER:

1. THE DIAMETER OF THE WATER MAIN SHALL NOT BE GREATER THAN 8 INCHES.
2. COLORAOD SPRINGS UTILITIES-APPROVED, LOAD-RATED, SLIP TYPE VALVE BOX TOP SECTION ARE REQUIRED OVER STANDARD WATER STOP BOXES. CURB STOP LID SHALL BE RECESSED 3-4 INCHES BELOW FINAL GRADE. VALVE BOX TOPS TO BE MARKED WITH "WATER". SEE DETAIL BELOW.

NOTE:

1. THE UTILITY SERVICE PLAN FOR THE PROPOSED DEVELOPMENT SHALL SHOW THE PROJECT-SPECIFIC LOCATION OF ALL UTILITIES AND APPURTENANCES SHOWN ON DETAIL DRAWINGS A3-14 AND A3-15. APPROVAL SHALL BE ON A CASE BY CASE BASIS.



DESIGN GUIDELINES FOR PRIVATE STREET WITH PUBLIC UTILITIES

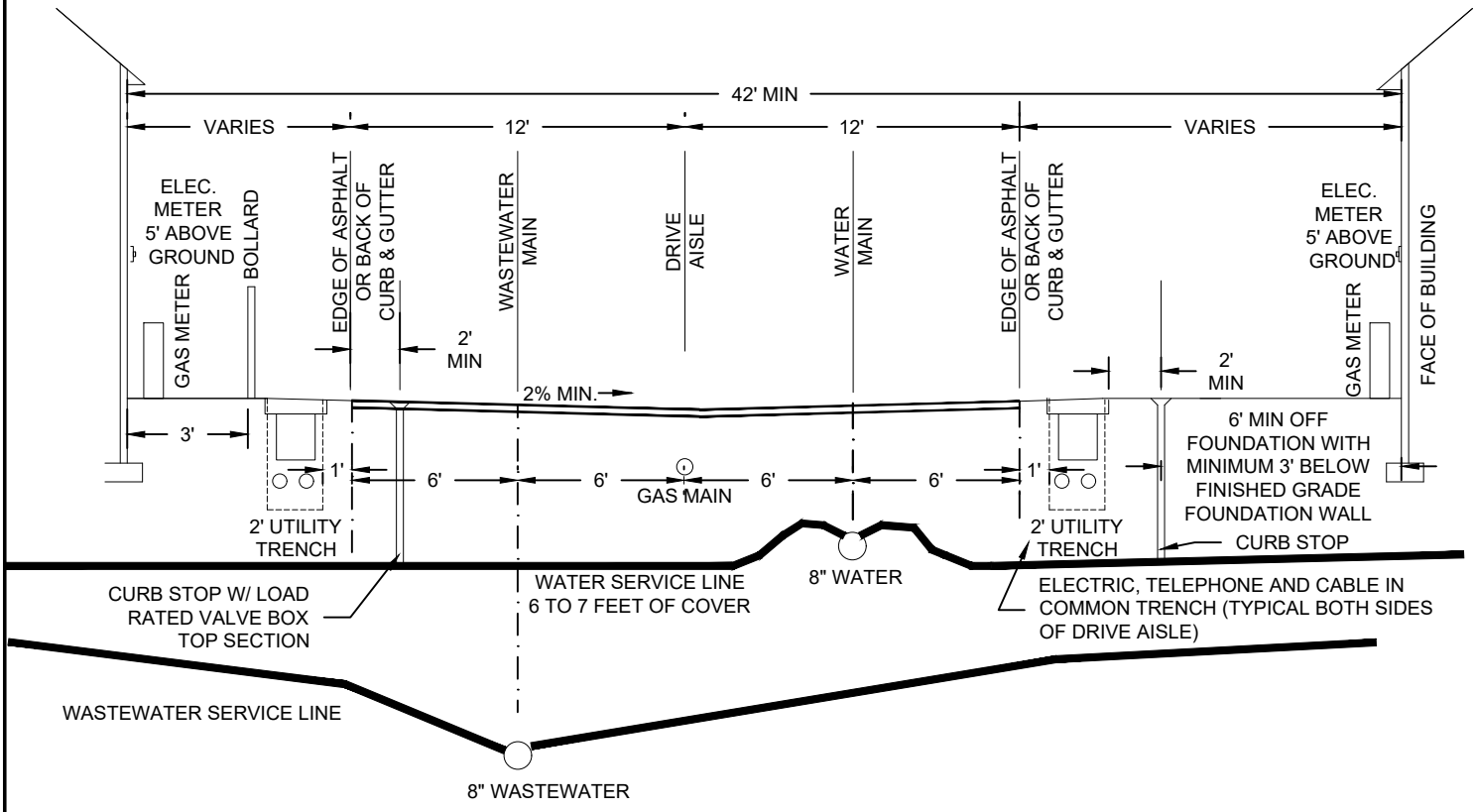
WATER:

1. THE DIAMETER OF THE WATER MAIN SHALL BE NOT GREATER THAN 8 INCHES.
2. COLORADO SPRINGS UTILITIES-APPROVED, LOAD-RATED, SLIP TYPE VALVE BOX TOP SECTIONS ARE REQUIRED OVER STANDARD WATER STOP BOXES . CURB STOP LID SHALL BE RECESSED 3-4 INCHES BELOW FINAL GRADE. VALVE BOX TOPS TO BE MARKED WITH "WATER". SEE DETAIL DRAWING A3-12.
3. CURB STOPS SHALL BE LOCATED ON A CASE BY CASE BASIS PER THE FOLLOWING OPTIONS:
   - A. TO INSTALL CURB STOPS IN THE DRIVEWAY, CURB STOP SHALL BE LOCATED A MINIMUM OF 2 FT FROM THE EDGE OF ASPHALT OR CURB AND GUTTER. CURB STOPS SHALL BE LOCATED A MINIMUM OF 9 FEET FROM ANY BUILDING FOUNDATION. ALTERNATIVELY, CURB STOP MAY BE LOCATED A MINIMUM OF 6 FEET FROM THE FOUNDATION PROVIDED THE FOUNDATION HAS A MINIMUM 3 FOOT BELOW FINISHED GRADE FOUNDATION WALL. CURB STOPS SHALL BE INSTALLED IN ADJUSTABLE TRAFFIC RATED BOXES PER THE CURRENT WATER LESS. SEE DETAIL DRAWING A3-15.
     - a. GIVEN THE NEED FOR 1 FOOT OF SEPARATION BETWEEN EDGE OF ASPHALT / BACK OF CURB & GUTTER TO THE UTILITY TRENCH, A 2 FEET WIDE TRENCH, AND 2 FEET OF SEPARATION BETWEEN THE TRENCH AND THE CENTER OF THE CURB STOP, IT IS UNLIKELY THAT DRIVEWAYS CAN BE MUCH LESS THAN 11 FEET LONG.
     - b. SOME FLEXIBILITY FROM THESE DRIVEWAY LENGTH REQUIREMENTS MAY BE SUPPORTED WHERE ONE OR MORE OF THE FOLLOWING CONDITIONS EXIST:
       - CURVED STREETS RESTRICT THE ABILITY TO PROVIDE ALL UNITS OF STRUCTURE TO COMPLY WITH DRIVEWAY LENGTH STANDARDS
       - DESIRE FOR ARCHITECTURAL ARTICULATION WITHIN INDIVIDUAL STRUCTURES CREATE VARIABLE DRIVEWAY LENGTHS
       - THE PROVISION OF AMPLE ON-STREET AND/OR OFF-STREET GUEST PARKING WITHIN THE PROJECT REDUCES THE DEMAND TO PARK IN UNIT DRIVEWAYS
       - SLOPE OR OTHER SITE CONSTRAINTS RESTRICT THE ABILITY FOR ALL UNITS OF STRUCTURE TO COMPLY WITH DRIVEWAY LENGTH STANDARDS
   - B. LOCATE CURB STOPS IN PRIVATE STREETS. CURB STOPS SHALL BE INSTALLED IN ADJUSTABLE TRAFFIC RATED BOXES. SEE DETAIL DRAWING A3-15.
   - C. CONSTRUCT A MANIFOLD IN OPEN SPACES OR AREAS WHERE SEPARATION CRITERIA FROM UTILITIES AND STRUCTURES CAN BE MET. SEE DETAIL DRAWING A3-17. COLORADO SPRINGS UTILITIES SHALL MAINTAIN THE SERVICE LINE FROM THE PUBLIC WATER MAIN TO THE SECONDARY CURB STOP. THE INDIVIDUAL PROPERTY OWNER SHALL MAINTAIN THE WATER SERVICE LINE FROM THE SECONDARY CURB STOP TO THE PREMISE TO BE SERVED. IF THE CUSTOMER DAMAGES THE SECONDARY CURB STOP THEY SHALL BE RESPONSIBLE FOR ITS REPAIR. IF THE WATER SERVICE LINE CROSSES PRIVATE PROPERTY A PRIVATE EASEMENT SHALL BE REQUIRED OF SUFFICIENT WIDTH TO ALLOW FOR FUTURE OPERATION AND MAINTENANCE.
   - D. CONSTRUCT PRIVATE COMMON SERVICE LINES FROM THE MAIN TO EACH UNIT WITH A MASTER METER, AND BACKFLOW PREVENTION ASSEMBLY. THE RESPONSIBILITY FOR MAINTENANCE OF COMMON SERVICE LINES AND MASTER METERS SHALL BE THE HOMEOWNERS ASSOCIATION OR ANOTHER COMMERCIAL ENTITY. SEE DETAIL DRAWING A3-19.
   - E. UNIT DEVELOPMENTS FOR RESIDENTIAL PURPOSES THAT HAVE EACH UNIT SEPARATELY METERED ARE NOT REGULATED FOR BACKFLOW PREVENTION, AND DO NOT AUTOMATICALLY REQUIRE BACKFLOW PREVENTION. HOWEVER, IF THE BUILDING HAS MULTIPLE UNITS SERVED BY A SINGLE METER, IT IS REGULATED AND REQUIRES A BACKFLOW PREVENTION ASSEMBLY SEE SECTION 2.7.N FOR REQUIREMENTS.

NOTE:

1. THE DEVELOPMENT PLAN FOR THE PROPOSED DEVELOPMENT SHALL SHOW TYPICAL DETAILS FOR THE PROJECT-SPECIFIC LOCATION OF ALL UTILITIES, SERVICE LINES, CURB STOPS AND APPURTENANCES. LOCATION APPROVAL SHALL BE ON A CASE BY CASE BASIS.

DESIGN GUIDELINES FOR UTILITY CROSS SECTION FOR PRIVATE STREET WITH PUBLIC UTILITIES



NOTES:

THE DRIVE AISLE RESTRICTIONS:

TO BE READ IN CONJUNCTION WITH NOTES ON SHEET A3-12 AND A3-13

1. NO STORM DRAIN FACILITIES
2. NO SIDEWALKS
3. NO STREET LIGHTS
4. NO TRANSFORMERS
5. NO PARKING
6. NO EDIFICE (BUILDING) PROJECTIONS IN THE UTILITY EASEMENT, (i.e. DECKS) WITH THE EXCEPTION FOR THE ROOF SOFFITT.
7. CURB STOP MAY BE LOCATED BEHIND CURB AND GUTTER OR EDGE OF ASPHALT IF SEPARATION CRITERIA ARE MET: CURB STOP MUST BE A MINIMUM OF 2 FEET FROM BACK OF CURB, EDGE OF ASPHALT, AND CLOSEST EDGE OF JOINT TRENCH; CURB STOP MUST BE A MINIMUM OF 9 FEET FROM THE BUILDING FOUNDATION (OR CURB STOP MAY BE A MINIMUM OF 6 FEET FROM FOUNDATION IF BUILDING HAS A 3 FOOT MINIMUM CUTOFF WALL).
8. WHERE THE CONDITIONS IN NOTE 7 CANNOT BE MET, THE CURB STOP MAY BE LOCATED IN THE DRIVE AISLE, A MINIMUM OF 2 FEET FROM THE EDGE OF ASPHALT OR THE BACK OF CURB AND GUTTER.

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PRIVATE STREET WITH PUBLIC UTILITIES
UTILITIES CROSS SECTION
CURB STOP LOCATIONS A AND B

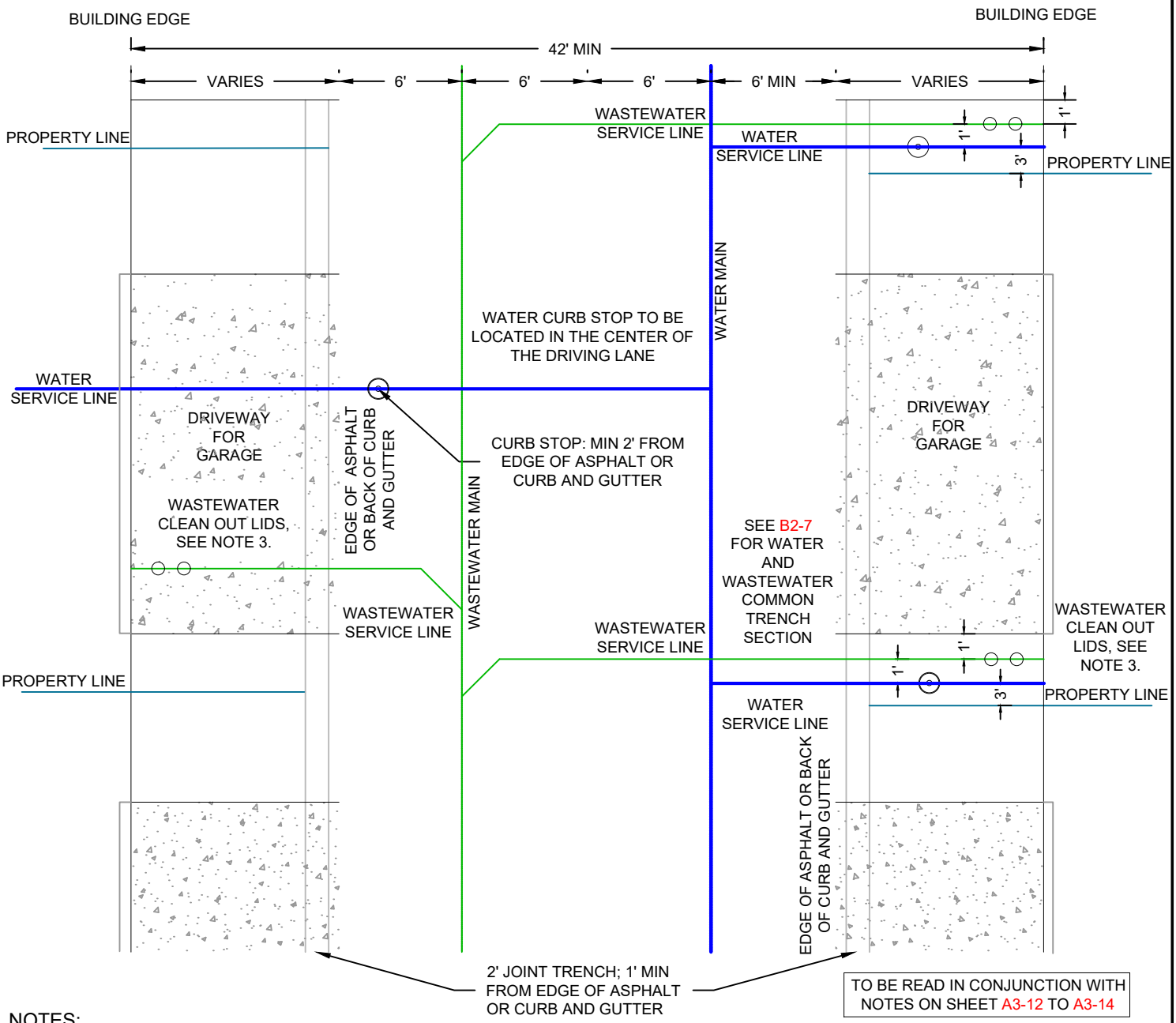
A3-14

DATED 07/2025

TYPICAL DESIGN FOR SERVICES FOR PRIVATE STREET WITH PUBLIC UTILITIES

REFER TO SECTION 3.2.C FOR PRELIMINARY UTILITY PLAN AND MEETING REQUIREMENTS. ELECTRIC AND GAS CONFIGURATION WITH THE APPROVAL OF COLORADO SPRINGS UTILITIES' FIELD ENGINEERS.

REFER TO *GAS LESS* AND *ELECTRIC LESS* FOR REQUIRED CLEARANCES FOR GAS AND ELECTRIC INFRASTRUCTURE. SEE DETAIL DRAWINGS B4-1 AND B4-3 IN *WATER LESS* FOR WATER METER CLEARANCES.



TO BE READ IN CONJUNCTION WITH NOTES ON SHEET A3-12 TO A3-14

NOTES:

1. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND GAS OR ELECTRIC SERVICE LINE MUST BE 3 FEET.
2. CURB STOP MAY BE LOCATED BEHIND CURB AND GUTTER OR EDGE OF ASPHALT IF SEPARATION CRITERIA ARE MET: CURB STOP MUST BE A MINIMUM OF 2 FEET FROM BACK OF CURB, EDGE OF ASPHALT, AND CLOSEST EDGE OF JOINT TRENCH; CURB STOP MUST BE A MINIMUM OF 9 FEET FROM THE BUILDING FOUNDATION (OR CURB STOP MAY BE A MINIMUM OF 6 FEET FROM FOUNDATION IF BUILDING HAS A 3 FOOT MINIMUM CUTOFF WALL).
3. THE WASTEWATER CLEANOUT SHALL BE LOCATED 2 FT OFF THE FACE OF THE BUILDING. IF LOCATED UNDER THE DRIVEWAY, THE WASTEWATER SERVICE LINE SHALL BE CONSTRUCTED OUT OF SCHEDULE 40 PVC AND THE CLEANOUT SHALL BE DESIGNED TO CARRY HS-20 LOADING.

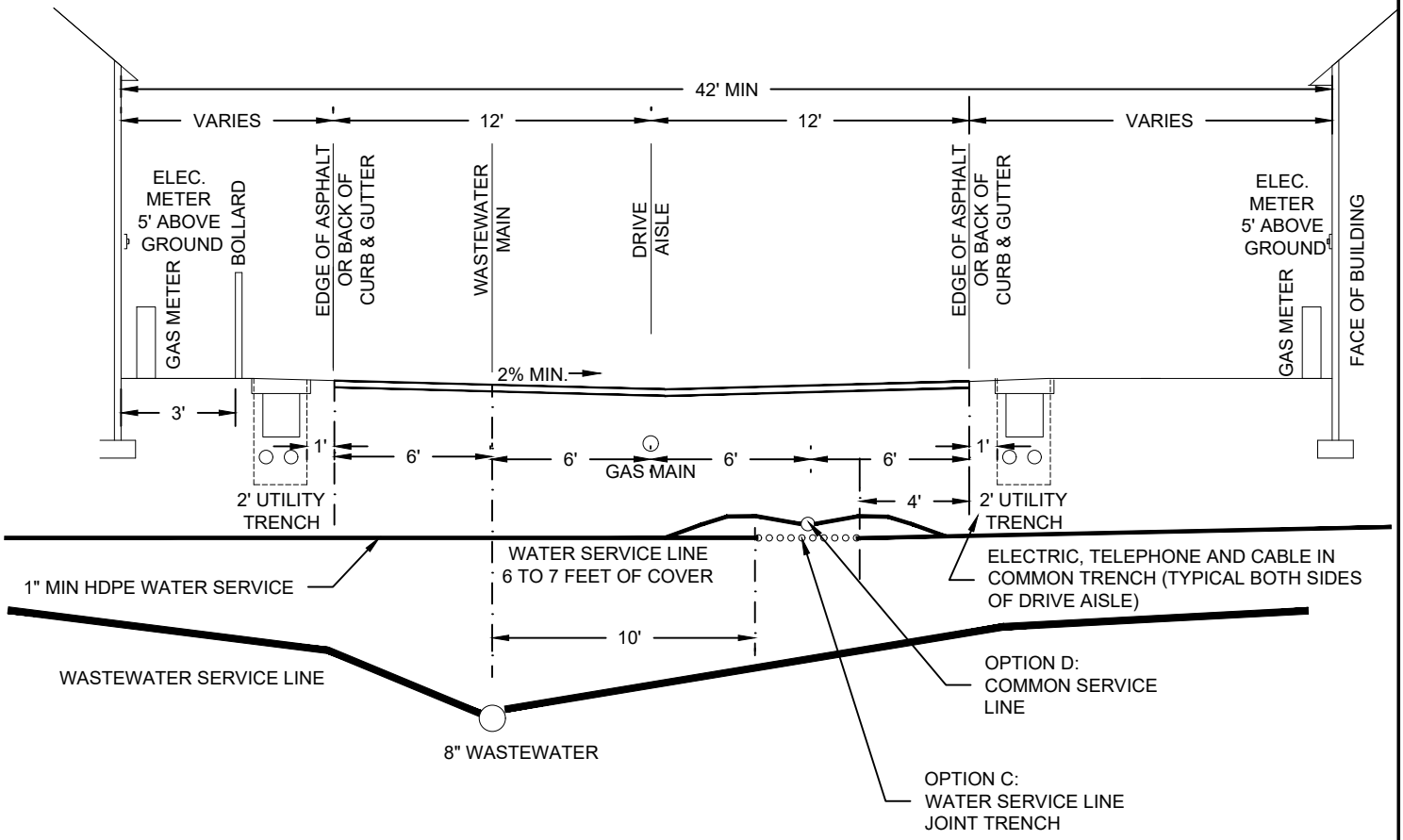
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PRIVATE STREET WITH PUBLIC UTILITIES
WATER SERVICE LINE
CURB STOP LOCATION A AND B

A3-15

DATED 07/2025

DESIGN GUIDELINES FOR UTILITY CROSS SECTION FOR PRIVATE STREET WITH PUBLIC UTILITIES



TO BE READ IN CONJUNCTION WITH NOTES ON SHEET A3-12 AND A3-13

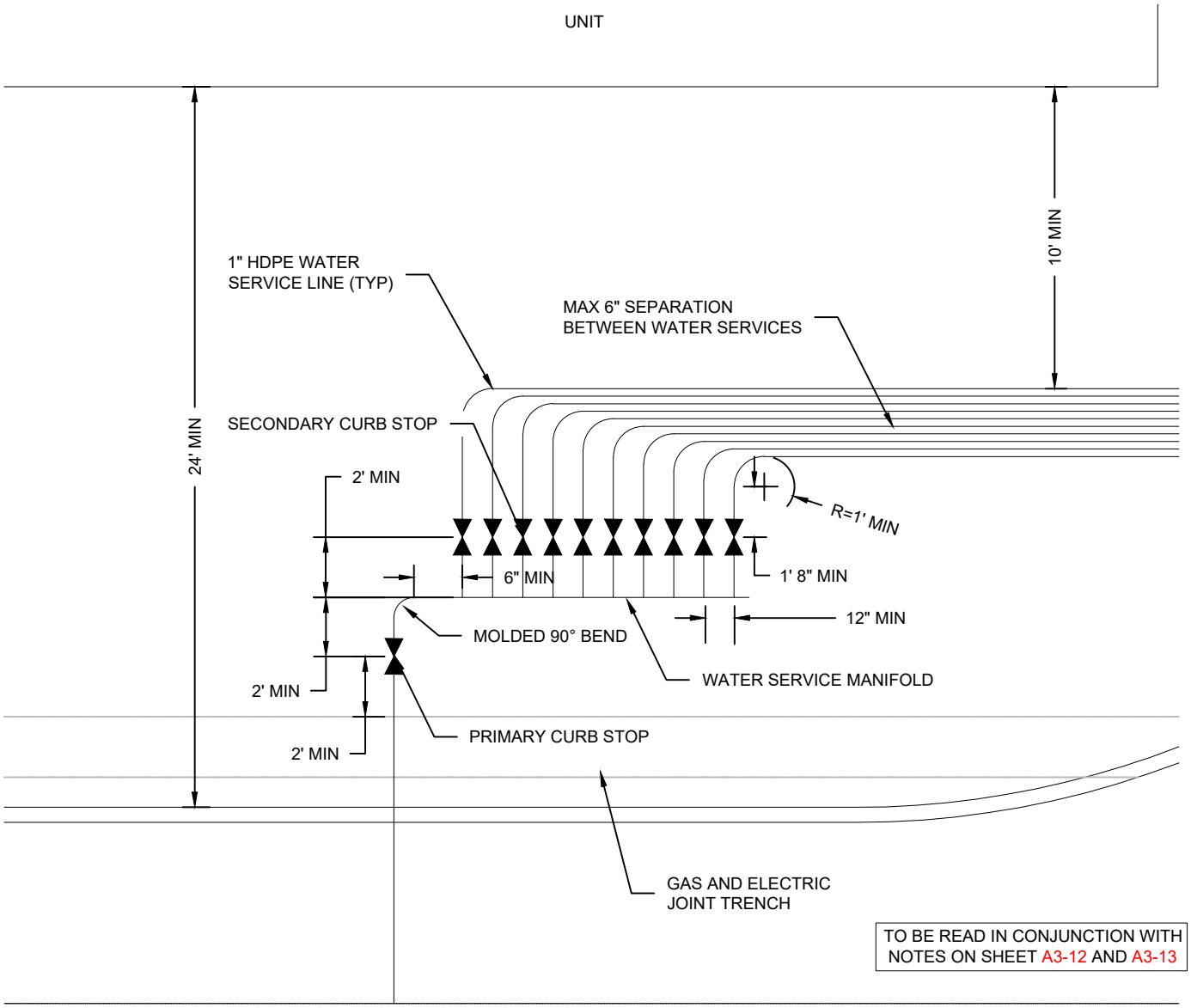
NOTES:

THE DRIVE AISLE RESTRICTIONS:

1. NO STORM DRAIN FACILITIES
2. NO SIDEWALKS
3. NO STREET LIGHTS
4. NO TRANSFORMERS
5. NO PARKING
6. NO EDIFICE (BUILDING) PROJECTIONS IN THE UTILITY EASEMENT, (i.e. DECKS) WITH THE EXCEPTION FOR THE ROOF SOFFIT (EAVE).
7. REFERENCE DETAIL DRAWINGS A3-17, A3-18 AND A3-19.

Colorado Springs Utilities It's how we're all connected	PRIVATE STREET WITH PUBLIC UTILITIES CROSS SECTION CURB STOP LOCATIONS C AND D	A3-16 DATED 07/2022

TYPICAL DESIGN FOR SERVICES FOR PRIVATE STREET WITH PUBLIC UTILITIES CURB STOP MANIFOLD



NOTES:

1. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND GAS OR ELECTRIC SERVICE LINE MUST BE 3 FEET.
2. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND THE WASTEWATER MAIN SHALL BE 10 FEET.
3. WATER SERVICE LINE AND MANIFOLD SHALL BE COPPER OR HDPE FROM THE WATER MAIN TO THE SECONDARY CURB STOP.
4. THE WATER SERVICE LINE SHALL BE HDPE FROM THE SECONDARY CURB STOP TO THE METER LOOP.
5. THE WATER SERVICE LINE AND MANIFOLD SHALL BE THE SAME SIZE AND SHALL BE SIZED BY THE DESIGN ENGINEER FOR PEAK DAY DEMAND.
6. THE WATER SERVICE LINES AND MANIFOLD SHALL BE A MAXIMUM DIAMETER OF 2 INCHES.
7. THE PRIMARY CURB STOP SHALL BE LOCATED A MINIMUM OF 2 FEET FROM THE BACK OF CURB, EDGE OF ASPHALT AND CLOSEST EDGE OF THE JOINT TRENCH.
8. SECONDARY CURB STOPS SHALL BE LOCATED A MINIMUM OF 9 FEET FROM THE BUILDING FOUNDATION; IF BUILDING HAS A 3 FOOT MINIMUM CUTOFF WALL, SECONDARY CURB STOP MAY BE A MINIMUM OF 6 FEET FROM FOUNDATION.
9. WATER SERVICES LINES IN THE COMMON TRENCH SHALL BE SEPARATED BY A MAXIMUM HORIZONTAL DISTANCE OF 6 INCHES.
10. HDPE SERVICE LINES WITHIN THE JOINT TRENCH SHALL BE SECURED WITH A RACK EVERY 10 FEET TO ENSURE SEPARATION OF SERVICES.
11. MANIFOLD AND SERVICE LINE JOINT TRENCH SHALL BE EMBEDDED WITH WELL GRADED SAND A MINIMUM OF 4 INCHES BELOW AND 6 INCHES ABOVE THE WATER SERVICE LINE OUTER DIAMETER.
12. CURB STOP LIDS SHALL BE MARKED WITH ADDRESS.

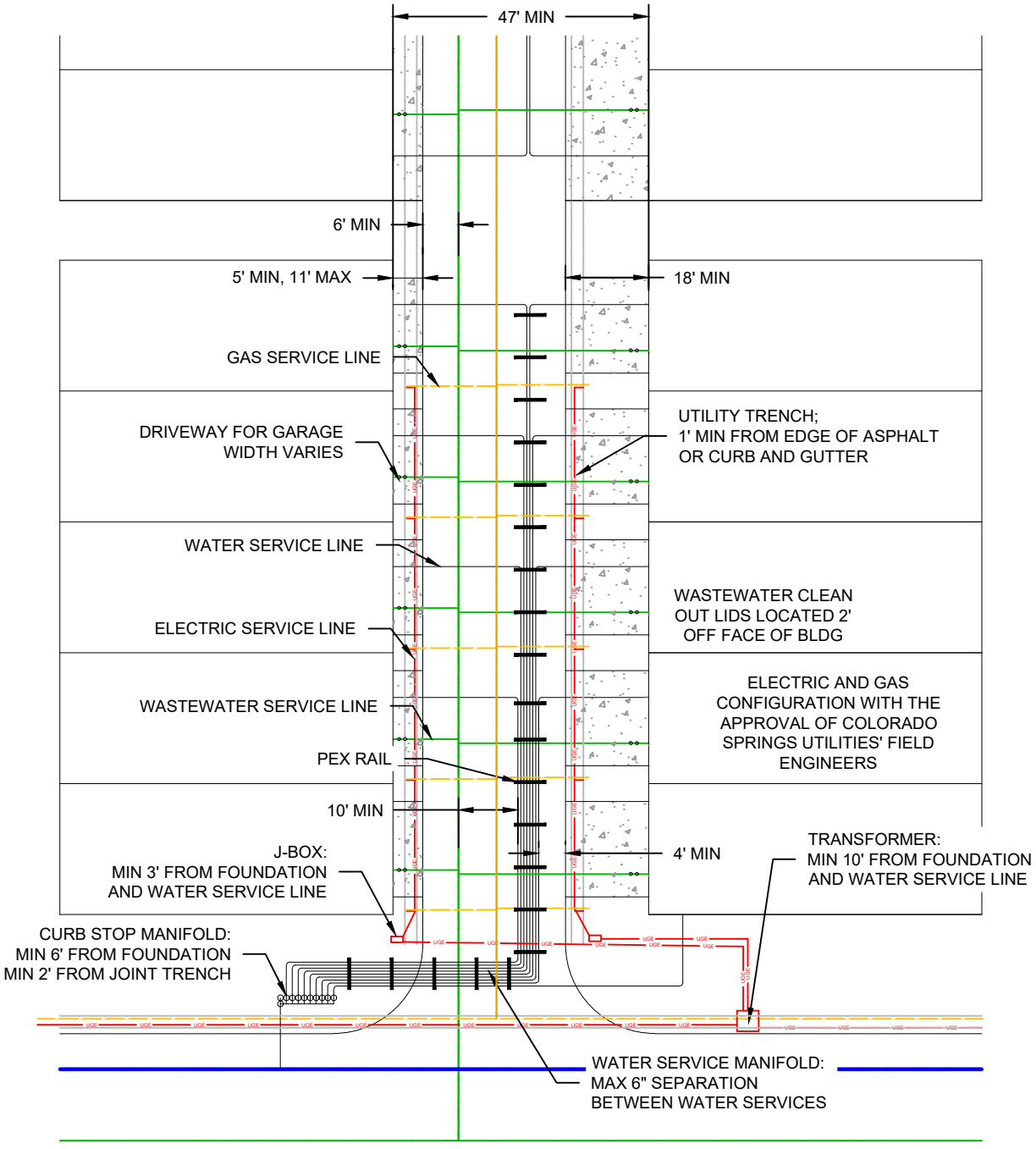
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PRIVATE STREET WITH PUBLIC UTILITIES
WATER SERVICE LINE
CURB STOP MANIFOLD

A3-17

DATED 07/2025

TYPICAL DESIGN FOR SERVICES FOR PRIVATE STREET WITH PUBLIC UTILITIES



TO BE READ IN CONJUNCTION WITH NOTES ON SHEET A3-12 AND A3-13

NOTES:

1. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND GAS OR ELECTRIC SERVICE LINE MUST BE 3 FEET.
2. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND THE WASTEWATER MAIN SHALL BE 10 FEET.
3. THE WATER SERVICE LINE MANIFOLD SHALL BE INSTALLED PER DETAIL DRAWING A3-17.
4. THE WATER SERVICE LINE SHALL BE HDPE FROM THE SECONDARY CURB STOP TO THE METER LOOP
5. 4 OR MORE WATER SERVICE LINES IN A COMMON TRENCH SHALL BE SEPARATED WITH PEX RAILS. RAILS SHALL BE LOCATED WITHIN 2 FEET OF ANY BENDS AND EVERY 5 FEET ALONG THE WATER SERVICE LINES. ALTERNATELY EACH WATER SERVICE LINE MAY BE PLACED IN SCHEDULE 40 PVC CONDUIT A MINIMUM OF 4" DIAMETER. END OF THE CONDUITS SHALL BE SEALED AND EACH CONDUIT SHALL BE IDENTIFIED WITH TRACER WIRE.

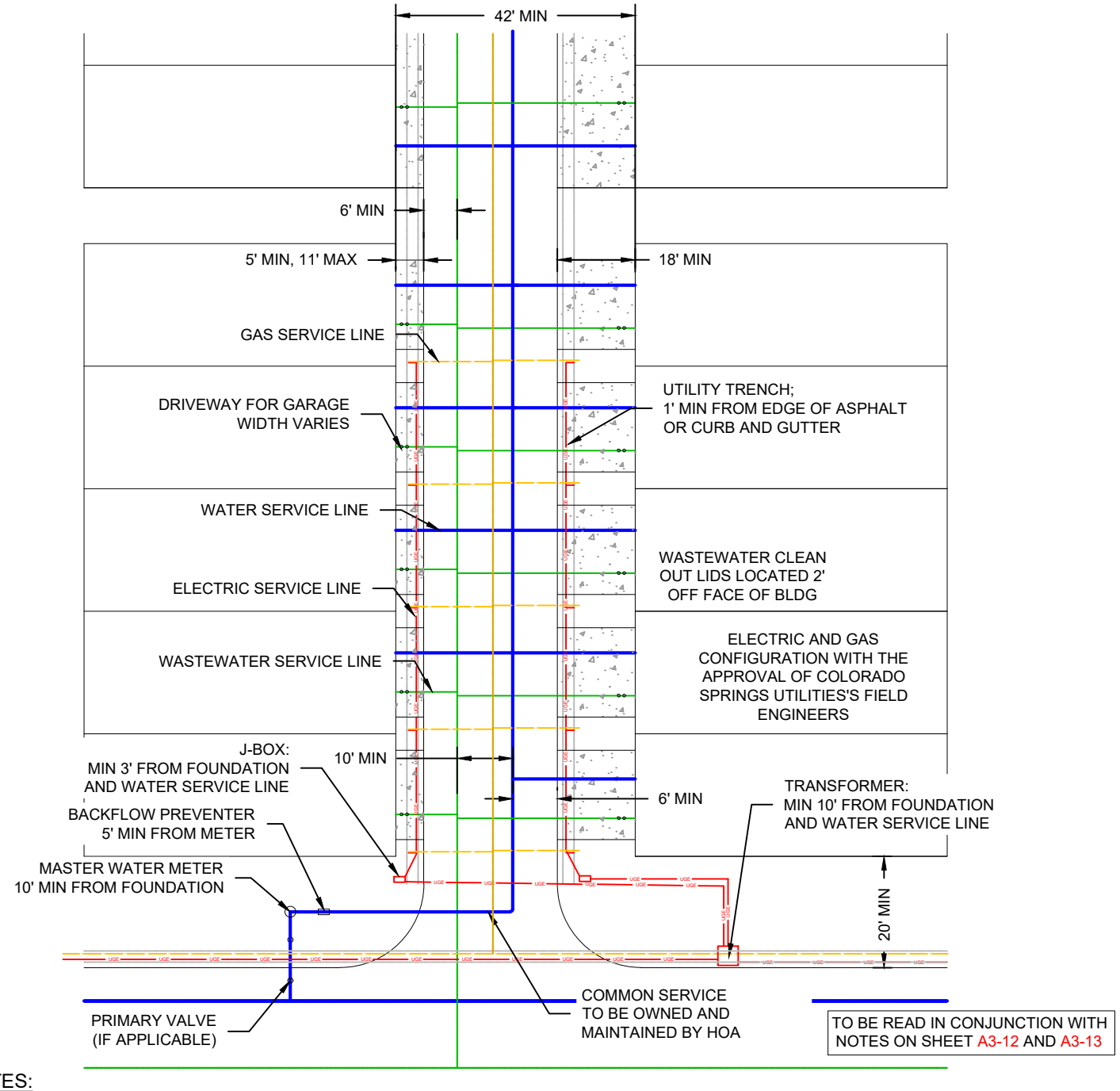
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PRIVATE STREET WITH PUBLIC UTILITIES
WATER SERVICE LINE
CURB STOP OPTION C

A3-18

DATED 07/2022

TYPICAL DESIGN FOR SERVICES FOR PRIVATE STREET WITH PUBLIC UTILITIES



NOTES:

1. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND GAS OR ELECTRIC SERVICE LINE MUST BE 3 FEET.
4. THE COMMON WATER SERVICE LINE SHALL BE HDPE.
5. THE COMMON WATER SERVICE LINE SHALL BE SIZED BY THE DESIGN ENGINEER FOR PEAK DAY DEMAND AND SHALL BE A MINIMUM OF 6 INCHES IN DIAMETER.
6. INDIVIDUAL WATER SERVICE LINES SHALL BE A MINIMUM 1" HDPE.
7. COMMON WATER SERVICE LINES 6 INCHES AND GREATER SHALL BE DESIGN AND CONSTRUCTED PER THE WATER MAIN CRITERIA.
8. THE CURB STOP/SECONDARY VALVE SHALL BE LOCATED A MINIMUM OF 2 FEET FROM THE BACK OF CURB, EDGE OF ASPHALT AND CLOSEST EDGE OF THE JOINT TRENCH.
9. MASTER METERS SHALL BE LOCATED A MINIMUM OF 10 FEET FROM THE BUILDING FOUNDATION.
10. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN WATER SERVICE LINES AND THE WASTEWATER MAIN SHALL BE 10 FEET OUTSIDE DIAMETER TO OUTSIDE DIAMETER.

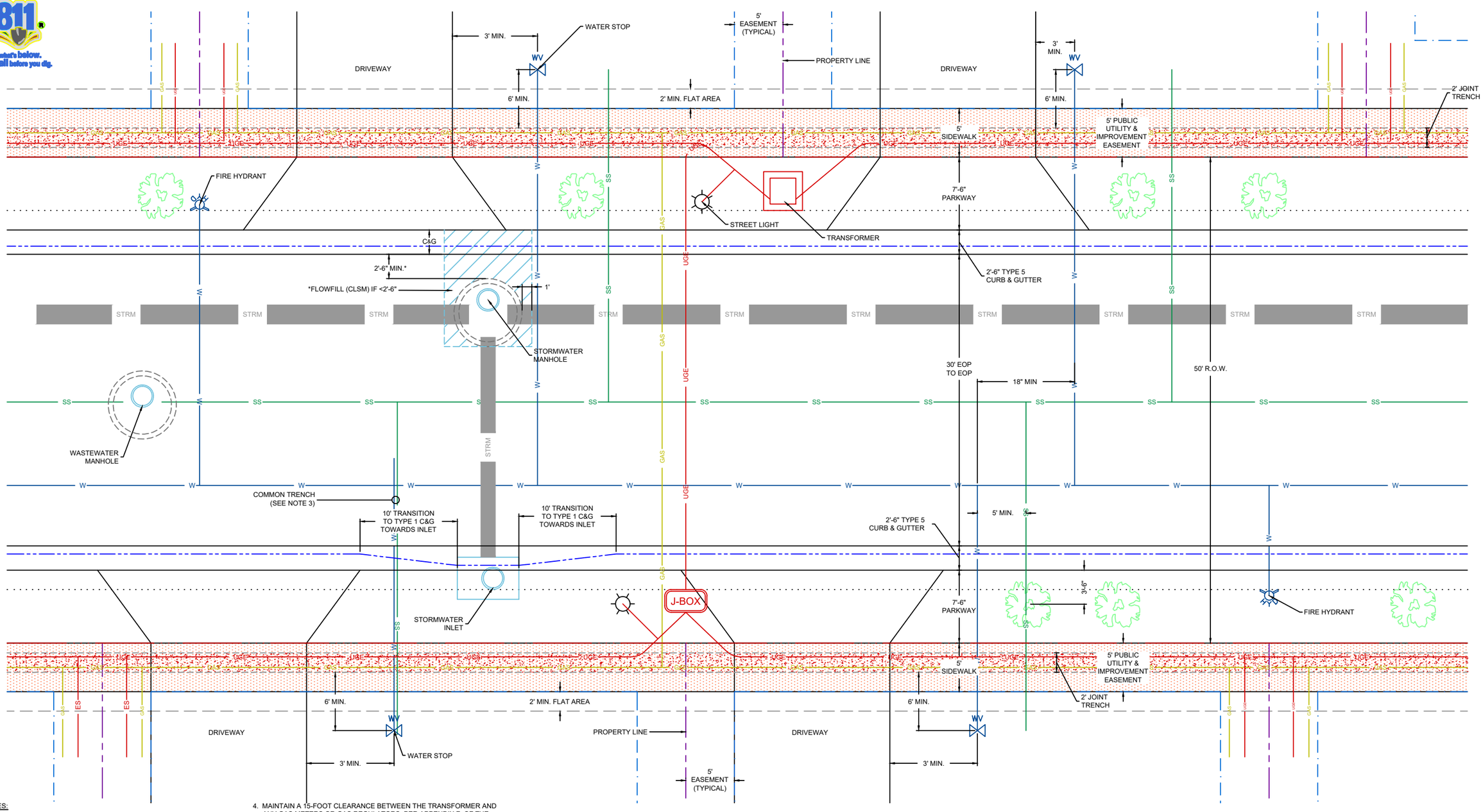
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PRIVATE STREET WITH PUBLIC UTILITIES
COMMON WATER SERVICE LINE
CURB STOP OPTION D

A3-19

DATED 07/2022

Know what's below. Call before you dig.



NOTES:

1. STUB WATER WITH CURB STOP AND WASTEWATER 6-FEET MINIMUM BEHIND EDGE OF JOINT TRENCH; 15-FEET MINIMUM FROM PROPERTY LINE AND NOT UNDER DRIVEWAY. KEEP 3-FEET SEPARATION FROM WATER AND WASTEWATER TO GAS SERVICE.
2. WATER AND WASTEWATER ARE TYPICALLY ON THE TOPOGRAPHIC LOW SIDE OF THE LOT.
3. WATER AND WASTEWATER SERVICE LINES CAN BE PLACED IN A COMMON TRENCH WITH 1-FOOT VERTICAL AND HORIZONTAL SEPARATION.
4. MAINTAIN A 15-FOOT CLEARANCE BETWEEN THE TRANSFORMER AND ANY GAS METERS OR GAS REGULATORS, PER APPENDIX F, OF THE ELECTRIC LESS.
5. A MINIMUM SETBACK OF 15-FEET FROM BACK OF CURB TO STRUCTURE IS REQUIRED TO MEET CSU's SEPARATION REQUIREMENT BETWEEN STRUCTURES AND UTILITIES. FOR SETBACKS LESS THAN 15-FEET, SEE THE DEVELOPMENT PLAN REQUIREMENTS LISTED IN THE LESS.
6. ALL PRIVATE TELECOMMUNICATION SHALL BE INSTALLED PER CITY OF COLORADO SPRINGS ENGINEERING REQUIREMENTS AND SHALL MEET TYPICAL PARALLEL. CLEARANCES (SEPARATE TRENCHES) AND CROSSING CLEARANCE MATRIX FOR COLORADO SPRINGS UNDERGROUND UTILITIES.

THIS PLAN DESIGN IS TO BE USED IN CONJUNCTION WITH THE CROSS SECTIONS

LINE LEGEND

UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
GAS	GAS	MIN. 30"
UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

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RESIDENTIAL, LOCAL DETACHED SIDEWALK PLAN VIEW

APPROVED:

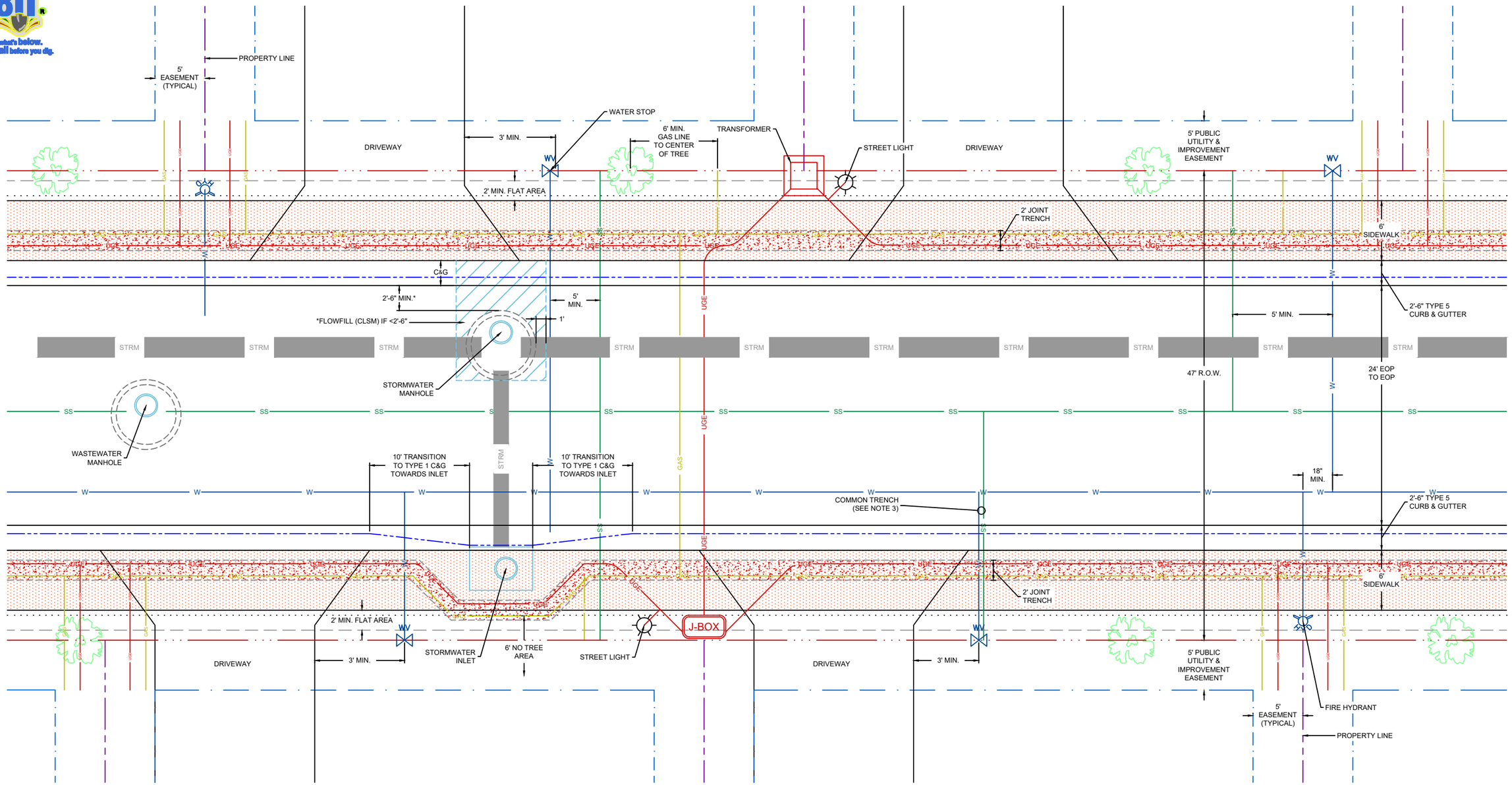
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-20

DATED: 11/2025

User: BSHANER Dec 10, 2025 - 5:51pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATER\WLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-20

Know what's below. Call before you dig.



NOTES:

1. STUB WATER WITH CURB STOP AND WASTEWATER 6-FEET MINIMUM BEHIND EDGE OF JOINT TRENCH; 15-FEET MINIMUM FROM PROPERTY LINE AND NOT UNDER DRIVEWAY. KEEP 3-FEET SEPARATION FROM WATER AND WASTEWATER TO GAS SERVICE.
2. WATER AND WASTEWATER ARE TYPICALLY ON THE TOPOGRAPHIC LOW SIDE OF THE LOT.
3. WATER AND WASTEWATER SERVICE LINES CAN BE PLACED IN A COMMON TRENCH WITH 1-FOOT VERTICAL AND HORIZONTAL SEPARATION.
4. MAINTAIN A 15-FOOT CLEARANCE BETWEEN THE TRANSFORMER AND ANY GAS METERS OR GAS REGULATORS, PER APPENDIX F, OF THE ELECTRIC LESS.
5. A MINIMUM SETBACK OF 15-FEET FROM BACK OF CURB TO STRUCTURE IS REQUIRED TO MEET CSU's SEPARATION REQUIREMENT BETWEEN STRUCTURES AND UTILITIES. FOR SETBACKS LESS THAN 15-FEET, SEE THE DEVELOPMENT PLAN REQUIREMENTS LISTED IN THE LESS.
6. ALL PRIVATE TELECOMMUNICATION SHALL BE INSTALLED PER CITY OF COLORADO SPRINGS ENGINEERING REQUIREMENTS AND SHALL MEET TYPICAL PARALLEL. CLEARANCES (SEPARATE TRENCHES) AND CROSSING CLEARANCE MATRIX FOR COLORADO SPRINGS UNDERGROUND UTILITIES.

THIS PLAN DESIGN IS TO BE USED IN CONJUNCTION WITH THE CROSS SECTIONS

LINE LEGEND

UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
GAS	GAS	MIN. 30"
UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

Colorado Springs Utilities
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MINOR RESIDENTIAL (LOCAL) (<21 LOTS) ATTACHED SIDEWALKS PLAN VIEW

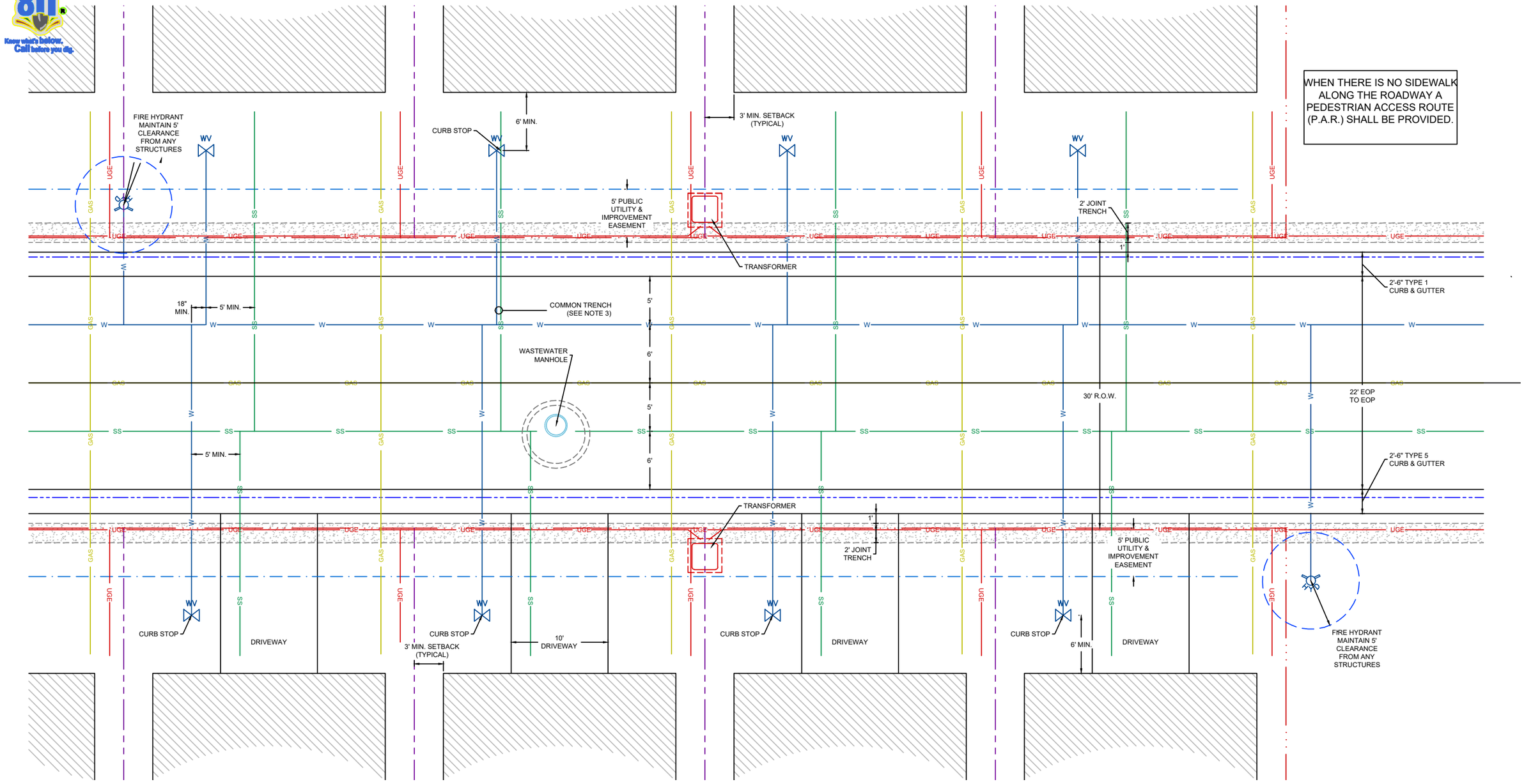
APPROVED:

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A3-21

DATED: 11/2025

User: BSHANER Dec 10, 2025 - 5:51pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\501 - LINE EXTENSION AND SERVICE STANDARDS WORKINGS\2026 VERSION\01 - WATERWLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-21



WHEN THERE IS NO SIDEWALK ALONG THE ROADWAY A PEDESTRIAN ACCESS ROUTE (P.A.R.) SHALL BE PROVIDED.

NOTES:

1. STUB WATER WITH CURB STOP AND WASTEWATER 6-FEET MINIMUM BEHIND EDGE OF JOINT TRENCH; 15-FEET MINIMUM FROM PROPERTY LINE AND NOT UNDER DRIVEWAY. KEEP 3-FEET SEPARATION FROM WATER AND WASTEWATER TO GAS SERVICE.
2. WATER AND WASTEWATER ARE TYPICALLY ON THE TOPOGRAPHIC LOW SIDE OF THE LOT.
3. WATER AND WASTEWATER SERVICE LINES CAN BE PLACED IN A COMMON TRENCH WITH 1-FOOT VERTICAL AND HORIZONTAL SEPARATION.
4. MAINTAIN A 15-FOOT CLEARANCE BETWEEN THE TRANSFORMER AND ANY GAS METERS OR GAS REGULATORS, PER APPENDIX F, OF THE ELECTRIC LESS.
5. A MINIMUM SETBACK OF 15-FEET FROM BACK OF CURB TO STRUCTURE IS REQUIRED TO MEET CSU's SEPARATION REQUIREMENT BETWEEN STRUCTURES AND UTILITIES. FOR SETBACKS LESS THAN 15-FEET, SEE THE DEVELOPMENT PLAN REQUIREMENTS LISTED IN THE LESS.
6. ALL PRIVATE TELECOMMUNICATION SHALL BE INSTALLED PER CITY OF COLORADO SPRINGS ENGINEERING REQUIREMENTS AND SHALL MEET TYPICAL PARALLEL. CLEARANCES (SEPARATE TRENCHES) AND CROSSING CLEARANCE MATRIX FOR COLORADO SPRINGS UNDERGROUND UTILITIES.

THIS PLAN DESIGN IS TO BE USED IN CONJUNCTION WITH THE CROSS SECTIONS

LINE LEGEND

UTILITY	SYMBOL	DEPTH TO TOP OF PIPE
GAS	GAS	MIN. 30"
UNDERGROUND ELECTRIC	UGE	MIN. 42"
WATER	W	MIN. 60"
WASTEWATER	SS	MIN. 60"
STORM SEWER/STRUCTURES	STRM	PER DCM

Colorado Springs Utilities
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HIGH DENSITY RESIDENTIAL PLAN VIEW

APPROVED:

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

A3-22

DATED: 11/2025

Know what's below. Call before you dig. 811

User: BSHANER Dec 10, 2025 - 5:51pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\01 - WATER\WLESS DETAILS\STREET SECTIONS.DWG - Layout: A3-22

PER SLIP JOINT OF DIP PIPE

PIPE DATA	MFRS. DEFL.	DESIGN DEFLECTION (80% MAX.)		APPROX. RADIUS FOR DEFLECTING CURVES WITHOUT BENDS	
PIPE SIZE		(HORZ. DEFL.)	(VERT. DEFL.)	20'L	18'L
4" 6" 8" 10" 12"	5°00'	4°00'	6.99%	286'	258'
14" 16"	4°00'	3°12'	5.59%	358'	322'
18" 20" 24" 30" 36"	3°00'	2°24'	4.19%	477'	430'
42"	2°00'	1°36'	2.79%	716'	645'

DATA FOR DIP PIPE

SHADED COLUMN IS MANUFACTURERS REFERENCE ONLY

PER SLIP JOINT OF PVC PIPE W/HIGH DEFLECTION COUPLINGS

	PIPE DATA	MFRS. TOTAL JOINT DEFL.W/ COUPL.	DESIGN DEFLECTION (80% MAX.)		MIN. RADIUS FOR DEFLECTING CURVES WITH HIGH DEFL. COUPLINGS
	PIPE SIZE		(HORZ. DEFL.)	(VERT. DEFL.)	20'L
CLASS 305 (DR-14)	4"	5°00'	4°00'	6.99%	286'
	6"	5°00'	4°00'	6.99%	286'
	8"	5°00'	4°00'	6.99%	286'
	12"	5°00'	4°00'	6.99%	286'
CLASS 235 (DR-18)	16"	NO DEFLECTION COUPLINGS FOR 16" OR GREATER			

DATA FOR PVC PIPE

SHADED COLUMN IS MANUFACTURERS REFERENCE ONLY

NOTES:

1. COLORADO SPRINGS UTILITIES USES A 1.25 SAFETY FACTOR TO AVOID OVER DEFLECTION OF THE PIPE.
2. SLIP JOINT PVC PIPE SHALL NOT BE DEFLECTED WITHOUT THE USE OF HIGH DEFLECTION COUPLINGS (HDC).

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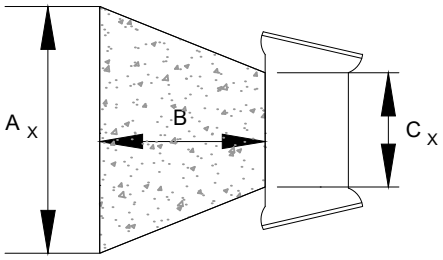
MAXIMUM PIPELINE DEFLECTION DATA FOR DIP AND PVC PIPE

A4-1

DATED 03/2014

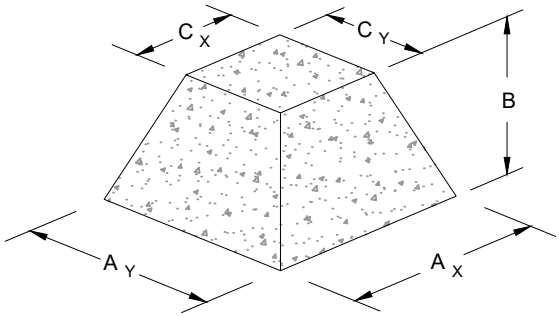
THRUST BLOCK DIMENSIONS and VOLUMES - PVC & DIP 250 psi

MAIN SIZE (in.)	TYPE OF FITTING	MINIMUM BEARING SURFACE AREA (ft^2)	MINIMUM A_X(ft)	MINIMUM A_Y(ft)	MINIMUM C_X(ft)	MINIMUM C_Y(ft)	MINIMUM B (ft)	APPROXIMATE VOLUME (yd^3)
4	11.25° BEND	1.00	1.00	1.00	0.25	0.33	2.00	0.25
4	22.5° BEND	2.00	1.41	1.41	0.21	0.33	2.00	0.25
4	45° BEND	3.50	1.87	1.87	0.42	0.33	2.00	0.25
4	TEE & DEAD END	4.75	2.18	2.18	0.67	0.33	2.00	0.25
6	11.25° BEND	2.00	1.41	1.41	0.25	0.50	2.00	0.25
6	22.5° BEND	3.75	1.94	1.94	0.38	0.50	2.00	0.25
6	45° BEND	7.25	2.69	2.69	0.58	0.50	2.00	0.25
6	TEE & DEAD END	9.50	3.08	3.08	0.83	0.50	2.00	0.50
8	11.25° BEND	3.25	1.80	1.80	0.34	0.67	2.00	0.25
8	22.5° BEND	6.50	2.55	2.55	0.48	0.67	2.00	0.25
8	45° BEND	12.50	3.57	3.50	0.67	0.67	2.00	0.50
8	TEE & DEAD END	16.25	4.64	3.50	1.08	0.67	2.00	0.75



THRUST BLOCK DIMENSIONS and VOLUMES - PVC (Maximum Static Pressure = 170 psi)

MAIN SIZE (in.)	TYPE OF FITTING	MINIMUM BEARING SURFACE AREA (ft^2)	MINIMUM A_X(ft)	MINIMUM A_Y(ft)	MINIMUM C_X(ft)	MINIMUM C_Y(ft)	MINIMUM B (ft)	APPROXIMATE VOLUME (yd^3)
12	11.25° BEND	4.75	2.18	2.18	0.43	1.00	2.00	0.25
12	22.5° BEND	9.25	3.04	3.04	0.64	1.00	2.00	0.50
12	45° BEND	18.00	4.92	3.66	1.00	1.00	2.00	0.75
12	TEE & DEAD END	23.50	6.42	3.66	1.46	1.00	2.48	1.00
16	11.25° BEND	8.00	2.83	2.83	0.44	1.33	2.00	0.50
16	22.5° BEND	16.00	4.27	3.75	0.66	1.33	2.00	0.75
16	45° BEND	31.00	8.27	3.75	1.00	1.33	3.64	1.75
16	TEE & DEAD END	40.50	10.80	3.75	1.92	1.33	4.44	3.00



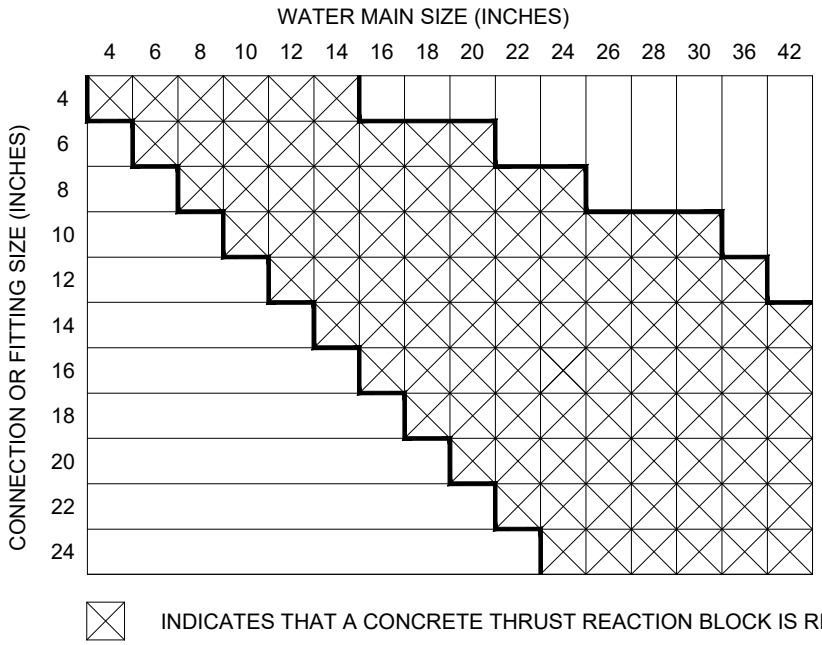
THRUST BLOCK DIMENSIONS and VOLUMES - DIP (Maximum Static Pressure = 250 psi)

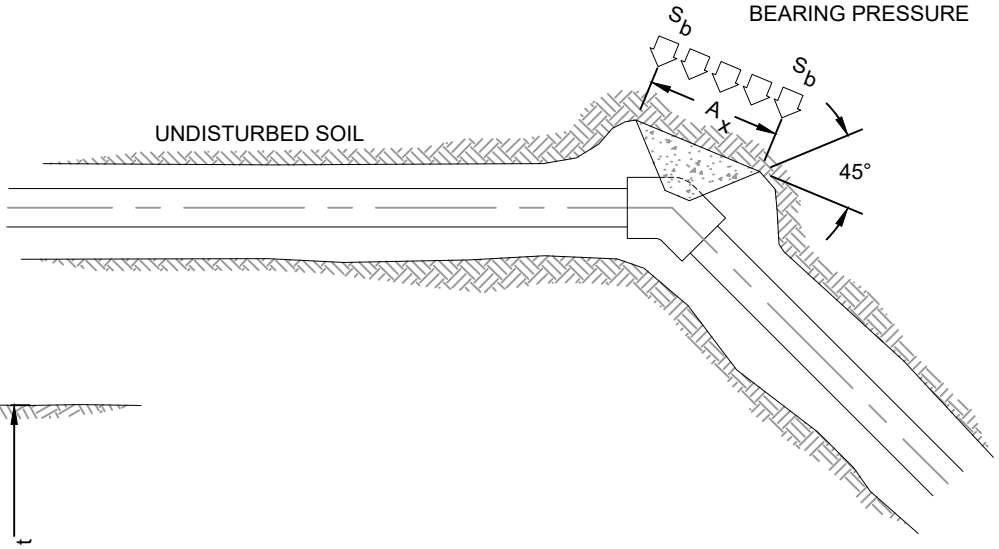
MAIN SIZE (in.)	TYPE OF FITTING	MINIMUM BEARING SURFACE AREA (ft^2)	MINIMUM A_X(ft)	MINIMUM A_Y(ft)	MINIMUM C_X(ft)	MINIMUM C_Y(ft)	MINIMUM B (ft)	APPROXIMATE VOLUME (yd^3)
12	11.25° BEND	6.75	2.60	2.60	0.43	1.00	2.00	0.50
12	22.5° BEND	13.50	3.69	3.66	0.64	1.00	2.00	0.50
12	45° BEND	26.25	7.17	3.66	1.00	1.00	3.09	1.50
12	TEE & DEAD END	34.25	9.36	3.66	1.46	1.00	3.95	2.25
16	11.25° BEND	11.75	3.43	3.43	0.44	1.33	2.00	0.50
16	22.5° BEND	23.25	6.20	3.75	0.66	1.33	2.77	1.00
16	45° BEND	45.50	12.13	3.75	1.00	1.33	5.57	4.00
16	TEE & DEAD END	59.50	15.87	3.75	1.92	1.33	6.98	6.50

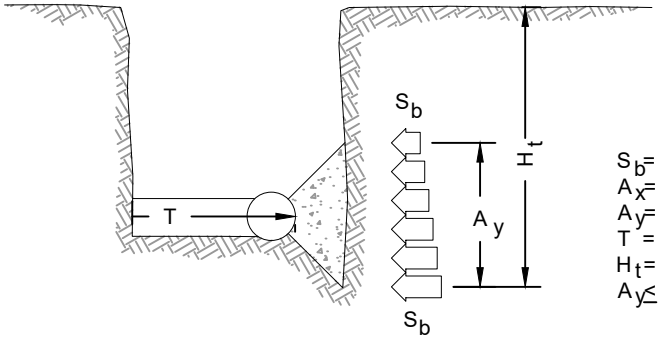
NOTES:

1. THE MINIMUM BEARING SURFACE AREAS SHOWN ARE BASED ON A MAX STATIC PIPE PRESSURE OF 170/250 POUNDS PER SQUARE INCH PLUS A SAFETY FACTOR OF 1.5 AND AN ALLOWABLE SOIL BEARING CAPACITY OF 1500 POUNDS PER SQUARE FOOT. BEARING SURFACE AREA IS ROUNDED UP TO THE NEAREST 0.25 SQUARE FEET. REFERENCE AWWA M-23 AND M-41.
2. THE DESIGN ENGINEER IS RESPONSIBLE FOR VERIFYING ASSUMPTIONS BASED ON ACTUAL SITE CONDITIONS. IF SITE CONDITIONS VARY FROM THE ASSUMPTIONS THE DESIGN ENGINEER SHALL PROVIDE A SITE SPECIFIC DESIGN IN ACCORDANCE WITH AWWA M-23, PVC PIPE - DESIGN AND INSTALLATION AND AWWA M-41, DUCTILE-IRON PIPE AND FITTINGS. SITE SPECIFIC DESIGNS INCLUDING GEOTECHNICAL INFORMATION SHALL BE SUBMITTED TO COLORADO SPRINGS UTILITIES FOR REVIEW.
3. THE MINIMUM BEARING SURFACE AREA AND APPROXIMATE VOLUME OF CONCRETE SHALL BE SHOWN ON THE CONSTRUCTION PLANS FOR ALL CONCRETE THRUST BLOCKS. CONCRETE MIX SHALL BE PER MATERIAL CHAPTER 4.
4. THE APPROXIMATE VOLUMES SHOWN ARE BASED ON THE MINIMUM BEARING SURFACE AREA AND THE MINIMUM TRENCH DIMENSIONS. THE APPROXIMATE VOLUME IS ROUNDED UP TO THE NEAREST 0.25 CUBIC YARDS.
5. THESE CHARTS MAY ONLY BE USED IF THE BLOCK HEIGHT (Ay) IS EQUAL TO OR LESS THAN ONE HALF THE TOTAL DEPTH (Ht) FROM THE FINISHED GRADE TO THE BOTTOM OF THE BLOCK. THE MINIMUM DIMENSIONS SHOWN ARE BASED ON A PIPE DEPTH OF 5 FEET. SEE DETAIL DRAWING A4-3.
6. A SITE SPECIFIC DESIGN SHALL BE REQUIRED FOR PIPES LARGER THAN 16 INCHES OR MAX STATIC PIPE PRESSURES GREATER THAN 250 POUNDS PER SQUARE INCH. THE DESIGN ENGINEER HAS THE OPTION OF PROVIDING A SITE SPECIFIC DESIGN FOR PIPES SMALLER THAN 16 INCHES OR MAX STATIC PRESSURES LESS THAN 250 POUNDS PER SQUARE INCH.
7. ALL CALCULATIONS SHALL BE PROVIDED TO COLORADO SPRINGS UTILITIES FOR REVIEW.

CONCRETE THRUST REACTION BLOCK REQUIREMENTS FOR TEES OR TAPS







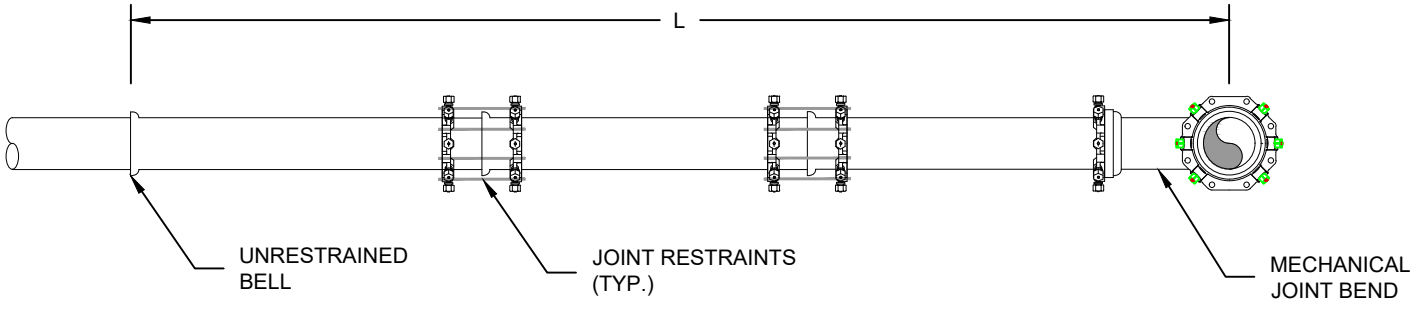
S_b = SOIL BEARING CAPACITY
A_x = CONCRETE THRUST REACTION BLOCK WIDTH
A_y = CONCRETE THRUST REACTION BLOCK HEIGHT
T = THRUST
H_t = DEPTH TO BOTTOM OF THE CONCRETE THRUST REACTION BLOCK
$A_y \leq$ 1/2 H_t

NOTES:

1. A SITE SPECIFIC DESIGN SHALL BE REQUIRED FOR CONNECTIONS OR FITTING SIZE COMBINATIONS NOT SHOWN ABOVE.
2. THE CONCRETE THRUST REACTION BLOCK SHALL BEAR AGAINST UNDISTURBED SOIL.
3. THE CONCRETE THRUST REACTION BLOCK SHALL BE INSTALLED WITH A 45° ANGLE FROM THE FITTING TO THE UNDISTURBED SOIL AS SHOWN IN THE DRAWING ABOVE.
4. REFER TO DETAIL DRAWING A4-2 FOR STANDARD CONCRETE THRUST REACTION BLOCK DIMENSIONS AND VOLUMES.
5. DUCTILE IRON FITTINGS AND PIPE SHALL BE WRAPPED IN POLYETHYLENE TUBING WHERE ADJACENT TO CONCRETE.

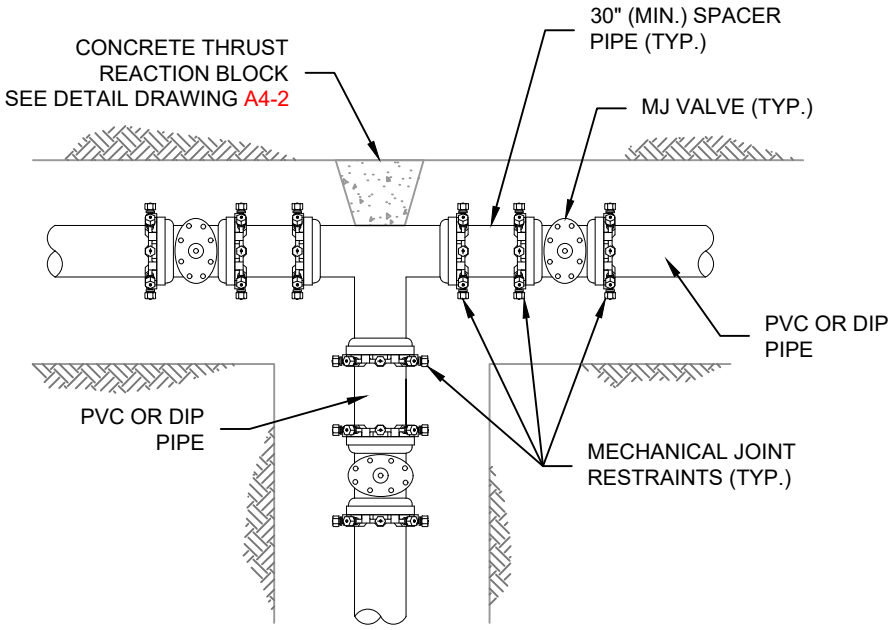
L = MINIMUM RESTRAINED PIPE LENGTH (FEET)

PIPE DIAMETER		45° BEND			22-1/2° BEND			11-1/4° BEND			DEAD END VALVE OR PLUG, TO INCLUDE IN-LINE VALVES (SEE NOTE 9)		
MAX. STATIC PRESSURE (PSI)		<100	100-150	150-200	<100	100-150	150-200	<100	100-150	150-200	<100	100-150	150-200
4 INCH	DUCTILE IRON AND PVC	5	7	9	2	3	4	1	2	2	34	51	68
6 INCH	DUCTILE IRON AND PVC	6	9	12	3	5	6	2	3	3	49	73	97
8 INCH	DUCTILE IRON AND PVC	8	12	16	4	6	8	2	3	4	63	94	125
12 INCH	DUCTILE IRON AND PVC	12	17	23	6	8	11	3	4	6	89	133	177
16 INCH	DUCTILE IRON AND PVC	15	22	29	7	11	14	4	5	7	USE CONCRETE REVERSE ANCHOR	USE CONCRETE REVERSE ANCHOR	USE CONCRETE REVERSE ANCHOR
20 INCH	DUCTILE IRON AND PVC	18	26	35	9	13	17	4	6	8			
24 INCH	DUCTILE IRON AND PVC	20	30	40	10	15	20	5	7	10			
30 INCH	DUCTILE IRON AND PVC	24	36	48	12	18	24	6	9	12			
36 INCH	DUCTILE IRON AND PVC	28	42	56	14	20	27	7	10	14			

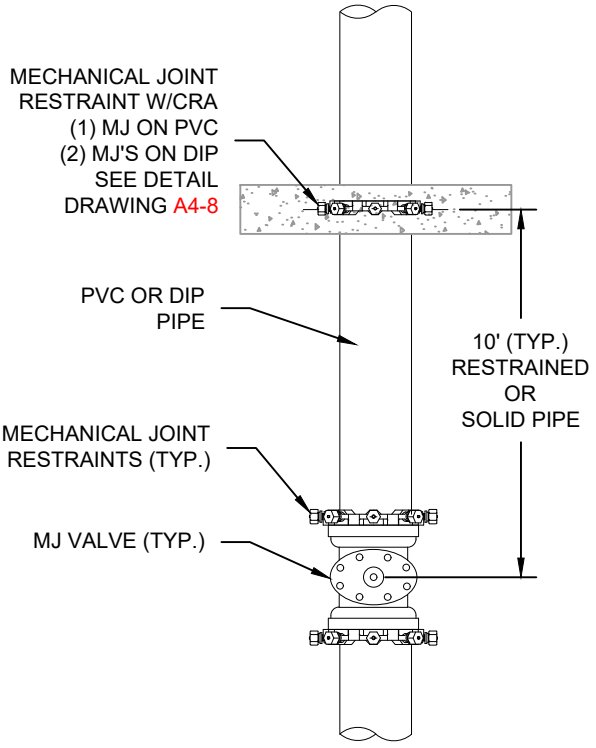


NOTES:

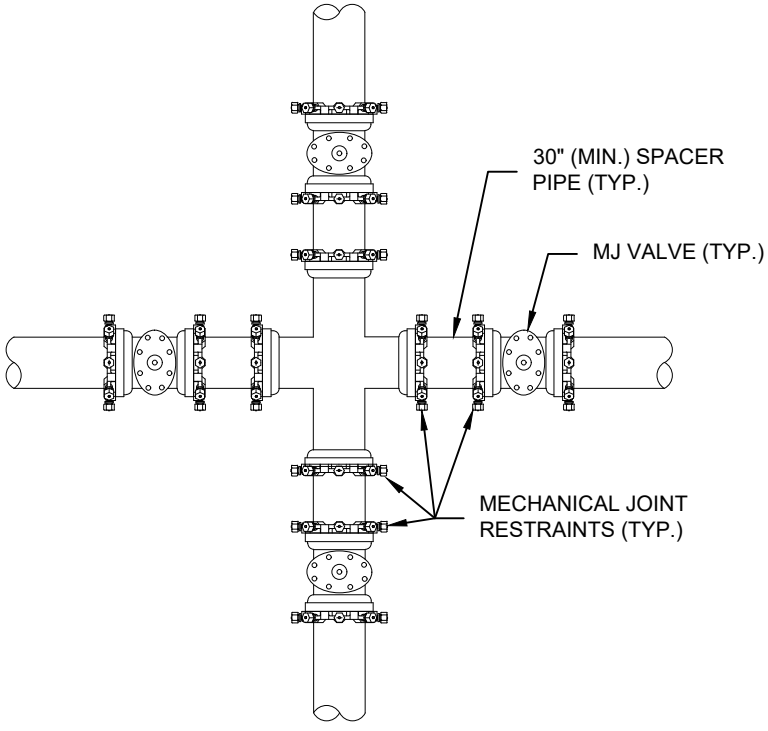
1. PRESSURE GREATER THAN 200 PSI REQUIRE SPECIAL DESIGN APPROVED BY SPRINGS UTILITIES. APPROVED BY COLORADO SPRINGS UTILITIES.
2. LENGTH IS BASED ON MINIMUM 5 FEET OF GROUND COVER AND SOIL COMPACTED ACCORDING TO CHAPTER 5 OF THESE WATER LESS. IF THE DEPTH IS LESS THAN 5 FEET RESTRAINED LENGTH MUST BE DESIGNED BY THE DESIGN ENGINEER.
3. APPROVED METHODS OF RESTRAINED PIPE BEYOND INITIAL FITTING SHALL BE IN ACCORDANCE WITH CHAPTER 4.
4. RESTRAINED PIPE LENGTH APPLIES TO CONDITIONS WHERE NO CONCRETE THRUST REACTION BLOCK IS PRESENT.
5. CALCULATIONS ARE BASED ON A POORLY GRADED SANDS, GRAVEL AND GRAVEL-SAND MIXTURE, LITTLE OR NO FINES, TYPE 4 BEDDING CONDITIONS - "PIPE BEDDED IN SAND, GRAVEL OR CRUSHED STONE TO A DEPTH OF 1/8 PIPE DIAMETER (4" MIN.)." FACTOR OF SAFETY 2:1.
6. FIGURES ARE BASED ON DIP WRAPPED IN POLYETHYLENE MATERIAL.
7. MEASUREMENTS ARE IN FEET.
8. USE CRA FOR DOWN TURNING BENDS.
9. RESTRAINED LENGTH FOR DEAD END MAY BE USED AT THE DISCRETION OF COLORADO SPRINGS UTILITIES.



TEE INSTALLATION



IN LINE VALVE INSTALLATION

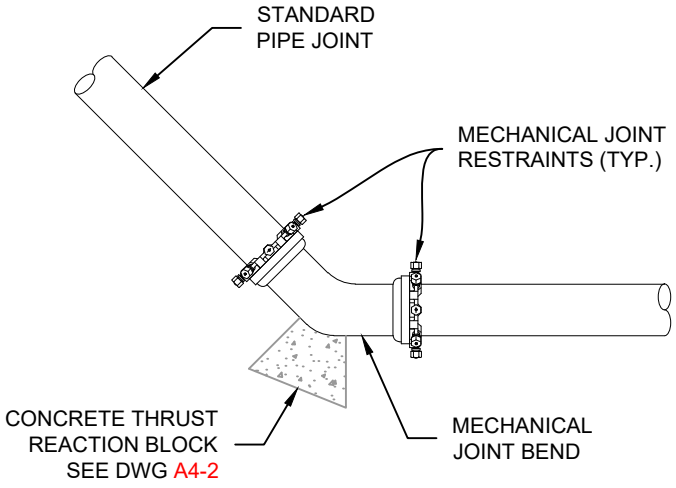


CROSS INSTALLATION

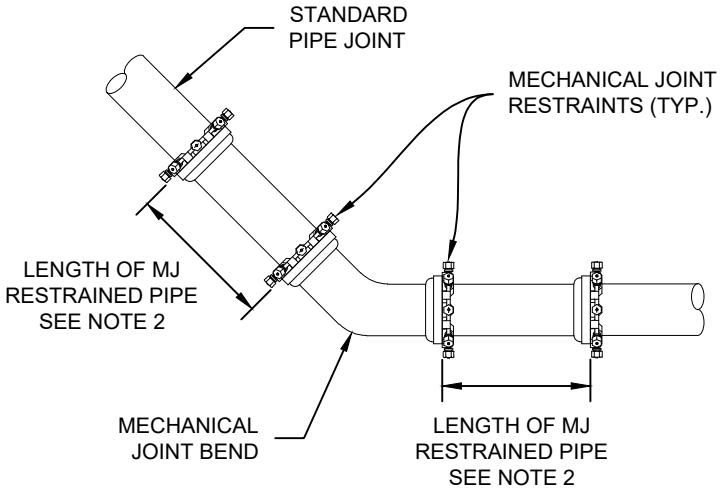
NOTES:

1. MECHANICAL JOINT RESTRAINTS SHALL BE APPROVED ACCORDING TO CHAPTER 4 FOR DIP AND PVC PIPE.
2. DUCTILE IRON FITTINGS AND PIPE SHALL BE WRAPPED IN POLYETHYLENE TUBING WHERE ADJACENT TO CONCRETE.

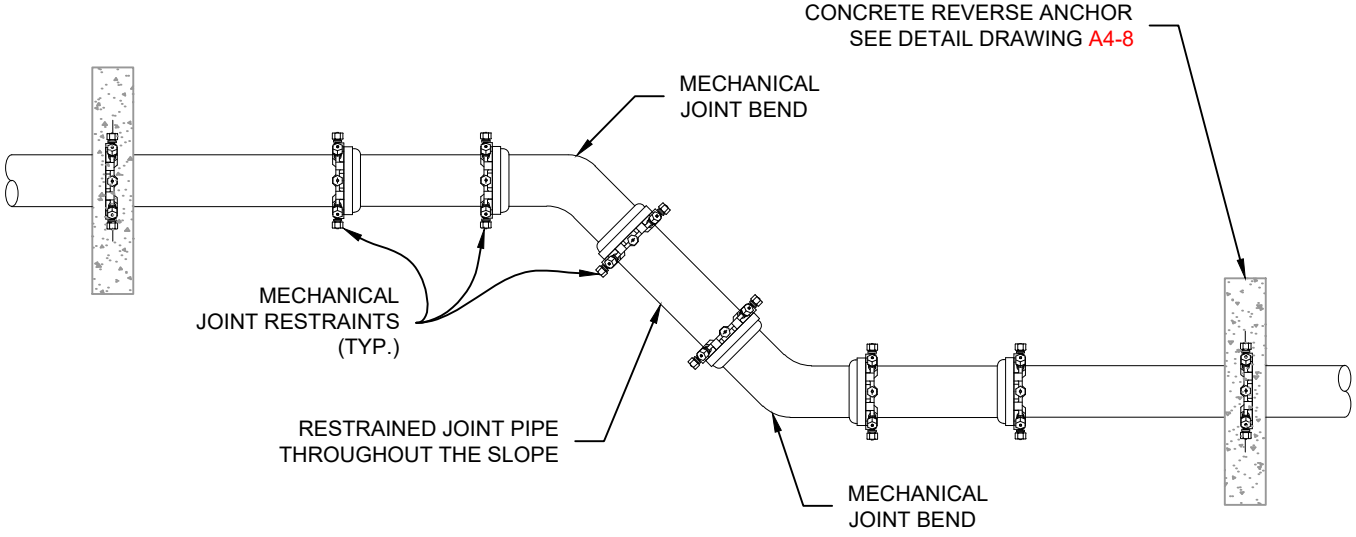
Colorado Springs Utilities It's how we're all connected	VALVE AND FITTINGS W/ MECHANICAL JOINT RESTRAINTS	A4-5 DATED 06/2015



HORIZONTAL BENDS W/MJ RESTRAINTS AND CTRB



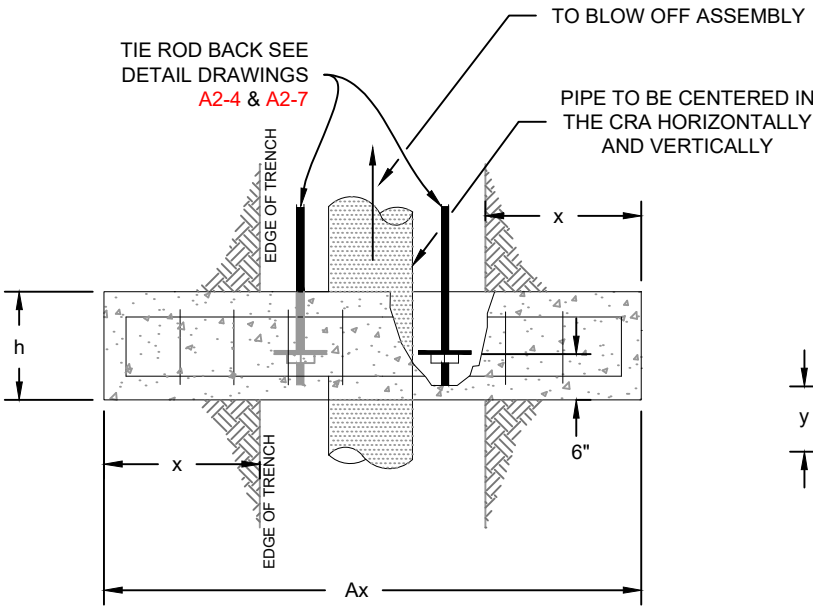
HORIZONTAL BENDS W/MJ RESTRAINTS WITHOUT CTRB



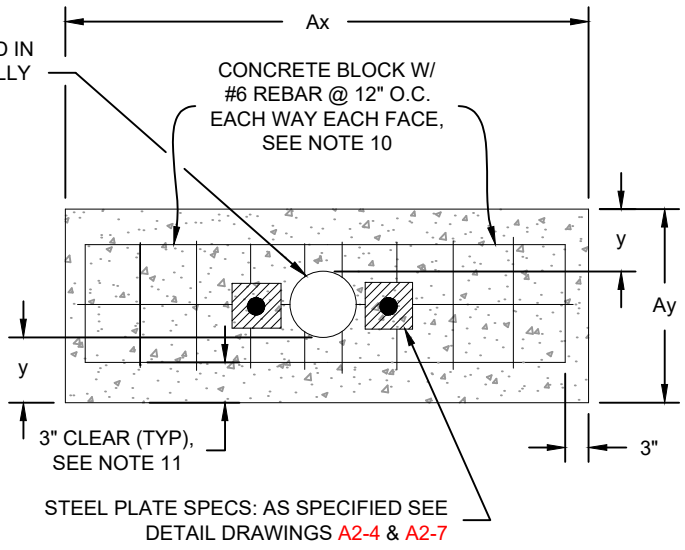
VERTICAL BENDS W/ CONCRETE REVERSE ANCHORS ON SLOPES 10% OR GREATER

NOTES:

1. MECHANICAL JOINT RESTRAINTS SHALL BE APPROVED ACCORDING TO CHAPTER 4 FOR DIP AND PVC PIPE.
2. LENGTH OF PIPE REQUIRING JOINT RESTRAINT SHALL BE DETERMINED FROM CHART ON DETAIL DRAWING A4-4.
3. DUCTILE IRON FITTINGS AND PIPE SHALL BE WRAPPED IN POLYETHYLENE TUBING WHERE ADJACENT TO CONCRETE.



PLAN
DEAD END OR REVERSE ANCHOR



ELEVATION
DEAD END OR REVERSE ANCHOR

DIAMETER (in)	PRESSURE (psi)	x (in)	Ax (in)	y (in)	Ay (in)	Ab (sf)	h (in)	Vol (cy)
4	250	12	72	12	28.80	6.80	18	1.0
6	250	18	84	12	30.90	9.73	18	1.0
8	250	36	120	12	33.05	18.53	18	1.5
12	170	36	120	15	43.20	24.60	18	2.0
12	250	48	144	18	49.20	36.80	24	3.75
16	170	54	156	18	53.40	44.05	24	4.25
16	250	60	168	24	65.40	60.50	36	8.5

NOTES:

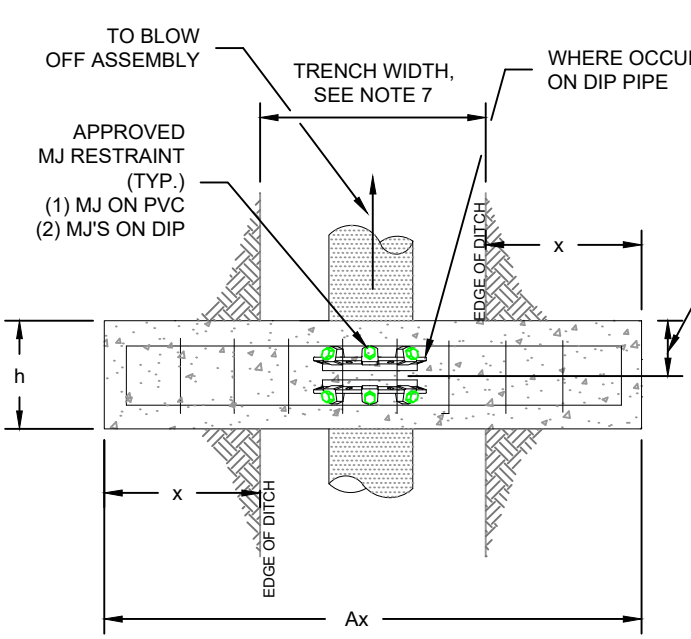
1. THE MINIMUM BEARING SURFACE AREAS SHOWN ARE BASED ON A MAX STATIC PIPE PRESSURE OF 170/250 POUNDS PER SQUARE INCH PLUS A SAFETY FACTOR OF 1.5, AND AN ALLOWABLE SOIL BEARING CAPACITY OF 1500 POUNDS PER SQUARE FOOT. REFERENCE AWWA M-23 AND M-41.
2. THE DESIGN ENGINEER IS RESPONSIBLE FOR VERIFYING ASSUMPTION BASED ON ACTUAL SITE CONDITIONS. IF SITE CONDITIONS VARY FROM THE ASSUMPTIONS THE DESIGN ENGINEER SHALL PROVIDE A SITE SPECIFIC DESIGN IN ACCORDANCE WITH AWWA M-23, PVC PIPE - DESIGN AND INSTALLATION AND AWWA M-41, DUCTILE-IRON PIPE AND FITTINGS. SITE SPECIFIC DESIGNS INCLUDING GEOTECHNICAL INFORMATION SHALL BE SUBMITTED TO COLORADO SPRINGS UTILITIES FOR REVIEW.
3. THE MINIMUM LATERAL BEARING SURFACE AREA (Ab) AND APPROXIMATE VOLUME OF CONCRETE (Vol) SHALL BE SHOWN ON THE CONSTRUCTION PLANS FOR ALL CONCRETE REVERSE ANCHORS.
4. THE APPROXIMATE VOLUMES SHOWN ARE BASED ON THE MINIMUM DIMENSIONS IN THE TABLE. APPROXIMATE VOLUME IS ROUNDED UP TO THE NEAREST 0.25 CUBIC YARDS.
5. A SITE SPECIFIC DESIGN SHALL BE REQUIRED FOR PIPES LARGER THAN 16 INCHES OR MAX STATIC PIPE PRESSURES GREATER THAN 250 POUNDS PER SQUARE INCH. THE DESIGN ENGINEER HAS THE OPTION OF PROVIDING A SITE SPECIFIC DESIGN FOR PIPES SMALLER THAN 16 INCHES OR MAX STATIC PRESSURES LESS THAN THE PRESSURE LISTED IN THE TABLE.
6. FOR CORROSION PROTECTION OF THE RODS SEE DETAIL DRAWING A8-11.
7. A TRENCH WIDTH OF 4 FEET AND 6" BEDDING UNDER THE PIPE ARE ASSUMED FOR BEARING CALCULATIONS, (Ax, Ay, x AND y).
8. THE DESIGN ENGINEER SHALL ENSURE THE CONSTRUCTION OF THE CONCRETE REVERSE ANCHOR SHALL NOT CONFLICT WITH OTHER UTILITIES.
9. DUCTILE IRON FITTINGS AND PIPE SHALL BE WRAPPED IN POLYETHYLENE TUBING WHERE ADJACENT TO CONCRETE.
10. THE REBAR IS TO BE POSITIONED CONSISTENTLY THROUGHOUT THE ENTIRE THREE-DIMENSIONAL (3D) VOLUME OF THE CRA TO PROVIDE REINFORCEMENT. THE MAXIMUM HORIZONTAL AND VERTICAL SPACING BETWEEN INDIVIDUAL RODS OF REBAR IS 12" ON CENTER (O.C.). THIS SPACING MAY DECREASE DEPENDING ON THE DIMENSIONS OF THE CRA BUT CANNOT EXCEED 12". THE SPACING USED BETWEEN RODS OF REBAR SHALL BE CONSISTENT THROUGHOUT THE CRA.
11. THERE SHALL BE A 3" CLEARANCE OF NON-REINFORCED CONCRETE ENCASING THE REINFORCED PORTION OF THE CRA ON ALL SIDES WITHIN THE 3D VOLUME. ANY DEVIATIONS FROM 3" OF CLEAR SPACE WILL REQUIRE CUSTOM CALCULATIONS PER SECTION 2.6.F.7.

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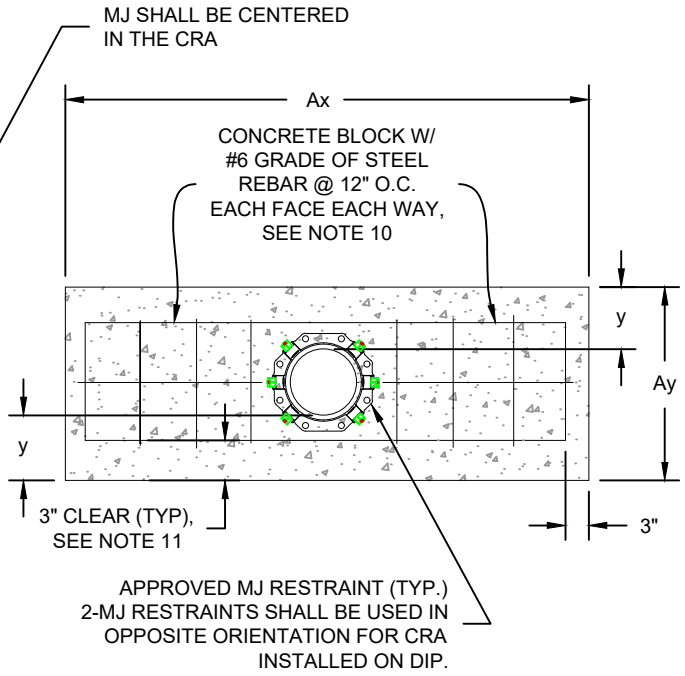
CONCRETE REVERSE ANCHOR DIMENSIONS FOR TIE ROD RESTRAINT

A4-7

DATED 07/2025



PLAN
DEAD END OR REVERSE ANCHOR



ELEVATION
DEAD END OR REVERSE ANCHOR

DIAMETER (in)	PRESSURE (psi)	x (in)	Ax (in)	y (in)	Ay (in)	Ab (sf)	h (in)	Vol (cy)
4	250	12	72	12	28.80	6.80	18	1.0
6	250	18	84	12	30.90	9.73	18	1.0
8	250	36	120	12	33.05	18.53	18	1.5
12	170	36	120	15	43.20	24.60	18	2.0
12	250	48	144	18	49.20	36.80	24	3.75
16	170	54	156	18	53.40	44.05	24	4.25
16	250	60	168	24	65.40	60.50	36	8.5

NOTES:

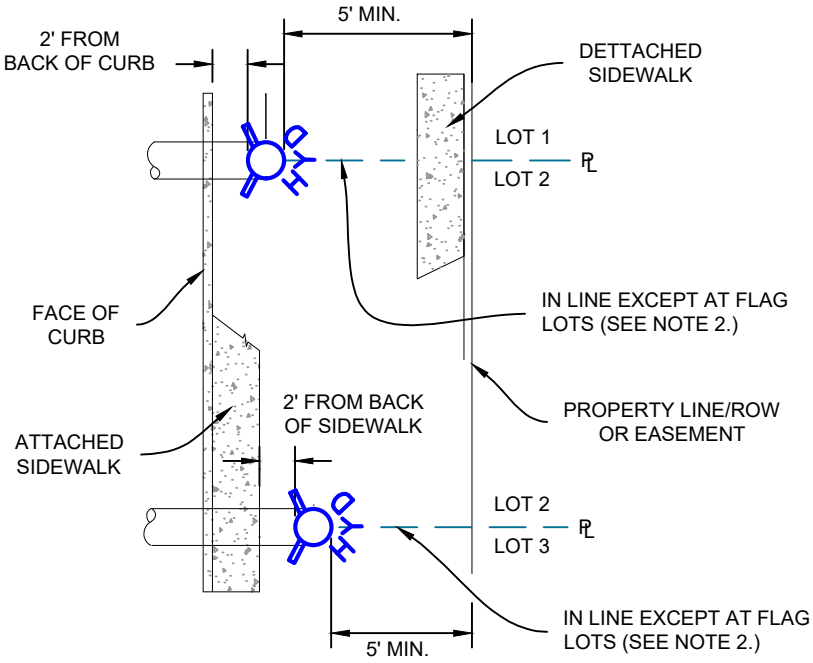
1. THE MINIMUM BEARING SURFACE AREAS SHOWN ARE BASED ON A MAX STATIC PIPE PRESSURE OF 170/250 POUNDS PER SQUARE INCH PLUS A SAFETY FACTOR OF 1.5, AND AN ALLOWABLE SOIL BEARING CAPACITY OF 1500 POUNDS PER SQUARE FOOT. FOR HDPE ADDITIONAL ASSUMPTIONS INCLUDE A MAX 50°-F TEMPERATURE CHANGE AND A POISSON RATIO OF 0.45. REFERENCE AWWA M-23, M-41 AND M-55.
2. THE DESIGN ENGINEER IS RESPONSIBLE FOR VERIFYING ASSUMPTION BASED ON ACTUAL SITE CONDITIONS. IF SITE VARY FROM THE ASSUMPTIONS THE DESIGN ENGINEER SHALL PROVIDE A SITE SPECIFIC DESIGN THAT SHALL BE IN ACCORDANCE WITH AWWA M-23, PVC PIPE - DESIGN AND INSTALLATION AND AWWA M-41, DUCTILE-IRON PIPE AND FITTINGS. SITE SPECIFIC DESIGNS USING GEOTECHNICAL INFORMATION SHALL BE SUBMITTED TO COLORADO SPRINGS UTILITIES FOR APPROVAL.
3. THE MINIMUM LATERAL BEARING SURFACE AREA (Ab) AND APPROXIMATE VOLUME OF CONCRETE (Vol) SHALL BE SHOWN ON THE CONSTRUCTION PLANS FOR ALL CONCRETE REVERSE ANCHORS.
4. THE APPROXIMATE VOLUMES SHOWN ARE BASED ON THE MINIMUM DIMENSIONS IN THE TABLE. THE APPROXIMATE VOLUME IS ROUNDED UP TO THE NEAREST 0.25 CUBIC YARDS.
5. A SITE SPECIFIC DESIGN SHALL BE REQUIRED FOR PIPES LARGER THAN 16 INCHES OR MAX STATIC PIPE PRESSURES GREATER THAN 250 POUNDS PER SQUARE INCH. THE DESIGN ENGINEER HAS THE OPTION OF PROVIDING A SITE SPECIFIC DESIGN FOR PIPES SMALLER THAN 16 INCHES OR MAX STATIC PRESSURES LESS THAN THE PRESSURE LISTED IN THE TABLE.
6. FOR CORROSION PROTECTION OF THE RODS SEE DETAIL DRAWING A8-11.
7. A TRENCH WIDTH OF 4 FEET AND 6" BEDDING UNDER THE PIPE ARE ASSUMED FOR BEARING CALCULATIONS, (Ax, Ay, x AND y).
8. THE DESIGN ENGINEER SHALL ENSURE THE CONSTRUCTION OF THE CONCRETE REVERSE ANCHOR SHALL NOT CONFLICT WITH OTHER UTILITIES.
9. DUCTILE IRON FITTINGS AND PIPE SHALL BE WRAPPED IN POLYETHYLENE TUBING WHERE ADJACENT TO CONCRETE.
10. THE REBAR IS TO BE POSITIONED CONSISTENTLY THROUGHOUT THE ENTIRE THREE-DIMENSIONAL (3D) VOLUME OF THE CRA TO PROVIDE REINFORCEMENT. THE MAXIMUM HORIZONTAL AND VERTICAL SPACING BETWEEN INDIVIDUAL RODS OF REBAR IS 12" ON CENTER (O.C.). THIS SPACING MAY DECREASE DEPENDING ON THE DIMENSIONS OF THE CRA BUT CANNOT EXCEED 12". THE SPACING USED BETWEEN RODS OF REBAR SHALL BE CONSISTENT THROUGHOUT THE CRA.
11. THERE SHALL BE A 3" CLEARANCE OF NON-REINFORCED CONCRETE ENCASING THE REINFORCED PORTION OF THE CRA ON ALL SIDES WITHIN THE 3D VOLUME. ANY DEVIATIONS FROM 3" OF CLEAR SPACE WILL REQUIRE CUSTOM CALCULATIONS PER SECTION 2.6.F.7.

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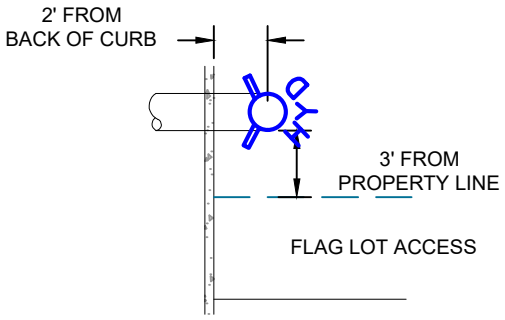
CONCRETE REVERSE ANCHOR
FOR MECHANICAL JOINT RESTRAINTS

A4-8

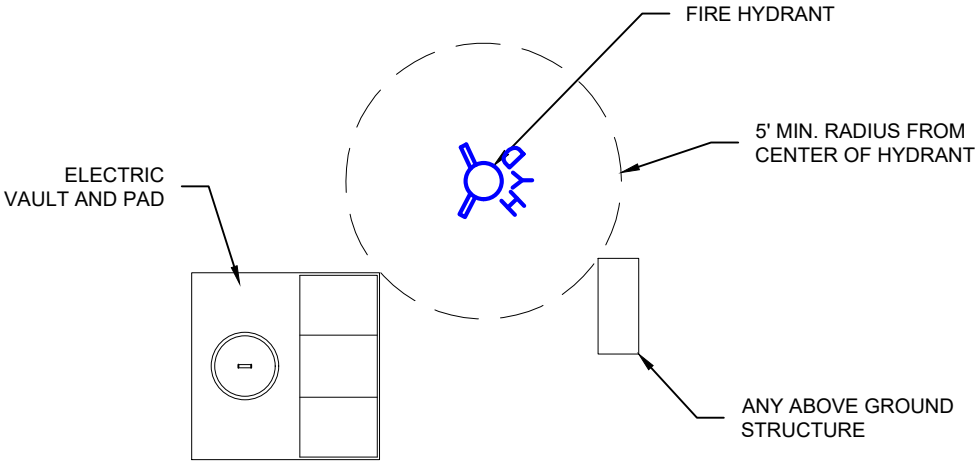
DATED 08/2023



LOT LINE LOCATIONS



FLAG LOT LOCATIONS



PAD AND VAULT ACCESS CLEARANCES

NOTES:

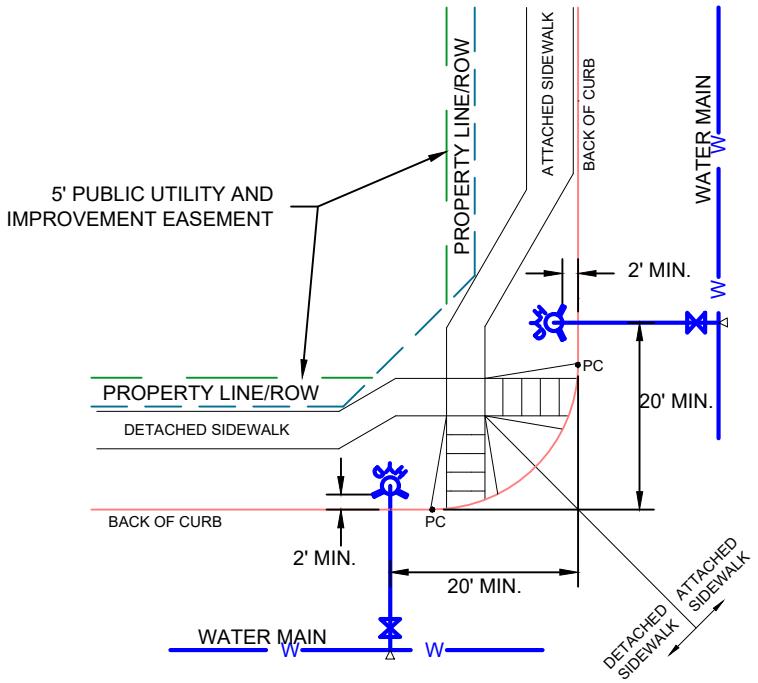
1. HYDRANT NOZZLE SHALL BE POSITIONED AT RIGHT ANGLES TO THE NEAREST CURB. IF NO CURB OR SIDEWALK EXIST, NOZZLE SHALL BE PLACED AT RIGHT ANGLE TO STREET OR ALLEY.
2. HYDRANTS INSTALLED AT FLAG LOT LINES SHALL BE OFFSET 3' FROM THE LOT LINE.
3. HYDRANTS SHALL BE PLACED A MINIMUM OF 5.0 FEET FROM ANY UTILITY OR DRAINAGE STRUCTURE. (TO BE COORDINATED WITH JOINT TRENCH INSTALLATION).
4. EASEMENTS MUST BE PROVIDED FOR ANY PUBLIC HYDRANT WHICH IS CLOSER THAN 5.0 FEET INSIDE THE RIGHT-OF-WAY LINE.
5. A SAFE WORKING CLEARANCE IS NECESSARY FOR THE FIRE DEPARTMENT TO IDENTIFY, ATTACH HOSES TO AND OPERATE A FIRE HYDRANT IN CASE OF AN EMERGENCY. A 3 FOOT CLEAR SPACE SHALL BE MAINTAINED AROUND THE CIRCUMFERENCE OF FIRE HYDRANTS EXCEPT AS OTHERWISE REQUIRED OR APPROVED BY THE COLORADO SPRINGS FIRE DEPARTMENT.
6. FIRE HYDRANTS SHALL BE INSTALLED WITH CLEARANCES PER THE MOST CURRENT APPROVED IFC.

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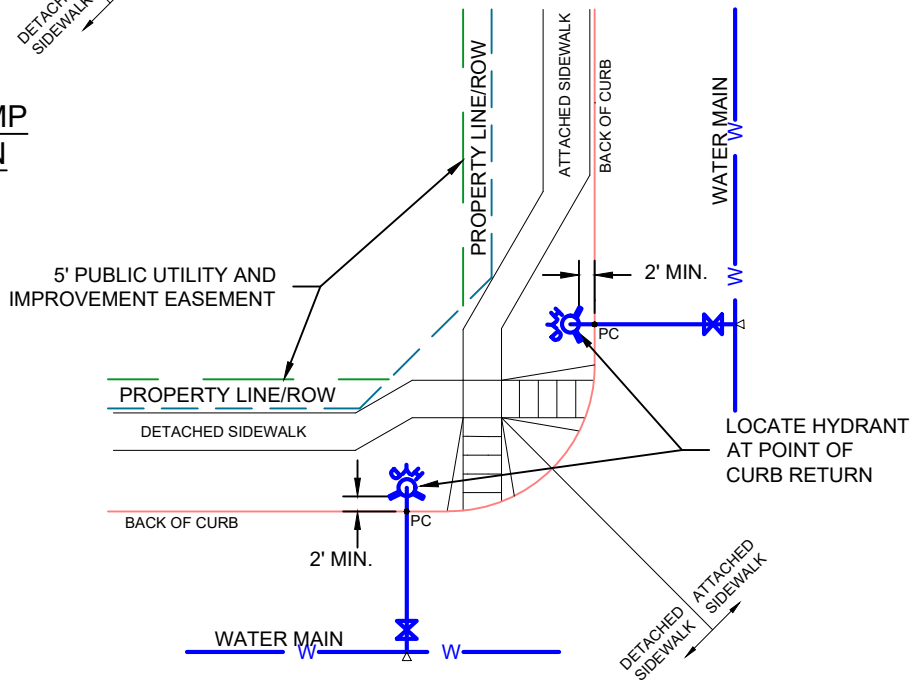
FIRE HYDRANT LOCATIONS

A5-1

DATED 03/2014



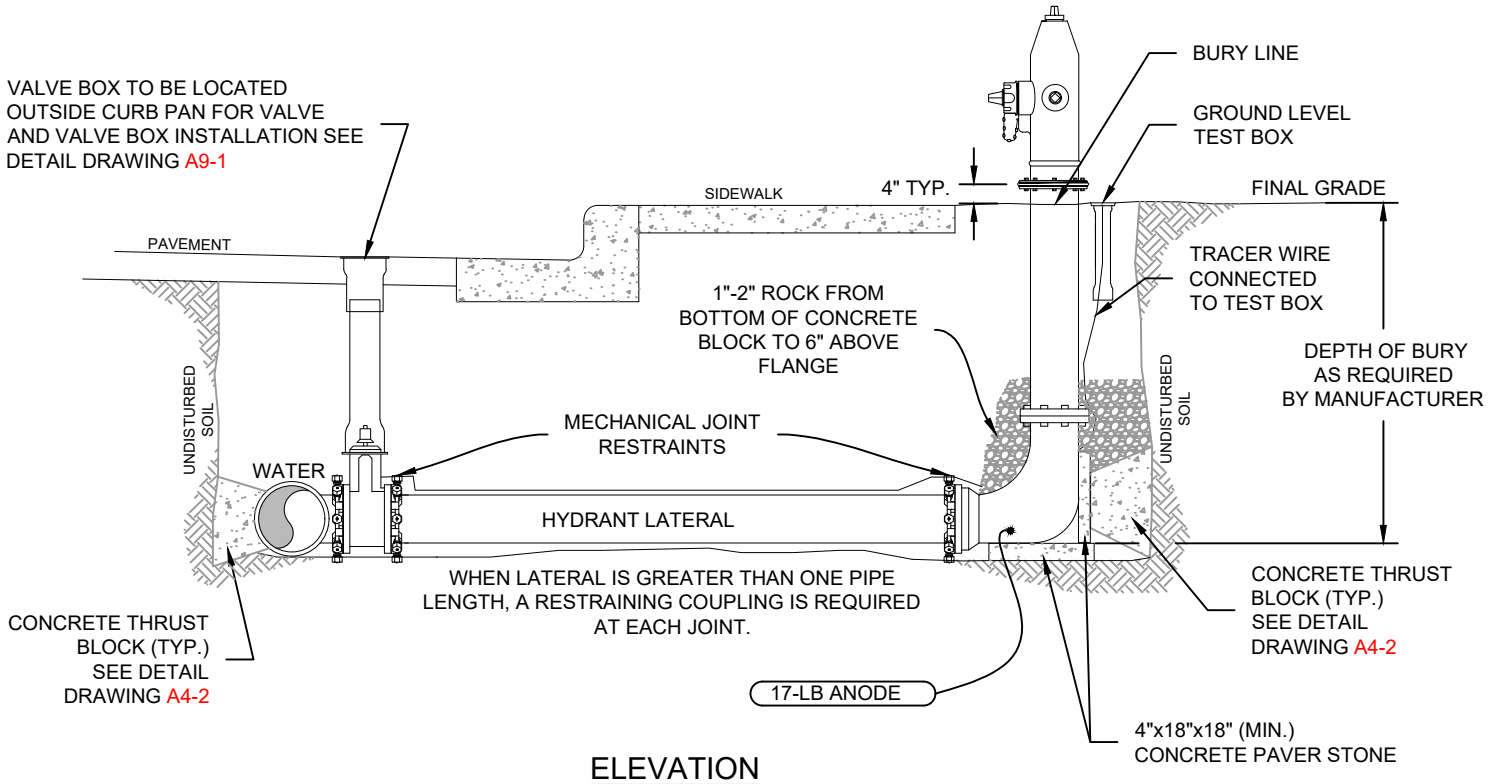
STANDARD PEDESTRIAN RAMP LAYOUT FOR CURB RETURN RADIUS 20' OR LESS



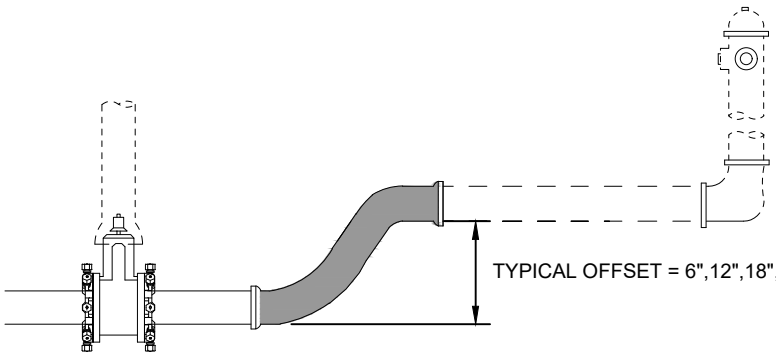
STANDARD PEDESTRIAN RAMP LAYOUT FOR CURB RETURN RADIUS 25' OR GREATER

NOTES:

1. THE FIRE HYDRANT SHALL BE LOCATED BEHIND THE POINT OF CURB RETURN FOR CURB RETURN RADIUS 25 FEET OR GREATER.
2. WHERE THE CURB RETURN RADIUS IS 20 FEET OR LESS THE CENTER OF THE HYDRANT SHALL BE LOCATED 20 FEET OFF OF THE BACK OF CURB OF THE INTERSECTING STREET.
3. IN ALL CASES THE FIRE HYDRANT SHALL BE LOCATED A MINIMUM OF 2 FEET OUTSIDE OF THE PEDESTRIAN RAMP OR SIDEWALK.
4. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER OR THE DEVELOPER'S ENGINEER TO VERIFY THAT PROPOSED HYDRANT LOCATIONS WILL NOT CONFLICT WITH ANY OTHER UTILITIES, FACILITIES, PEDESTRIAN RAMP INSTALLATIONS, DRAINAGE FACILITIES, PROPOSED PROPERTY STRUCTURES OR IMPROVEMENTS PRIOR TO BEGINNING CONSTRUCTION.



ELEVATION



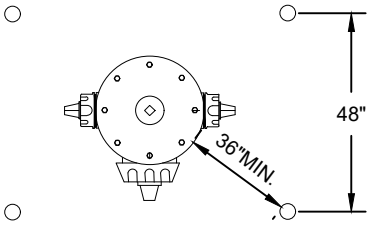
VERTICAL & HORIZONTAL OFFSET BEND UPON INSPECTOR'S AND COLORADO SPRINGS UTILITIES APPROVAL

NOTE:
DIP LATERALS AND HYDRANTS SHALL BE POLY WRAPPED AND INCLUDE 1-17lb. ANODE.

ELEVATION

NOTES:

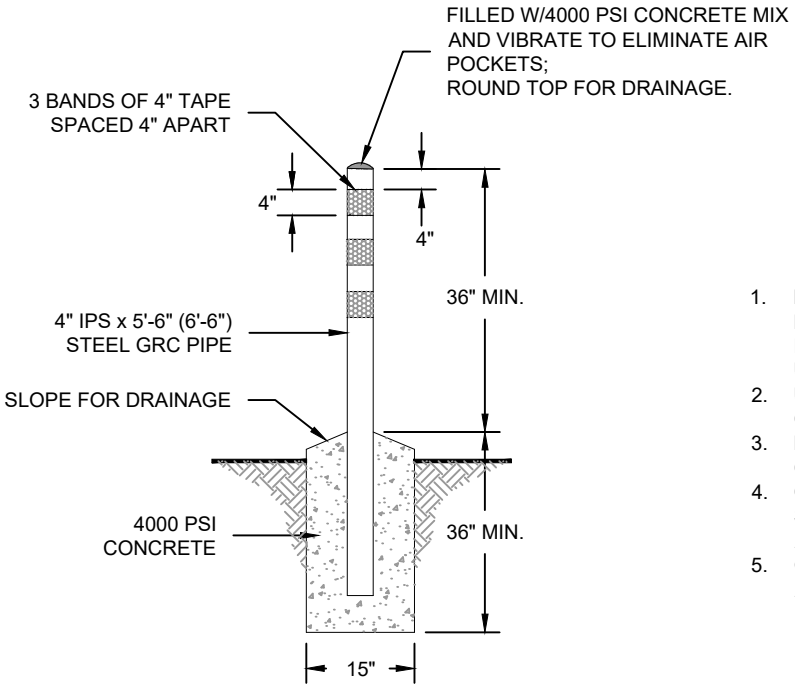
1. MECHANICAL JOINT RESTRAINTS SHALL BE INSTALLED PER DETAIL DRAWINGS A4-4, A4-5, & CHAPTER 5.
2. TRACER WIRE AND GROUND LEVEL TEST BOX TO BE INSTALLED WITH EACH FIRE HYDRANT. PLACE TEST BOX WITHIN 6" FROM THE HYDRANT.
3. REFERENCE DETAIL DRAWINGS A5-1 & A5-2 FOR FIRE HYDRANT LOCATION.
4. INSTALLATION OF A PRIVATE FIRE HYDRANT WILL REQUIRE A SECONDARY VALVE INSTALLED AT THE PROPERTY LINE.
5. HYDRANT BASE BLOCK SHALL BE PLACED ON UNDISTURBED EARTH.
6. DO NOT BLOCK WEEP HOLE WITH POLYWRAP.
7. COVER DRAIN ROCK WITH POLYWRAP PRIOR TO BACKFILL.
8. FOR HDPE HYDRANT CONNECTION SEE DETAIL DRAWING A10-9.
9. FOR PRIVATE FIRE HYDRANTS A SECONDARY VALVE SHALL BE INSTALLED ON THE PROPERTY LINE OR RIGHT-OF WAY LINE.



BOLLARD PLACEMENT (TOP VIEW)

REFERENCE CURRENTLY ADOPTED FIRE CODE REQUIREMENTS

BOLLARDS ARE NECESSARY WHERE FIRE HYDRANTS ARE SUBJECT TO DAMAGE FROM VEHICULAR MOVEMENT.

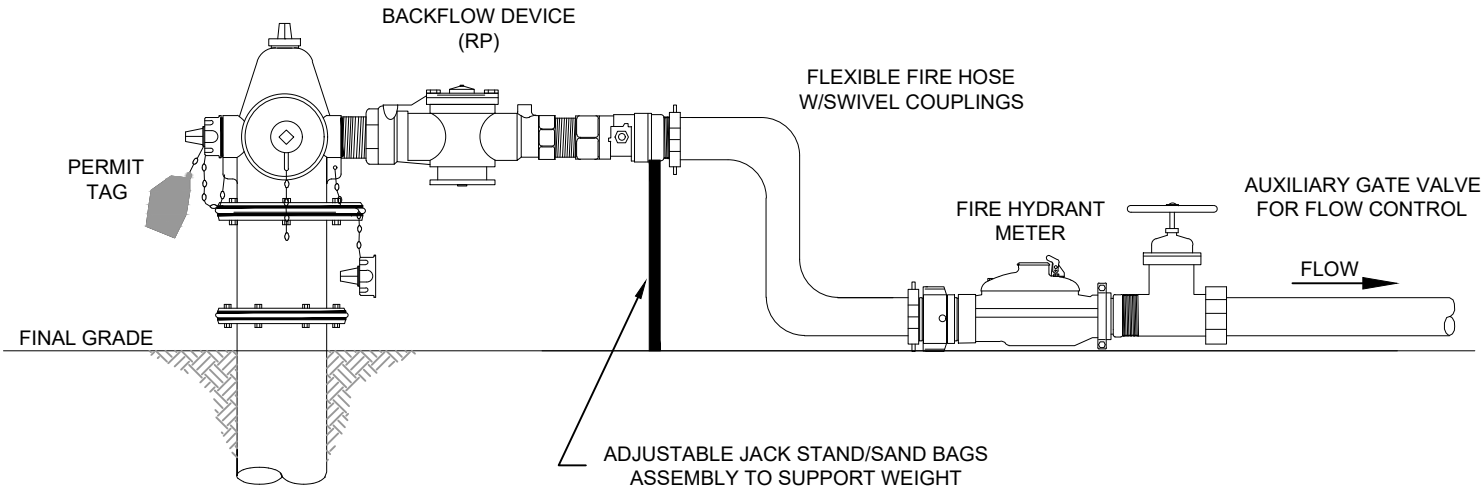


CONCRETE FILLED POST

1. BARRICADE POSTS SHALL BE INSTALLED PLUMB AND LEVEL ACROSS THE TOPS FROM ONE TO ANOTHER WHEN TWO ARE USED.
2. USE 4" GRC PIPE AND PAINT WITH TWO COATS OF SILVER PAINT.
3. DIG 15" X 36" HOLE - CONDUIT TO BE CENTERED IN HOLE.
4. CONCRETE FOR ANCHORING POSTS SHALL BE 4000PSI MIX #2, APPROXIMATELY 8.3 CU.FT./POLE
5. GUARD POSTS SHALL COMPLY WITH THE ADOPTED CSFD FIRE CODE.

TAPERED SQUARE NUT WRENCH

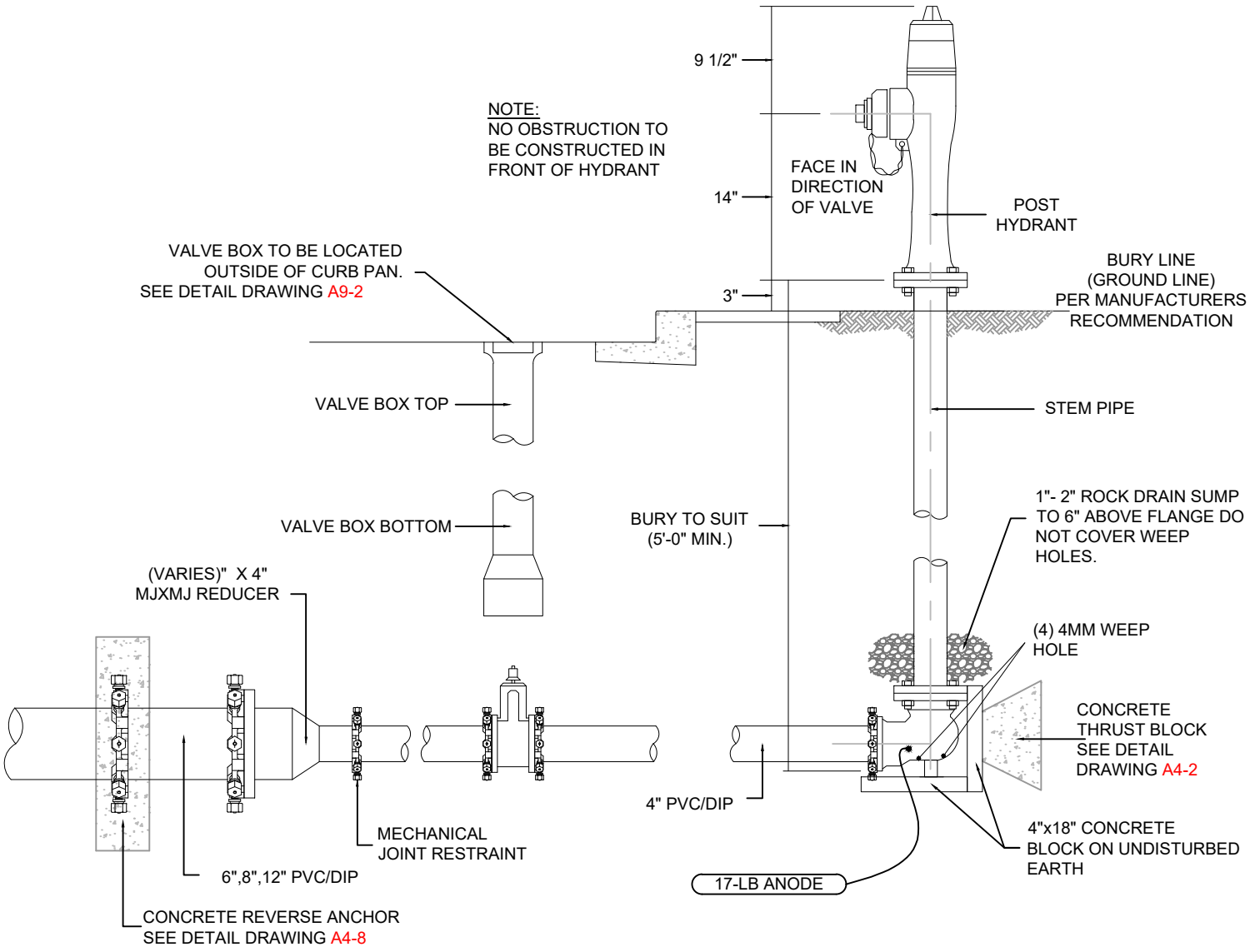




ASSEMBLY SEQUENCE

NOTES:

1. FLUSH HYDRANT BEFORE CONNECTING BACKFLOW AND METER CONFIGURATION WITH STAND. BACKFLOW PREVENTION ASSEMBLY MUST BE CONNECTED DIRECTLY TO THE HYDRANT.
2. HYDRANTS SHALL BE FULLY OPENED WHEN IN USE; DO NOT THROTTLE HYDRANT FLOW WITH THE HYDRANT STEM VALVE. FLOW SHALL BE CONTROLLED WITH THE OUTLET GATE VALVE ONLY. WHERE BALL VALVES ARE PROVIDED FOR ISOLATION AND TESTING OF THE RP, THE HANDLE SHALL BE REMOVED FROM THE VALVES. THESE VALVES ARE ONLY TO BE USED IN SERVICING AND TESTING RP AND SHALL NOT BE USED TO CONTROL HYDRANT FLOWS AND SHALL BE IN THE FULL OPEN POSITION AT ALL TIMES DURING HYDRANT FLOWS.
3. USE OF HYDRANT REQUIRES A PERMIT, AND ADHERENCE TO ALL TERMS AND CONDITIONS OF THE PERMIT AND ASSOCIATED REQUIREMENTS. CONTACT SPRINGS UTILITIES DEVELOPMENT SERVICES AT (719) 668-8111.
4. SEE REFERENCE HYDRANT USE PERMIT IN CONSTRUCTION SECTION 5.7.
5. USE OF A HYDRANT WITHOUT A BACKFLOW PREVENTION DEVICE IS IN VIOLATION OF THE COLORADO SPRINGS WATER CODE FOR CROSS CONNECTION CONTROL (CITY CODE 12.4.1203) ALL HYDRANT CONNECTIONS REQUIRE A REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER (RP) TYPE PER COLORADO PRIMARY DRINKING WATER REGULATION. KEEP THE RP CENTER DISCHARGE OUTLET AT LEAST 12 INCHES ABOVE GRADE.
6. NO HOSE SHALL BE CONNECTED BETWEEN THE HYDRANT AND BACKFLOW DEVICE.
7. CONTRACTOR SHALL USE A HYDRANT WRENCH WITH TAPERED SQUARE BOX DESIGNED SPECIFICALLY FOR COLORADO SPRINGS UTILITIES FIRE HYDRANTS TO OPERATE THE FIRE HYDRANT. NO OTHER TYPE OF WRENCH SHALL BE USED.
8. PERMITS WILL NOT BE ISSUED FOR FIRE HYDRANTS WITH WATER PRESSURE GREATER THAN 120 PSI.



NOTE:

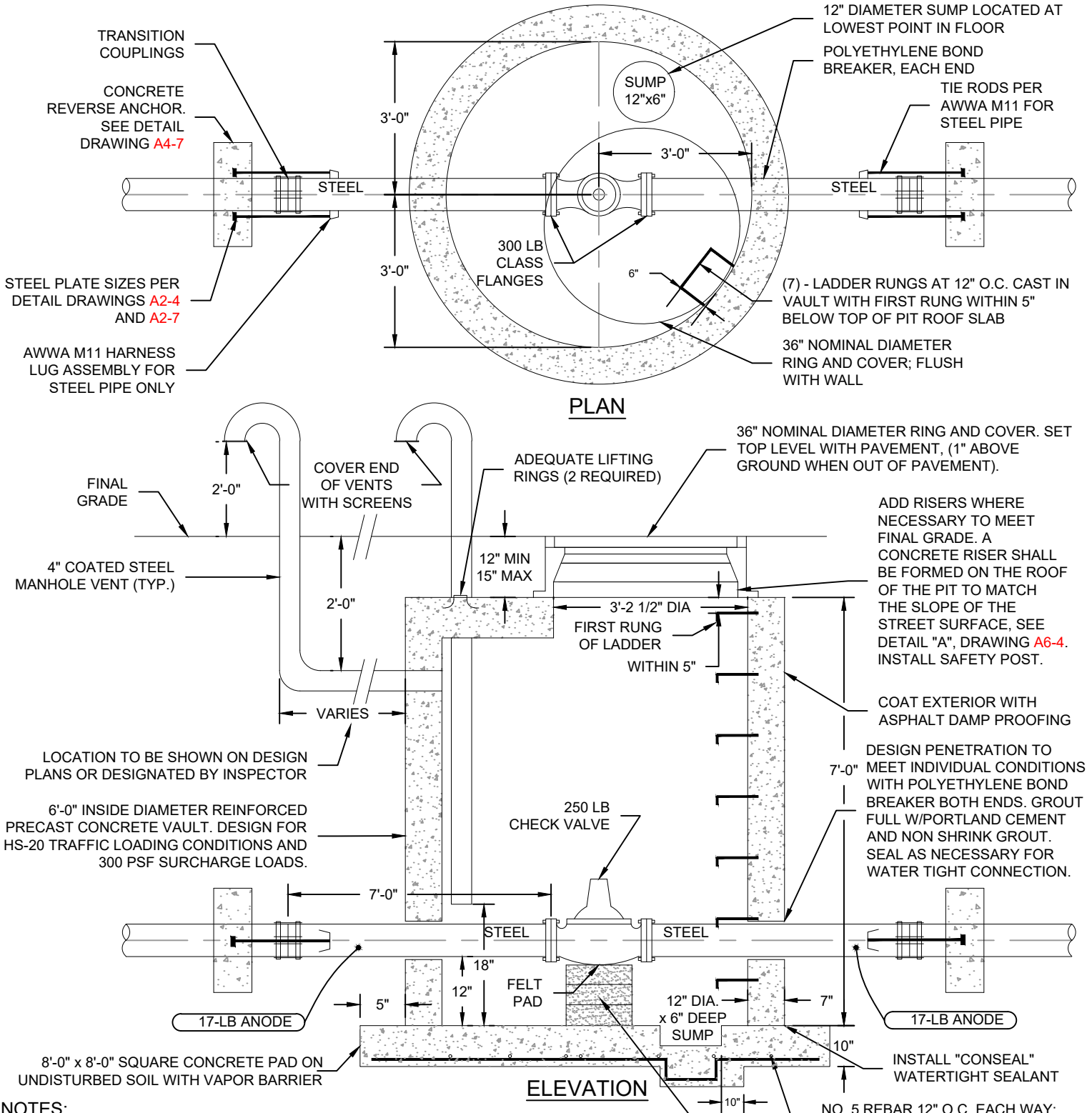
1. TRACER WIRE AND 17lb ANODE TO BE INSTALLED WITH EACH POST HYDRANT.
2. WHEN LATERAL IS GREATER THAN ONE PIPE LENGTH A RESTRAINING COUPLING IS REQUIRED AT EACH JOINT.
3. MAINTAIN 5' MIN. CLEARANCE AROUND POST HYDRANT FROM ABOVE GROUND STRUCTURE/VAULTS.
4. REFERENCE DETAIL DRAWING A5-1 FOR POST HYDRANT LOCATION.

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POST HYDRANT DETAIL FOR USE ON TEMPORARY OR PERMANENT DEAD ENDS

A5-6

DATED 01/2018



NOTES:

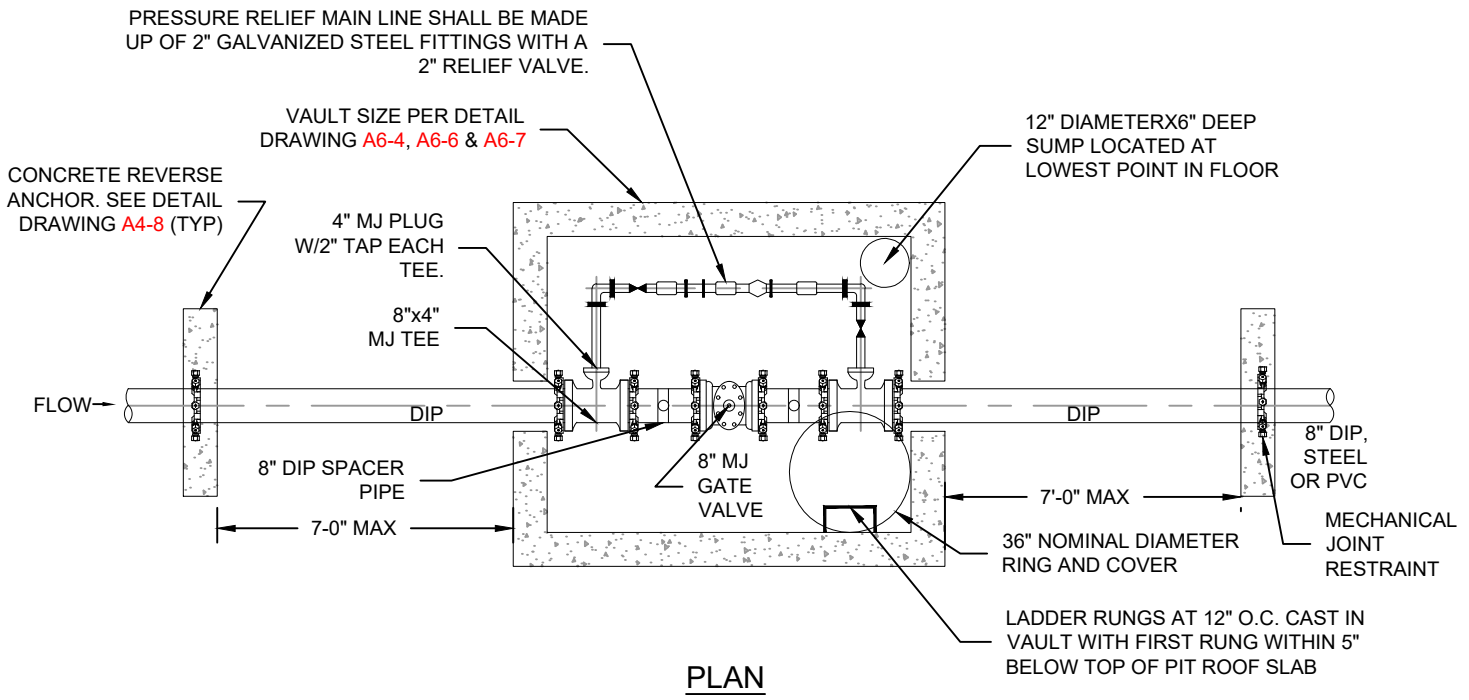
1. ALL CONCRETE WORK SHALL COMPLY WITH THE LATEST ACI-318 SPECIFICATIONS.
2. ALL LADDER RUNGS MUST LINE UP BOTH HORIZONTALLY AND VERTICALLY.
3. JOINT HARNESS TIE BOLTS AND LUGS SHALL CONFORM TO AWWA M11 FOR STEEL PIPE.
4. ALL CHECK VALVES GREATER THAN 12" SHALL BE SPECIALLY DESIGNED AND APPROVED BY COLORADO SPRINGS UTILITIES.
5. ALL MATERIALS SHALL BE SUPPLIED AND INSTALLED BY CONTRACTOR. INTERNAL COMPONENTS MAY BE REIMBURSED BY COLORADO SPRINGS UTILITIES. SEE CHAPTER 2.
6. CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD WITH A CAST IN PLACE FOUNDATION AS SHOWN.
7. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.8.
8. DIP FITTINGS, BENDS, REDUCERS, AND TEES MUST BE CEMENT MORTAR LINED PER SECTIONS 4.4.B.1 AND 4.4.B.2.

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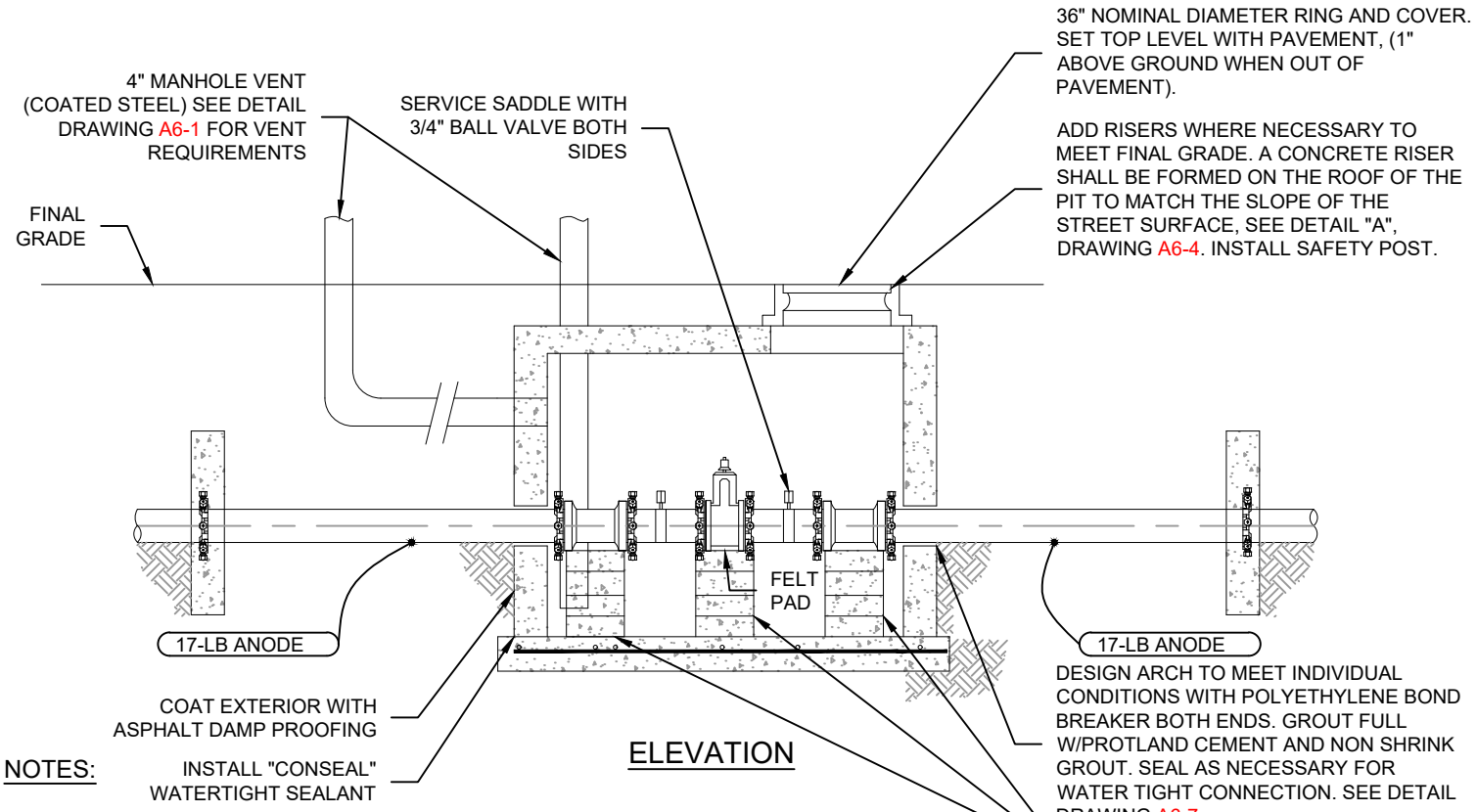
PRESSURE REGULATION AND WATER SYSTEM CONTROL CHECK VALVE STATION

A6-1

DATED 07/2025



PLAN



ELEVATION

NOTES:

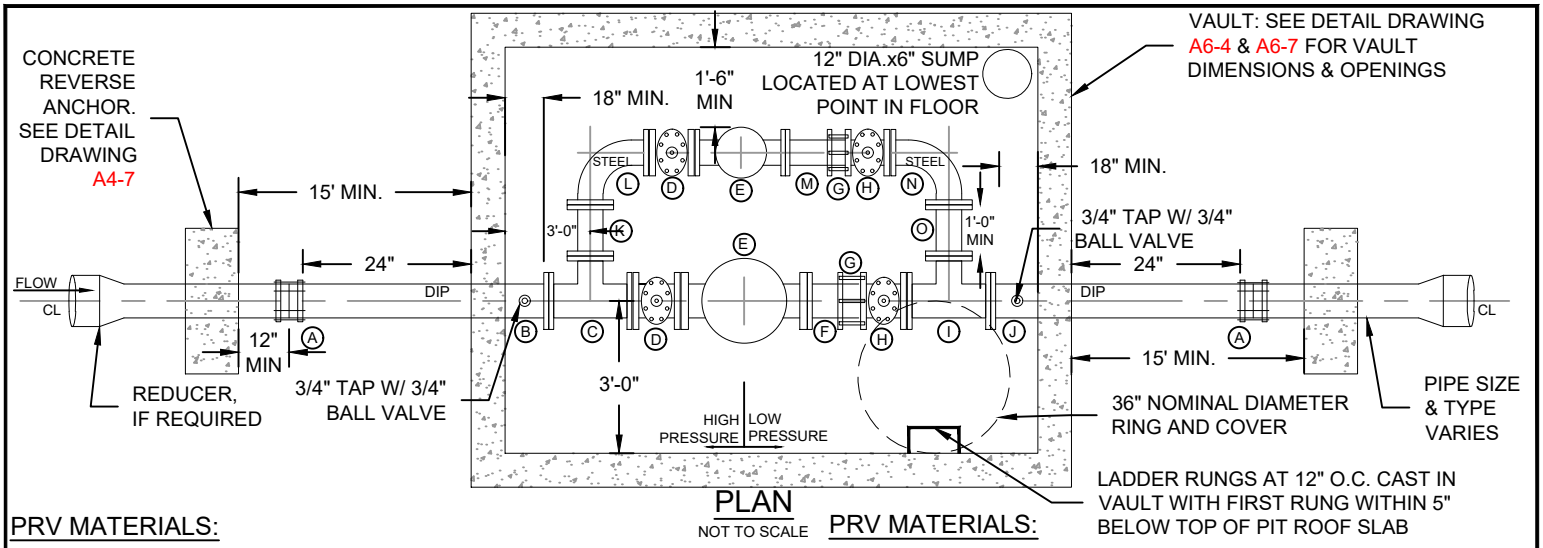
1. MECHANICAL JOINT RESTRAINTS OR FLANGES SHALL BE USED BETWEEN TEES AND VALVES.
2. CONTRACTOR SHALL DETERMINE DIMENSIONS OF ALL 2" MATERIALS FOR PROPER INSTALLATION.
3. CONCRETE VAULTS SHALL MEET ALL CRITERIA AS OUTLINED ON DETAIL DRAWINGS A6-4, A6-6, and A6-7.
4. ALL MATERIAL INSIDE VAULT SUPPLIED BY CONTRACTOR AND REIMBURSED BY COLORADO SPRINGS UTILITIES. SEE CHAPTER 2.
5. PIPE SIZES AND MATERIALS TO BE BASED ON HYDRAULIC MODELING FOR PIPES LARGER THAN 8 INCH.
6. MAIN LINE VALVE IS NORMALLY CLOSED IN ALL APPLICATIONS.
7. PIPE SHALL BE RESTRAINED BETWEEN THE CRA AND THE VAULT.
8. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
9. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.8.
10. DIP FITTINGS, BENDS, REDUCERS, AND TEES MUST BE CEMENT MORTAR LINED PER SECTIONS 4.4.B.1 AND 4.4.B.2.

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PRESSURE RELIEF STATION

A6-2

DATED 07/2025



PLAN

NOT TO SCALE

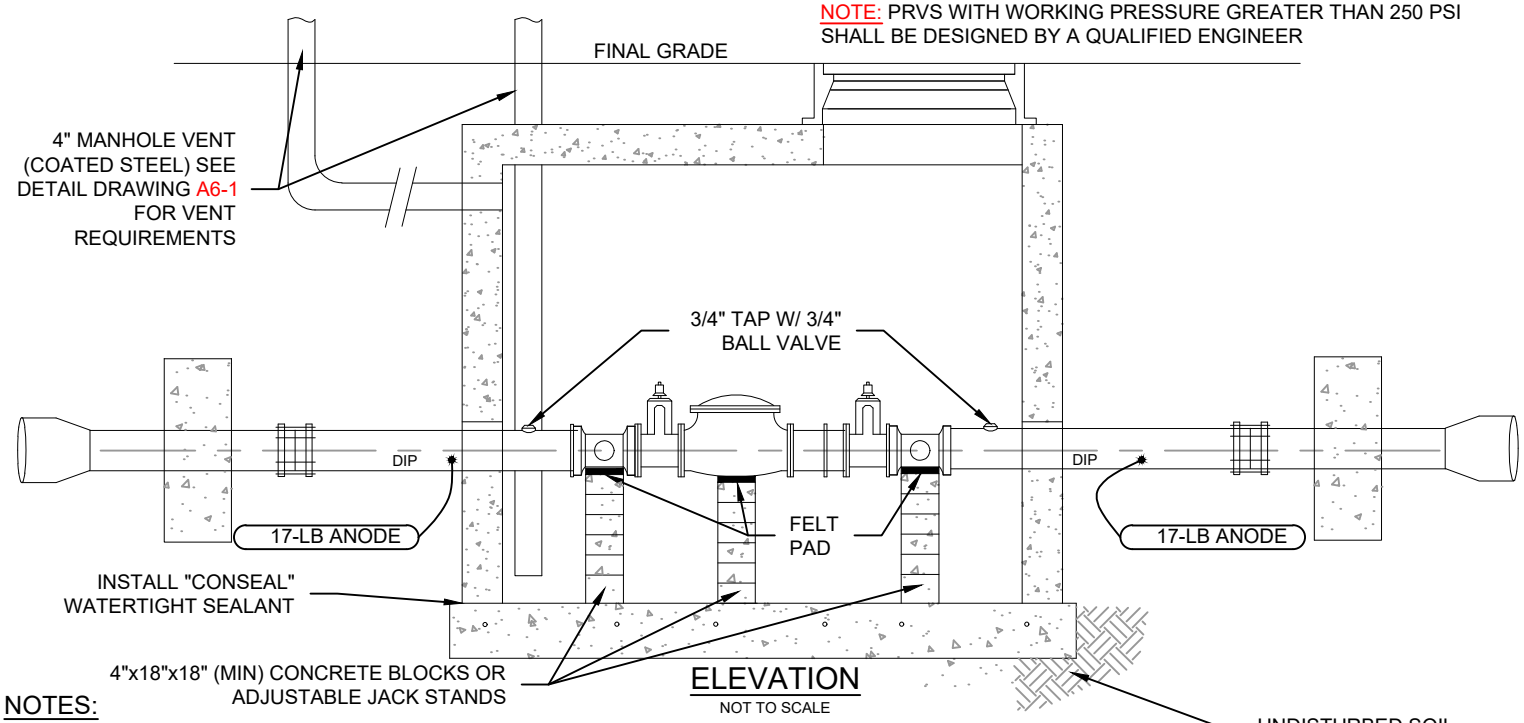
PRV MATERIALS:

- A - SOLID SLEEVE COUPLINGS
- B - RESTRAINED FLANGE ADAPTOR WITH ISOLATION KIT
- C - FLANGE x FLANGE (ANSI CL 150) STEEL TEE
- D - 250 VALVE BODY GATE VALVE W / ANSI CL 150 FLANGES
- E - CLASS 250 VALVE BODY, DI, CLA-VAL REGULATORS
- F - FLANGE (ANSI CL 150) x SPIGOT STEEL FITTING
- G - RESTRAINED FLANGE ADAPTOR
- H- 250 VALVE BODY GATE VALVE W / ANSI CL 150 FLANGES

PRV MATERIALS:

- I- FLANGE x FLANGE (ANSI CL 150) STEEL TEE
- J- RESTRAINED FLANGE ADAPTOR WITH ISOLATION KIT
- K- FLANGE x FLANGE (ANSI CL 150) STEEL SPOOL PIECE
- L- FLANGE x FLANGE (ANSI CL 150) STEEL 90° ELBOW
- M- FLANGE (ANSI CL 150) x SPIGOT STEEL FITTING
- N- FLANGE x FLANGE (ANSI CL 150) STEEL 90° ELBOW
- O- FLANGE x FLANGE (ANSI CL 150) STEEL SPOOL PIECE

NOTE: PRVS WITH WORKING PRESSURE GREATER THAN 250 PSI SHALL BE DESIGNED BY A QUALIFIED ENGINEER



ELEVATION

NOT TO SCALE

NOTES:

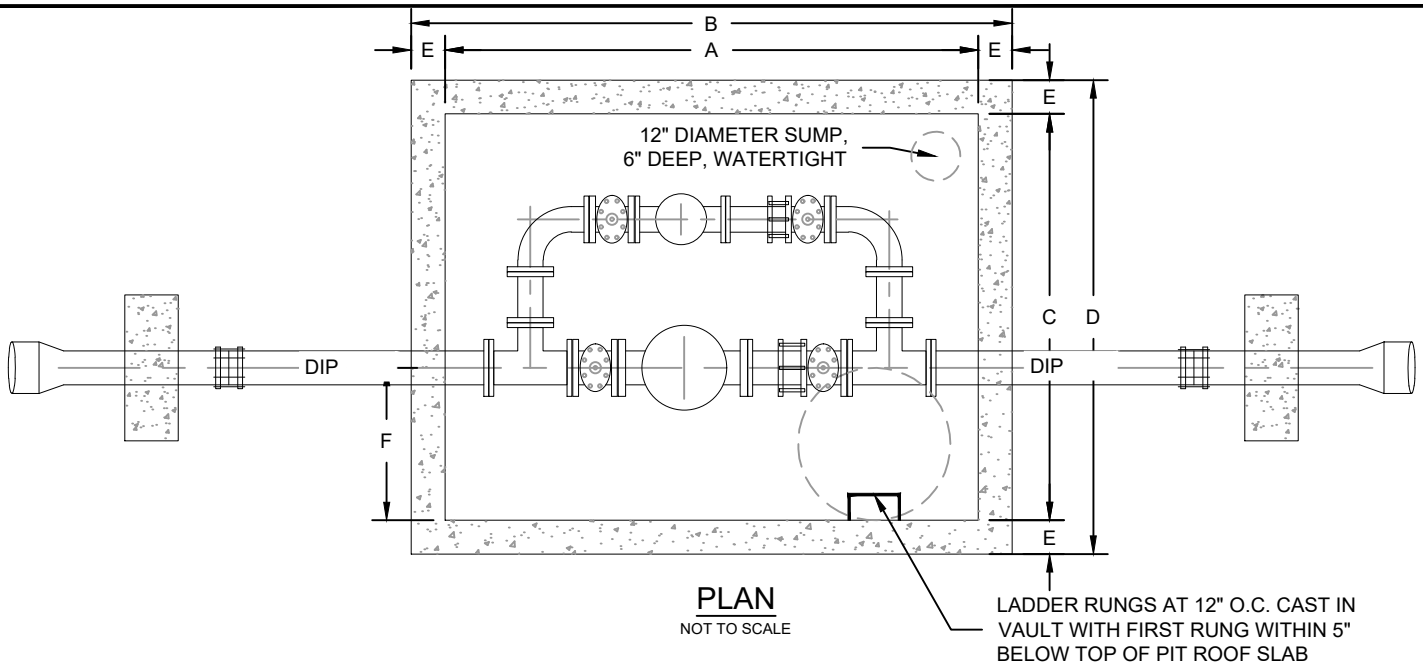
1. ALL GATE VALVES SHALL BE 250 PSI, TESTED TO AWWA C509/C515 WITH FLANGED ENDS TO ASME/ANSI B16.1.
2. ALL PRESSURE REGULATORS SHALL BE CLA-VAL (ASTM A536) WITH ASME/ANSI B16.42/B16.5, CL 150 FLANGES.
3. ALL STEEL PIPE DIMENSIONS SHALL COMPLY WITH ANSI/AWWA C208-07.
4. ALL STEEL PIPE FLANGE DIMENSIONS FOR OUTSIDE AND INSIDE DIAMETER OF FLANGE, BOLT CIRCLE PATTERN, NUMBER OF BOLTS AND DIAMETER OF BOLT HOLES SHALL COMPLY WITH ANSI B16.42 / B16.5, CL 150. ALL STEEL PIPE FLANGE THICKNESS SHALL COMPLY WITH ANSI/AWWA C207-07, CLASS E.
5. REFER TO DETAIL DRAWINGS A6-4 AND A6-7 FOR VAULT DIMENSIONS AND DETAILS.
6. A SITE SPECIFIC DESIGN SHALL BE REQUIRED FOR ALL PRESSURE REGULATOR STATIONS WITH PRESSURE REGULATORS LARGER THAN 16 INCH.
7. ALL MATERIALS SHALL BE SUPPLIED AND INSTALLED BY THE CONTRACTOR. INTERNAL COMPONENTS MAY BE REIMBURSED BY COLORADO SPRINGS UTILITIES. SEE CHAPTER 2.
8. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
9. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.8.
10. ADDITIONAL REQUIREMENTS FOR TELEMETRY MAY BE NECESSARY AT THE DISCRETION OF COLORADO SPRINGS UTILITIES

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PRESSURE REGULATOR STATIONS 6", 8" & 12" COMPONENT CONFIGURATION & MATERIALS

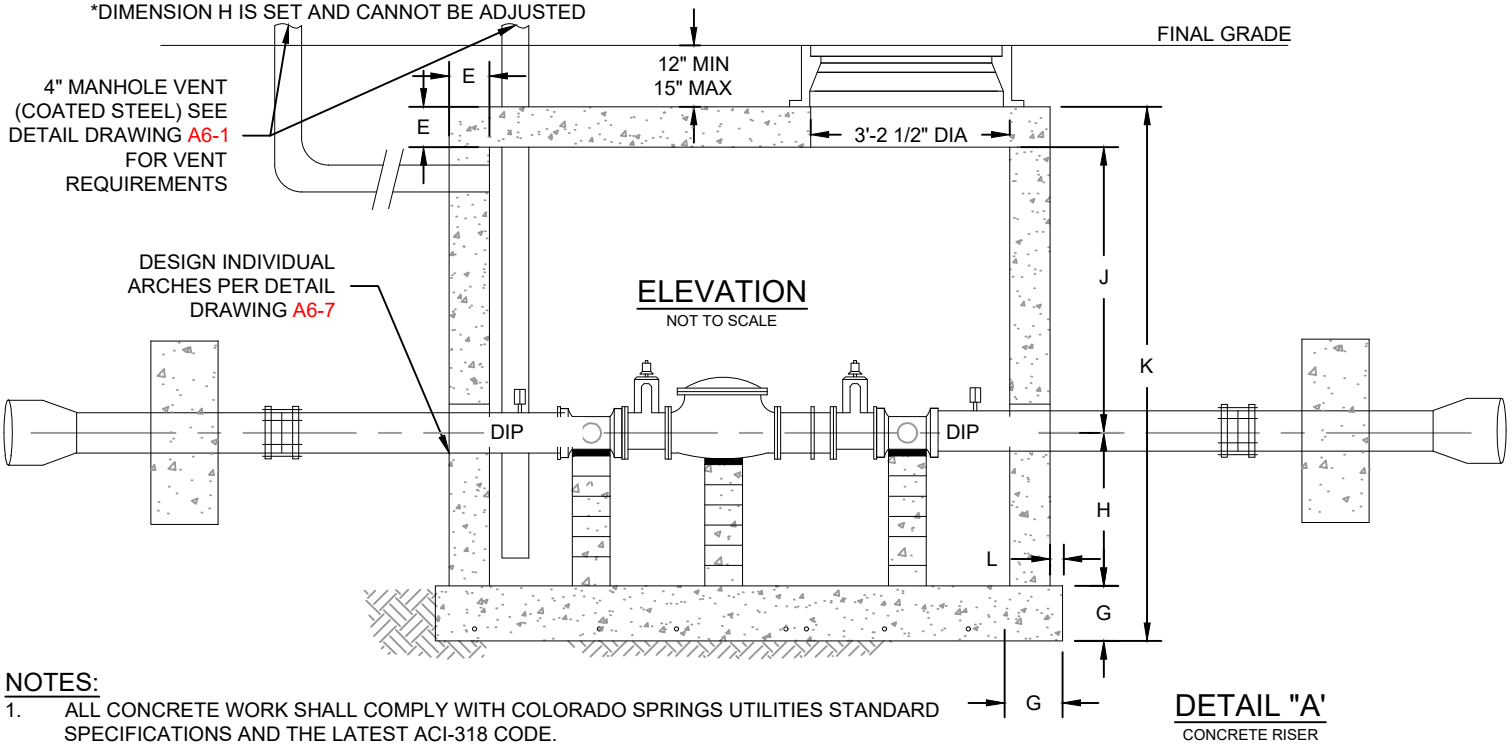
A6-3

DATED 07/2025



	PRV VAULT MIN. SIZE	A	B	C	D	E	F	G	H*	J	K	L
MAIN SIZE	6" & 8"	12'-6"	13'-10"	8'-0"	9'-4"	0'-8"	3'-0"	0'-10"	3'-2"	3'-6"	8'-2"	0'-4"
MAIN SIZE	12"	14'-8"	16'-0"	9'-0"	10'-4"	0'-8"	3'-0"	0'-10"	3'-2"	3'-6"	8'-2"	0'-4"

*DIMENSION H IS SET AND CANNOT BE ADJUSTED

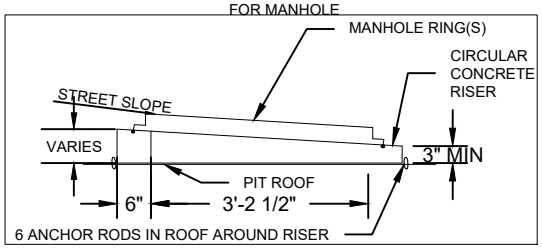


NOTES:

1. ALL CONCRETE WORK SHALL COMPLY WITH COLORADO SPRINGS UTILITIES STANDARD SPECIFICATIONS AND THE LATEST ACI-318 CODE.
2. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
3. VAULTS FOR PRESSURE REGULATOR STATIONS LARGER THAN 16 INCH WILL BE SPECIFICALLY DESIGNED BY THE ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
4. HEIGHT OF VAULT MAY CHANGE DUE TO DEPTH OF PIPE.
5. SHOP DETAIL DRAWINGS FOR ALL VAULTS ARE REQUIRED AND WILL BE APPROVED BY COLORADO SPRINGS UTILITIES.
6. FOR VAULT OPENINGS SEE PER DETAIL DRAWING A6-7.
7. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.8.

DETAIL "A'

CONCRETE RISER
FOR MANHOLE

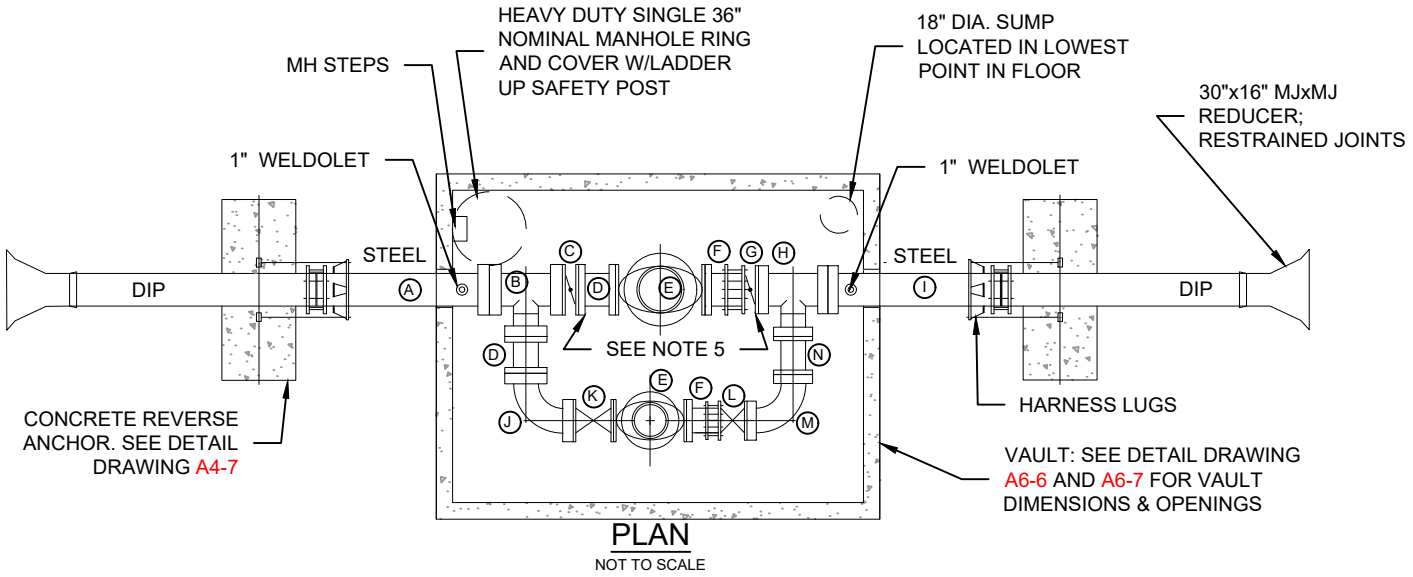


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PRESSURE REGULATOR STATIONS
6", 8" & 12"
VAULT DIMENSIONS

A6-4

DATED 07/2025



PLAN

NOT TO SCALE

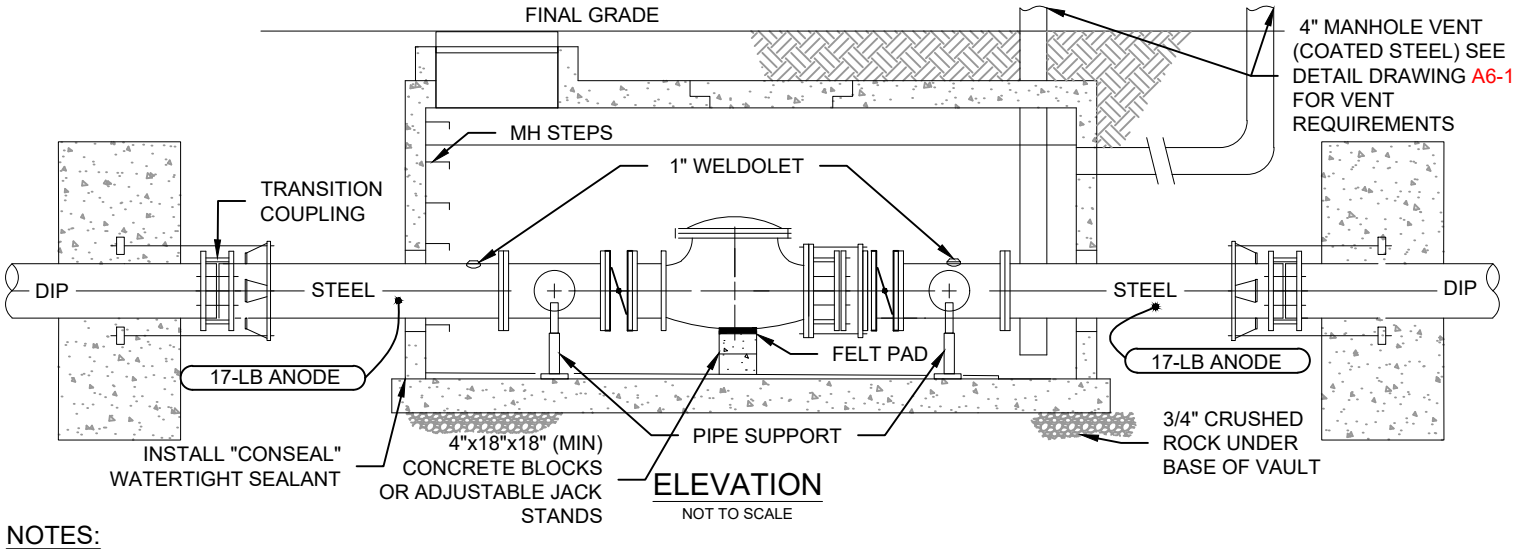
PRV MATERIALS:

A. FLANGE STEEL TAILPIECE (ANSI CL 150)
B. FLANGE x FLANGE (ANSI CL 150) STEEL TEE
C. 250 VALVE BODY BUTTERFLY VALVE W/ ANSI 150 FLANGES
D. FLANGE x FLANGE (ANSI CL 150) STEEL SPOOL PIECE
E. CLASS 250 VALVE BODY, DI, CLA-VAL REGULATORS
F. RESTRAINED FLANGE ADAPTOR
G. 150 VALVE BODY BUTTERFLY VALVE W/ ANSI 125 FLANGES
H. FLANGE x FLANGE (ANSI CL150) STEEL TEE
I. FLANGE STEEL TAILPIECE (ANSI CL 150)

PRV MATERIALS:

J. FLANGE x FLANGE (ANSI CL 150) LONG RADIUS 90° ELBOW
K. CLASS 250 VALVE BODY GATE VALVE W/ ANSI 150 FLANGES
L. CLASS 250 VALVE BODY GATE VALVE W/ ANSI CL 150 FLANGES
M. FLANGE x FLANGE (ANSI CL 150) LONG RADIUS 90° ELBOW
N. FLANGE x FLANGE (ANSI CL 150) STEEL SPOOL PIECE

NOTE: PRVs WITH WORKING PRESSURE GREATER THAN 250 PSI SHALL BE DESIGNED BY A QUALIFIED ENGINEER



ELEVATION

NOT TO SCALE

NOTES:

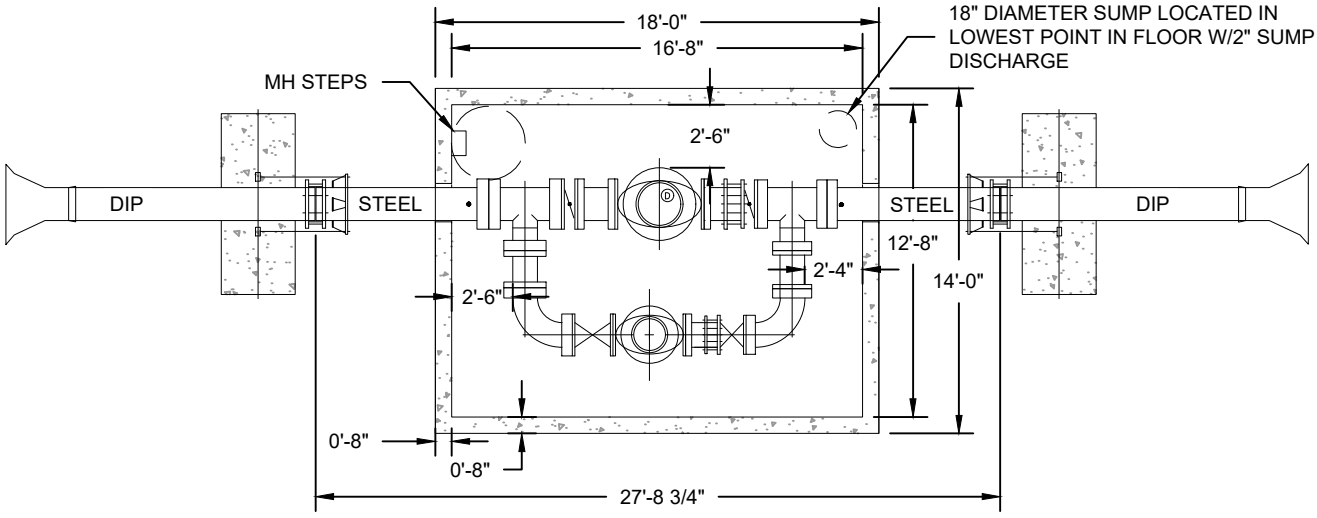
1. ALL PRESSURE REGULATORS SHALL BE CLA-VAL (ASTM A536) WITH ASME/ANSI B16.42/B16.5, CL 150 FLANGES.
2. ALL STEEL PIPE DIMENSIONS SHALL COMPLY WITH ANSI/AWWA C208-07.
3. ALL STEEL PIPE FLANGE DIMENSIONS FOR OUTSIDE AND INSIDE DIAMETER OF FLANGE, BOLT CIRCLE PATTERN, NUMBER OF BOLTS AND
4. DIAMETER OF BOLT HOLES SHALL COMPLY WITH ANSI B16.42 / B16.5, CL 150. ALL STEEL PIPE FLANGE THICKNESS SHALL COMPLY WITH ANSI/AWWA C207-07, CLASS E.
5. ENSURE ADEQUATE SEPARATION FROM INLET AND OUTLET BUTTERFLY VALVES TO PRESSURE REDUCING VALVE . BUTTERFLY VALVE DISKS SHALL NOT OBSTRUCT THE PRESSURE REDUCING VALVE'S OPERATION.
6. REFER TO DETAIL DRAWINGS A6-6 AND A6-7 FOR VAULT DIMENSIONS AND DETAILS.
7. A SITE SPECIFIC DESIGN SHALL BE REQUIRED FOR ALL PRESSURE REGULATOR STATIONS WITH PRESSURE REGULATORS LARGER THAN 16 INCH.
8. ALL MATERIALS SHALL BE SUPPLIED AND INSTALLED BY THE CONTRACTOR. INTERNAL COMPONENTS MAY BE REIMBURSED BY COLORADO SPRINGS UTILITIES. SEE CHAPTER 2.
9. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
10. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.8.
11. ADDITIONAL REQUIREMENTS FOR TELEMETRY MAY BE NECESSARY AT THE DISCRETION OF COLORADO SPRINGS UTILITIES.
12. JOINT HARNESS TIE BOLTS AND LUGS SHALL CONFORM TO AWWA M11 FOR STEEL PIPE.

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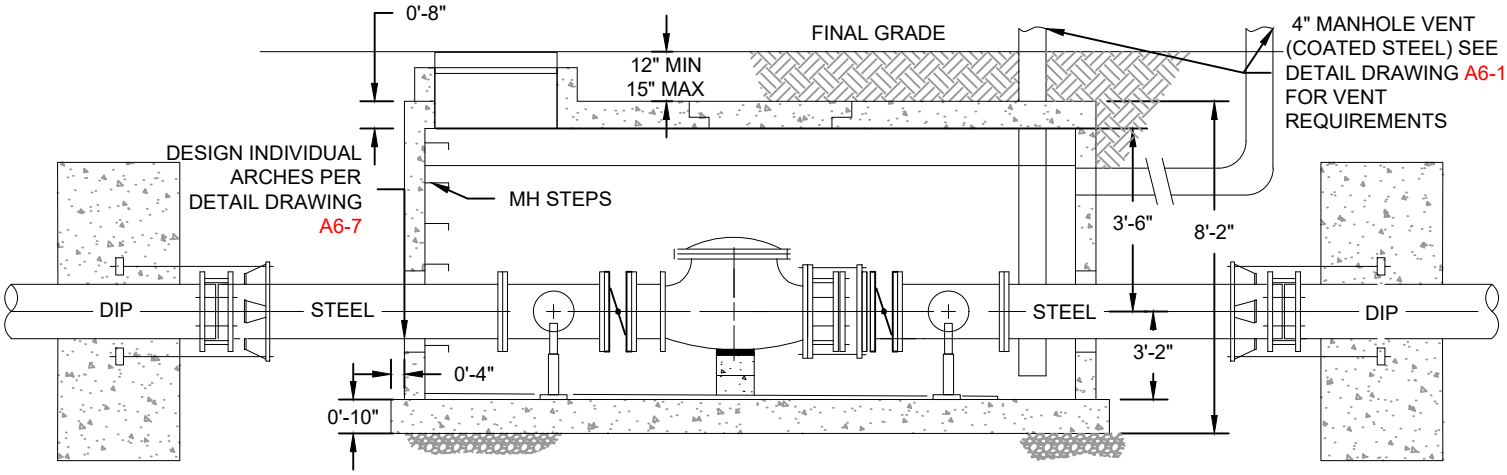
PRESSURE REGULATOR STATIONS 16" COMPONENT CONFIGURATION & MATERIALS

A6-5

DATED 07/2025



PLAN
NOT TO SCALE



ELEVATION
NOT TO SCALE

NOTES:

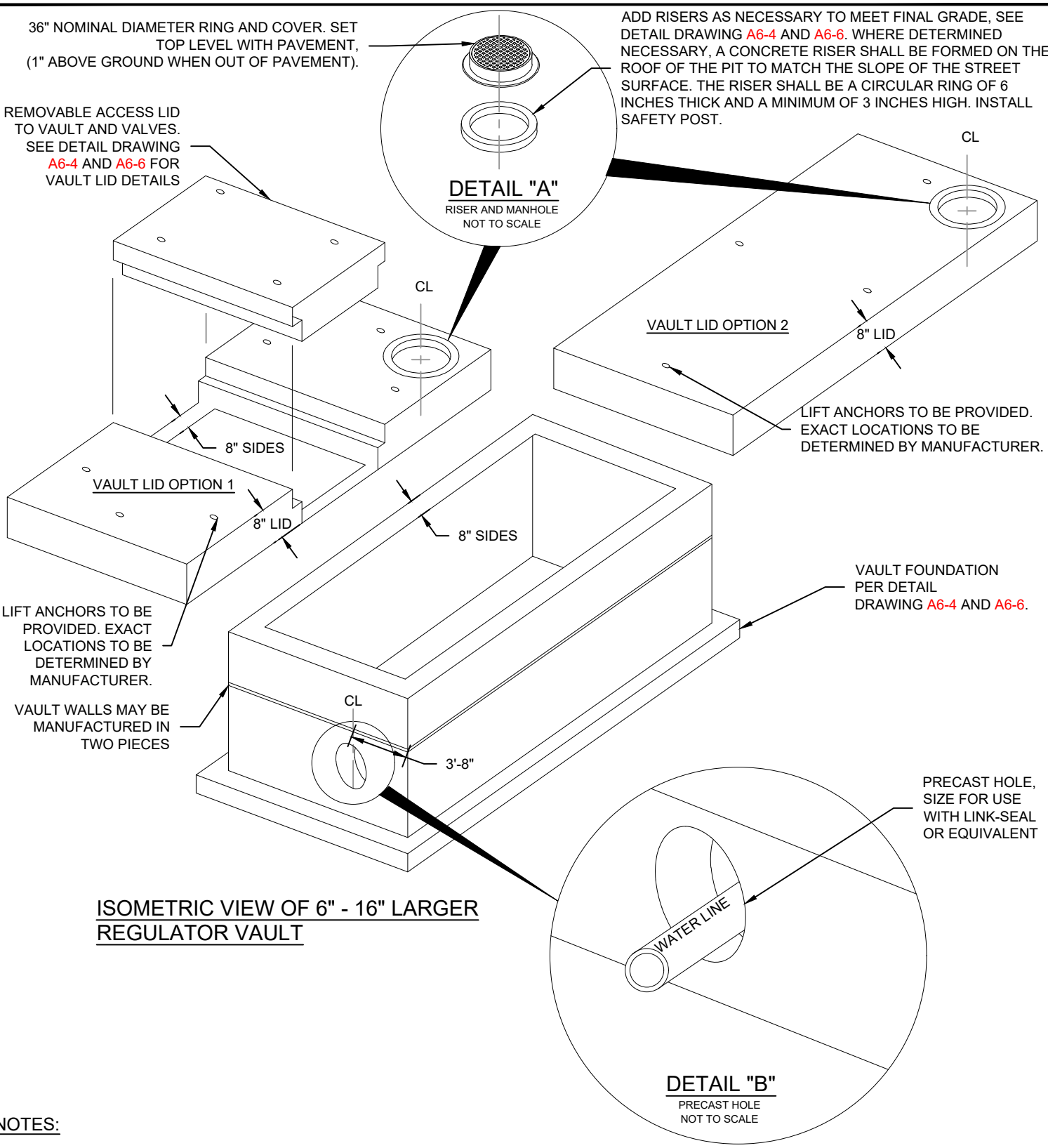
1. ALL CONCRETE WORK SHALL COMPLY WITH COLORADO SPRINGS UTILITIES STANDARD SPECIFICATIONS AND THE LATEST ACI-318 CODE.
2. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
3. VAULTS FOR PRESSURE REGULATOR STATIONS LARGER THAN 16 INCH WILL BE SPECIFICALLY DESIGNED BY THE ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
4. HEIGHT OF VAULT MAY CHANGE DUE TO DEPTH OF PIPE
5. SHOP DETAIL DRAWINGS FOR ALL VAULTS ARE REQUIRED AND WILL BE APPROVED BY COLORADO SPRINGS UTILITIES.
6. FOR VAULT OPENINGS SEE PER DETAIL DRAWING A6-7.
7. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.8.
8. DIP FITTINGS, BENDS, REDUCERS, AND TEES MUST BE CEMENT MORTAR LINED PER SECTIONS 4.4.B.1 AND 4.4.B.2.

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PRESSURE REGULATOR STATIONS
16"
VAULT DIMENSIONS

A6-6

DATED 07/2025



ISOMETRIC VIEW OF 6" - 16" LARGER REGULATOR VAULT

NOTES:

1. ALL CONCRETE WORK SHALL COMPLY WITH COLORADO SPRINGS UTILITIES STANDARD SPECIFICATIONS AND THE LATEST ACI-318 CODE.
2. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
3. VAULTS FOR PRESSURE REGULATOR STATIONS LARGER THAN 16 INCH WILL BE SPECIFICALLY DESIGNED BY THE ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
4. SHOP DETAIL DRAWINGS FOR ALL VAULTS ARE REQUIRED AND WILL BE APPROVED BY COLORADO SPRINGS UTILITIES.
5. ROOF SLABS FOR 6" & 8" PRESSURE REGULATOR VAULTS SHALL BE SINGLE SLAB, OPTION 2.
6. VENT HOLES PLACED PER SITE REQUIREMENTS. FOR VENT HOLE REQUIREMENTS SEE DETAIL DRAWING A6-1.

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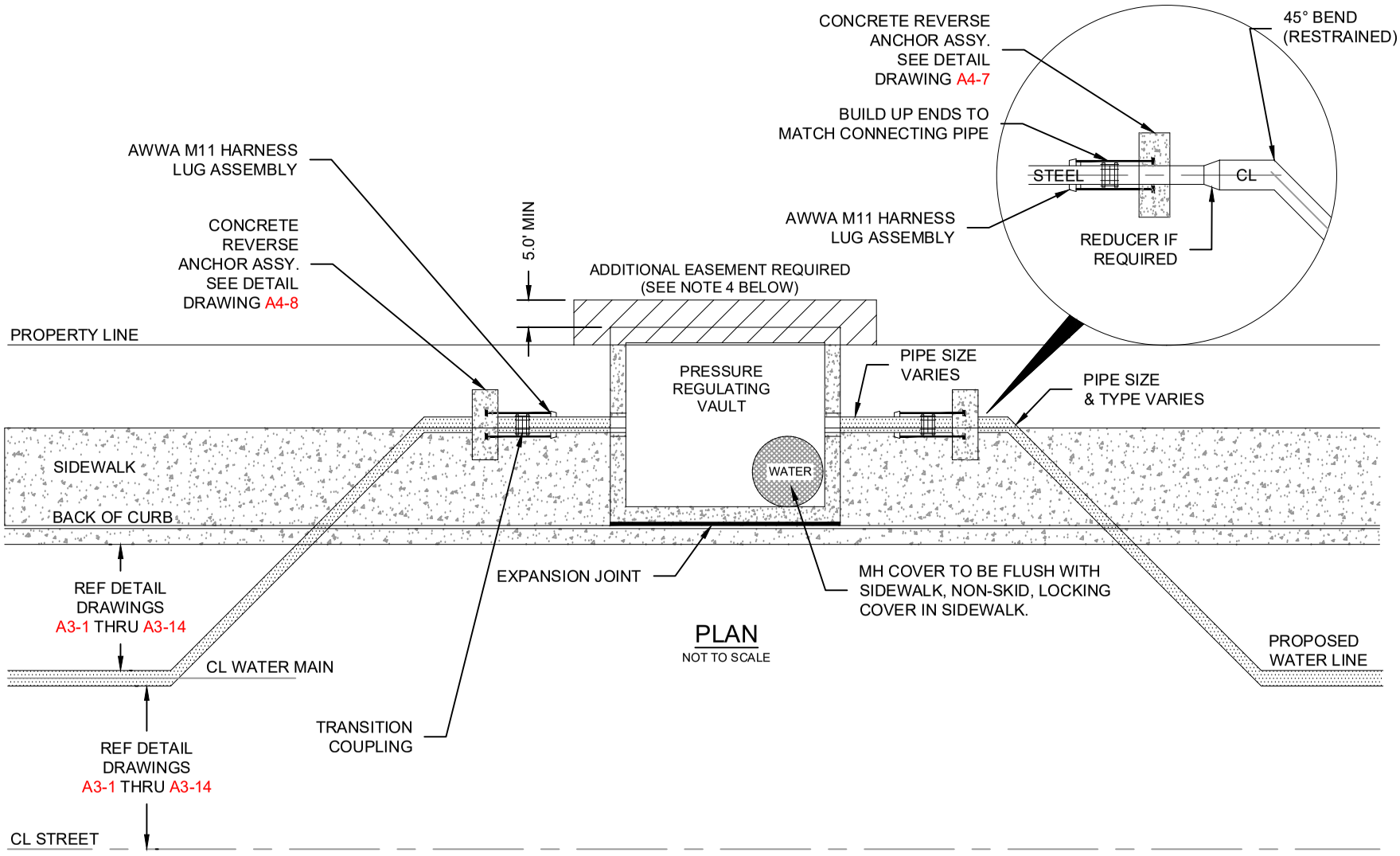
PRESSURE REGULATOR STATIONS 6", 8", 12" & 16" VAULT OPENINGS

A6-7

DATED 07/2025

Colorado Springs Utilities

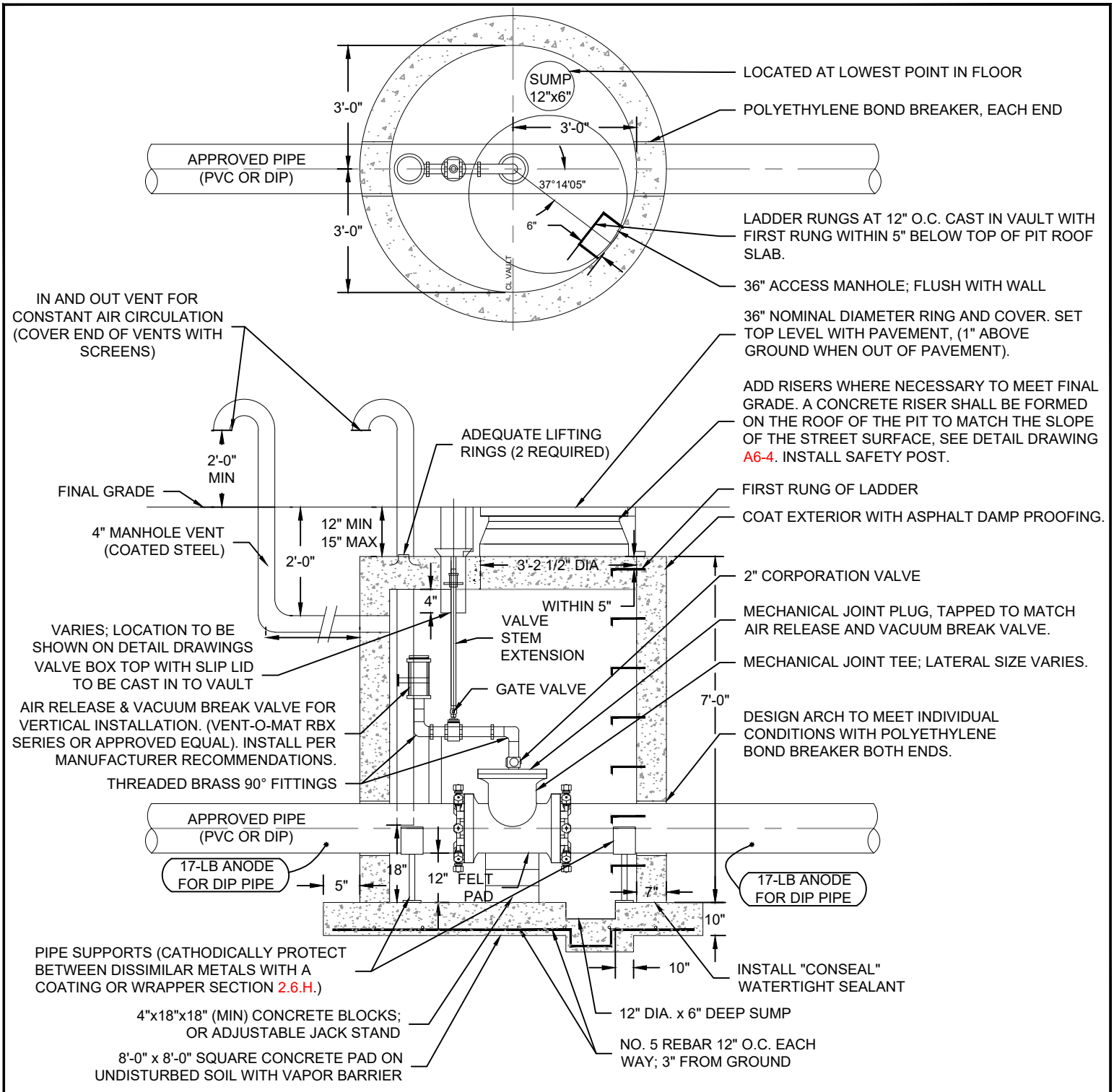
LOCATION OF PRESSURE REGULATOR STATION



NOTES:

1. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD..
2. ALL PRESSURE REGULATOR INSTALLATIONS LARGER THAN 12" SHALL BE DESIGNED BY DESIGN ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
3. ALL MATERIAL INSIDE VAULT SUPPLIED BY CONTRACTOR AND REIMBURSED BY COLORADO SPRINGS UTILITIES. SEE CHAPTER 2.
4. LOCATION OF PRV VAULT MAY VARY DUE TO WIDTH OF ROW AND SIDEWALKS. COORDINATE WITH GAS AND ELECTRIC DEPARTMENT PRIOR TO INSTALLATION. ADDITIONAL EASEMENT MAY BE NECESSARY TO PROVIDE A MINIMUM OF 5.0' FROM THE OUTSIDE EDGE OF EXTERIOR VAULT WALLS.
5. PRV DETAILS SHOWN IN DETAIL DRAWINGS A6-3 TO A6-6.
6. ALL FITTINGS TO BE MECHANICALLY JOINT (MJ) RESTRAINED.
7. IF REDUCER IS REQUIRED, IT SHALL BE PLACED BETWEEN THE CRA AND 45° BEND. SEE DETAIL ABOVE.
8. JOINT HARNESS TIE BOLTS AND LUGS SHALL CONFORM TO AWWA M11 FOR STEEL PIPE.

DATED 06/2015



NOTES:

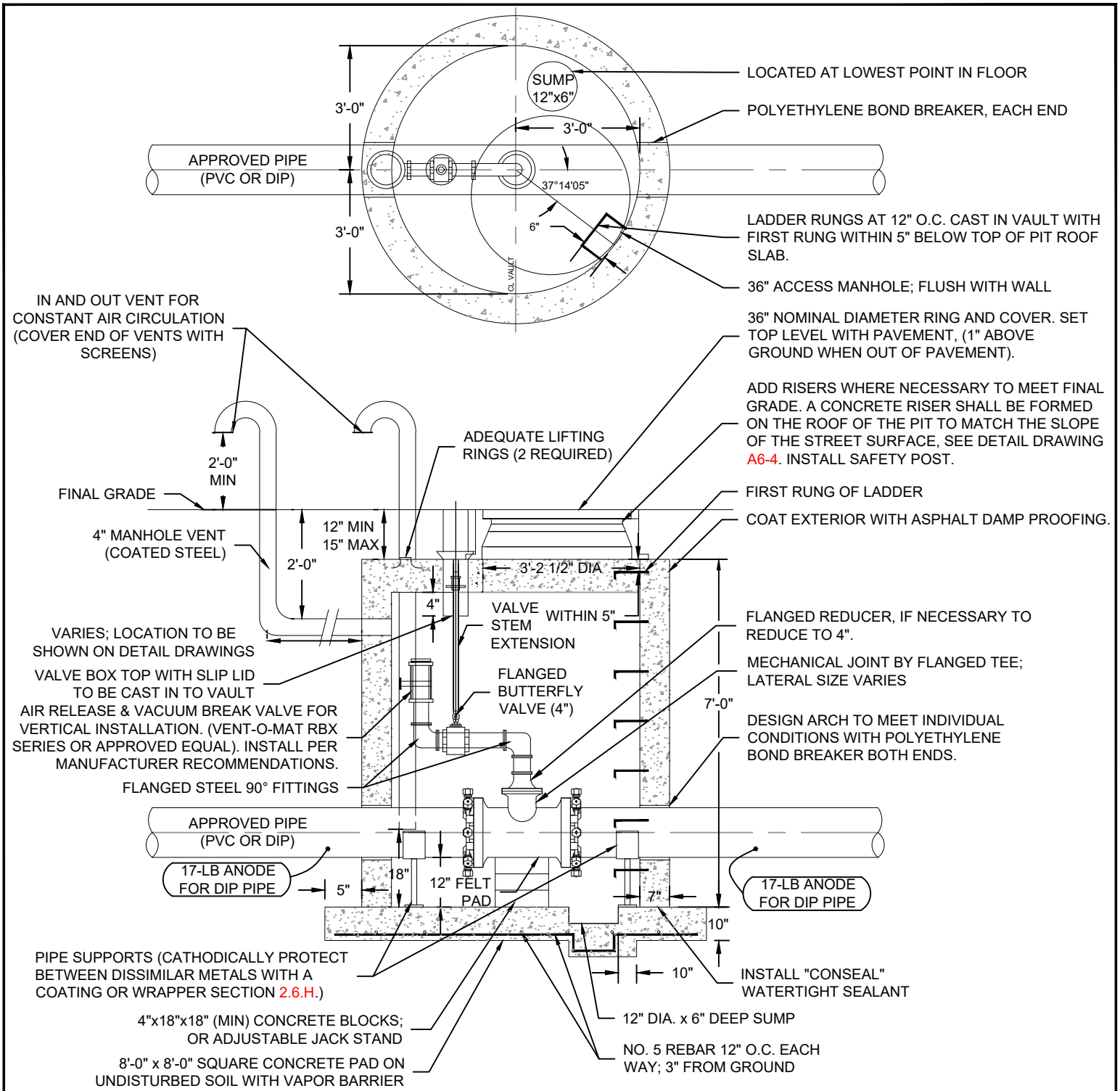
1. ALL CONCRETE WORK SHALL COMPLY WITH LATEST ACI-318 SPECIFICATIONS.
2. ALL LADDER RUNGS MUST LINE UP BOTH HORIZONTALLY AND VERTICALLY.
3. ALL SUPPORT MATERIALS SHALL BE GIVEN 2 COATS OF RUST INHIBITIVE PAINT.
4. AIR AND VACUUM VALVE STATIONS TO BE HOUSED IN A 6' DIAMETER PRECAST CONCRETE VAULT DESIGNED FOR HS-20 LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
5. GROUT ALL ARCHES FULL W/PORTLAND CEMENT, NON-SHRINK GROUT. SEAL AS NECESSARY FOR WATERTIGHT CONNECTION.
6. FOR HDPE MAIN LINE, TRANSITION TO APPROVED PIPE MATERIAL (PVC OR DIP) TO 10 FT OUTSIDE MANHOLE; SEE DETAIL DRAWING A10-6.
7. AIR AND VACUUM VALVE STATIONS SHALL BE DESIGNED PER PIPELINE REQUIREMENTS.
8. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.8.
9. DIP FITTINGS, BENDS, REDUCERS, AND TEES MUST BE CEMENT MORTAR LINED PER TO SECTIONS 4.4.B.1 AND 4.4.B.2.

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AIR AND VACUUM VALVE STATION
2" AIR VAC

A6-9

DATED 07/2022



NOTES:

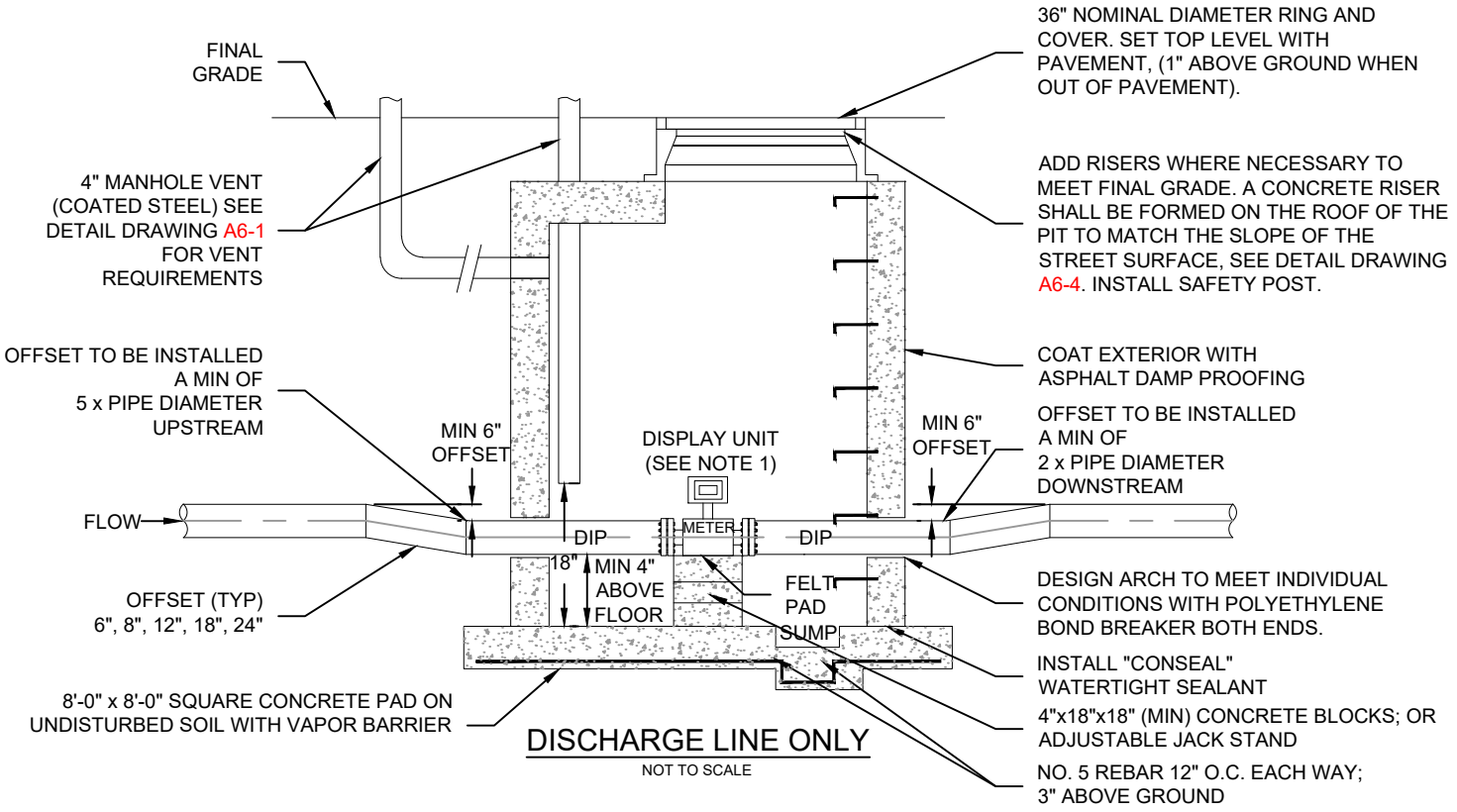
1. ALL CONCRETE WORK SHALL COMPLY WITH LATEST ACI-318 SPECIFICATIONS.
2. ALL LADDER RUNGS MUST LINE UP BOTH HORIZONTALLY AND VERTICALLY.
3. ALL SUPPORT MATERIALS SHALL BE GIVEN 2 COATS OF RUST INHIBITIVE PAINT.
4. AIR AND VACUUM VALVE STATIONS TO BE HOUSED IN A 6' DIAMETER PRECAST CONCRETE VAULT DESIGNED FOR HS-20 LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
5. GROUT ALL ARCHES FULL W/PORTLAND CEMENT, NON-SHRINK GROUT. SEAL AS NECESSARY FOR WATERTIGHT CONNECTION.
6. FOR HDPE MAIN LINE, TRANSITION TO APPROVED PIPE MATERIAL (PVC OR DIP) TO 10 FT OUTSIDE MANHOLE; SEE DETAIL DRAWING A10-6.
7. AIR AND VACUUM VALVE STATIONS SHALL BE DESIGNED PER PIPELINE REQUIREMENTS.
8. STEEL PIPE SHALL BE COATED PER SECTION 4.4.B.7.
9. DIP FITTINGS, BENDS, REDUCERS, AND TEES MUST BE CEMENT MORTAR LINED PER TO SECTIONS 4.4.B.1 AND 4.4.B.2.

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AIR AND VACUUM VALVE STATION
4" AIR VAC

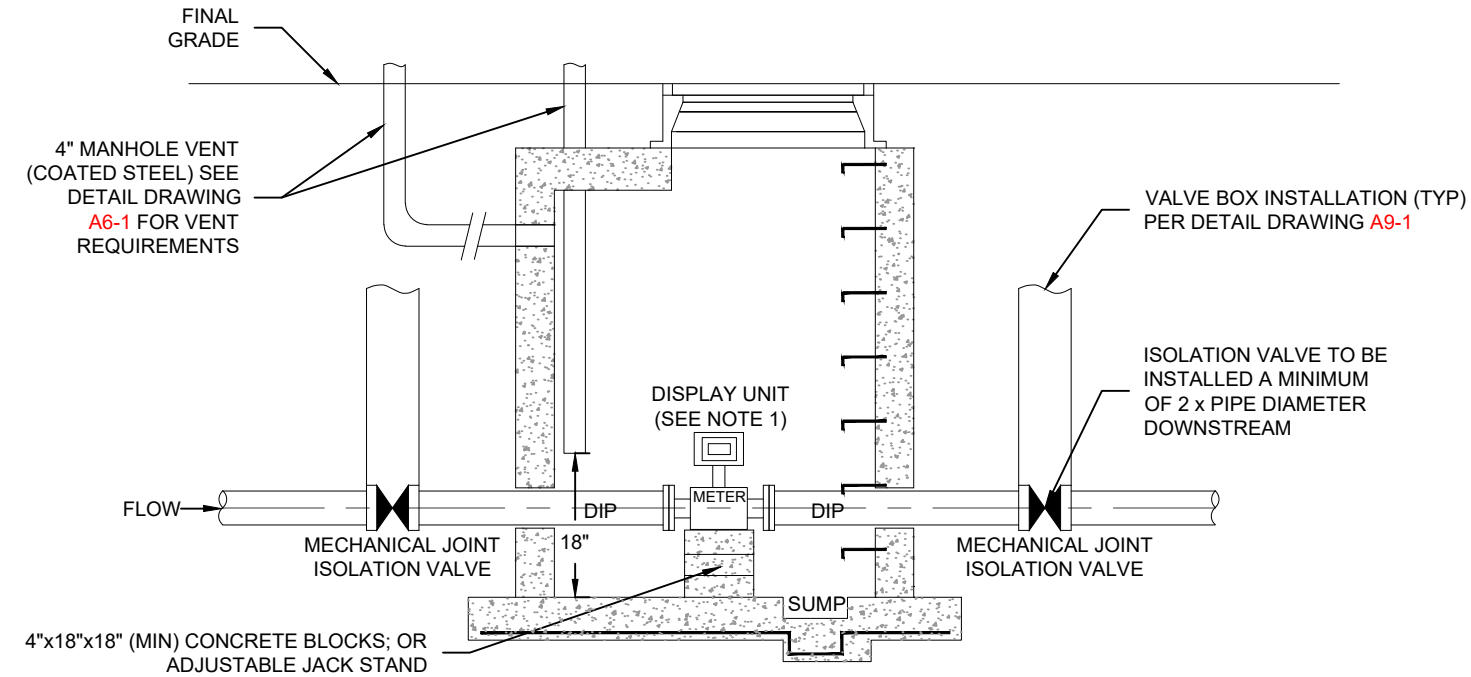
A6-10

DATED 07/2025



DISCHARGE LINE ONLY

NOT TO SCALE

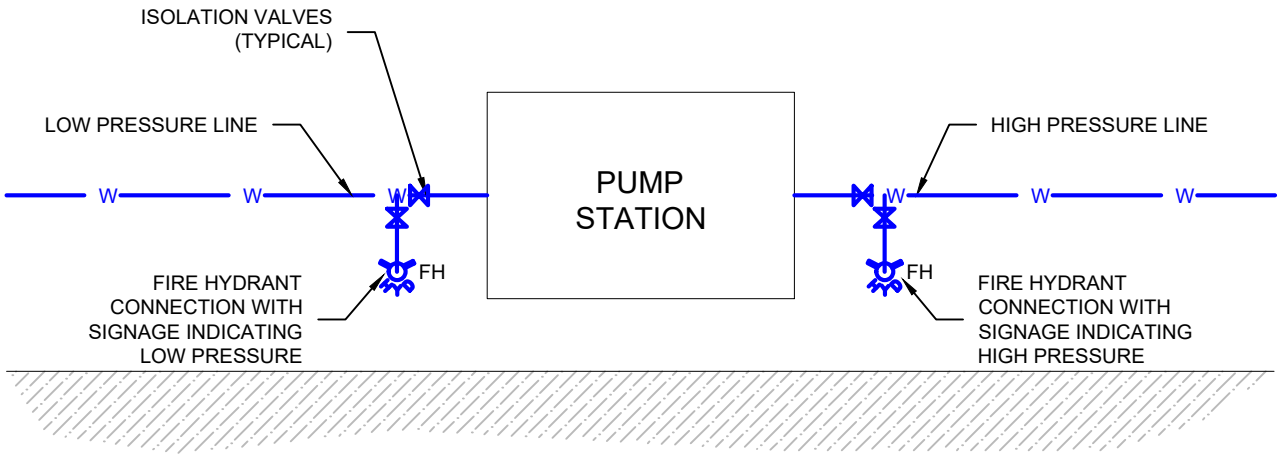


PRESSURE LINE ONLY

NOT TO SCALE

NOTES:

1. METER VAULTS TO HAVE TWO (2) EACH 2" KNOCKOUTS FOR INSTALLATION OF 115 VAC ELECTRICAL AND REMOTE SIGNAL WIRE. LOCATION TO BE DETERMINED PER INDIVIDUAL APPLICATION BY COLORADO SPRINGS UTILITIES.
2. ELECTRICAL EQUIPMENT AND DISPLAY UNIT TO BE MOUNTED IN A DRY LOCATION.
3. METER TO BE COMPATIBLE WITH COLORADO SPRINGS UTILITIES CURRENT DATA COLLECTION PROGRAM.
4. CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD WITH A CAST IN PLACE FOUNDATION AS SHOWN.



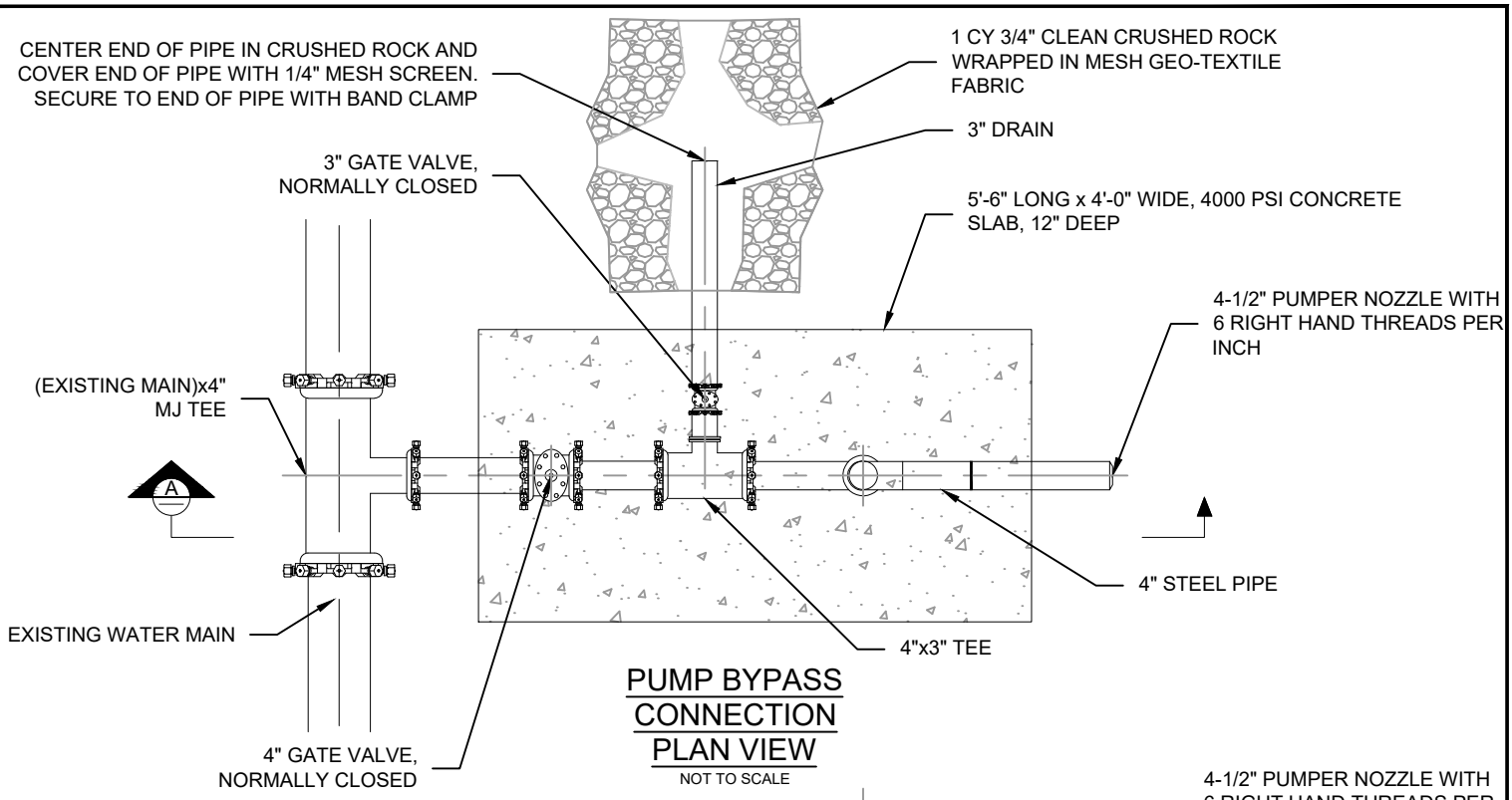
PLAN VIEW

NOT TO SCALE

NOTES:

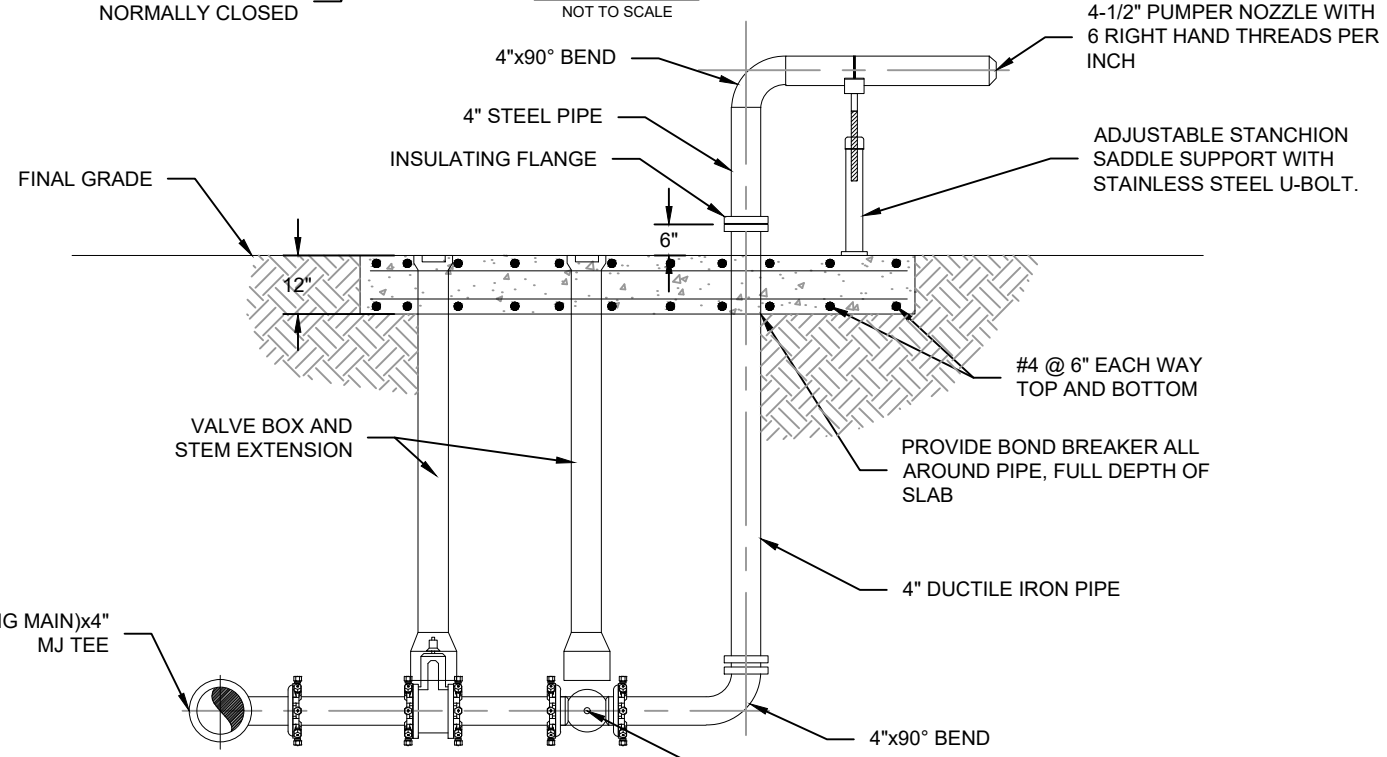
1. HYDRANTS TO BE LOCATED NOT MORE THAN 40 FT FROM EACH OTHER AND NO MORE THAN 20 FT FROM VEHICULAR ACCESS.
2. HYDRANT LOCATIONS TO BE DETERMINED BY SITE LAYOUT CONDITIONS.
3. DETAIL DRAWING A6-12 TO BE USED WHEN PRESSURES EXCEED THE PRESSURE RATING OF THE FIRE HYDRANTS.

Colorado Springs Utilities It's how we're all connected	PUMP STATION BYPASS SCHEMATIC LAYOUT	A6-12 DATED 07/2022



PUMP BYPASS CONNECTION PLAN VIEW

NOT TO SCALE



PUMP BYPASS CONNECTION SECTION "A"

NOT TO SCALE

NOTES:

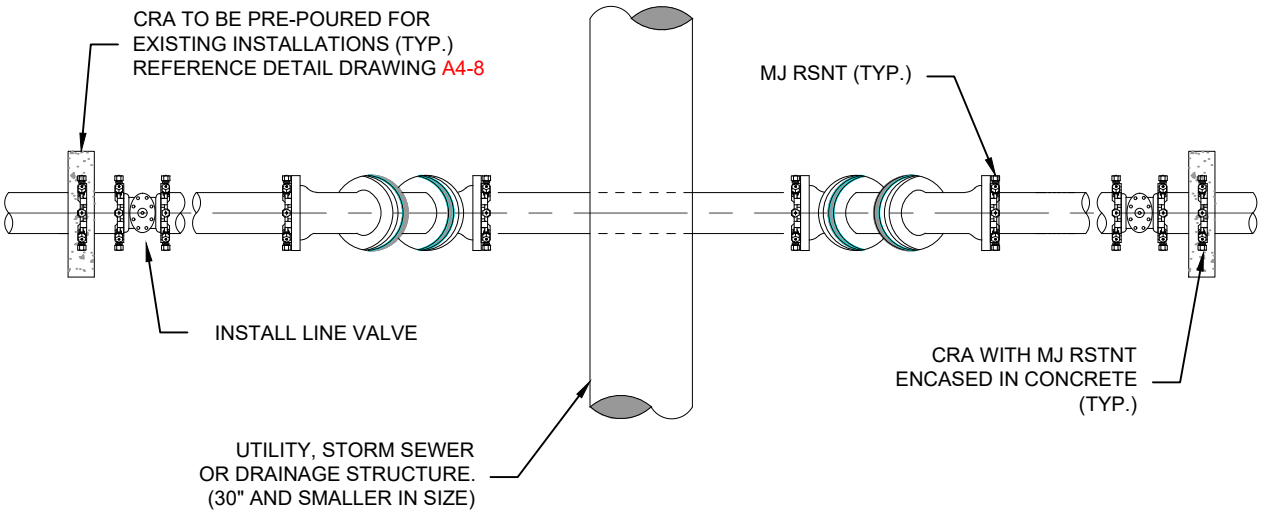
1. THIS DETAIL TO BE USED WHEN THE PRESSURES EXCEED THE PRESSURE RATING OF THE FIRE HYDRANTS.
2. TEE SHALL BE 4" LATERAL FROM EXISTING WATER MAIN SIZE, I.E., 8" x 4", 12" x 4", ETC.
3. PROVIDE CLEAN CRUSHED ROCK WRAPPED IN GEO-TEXTILE FABRIC FOR STAND PIPE DRAINAGE WHEN NOT IN USE.
4. ALL MECHANICAL JOINT (MJ) CONNECTIONS SHALL BE RESTRAINED.
5. PUMPER NOZZLES SHALL BE LOCATED EACH NOT MORE THAN 40 FT FROM EACH OTHER AND NO MORE THAN 20 FT FROM VEHICULAR ACCESS. LOCATIONS TO BE DETERMINED BY SITE LAYOUT.

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PUMP STATION BYPASS SCHEMATIC LAYOUT (ALTERNATIVE)

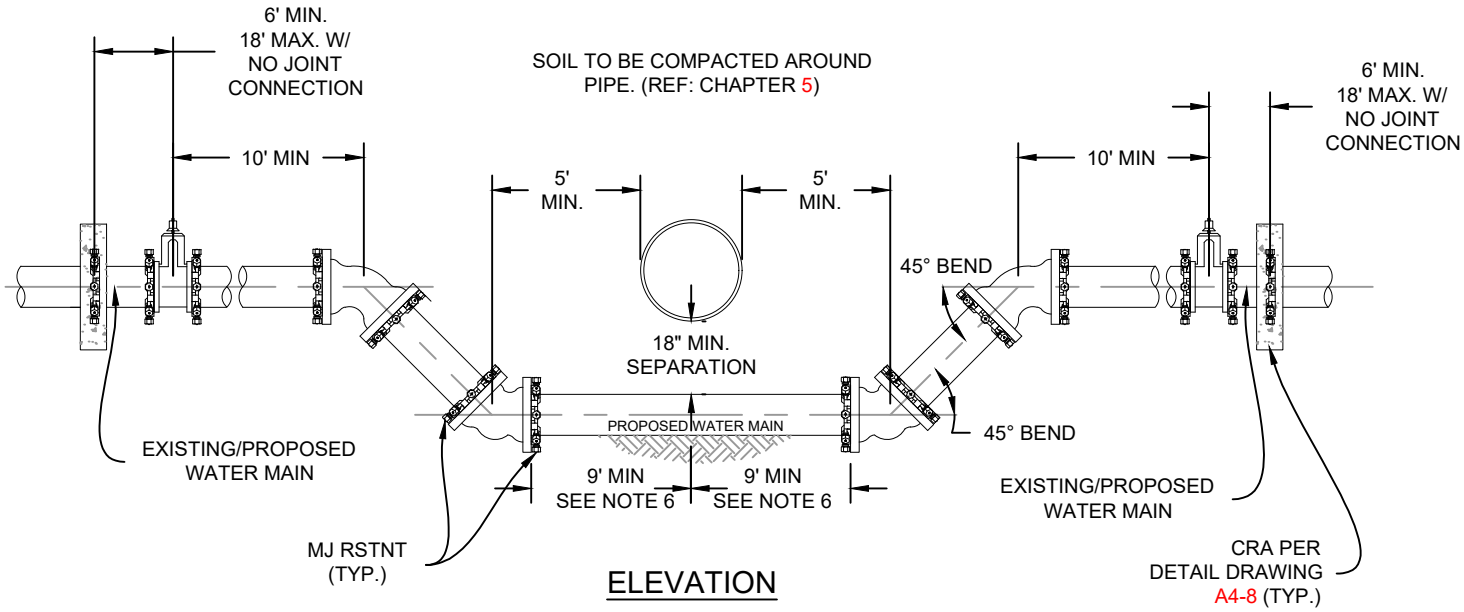
A6-13

DATED 03/2014



PLAN

FINAL/EXISTING GRADE



ELEVATION

NOTES:

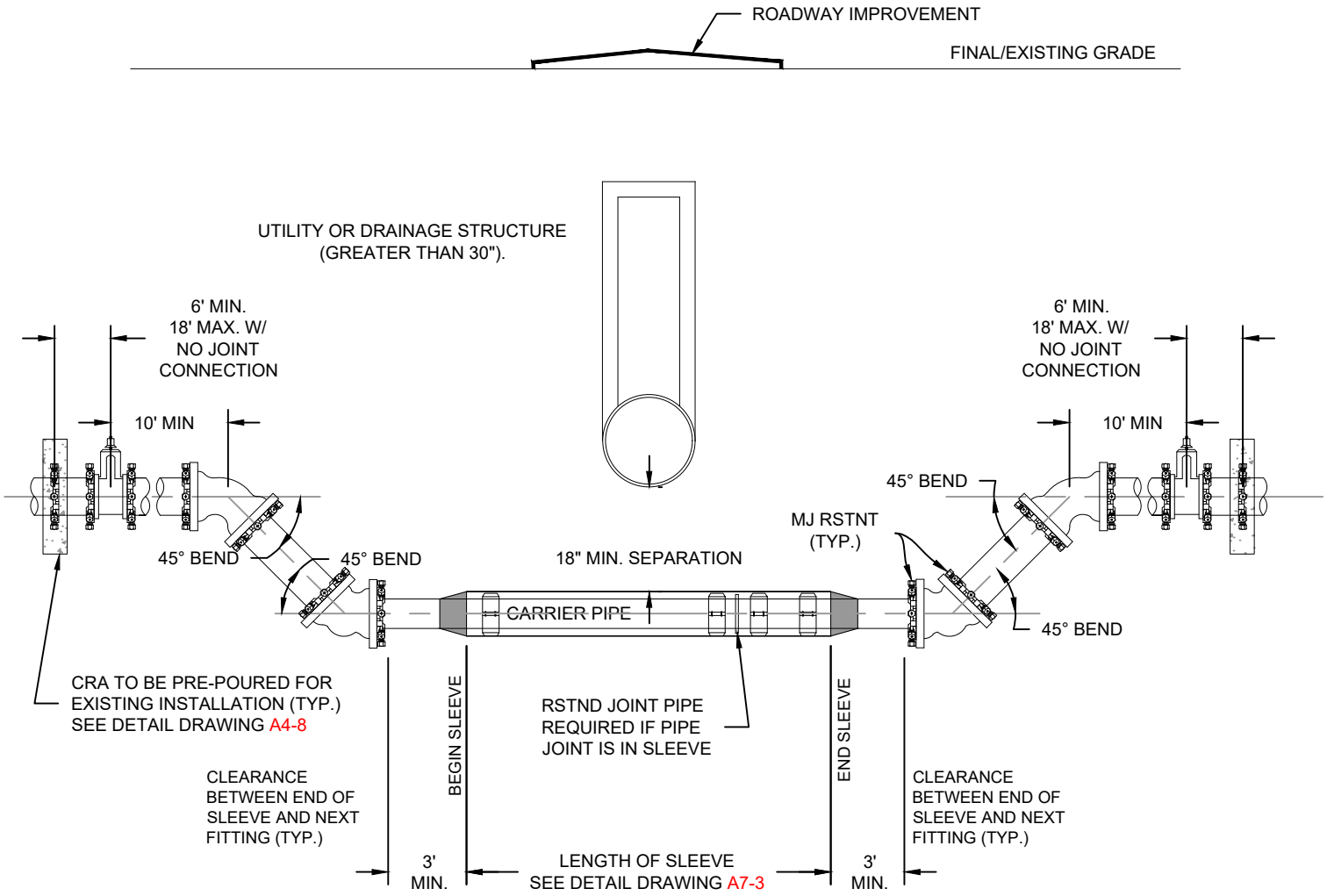
1. ALL DUCTILE IRON FITTINGS AND PIPE SHALL BE CATHODICALLY PROTECTED PER SECTION 2.6.H.
2. ALL FITTINGS SHALL HAVE MJ RESTRAINTS IN ACCORDANCE WITH CHAPTER 5.
3. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES INSPECTOR'S DIRECTION.
4. RESTRAINED JOINTS ARE REQUIRED WITHIN LOWERING.
5. NO TAPS OR TEES ARE ALLOWED WITHIN THE LOWERING.
6. WHERE WATER MAIN CROSSES UNDER STORM SEWER, WASTEWATER OR NON-POTABLE WATER INFRASTRUCTURE, A MINIMUM OF 9 FEET REQUIRED BETWEEN THE CENTERLINE OF THE CROSSING AND THE FIRST JOINT. THIS MEETS THE REQUIREMENTS FOR SECONDARY CONTAINMENT AS DESCRIBED IN SECTION 2.6.F.2.

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LOWERING DETAIL
UTILITY CROSSING 30" & SMALLER

A7-1

DATED 06/2015



NOTES:

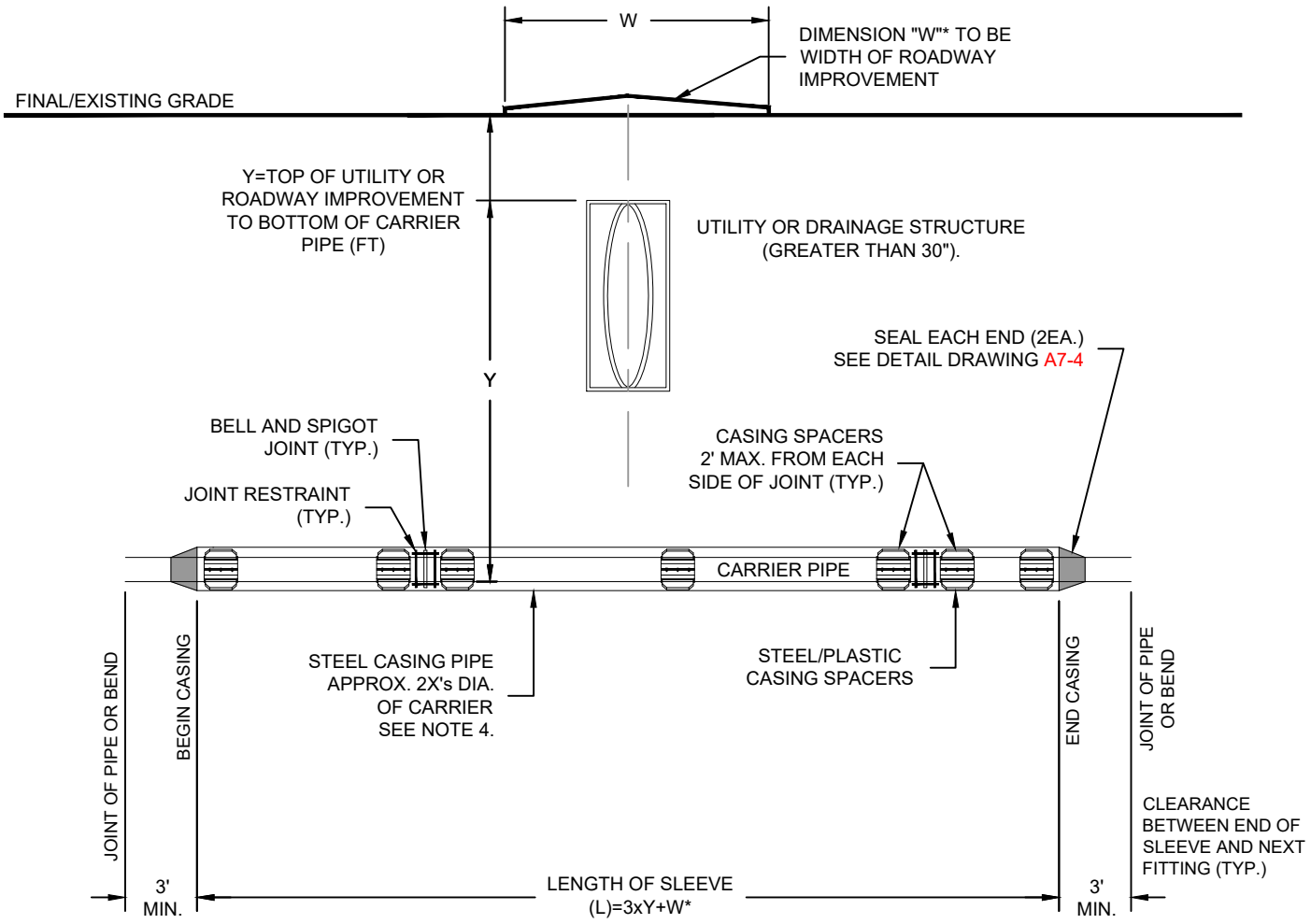
1. ALL DUCTILE IRON FITTINGS AND PIPE SHALL BE CATHODICALLY PROTECTED PER SECTION 2.6.H.
2. ALL FITTINGS SHALL HAVE MJ RESTRAINTS IN ACCORDANCE WITH CHAPTER 5.
3. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES INSPECTOR'S DIRECTION.
4. RESTRAINED JOINTS ARE REQUIRED WITHIN LOWERING.
5. NO TAPS OR TEES ARE ALLOWED WITHIN THE LOWERING.
6. WHERE WATER MAIN CROSSES UNDER STORM SEWER, WASTEWATER OR NON-POTABLE WATER INFRASTRUCTURE, REFERENCE SECTION 2.6.F.2.

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LOWERING DETAIL W/CASING
UTILITY CROSSING GREATER THAN 30"

A7-2

DATED 06/2015



NOTE:
AN ADDITIONAL CASING SPACER SHALL BE CENTERED ON THE PIPE WHEN 18' TO 20' LONG PIPE JOINTS ARE USED. (TYP.)

* "W" SHALL BE ADDED WHEN A SLEEVE IS REQUIRED TO CROSS A ROADWAY IMPROVEMENT SUCH AS A ROUNDABOUT OR MEDIAN. "W" IS NOT REQUIRED WHEN CROSSING AN UNDERGROUND UTILITY.

NOTES:

1. ALL FITTINGS AND BELLS SHALL BE RESTRAINED IN THE CASING PIPE.
2. LOCATE CASING SPACERS AT "HOMING" LOCATION FOR SLEEVES GREATER THAN 50 FEET IN LENGTH TO PREVENT DAMAGE TO BELL DURING INSTALLATION AND EXTRACTION OF PIPE, IF REMOVED.
3. CASING SHALL BE STEEL PIPE WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI. CASING THICKNESS SHALL BE SPECIFIED BY THE DESIGN ENGINEER ON THE PLANS BASED ON THE ANTICIPATED LOADS. SEE DETAIL DRAWING A7-4.
4. THE DIAMETER OF THE CASING SHALL BE SPECIFIED BY THE DESIGN ENGINEER. THE DIAMETER SHALL TAKE INTO ACCOUNT THE MAXIMUM O.D. WITH THE USE OF RESTRAINED JOINT PIPE.
5. SEE DETAIL DRAWING A7-4 FOR CASING SPACER DETAILS.
6. LOCATE SPACERS ON BOTH SIDES OF JOINTS TO ELIMINATE DEFLECTION OF THE JOINT IN THE SLEEVE.
7. WHERE WATER MAIN CROSSES UNDER STORM SEWER, WASTEWATER OR NON-POTABLE WATER INFRASTRUCTURE, REFERENCE SECTION 2.6.G.2.
8. WHEN CROSSING A ROADWAY IMPROVEMENT, THE WIDTH OF THE IMPROVEMENT SHALL BE ADDED TO THE LENGTH OF THE SLEEVE.

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TYPICAL STEEL CASING INSTALLATION

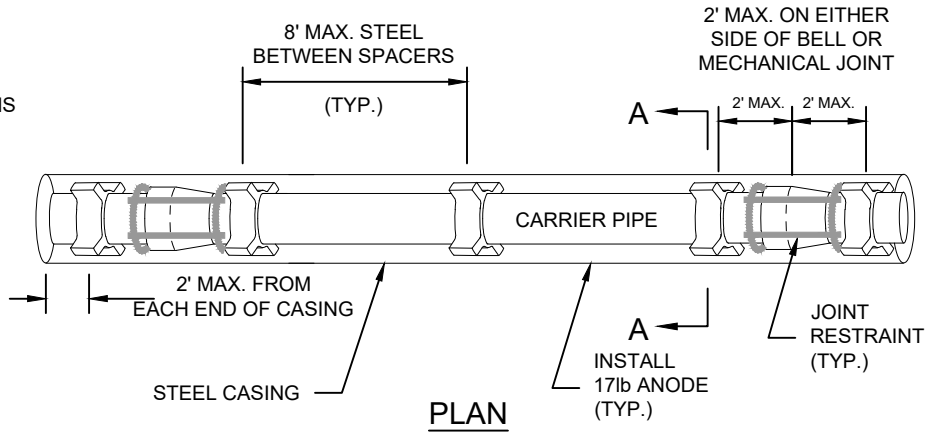
A7-3

DATED 07/2025

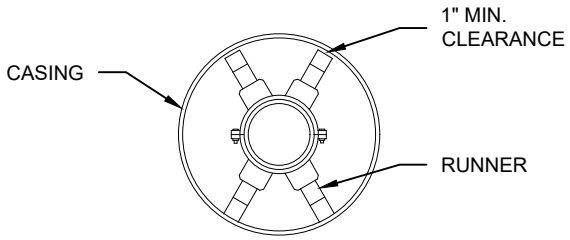
CASING PIPE MINIMUM SIZES AND THICKNESSES
(TO BE VERIFIED BY THE DESIGN ENGINEER)
BASED ON ACTUAL LOADING AND SITE CONDITIONS

CASING PIPE NOMINAL SIZE (IN)	MIN. THICKNESS (IN)
12	0.250
14	0.312
16	0.312
18	0.312
20	0.375
24	0.500
32	0.500
36	0.625

CASING PIPE MINIMUM SIZES AND THICKNESSES ARE BASED ON E80 LOADING. VARIANCES TO THESE MINIMUMS MAY BE ALLOWED WITH SUPPORTING CALCULATIONS FROM THE DESIGN ENGINEER



PLAN



SECTION A-A

TYPICAL PIPE SUPPORT CASING ARRANGEMENT (CENTERED/RESTRAINED)

CARRIER PIPE:

1. CARRIER PIPE SHALL BE CENTERED WITHIN CASING BY USE OF APPROVED STAINLESS STEEL CASING SPACERS AS MANUFACTURED BY APPROVED MANUFACTURER BY COLORADO SPRINGS UTILITIES. (REFERENCE CHAPTER 2)

PLACEMENT OF SPACERS ON CARRIER PIPE:

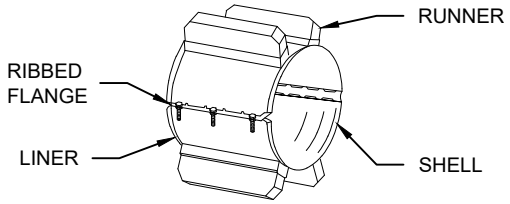
1. GENERAL - ONE SPACER SHALL BE PLACED MAX. 2' FROM EACH END OF CASING AND ON EITHER SIDE OF EACH BELL OR MECHANICAL JOINT. SUBSEQUENT SPACERS SHALL BE PLACED AT 8' INTERVALS WITHIN THE CASING, OR IN ACCORDANCE WITH PIPE MANUFACTURERS RECOMMENDATIONS.

END SEALS:

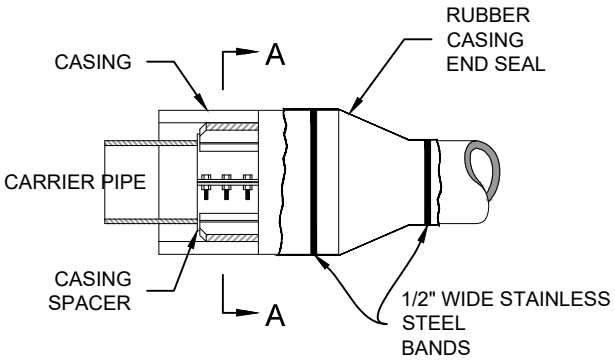
1. END SEALS SHALL BE USED TO ENSURE A WATER TIGHT SEAL ON EITHER END OF THE CASING.

CATHODIC PROTECTION:

1. CASING SHALL BE CATHODICALLY PROTECTED PER SECTION 2.6.H.



SPACER



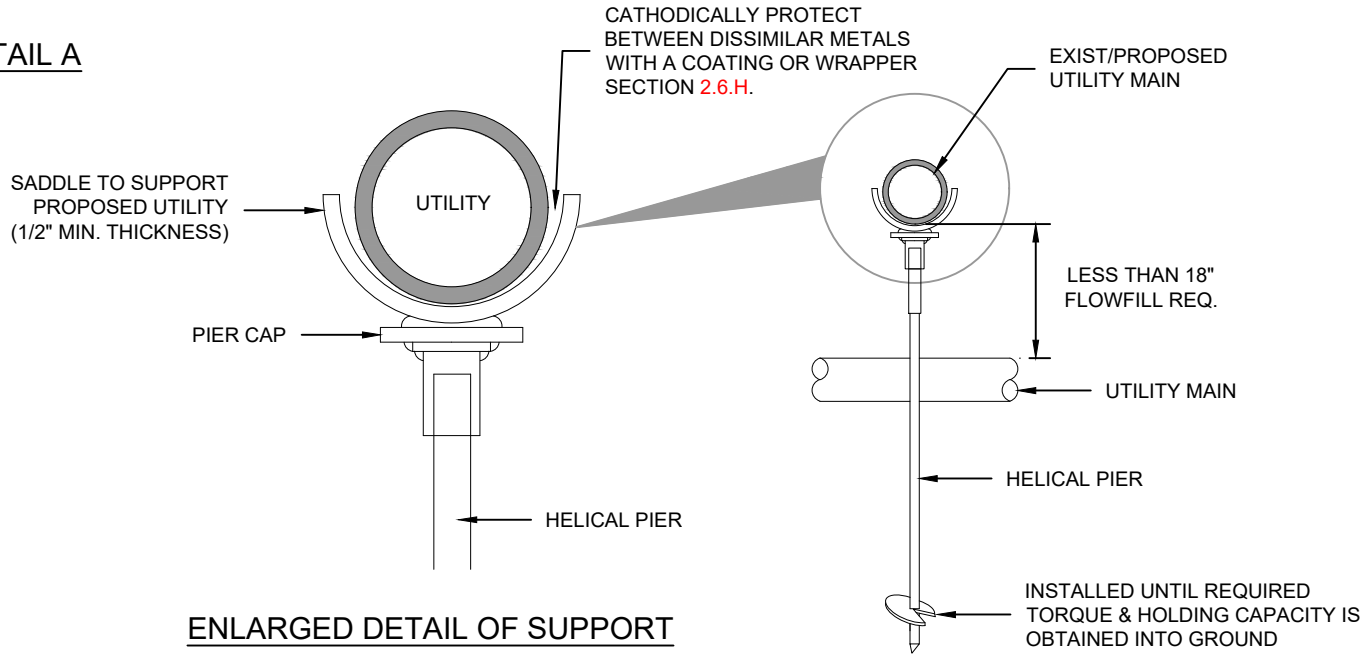
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TYPICAL STEEL CASING INSTALLATION

A7-4

DATED 07/2025

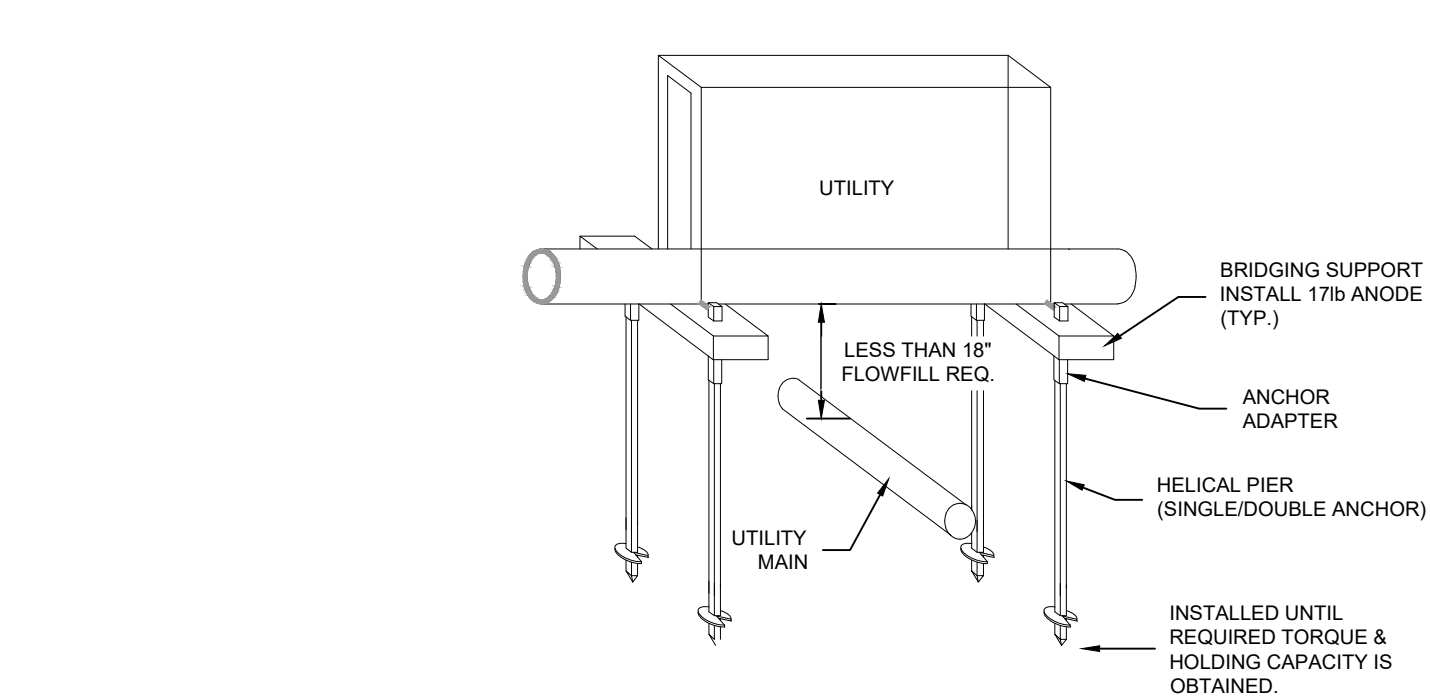
DETAIL A



ENLARGED DETAIL OF SUPPORT

NOTE: HELICAL PIERS AND PIER CAPS SHALL BE DESIGNED BY THE DESIGN ENGINEER.

DETAIL B



NOTES:

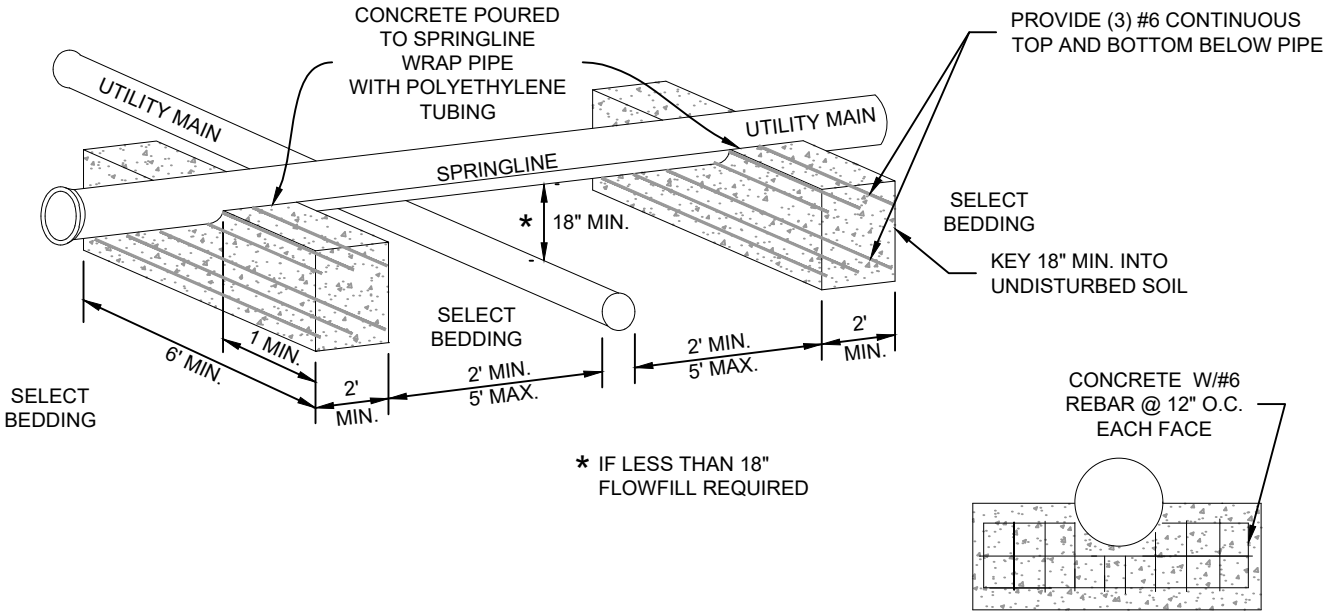
1. IF UPPER UTILITY IS GREATER THAN 30" IN SIZE LOWER UTILITY MUST BE IN A CASING PIPE. REFERENCE DETAIL DRAWING A7-2 & A7-3.
2. ALL METALLIC STRUCTURE AND PIPE SHALL BE CATHODICALLY PROTECTED PER SECTION 2.6.H.
3. THE BRIDGING SUPPORT SHALL BE DESIGNED BY THE DESIGN ENGINEER.

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PIPE BRIDGING DETAIL
W/HELICAL PIERS

A7-5

DATED 06/2015

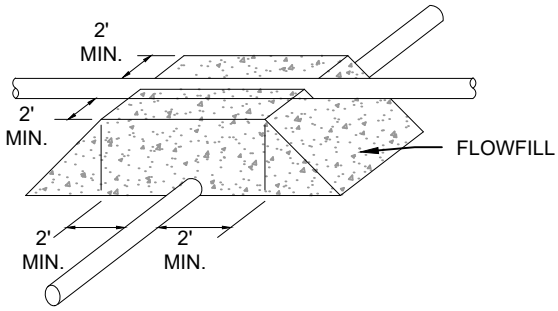


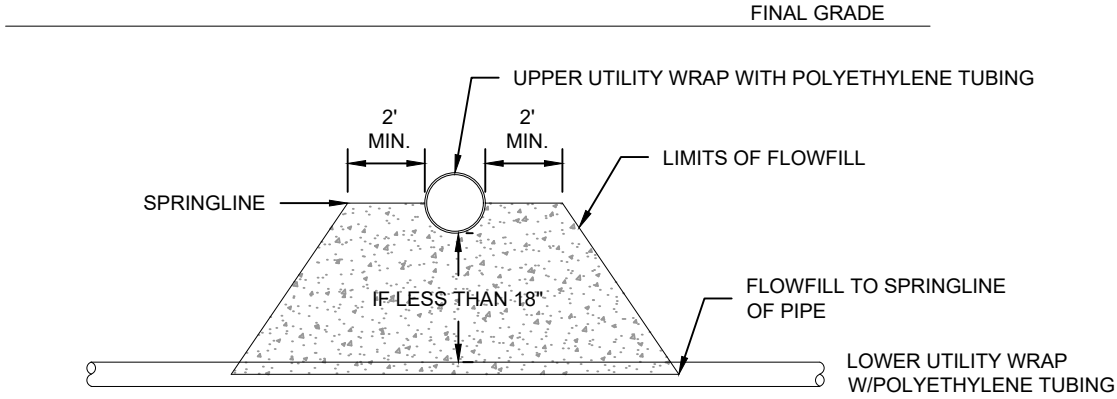
NOTES:

1. CONCRETE SHALL BE REINFORCED WITH NO. 6 REBAR, SET ON 12" CENTERS
2. NO JOINTS OF UTILITY MAIN SHALL BE ALLOWED BETWEEN CONCRETE BRIDGING BLOCKS.
3. CONCRETE AND REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 4.

ELEVATION

FLOWFILL DETAIL





NOTES:

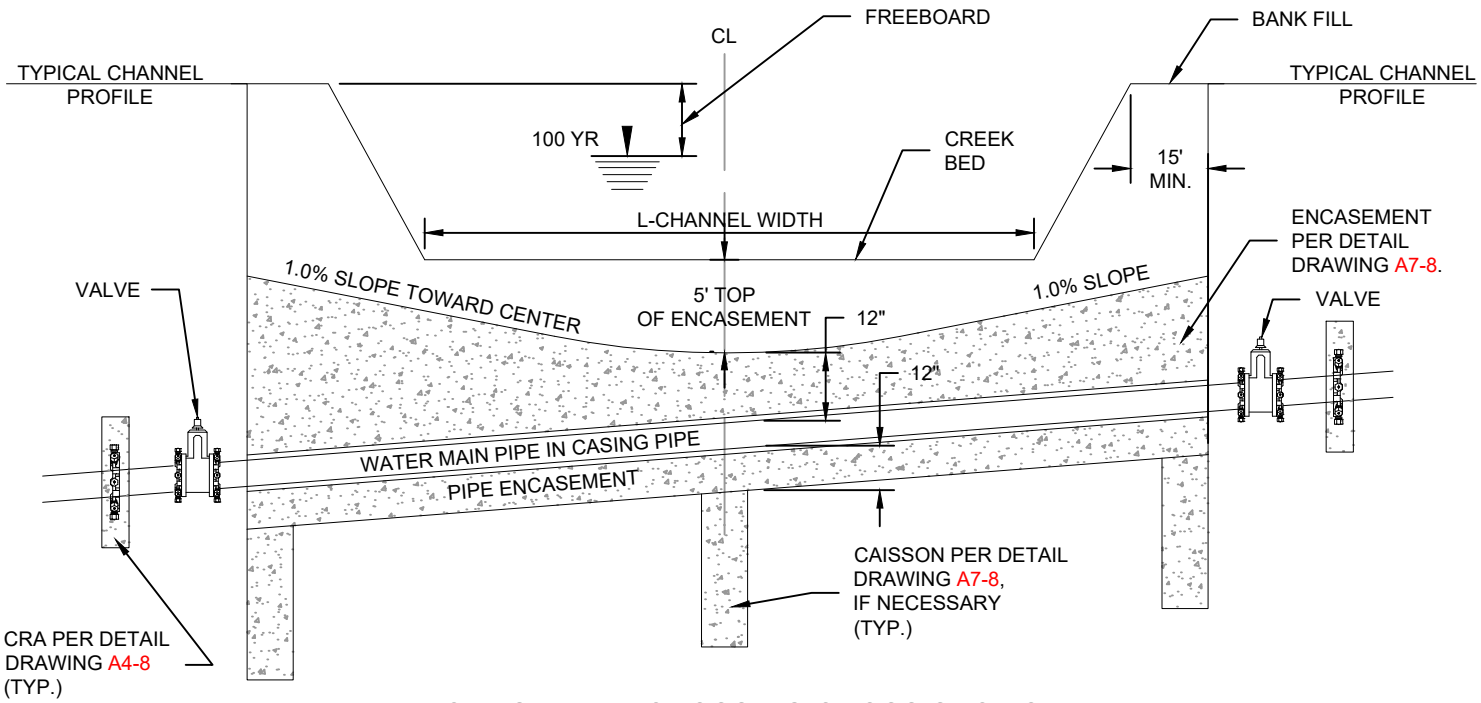
1. ALL FLOWABLE-FILL SHALL BE IN CONFORMANCE WITH CHAPTER 4.
2. SEE SECTION 2.6.G FOR UTILITY CROSSING STANDARDS.

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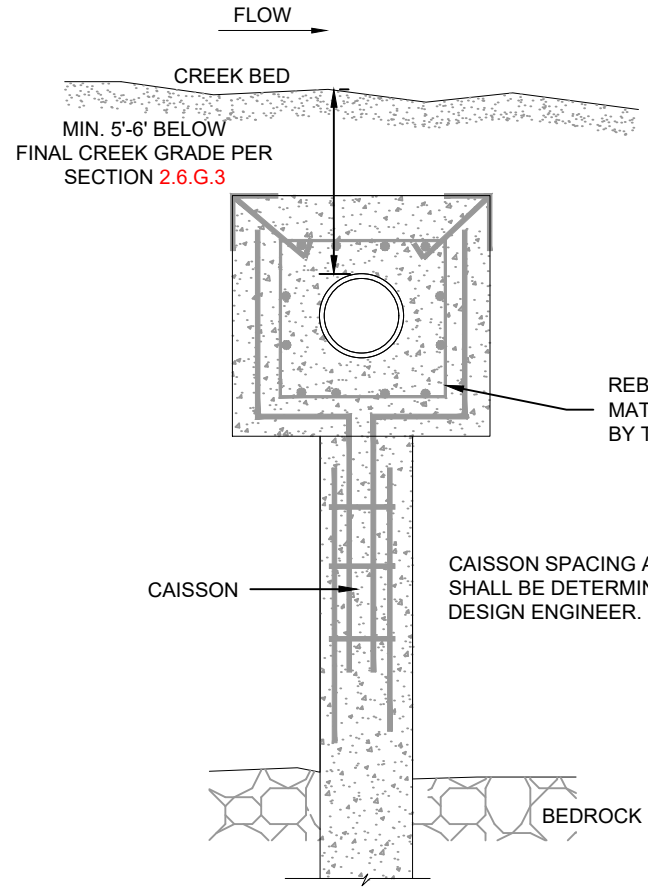
PIPE BRIDGING DETAIL
W/CONCRETE CRADLES

A7-6

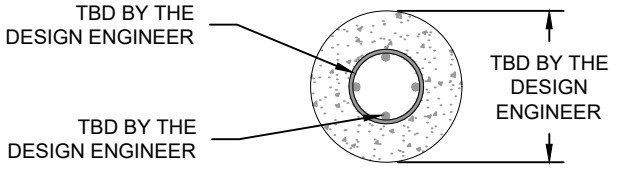
DATED 03/2014



TYPICAL STREAM CROSSING CROSS SECTION



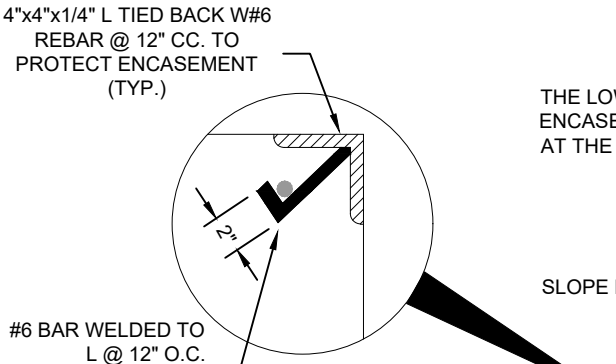
CONCRETE ENCASEMENT DETAIL WITH CAISSON



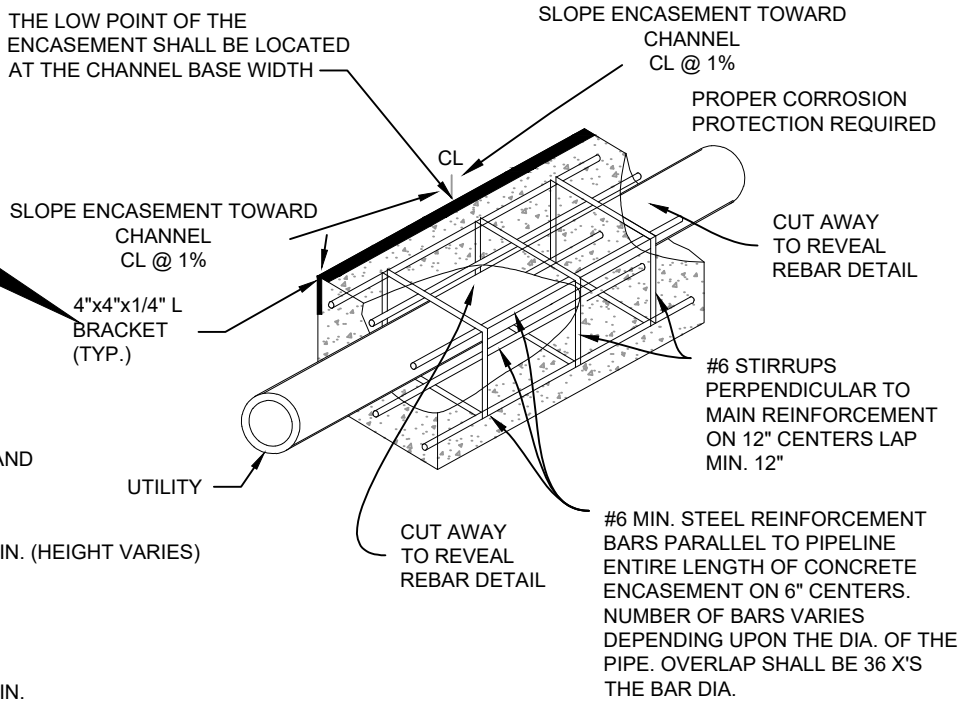
CAISSON CROSS SECTION

STREAM CROSSING NOTES:

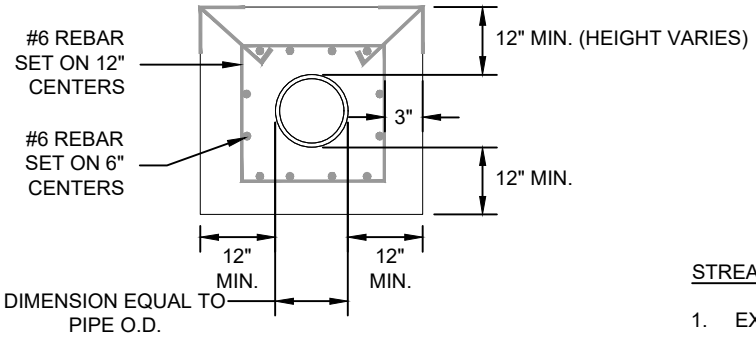
1. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES INSPECTOR'S DIRECTIONS.
2. ALL STREAM CROSSINGS SHALL BE REVIEWED AND APPROVED BY COLORADO SPRINGS UTILITIES PLANNING AND ENGINEERING.
3. CONCRETE ENCASEMENT OF THE WATER MAIN IS NOT REQUIRED WHEN CROSSING FORMED CONCRETE CHANNELS. CASING PIPE IS STILL REQUIRED.



L BRACKET DETAIL



LINED STEEL OR DUCTILE IRON PIPE POLYWRAPPED AND BONDED PRIOR TO PLACEMENT OF CONCRETE.

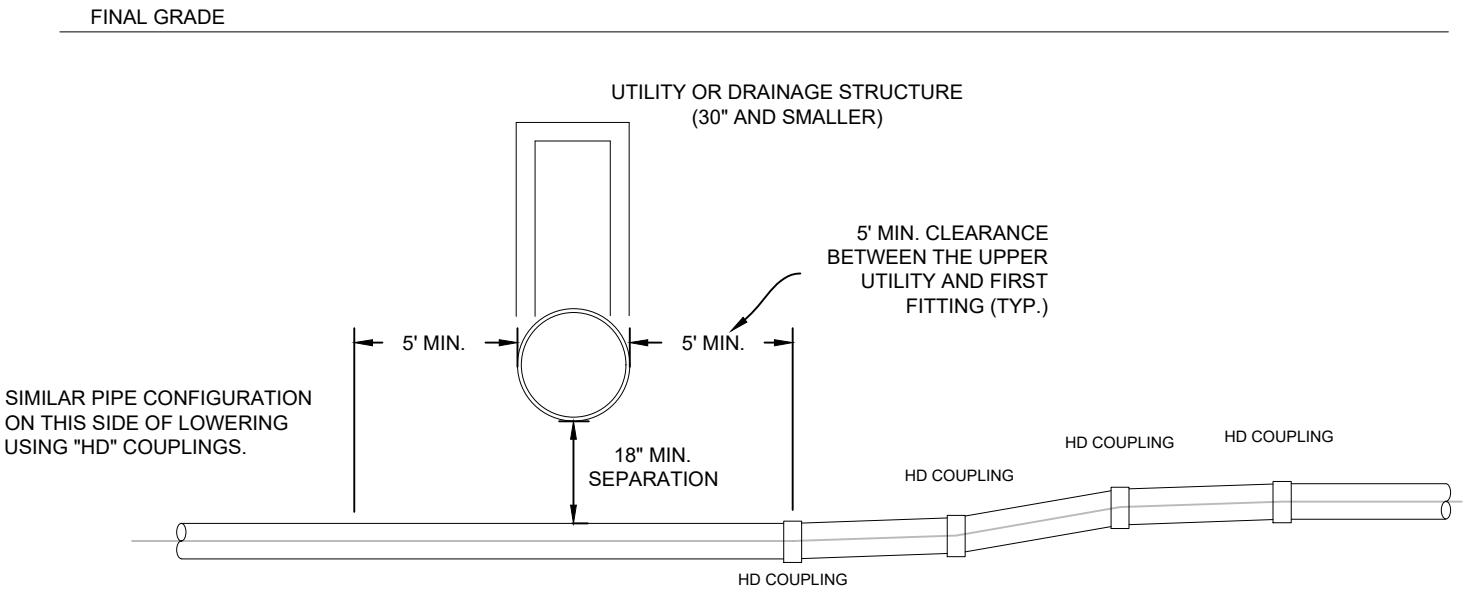


CONCRETE ENCASEMENT DETAIL WITHOUT CAISSON

STREAM CROSSING NOTES:

1. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES INSPECTOR'S DIRECTIONS.
2. ALL STREAM CROSSINGS SHALL BE REVIEWED AND APPROVED BY COLORADO SPRINGS UTILITIES PLANNING AND ENGINEERING.
3. CONCRETE ENCASEMENT OF THE WATER MAIN IS NOT REQUIRED WHEN CROSSING FORMED CONCRETE CHANNELS. CASING PIPE IS STILL REQUIRED.

EXAMPLE OF A SLIP JOINT OF PVC PIPE WITH HIGH DEFL COUPLINGS



HIGH DEFLECTION COUPLING (4"-12") 4° DEFL.
(i.e. MAX. 2° IN AND OUT OF COUPLING)
(REFERENCE DETAIL DRAWING A4-1)

NOTE:

1. MINIMUM PIPE LENGTH 5' BETWEEN EACH HD COUPLING.

ELEVATION

PER SLIP JOINT OF PVC PIPE W/HIGH DEFLECTION COUPLINGS

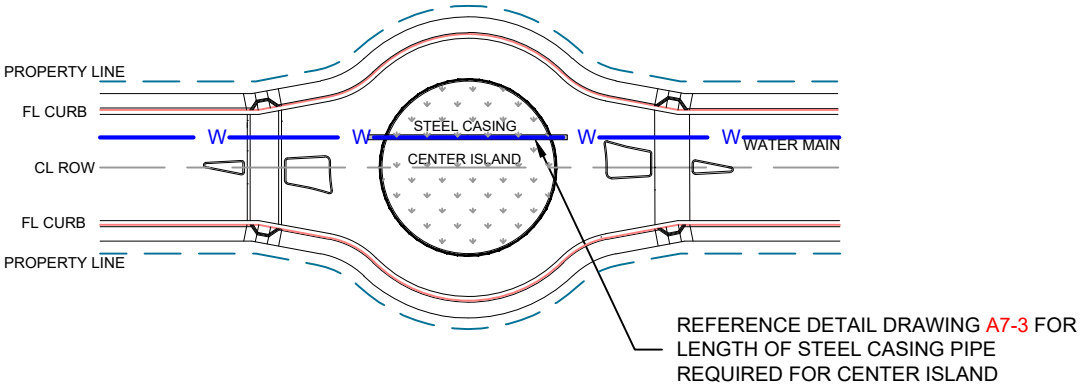
	PIPE DATA	MFRS. TOTAL JOINT DEFL.W/ COUPL.	DESIGN DEFLECTION (80% MAX.)		MIN. RADIUS FOR DEFLECTING CURVES WITH HIGH DEFL. COUPLINGS
	PIPE SIZE		(HORZ. DEFL.)	(VERT. DEFL.)	20'L
CLASS 305 (DR-14)	4"	5°00'	4°00'	6.99%	286'
	6"	5°00'	4°00'	6.99%	286'
	8"	5°00'	4°00'	6.99%	286'
	12"	5°00'	4°00'	6.99%	286'
CLASS 235 (DR-18)	NO DEFLECTION COUPLINGS FOR 16" OR GREATER				

DATA FOR PVC PIPES

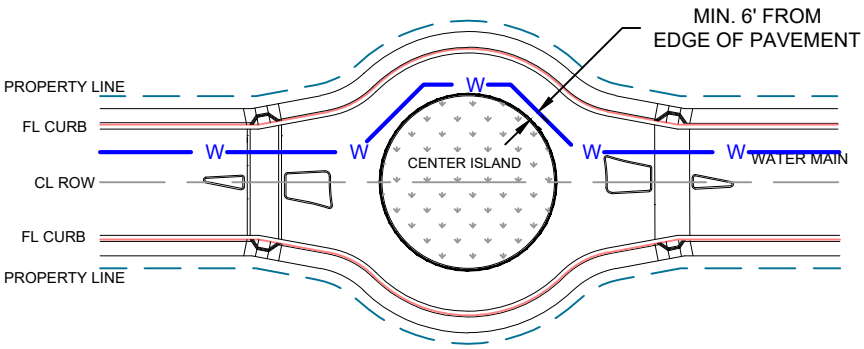
NOTES:

1. SEE DETAIL DRAWING A4-1 DETAIL FOR HORIZONTAL RADIUS.

EXAMPLE A



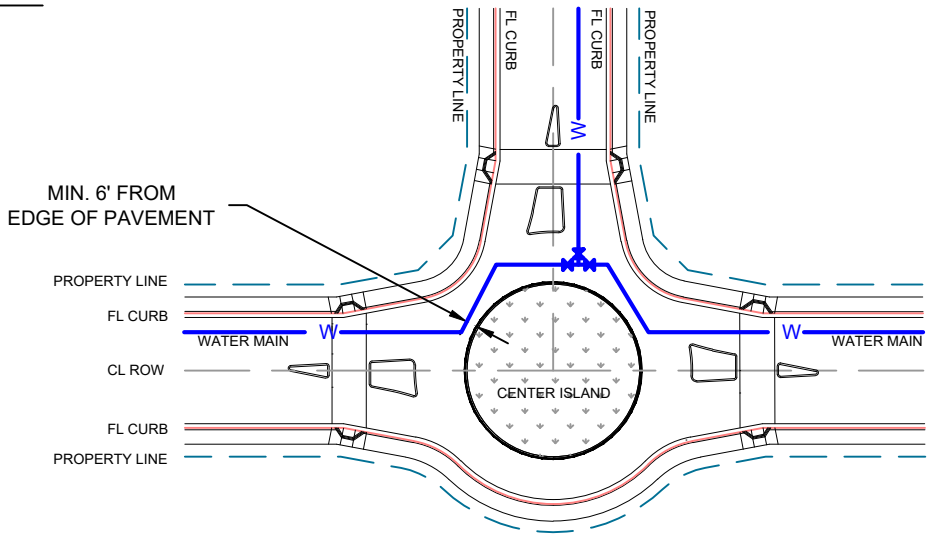
EXAMPLE B



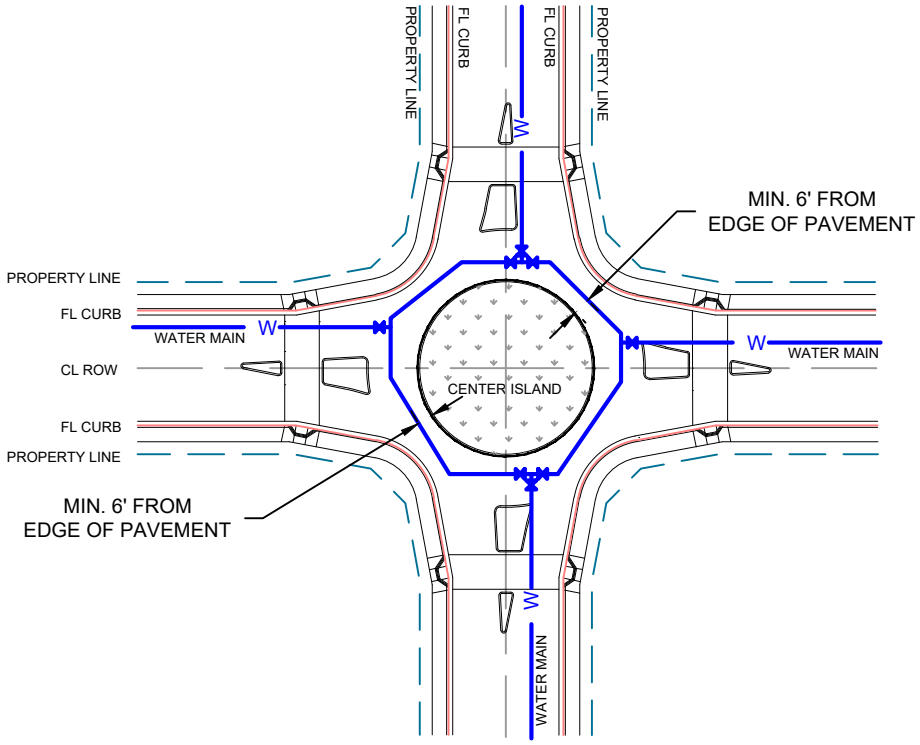
NOTES:

1. REFERENCE SECTION 2.6.G, FOR DESIGN REQUIREMENTS.
2. ROUNDABOUTS SHALL BE DESIGNED PER THE CITY OF COLORADO SPRINGS TRAFFIC CRITERIA MANUAL.
3. MAINTAIN A MINIMUM OF 6' FROM THE EDGE OF PAVEMENT TO CENTERLINE OF WATER MAIN.
4. SEE DETAIL DRAWINGS A3-1 THRU A3-10 FOR LOCATION OF UTILITIES IN THE RIGHT OF WAY.
5. SERVICE TAPS SHALL BE LOCATED A MINIMUM OF 15 FT OUTSIDE THE ROUNDABOUT.

EXAMPLE C



EXAMPLE D



NOTES:

1. REFERENCE SECTION 2.6.G, FOR DESIGN REQUIREMENTS.
2. ROUNDABOUTS SHALL BE DESIGNED PER THE CITY OF COLORADO SPRINGS TRAFFIC CRITERIA MANUAL.
3. MAINTAIN A MINIMUM OF 6' FROM THE EDGE OF PAVEMENT TO CENTERLINE OF WATER MAIN.
4. SEE DETAIL DRAWINGS A3-1 THRU A3-10 FOR LOCATION OF UTILITIES IN THE RIGHT OF WAY.
5. SERVICE TAPS SHALL BE LOCATED A MINIMUM OF 15 FT OUTSIDE THE ROUNDABOUT.

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TYPICAL ROUNDABOUT DETAIL

A7-11

DATED 03/2014

FIELD INSTALLATION OF POLYETHYLENE TUBING FOR DIP PIPE AND FITTINGS

STEP 1:

PLACE TUBE OF POLYETHYLENE MATERIAL ON PIPE PRIOR TO LOWERING IT INTO TRENCH.

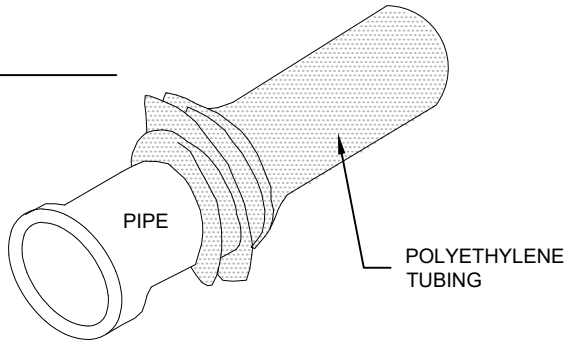
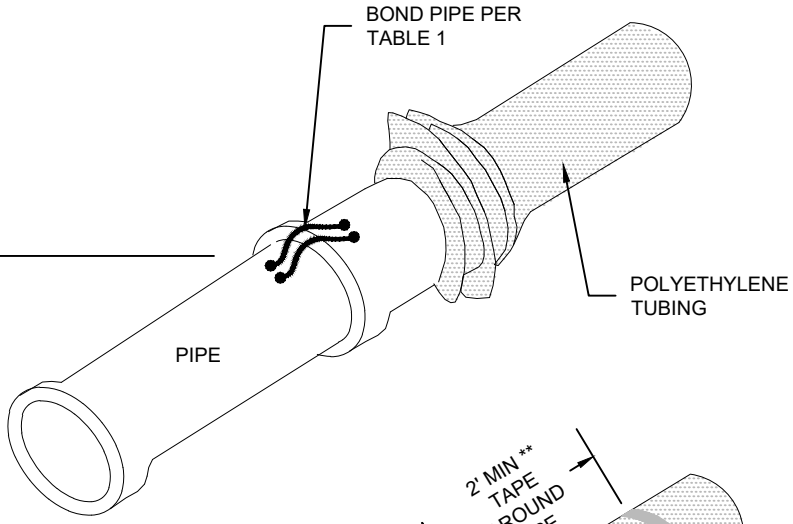


TABLE 1 SUITABLE CONDUCTOR SIZES FOR JOINT BONDING OF DUCTILE IRON PIPE		
PIPE SIZE (IN)	QUANTITY - SIZE OF BOND	SIZE OF CHARGE (G)
3 TO 14	1 - #8 STRANDED OR SOLID	25
16 to 36	2 - #8 STRANDED OR SOLID	25
	1 - BONDING STRAP	15
42 TO 64	2 - #4 STRANDED OR SOLID	32
	4 - #8 STRANDED OR SOLID	25

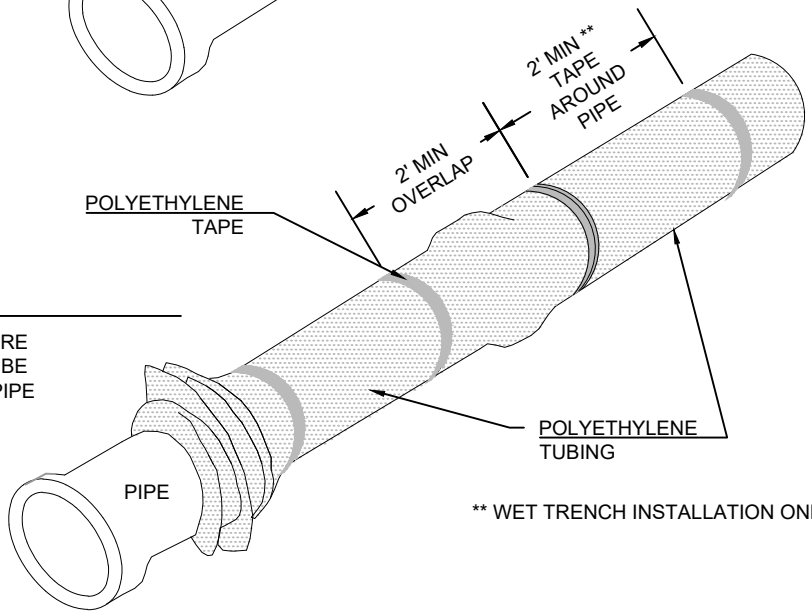
STEP 2:

INSTALL BONDING STRAP OR WIRE AT EVERY JOINT OF PIPE PRIOR TO WRAPPING. PULL TUBE OVER THE LENGTH OF THE PIPE. TAPE TUBE TO END AT JOINT. FOLD MATERIAL AROUND THE ADJACENT SPIGOT END AND WRAP WITH TAPE TO HOLD THE PLASTIC TUBE IN PLACE.



STEP 3:

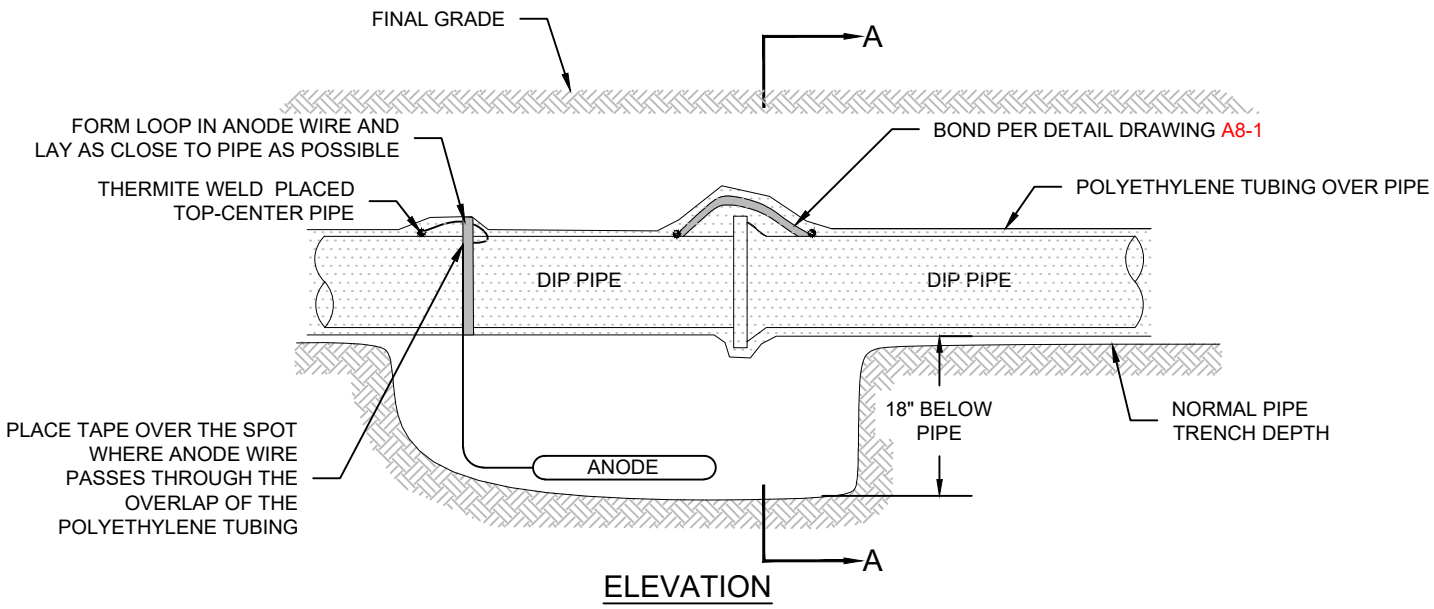
OVERLAP FIRST TUBE WITH ADJACENT TUBE AND SECURE WITH PLASTIC ADHESIVE TAPE. THE POLYETHYLENE TUBE MATERIAL SHALL BE NEATLY DRAWN UP AROUND THE PIPE BARREL FOLDED ON TOP OF PIPE AND TAPED IN PLACE



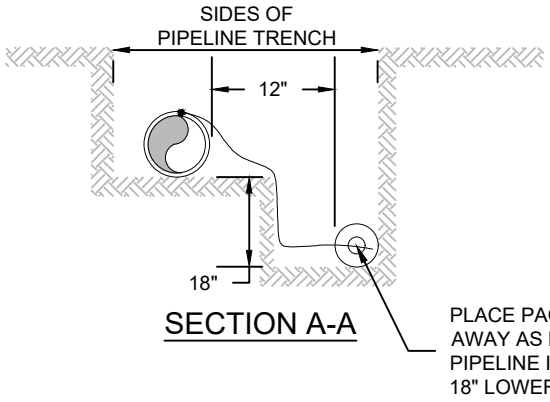
** WET TRENCH INSTALLATION ONLY

NOTES:

1. ANY TEARS OR HOLES SHALL BE REPAIRED WITH POLYETHYLENE TUBING AND TAPE.
2. WHEN WORKING AROUND EXISTING POLY WRAPPED PIPE, ANY TEARS AS A RESULT OF CONSTRUCTION SHALL BE REPAIRED.
3. WHEN WORKING AROUND EXISTING BONDED PIPE, ANY BROKEN BONDS AS A RESULT OF CONSTRUCTION, SHALL BE REPAIRED.



ELEVATION



SECTION A-A

NOTES:

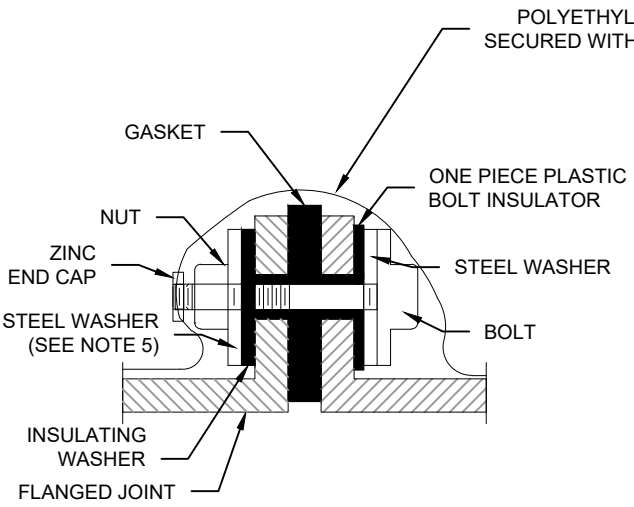
1. THERMITE WELD ANODE TO PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
2. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
3. PACKED ANODE SHOULD BE COVERED WITH FINE SOIL CONTAINING NO ROCKS OR DIRT CLUMPS AND SHALL BE HAND TAMPED TO THE BOTTOM OF THE PIPE FOR COMPACTION.
4. ANODE WITH BROKEN BAGS SHALL NOT BE USED.
5. ANODES SHALL BE REMOVED FROM PLASTIC PACKAGING.
6. IT IS NOT NECESSARY TO WET THE ANODES.
7. DIP PIPE SHALL BE ENCASED IN POLYETHYLENE TUBING PER DETAIL DRAWING A8-1.

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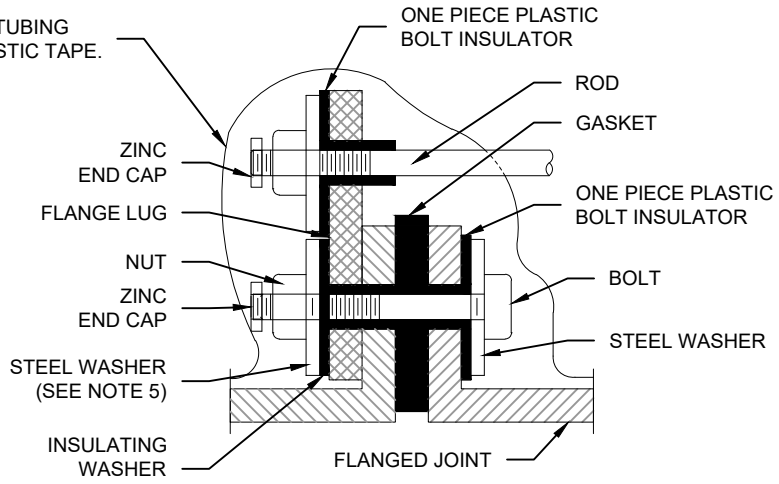
BONDING JOINT AND ANODE INSTALLATION

A8-2

DATED 06/2015

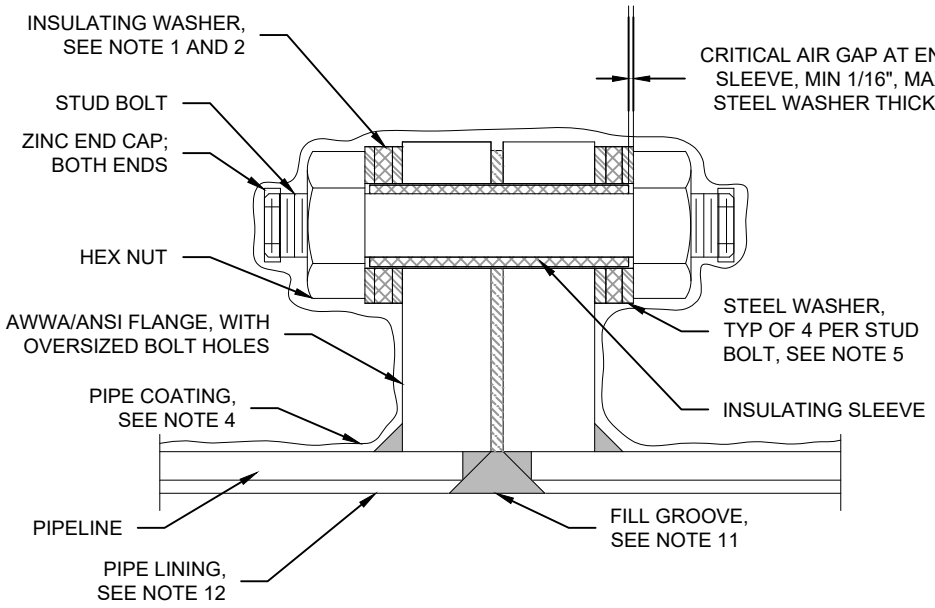


INSULATED FLANGE JOINT

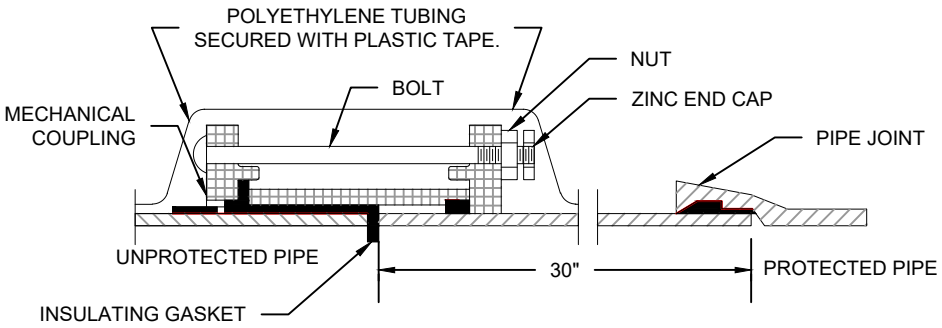


INSULATED TIE BACK ROD

(WITH APPROVAL OF COLORADO SPRINGS UTILITIES)



INSULATED STEEL COUPLING

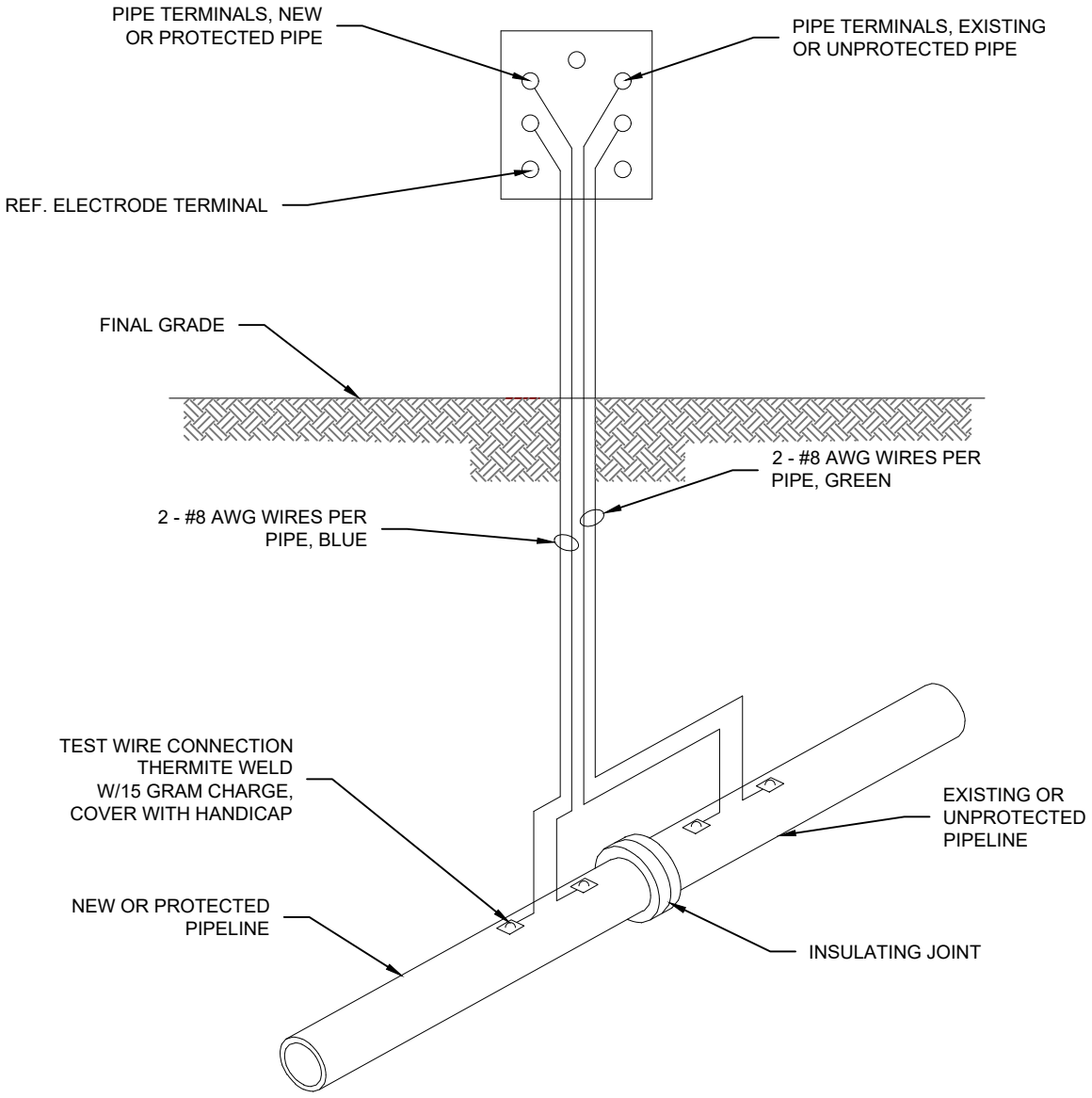


INSULATED MECHANICAL COUPLING

NOTES:

1. PROVIDE INSULATING KIT FOR APPLICABLE FLANGE TYPE AND PRESSURE RATING.
2. INSTALL DOUBLE INSULATING WASHER SET FOR VAULT OR EXPOSED FLANGES.
3. INSTALL SINGLE INSULATING WASHER SET FOR BURIED OR SUBMERGED FLANGES WITH INSULATORS OR WRAP ON UNPROTECTED SIDE OF FLANGE.
4. COAT BURIED OR IMMERSED INSULATING FLANGES FOR 12-INCHES MINIMUM ON EACH SIDE OF FLANGE.
5. FOR PIPE LESS THAN 36-INCHES DIAMETER, DO NOT INSTALL INNER STEEL WASHERS.
6. TEST COMPLETED JOINT FOR ELECTRICAL ISOLATION AND REPAIR AS REQUIRED.
7. CARE SHOULD BE TAKEN TO INSURE THAT THE TIE-BACK BOLTS DO NOT, ALONG THEIR LENGTH, CONTACT ANY PART OF THE PIPE APPURTENANCES.
8. INSULATION KITS SHALL BE INSTALLED PER MANUFACTURER RECOMMENDATIONS.
9. CONTINUITY TESTING SHALL BE ACCOMPLISHED PRIOR TO FINAL ACCEPTANCE.
10. TEST STATIONS SHALL BE INSTALLED AT INSULATING COUPLINGS PER DETAIL DRAWING A8-4.
11. FILL INTERIOR GAP BETWEEN FLANGES WITH DIELECTRIC FILLER OF SEALANT COMPATIBLE WITH SPECIFIED PIPE LINING.
12. EXTEND SPECIFIED PIPE LINING TO FACE OF FLANGE AND COAT INTERIOR OF MORTAR LINED PIPE FOR TWO PIPE DIAMETERS WITH NSF APPROVED EPOXY AT 20 MILS DFT.

TERMINAL BOARD WIRING DIAGRAM



NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE THE TERMINAL BOARD.
2. THERMITE WELD WIRES TO PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
4. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.

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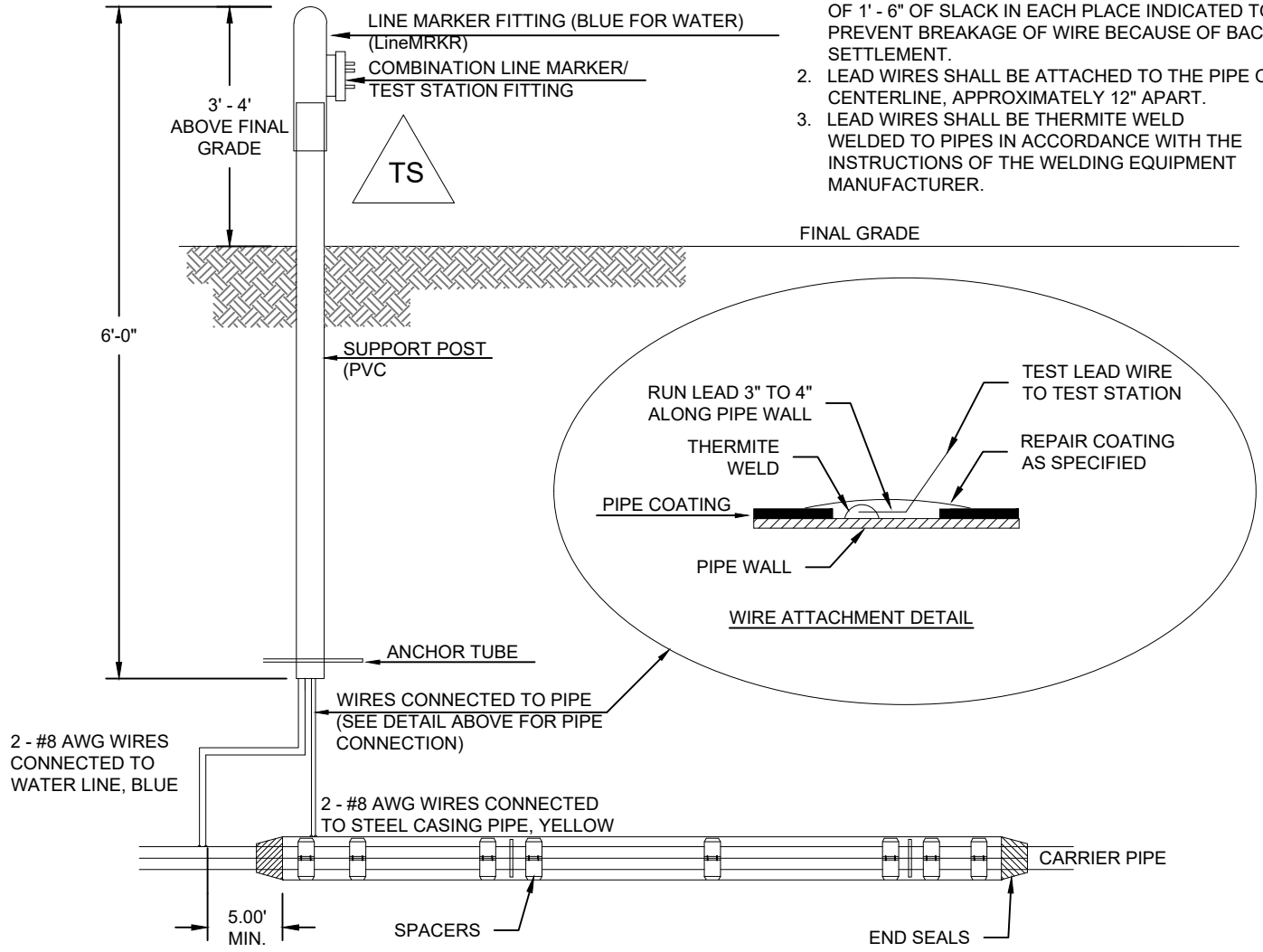
INSTALLATION OF CATHODIC PROTECTION TEST STATION AT AN INSULATING JOINT

A8-4

DATED 07/2022

NOTES:

1. ALL LEAD WIRES SHALL BE INSTALLED WITH A MINIMUM OF 1' - 6" OF SLACK IN EACH PLACE INDICATED TO PREVENT BREAKAGE OF WIRE BECAUSE OF BACKFILL SETTLEMENT.
2. LEAD WIRES SHALL BE ATTACHED TO THE PIPE ON THE CENTERLINE, APPROXIMATELY 12" APART.
3. LEAD WIRES SHALL BE THERMITE WELD WELDED TO PIPES IN ACCORDANCE WITH THE INSTRUCTIONS OF THE WELDING EQUIPMENT MANUFACTURER.



TYPICAL DETAIL FOR TEST STATION WITH STEEL SLEEVE INSTALLATION

NOTES:

1. THE CASING SHALL BE CATHODICALLY PROTECTED UNDER THE DIRECTION OF THE COLORADO SPRINGS UTILITIES INSPECTOR. SEE SECTION 2.6.H.
2. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES INSPECTORS' DIRECTION.
3. REFERENCE STANDARD DETAIL DRAWING A7-3 - STEEL CASING INSTALLATION.
4. CONTRACTOR TO COORDINATE W/ COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
5. THERMITE WELD WIRES TO DIP/CIP PIPE W/ 15 GRAM CHARGE. INSTALL COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
6. THERMITE WELD WIRES TO STEEL PIPE W/ 25 GRAM CHARGE. INSTALL COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
7. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
8. CONTRACTOR TO VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.

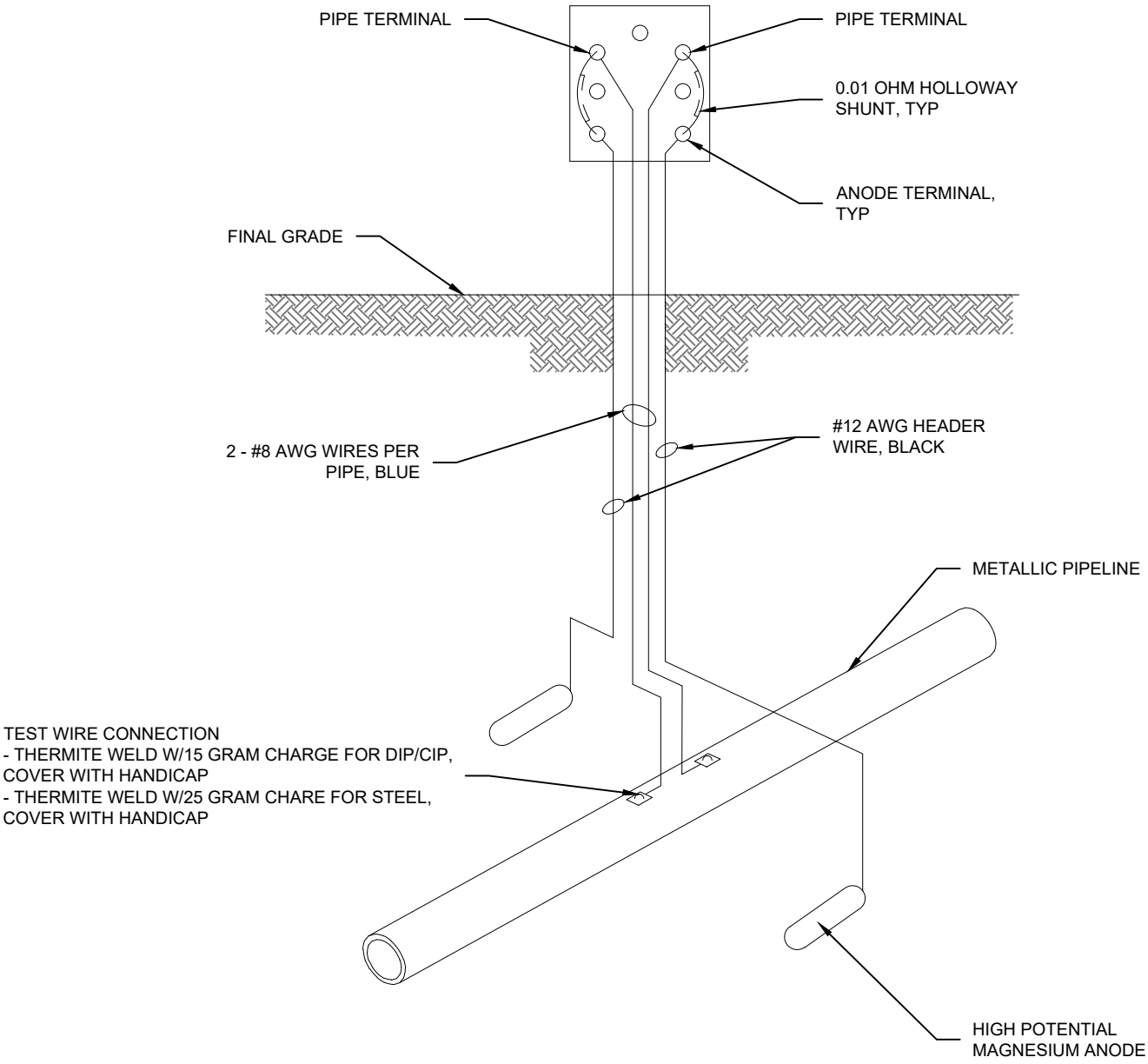
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INSTALLATION OF CATHODIC PROTECTION TEST STATION AT A CASING PIPE

A8-5

DATED 07/2022

TERMINAL BOARD WIRING DIAGRAM

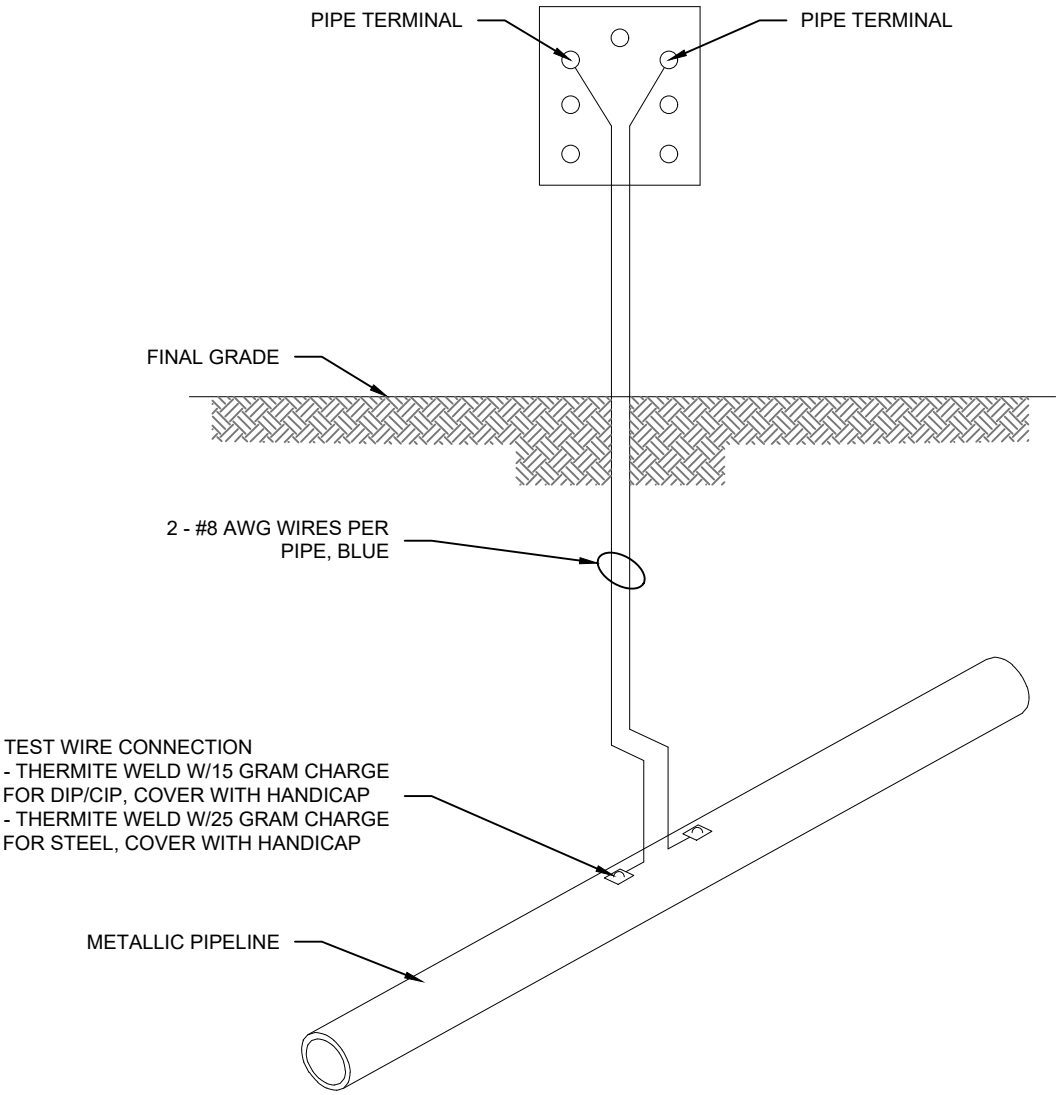


NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO DIP/CIP PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD WIRES TO STEEL PIPE WITH A 25 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
4. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
5. CONTRACTOR TO VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.

Colorado Springs Utilities It's how we're all connected	INSTALLATION OF CATHODIC PROTECTION TEST STATION AT AN ANODE	A8-6 DATED 07/2022

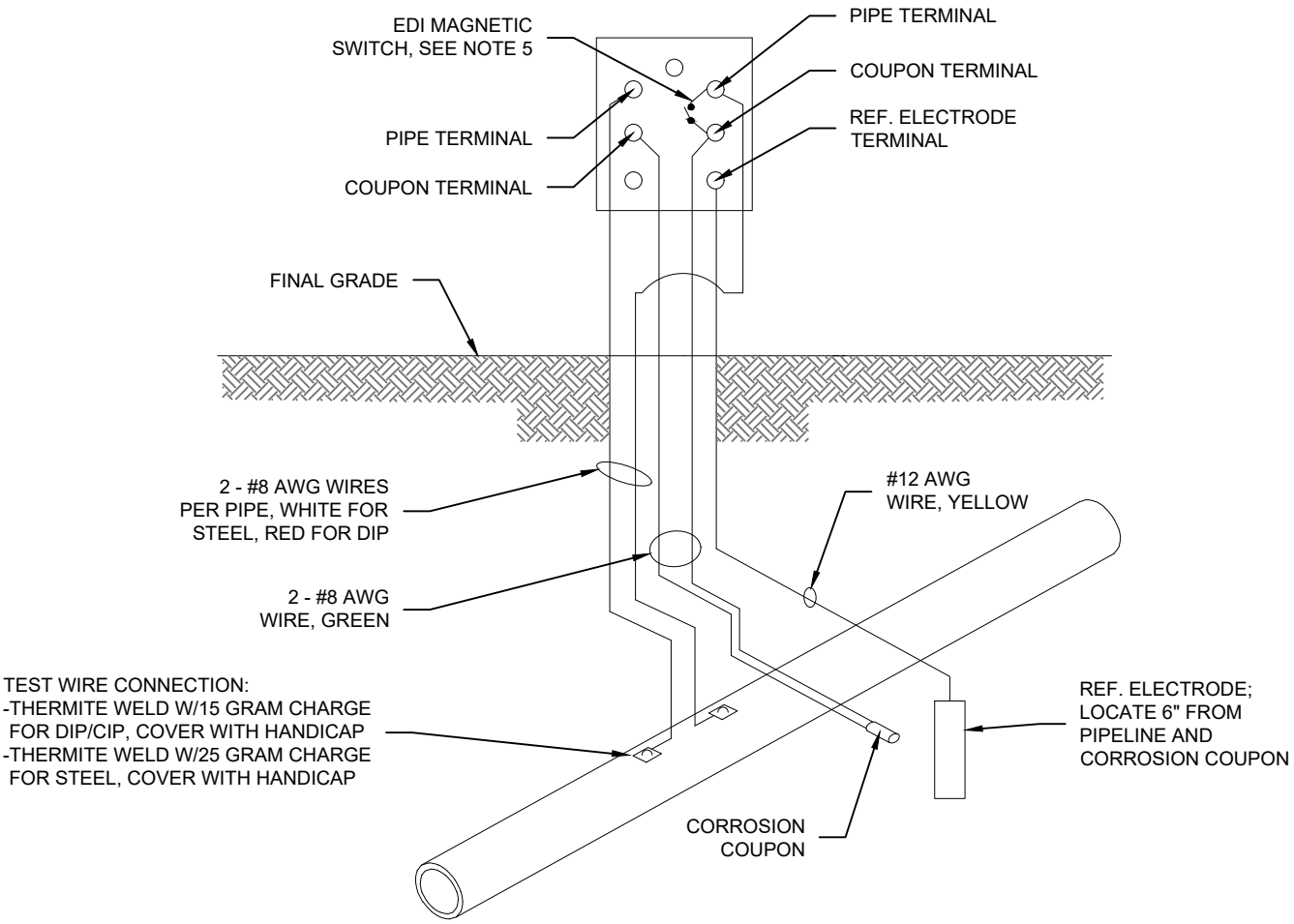
TERMINAL BOARD
WIRING DIAGRAM



NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO DIP/CIP PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD WIRES TO STEEL PIPE WITH A 25 GRAM CHARGE. INSTALL A COPPER SLEEE WHEN WIRE IS #10 OR SMALLER.
4. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
5. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.

TERMINAL BOARD WIRING DIAGRAM

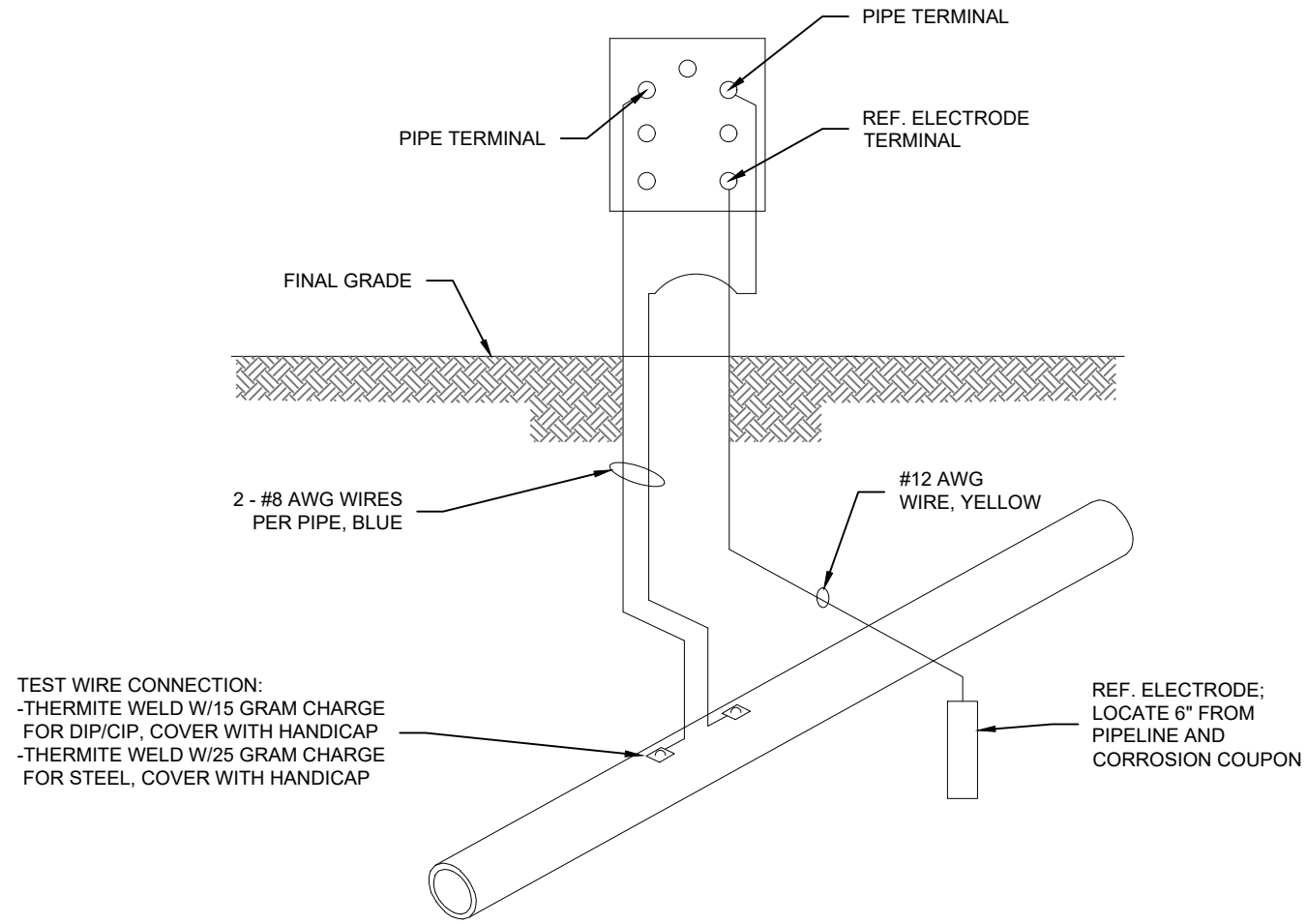


NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO PIPE WITH A 15 GRAM CHARGE FOR DIP/CIP. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD WIRES TO PIPE WITH 25 GRAM CHARGE FOR STEEL. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
4. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
5. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.
6. REMOVE MAGNETIC SWITCH FOR A REMOTE TERMINAL UNIT (RTU).

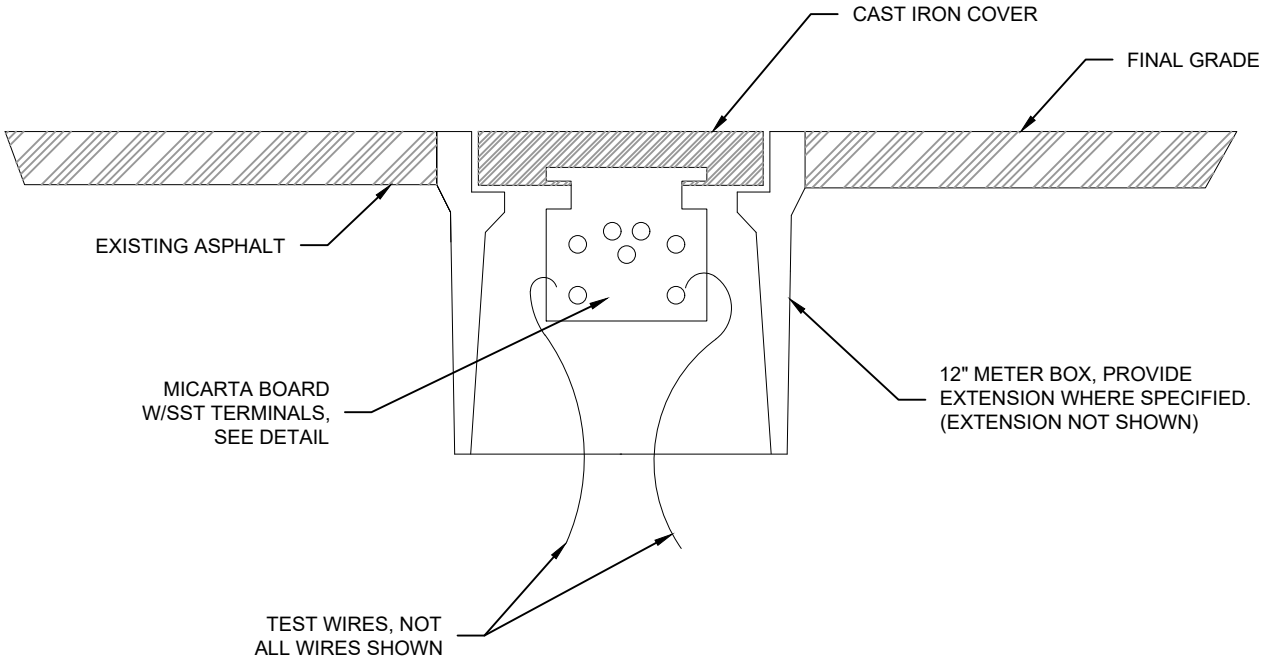
Colorado Springs Utilities It's how we're all connected	INSTALLATION OF CATHODIC PROTECTION TEST STATION WITH A CORROSION COUPON	A8-8A DATED 01/2018

TERMINAL BOARD WIRING DIAGRAM



NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO PIPE WITH A 15 GRAM CHARGE FOR DIP/CIP. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD WIRES TO PIPE WITH 25 GRAM CHARGE FOR STEEL. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
4. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
5. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.
6. REMOVE MAGNETIC SWITCH FOR A REMOTE TERMINAL UNIT (RTU).

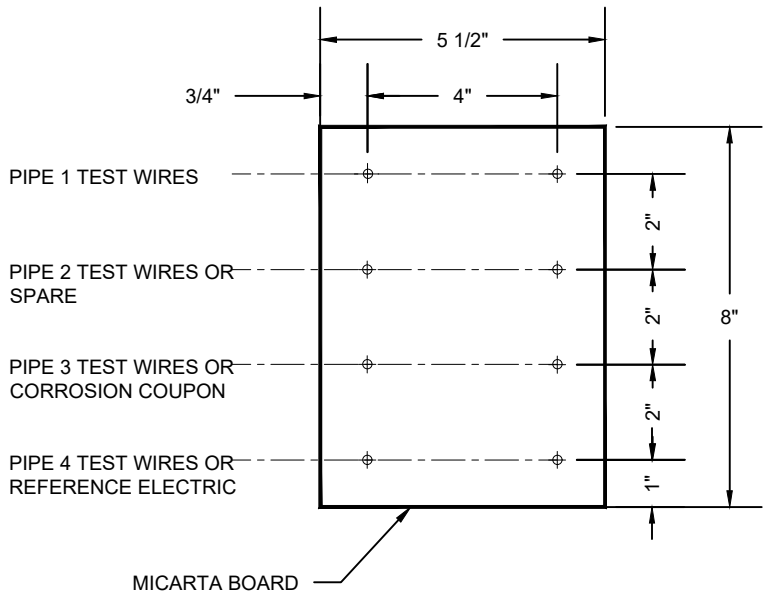


NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO DIP/CIP PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD WIRES TO STEEL PIPE WITH A 25 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
4. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
5. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.
6. COLOR CODE WIRE INSULATION AS SHOWN IN APPLICABLE TEST STATION DETAILS. CONNECT EACH TEST WIRE TO SEPARATE TERMINAL.
7. WIRE CONFIGURATION FOR FLUSH MOUNT STYLE TEST STATIONS SIMILAR TO POST MOUNT STYLE TEST STATIONS.
8. PROVIDE 18 INCHES SLACK IN TEST WIRES, MINIMUM.

NOTES:

1. TERMINALS SHALL BE 1/4" STAINLESS STEEL W/LOCKING WASHER, TWO FLAT WASHERS, AND DOUBLE NUTS.
2. ALL WIRE CONNECTIONS TO BE W/RING TONGUE COMPRESSION TERMINALS.
3. WIRES ON TEST STATIONS TO BE PERMANENTLY LABELED WITH PIPE IDENTIFICATION (i.e. 12" DIP) USING NYLON WIRE MARKER TAGS.

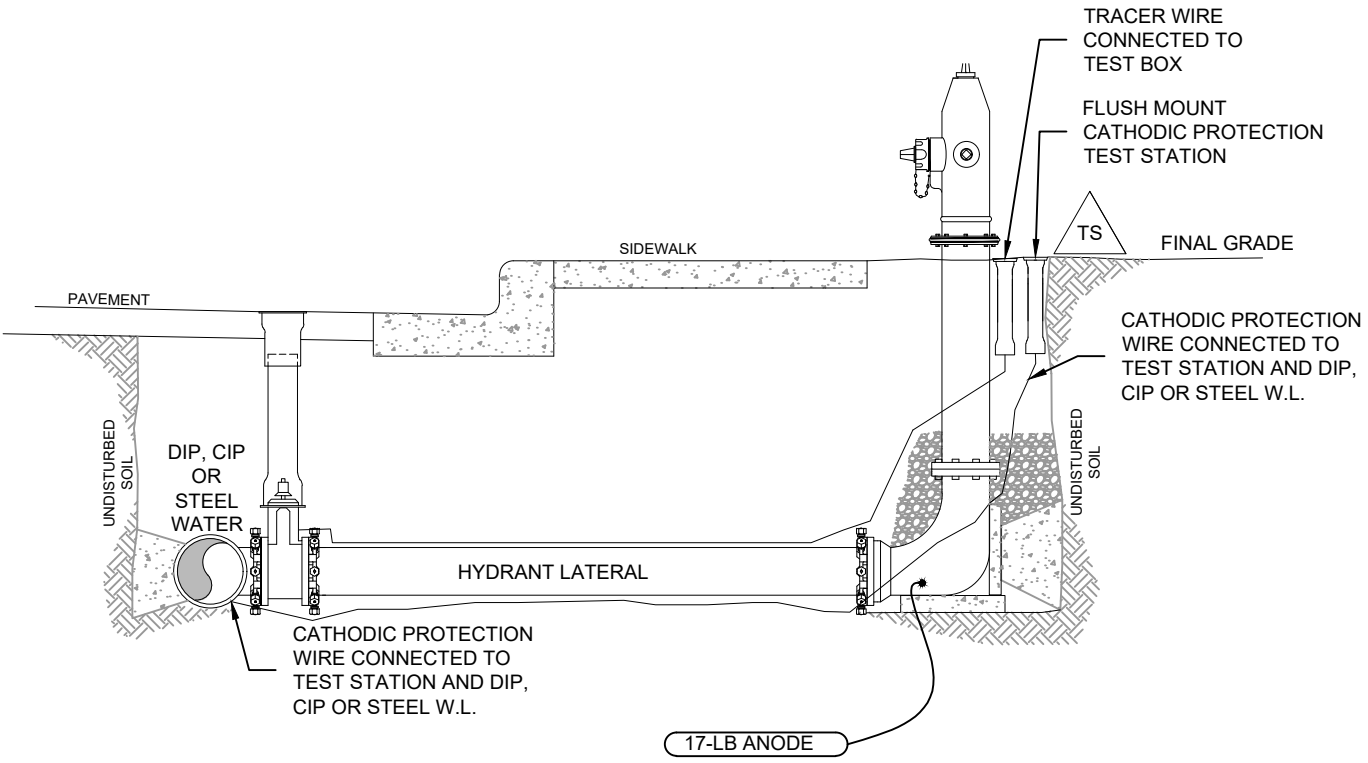


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TEST STATION
FLUSH MOUNT

A8-9

DATED 01/2018



CATHODIC PROTECTION WIRE CONNECTIONS FOR DIP, CIP OR STEEL W.L.

NOTES:

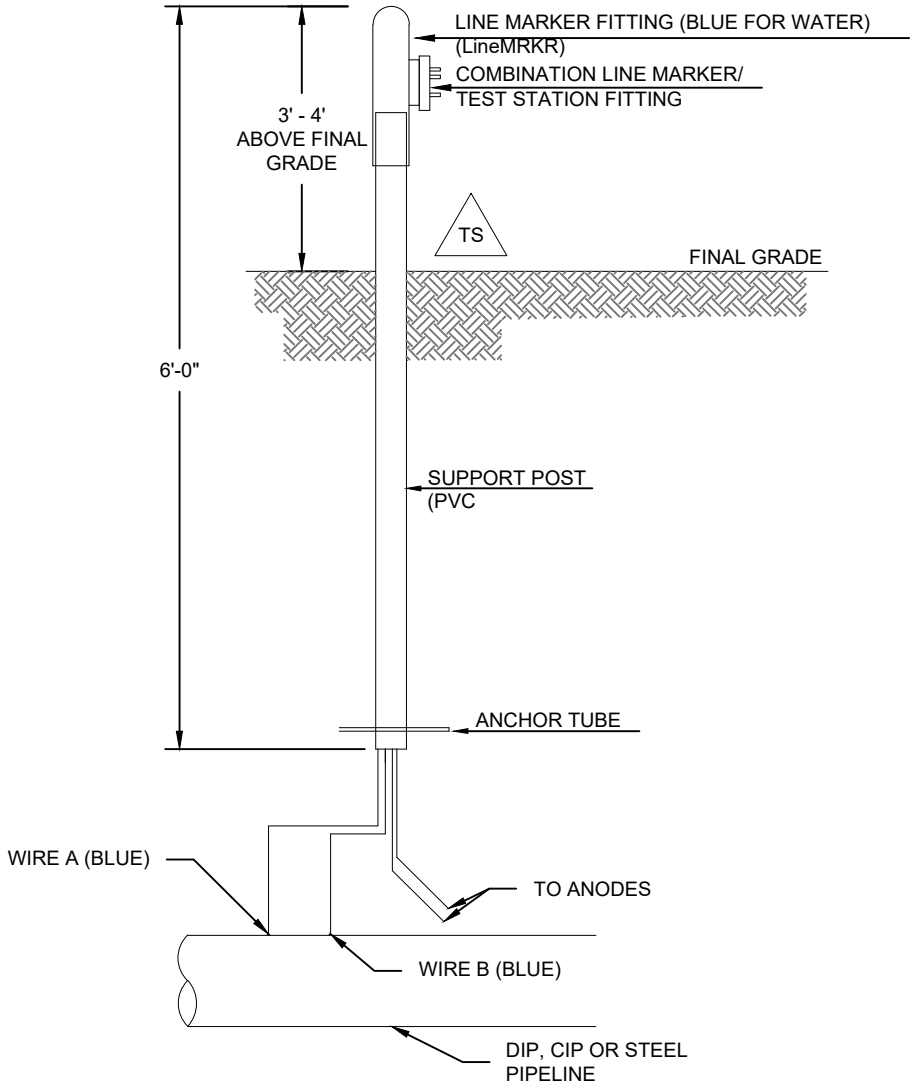
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2. THERMITE WELD WIRES TO DIP/CIP PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD WIRES TO STEEL PIPE WITH A 25 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
4. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
5. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.
6. COLOR CODE WIRE INSULATION AS SHOWN IN APPLICABLE TEST STATION DETAILS. CONNECT EACH TEST WIRE TO SEPARATE TERMINAL.
7. WIRE CONFIGURATION FOR FLUSH MOUNT STYLE TEST STATIONS SIMILAR TO POST MOUNT STYLE TEST STATIONS.
8. PROVIDE 18 INCHES SLACK IN TEST WIRES, MINIMUM.
9. SEE DETAIL DRAWING A5-3 FOR TYPICAL FIRE HYDRANT INSTALLATION.

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INSTALLATION OF CATHODIC PROTECTION TEST STATION FOR DIP, CIP AND STEEL WATER MAINS IN IMPROVED AREAS

A8-10

DATED 01/2018



NOTES:

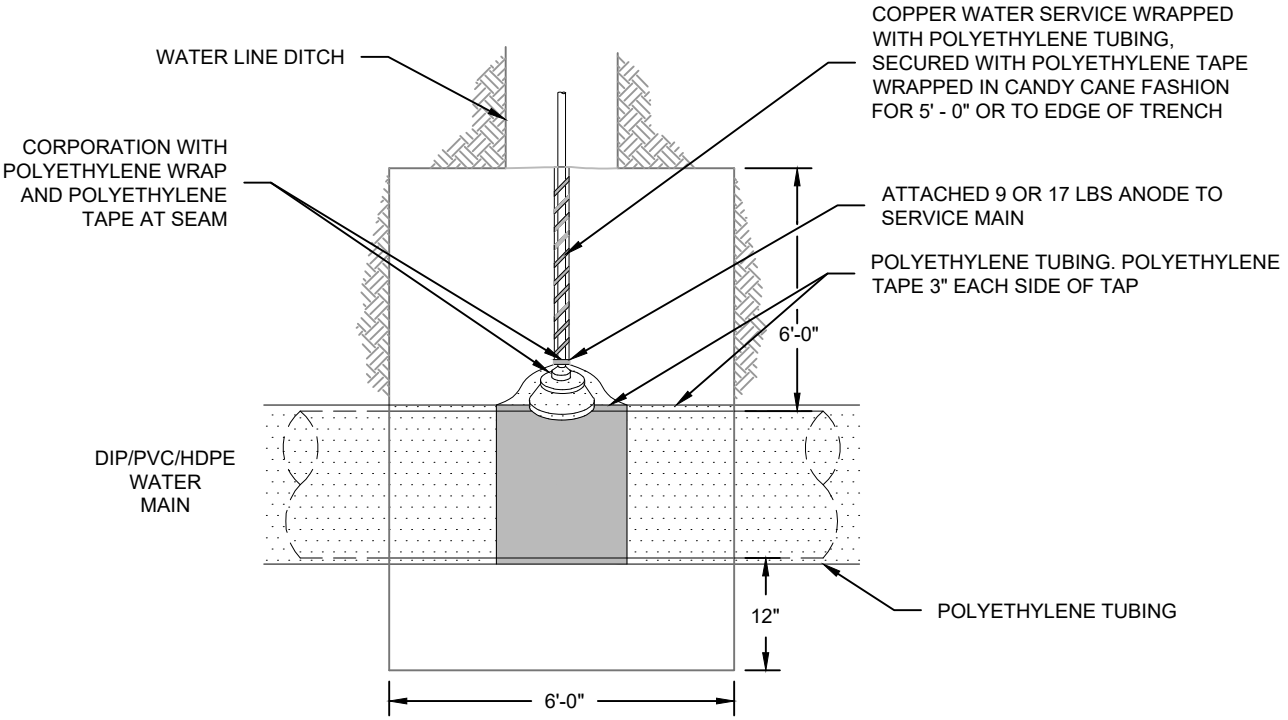
1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO DIP/CIP PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD WIRES TO STEEL PIPE WITH A 25 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
4. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
5. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.
6. COLOR CODE WIRE INSULATION AS SHOWN IN APPLICABLE TEST STATION DETAILS. CONNECT EACH TEST WIRE TO SEPARATE TERMINAL.
7. WIRE CONFIGURATION FOR FLUSH MOUNT STYLE TEST STATIONS SIMILAR TO POST MOUNT STYLE TEST STATIONS.
8. PROVIDE 18 INCHES SLACK IN TEST WIRES, MINIMUM.

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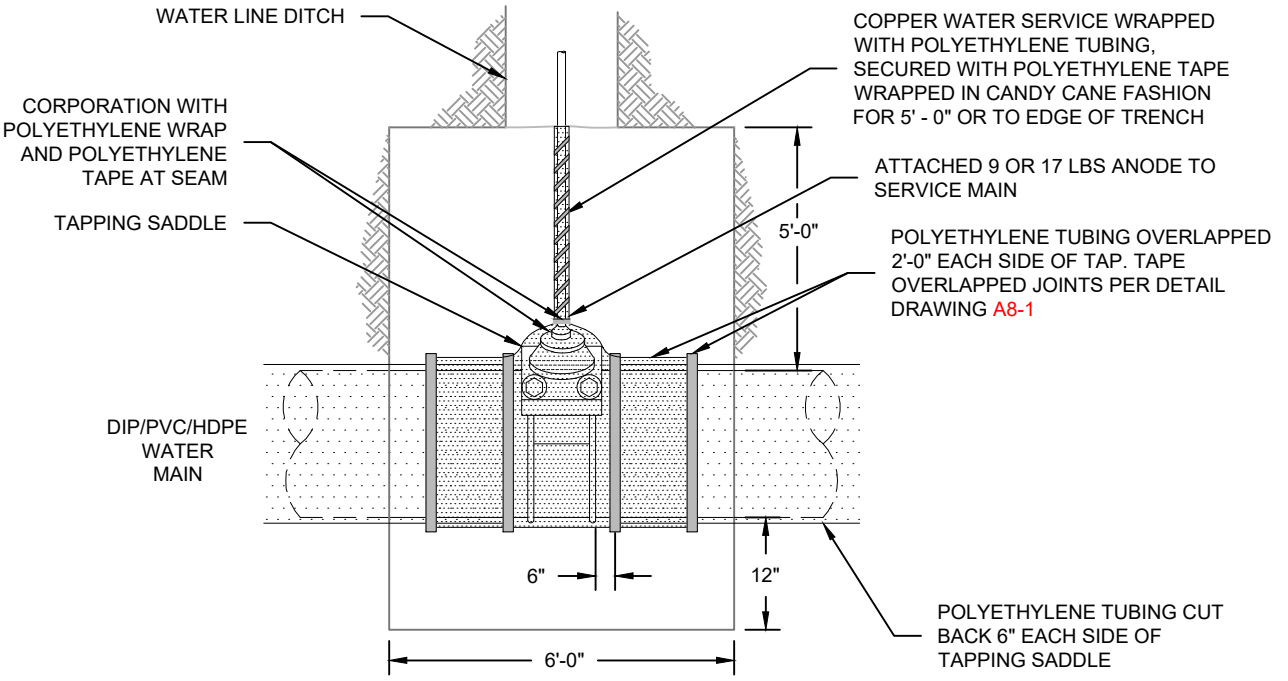
INSTALLATION OF POST MOUNT TEST STATION IN UNIMPROVED AREAS

A8-11

DATED 01/2018



TAPPING DETAIL FOR 1/2" THROUGH 1" CONNECTION

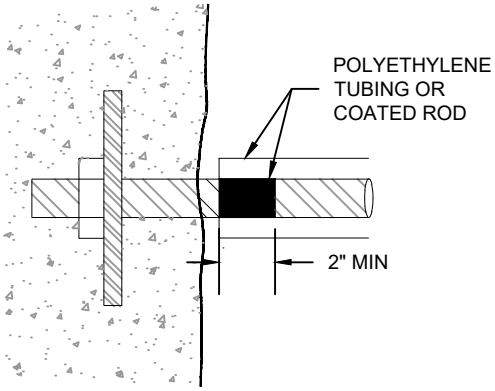


TAPPING DETAIL FOR 1 1/2" AND 2" CONNECTION

NOTES:

1. DO NOT WRAP OR WAX TAPE THE CURB STOP ON COPPER WATER SERVICE LINES.
2. HDPE WATER SERVICE CORPORATION STOP AND CURB STOP SHALL BE WRAPPED OR WAX TAPED PER SECTION 2.6.H.10.

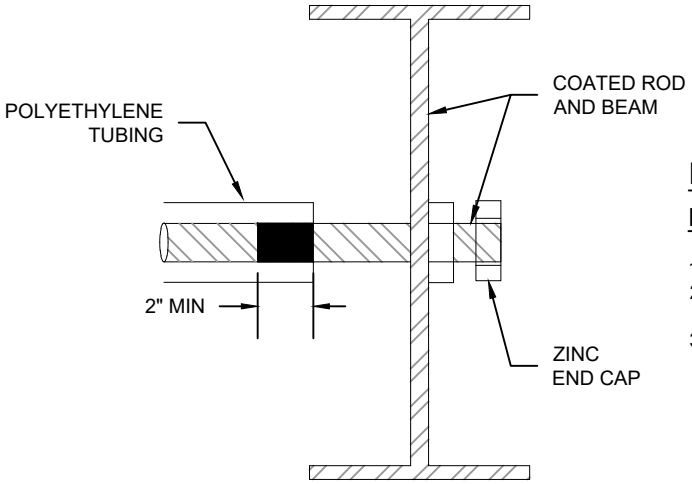
Colorado Springs Utilities It's how we're all connected	INSTALLATION OF CATHODIC PROTECTION ON WATER SERVICE LINES	A8-12 DATED 07/2022



METAL IN CONCRETE

NOTES:

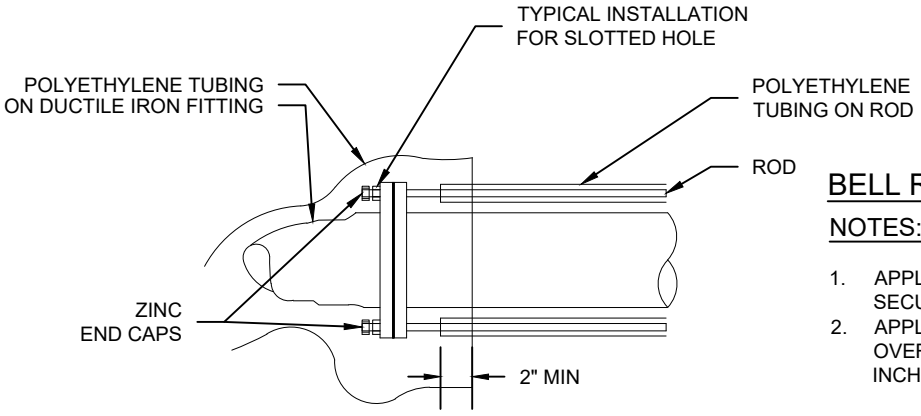
1. COAT METAL PARTS WHERE IN CONTACT WITH CONCRETE, EXTENDING COATING SEVERAL INCHES BEYOND THE CONCRETE, SEE SECTION 2.6.H.
2. APPLY POLYETHYLENE WRAP TO THE ROD, OVERLAPPING THE POLYETHYLENE WRAP AND COATING A MINIMUM OF 2 INCHES.
3. SECURE POLYETHYLENE WRAP TO THE ROD USING 2 INCH WIDE POLYETHYLENE PRESSURE-SENSITIVE TAPE.



ROD THROUGH I-BEAM

NOTES:

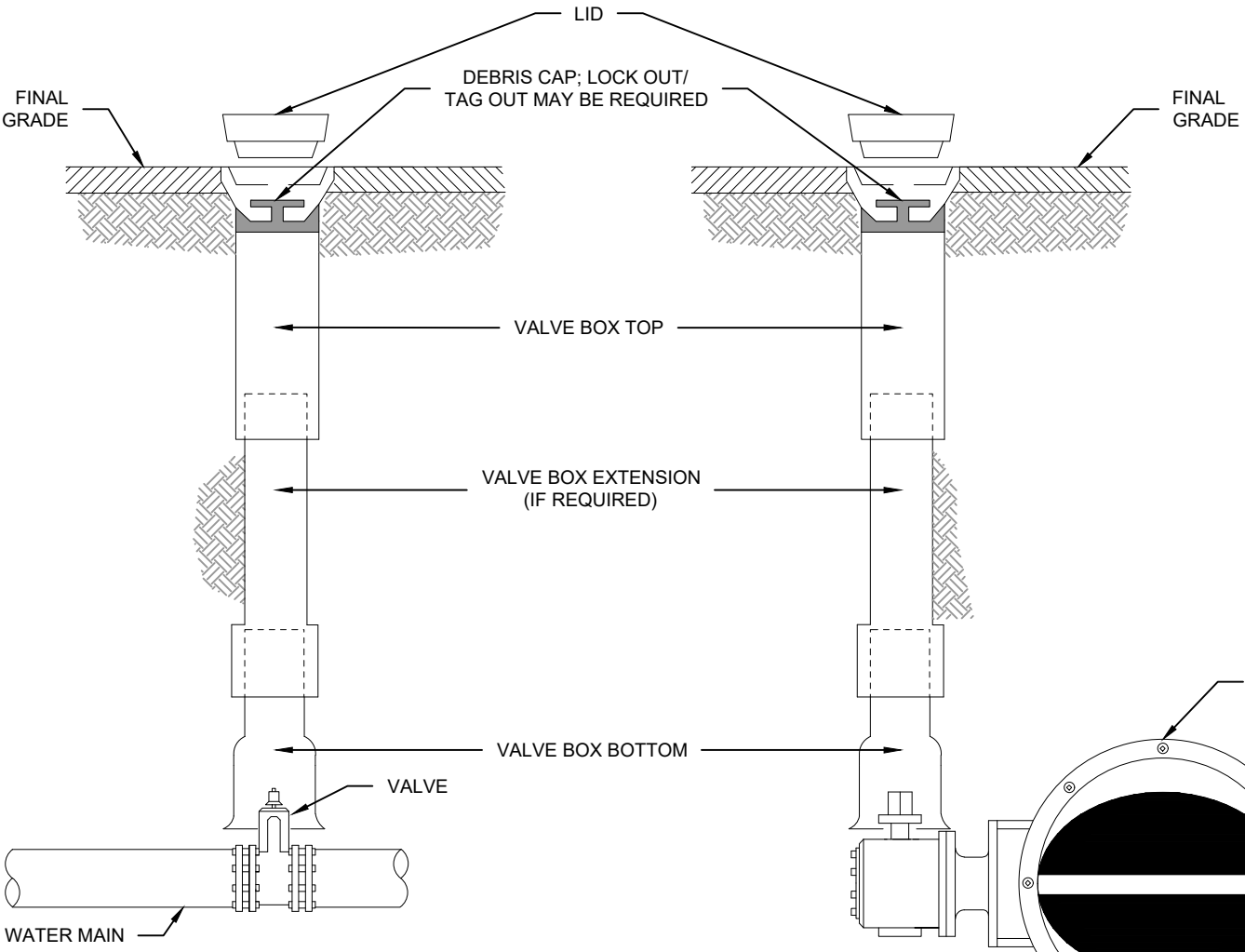
1. COAT ENTIRE I-BEAM, SEE SECTION 2.6.H.
2. COAT NUT AND ROD, EXTENDING COATING SEVERAL INCHES BEYOND THE BEAM.
3. APPLY POLYETHYLENE WRAP TO THE ROD, OVERLAPPING THE COATING A MINIMUM OF 2 INCHES AND SECURE WITH TAPE.



BELL RESTRAINT

NOTES:

1. APPLY POLYETHYLENE WRAP TO THE ROD AND SECURE WITH TAPE, SEE SECTION 2.6.H.
2. APPLY POLYETHYLENE WRAP ON THE FITTING, OVERLAPPING THE COATING A MINIMUM OF 2 INCHES AND SECURE WITH TAPE.



TYPICAL GATE VALVE BOX

MJ OR FLANGED
BUTTERFLY VALVE
WITH ROTATED ACTUATOR VALVE BOX

NOTES:

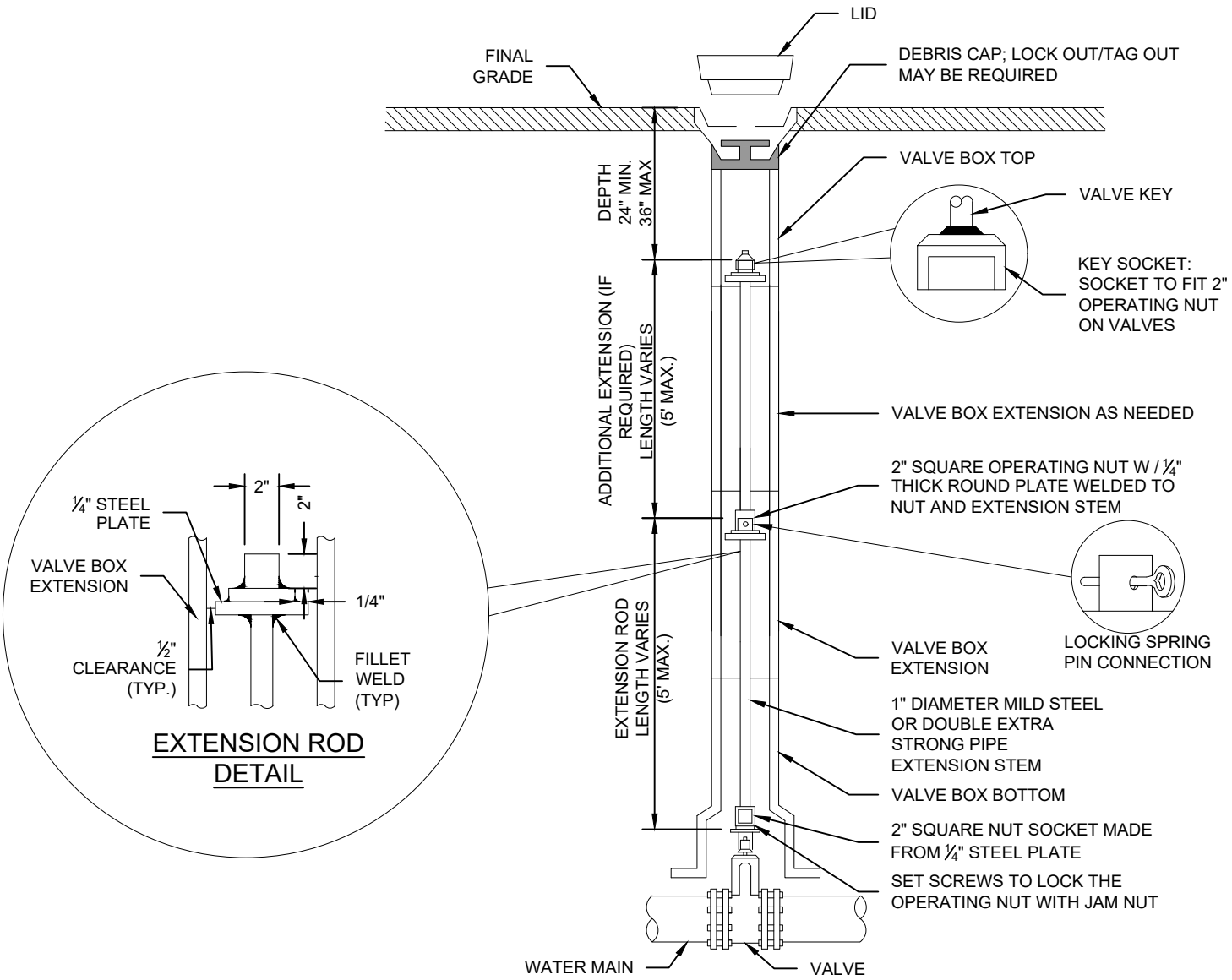
1. MAIN AND FIRE HYDRANT VALVES AND VALVE BOXES SHALL NOT BE IN THE CURB PAN, CURB OR SIDEWALK.
2. VALVE BOXES SHALL BE SLIP TYPE, PER CHAPTER 4.
3. DEBRIS CAPS SHALL BE INSTALLED AS CLOSE UNDER THE CAST IRON COVER WITHOUT INTERFERING WITH COVER OPERATIONS.
4. DEBRIS CAPS WITH FLEXIBLE SKIRTS SHALL BE TRIMMED TO PROVIDE A SMOOTH CONTACT WITH THE INTERIOR OF THE VALVE BOX.
5. FOR SERVICE LINES 4" AND GREATER, TRACER WIRE WILL BE BROUGHT UP IN THE SECONDARY VALVE BOX.

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VALVE BOX INSTALLATION

A9-1

DATED 03/2014



NOTES:

1. THIS DRAWING DEPICTS DEEP VALVE BOX INSTALLATIONS WITH EXTENSION RODS.
2. FOR BUTTERFLY VALVES, SUPPORT GEAR CASING WITH 4"x18"x18" (MIN) CONCRETE BLOCKS.
3. REFER TO DETAIL DRAWING A9-1 FOR TYPICAL VALVE BOX INSTALLATION REQUIREMENTS.

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DEEP VALVE BOX INSTALLATION WITH EXTENSION RODS FOR DEPTHS OVER 10'

A9-2

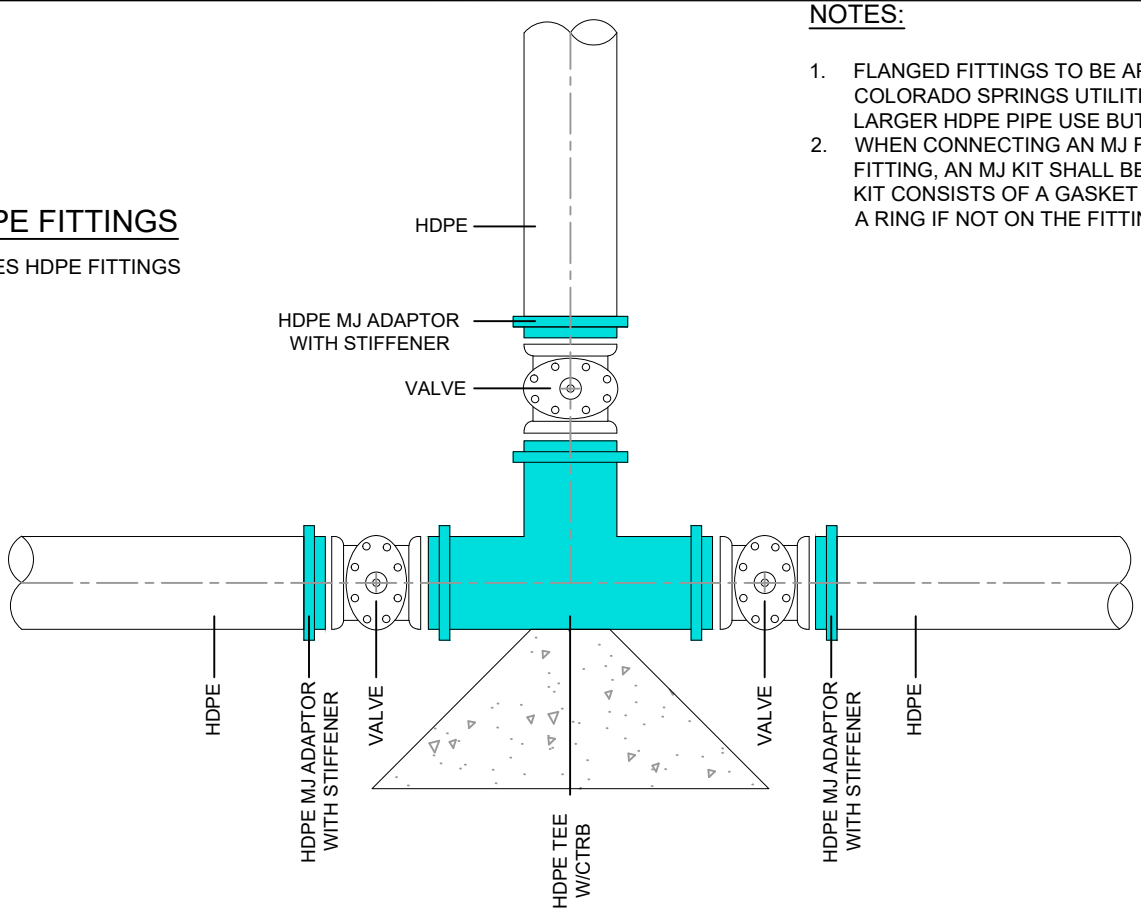
DATED 03/2014

TIE-IN HDPE FITTINGS

DENOTES HDPE FITTINGS

NOTES:

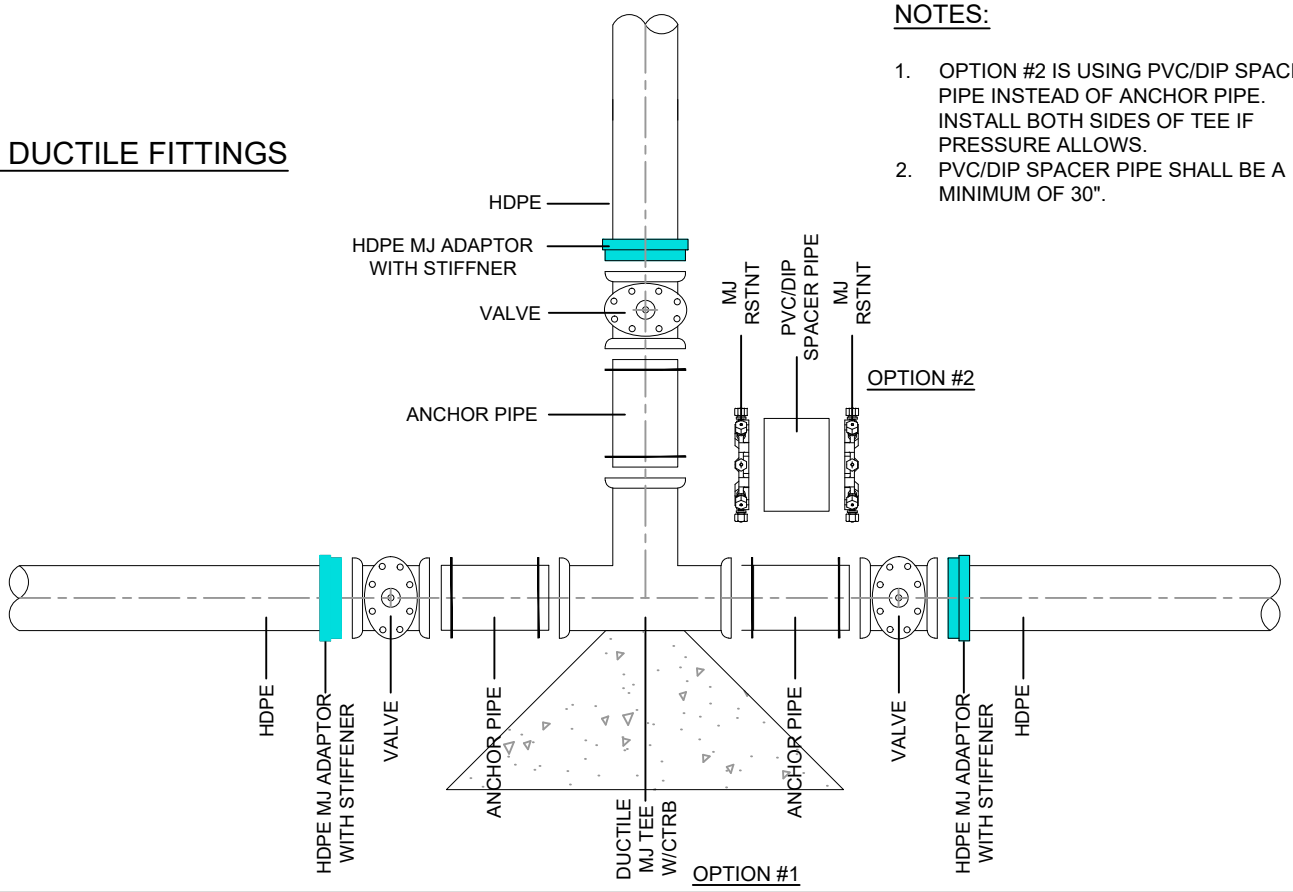
1. FLANGED FITTINGS TO BE APPROVED BY COLORADO SPRINGS UTILITIES. FOR 16" OR LARGER HDPE PIPE USE BUTTERFLY VALVES.
2. WHEN CONNECTING AN MJ FITTING TO AN MJ FITTING, AN MJ KIT SHALL BE USED. THE MJ KIT CONSISTS OF A GASKET AND BOLTS (AND A RING IF NOT ON THE FITTING)



TIE-IN DUCTILE FITTINGS

NOTES:

1. OPTION #2 IS USING PVC/DIP SPACER PIPE INSTEAD OF ANCHOR PIPE. INSTALL BOTH SIDES OF TEE IF PRESSURE ALLOWS.
2. PVC/DIP SPACER PIPE SHALL BE A MINIMUM OF 30".



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TEE CONNECTION TO HDPE MAIN USING HDPE FITTINGS AND/OR DUCTILE FITTINGS

A10-1

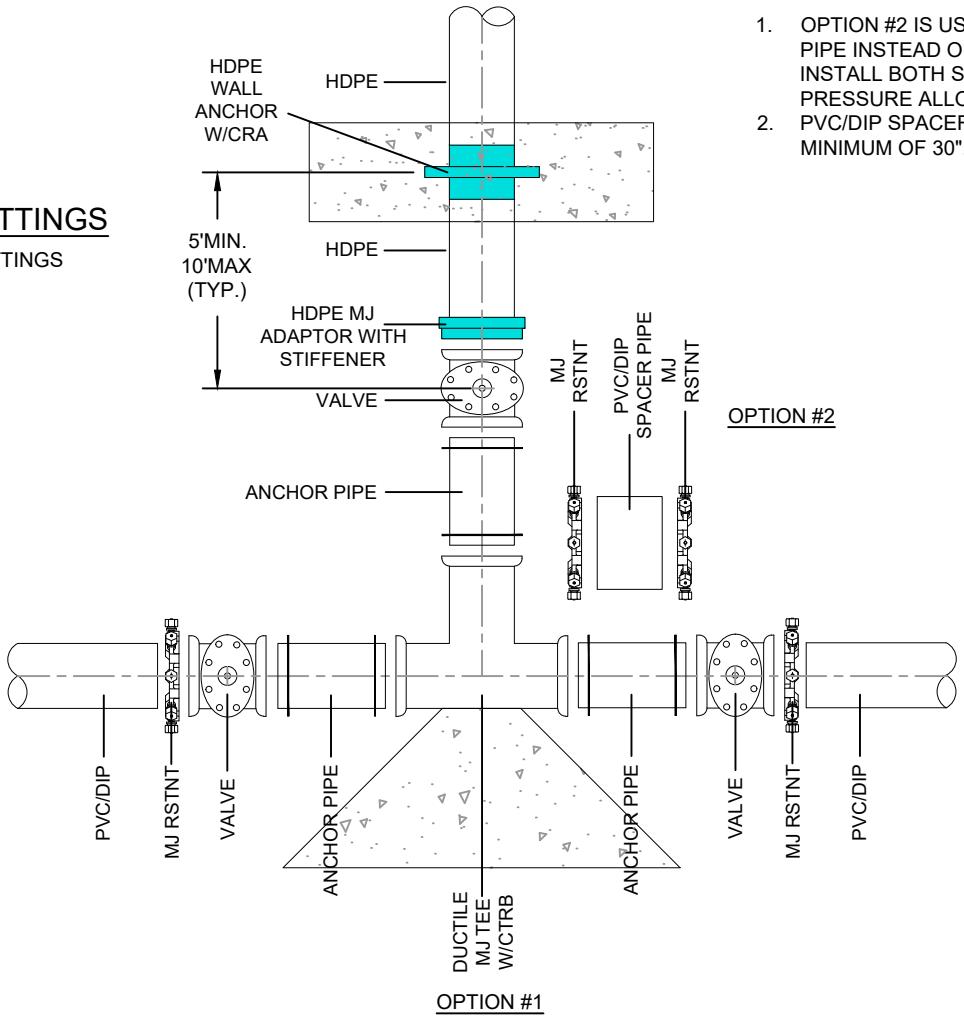
DATED 08/2022

NOTES:

1. OPTION #2 IS USING PVC/DIP SPACER PIPE INSTEAD OF ANCHOR PIPE. INSTALL BOTH SIDES OF TEE IF PRESSURE ALLOWS.
2. PVC/DIP SPACER PIPE SHALL BE A MINIMUM OF 30".

TIE-IN DUCTILE FITTINGS

DENOTES HDPE FITTINGS



OPTION #1

NOTES:

1. FLANGED FITTINGS TO BE APPROVED BY COLORADO SPRINGS UTILITIES. FOR 16" OR LARGER HDPE PIPE USE BUTTERFLY VALVES.
2. SEE DETAIL DRAWING A10-7 FOR WALL ANCHOR DETAIL.
3. SEE DETAIL DRAWING A4-8 FOR CONCRETE REVERSE ANCHOR DIMENSIONS AND SIZING.
4. WHEN CONNECTING AN MJ FITTING TO AN MJ FITTING, AN MJ KIT SHALL BE USED. THE MJ KIT CONSISTS OF A GASKET AND BOLTS (AND A RING IF NOT ON THE FITTING)
5. POISSON AND THERMAL EFFECTS TO BE CALCULATED BY THE ENGINEER TO DETERMINE CRA SIZE.

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TEE CONNECTION FROM PVC/DIP MAIN TO HDPE USING DUCTILE FITTINGS

A10-2

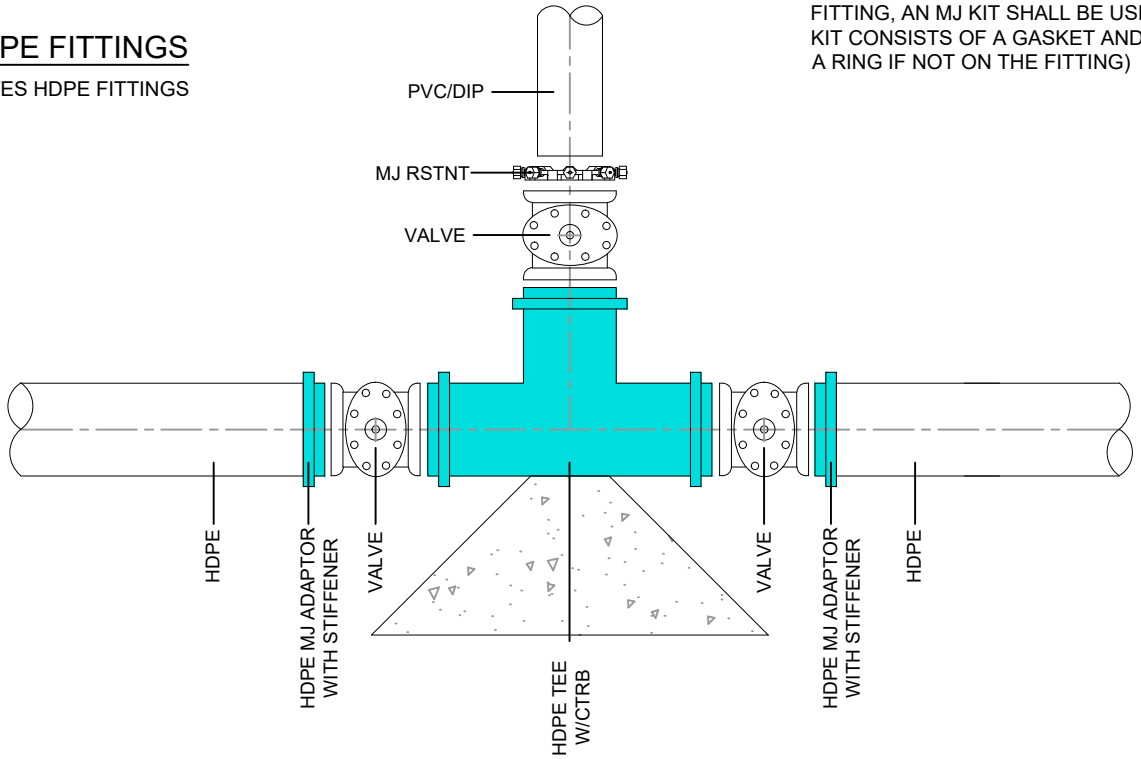
DATED 08/2022

NOTES:

1. FLANGED FITTINGS TO BE APPROVED BY COLORADO SPRINGS UTILITIES. FOR 16" OR LARGER HDPE PIPE USE BUTTERFLY VALVES.
2. WHEN CONNECTING AN MJ FITTING TO AN MJ FITTING, AN MJ KIT SHALL BE USED. THE MJ KIT CONSISTS OF A GASKET AND BOLTS (AND A RING IF NOT ON THE FITTING)

TIE-IN HDPE FITTINGS

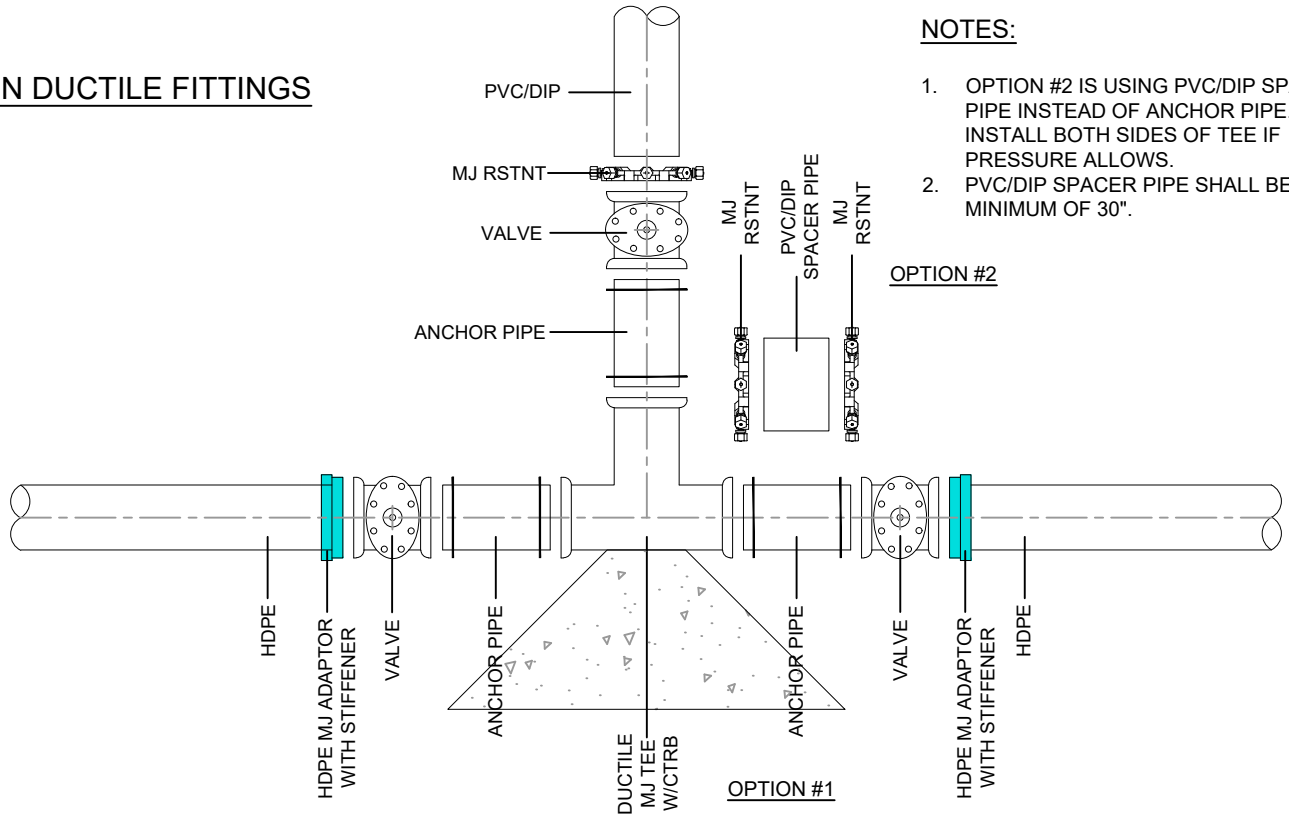
DENOTES HDPE FITTINGS



TIE-IN DUCTILE FITTINGS

NOTES:

1. OPTION #2 IS USING PVC/DIP SPACER PIPE INSTEAD OF ANCHOR PIPE. INSTALL BOTH SIDES OF TEE IF PRESSURE ALLOWS.
2. PVC/DIP SPACER PIPE SHALL BE A MINIMUM OF 30".



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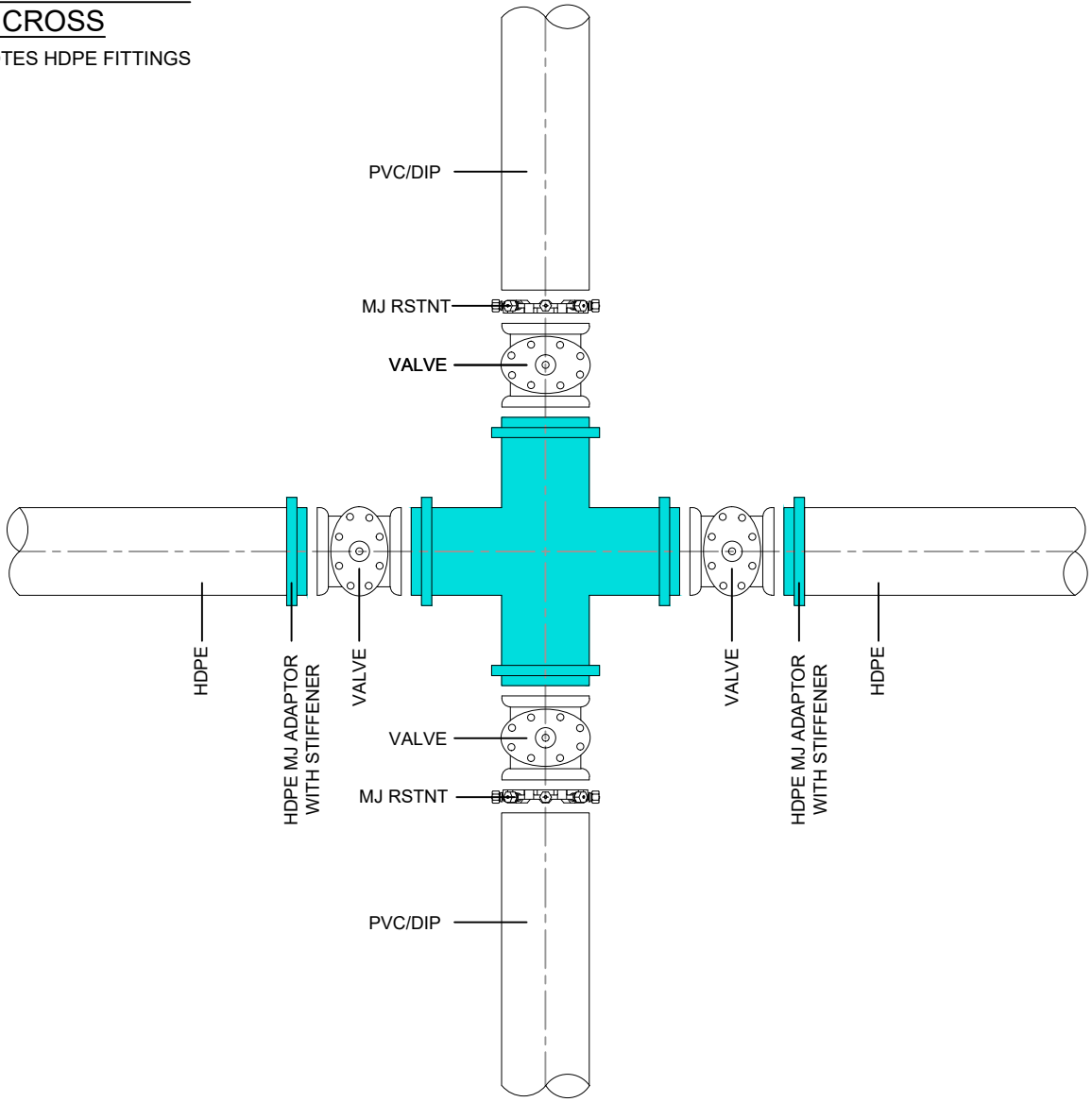
HDPE MAIN TEE CONNECTION TO PVC/DIP USING HDPE FITTINGS AND/OR DUCTILE FITTINGS

A10-3

DATED 08/2022

TIE-IN HDPE FITTINGS W/HDPE CROSS

DENOTES HDPE FITTINGS



NOTES:

1. FLANGED FITTINGS TO BE APPROVED BY COLORADO SPRINGS UTILITIES. FOR 16" OR LARGER HDPE PIPE USE BUTTERFLY VALVES.
2. WHEN CONNECTING AN MJ FITTING TO AN MJ FITTING, AN MJ KIT SHALL BE USED. THE MJ KIT CONSISTS OF A GASKET AND BOLTS (AND A RING IF NOT ON THE FITTING)

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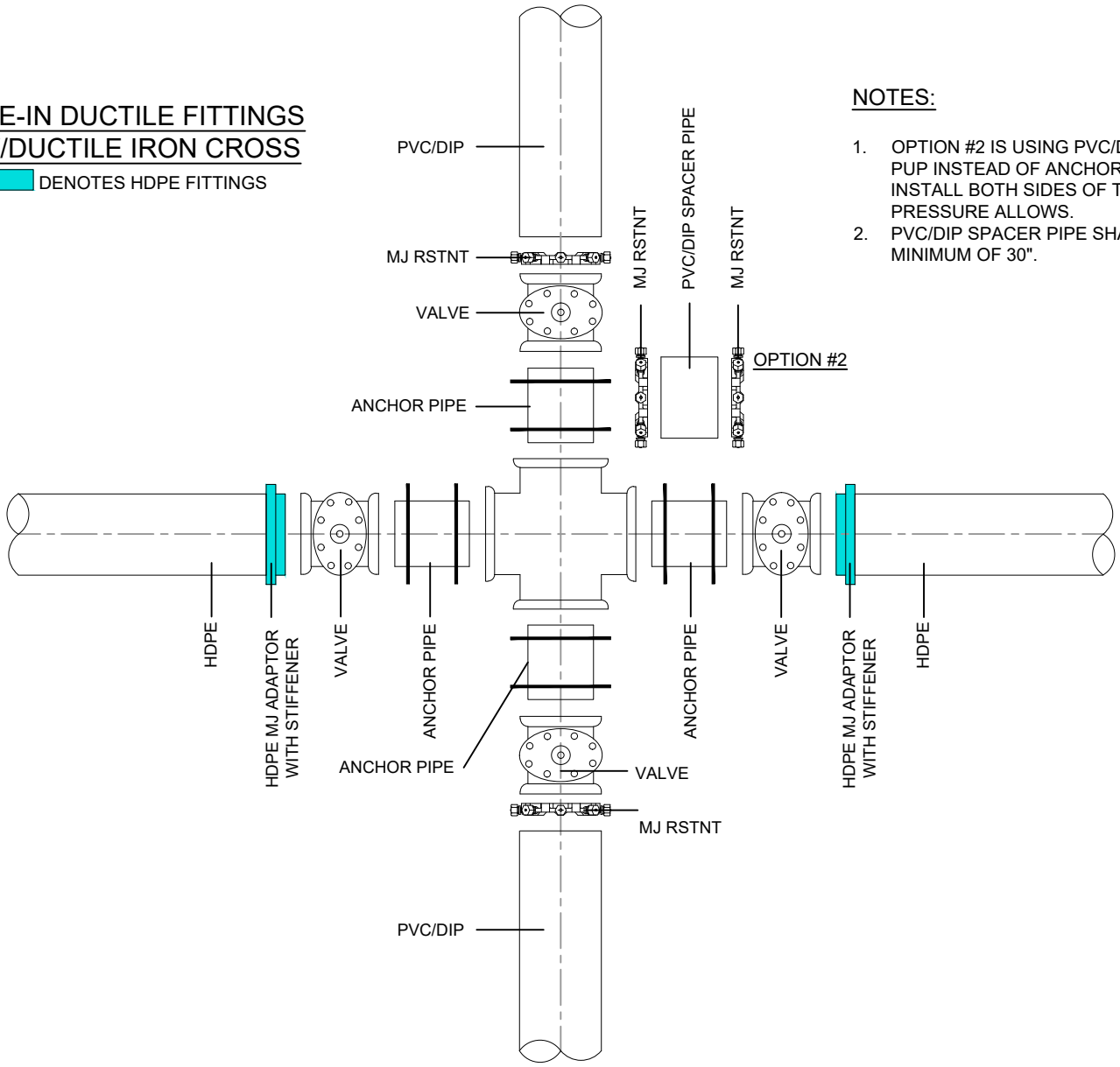
HDPE MAIN CROSS CONNECTION TO PVC/DIP USING HDPE FITTINGS AND/OR DUCTILE FITTINGS

A10-4

DATED 08/2022

TIE-IN DUCTILE FITTINGS W/DUCTILE IRON CROSS

DENOTES HDPE FITTINGS



NOTES:

1. OPTION #2 IS USING PVC/DIP PIPE PUP INSTEAD OF ANCHOR PIPE. INSTALL BOTH SIDES OF TEE IF PRESSURE ALLOWS.
2. PVC/DIP SPACER PIPE SHALL BE A MINIMUM OF 30".

NOTES:

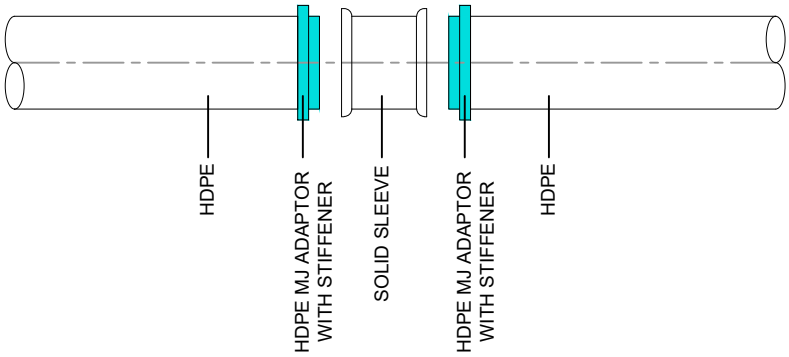
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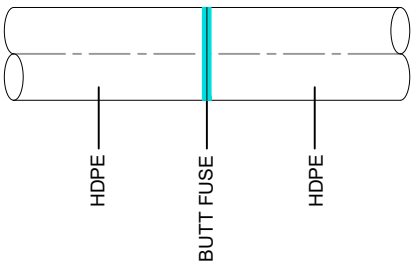
DUCTILE IRON MAIN CROSS CONNECTION TO PVC/DIP USING HDPE FITTINGS AND/OR DUCTILE FITTINGS

A10-5

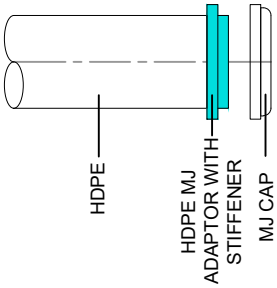
DATED 08/2022



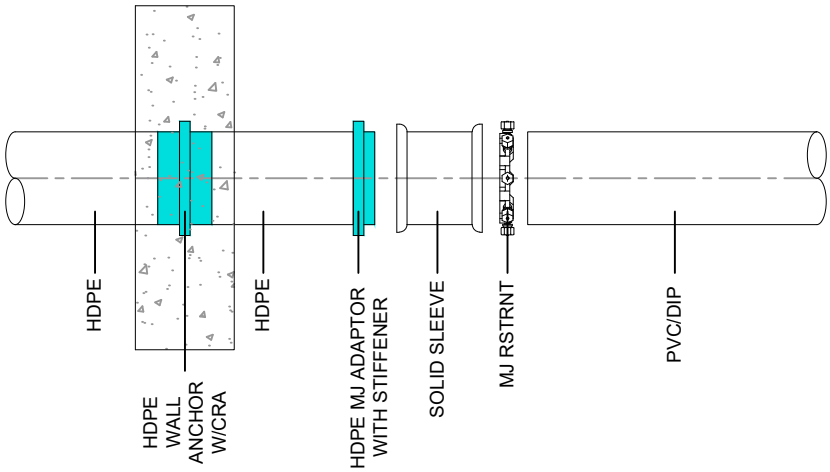
TRANSITION HDPE TO HDPE W/BREAK POINT



TRANSITION HDPE TO HDPE BY BUTT FUSION



HDPE DEAD END



TRANSITION HDPE TO OTHER PIPE MATERIAL

NOTES: DENOTES HDPE FITTINGS

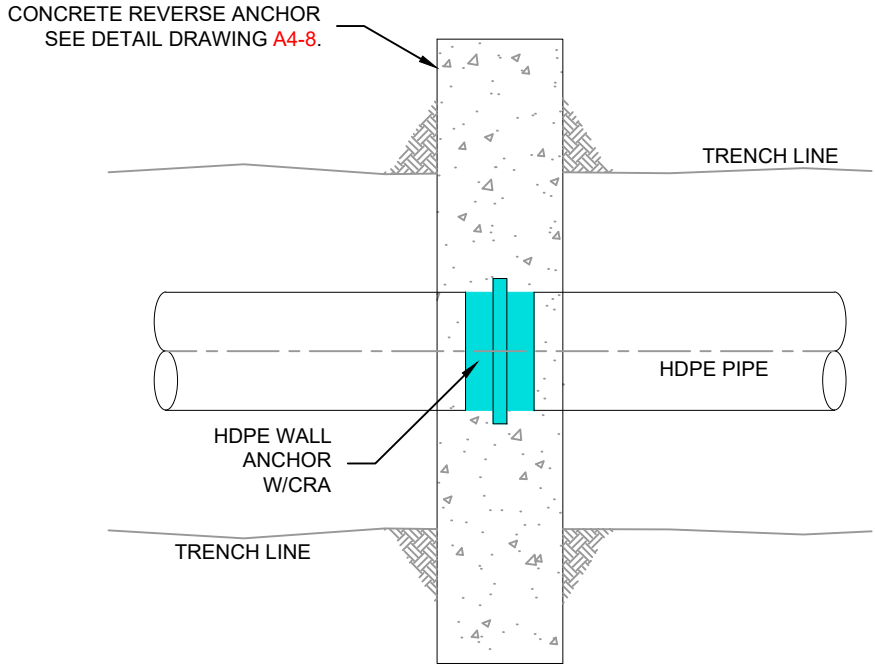
1. FLANGED FITTINGS TO BE APPROVED BY COLORADO SPRINGS UTILITIES. FOR 16" OR LARGER HDPE PIPE USE BUTTERFLY VALVES.
2. SEE DETAIL DRAWING A10-7 FOR WALL ANCHOR DETAIL.
3. SEE DETAIL DRAWING A4-8 FOR CONCRETE REVERSE ANCHOR DIMENSIONS AND SIZING.
4. WHEN CONNECTING AN MJ FITTING TO AN MJ FITTING, AN MJ KIT SHALL BE USED. THE MJ KIT CONSISTS OF A GASKET AND BOLTS (AND A RING IF NOT ON THE FITTING)
5. POISSON AND THERMAL EFFECTS TO BE CALCULATED BY THE ENGINEER TO DETERMINE CRA SIZE.

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HDPE TRANSITION TO HDPE OR OTHER PIPE MATERIAL

A10-6

DATED 08/2022



NOTES: DENOTES HDPE FITTINGS

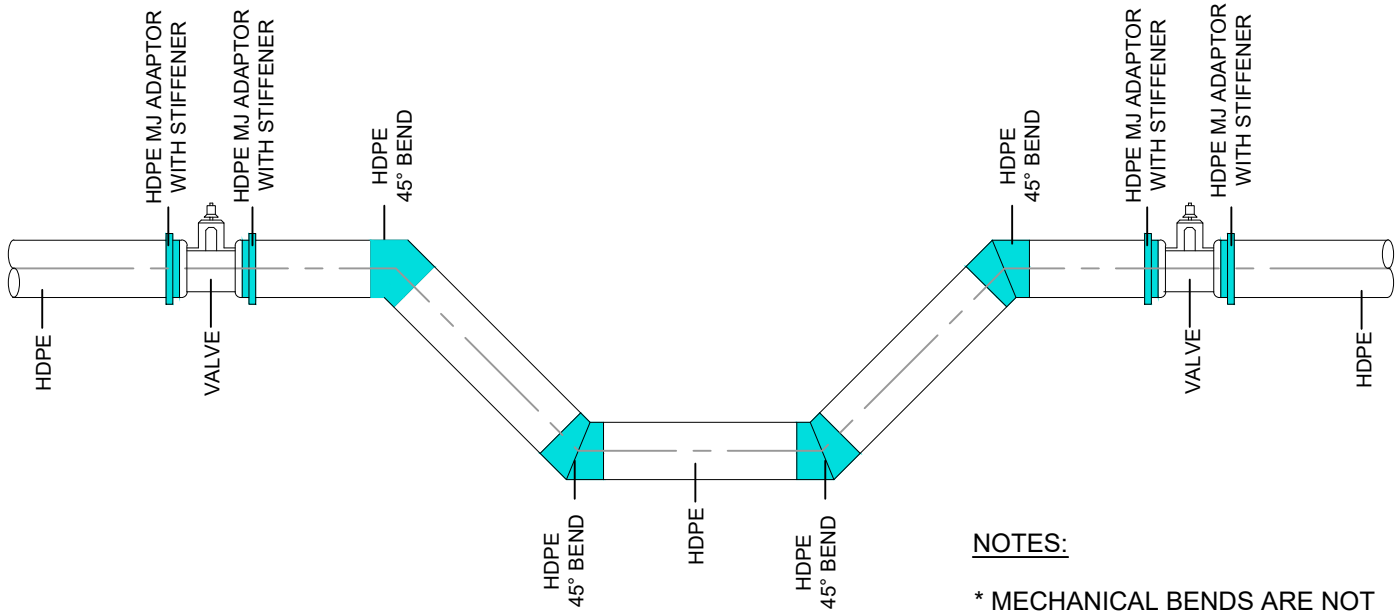
1. FLANGED FITTINGS TO BE APPROVED BY COLORADO SPRINGS UTILITIES. FOR 16" OR LARGER HDPE PIPE USE BUTTERFLY VALVES.
2. SEE DETAIL DRAWING A4-8 FOR CONCRETE REVERSE ANCHOR FOR DIMENSIONS AND SIZING.
3. POISSON AND THERMAL EFFECTS TO BE CALCULATED BY THE ENGINEER TO DETERMINE CRA SIZE.

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TYPICAL INSTALLATION
HDPE WALL ANCHOR

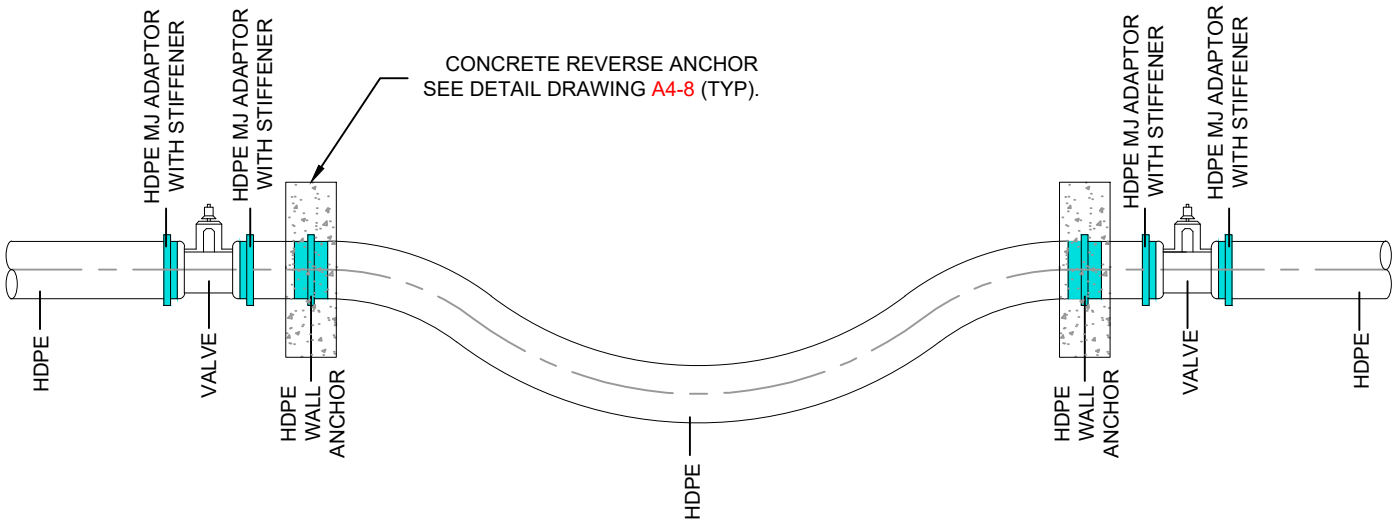
A10-7

DATED 08/2022



NOTES:

* MECHANICAL BENDS ARE NOT ALLOWED IN A HDPE LOWERING.



TYPICAL BORE APPLICATION

NOTES: DENOTES HDPE FITTINGS

1. FLANGED FITTINGS TO BE APPROVED BY COLORADO SPRINGS UTILITIES. FOR 16" OR LARGER HDPE PIPE USE BUTTERFLY VALVES.
2. SEE DETAIL DRAWING A10-7 FOR WALL ANCHOR DETAIL.
3. SEE DETAIL DRAWING A4-8 FOR CONCRETE REVERSE ANCHOR FOR DIMENSIONS AND SIZING.
4. POISSON AND THERMAL EFFECTS TO BE CALCULATED BY THE ENGINEER TO DETERMINE CRA SIZE.

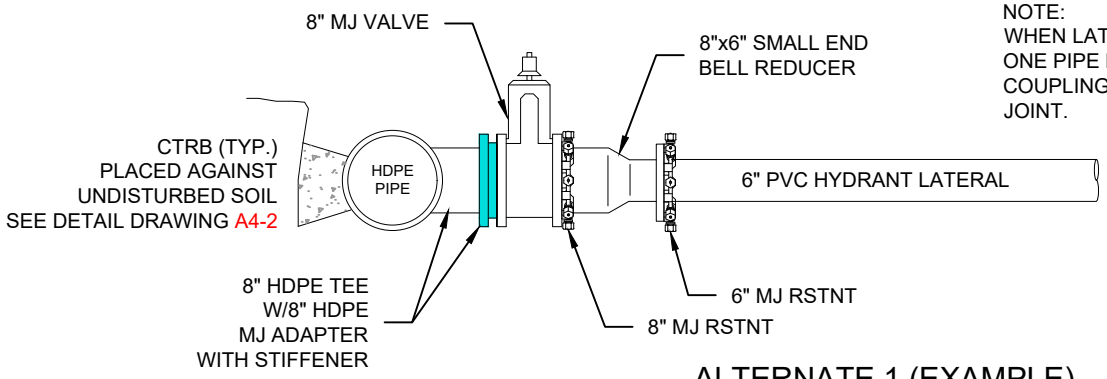
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TYPICAL INSTALLATION
HDPE LOWERINGS

A10-8

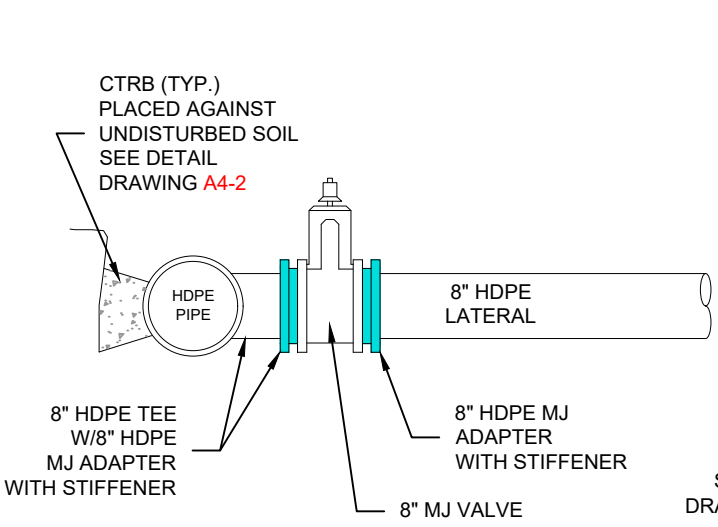
DATED 08/2022

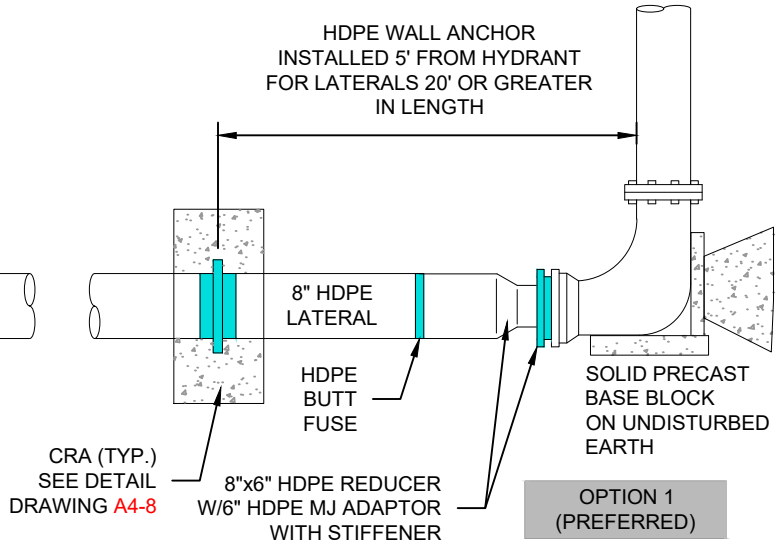
TYPICAL HDPE FIRE HYDRANT CONNECTION DETAILS



NOTE:
WHEN LATERAL IS GREATER THAN ONE PIPE LENGTH, A RESTRAINING COUPLING IS REQUIRED AT EACH JOINT.

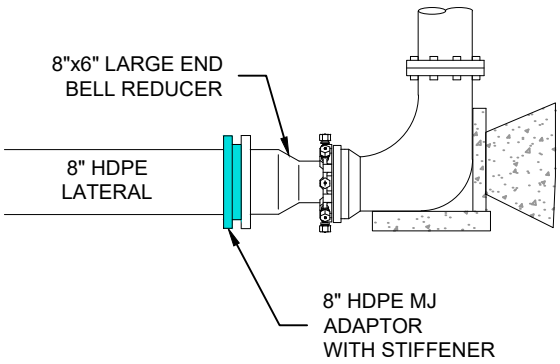
ALTERNATE 1 (EXAMPLE)
8"x8" HDPE TEE W/6" PVC CONNECTION





OPTION 1 (PREFERRED)

ALTERNATE 2 (EXAMPLE)
8" HDPE HYDRANT CONNECTION



OPTION 2

NOTES: DENOTES HDPE FITTINGS

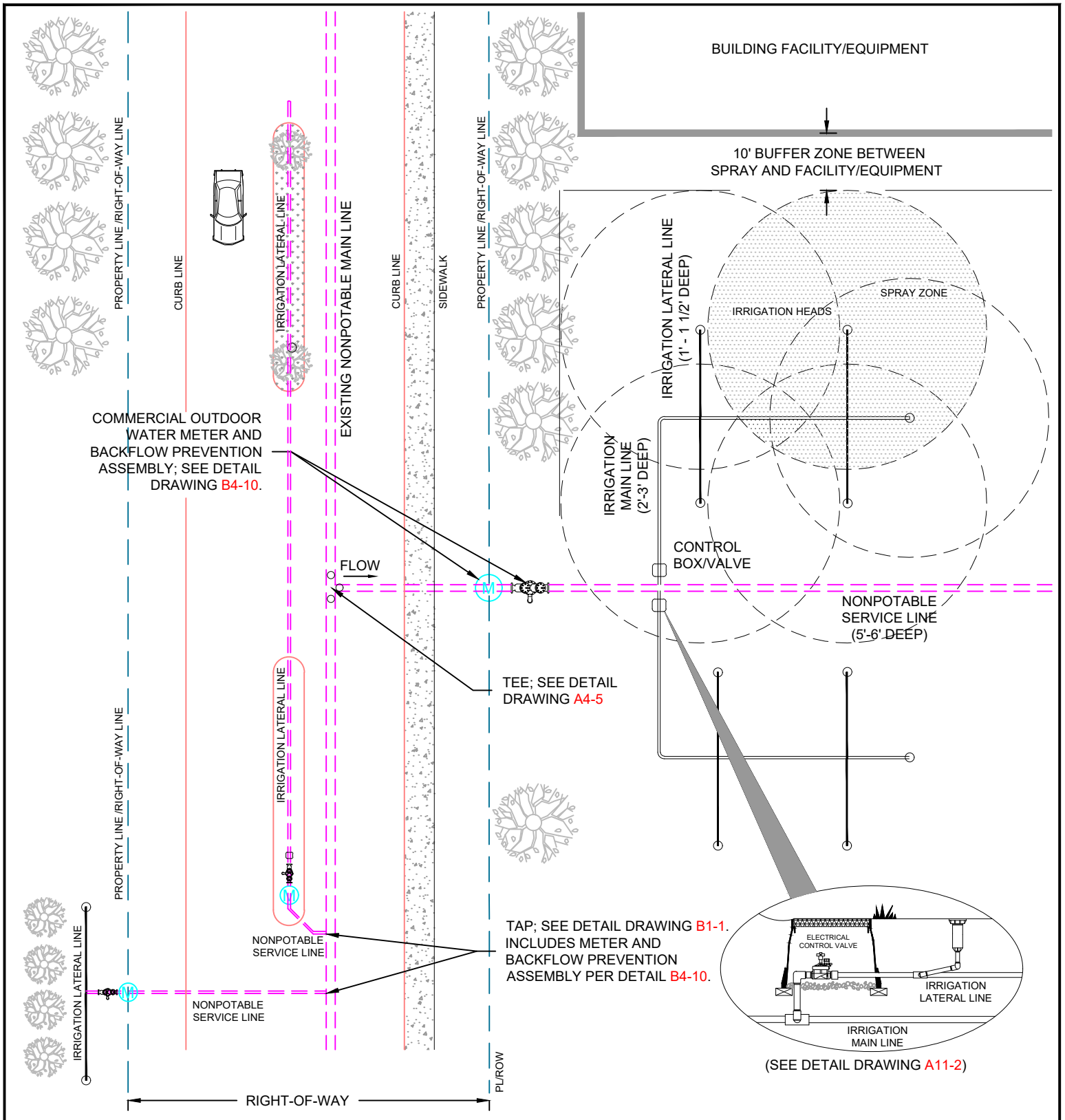
1. PIPE SIZES WILL VARY DUE TO SITE DESIGN.
2. MINIMUM SIZE FOR HDPE HYDRANT LATERAL IS 8".
3. VALVE BOX TO BE LOCATED OUTSIDE CURB PAN FOR VALVE AND VALVE BOX SETTINGS.
4. FIRE HYDRANT TO BE INSTALLED TO BURY LINE AS INDICATED ON HYDRANT ASSEMBLY.
5. GROUND LEVEL TEST BOX AND TRACER WIRE TO BE INSTALLED AND CONNECTED.
6. DEPTH OF BURY AS REQUIRED
7. NO OBSTRUCTIONS TO BE CONSTRUCTED IN FRONT OF THE FIRE HYDRANT.
8. SEE DETAIL DRAWING A5-1 FOR FIRE HYDRANT LOCATION.
9. POISSON AND THERMAL EFFECTS TO BE CALCULATED BY THE ENGINEER TO DETERMINE CRA SIZE.

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TYPICAL HDPE FIRE HYDRANT CONNECTION DETAIL

A10-9

DATED 08/2022



NOTES:

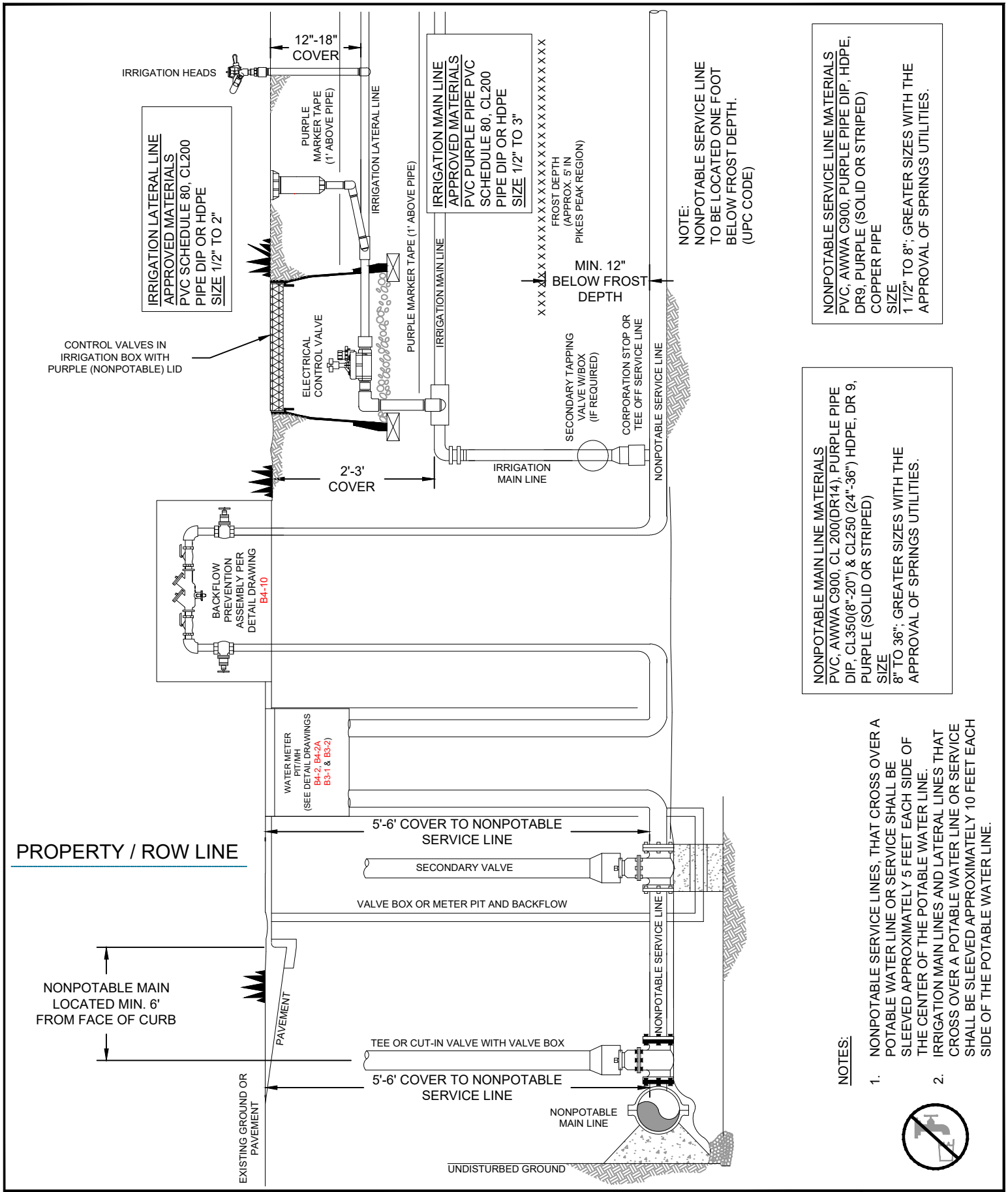
1. NONPOTABLE SERVICE LINES, THAT CROSS OVER A POTABLE WATER LINE OR SERVICE SHALL BE SLEEVED APPROXIMATELY 5 FEET EACH SIDE OF THE CENTER OF THE POTABLE WATER LINE.
2. IRRIGATION MAIN LINES AND LATERAL LINES THAT CROSS OVER A POTABLE WATER LINE OR SERVICE SHALL BE SLEEVED APPROXIMATELY 10 FEET EACH SIDE OF THE POTABLE WATER LINE.

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NON-POTABLE SCHEMATIC IRRIGATION PLAN

A11-1

DATED01/2017



NOTES:

1. NONPOTABLE SERVICE LINES, THAT CROSS OVER A POTABLE WATER LINE OR SERVICE SHALL BE SLEEVED APPROXIMATELY 5 FEET EACH SIDE OF THE CENTER OF THE POTABLE WATER LINE.
2. IRRIGATION MAIN LINES AND LATERAL LINES THAT CROSS OVER A POTABLE WATER LINE OR SERVICE SHALL BE SLEEVED APPROXIMATELY 10 FEET EACH SIDE OF THE POTABLE WATER LINE.

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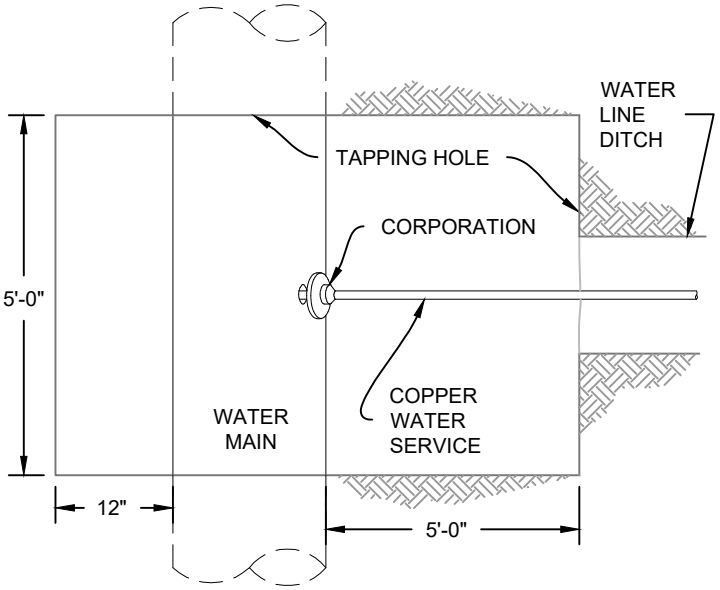
NON-POTABLE TYPICAL CONNECTION DETAILS

A11-2

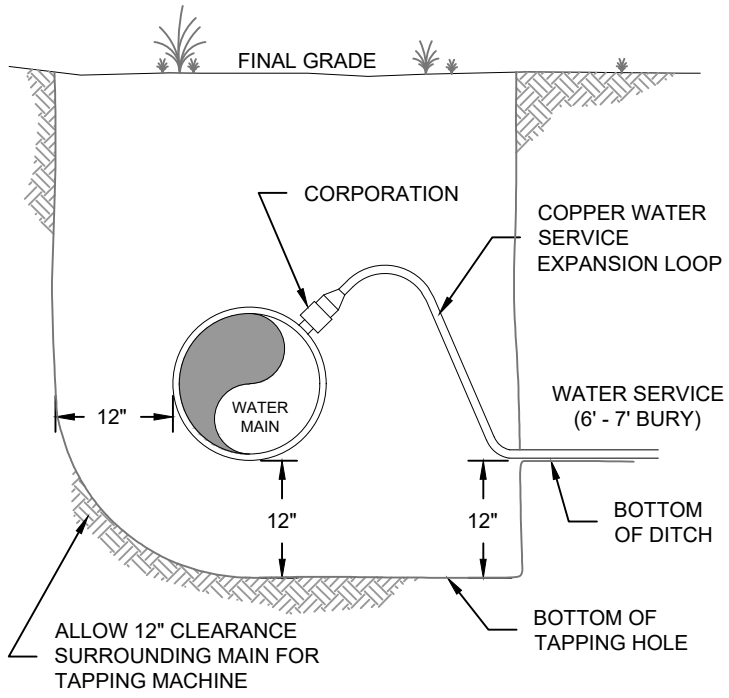
DATED 08/2022

TAPPING DETAIL FOR 3/4" AND 1" CONNECTION

SERVICE TAPS 3/4" & 1"
CORPORATION ONLY (DIRECT TAPPING).



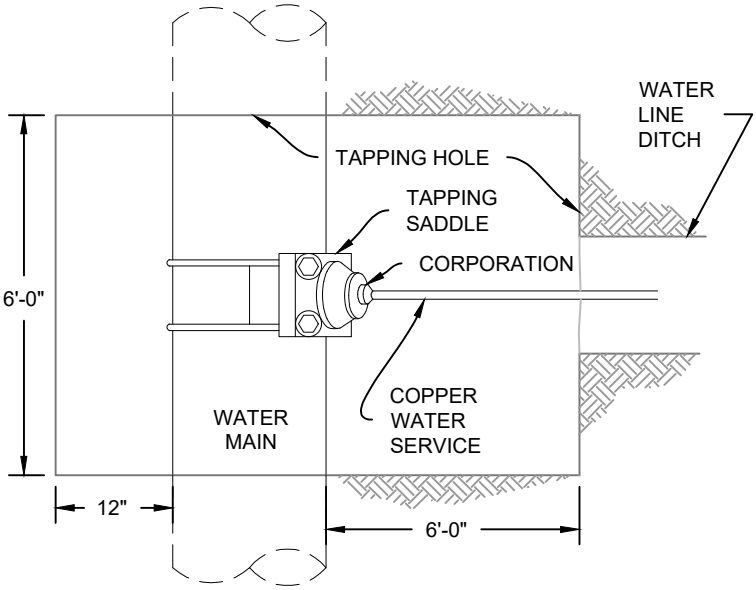
PLAN VIEW



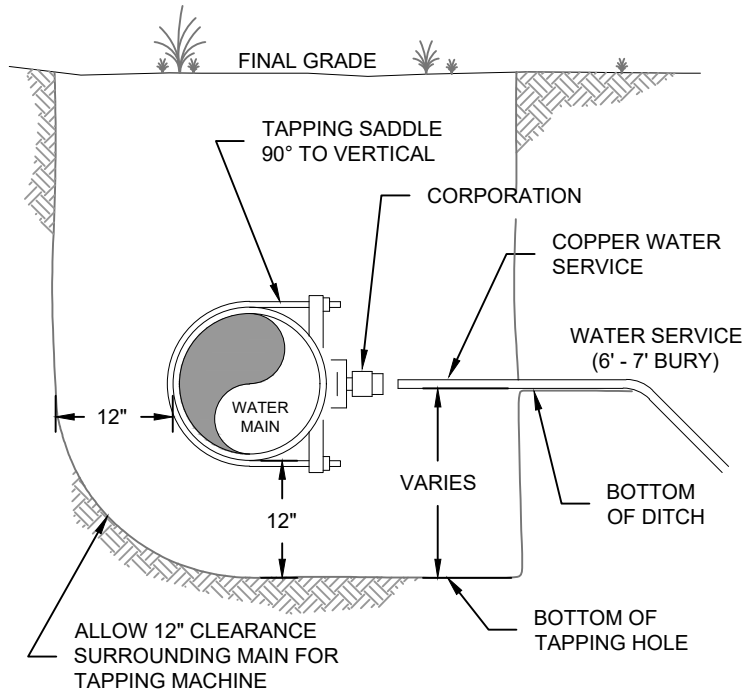
ELEVATION

TAPPING DETAIL FOR 1 1/2" AND 2" CONNECTION

SERVICE TAPS 1 1/2" & 2"
TAPPING SADDLE.



PLAN VIEW



ELEVATION

NOTES:

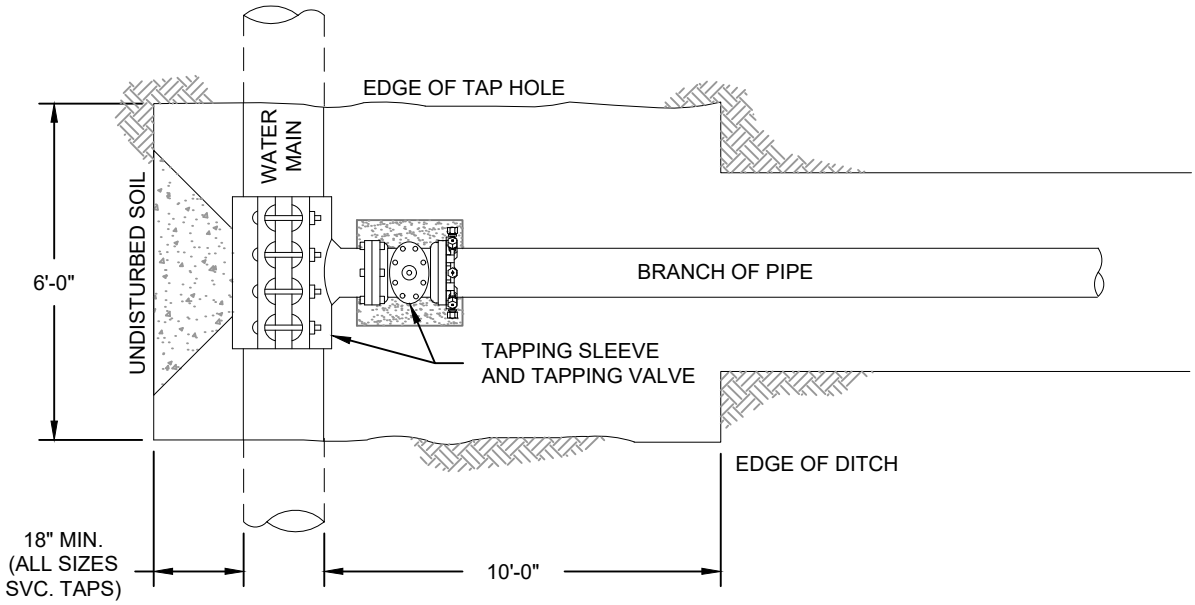
1. TRENCH WALLS AND SHORING SHALL COMPLY WITH OSHA STANDARDS.
2. FOR HDPE TAPS USE A SIDEWALL FUSION TAPPING SADDLE CONFIGURATION AT 90° SEE SECTION 6.7.B.
3. TO BE READ IN CONJUNCTION WITH SECTION 2.7.C AND SECTION 5.21.E.
4. WHERE COMPACTION CANNOT BE ACHIEVED UNDER THE WATER MAIN FLOWFILL SHALL BE USED.
5. SEE DETAIL DRAWING A8-10 FOR CATHODIC PROTECTION.

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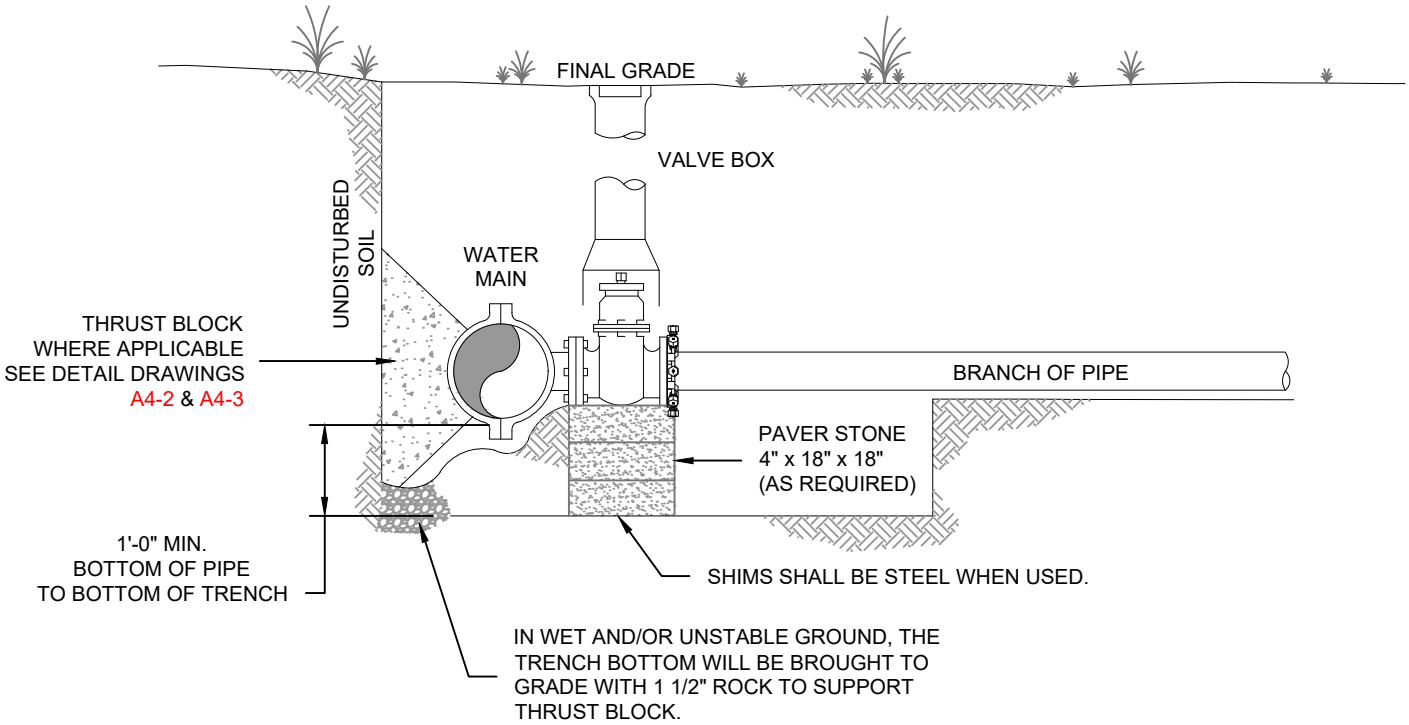
TAPPING DETAILS 3/4" THRU 2" FOR TYPE "K" COPPER

B1-1

DATED 03/2014



PLAN VIEW



ELEVATION

NOTES:

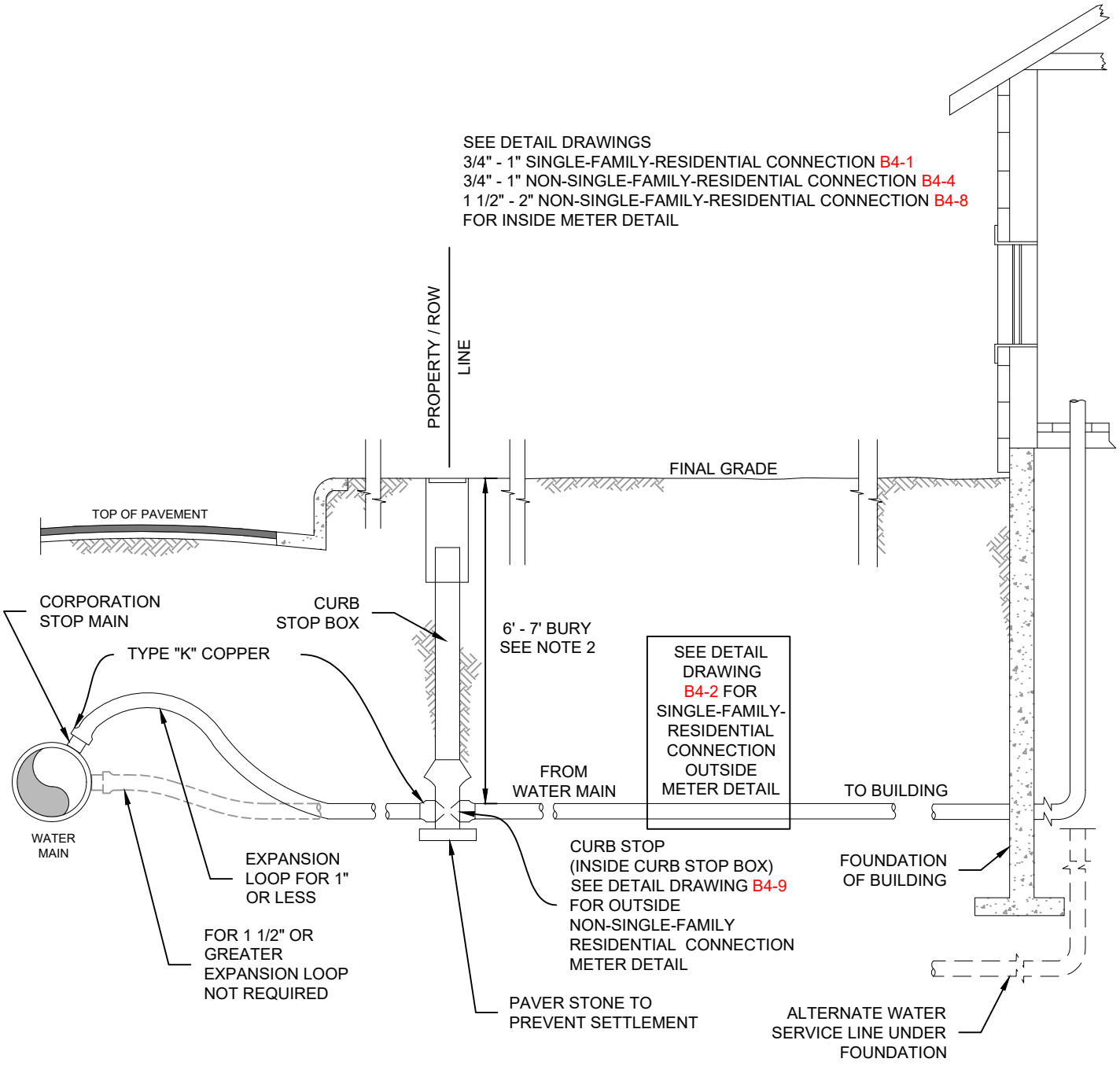
1. 4" WATER SERVICE LINES TYPICALLY REQUIRE A TEE AND VALVE PER SECTION 2.6.C. THIS DRAWING MAY ONLY BE USED AT THE DISCRETION OF COLORADO SPRINGS UTILITIES.
2. TRENCH WALLS AND SHORING SHALL COMPLY WITH OSHA STANDARDS.
3. WHERE COMPACTION CANNOT BE ACHIEVED UNDER THE WATER MAIN FLOWFILL SHALL BE USED.
4. ATTACH ANODES FOR CATHODIC PROTECTION.

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DETAILS FOR TAPS 4" AND OVER FOR DUCTILE OR PVC PIPE

B1-2

DATED 03/2014



NOTES:

1. REFERENCE SECTION 2.7 WATER SERVICE LINE DESIGN.
2. FOR AREAS WITH DEEPER FROST DEPTHS SEE SECTION 2.6.G.1 FOR DEPTH OF BURY REQUIREMENTS.
3. SEE DETAIL DRAWING B4-9 FOR NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION OUTSIDE METER DETAIL.

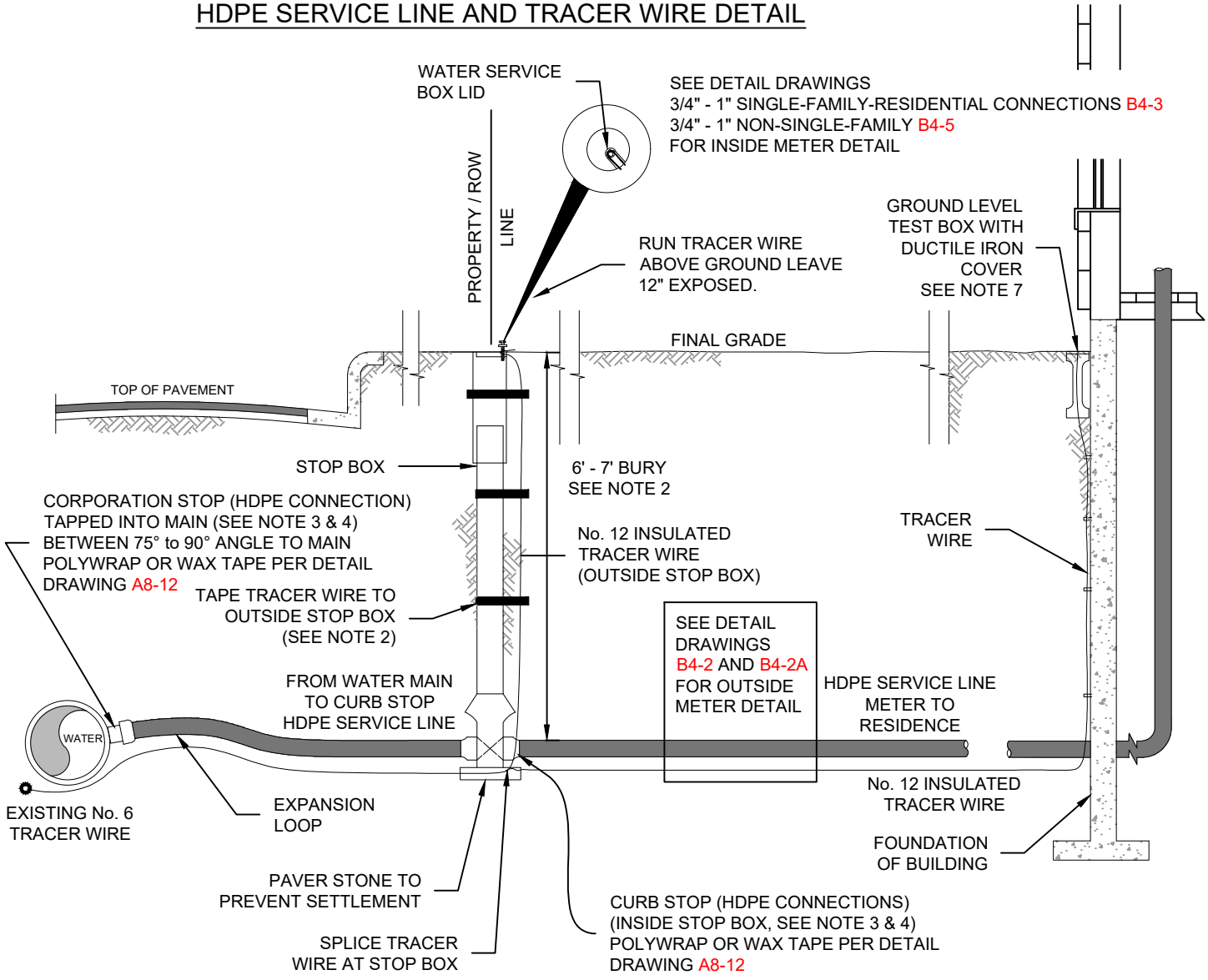
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TYPICAL INSTALLATION FOR TYPE "K" COPPER SERVICE LINE, STOP BOX AND METER INSTALLATION 3/4" - 2"

B1-3

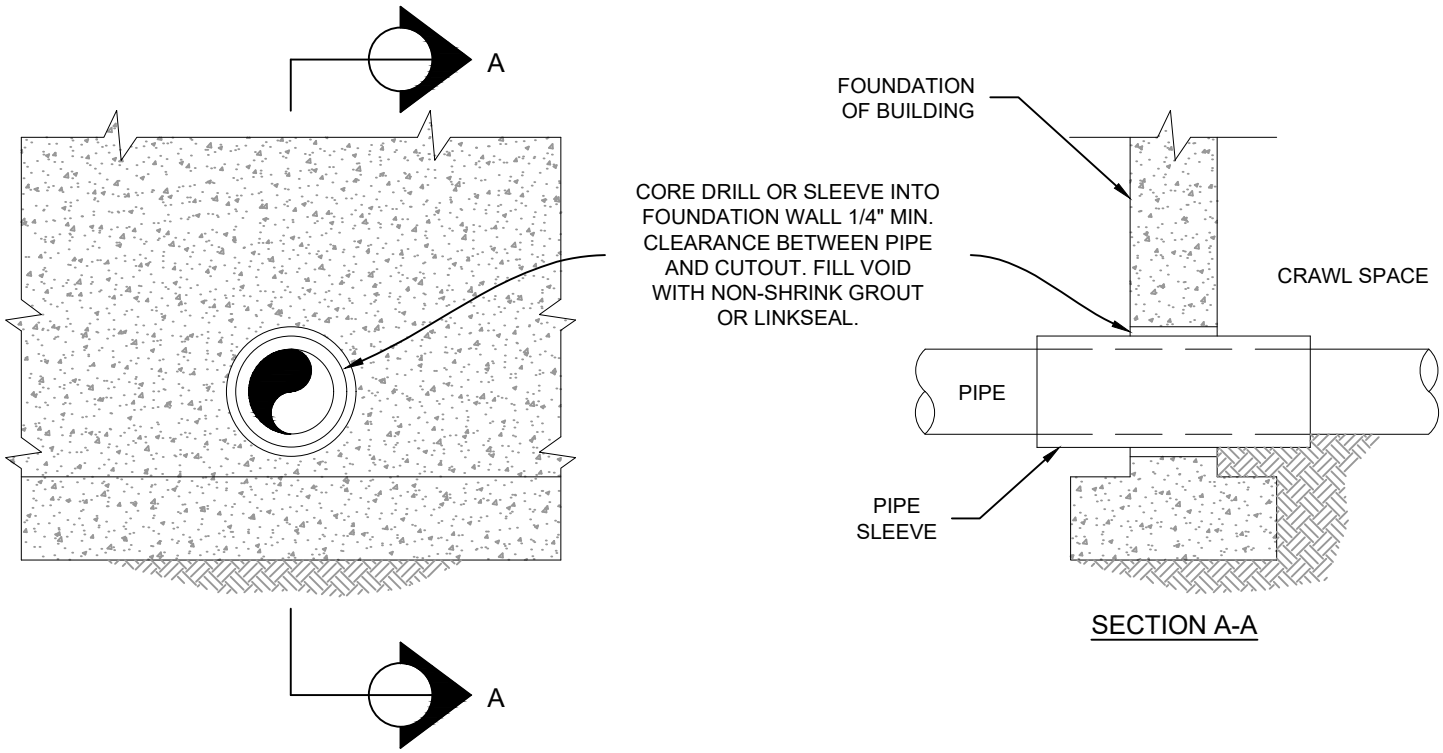
DATED 01/2017

HDPE SERVICE LINE AND TRACER WIRE DETAIL

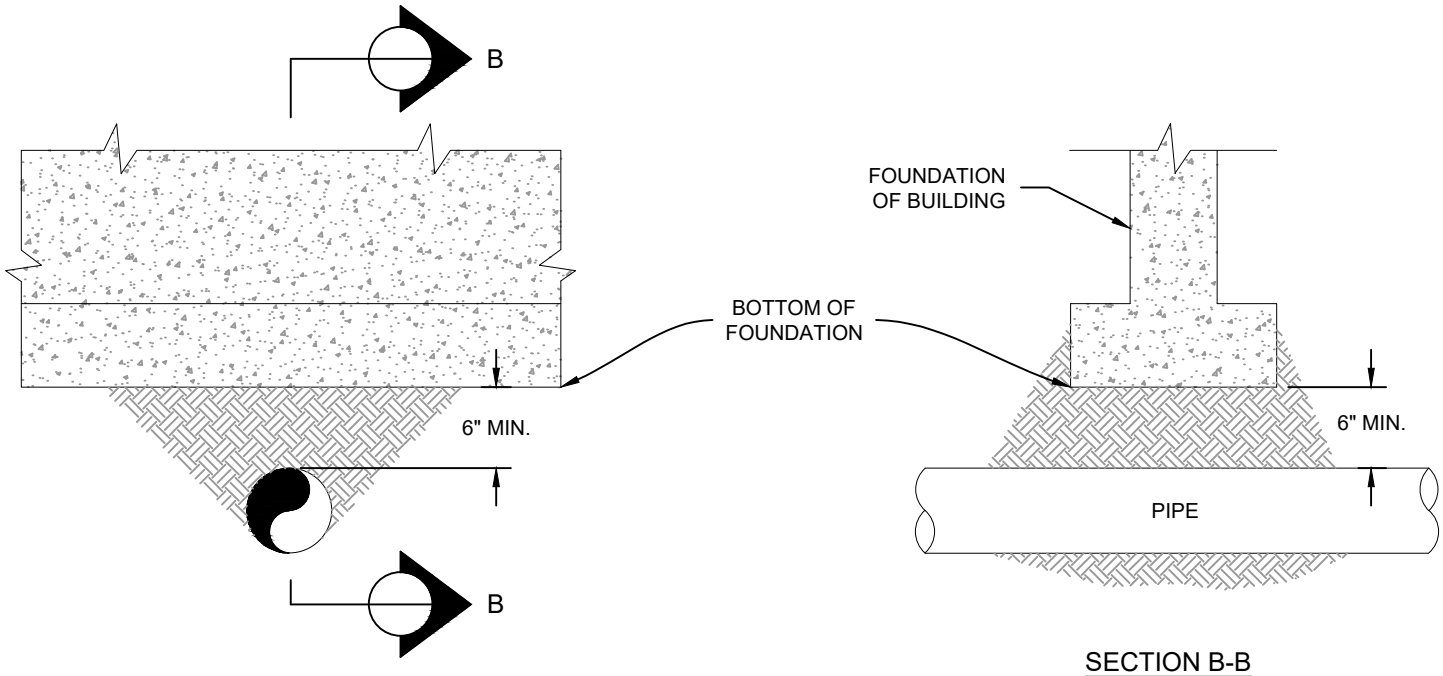


WATER SERVICE LINE NOTES:

1. NO. 12 INSULATED TRACER WIRE SHALL BE PLACED ALONG SERVICE LINE AND SHALL BE A CONTINUOUS (WITHOUT SPLICES) LENGTH, WITH THE EXCEPTION OF THE SPLICE AT THE STOP BOX WHICH SHALL BE MADE WITH A COPPER CRIMP OR SPLIT BOLT CONNECTOR.
2. FOR GREEN MOUNTAIN FALLS SEE SECTION 2.6.G.1 DEPTH OF BURY.
3. WHEN A NEW HDPE SERVICE IS CONNECTED TO A PVC MAIN, THE SERVICE LINE TRACER WIRE SHALL BE CONNECTED TO THE MAIN'S TRACER WIRE WITH A COPPER CRIMP OR SPLIT-BOLT CONNECTOR. THE TRACER WIRE IS THEN TAPED ALONG THE SERVICE LINE IN AT LEAST 3 LOCATIONS NOT TO EXCEED 10' SPACING. AT THE CURB BOX, THE TRACER WIRE WILL BE TAPED TO THE OUTSIDE OF THE CURB BOX IN AT LEAST THREE PLACES AND BROUGHT TO THE EXISTING GRADE ADJACENT TO THE CURB BOX COVER. 12" OF TRACER WIRE SHALL BE EXPOSED ABOVE GROUND THEN THE TRACER WIRE WILL BE SPLICED AT THE STOP BOX AND TAPED TO THE SERVICE LINE UNTIL IT REACHES THE FOUNDATION WALL. THE TRACER WIRE SHALL FOLLOW THE FOUNDATION WALL AND TERMINATE IN A GROUND LEVEL TEST BOX NO MORE THAN 12" FROM THE FOUNDATION WALL.
4. STIFFENERS SHALL BE INSTALLED WITHIN THE HDPE SERVICE LINE AT THE CONNECTION POINTS OF THE FITTINGS.
5. IF A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED, IT MUST BE LOCATED BEFORE THE FIRST BRANCH LINE. FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS, INCLUDING LOCATION, SEE SECTION 2.7.N.
6. THE FINAL LOCATION OF THE GROUND LEVEL TEST BOX SHALL BE 12" FROM THE FOUNDATION OR THE SAME DISTANCE FROM THE FOUNDATION AS THE WASTEWATER SERVICE LINE CLEANOUT.
7. WHERE THE WATER SERVICE LINE AND WASTEWATER SERVICE LINE ARE LOCATED IN THE SAME TRENCH, THE TRACER WIRE MAY BE WRAPPED AND TAPPED AROUND THE OUTSIDE OF THE WASTEWATER CLEANOUT.



SECTION A-A



SECTION B-B

BUILDING ENTRY ALTERNATIVES

NOTES:

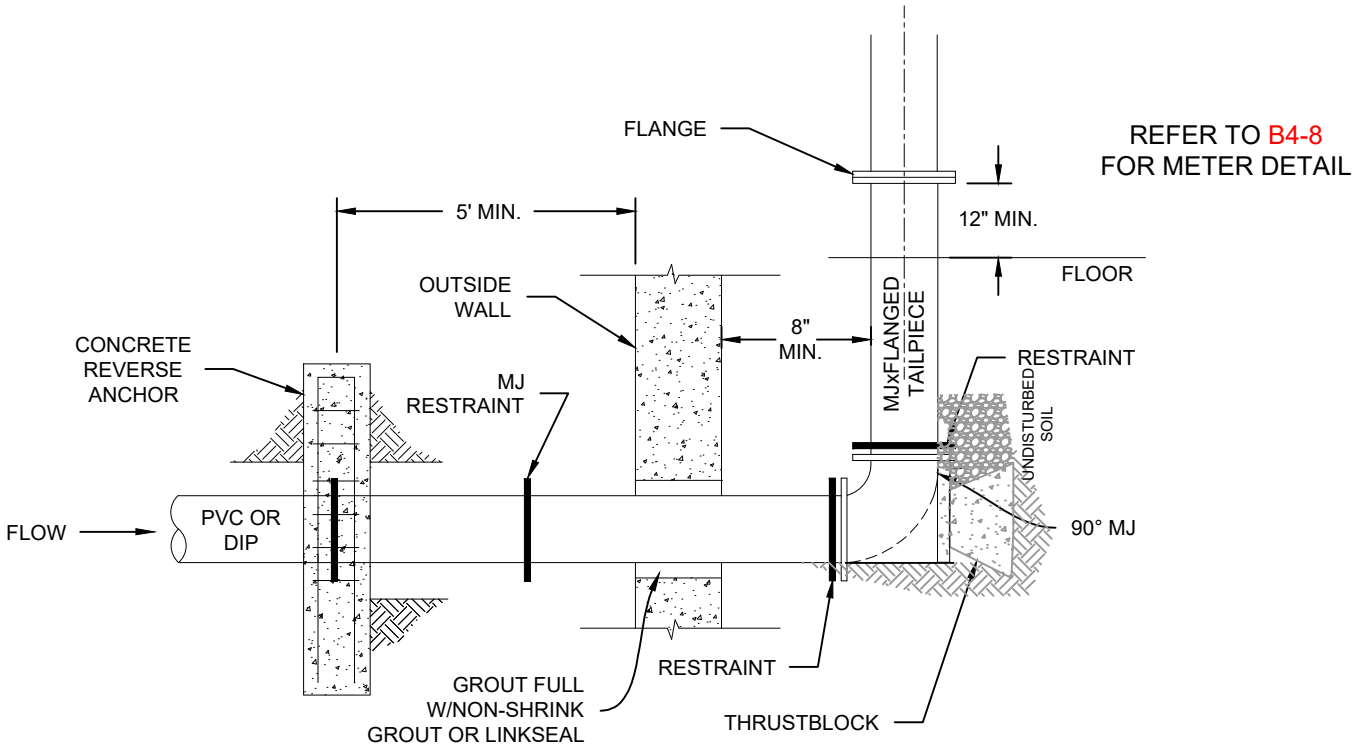
1. WHERE COMPACTION CANNOT BE ACHIEVED UNDER THE WATER MAIN FLOWFILL SHALL BE USED.

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WATER SERVICE ENTRY POINT

B1-5

DATED 01/2017



90° MJ
ENTERING BUILDING

NOTES:

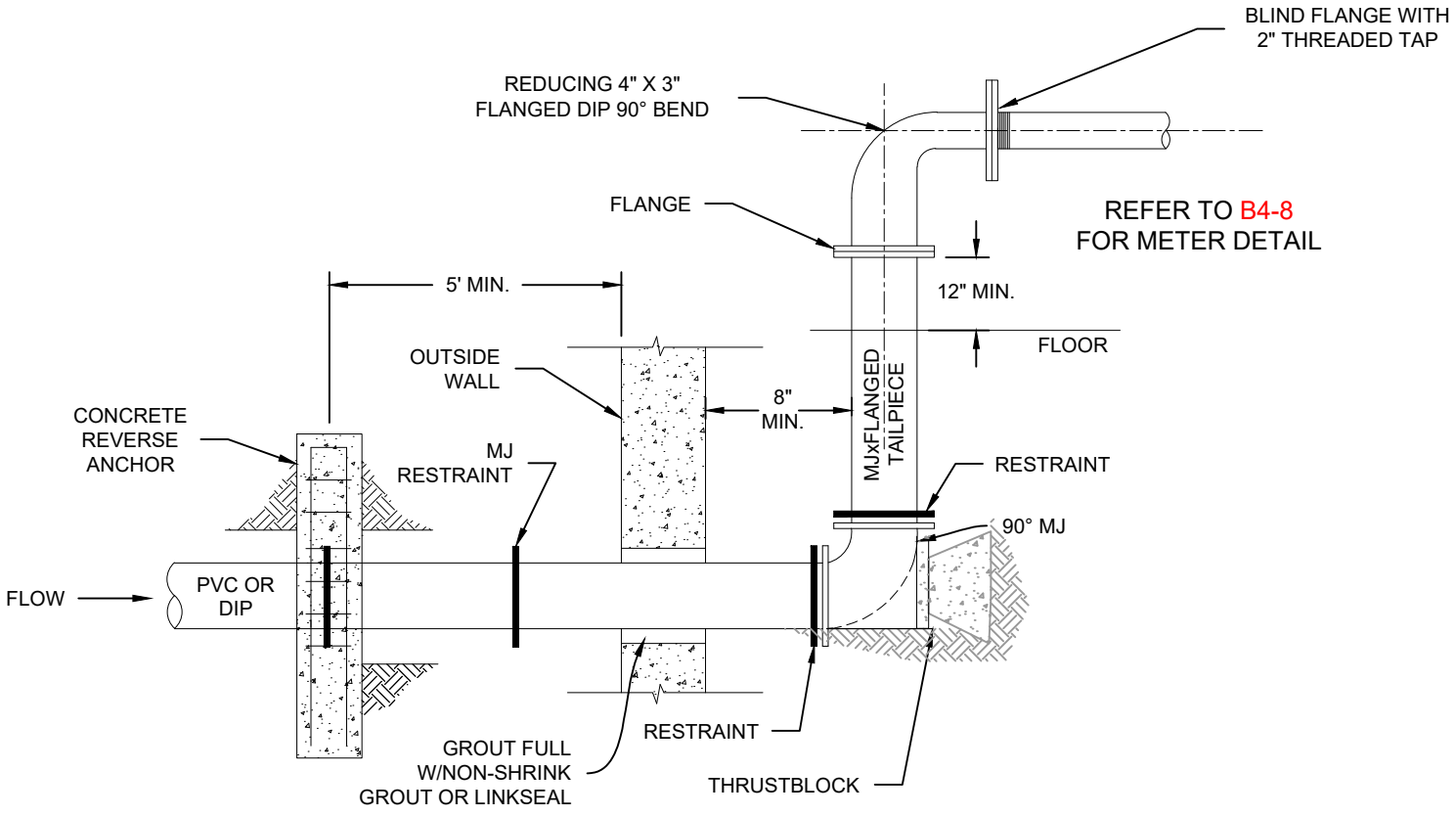
1. MECHANICAL JOINT PIPE RESTRAINTS MAY BE USED IN PLACE OF A CONCRETE REVERSE ANCHOR WHEN INSTALLED IN ACCORDANCE WITH CHAPTER 5 OF COLORADO SPRINGS UTILITIES WATER LESS STANDARDS.
2. WHERE COMPACTION CANNOT BE ACHIEVED UNDER THE WATER MAIN FLOWFILL SHALL BE USED.

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TYPICAL WATER ENTRY 4" AND GREATER

B1-5A

DATED 07/2025



90° MJ
ENTERING BUILDING

NOTES:

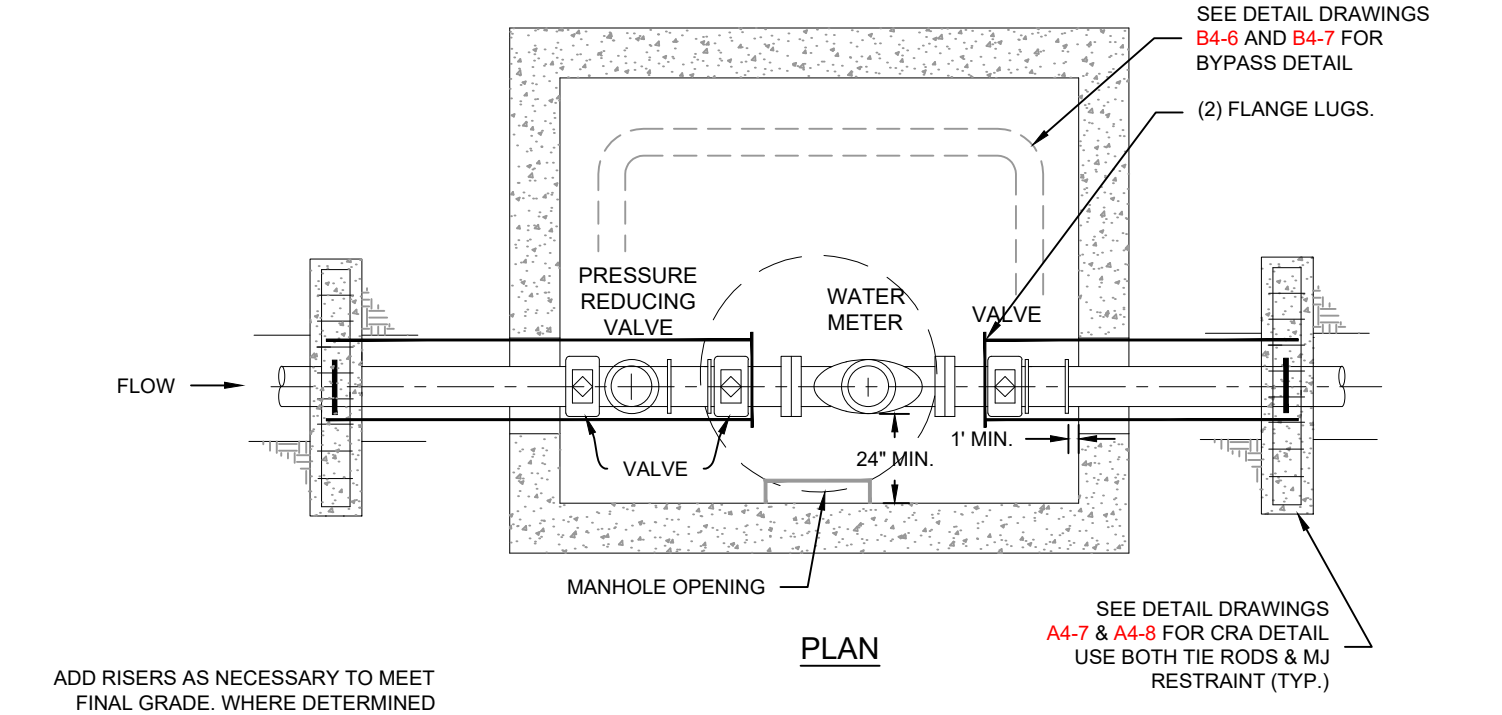
1. MECHANICAL JOINT PIPE RESTRAINTS MAY BE USED IN PLACE OF A CONCRETE REVERSE ANCHOR WHEN INSTALLED IN ACCORDANCE WITH CHAPTER 5 OF COLORADO SPRINGS UTILITIES WATER LESS STANDARDS.
2. WHERE COMPACTION CANNOT BE ACHIEVED UNDER THE WATER MAIN FLOWFILL SHALL BE USED.

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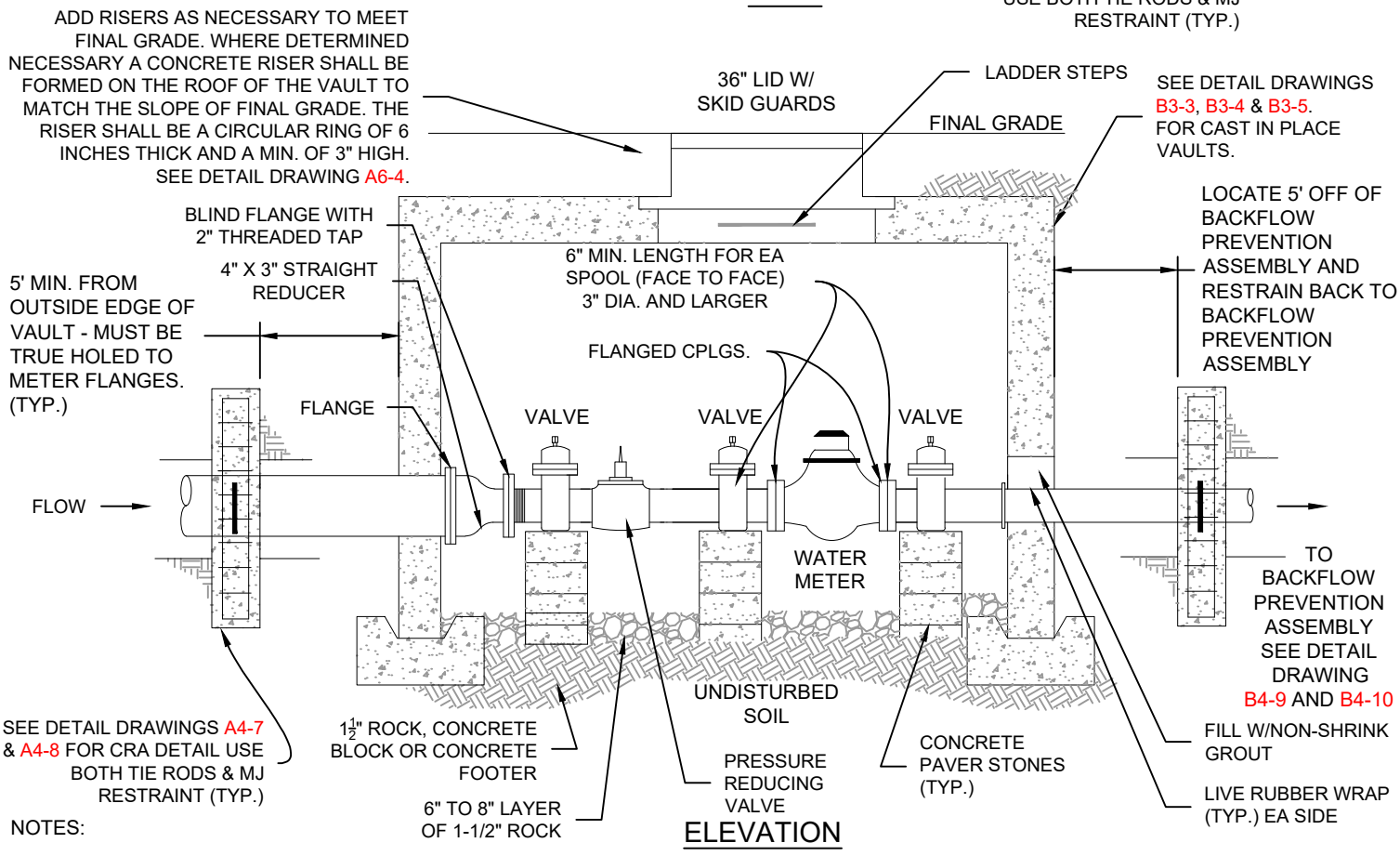
4" OR LARGER MJ RESTRAINT AND REDUCTION TO 2" METER ENTERING BUILDINGS

B1-6

DATED 07/2025



PLAN



ELEVATION

NOTES:

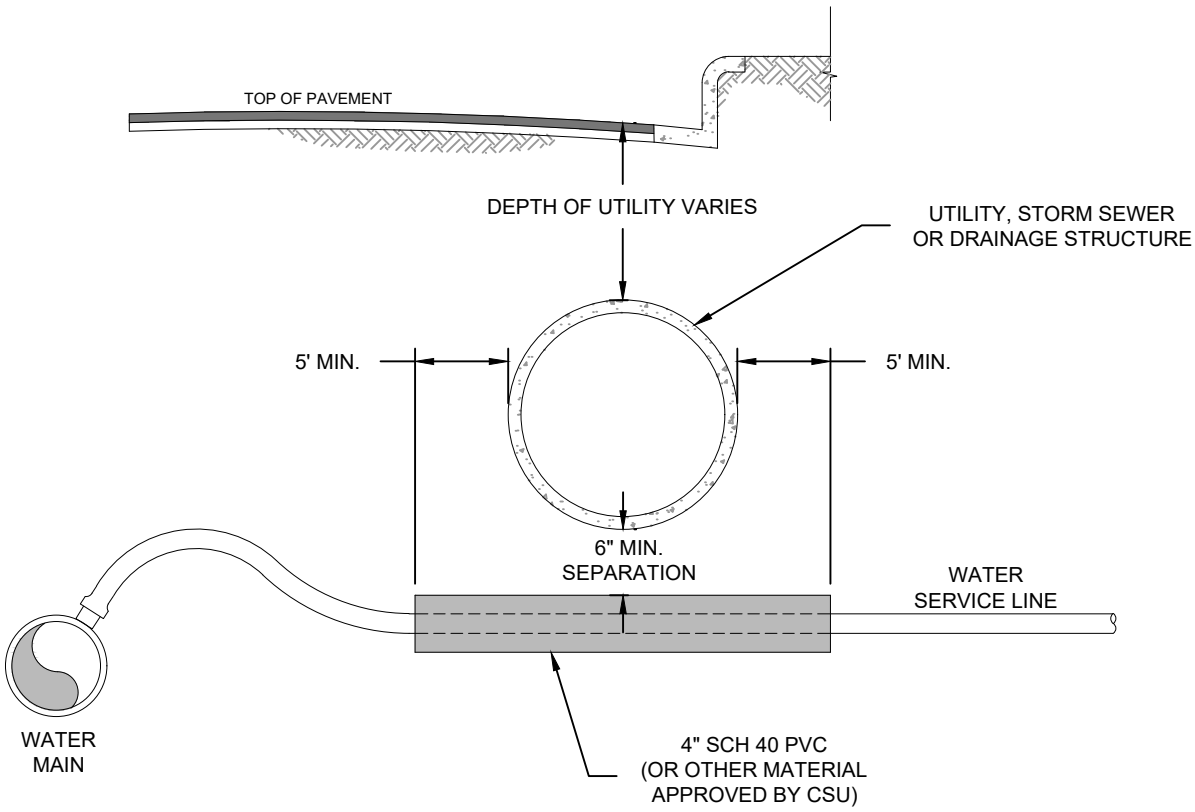
1. REFER TO DETAIL DRAWINGS B4-4, B4-5 AND B4-8 FOR METER INSTALLATION REQUIREMENTS.
2. THE METER MUST BE INSTALLED WITH THE CLEARANCE DIMENSIONS AS SHOWN IN DETAIL DRAWING B4-19 THRU B4-22. ONE SIDE OF THE METER SHALL BE FREE FROM ANY OBSTRUCTION. 3' MINIMUM CLEARANCE IS REQUIRED ABOVE AND IN FRONT OF THE METER.
3. TIE RODS TO BE CATHODICALLY PROTECTED PER DETAIL DRAWING A8-11.
4. PRECAST CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
5. SEE DETAIL DRAWING B3-5 FOR FOOTER DIMENSIONS AND STRUCTURAL REQUIREMENTS.
6. SEE DETAIL DRAWINGS B3-3 AND B3-5 FOR PRECAST VAULT DIMENSIONS.
7. NO DRAIN VALVES, OUTLETS OR BRANCH LINES SHALL BE LOCATED BEFORE THE APPROVED BACKFLOW PREVENTION ASSEMBLY.
8. BACKFLOW PREVENTION ASSEMBLY MUST BE LOCATED NO MORE THAN 10' FROM THE OUTSIDE EDGE OF VAULT.

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4" REDUCTION TO 2" METER VAULT

B1-6A

DATED 07/2025



NOTES:

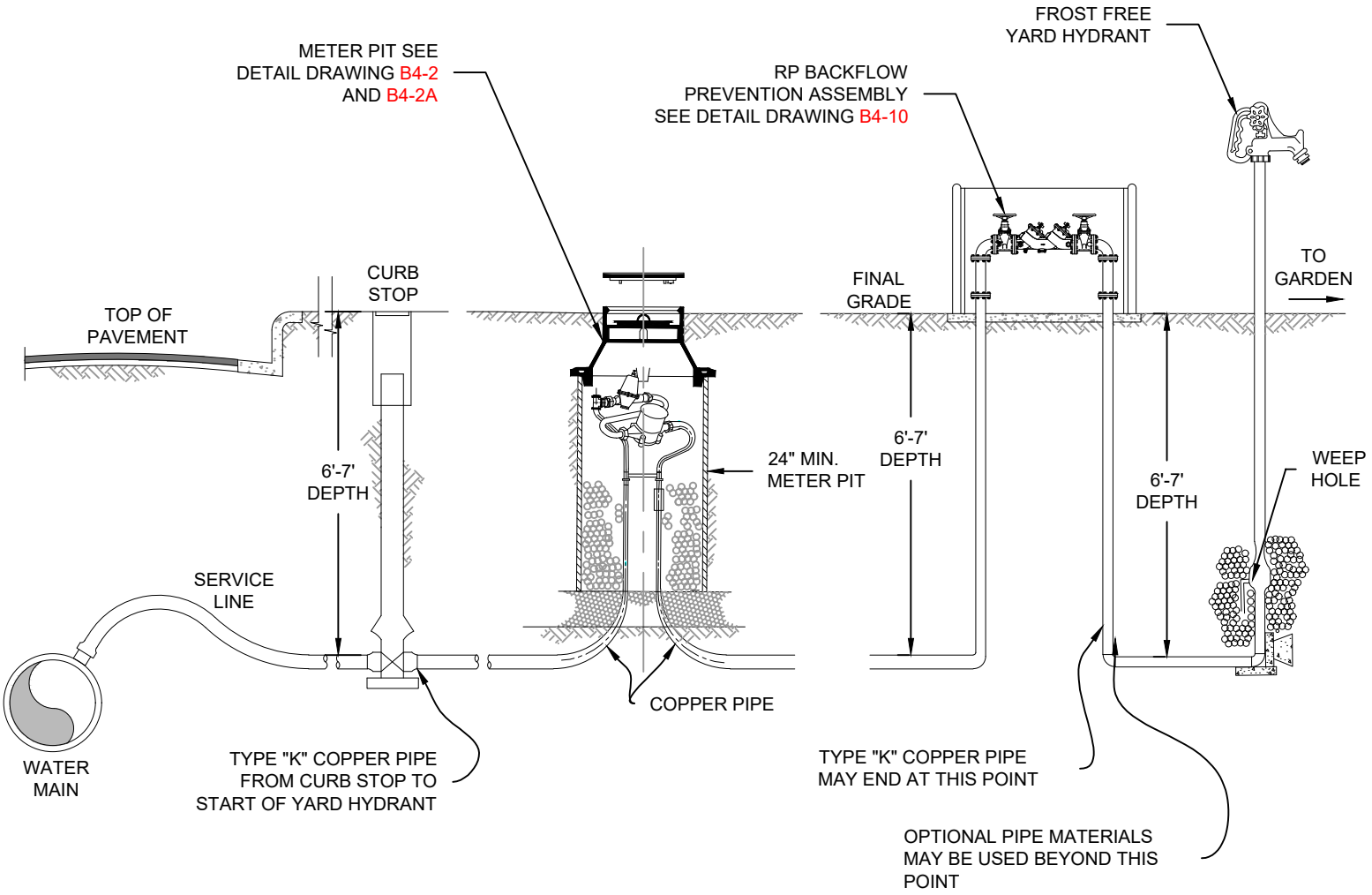
1. SHOULD ANY SITUATION BE ENCOUNTERED THAT DOES NOT MEET STANDARDS, NOTIFY COLORADO SPRINGS UTILITY INSPECTOR.
2. REFERENCE SECTION 2.7.F OF THESE STANDARDS FOR CROSSING DESIGN INFORMATION.
3. FOR SERVICES 4" AND LARGER SEE DETAIL DRAWINGS A7-1 AND A7-2.
4. A SLEEVE IS REQUIRED WHERE SEPARATION IS LESS THAN 18" FROM BOTTOM OF UTILITY TO TOP OF WATER SERVICE OR WHERE THE UTILITY IS 30" OR GREATER IN SIZE.
5. PROVIDE WATER TIGHT SEAL ON BOTH ENDS OF SLEEVE.
6. IF THE SERVICE IS LOCATED WITHIN STORM SEWER BEDDING IT SHALL BE SLEEVED THROUGH THE BEDDING A MINIMUM OF 5' EITHER SIDE REGARDLESS OF DEPTH.
7. WHERE COMPACTION CANNOT BE ACHIEVED FLOWFILL SHALL BE USED.

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INSTALLATION FOR SERVICE LINE W/SLEEVE UNDER A UTILITY 3/4" - 2"

B1-7

DATED 03/2014



NOTES:

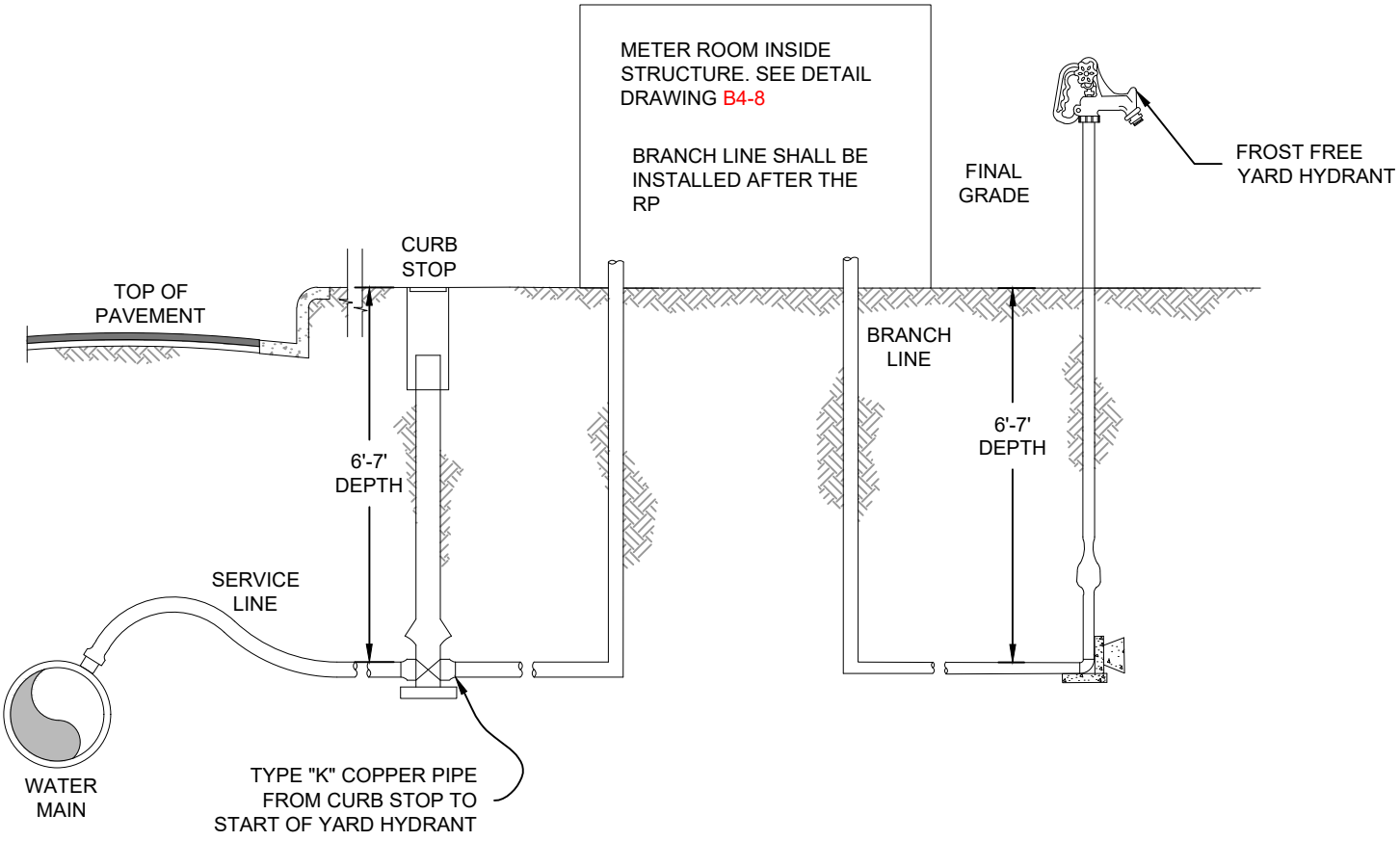
1. METER AND PRESSURE REGULATOR SHALL BE INSTALLED PER DETAIL DRAWINGS B4-2 AND B4-2A.
2. SERVICE LINE ASSEMBLY SHALL BE CONSTRUCTED WITH TYPE "K" COPPER PIPE FROM CURB STOP TO THE FIRST ELBOW OF THE YARD HYDRANT ASSEMBLY
3. THE BACKFLOW PREVENTION ASSEMBLY SHALL BE PER DETAIL DRAWING B4-10.
4. FOR SEASONAL USE ONLY: REFERENCE DRAWING A 10-3B FOR TEMPORARY REMOVAL OF BACKFLOW DEVICE
5. METER PIT AND YARD HYDRANT MUST BE FROST FREE UNITS TO PROTECT FROM FREEZING DURING WINTER MONTHS
6. YARD HYDRANT MUST DRAIN WHEN NOT IN USE, 3/4"-2" ROCK SHALL BE USED AROUND WEEP HOLE OR DRAIN TO ALLOW DRAINAGE
7. SYSTEM SHOULD BE DRAINED AND BLOWN OUT BY OCTOBER 20TH OF EACH YEAR TO AVOID DAMAGE FROM FREEZING, UNLESS ALTERNATIVE PRECAUTIONS ARE UNDERTAKEN BY THE OWNER
8. ALL PROPOSED INSTALLATIONS FOR COMMUNITY GARDENS MUST BE SUBMITTED WITH A UTILITY SERVICE PLAN OR ALTERNATIVELY A SITE PLAN SHOWING THE LOCATION OF ALL REQUIRED APPURTENANCES

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COMMUNITY GARDEN SERVICE DETAIL

B1-8

DATED 01/2017



NOTES:

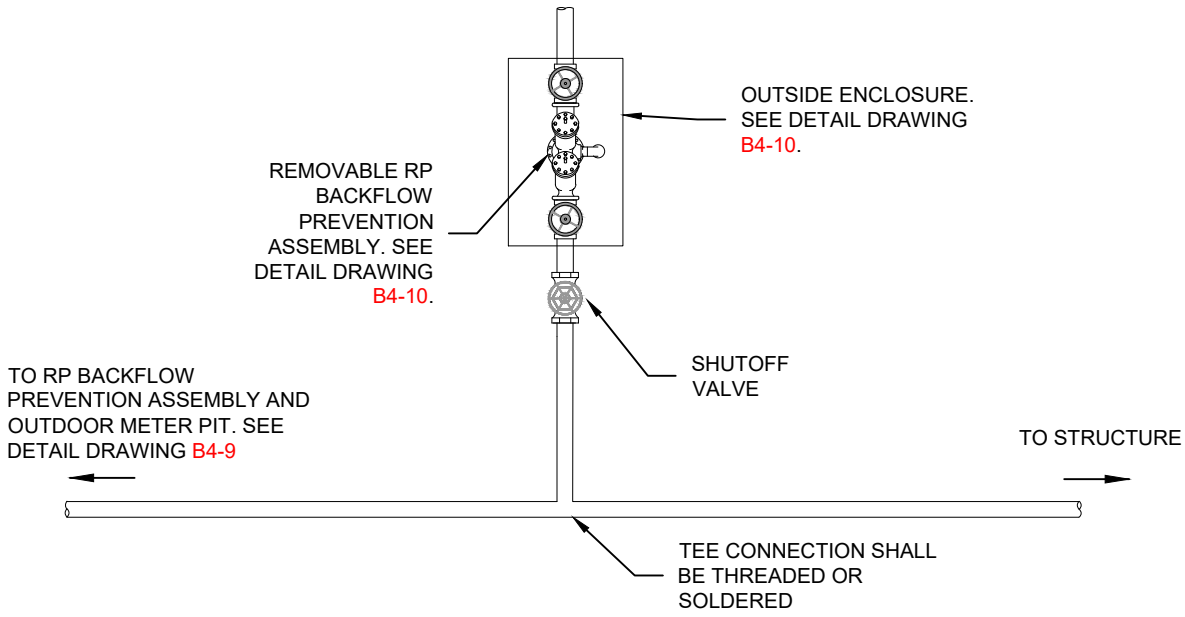
1. SERVICE LINE ASSEMBLY SHALL BE CONSTRUCTED WITH TYPE "K" COPPER PIPE FROM CURB STOP TO THE FIRST ELBOW OF THE YARD HYDRANT ASSEMBLY.
2. FOR SEASONAL USE ONLY: REFERENCE DRAWING B4-10 FOR TEMPORARY REMOVAL OF BACKFLOW DEVICE.
3. METER PIT AND YARD HYDRANT MUST BE FROST FREE UNITS TO PROTECT FROM FREEZING DURING WINTER MONTHS.
4. ALL PROPOSED INSTALLATIONS FOR POTABLE YARD HYDRANTS MUST BE SUBMITTED WITH A UTILITY SERVICE PLAN OR ALTERNATIVELY A SITE PLAN SHOWING THE LOCATION OF ALL REQUIRED APPURTENANCES .

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POTABLE YARD HYDRANT DETAIL

B1-9

DATED 08/2022

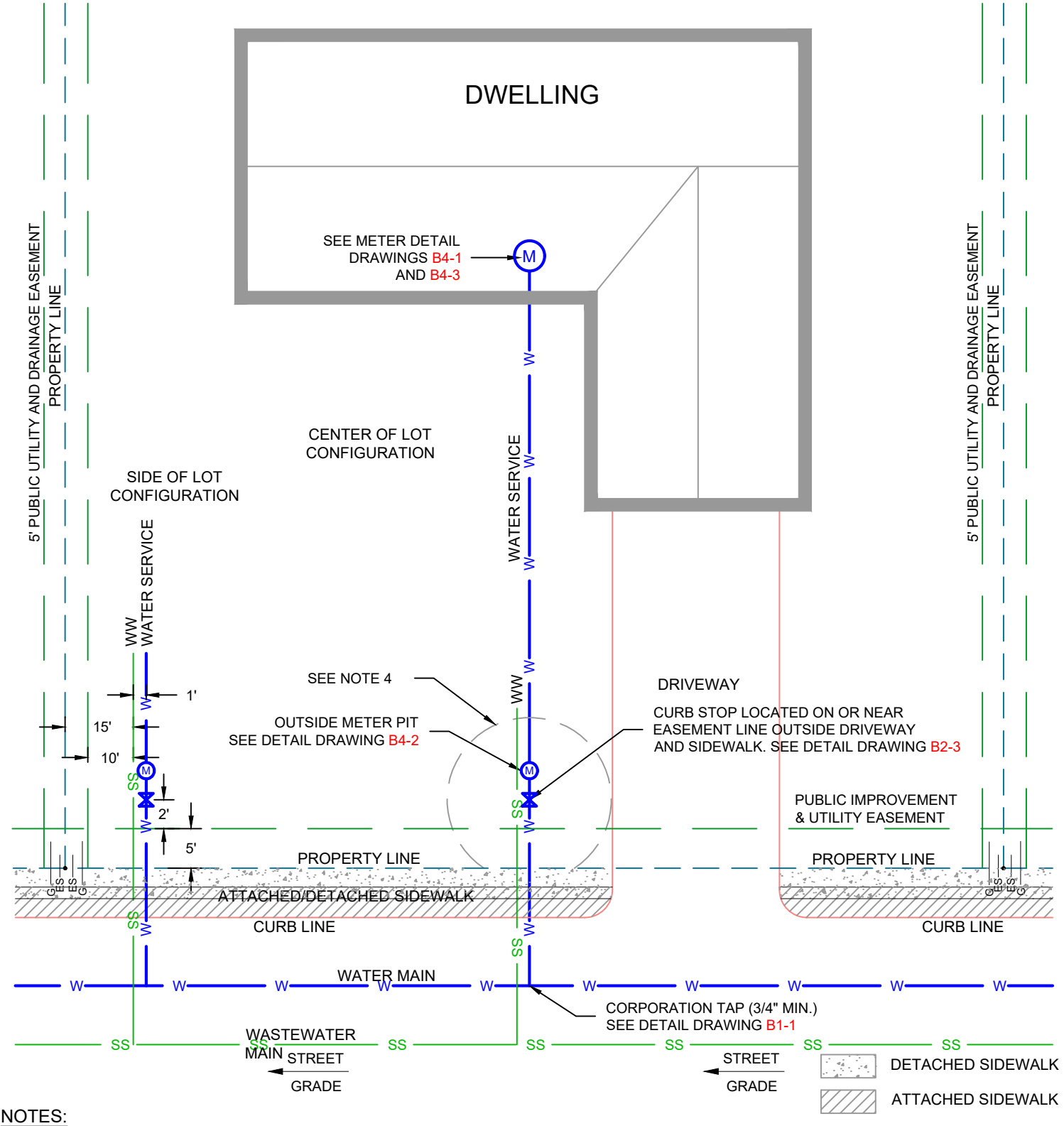


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COMMERCIAL SERVICE LINE BRANCH BEFORE STRUCTURE

B1-10

DATED 08/2022



NOTES:

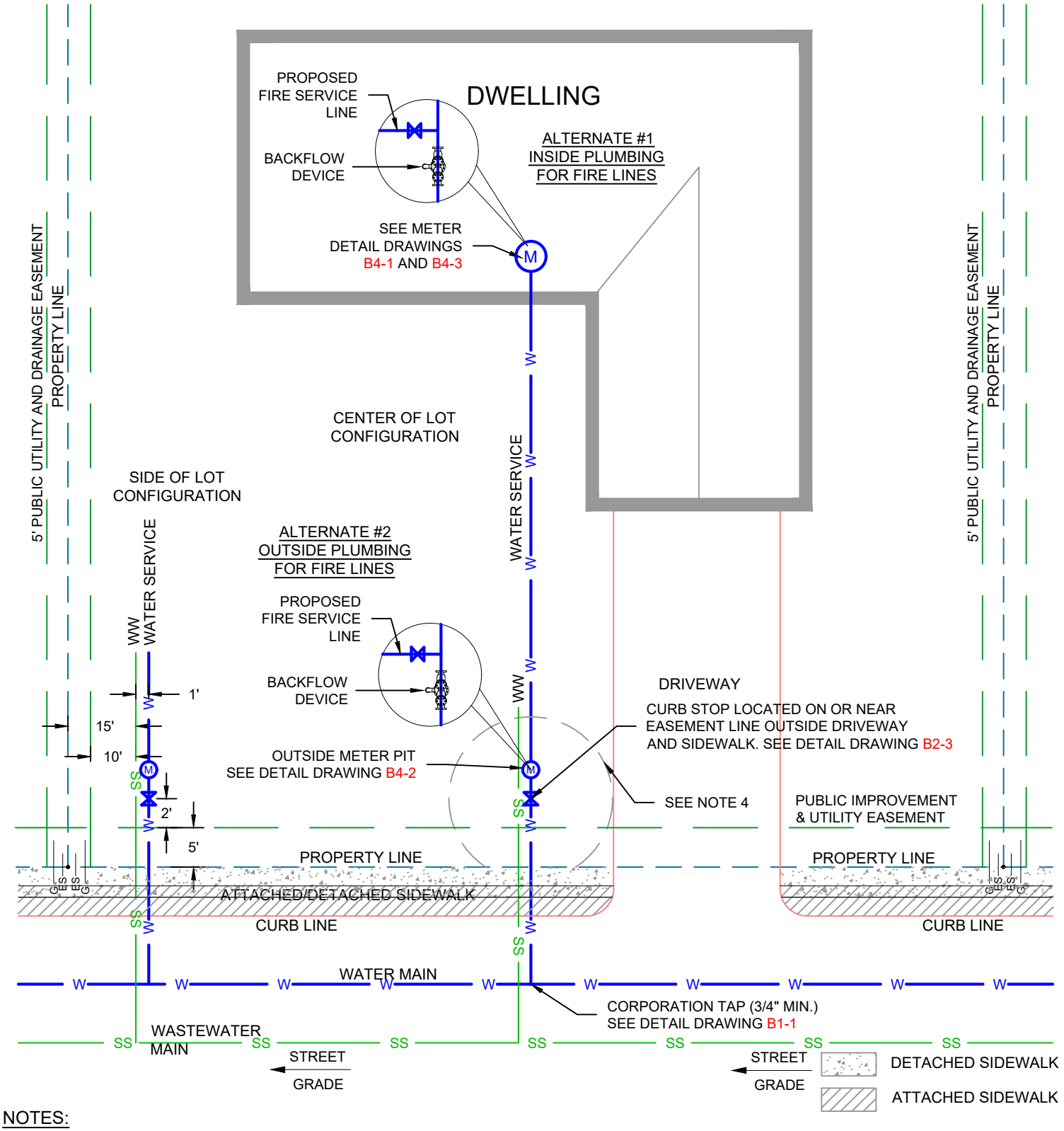
1. DIMENSIONS SHOWN ARE TYPICAL UNLESS OTHERWISE NOTED ON PLANS.
2. EITHER CENTER-OF-LOT INSTALLATION OR SIDE-OF-LOT INSTALLATION ARE ACCEPTABLE AND AT THE ENGINEERS DISCRETION. WATER/WASTEWATER SERVICE LINES SHALL BE PLACED WHEN CENTER-OF-LOT OUTSIDE DRIVEWAY, AND A MINIMUM OF 15' FROM SIDE-LOT-LINE WITH APPLICABLE SEPARATION CRITERIA.
3. IN AREAS WHERE CROSSING GAS AND ELECTRIC IN A JOINT TRENCH, THE CURB STOP SHALL BE LOCATED PER DETAIL DRAWING B2-3.
4. NO PERMANENT STRUCTURES OR LANDSCAPING SHALL BE LOCATED WITHIN 5' RADIUS OF THE CURB STOP BOX OR METER PIT.
5. CURB STOP DISTANCE FROM SIDEWALK DETACHED OR ATTACHED WILL VARY UPON WIDTH OF SIDEWALKS, SEE DETAIL DRAWING B2-3.

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TYPICAL SERVICE LOCATIONS TO A SINGLE- FAMILY RESIDENTIAL DWELLING

B2-1

DATED 01/2016



NOTES:

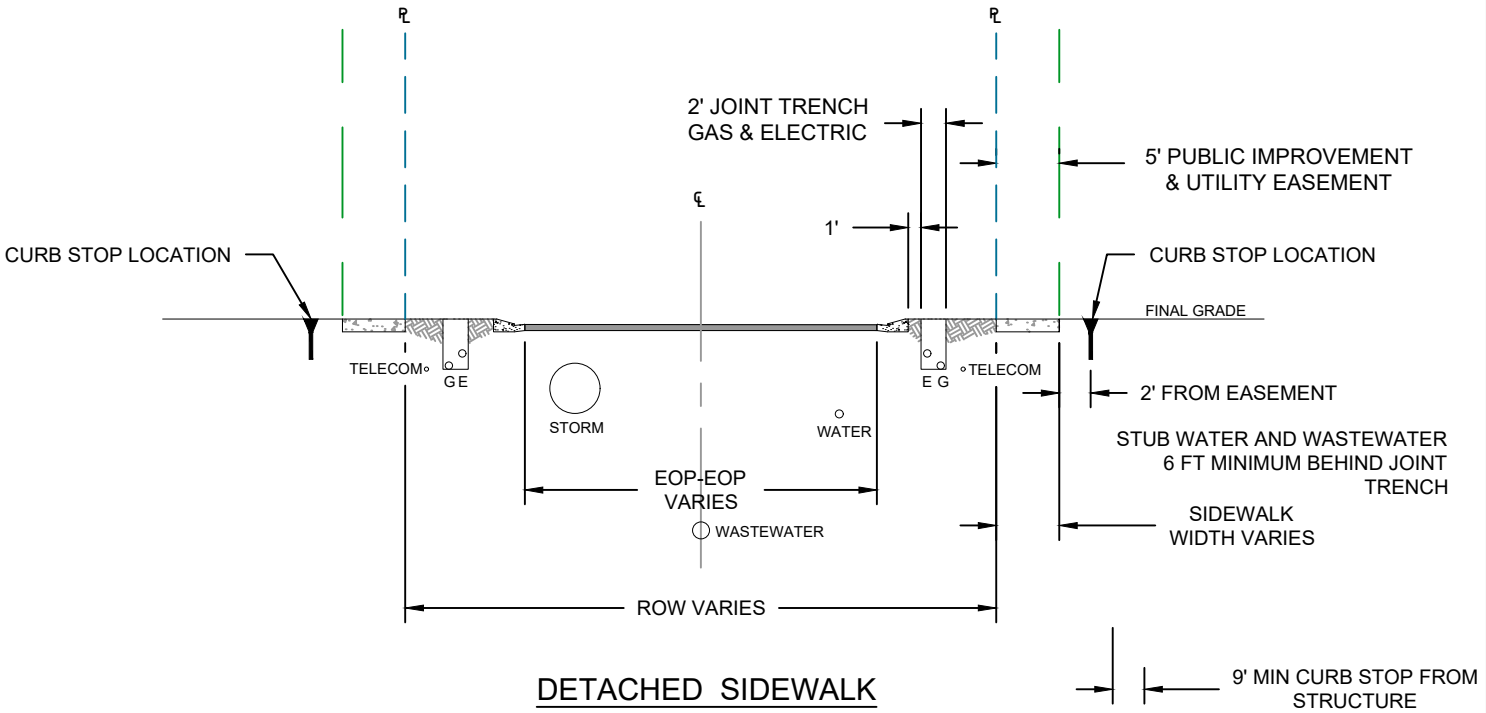
1. DIMENSIONS SHOWN ARE TYPICAL UNLESS OTHERWISE NOTED ON PLANS.
2. EITHER CENTER-OF-LOT INSTALLATION OR SIDE-OF-LOT INSTALLATION ARE ACCEPTABLE AND AT THE ENGINEERS DISCRETION. WATER/WASTEWATER SERVICE LINES SHALL BE PLACED WHEN CENTER-OF-LOT OUTSIDE DRIVEWAY, AND A MINIMUM OF 15' FROM SIDE-LOT-LINE WITH APPLICABLE SEPARATION CRITERIA.
3. IN AREAS WHERE CROSSING GAS AND ELECTRIC IN A JOINT TRENCH, THE CURB STOP SHALL BE LOCATED PER DETAIL DRAWING B2-3.
4. NO PERMANENT STRUCTURES OR LANDSCAPING SHALL BE LOCATED WITHIN 5' RADIUS OF THE CURB STOP BOX OR METER PIT.
5. CURB STOP DISTANCE FROM SIDEWALK DETACHED OR ATTACHED WILL VARY UPON WIDTH OF SIDEWALKS, SEE DETAIL DRAWING B2-3.

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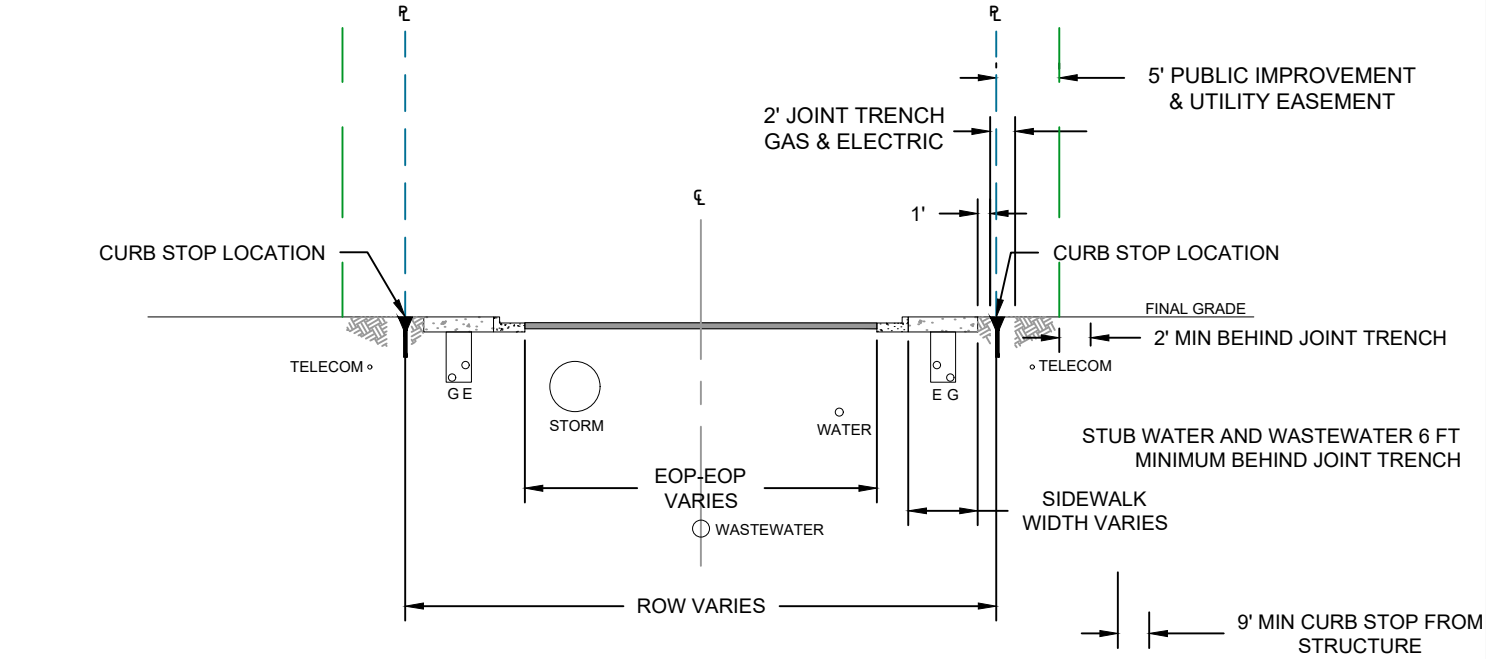
TYPICAL SERVICE LOCATIONS WITH FIRE LINE TO A SINGLE-FAMILY RESIDENTIAL DWELLING

B2-2

DATED 01/2017



DETACHED SIDEWALK



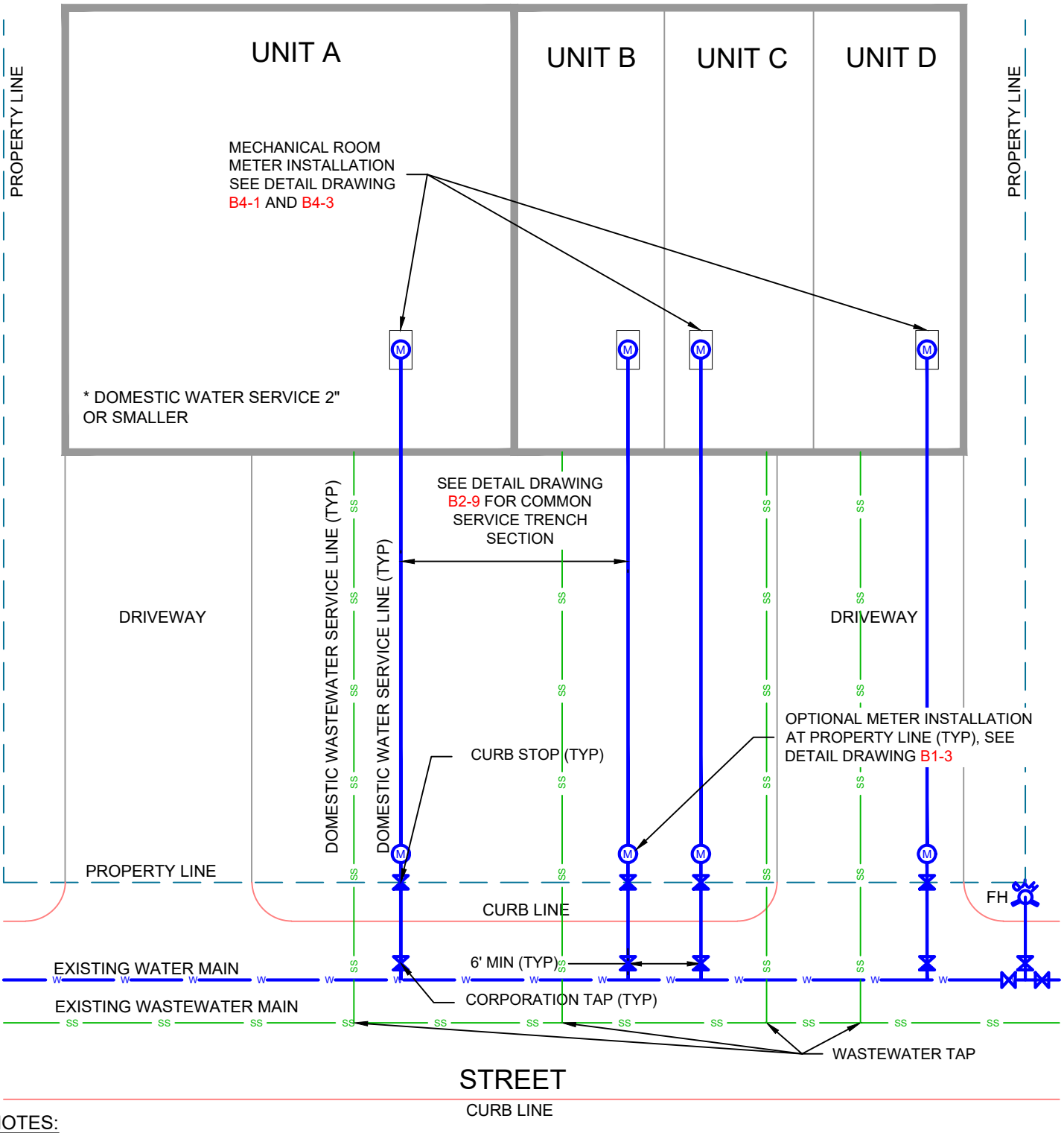
ATTACHED SIDEWALK

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SINGLE-FAMILY RESIDENTIAL STREET
CURB STOP LOCATION

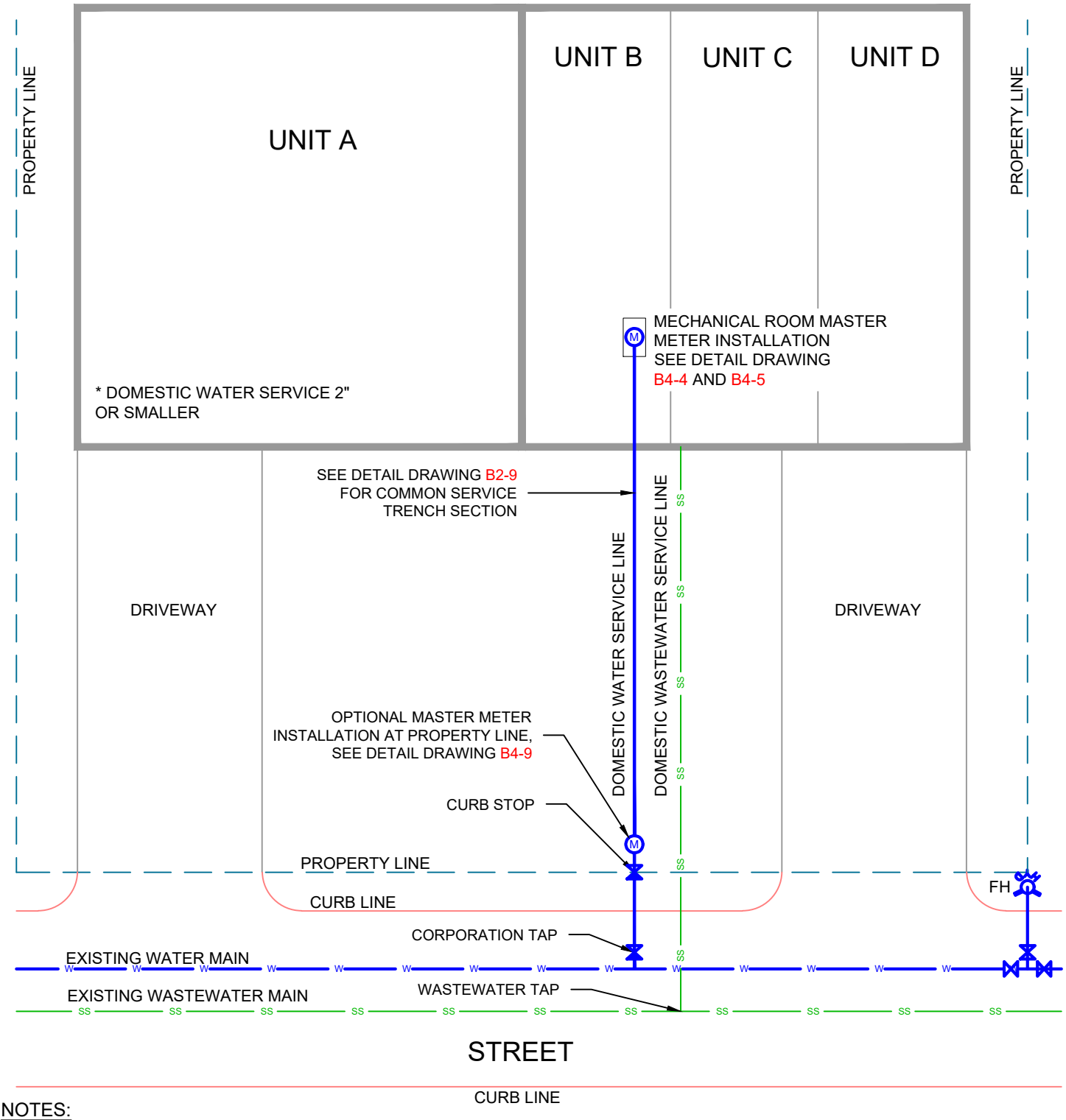
B2-3

DATED 07/2025



NOTES:

1. THIS DETAIL DRAWING APPLIES TO A SINGLE PLATTED LOT WITH MULTIPLE DWELLING UNITS, WHERE EACH UNIT IS CONNECTED AND METERED SEPARATELY. IF THE PROPERTY IS SUBDIVIDED, INDIVIDUAL SERVICE LINES SHOULD BE INCLUDED ON THE INDIVIDUALLY PLATTED LOT. IN THE ALTERNATIVE A PRIVATE EASEMENT SHOULD BE PROVIDED TO ACCOMMODATE WATER SERVICE LINES THAT MAY CROSS ANOTHER PLATTED LOT.



NOTES:

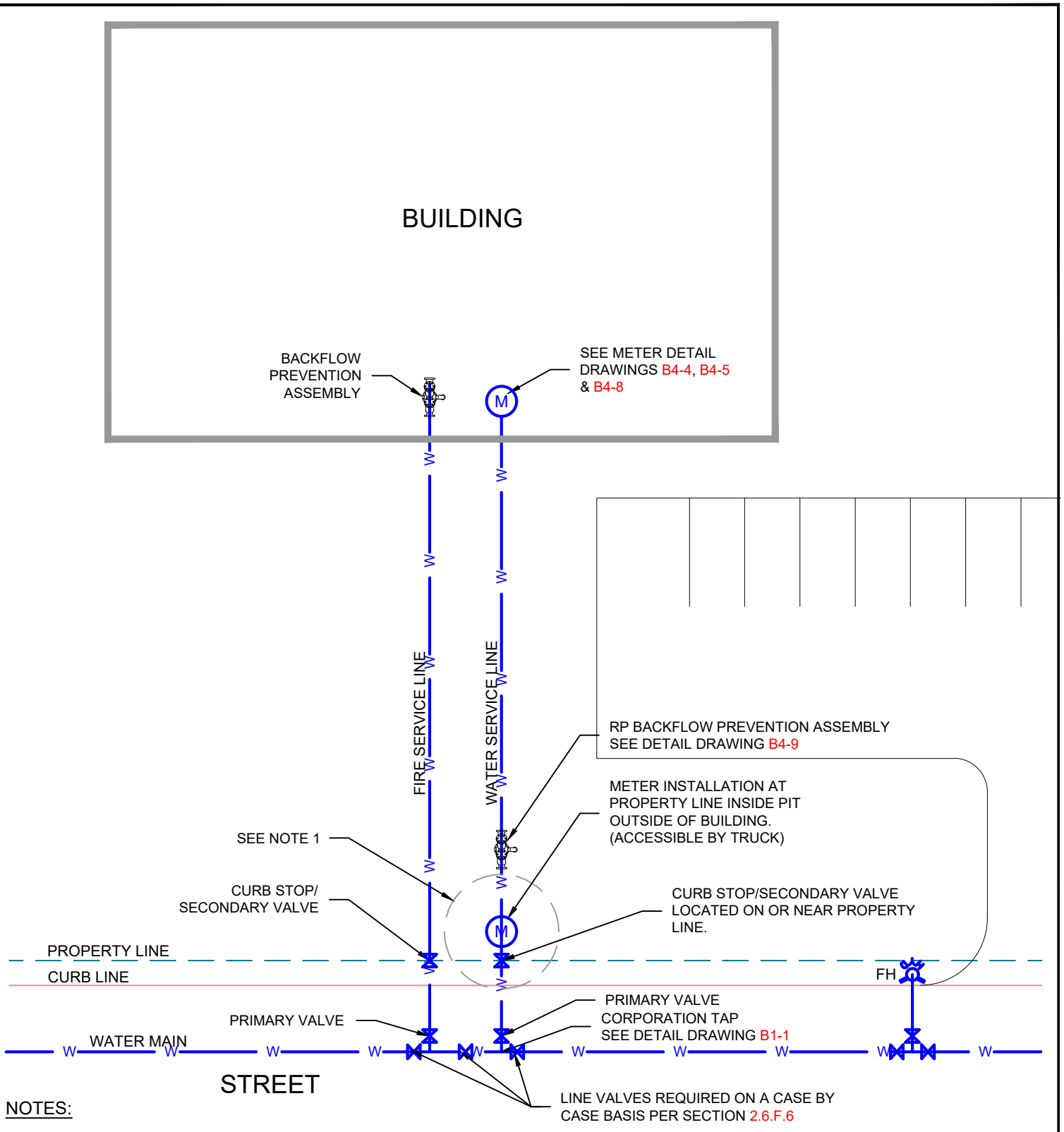
1. THIS DETAIL DRAWING APPLIES TO A SINGLE PLATTED LOT WITH MULTIPLE DWELLING UNITS AND ONE WATER SERVICE LINE CONNECTION TO THE WATER MAIN. IF THE PROPERTY IS SUBDIVIDED, INDIVIDUAL SERVICE LINES SHALL BE PROVIDED BY THE OWNER/DEVELOPER FOR EACH INDIVIDUALLY PLATTED LOT.
2. FOR SINGLE TAPS PROVIDING WATER SERVICE TO MULTIPLE UNITS, A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED DIRECTLY AFTER THE MASTER METER AND/OR BEFORE THE FIRST BRANCH LINE. PLEASE SEE THE DEFINITION OF MULTI-FAMILY CONNECTION AND SECTION 2.7.N FOR BACKFLOW PREVENTION REQUIREMENTS.
3. UNITS CAN BE SUBMETERED BY THE CUSTOMER AFTER THE MASTER METER.

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MULTI-FAMILY RESIDENTIAL PREMISES UTILITY SERVICE OPTION #2

B2-5

DATED 01/2017



NOTES:

1. NO PERMANENT STRUCTURES OR LANDSCAPING WITHIN 5' RADIUS OF METER PIT OR VAULT.
2. FOR TAPS 4" OR LARGER SEE SECTION 2.6.B.
3. ALL VALVES AND APPURTENANCES (EXCEPT THE METER) SHALL BE OWNED AND MAINTAINED BY THE PROPERTY OWNER.
4. WATER AND WASTEWATER SERVICE LINES SHALL BE LOCATED A MINIMUM OF 15' FROM SIDE LOT LINES.
5. FOR DOMESTIC AN RP BACKFLOW PREVENTION ASSEMBLY IS REQUIRED DIRECTLY AFTER THE MASTER METER AND/OR BEFORE THE FIRST BRANCH LINE. SEE SECTION 2.7.N FOR BACKFLOW PREVENTION REQUIREMENTS.
6. FOR FIRE SERVICE A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED AT THE ENTRY TO THE BUILDING. SEE SECTION 2.7.N FOR BACKFLOW PREVENTION REQUIREMENTS.

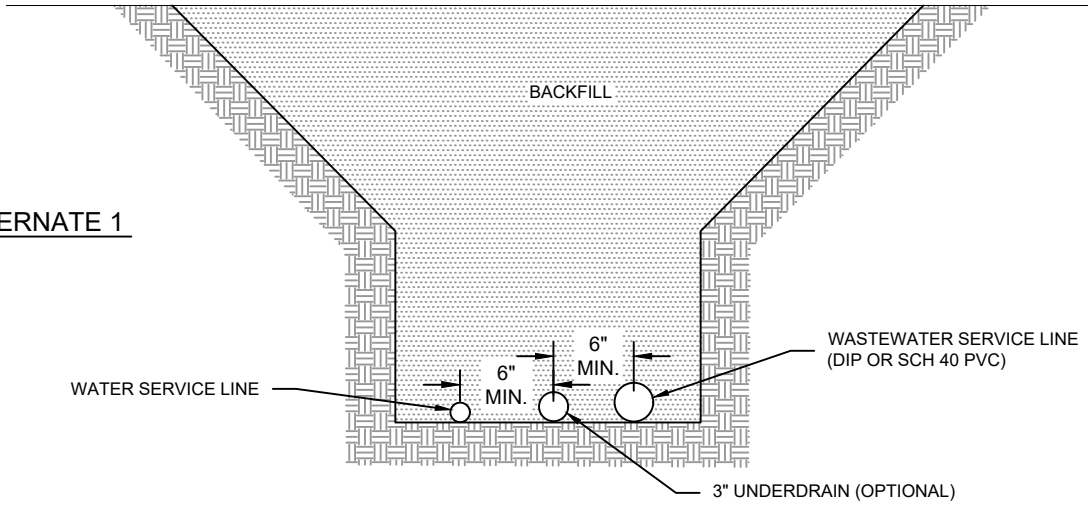
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FIRE AND DOMESTIC WATER SERVICE PLAN FOR A NON-SINGLE-FAMILY RESIDENTIAL BUILDING

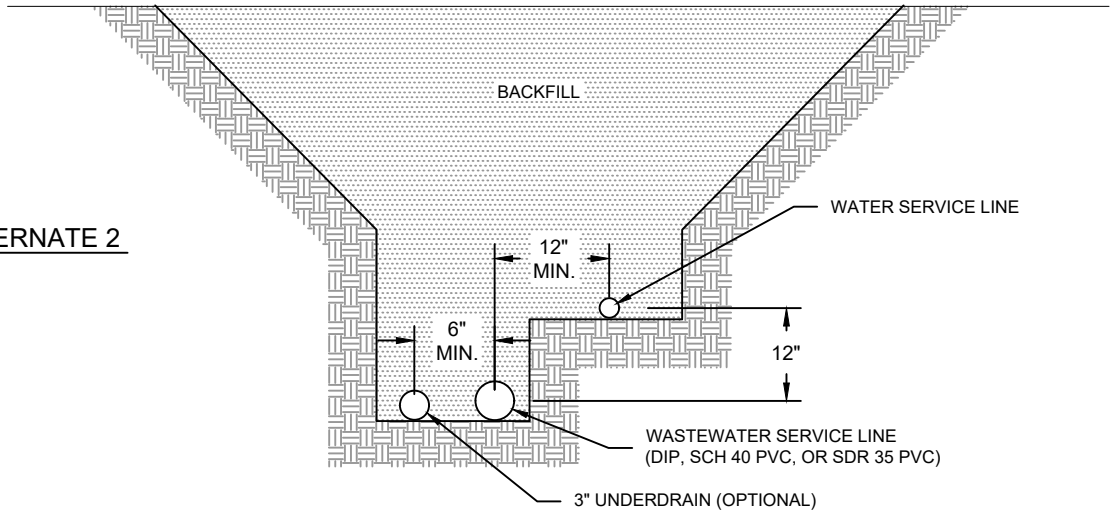
B2-6

DATED 07/2025

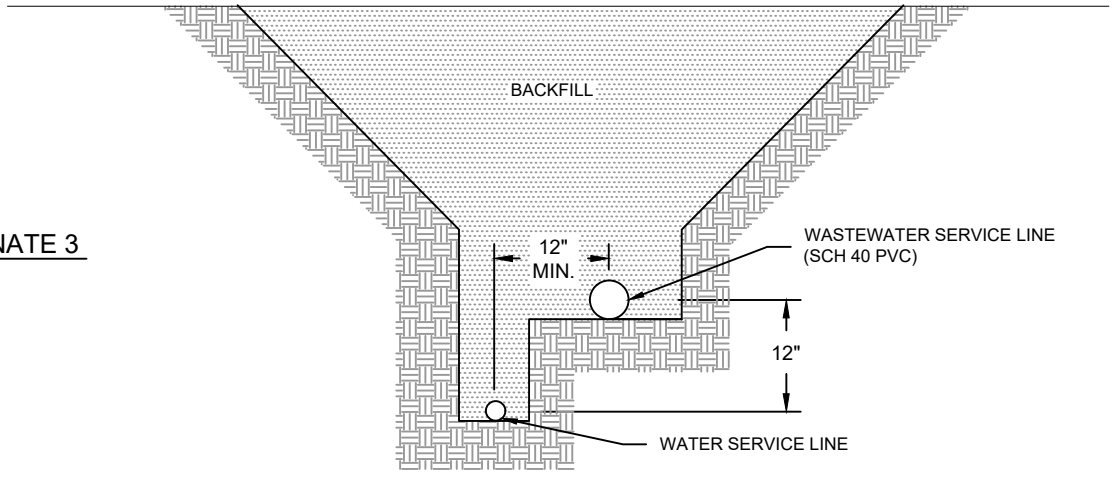
ALTERNATE 1



ALTERNATE 2



ALTERNATE 3

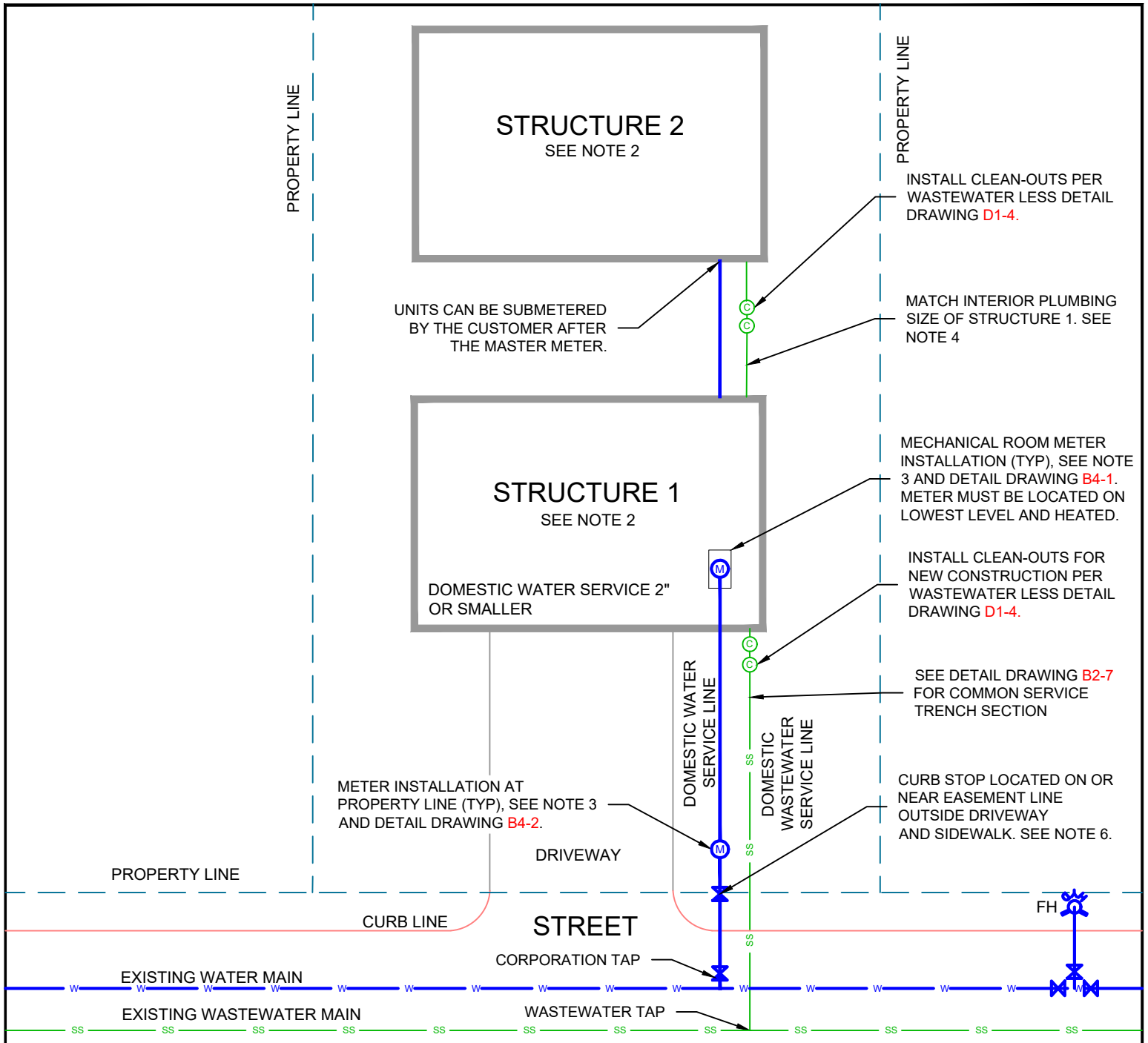


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TYPICAL COMMON SERVICE TRENCH SECTION

B2-7

DATED 08/2022



NOTES:

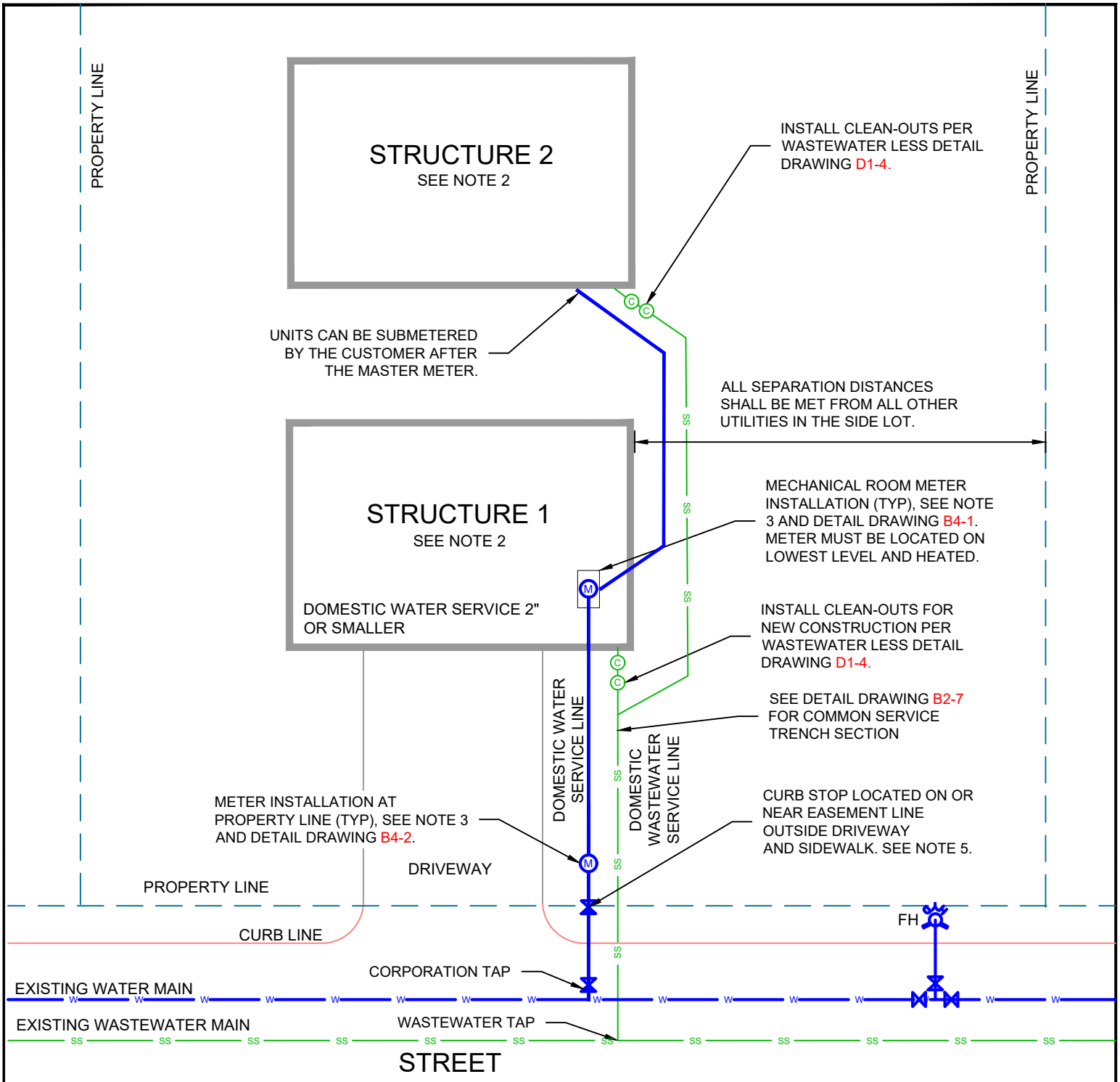
1. THIS DETAIL DRAWING APPLIES TO A SINGLE PLATTED LOT WITH A PRIMARY RESIDENCE AND AN ACCESSORY DWELLING UNIT (ADU) WITH ONE WATER SERVICE LINE CONNECTION TO THE WATER MAIN. IF THE LOT IS SUBDIVIDED, INDIVIDUAL SERVICE LINES SHALL BE PROVIDED BY THE OWNER/DEVELOPER FOR EACH INDIVIDUALLY PLATTED LOT.
2. STRUCTURE 1 IS THE FIRST BUILDING RECEIVING SERVICE AND IS THE CLOSEST BUILDING TO THE WATER AND WASTEWATER MAIN. STRUCTURE 2 IS THE SECOND BUILDING TO RECEIVE SERVICE. ONE STRUCTURE SHALL BE THE PRIMARY RESIDENCE AND THE OTHER SHALL BE THE ADU.
3. A METER ROOM INSTALLATION IS PREFERRED IF STRUCTURE 1 IS THE PRIMARY RESIDENCE. IF STRUCTURE 1 IS THE ADU, THEN AN OUTSIDE METER PIT IS THE PREFERRED INSTALLATION METHOD.
4. 3" SCHEDULE 40 PVC SHALL BE APPROVED WHEN BUILDING SEWER BRANCHES FROM EXISTING BUILDING DRAIN, SEE WASTEWATER LESS SECTION 4.3.B.2 AND 4.3.B.3.
5. SEWER CLEANOUT(S) REQUIRED BETWEEN PRIMARY RESIDENCE AND ADU.
6. CURB STOP MUST HAVE A MINIMUM OF 9-FEET HORIZONTAL SEPARATION FROM STRUCTURE. IF THE 9-FOOT SEPARATION CAN NOT BE MET, A 6-FOOT MINIMUM IS ALLOWED IF STRUCTURE 1 HAS A MINIMUM 3-FOOT BELOW FINISHED GRADE FOUNDATION WALL.
7. ALL SERVICE LINES UNDER STRUCTURE SLAB OR FOUNDATION SHALL BE CONSTRUCTED OUT OF SCHEDULE 40 PVC AND BE MAINTAINABLE IN THE FUTURE.

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SINGLE-FAMILY RESIDENTIAL WITH DETACHED ADU OPTION 1

B2-8

DATED 07/2022



NOTES:

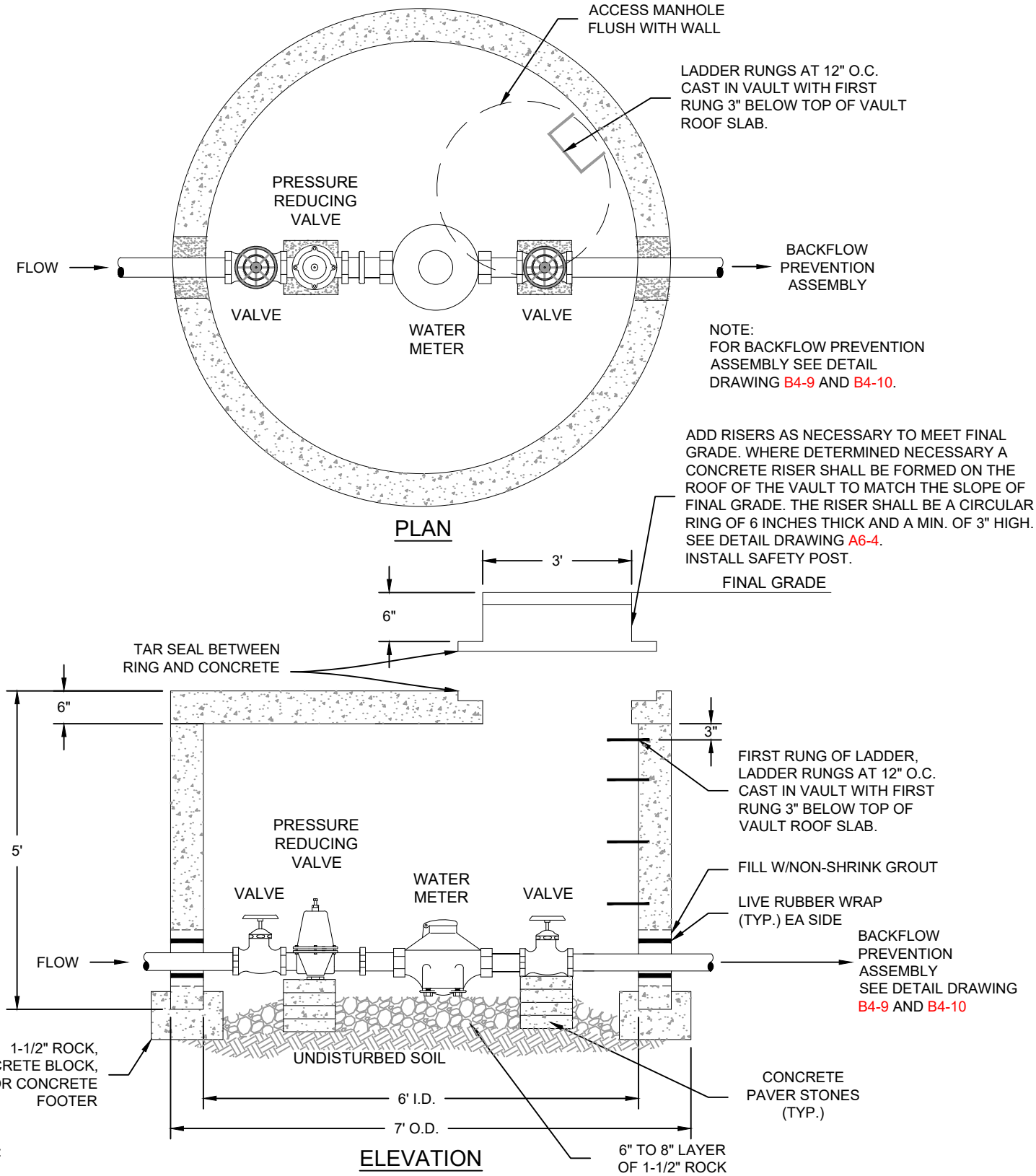
1. THIS DETAIL DRAWING APPLIES TO A SINGLE PLATTED LOT WITH A PRIMARY RESIDENCE AND AN ACCESSORY DWELLING UNIT (ADU) WITH ONE WATER SERVICE LINE CONNECTION TO THE WATER MAIN. IF THE LOT IS SUBDIVIDED, INDIVIDUAL SERVICE LINES SHALL BE PROVIDED BY THE OWNER/DEVELOPER FOR EACH INDIVIDUALLY PLATTED LOT.
2. STRUCTURE 1 IS THE FIRST BUILDING RECEIVING SERVICE AND IS THE CLOSEST BUILDING TO THE WATER AND WASTEWATER MAIN. STRUCTURE 2 IS THE SECOND BUILDING TO RECEIVE SERVICE. ONE STRUCTURE SHALL BE THE PRIMARY RESIDENCE AND THE OTHER SHALL BE THE ADU.
3. A METER ROOM INSTALLATION IS PREFERRED IF STRUCTURE 1 IS THE PRIMARY RESIDENCE. IF STRUCTURE 1 IS THE ADU, THEN AN OUTSIDE METER PIT IS THE PREFERRED INSTALLATION METHOD.
4. SEWER CLEANOUT(S) REQUIRED BETWEEN PRIMARY RESIDENCE AND ADU.
5. CURB STOP MUST HAVE A MINIMUM OF 9-FEET HORIZONTAL SEPARATION FROM STRUCTURE. IF THE 9-FOOT SEPARATION CAN NOT BE MET, A 6-FOOT MINIMUM IS ALLOWED IF STRUCTURE 1 HAS A MINIMUM 3-FOOT BELOW FINISHED GRADE FOUNDATION WALL.
6. ALL SERVICE LINES UNDER STRUCTURE SLAB OR FOUNDATION SHALL BE CONSTRUCTED OUT OF SCHEDULE 40 PVC AND BE MAINTAINABLE IN THE FUTURE.

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SINGLE-FAMILY RESIDENTIAL WITH DETACHED ADU OPTION 2

B2-9

DATED 07/2022



NOTES:

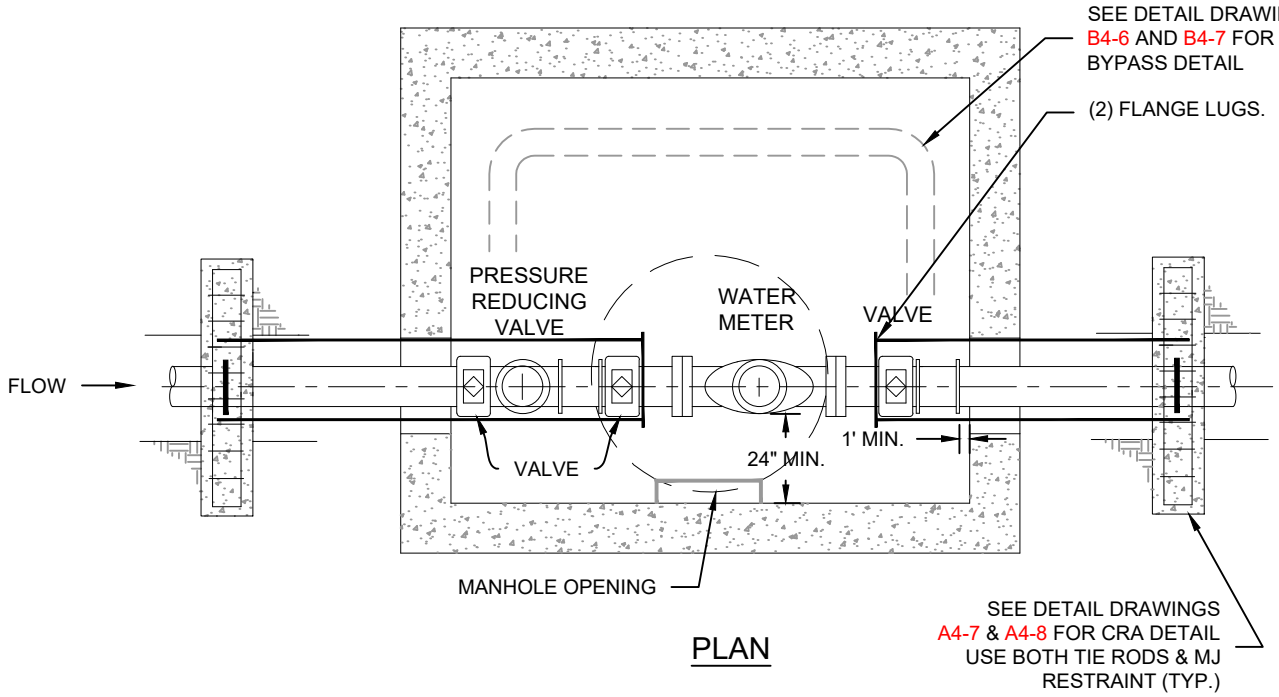
1. REFER TO DETAIL DRAWINGS B4-4, B4-5 AND B4-8 FOR METER INSTALLATION REQUIREMENTS.
2. THE METER MUST BE INSTALLED WITH THE CLEARANCE DIMENSIONS AS SHOWN IN DETAIL DRAWINGS B4-19 THRU B4-22. ONE SIDE OF THE METER SHALL BE FREE FROM ANY OBSTRUCTION. 3' MINIMUM CLEARANCE IS REQUIRED ABOVE AND IN FRONT OF THE METER.
3. THE PRESSURE REDUCING VALVE IS TO BE INSTALLED ON THE INLET SIDE OF METER.
4. PRECAST CONCRETE VAULT SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
5. SEE DETAIL DRAWING B3-5 FOR FOOTER DIMENSIONS AND STRUCTURAL REQUIREMENTS.
6. NO DRAIN VALVES, OUTLETS OR BRANCH LINES SHALL BE LOCATED BEFORE THE APPROVED BACKFLOW PREVENTION ASSEMBLY.

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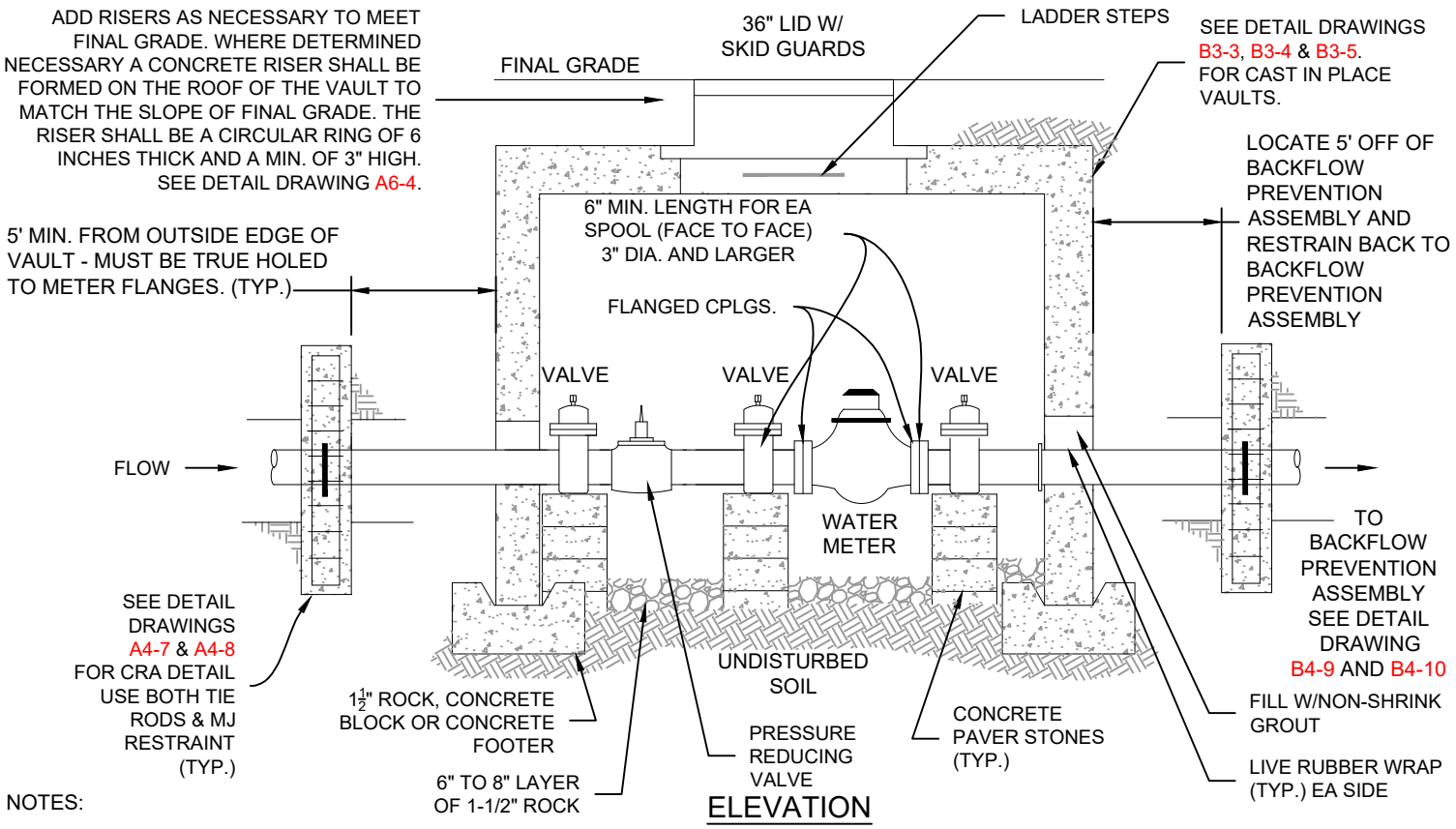
STANDARD ROUND PRE-CAST VAULT FOR 1-1/2" AND 2" METERS

B3-1

DATED 08/2022



PLAN



ELEVATION

NOTES:

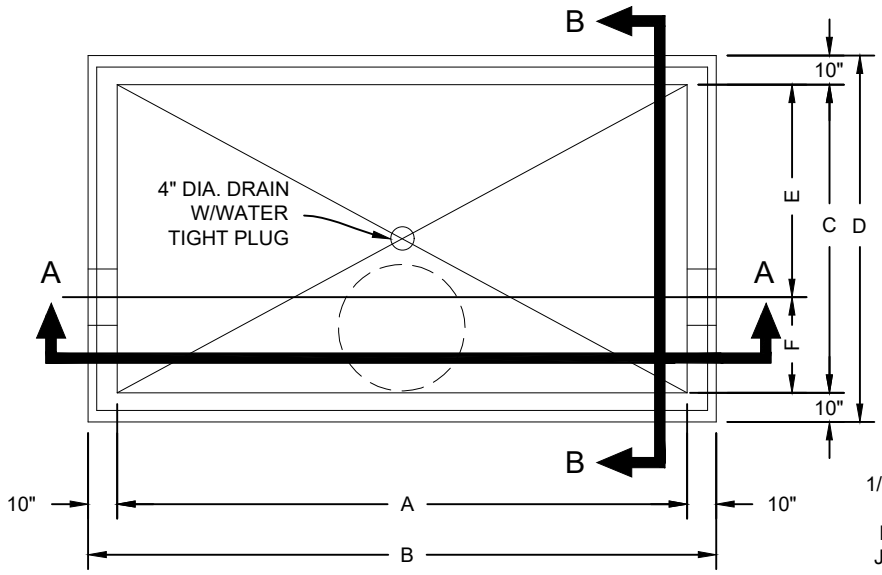
1. REFER TO DETAIL DRAWINGS B4-4, B4-5 AND B4-8 FOR METER INSTALLATION REQUIREMENTS.
2. THE METER MUST BE INSTALLED WITH THE CLEARANCE DIMENSIONS AS SHOWN IN DETAIL DRAWING B4-19 THRU B4-22. ONE SIDE OF THE METER SHALL BE FREE FROM ANY OBSTRUCTION. 3' MINIMUM CLEARANCE IS REQUIRED ABOVE AND IN FRONT OF THE METER.
3. TIE RODS TO BE CATHODICALLY PROTECTED PER DETAIL DRAWING A8-11.
4. PRECAST CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
5. SEE DETAIL DRAWING B3-5 FOR FOOTER DIMENSIONS AND STRUCTURAL REQUIREMENTS.
6. SEE DETAIL DRAWINGS B3-3 AND B3-5 FOR PRECAST VAULT DIMENSIONS.
7. NO DRAIN VALVES, OUTLETS OR BRANCH LINES SHALL BE LOCATED BEFORE THE APPROVED BACKFLOW PREVENTION ASSEMBLY.
8. BACKFLOW PREVENTION ASSEMBLY MUST BE LOCATED NO MORE THAN 10' FROM THE OUTSIDE EDGE OF VAULT.

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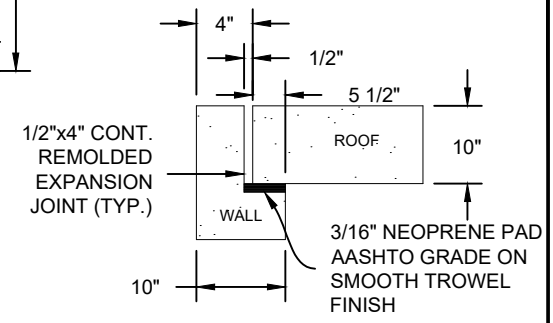
PRE-CAST CONCRETE VAULT FOR 3" THRU 10" METERS W/BYPASS

B3-2

DATED 08/2022



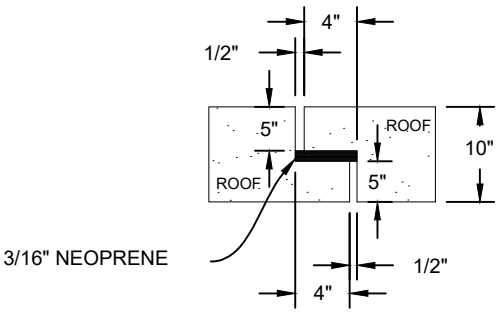
PLAN



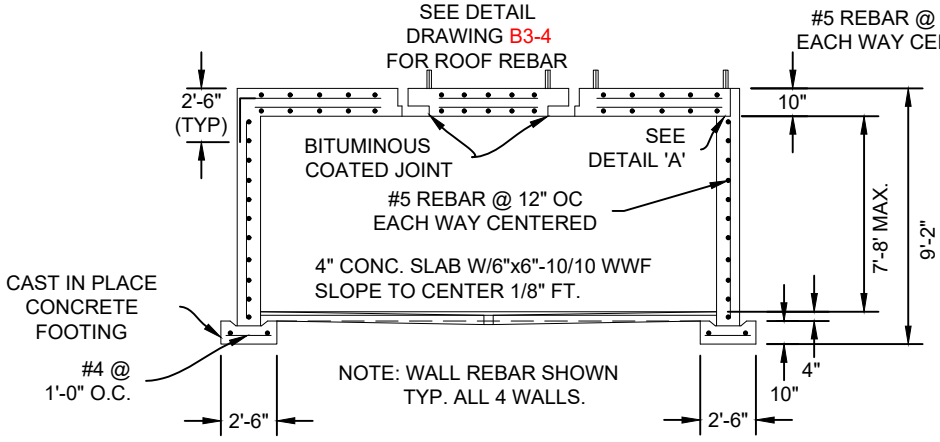
DETAIL 'A'
CORNER ROOF JOINT

METER SIZE	A	B	C	D	E	F	G	H	I
8"	16'-4"	18'-0"	8'-10"	10'-6"	5'-10"	3'-0"	9'-9"	7'-4"	5'-4"
10"	18'-6"	20'-2"	10'-0"	11'-8"	7'-0"	3'-0"	10'11"	7'-4"	7'-6"

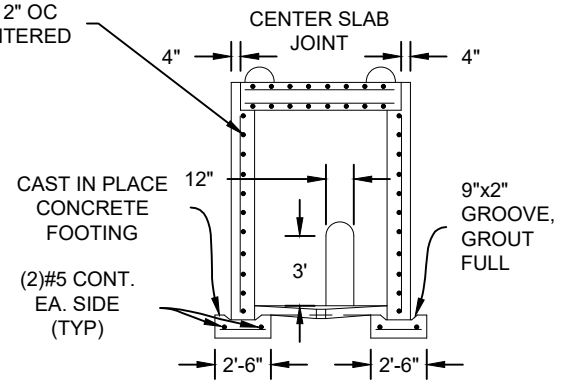
NOTE:
ALL CAST-IN-PLACE AND PRE-CAST VAULTS SHALL BE FABRICATED TO MEET HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.



DETAIL 'B'



SECTION AA



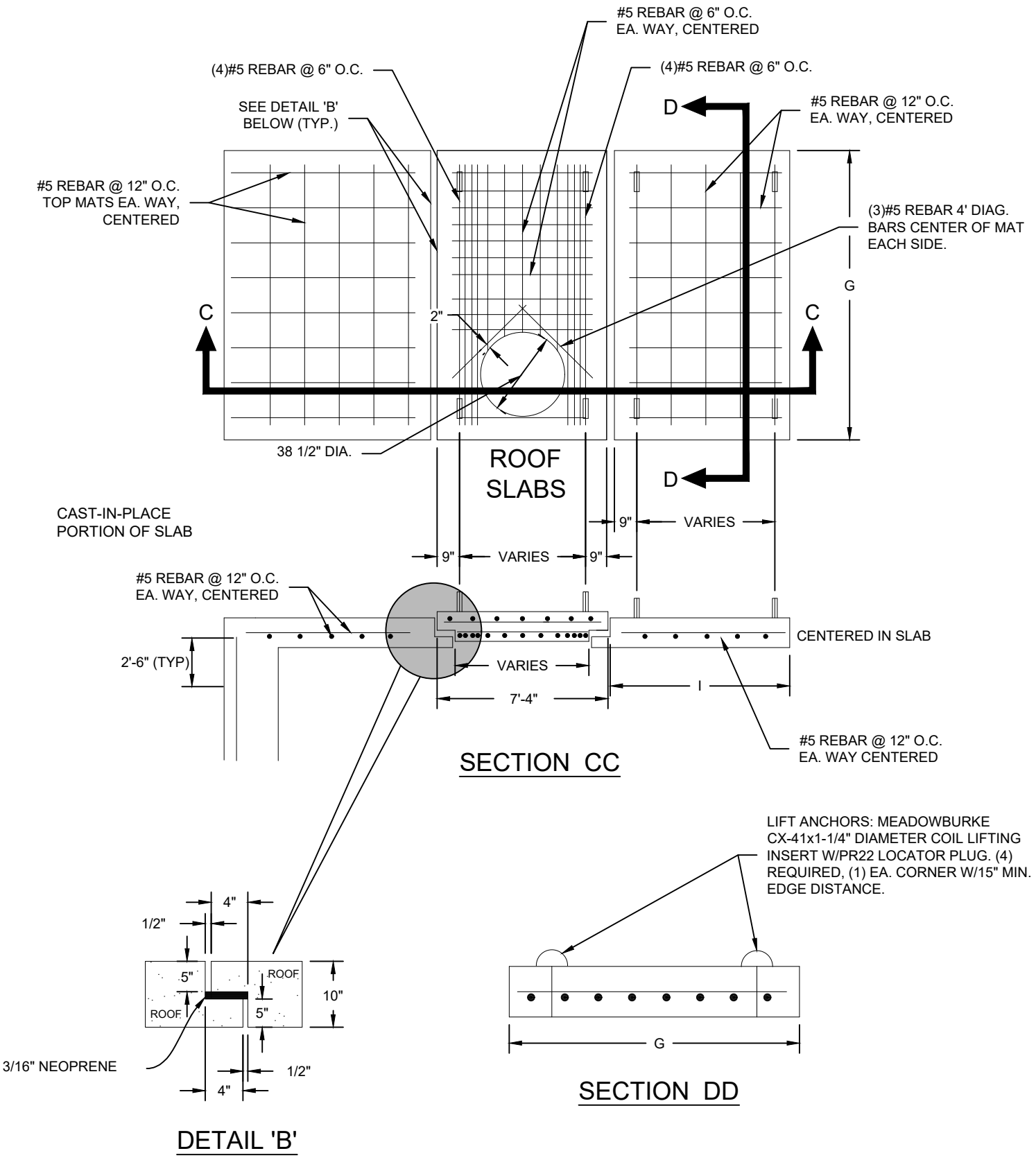
SECTION BB

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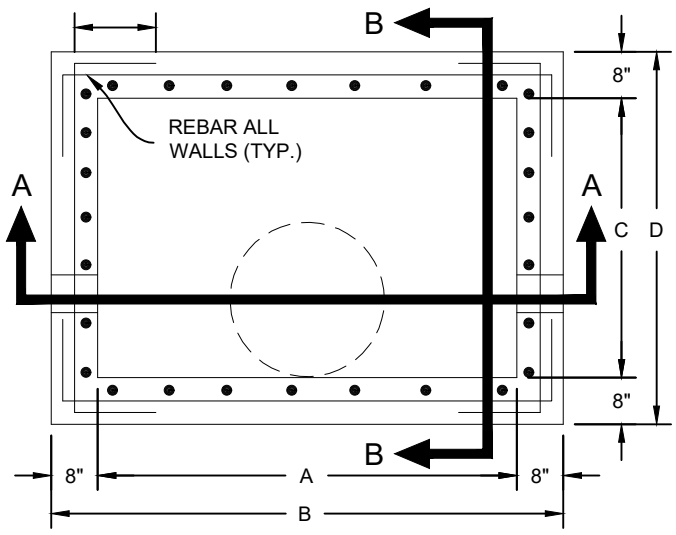
CAST IN PLACE
CONCRETE VAULT FOR
8" AND 10" METERS

B3-3

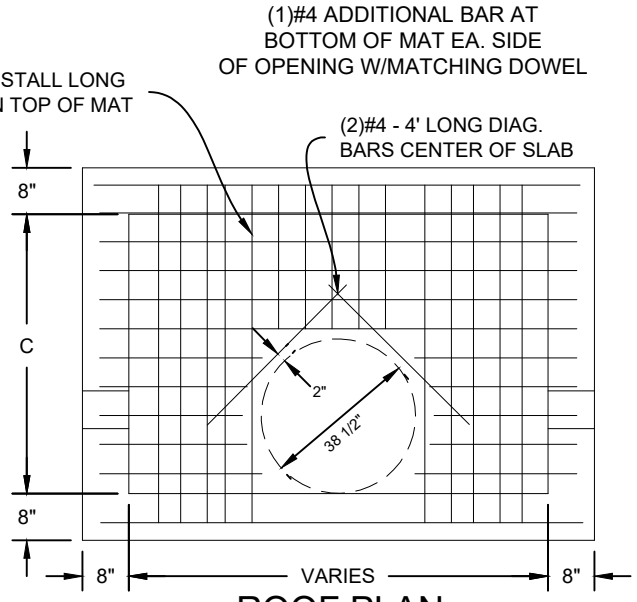
DATED 03/2014



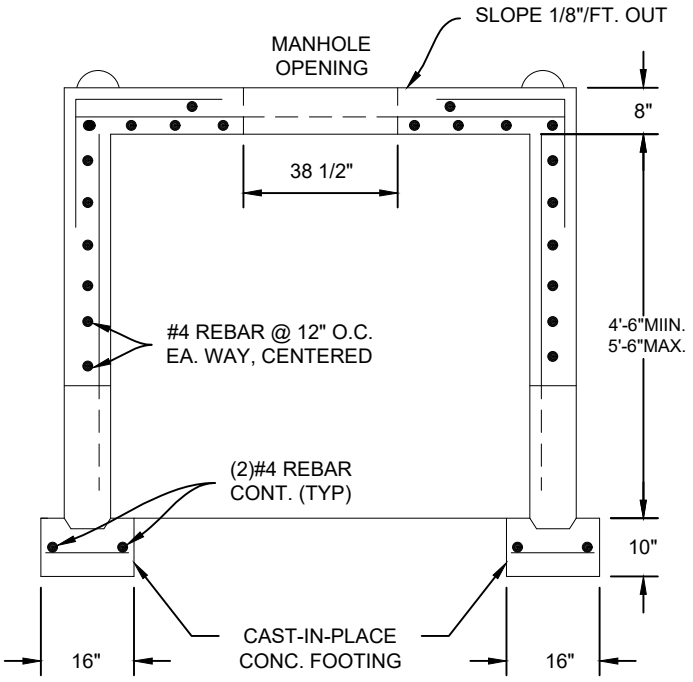
Colorado Springs Utilities It's how we're all connected	CAST IN PLACE CONCRETE VAULT FOR 8" AND 10" METERS	B3-4 DATED 03/2014



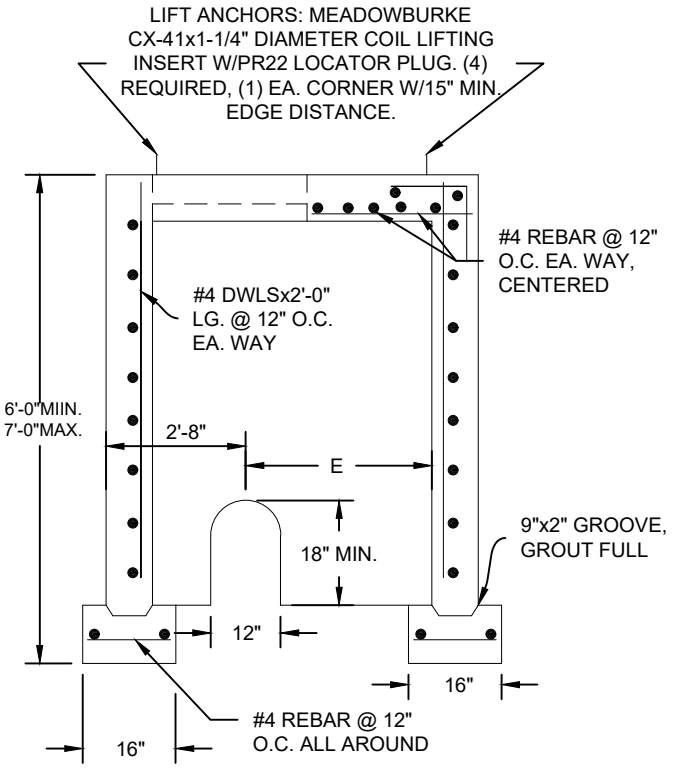
PLAN



ROOF PLAN



SECTION A-A



SECTION B-B

METER SIZE	A	B	C	D	E
3" & 4"	10'-0"	11'-4"	5'-0"	6'-4"	3'-8"
6"	11'-0"	12'-4"	5'-0"	6'-4"	3'-8"

PLAN:

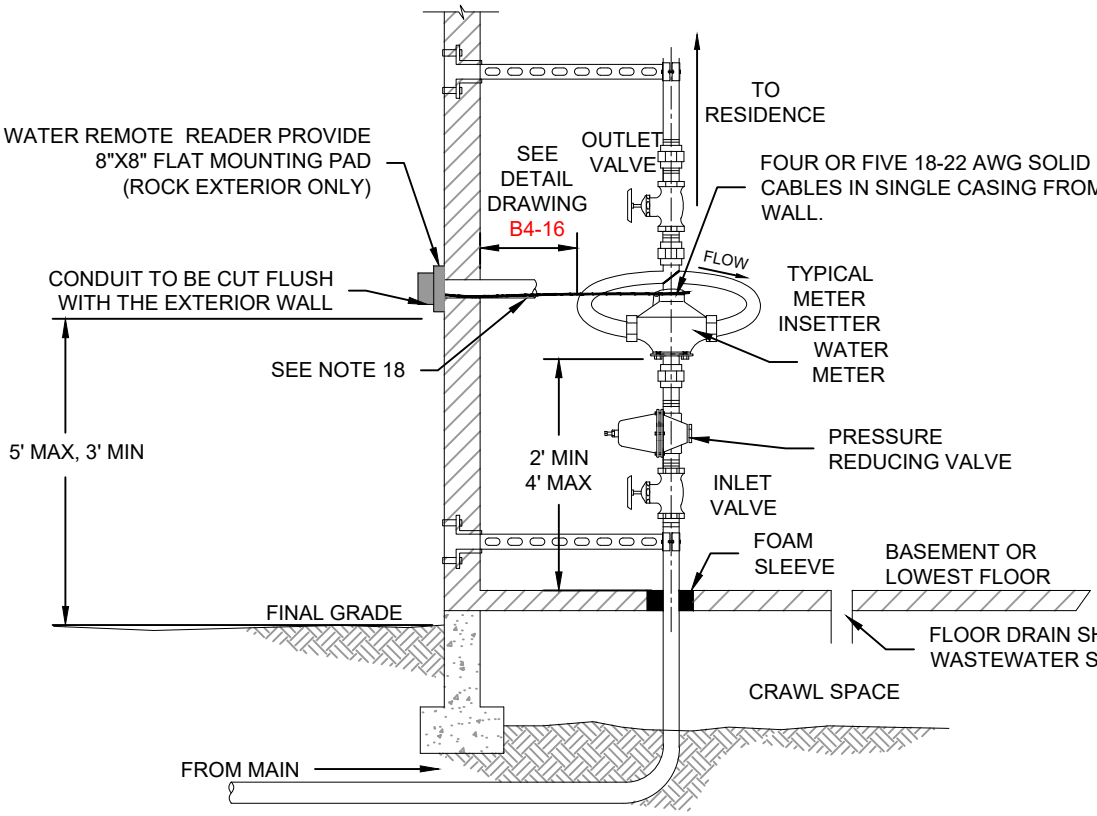
CONCRETE VAULT SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD, UNLESS APPROVED OTHERWISE. SEPARATE ROOF ACCEPTABLE.

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CAST IN PLACE
CONCRETE VAULT FOR
3", 4", AND 6" METERS

B3-5

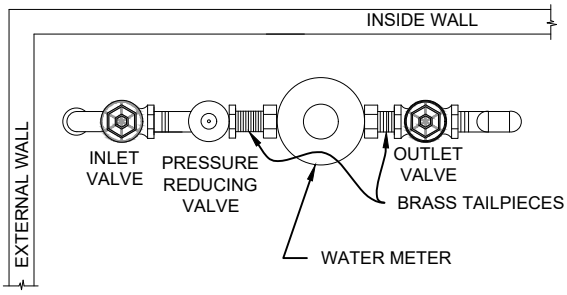
DATED 06/2015

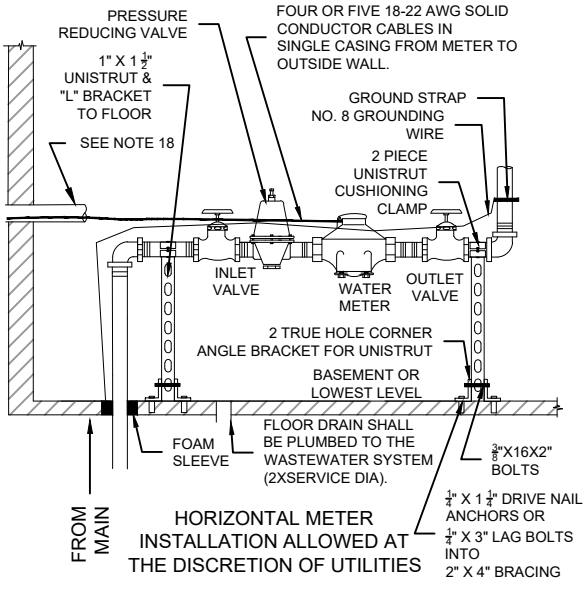


METER SIZE	METER LENGTH	LAY LENGTH W/ TAILPIECE
¾" SHORT	7 ½"	12"
1"	10 ¾"	15"

NOTES:

1. THE METER SHALL BE PROVIDED AND INSTALLED BY COLORADO SPRINGS UTILITIES.
2. REFERENCE SECTION 2.7.L (WATER METERS) FOR METER LOOP REQUIREMENTS.
3. METERS MUST BE LOCATED ON THE LOWEST FLOOR OF THE STRUCTURE. METERS SHALL NOT BE INSTALLED IN CRAWL SPACES, AREAS ONLY ACCESSIBLE BY LADDER, OR DESIGNATED STORAGE AREAS.
4. THE METER LOOP SHALL BE CONSTRUCTED OF COPPER, DUCTILE IRON OR STEEL.
5. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FIXED FLANGED OR THREADED.
6. THE METER SHALL BE INSTALLED WITH THE CLEARANCES SHOWN IN DETAIL DRAWINGS B4-16 TO B4-22.
7. THE WATER SERVICE LINE SHALL REMAIN INACCESSIBLE THROUGH THE STRUCTURE BEFORE THE METER TO PREVENT TAPPING OF THE SERVICE LINE BEFORE THE METER.
8. IF AN OUTLET IS TO BE WITHIN 24" OF THE METER LOOP, IT MUST BE GFCI.
9. BRASS INLET AND OUTLET VALVES SHALL BE INSTALLED ON EACH SIDE OF THE METER. INLET AND OUTLET VALVES SHALL BE FULL OPENING, GATE OR BALL VALVES WHICH CLOSE IN DIRECTION OF FLOW. NO CONNECTIONS ARE ALLOWED BETWEEN THE INLET AND OUTLET VALVES.
10. A MINIMUM OF 1' OF COPPER IS REQUIRED AFTER THE METER EXCEPT WHERE A MANIFOLD (MANIBLOCK) SYSTEM IS USED DIRECTLY AFTER THE METER AND IS SUPPORTED.
11. GROUNDING IS REQUIRED TO ELIMINATE POTENTIAL FOR DISCHARGE OF STATIC ELECTRICITY CAUSED BY FLOW OF WATER THROUGH PIPING. GROUNDING STRAP NOT REQUIRED ON PREFABRICATED LOOPS.
12. REMOTE READER WIRE SHALL EXIT THE BUILDING THROUGH A DEDICATED HOLE FOR REMOTE READER WIRE USE ONLY. A MINIMUM OF 24 INCHES OF SLACK WIRE SHALL BE PROVIDED AT METER AND REMOTE READER.
13. AN 8 INCH X 8 INCH FLAT SPACE (ROCK EXTERIOR ONLY) SHALL BE PROVIDED FOR MOUNTING OF THE REMOTE READER ON THE EXTERNAL WALL. A MINIMUM OF 12 INCHES OF CLEARANCE FROM ANY VERTICAL PROTRUSION (ROOF DRAIN, CHIMNEY, ELECTRIC OR GAS METER ETC.) SHALL BE MAINTAINED FROM THE REMOTE READER.
14. GAS FLEX LINE SERVICES SHALL BE LOCATED A MINIMUM OF 18" FROM THE METER LOOP.
15. IF A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED, IT SHALL BE LOCATED BEFORE THE FIRST BRANCH LINE. FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS, INCLUDING LOCATION, SEE SECTION 2.7.N.
16. THE BACKFLOW PREVENTER SHALL BE SOLDERED OR FIXED FLANGED.
17. A CUSHIONING CLAMP IS REQUIRED WHEN A UNISTRUT IS USED.
18. CONDUIT SHALL TERMINATE WITHIN 12" OF METER LOOP. METER WIRE SHALL BE ENCASED IN ½" CONDUIT AND SHALL PASS THROUGH THE CONDUIT EASILY. A FIELD TEST SHALL BE PERFORMED BY UTILITIES INSPECTORS TO ENSURE THE METER WIRE CAN BE PULLED THROUGH THE CONDUIT WITHOUT BREAKING OR OTHERWISE COMPROMISING THE METER WIRE.





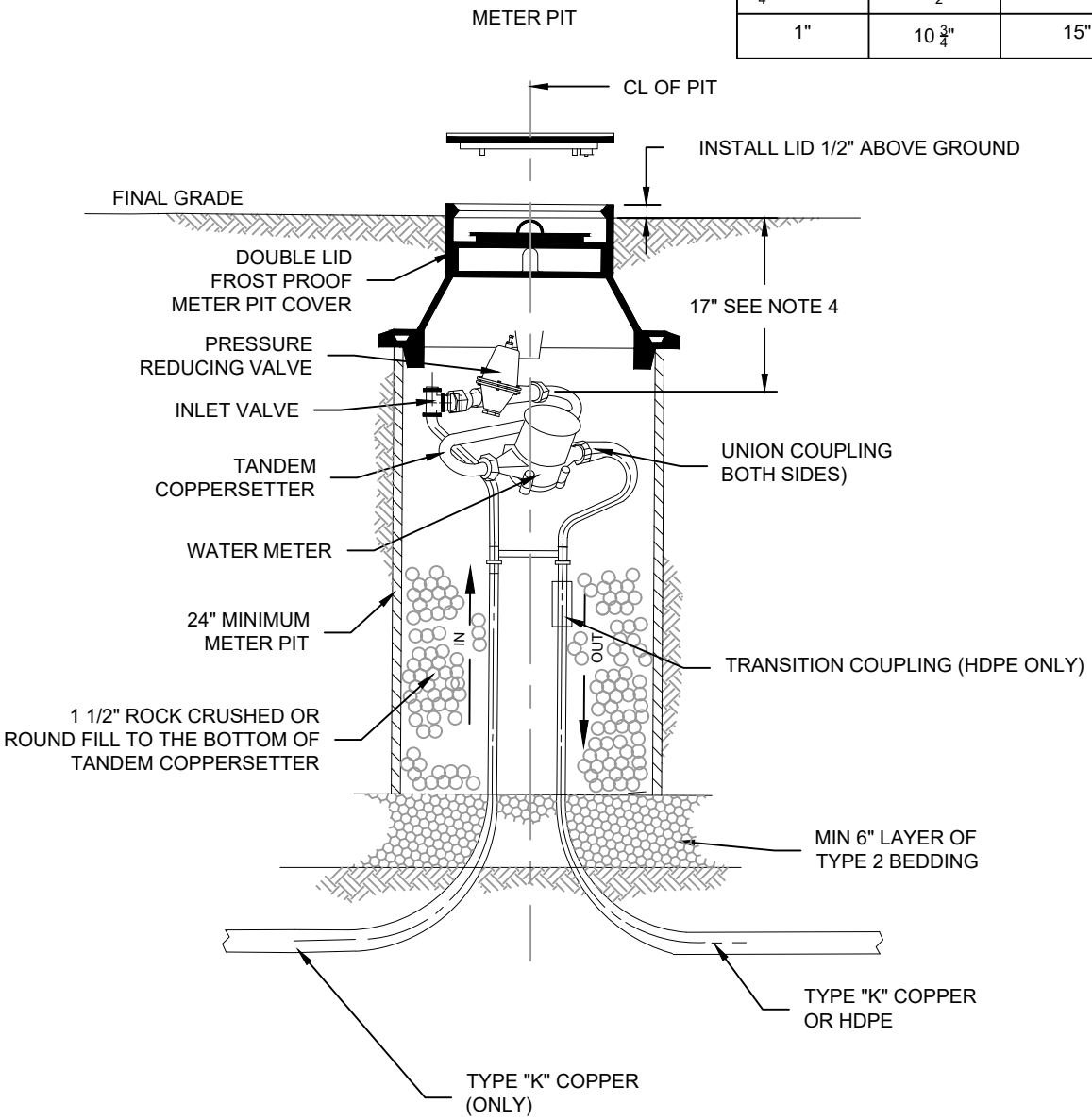
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TYPICAL INSTALLATION FOR 3/4" THRU 1" METERS INSIDE SINGLE-FAMILY-RESIDENTIAL CONNECTION COPPER SERVICE

B4-1

DATED 07/2025

METER SIZE	METER LENGTH	LAY LENGTH W/ TAILPIECES
$\frac{3}{4}$" SHORT	7 $\frac{1}{2}$"	12"
1"	10 $\frac{3}{4}$"	15"



NOTES:

1. THE METER SHALL BE PROVIDED AND INSTALLED BY COLORADO SPRINGS UTILITIES.
2. REFERENCE SECTION 2.7 WATER SERVICE LINE DESIGN.
3. METER PIT SHALL BE INSTALLED IMMEDIATELY FOLLOWING THE CURB STOP.
4. METER AND PRESSURE REGULATOR ARE INSTALLED WITH AN APPROVED TANDEM COPPERSETTER, TANDEM COPPERSETTER SHALL BE 17" FROM THE TOP PIT LID/FINISH GRADE TO CENTER OF SETTER. TANDEM COPPERSETTER SHALL HAVE AN INLET VALVE ONLY.
5. METER PIT SHALL BE AN APPROVED PLASTIC PIT WITH A MINIMUM DIAMETER OF 24" BY 36" IN HEIGHT WITH A FROST PROOF COVER.
6. SERVICE LINE SHALL BE TYPE "K" COPPER BETWEEN THE CURB STOP AND THE TANDEM COPPERSETTER TO PROVIDE METER STABILITY. TRANSITION TO HDPE MAY BE MADE AFTER THE OUTLET SIDE OF THE TANDEM COPPERSETTER WITH AN APPROVED TRANSITION COUPLING LOCATED WITHIN THE METER PIT.
7. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FLANGED OR THREADED. THE BACKFLOW PREVENTER SHALL BE SOLDERED OR FLANGED.
8. IF A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED, IT MUST BE LOCATED BEFORE THE FIRST BRANCH LINE. FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS, INCLUDING LOCATION, SEE SECTION 2.7.N.

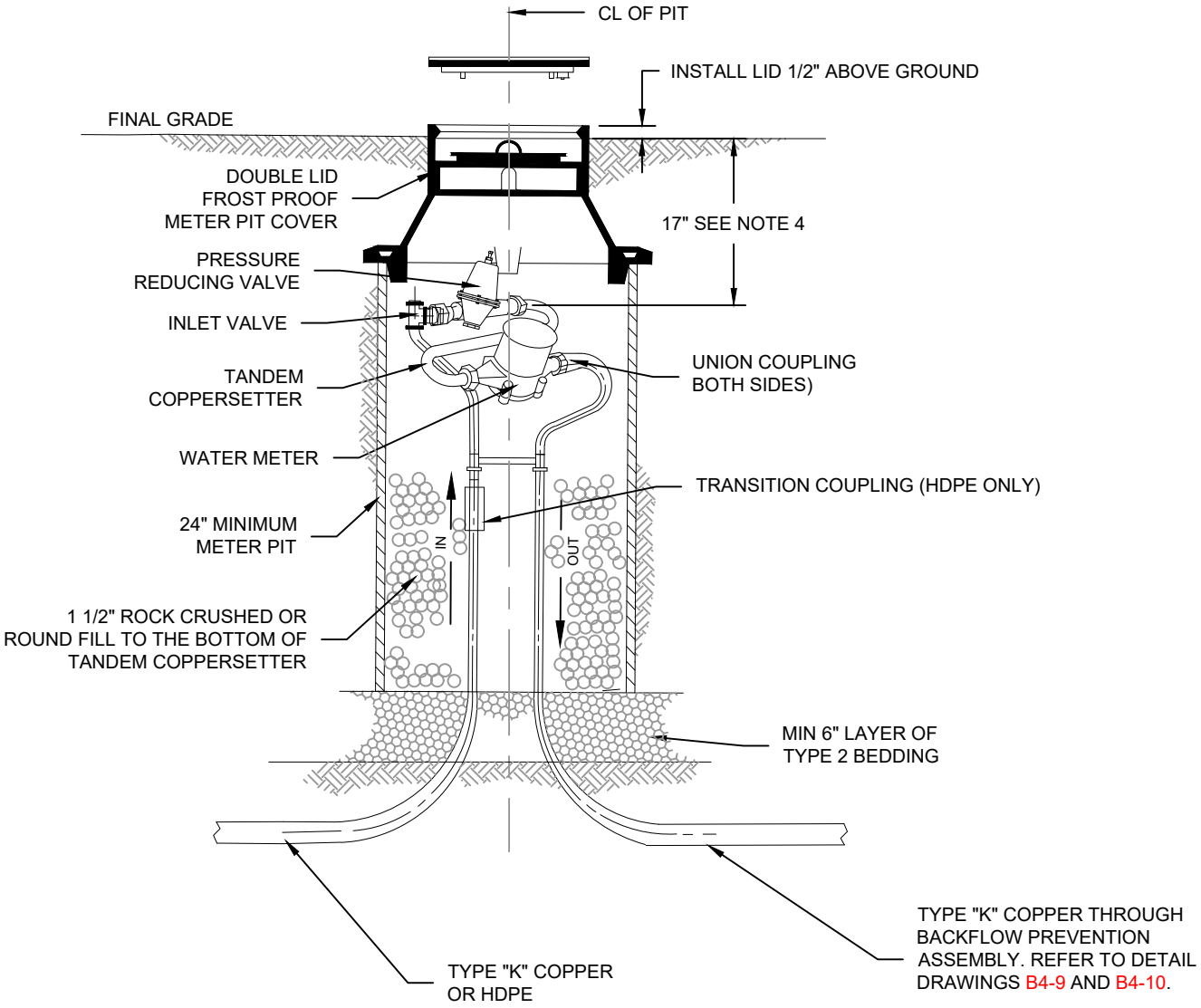
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3/4" THRU 1" OUTSIDE METER FOR SINGLE-FAMILY-RESIDENTIAL CONNECTIONS TYPE "K" COPPER AND HDPE SERVICE

B4-2

DATED 09/2022

METER SIZE	METER LENGTH	LAY LENGTH W/ TAILPIECES
$\frac{3}{4}$" SHORT	7 $\frac{1}{2}$"	12"
1"	10 $\frac{3}{4}$"	15"



NOTES:

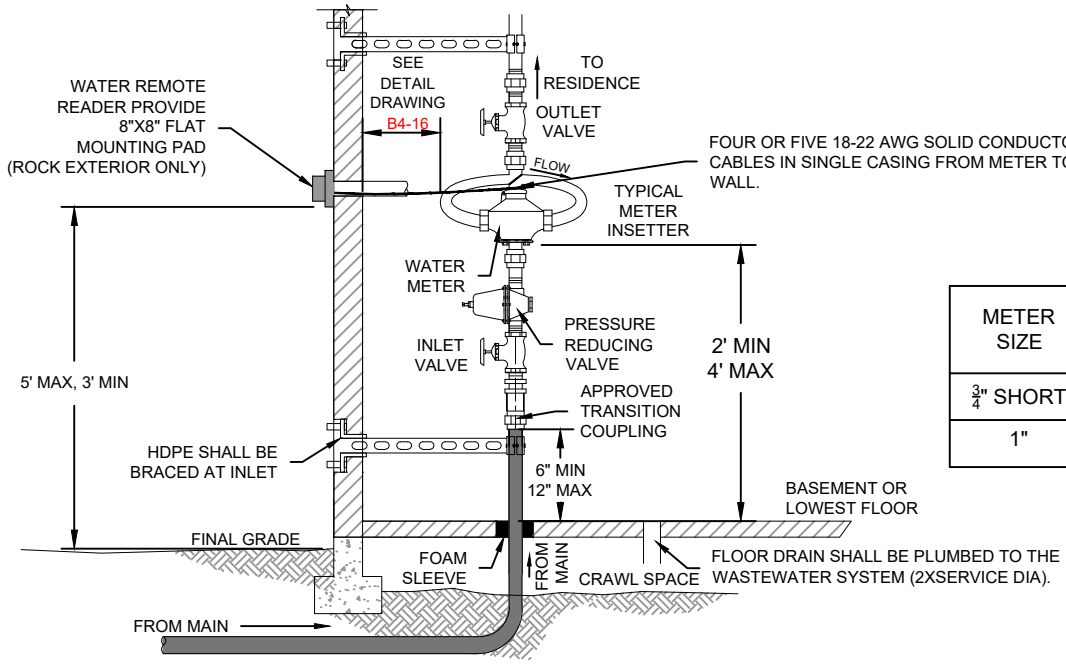
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2. REFERENCE SECTION 2.7 WATER SERVICE LINE DESIGN.
3. METER PIT SHALL BE INSTALLED IMMEDIATELY FOLLOWING THE CURB STOP.
4. METER AND PRESSURE REGULATOR ARE INSTALLED WITH AN APPROVED TANDEM COPPERSETTER, TANDEM COPPERSETTER SHALL BE 17" FROM THE TOP PIT LID/FINISH GRADE TO CENTER OF SETTER. TANDEM COPPERSETTER SHALL HAVE AN INLET VALVE ONLY.
5. METER PIT SHALL BE AN APPROVED PLASTIC PIT WITH A MINIMUM DIAMETER OF 24" BY 36" IN HEIGHT WITH A FROST PROOF COVER.
6. SERVICE LINE SHALL BE TYPE "K" COPPER BETWEEN THE TANDEM COPPERSETTER AND BACKFLOW ASSEMBLY TO PROVIDE METER STABILITY. TRANSITION TO HDPE MAY BE MADE BEFORE THE INLET SIDE OF THE TANDEM COPPERSETTER WITH AN APPROVED TRANSITION COUPLING LOCATED WITHIN THE METER PIT.
7. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FLANGED OR THREADED. THE BACKFLOW PREVENTER SHALL BE SOLDERED OR FLANGED.
8. IF A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED, IT MUST BE LOCATED BEFORE THE FIRST BRANCH LINE. FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS, INCLUDING LOCATION, SEE SECTION 2.7.N.

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3/4" THRU 1" OUTSIDE METER FOR NON SINGLE-FAMILY-RESIDENTIAL CONNECTIONS TYPE "K" COPPER AND HDPE SERVICE

B4-2A

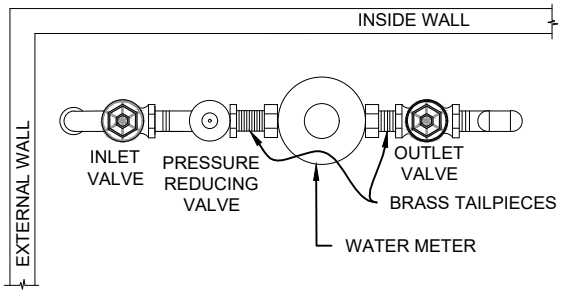
DATED 07/2025

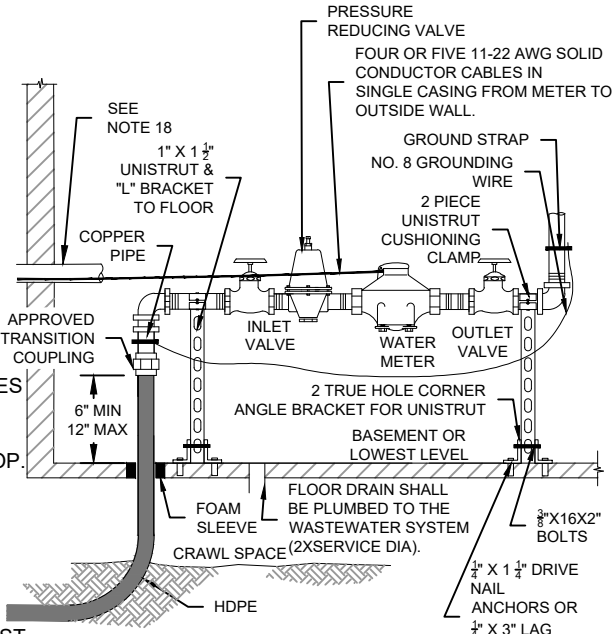


METER SIZE	METER LENGTH	LAY LENGTH W/ TAILPIECE
¾" SHORT	7 ½"	12"
1"	10 ¾"	15"

NOTES:

1. THE METER SHALL BE PROVIDED AND INSTALLED BY COLORADO SPRINGS UTILITIES.
2. REFERENCE SECTION 2.7.L (WATER METERS) FOR METER LOOP REQUIREMENTS.
3. METERS MUST BE LOCATED ON THE LOWEST FLOOR OF THE STRUCTURE. METERS SHALL NOT BE INSTALLED IN CRAWL SPACES, AREAS ONLY ACCESSIBLE BY LADDER, OR DESIGNATED STORAGE AREAS.
4. AN APPROVED TRANSITION COUPLING SHALL BE INSTALLED A MIN OF 6" AND A MAX OF 12" FROM THE FLOOR. THE METER LOOP SHALL BE CONSTRUCTED OF COPPER, DUCTILE IRON OR STEEL.
5. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FIXED FLANGED OR THREADED.
6. THE METER SHALL BE INSTALLED WITH THE CLEARANCES SHOWN IN DETAIL DRAWINGS B4-16 TO B4-22.
7. THE WATER SERVICE LINE SHALL REMAIN INACCESSIBLE THROUGH THE STRUCTURE BEFORE THE METER TO PREVENT TAPPING OF THE SERVICE LINE BEFORE THE METER.
8. IF AN OUTLET IS TO BE WITHIN 24" OF THE METER LOOP, IT MUST BE GFCI.
9. BRASS INLET AND OUTLET VALVES SHALL BE INSTALLED ON EACH SIDE OF THE METER. INLET AND OUTLET VALVES SHALL BE FULL OPENING, GATE OR BALL VALVES WHICH CLOSE IN DIRECTION OF FLOW. NO CONNECTIONS ARE ALLOWED BETWEEN THE INLET AND OUTLET VALVES.
10. A MINIMUM OF 1' OF COPPER IS REQUIRED AFTER THE METER EXCEPT WHERE A MANIFOLD (MANIBLOCK) SYSTEM IS USED DIRECTLY AFTER THE METER AND IS SUPPORTED.
11. THE METER SHALL BE SECURED WITH UNISTRUT BEFORE AND AFTER THE INLET AND OUTLET VALVES AS SHOWN. UNISTRUT SHALL BE ANCHORED TO THE COPPER PIPE.
12. GROUNDING IS REQUIRED TO ELIMINATE POTENTIAL FOR DISCHARGE OF STATIC ELECTRICITY CAUSED BY FLOW OF WATER THROUGH PIPING. GROUNDING STRAP NOT REQUIRED ON PREFABRICATED LOOPS.
13. REMOTE READER WIRE SHALL EXIT THE BUILDING THROUGH A DEDICATED HOLE FOR REMOTE READER WIRE USE ONLY. A MINIMUM OF 24 INCHES OF SLACK WIRE SHALL BE PROVIDED AT METER AND REMOTE READER.
14. AN 8 INCH X 8 INCH FLAT SPACE (ROCK EXTERIOR ONLY) SHALL BE PROVIDED FOR MOUNTING OF THE REMOTE READER ON THE EXTERNAL WALL. A MINIMUM OF 12 INCHES OF CLEARANCE FROM ANY VERTICAL PROTRUSION (ROOF DRAIN, CHIMNEY, GAS OR ELECTRIC METER, ETC.) SHALL BE MAINTAINED FROM THE REMOTE READER.
15. GAS FLEX LINE SERVICES SHALL BE LOCATED A MINIMUM OF 18" FROM THE METER LOOP.
16. IF A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED, IT SHALL BE LOCATED BEFORE THE FIRST BRANCH LINE. FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS, INCLUDING LOCATION, SEE SECTION 2.7.N.
17. THE BACKFLOW PREVENTER SHALL BE SOLDERED OR FIXED FLANGED.
18. A CUSHIONING CLAMP IS REQUIRED WHEN A UNISTRUT IS USED.
19. CONDUIT SHALL TERMINATE WITHIN 12" OF METER LOOP. METER WIRE SHALL BE ENCASED IN ½" CONDUIT AND SHALL PASS THROUGH THE CONDUIT EASILY. A FIELD TEST SHALL BE PERFORMED BY UTILITIES INSPECTORS TO ENSURE THE METER WIRE CAN BE PULLED THROUGH THE CONDUIT WITHOUT BREAKING OR OTHERWISE COMPROMISING THE METER WIRE.





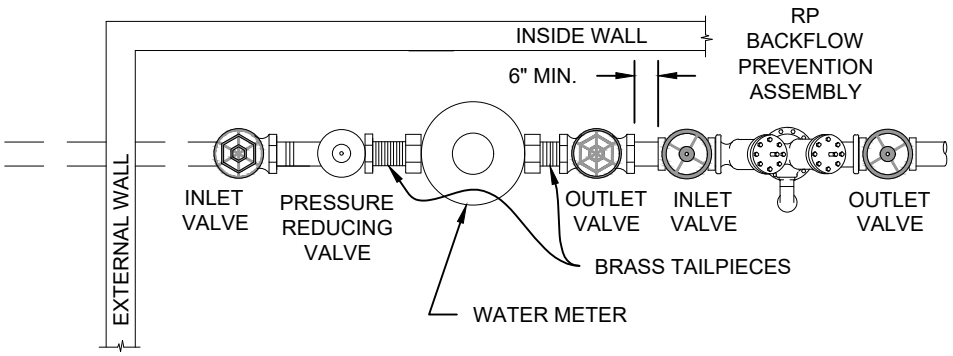
HORIZONTAL METER INSTALLATION ALLOWED AT THE DISCRETION OF UTILITIES

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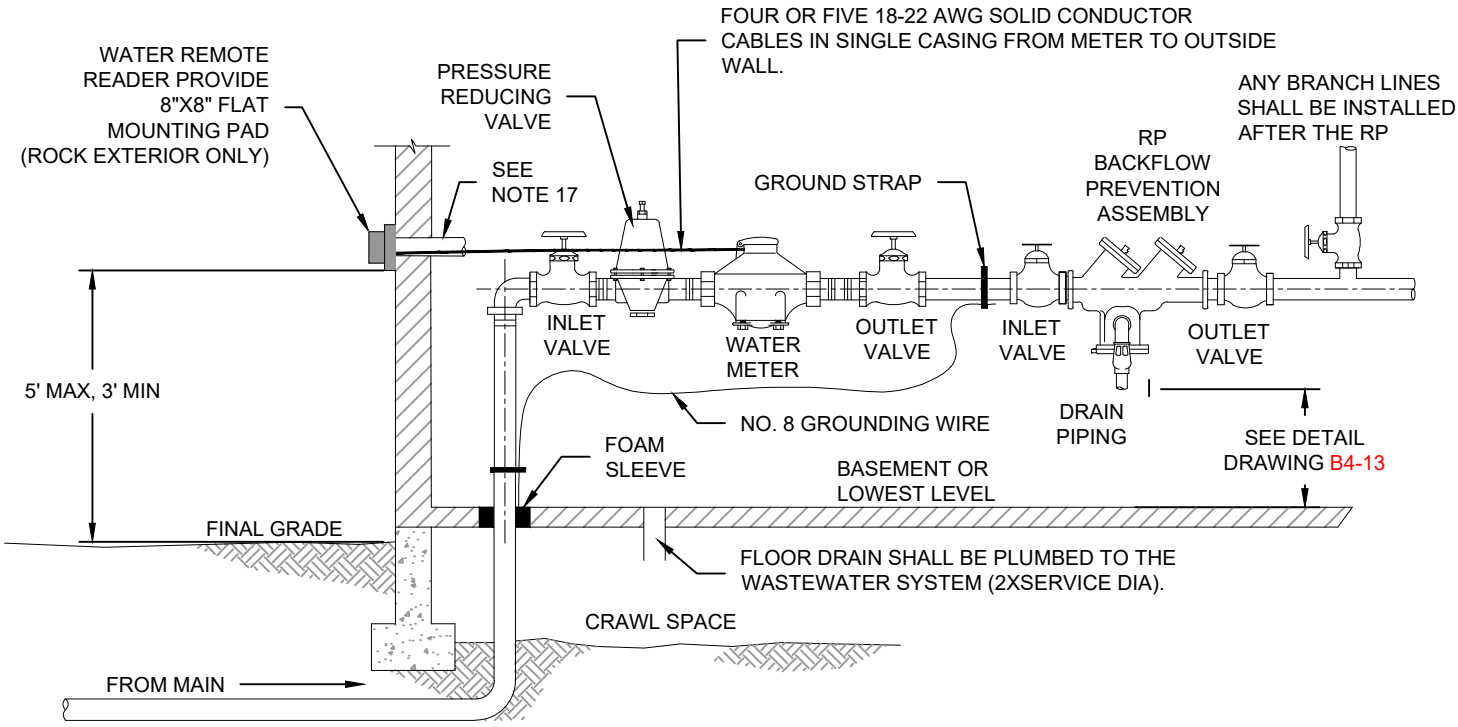
TYPICAL INSTALLATION FOR 3/4" THRU 1" METERS INSIDE SINGLE-FAMILY-RESIDENTIAL CONNECTION HDPE SERVICE

B4-3

DATED 07/2025



METER SIZE	METER LENGTH	LAY LENGTH W/ TAILPIECES
¾" SHORT	7 ½"	12"
1"	10 ¾"	15"



NOTES:

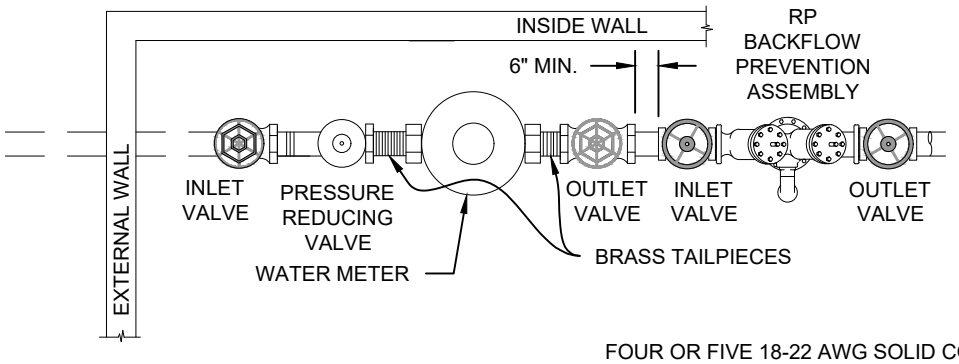
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3. METERS MUST BE LOCATED ON THE LOWEST FLOOR OF THE STRUCTURE. METERS SHALL NOT BE INSTALLED IN CRAWL SPACES, AREAS ONLY ACCESSIBLE BY LADDER, OR DESIGNATED STORAGE AREAS.
4. THE METER LOOP SHALL BE CONSTRUCTED OF COPPER, DUCTILE IRON OR STEEL.
5. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FIXED FLANGED OR THREADED.
6. THE METER SHALL BE INSTALLED WITH THE CLEARANCES SHOWN IN DETAIL DRAWINGS B4-16 TO B4-22.
7. THE METER SHALL BE LOCATED WITHIN 5 FEET OF AN EXTERIOR WALL IMMEDIATELY FOLLOWING THE WATER SERVICE LINE'S POINT OF ENTRY, PER SECTION 2.7.F.1 AND 2.7.F.2.
8. IF AN OUTLET IS TO BE WITHIN 24" OF THE METER LOOP, IT MUST BE GFCI.
9. BRASS INLET AND OUTLET VALVES SHALL BE INSTALLED ON EACH SIDE OF THE METER. INLET AND OUTLET VALVES SHALL BE FULL OPENING, GATE OR BALL VALVES WHICH CLOSE IN DIRECTION OF FLOW. NO CONNECTIONS ARE ALLOWED BETWEEN THE INLET AND OUTLET VALVES.
10. A MINIMUM OF 1' OF COPPER IS REQUIRED AFTER THE METER EXCEPT WHERE A MANIFOLD (MANIBLOCK) SYSTEM IS USED DIRECTLY AFTER THE METER AND IS SUPPORTED.
11. GROUNDING IS REQUIRED TO ELIMINATE POTENTIAL FOR DISCHARGE OF STATIC ELECTRICITY CAUSED BY FLOW OF WATER THROUGH PIPING. GROUNDING STRAP NOT REQUIRED ON PREFABRICATED LOOPS.
12. REMOTE READER WIRE SHALL EXIT THE BUILDING THROUGH A DEDICATED HOLE FOR REMOTE READER WIRE USE ONLY. A MINIMUM OF 24 INCHES OF SLACK WIRE SHALL BE PROVIDED AT METER AND REMOTE READER.
13. AN 8 INCH X 8 INCH FLAT SPACE (ROCK EXTERIOR ONLY) SHALL BE PROVIDED FOR MOUNTING OF THE REMOTE READER ON THE EXTERNAL WALL. A MINIMUM OF 12 INCHES OF CLEARANCE FROM ANY VERTICAL PROTRUSION (ROOF DRAIN, CHIMNEY, GAS OR ELECTRIC METER, ETC.) SHALL BE MAINTAINED FROM THE REMOTE READER.
14. GAS FLEX LINE SERVICES SHALL BE LOCATED A MINIMUM OF 18" FROM THE METER LOOP.
15. A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED, IT SHALL BE LOCATED BEFORE THE FIRST BRANCH LINE. FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS, INCLUDING LOCATION, SEE SECTION 2.7.N.
16. THE BACKFLOW PREVENTER SHALL BE SOLDERED OR FIXED FLANGED.
17. CONDUIT SHALL TERMINATE WITHIN 12" OF METER LOOP. METER WIRE SHALL BE ENCASED IN ½" CONDUIT AND SHALL PASS THROUGH THE CONDUIT EASILY. A FIELD TEST SHALL BE PERFORMED BY UTILITIES INSPECTORS TO ENSURE THE METER WIRE CAN BE PULLED THROUGH THE CONDUIT WITHOUT BREAKING OR OTHERWISE COMPROMISING THE METER WIRE.

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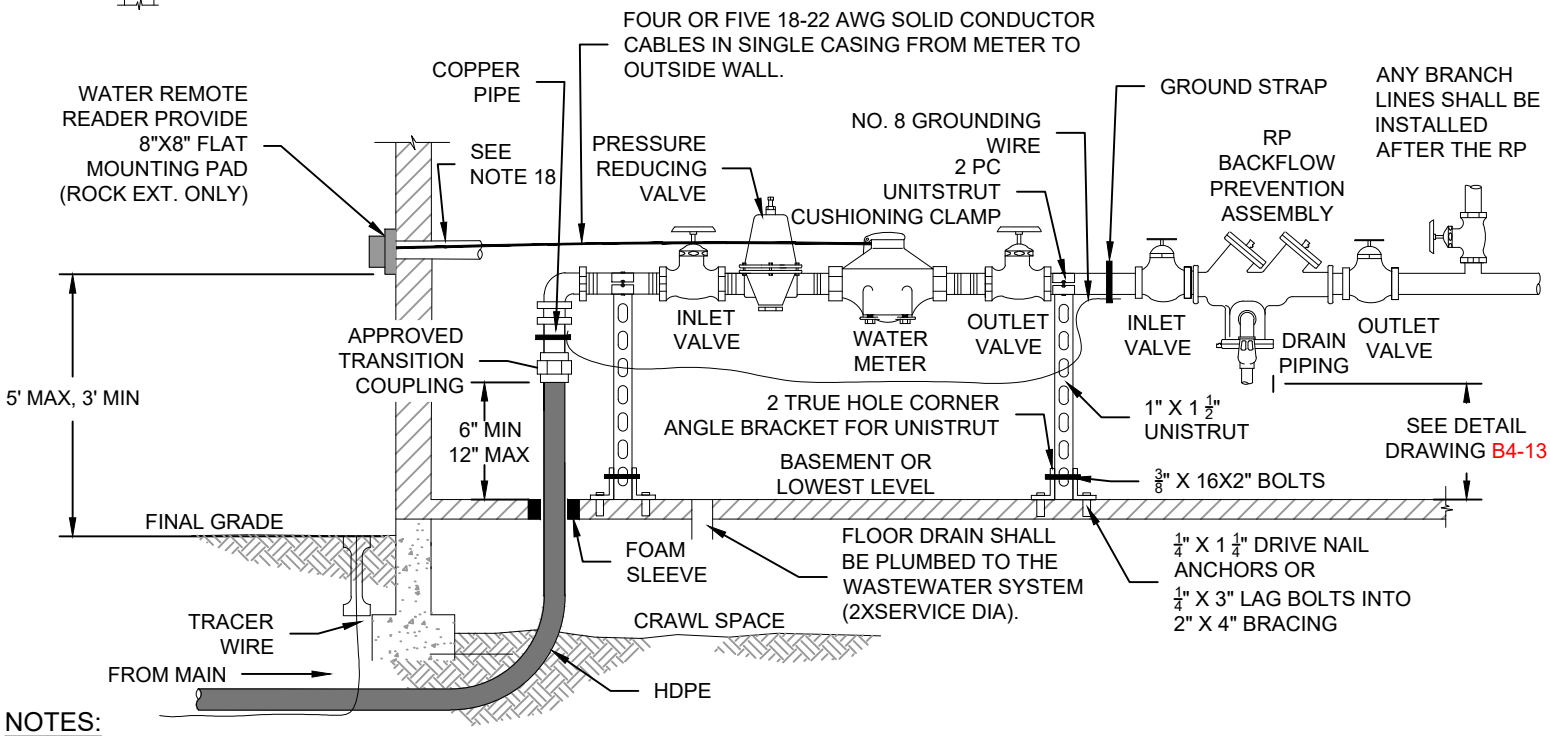
TYPICAL INSTALLATION FOR 3/4" THRU 1" METERS INSIDE NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION COPPER SERVICE

B4-4

DATED 07/2025



METER SIZE	METER LENGTH	LAY LENGTH W/ TAILPIECES
¾" SHORT	7 ½"	12"
1"	10 ¾"	15"
1 ½"	13-⅜"	SPOOL
2"	17-⅜"	SPOOL



NOTES:

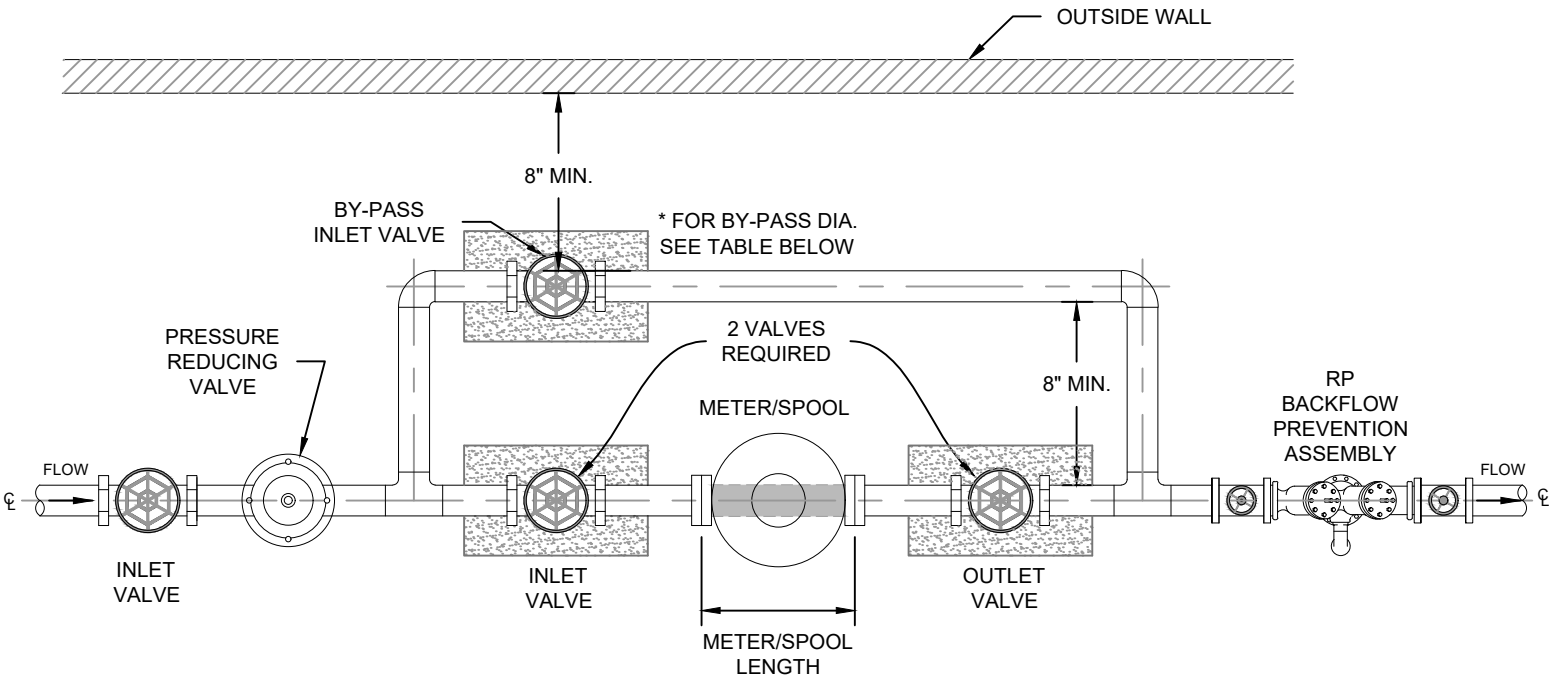
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4. AN APPROVED TRANSITION COUPLING SHALL BE INSTALLED A MIN OF 6" AND A MAX OF 12" FROM THE FLOOR. THE METER LOOP SHALL BE CONSTRUCTED OF COPPER, DUCTILE IRON OR STEEL.
5. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FIXED FLANGED OR THREADED.
6. THE METER SHALL BE INSTALLED WITH THE CLEARANCES SHOWN IN DETAIL DRAWINGS B4-16 TO B4-22.
7. THE METER SHALL BE LOCATED WITHIN 5 FEET OF AN EXTERIOR WALL IMMEDIATELY FOLLOWING THE WATER SERVICE LINE'S POINT OF ENTRY, PER SECTION 2.7.F.1 AND 2.7.F.2.
8. IF AN OUTLET IS TO BE WITHIN 24" OF THE METER LOOP, IT MUST BE GFCI.
9. BRASS INLET AND OUTLET VALVES SHALL BE INSTALLED ON EACH SIDE OF THE METER. INLET AND OUTLET VALVES SHALL BE FULL OPENING, GATE OR BALL VALVES WHICH CLOSE IN DIRECTION OF FLOW. NO CONNECTIONS ARE ALLOWED BETWEEN THE INLET AND OUTLET VALVES.
10. A MINIMUM OF 1' OF COPPER IS REQUIRED AFTER THE METER EXCEPT WHERE A MANIFOLD (MANIBLOCK) SYSTEM IS USED DIRECTLY AFTER THE METER AND IS SUPPORTED.
11. THE METER SHALL BE SECURED WITH UNISTRUT BEFORE AND AFTER THE INLET AND OUTLET VALVES AS SHOWN. UNISTRUT SHALL BE ANCHORED TO THE COPPER PIPE.
12. GROUNDING IS REQUIRED TO ELIMINATE POTENTIAL FOR DISCHARGE OF STATIC ELECTRICITY CAUSED BY FLOW OF WATER THROUGH PIPING. GROUNDING STRAP NOT REQUIRED ON PREFABRICATED LOOPS.
13. REMOTE READER WIRE SHALL EXIT THE BUILDING THROUGH A DEDICATED HOLE FOR REMOTE READER WIRE USE ONLY. A MINIMUM OF 24 INCHES OF SLACK WIRE SHALL BE PROVIDED AT METER AND REMOTE READER.
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18. CONDUIT SHALL TERMINATE WITHIN 12" OF METER LOOP. METER WIRE SHALL BE ENCASED IN ½" CONDUIT AND SHALL PASS THROUGH THE CONDUIT EASILY. A FIELD TEST SHALL BE PERFORMED BY UTILITIES INSPECTORS TO ENSURE THE METER WIRE CAN BE PULLED THROUGH THE CONDUIT WITHOUT BREAKING OR OTHERWISE COMPROMISING THE METER WIRE.

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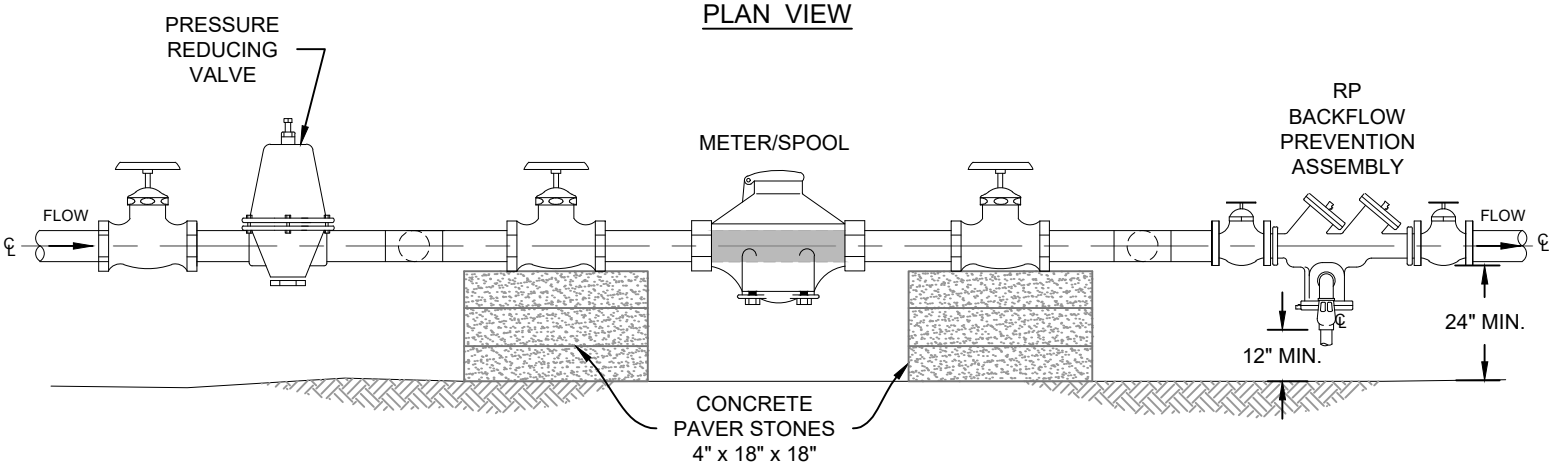
TYPICAL INSTALLATION FOR 3/4" THRU 2" METERS INSIDE NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION HDPE SERVICE

B4-5

DATED 07/2025



PLAN VIEW



ELEVATION

NOTES:

1. METERS SHALL BE PROVIDED AND INSTALLED BY COLORADO SPRINGS UTILITIES.
2. THE METER LOOP SHALL BE CONSTRUCTED OF COPPER, DUCTILE IRON OR STEEL.
3. METER LENGTHS VARY WITH CERTAIN TYPES OF METER AND A "SPOOL" SHOULD BE ACQUIRED FROM "COLORADO SPRINGS UTILITY WAREHOUSE" TO ASSURE PROPER SPACING FOR METER REQUIREMENTS.
4. BY-PASS VALVE TO BE SEALED BY COLORADO SPRINGS UTILITIES WHEN METER IS INSTALLED.
5. A MIN. OF 6" IS REQUIRED BETWEEN VALVE AND METER FLANGES, OR 2X's THE DIAMETER OF METER, WHICHEVER IS GREATER.
6. THE METER MUST BE INSTALLED PER THE REQUIREMENTS AND CLEARANCE DIMENSIONS AS SHOWN IN DETAIL DRAWING B4-8. ONE SIDE OF THE METER SHALL BE FREE FROM ANY OBSTRUCTION. 3' MINIMUM CLEARANCE IS REQUIRED ABOVE AND IN FRONT OF THE METER.
7. FOR 1 $\frac{1}{2}$" AND 2" METER SIZE NO CONCRETE PAVER STONES NEEDED.
8. THE PRESSURE REDUCING VALVE AND BACKFLOW ASSEMBLY SHALL NOT BE BY-PASSED.
9. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FIXED FLANGED OR THREADED. THE BACKFLOW PREVENTER SHALL BE SOLDERED OR FIXED FLANGED.

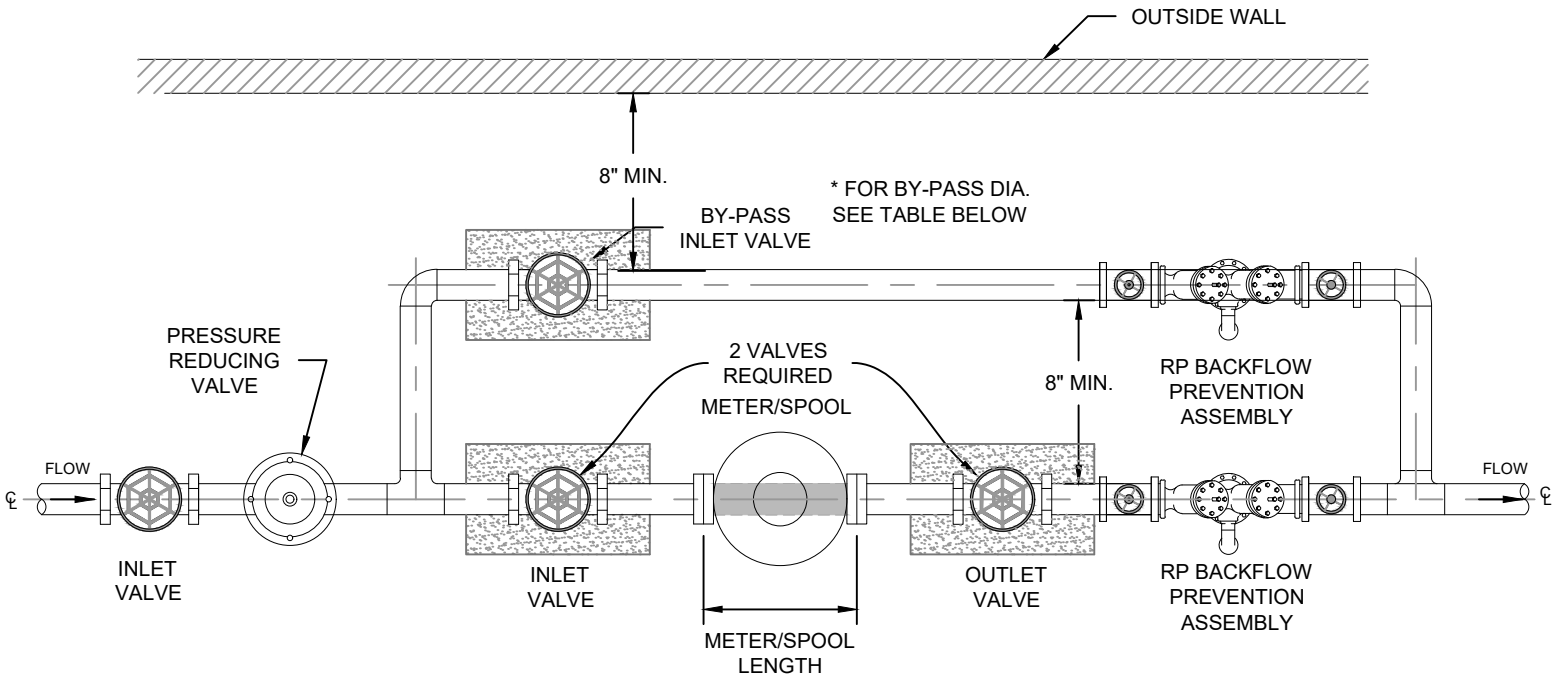
METER SIZE	METER/ SPOOL LENGTH	BY-PASS DIA.	CONNECTION TYPE
1 $\frac{1}{2}$"	13-$\frac{3}{8}$"	1"	THREADED
2"	17-$\frac{3}{8}$"	1"	THREADED
3"	17-$\frac{3}{8}$"	3"	FLANGED
4"	20-$\frac{3}{8}$"	4"	FLANGED
6"	24-$\frac{3}{8}$"	6"	FLANGED

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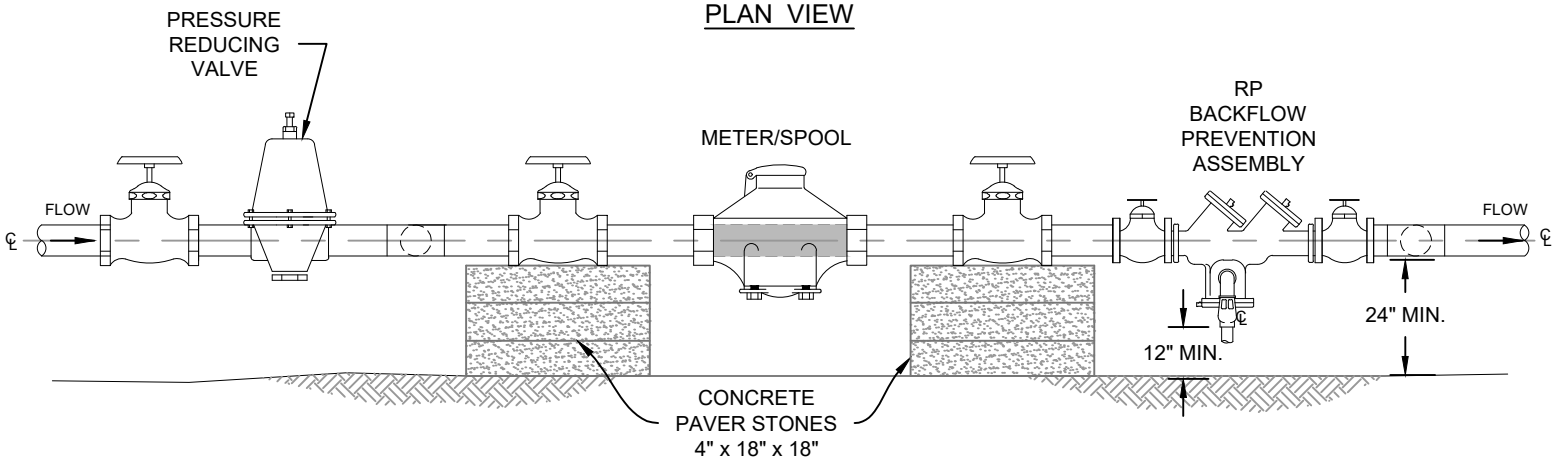
METER BY-PASS PLAN AND ELEVATION FOR NON-SINGLE-FAMILY-RESIDENTIAL CONNECTION METERS 1-1/2" THRU 6"

B4-6

DATED 03/2019



PLAN VIEW



ELEVATION

NOTES:

1. METERS SHALL BE PROVIDED AND INSTALLED BY COLORADO SPRINGS UTILITIES.
2. THE METER LOOP SHALL BE CONSTRUCTED OF COPPER, DUCTILE IRON OR STEEL.
3. METER LENGTHS VARY WITH CERTAIN TYPES OF METER.
4. AND A "SPOOL" SHOULD BE ACQUIRED FROM "COLORADO SPRINGS UTILITY WAREHOUSE" TO ASSURE PROPER SPACING FOR METER REQUIREMENTS.
5. BY-PASS VALVE TO BE SEALED BY COLORADO SPRINGS UTILITIES WHEN METER IS INSTALLED.
6. A MIN. OF 6" IS REQUIRED BETWEEN VALVE AND METER FLANGES, OR 2X's THE DIAMETER OF METER, WHICHEVER IS GREATER.
7. THE METER MUST BE INSTALLED PER THE REQUIREMENTS AND THE CLEARANCE DIMENSIONS AS SHOWN IN DETAIL DRAWING B4-8. ONE SIDE OF THE METER SHALL BE FREE FROM ANY OBSTRUCTION. 3' MINIMUM CLEARANCE IS REQUIRED ABOVE AND IN FRONT OF THE METER.
8. FOR 1 $\frac{1}{2}$" AND 2" METER SIZE NO CONCRETE PAVER STONES NEEDED.
9. THE PRESSURE REDUCING VALVE AND BACKFLOW ASSEMBLY SHALL NOT BE BY-PASSED.
10. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FIXED FLANGED OR THREADED. THE BACKFLOW PREVENTER SHALL BE SOLDERED OR FIXED FLANGED.

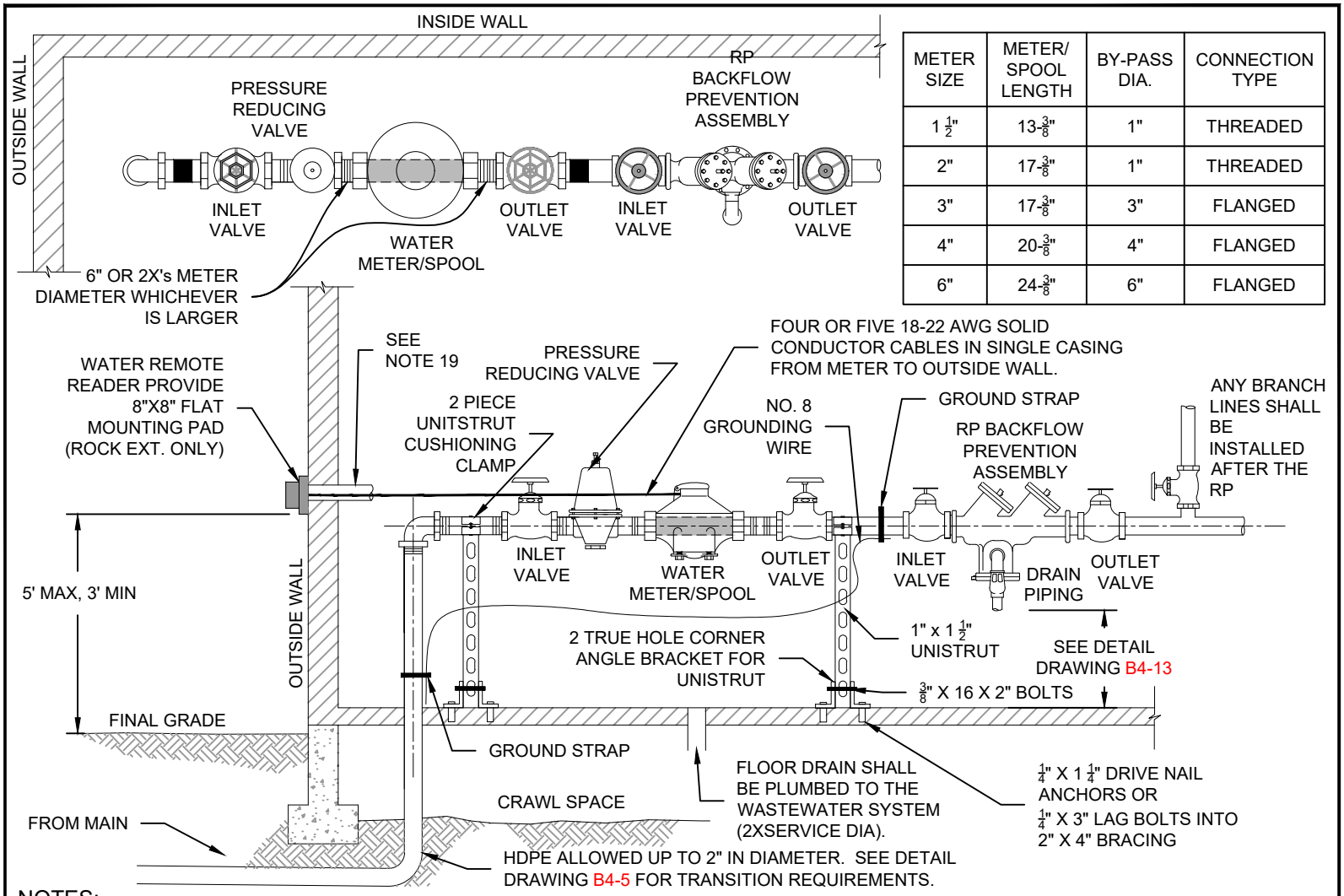
METER SIZE	METER/ SPOOL LENGTH	BY-PASS DIA.	CONNECTION TYPE
1 $\frac{1}{2}$"	13-$\frac{3}{8}$"	1"	THREADED
2"	17-$\frac{3}{8}$"	1"	THREADED
3"	17-$\frac{3}{8}$"	3"	FLANGED
4"	20-$\frac{3}{8}$"	4"	FLANGED
6"	24-$\frac{3}{8}$"	6"	FLANGED

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BY-PASS PLAN AND ELEVATION FOR CRITICAL CARE AND UNINTERRUPTIBLE SERVICE METERS 1-1/2" THRU 6"

B4-7

DATED 03/2019



METER SIZE	METER/ SPOOL LENGTH	BY-PASS DIA.	CONNECTION TYPE
1 1/2"	13-3/8"	1"	THREADED
2"	17-3/8"	1"	THREADED
3"	17-3/8"	3"	FLANGED
4"	20-3/8"	4"	FLANGED
6"	24-3/8"	6"	FLANGED

NOTES:

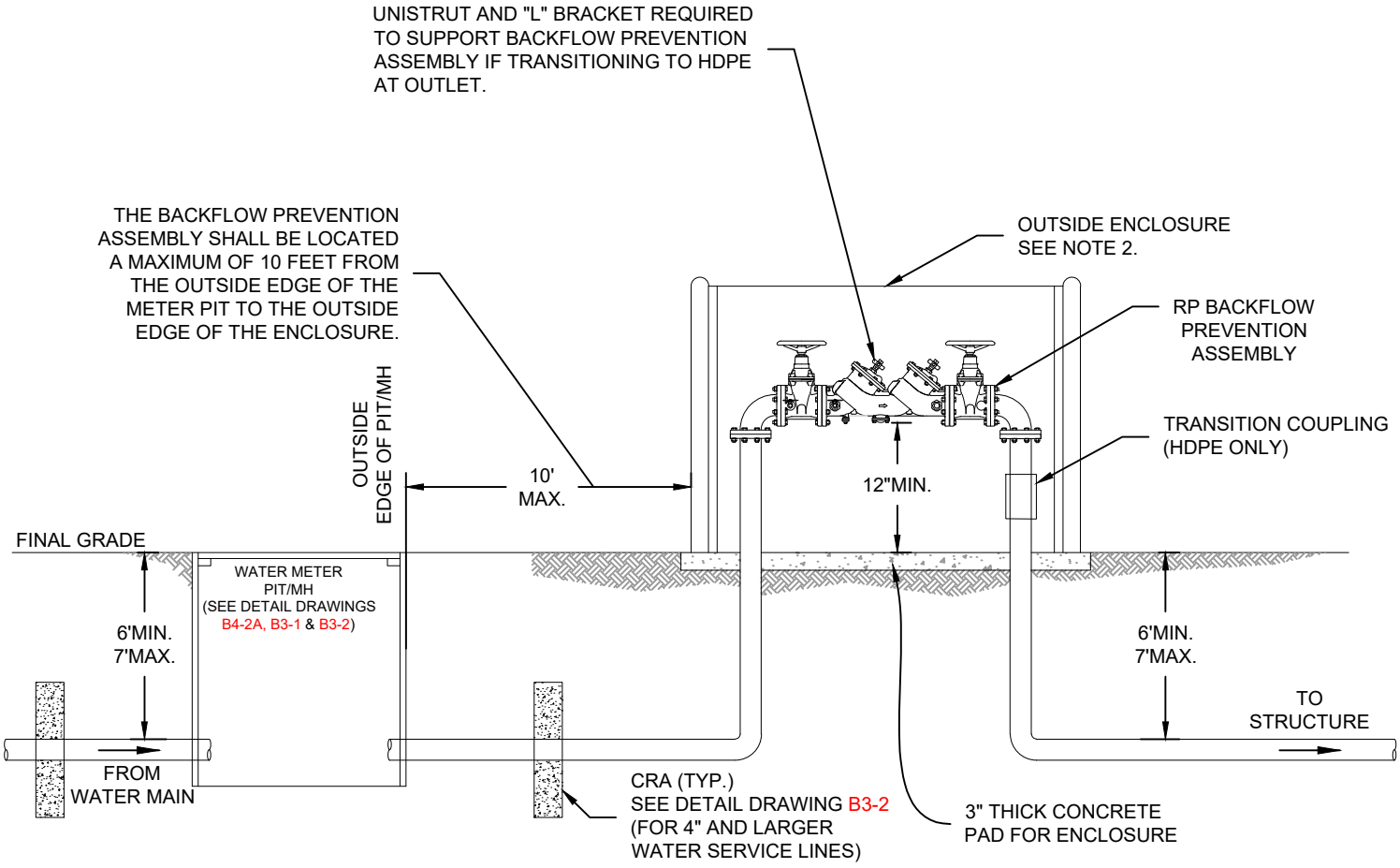
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3. REFERENCE SECTION 2.7.L (WATER METERS) FOR METER LOOP REQUIREMENTS.
4. METERS MUST BE LOCATED ON THE LOWEST FLOOR OF THE STRUCTURE. METERS SHALL NOT BE INSTALLED IN CRAWL SPACES, AREAS ONLY ACCESSIBLE BY LADDER, OR DESIGNATED STORAGE AREAS.
5. THE METER LOOP SHALL BE CONSTRUCTED OF COPPER, DUCTILE IRON OR STEEL.
6. ALL FITTINGS IN THE METER LOOP SHALL BE SOLDERED, FIXED FLANGED OR THREADED.
7. THE METER SHALL BE INSTALLED WITH THE CLEARANCES SHOWN IN DETAIL DRAWINGS B4-16 TO B4-22.
8. THE METER SHALL BE LOCATED WITHIN 5 FEET OF AN EXTERIOR WALL IMMEDIATELY FOLLOWING THE WATER SERVICE LINE'S POINT OF ENTRY, PER SECTION 2.7.F.1 AND 2.7.F.2.
9. IF AN OUTLET IS TO BE WITHIN 24" OF THE METER LOOP, IT MUST BE GFCI.
10. BRASS INLET AND OUTLET VALVES SHALL BE INSTALLED ON EACH SIDE OF THE METER. INLET AND OUTLET VALVES SHALL BE FULL OPENING, GATE OR BALL VALVES WHICH CLOSE IN DIRECTION OF FLOW. NO CONNECTIONS ARE ALLOWED BETWEEN THE INLET AND OUTLET VALVES.
11. A MINIMUM OF 1' OF COPPER IS REQUIRED AFTER THE METER EXCEPT WHERE A MANIFOLD (MANIBLOCK) SYSTEM IS USED DIRECTLY AFTER THE METER AND IS SUPPORTED.
12. BRACING 1 1/2" & 2" METER SHALL BE AS SHOWN. FOR METERS 3" OR GREATER SHALL BE DESIGNED TO ANCHOR METER LOOP AND KEEP SECURED, SUPPORT SHALL BE ATTACHED TO FLOOR.
13. GROUNDING IS REQUIRED TO ELIMINATE POTENTIAL FOR DISCHARGE OF STATIC ELECTRICITY CAUSED BY FLOW OF WATER THROUGH PIPING. GROUNDING STRAP NOT REQUIRED ON PREFABRICATED LOOPS.
14. REMOTE READER WIRE SHALL EXIT THE BUILDING THROUGH A DEDICATED HOLE FOR REMOTE READER WIRE USE ONLY. A MINIMUM OF 24 INCHES OF SLACK WIRE SHALL BE PROVIDED AT METER AND REMOTE READER.
15. AN 8 INCH X 8 INCH FLAT SPACE (ROCKE EXTERIOR ONLY) SHALL BE PROVIDED FOR MOUNTING OF THE REMOTE READER ON THE EXTERNAL WALL. A MINIMUM OF 12 INCHES OF CLEARANCE FROM ANY VERTICAL PROTRUSION (ROOF DRAIN, CHIMNEY, GAS OR ELECTRIC METER, ETC.) SHALL BE MAINTAINED FROM THE REMOTE READER.
16. GAS FLEX LINE SERVICES SHALL BE LOCATED A MINIMUM OF 18" FROM THE METER LOOP.
17. A BACKFLOW PREVENTION ASSEMBLY IS REQUIRED, IT SHALL BE LOCATED BEFORE THE FIRST BRANCH LINE. FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS, INCLUDING LOCATION, SEE SECTION 2.7.N.
18. THE BACKFLOW PREVENTER SHALL BE SOLDERED OR FIXED FLANGED.
19. CONDUIT SHALL TERMINATE WITHIN 12" OF METER LOOP. METER WIRE SHALL BE ENCASED IN ½" CONDUIT AND SHALL PASS THROUGH THE CONDUIT EASILY. A FIELD TEST SHALL BE PERFORMED BY UTILITIES INSPECTORS TO ENSURE THE METER WIRE CAN BE PULLED THROUGH THE CONDUIT WITHOUT BREAKING OR OTHERWISE COMPROMISING THE METER WIRE.

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TYPICAL INSTALLATION FOR 1-1/2" THRU 6" METERS INSIDE BUILDING

B4-8

DATED 07/2025



NOTES:

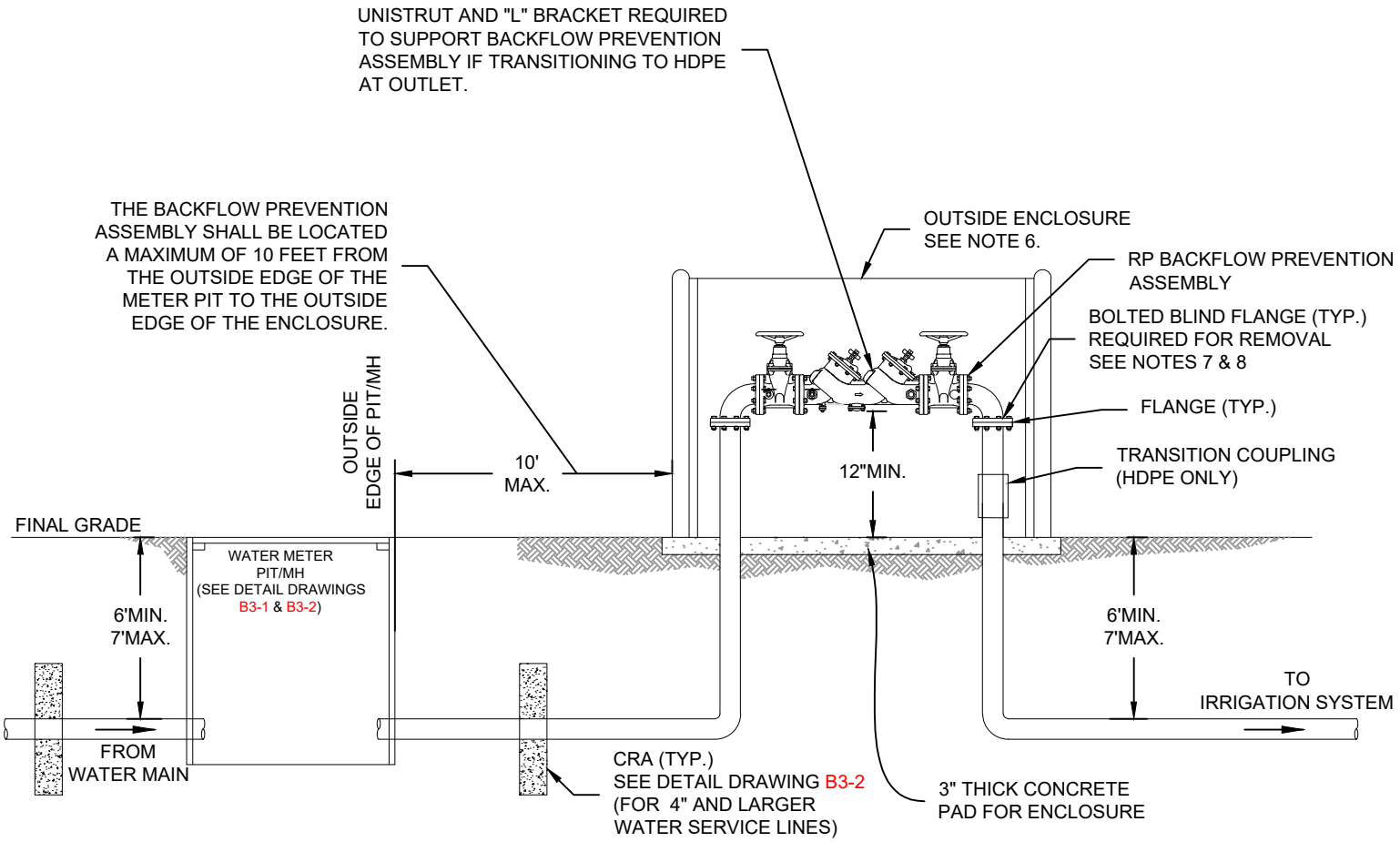
1. REFERENCE SECTION 2.7.N FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS.
2. OUTDOOR ENCLOSURES SHALL BE HEATED AND CONSTRUCTED PER ASSE STANDARD No.1060 TYPE I.
3. NO DRAIN VALVES SHALL BE LOCATED BEFORE THE APPROVED BACKFLOW PREVENTION ASSEMBLY.
4. THE APPROVED BACKFLOW PREVENTION ASSEMBLY SHALL BE SOLDERED OR FLANGED ONLY.
5. THE BACKFLOW PREVENTION ASSEMBLY SHALL BE ON AN APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY.
6. FOR CONSECUTIVE SYSTEMS AN APPROVED DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLY MAY BE USED.
7. FOR SERVICE LINES 4" AND GREATER, PIPE SHALL BE RESTRAINED BETWEEN THE METER PIT AND BACKFLOW PREVENTER.

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TYPICAL NON-SINGLE-FAMILY RESIDENTIAL OUTDOOR WATER METER AND BACKFLOW PREVENTION ASSEMBLY

B4-9

DATED 09/2022



NOTES:

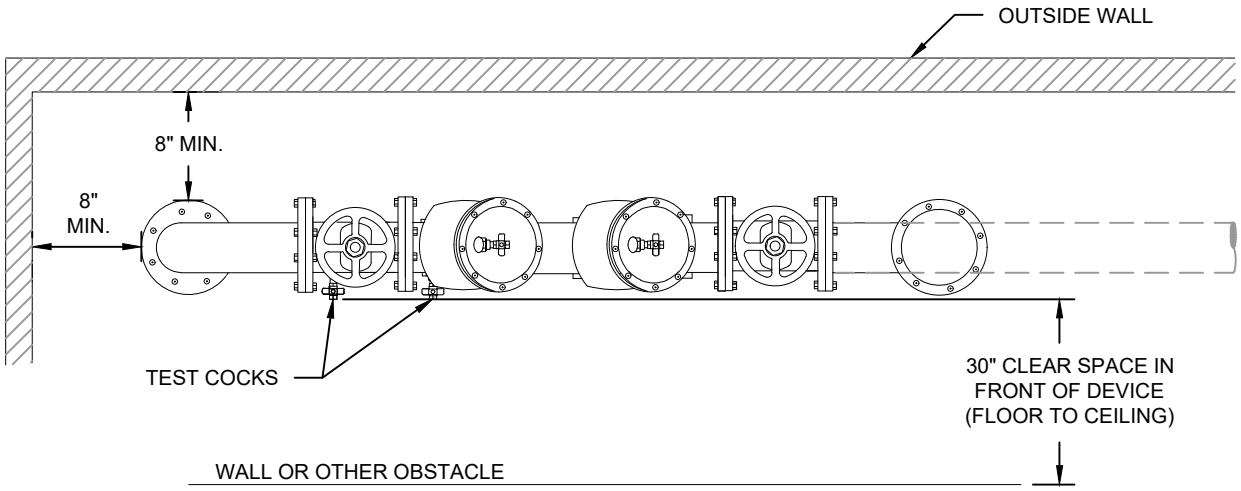
1. REFERENCE SECTION 2.7.N FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS.
2. NO DRAIN VALVES, OUTLETS OR BRANCH LINES SHALL BE LOCATED BEFORE THE APPROVED BACKFLOW PREVENTION ASSEMBLY.
3. THE APPROVED BACKFLOW PREVENTION ASSEMBLY SHALL BE INSTALLED WITH SOLDERED OR FLANGED ONLY.
4. THE BACKFLOW PREVENTION ASSEMBLY SHALL BE ON AN APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY.
5. REMOVABLE BACKFLOW PREVENTION ASSEMBLIES WILL BE EVALUATED ON A CASE BY CASE BASIS AND WILL ONLY BE APPROVED FOR SEASONAL IRRIGATION USERS.
6. SEASONAL BACKFLOW PREVENTION ASSEMBLIES SHALL BE LOCATED IN A LOCKABLE LID TO PROTECT FROM THEFT.
7. WHERE REMOVAL OF ASSEMBLY IS REQUESTED, FLANGES MUST BE INSTALLED ON THE IN-GROUND SUPPLY AND DISCHARGE PIPING SO THE EXPOSED PIPING OF THE WATER SYSTEM IS SEALED OFF WHILE THE BACKFLOW PREVENTER IS REMOVED.
8. DURING REMOVAL PERIOD, THE VALVE ON THE SUPPLY SIDE SHALL BE SHUT AND THE FLANGES SHALL BE SEALED WITH A BOLTED BLIND FLANGE.
9. FOR SERVICE LINES 4" AND GREATER, PIPE SHALL BE RESTRAINED BETWEEN THE METER PIT AND BACKFLOW PREVENTER.

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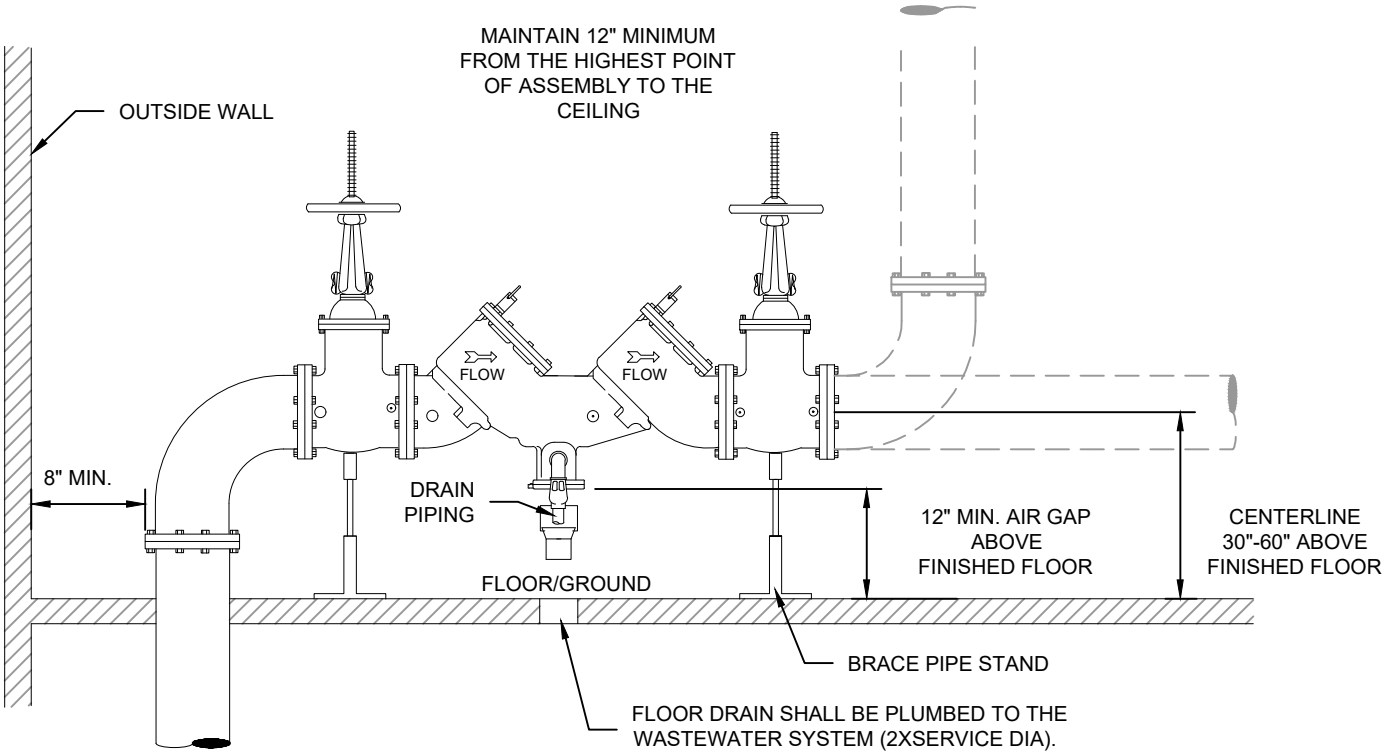
TYPICAL NON-SINGLE-FAMILY RESIDENTIAL OUTDOOR WATER METER AND REMOVABLE BACKFLOW PREVENTION ASSEMBLY FOR IRRIGATION SYSTEMS

B4-10

DATED 09/2022



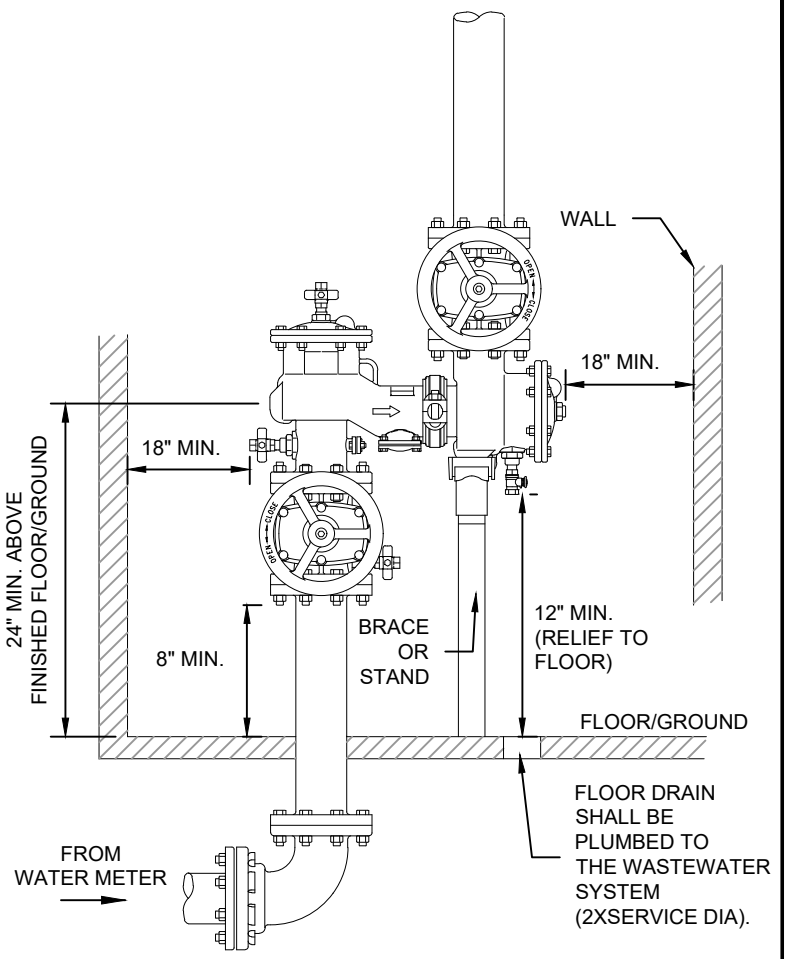
PLAN VIEW



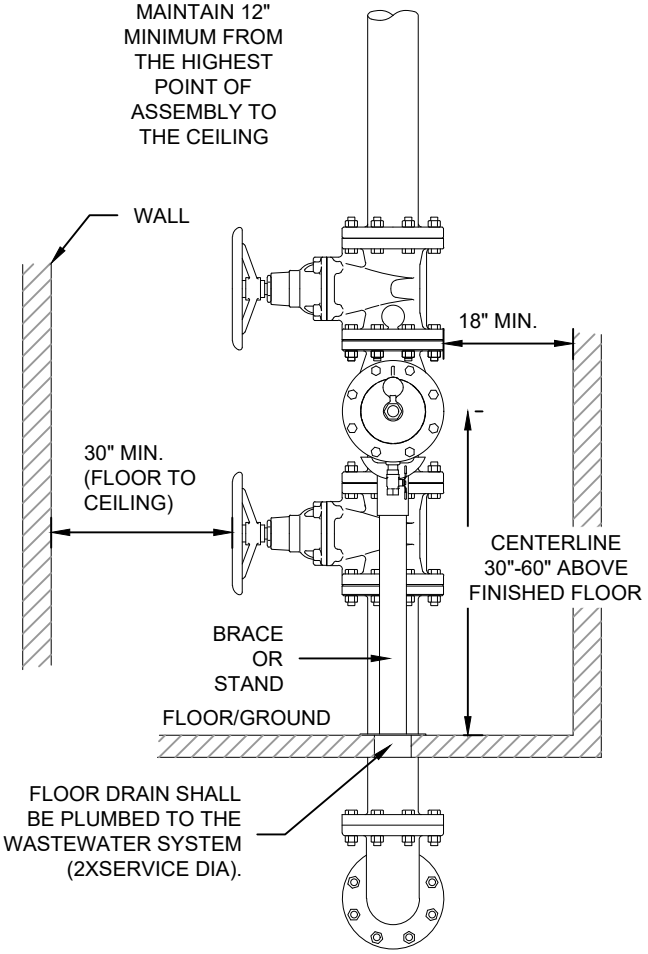
ELEVATION VIEW

NOTES:

1. SHUT-OFF VALVES, CHECK VALVES, AND TEST COCKS SHALL BE STANDARD TO THE APPROVED BACKFLOW PREVENTION ASSEMBLY.
2. TEST COCKS SHOULD BE LOCATED FACING THE THE CLEAR SPACE.
3. ALL ASSEMBLIES TO BE SUPPORTED BY A CRADLE PIPE STAND.
4. THE DEVICE SHALL BE INSTALLED AT AN ELEVATION THAT IS NO LESS THAN 30" -60" ABOVE FINISHED FLOOR.
5. THE DEVICE SHALL BE PLACED 18" AWAY FROM THE ADJACENT WALL TO THE EDGE OF THE SIDE WITH THE TEST COCK AND A MINIMUM OF 8" FROM ALL OTHER SIDES.
6. THE DEVICE SHALL BE PLACED WITH A MINIMUM OF 30" CLEAR SPACE IN FRONT OF THE DEVICE FROM FLOOR TO CEILING.
7. A MINIMUM OF 18" SHALL BE MAINTAINED FROM THE BOTTOM OF THE RELIEF VALVE TO THE FLOOR. AN ADEQUATE DRAIN IS REQUIRED FOR THE BACKFLOW PREVENTION ASSEMBLY. (UNDER THE DEVICE WHENEVER POSSIBLE)
8. A STRAINER IS RECOMMENDED TO BE INSTALLED BEFORE THE BACKFLOW DEVICE.
9. TEST COCKS ARE TO BE USED FOR TESTING OF THE BACKFLOW PREVENTION ASSEMBLY AND SHALL NOT BE MODIFIED.
10. CLEARANCE REQUIREMENTS APPLY TO BOTH REDUCED PRESSURE AND DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLIES.



ELEVATION VIEW



SECTIONAL VIEW

NOTES:

1. SHUT-OFF VALVES, CHECK VALVES, AND TEST COCKS SHALL BE STANDARD TO THE APPROVED BACKFLOW PREVENTION ASSEMBLY.
2. TEST COCKS SHOULD BE LOCATED FACING THE THE CLEAR SPACE.
3. ASSEMBLIES TO BE SUPPORTED BY A CRADLE PIPE STAND WHERE NECESSARY.
4. THE DEVICE SHALL BE INSTALLED AT AN ELEVATION THAT IS NO LESS THAN 30" -60" ABOVE FINISHED FLOOR.
5. THE DEVICE SHALL BE PLACED 18" AWAY FROM THE ADJACENT WALL TO THE EDGE OF THE SIDE WITH THE TEST COCK AND A MINIMUM OF 8" FROM ALL OTHER SIDES.
6. THE DEVICE SHALL BE PLACED WITH A MINIMUM OF 30" CLEAR SPACE IN FRONT OF THE DEVICE FROM FLOOR TO CEILING.
7. A MINIMUM OF 18" SHALL BE MAINTAINED FROM THE BOTTOM OF THE RELIEF VALVE TO THE FLOOR. AN ADEQUATE DRAIN IS REQUIRED FOR THE BACKFLOW PREVENTION ASSEMBLY. (UNDER THE DEVICE WHENEVER POSSIBLE)
8. A STRAINER IS RECOMMENDED TO BE INSTALLED BEFORE THE BACKFLOW DEVICE.
9. TEST COCKS ARE TO BE USED FOR TESTING OF THE BACKFLOW PREVENTION ASSEMBLY AND SHALL NOT BE MODIFIED.
10. DIMENSIONS ALSO APPLY TO VERTICAL DOWN/VERTICAL DOWN CONFIGURATIONS AND VERTICAL UP/VERTICAL DOWN (NO BRACE REQUIRED).
11. CLEARANCE REQUIREMENTS APPLY TO BOTH REDUCED PRESSURE AND DOUBLE CHECK BACKFLOW PREVENTION ASSEMBLIES.

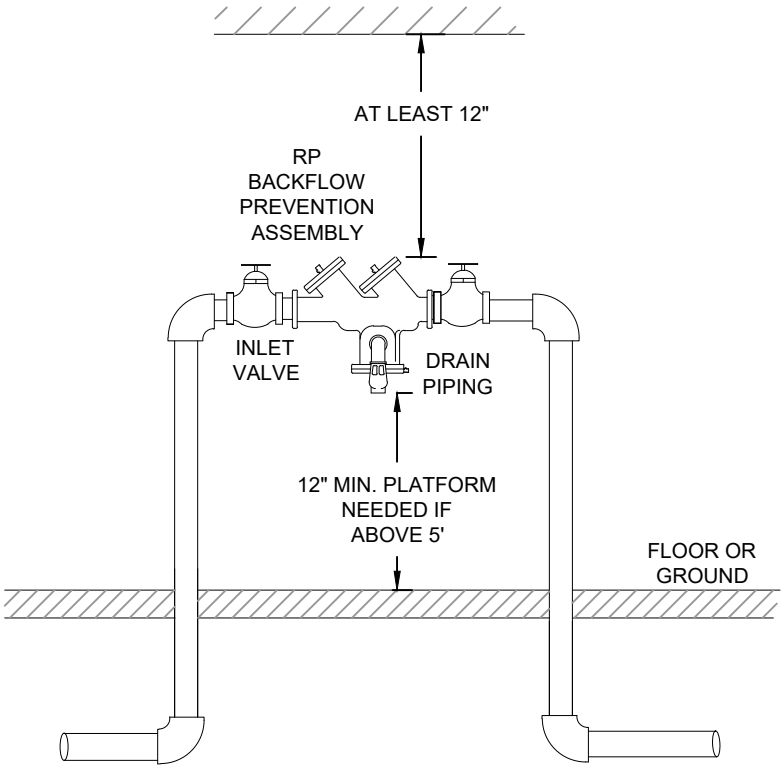
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VERTICAL UP/VERTICAL UP BACKFLOW PREVENTION ASSEMBLY

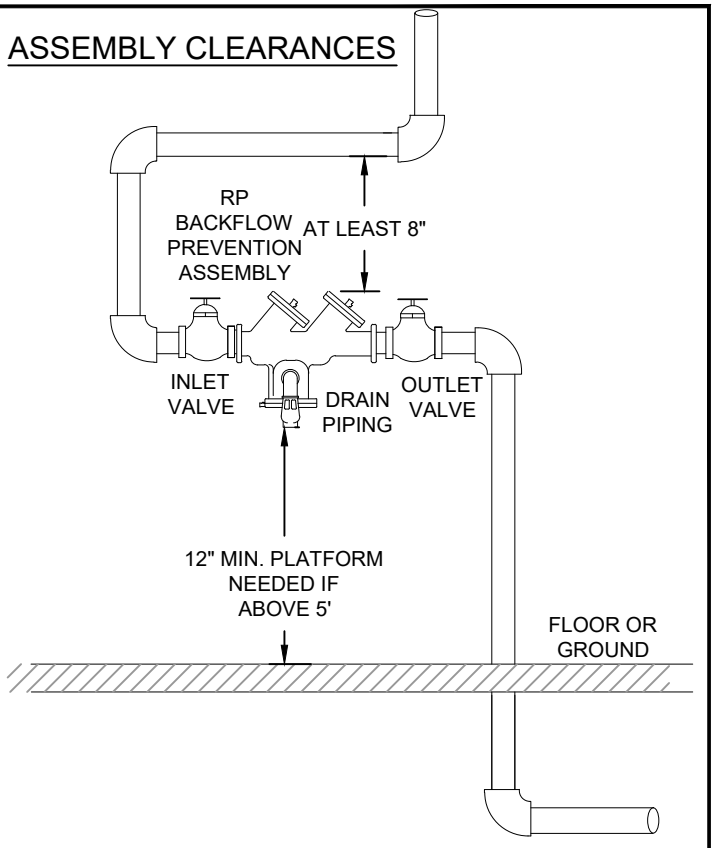
B4-12

DATED 01/2017

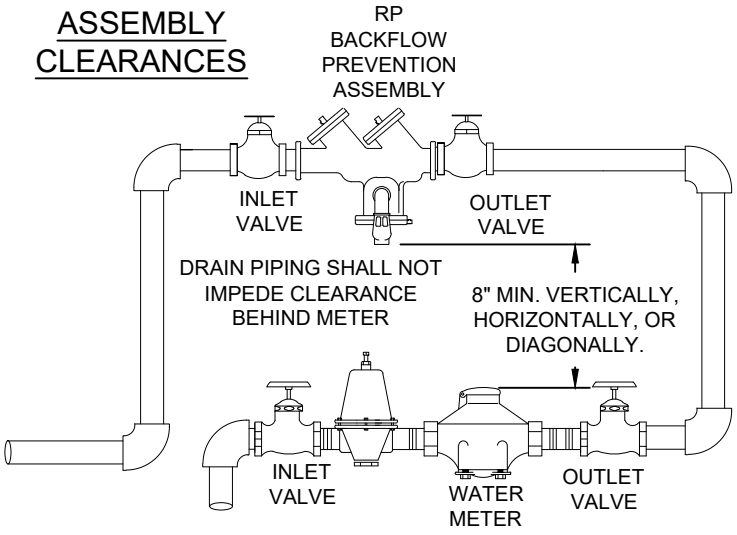
ASSEMBLY CLEARANCES



ASSEMBLY CLEARANCES

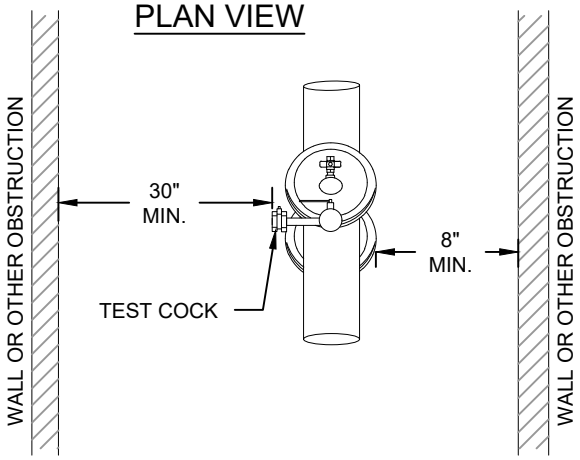


ASSEMBLY CLEARANCES



ASSEMBLY CLEARANCES

PLAN VIEW



NOTES:

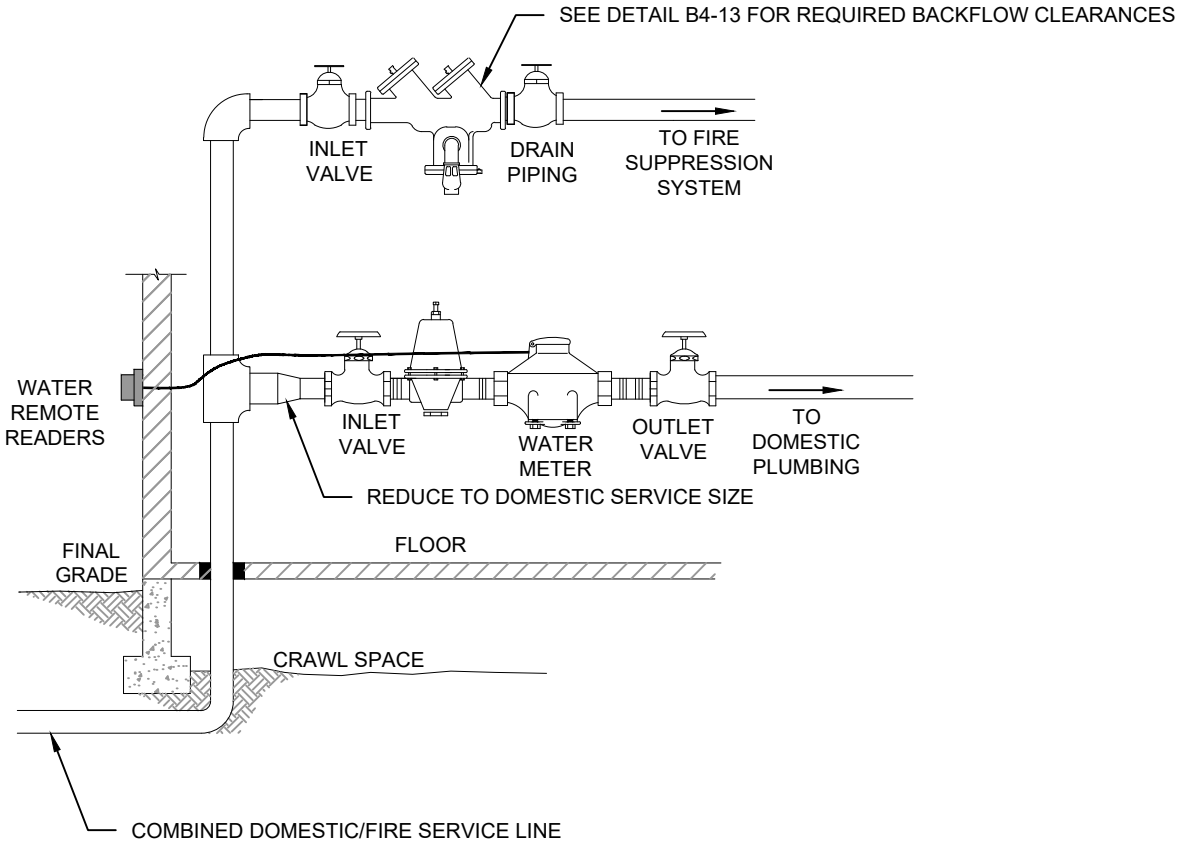
1. SHUT-OFF VALVES, CHECK VALVES, AND TEST COCKS SHALL BE STANDARD TO THE APPROVED BACKFLOW PREVENTION ASSEMBLY.
2. TEST COCKS SHOULD BE LOCATED FACING THE THE CLEAR SPACE.
3. ASSEMBLIES TO BE SUPPORTED BY A CRADLE PIPE STAND WHERE NECESSARY.
4. THE DEVICE SHALL BE INSTALLED AT AN ELEVATION THAT IS NO LESS THAN 30" -60" ABOVE FINISHED FLOOR.
5. THE DEVICE SHALL BE PLACED 18" AWAY FROM THE ADJACENT WALL TO THE EDGE OF THE SIDE WITH THE TEST COCK AND A MINIMUM OF 8" FROM ALL OTHER SIDES.
6. THE DEVICE SHALL BE PLACED WITH A MINIMUM OF 30" CLEAR SPACE IN FRONT OF THE DEVICE FROM FLOOR TO CEILING.
7. A MINIMUM OF 18" SHALL BE MAINTAINED FROM THE BOTTOM OF THE RELIEF VALVE TO THE FLOOR. AN ADEQUATE DRAIN IS REQUIRED FOR THE BACKFLOW PREVENTION ASSEMBLY (UNDER THE DEVICE WHENEVER POSSIBLE).
8. A STRAINER IS RECOMMENDED TO BE INSTALLED BEFORE THE BACKFLOW DEVICE FOR WATER METER LOOPS 2" AND SMALLER.
9. TEST COCKS ARE TO BE USED FOR TESTING OF THE BACKFLOW PREVENTION ASSEMBLY AND SHALL NOT BE MODIFIED.

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TYPICAL CLEARANCE FOR BACKFLOW PREVENTION ASSEMBLY

B4-13

DATED 06/2022



NOTES:

1. THIS CONFIGURATION IS ONLY APPLICABLE FOR STANDALONE NFPA 13D SYSTEMS.TEST COCKS SHOULD BE LOCATED FACING THE THE CLEAR SPACE.
2. REFERENCE SECTION 2.7.N FOR BACKFLOW PREVENTION ASSEMBLY REQUIREMENTS
3. REFERENCE DETAILS B4-1, B4-3, AND B4-16 TO B4-22 FOR ALLOWABLE METER CONFIGURATIONS AND CLEARANCES

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TYPICAL METER AND BACKFLOW PREVENTION ASSEMBLY LAYOUT FOR STANDALONE NFPA 13D SYSTEMS

B4-13A

DATED 06/2022

NOTES:

1. THIS DRAWING SHOWN IS DIAGRAMMATIC, AND IS INTENDED TO SHOW THE INTENT OF THE WORK IN PLUMBING PIPING TO ACCOMMODATE THE UTILITY SUBMETER.

2. BACKFLOW PREVENTION:
   ALL EXISTING CUA/IA CUSTOMERS, AND ALL NEW CUA/IA CUSTOMERS MUST INSTALL THE REQUIRED MAIN LINE CONTAINMENT BACKFLOW PREVENTION ASSEMBLY IN COMPLIANCE WITH THE CURRENT COLORADO SPRINGS UTILITIES WATER LINE EXTENSION & SERVICE STANDARDS AND CITY CODE TO ENTER/REMAIN IN THE CUA/IA PROGRAM. PLEASE NOTE THAT ADDITIONAL BACKFLOW PREVENTION BEYOND WHAT IS REQUIRED BY COLORADO SPRINGS UTILITIES, MAY BE REQUIRED BY REGIONAL BUILDING DEPARTMENT AND PLUMBING CODES.

3. A PLUMBING PERMIT IS REQUIRED, THROUGH THE REGIONAL BUILDING DEPARTMENT.

4. APPROVAL OF THE SUBMETER PIPING WORK INCLUDES BOTH COLORADO SPRINGS UTILITIES AND REGIONAL BUILDING DEPARTMENT APPROVAL.

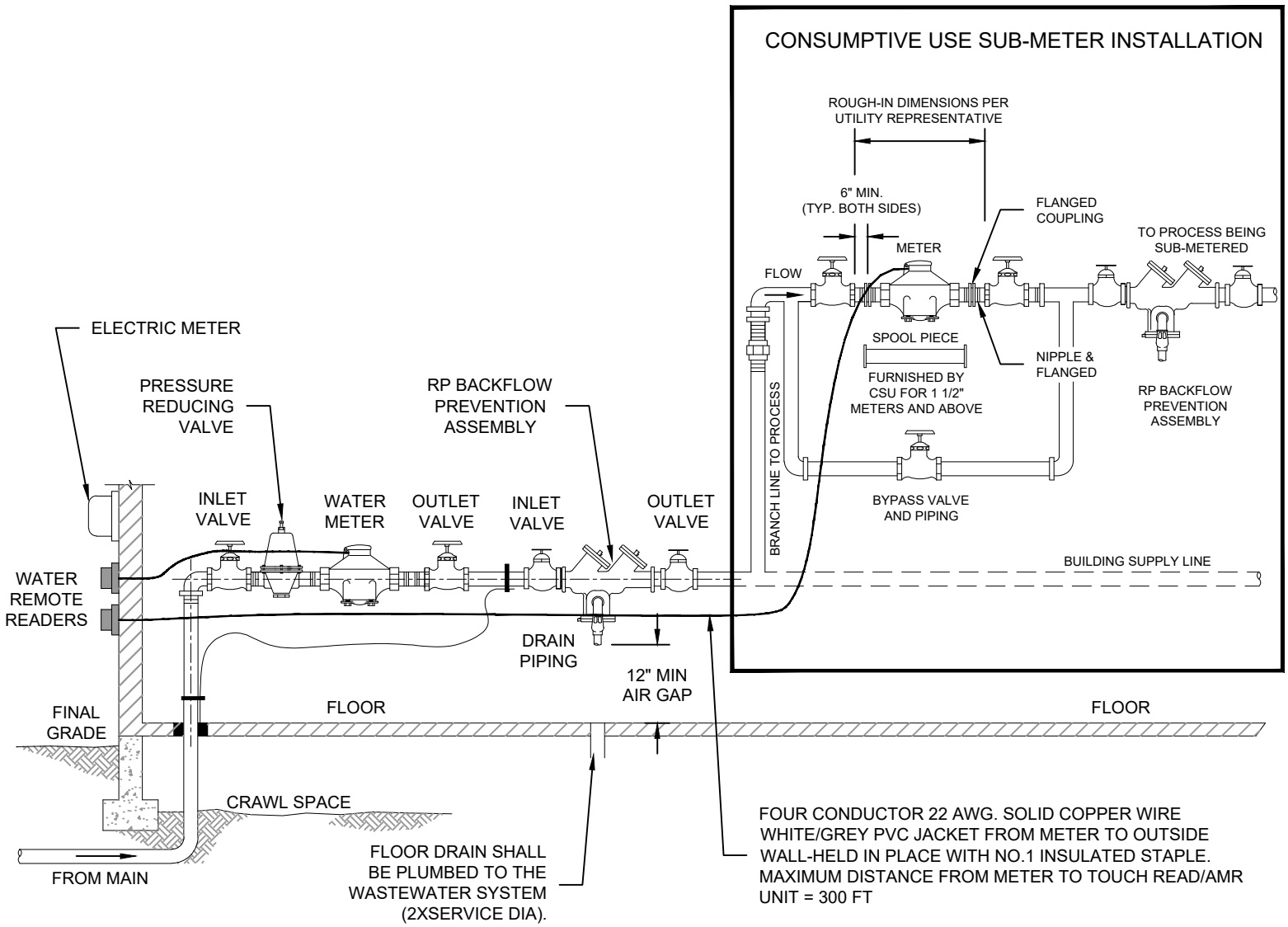
5. SUBMETER LOCATION SHALL BE APPROVED BY COLORADO SPRINGS UTILITIES. LOCATION SHALL ALLOW READY ACCESS FOR INSPECTION AND REPAIR. INSTALLATION SHALL INCLUDE DEDICATED UPSTREAM AND DOWNSTREAM SHUTOFF VALVES.

6. ANY AUTOMATED METER READING OR REMOTE READING PROVISIONS OF THE UTILITY SUBMETER MUST BE ACCOMMODATED. THIS MAY REQUIRE THE SUBMETER TO BE WITHIN A SPECIFIED DISTANCE OF AN EXTERIOR WALL OR OTHER REQUIREMENTS.

7. METER WILL BE SET BY COLORADO SPRINGS UTILITIES PERSONNEL.

8. WHERE A SUBMETER BYPASS IS CHOSEN BY THE CUSTOMER, THE FOLLOWING APPLY:
   A) LOCKS NOT REQUIRED. SINCE THE SUBMETER READINGS ARE USED FOR CREDIT ON THE CUSTOMERS WASTEWATER BILL,OPENING THE BYPASS ONLY REDUCES THE CUSTOMERS CREDITS, THEREFORE A UTILITY LOCK IS NOT REQUIRED.
   B) BYPASS PIPING SHALL BE ARRANGED TO BYPASS ONLY THE UTILITY SUBMETER. BYPASS PIPING SHALL NOT BYPASS OTHER APPURTENANCES SUCH AS THE BACKFLOW PREVENTER, PRESSURE REGULATOR, OR ANY CUSTOMER METER.
   C) RECOMMENDED BYPASS PIPING SIZES

METER SIZE	BYPASS SIZE
$\frac{3}{4}$"	$\frac{3}{4}$"
1"	1"
1-$\frac{1}{4}$"	1"
1-$\frac{1}{2}$"	1"
2"	1"
3" AND LARGER	LINE SIZE



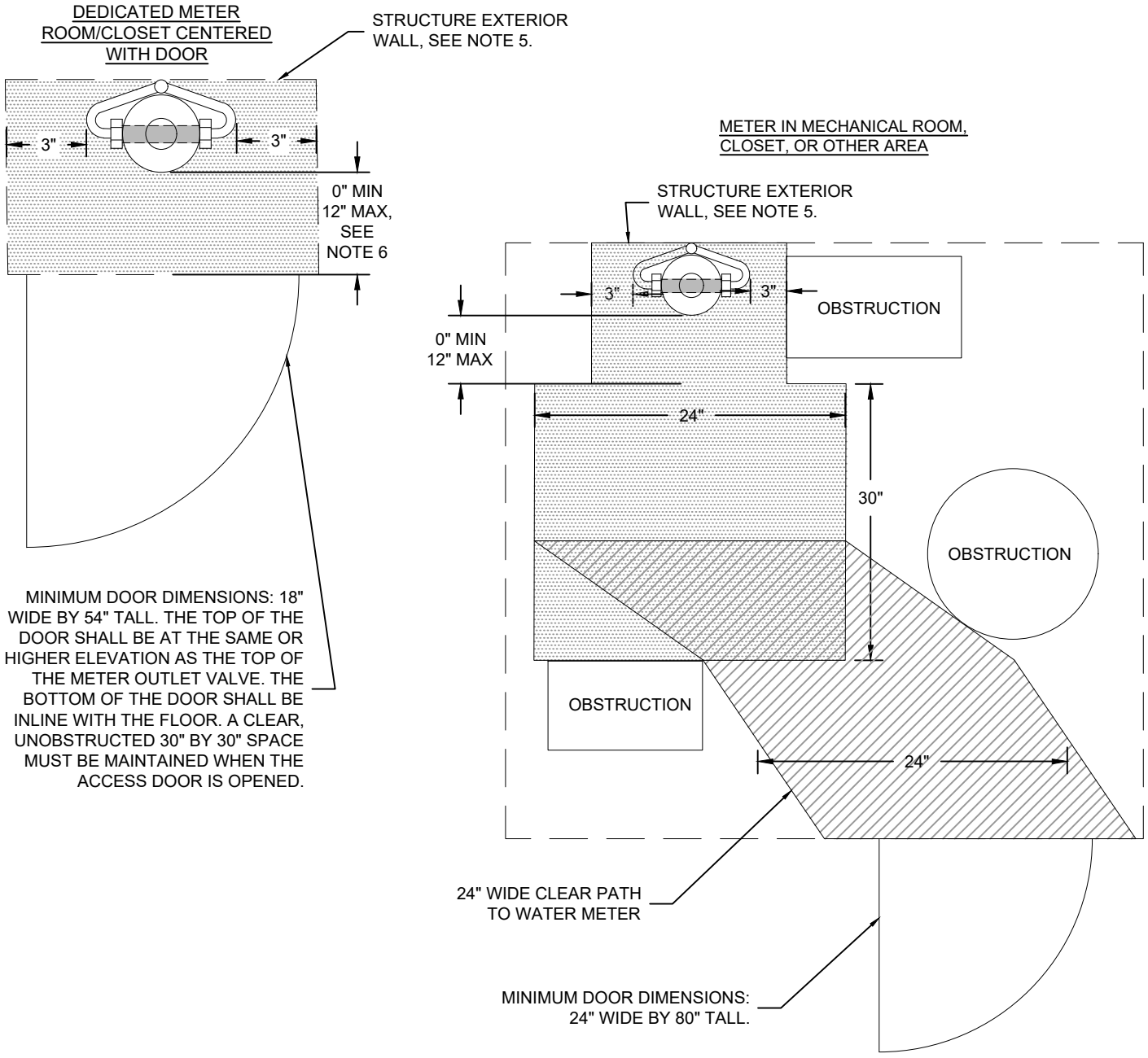
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SCHEMATIC DETAIL OF IRRIGATION AND CONSUMPTIVE USE SUB-METER INSTALLATION

B4-15

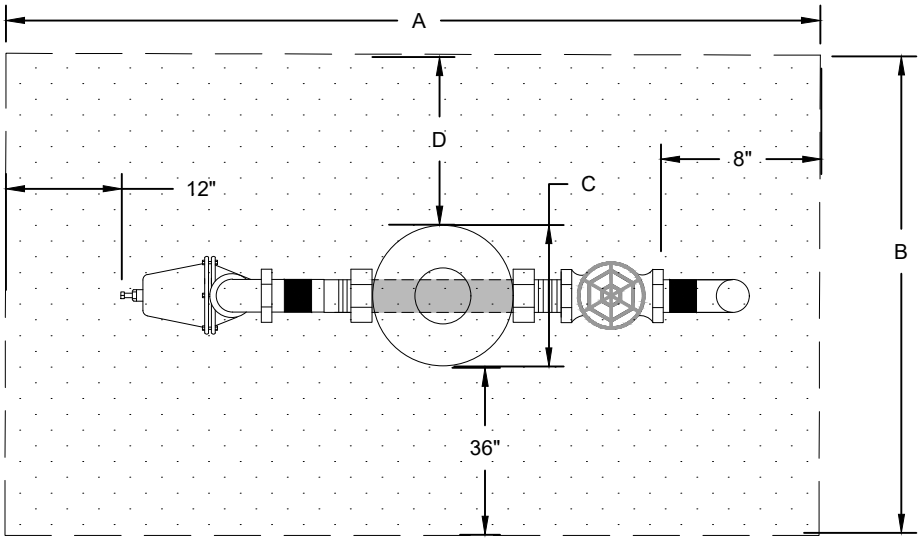
DATED 01/2017

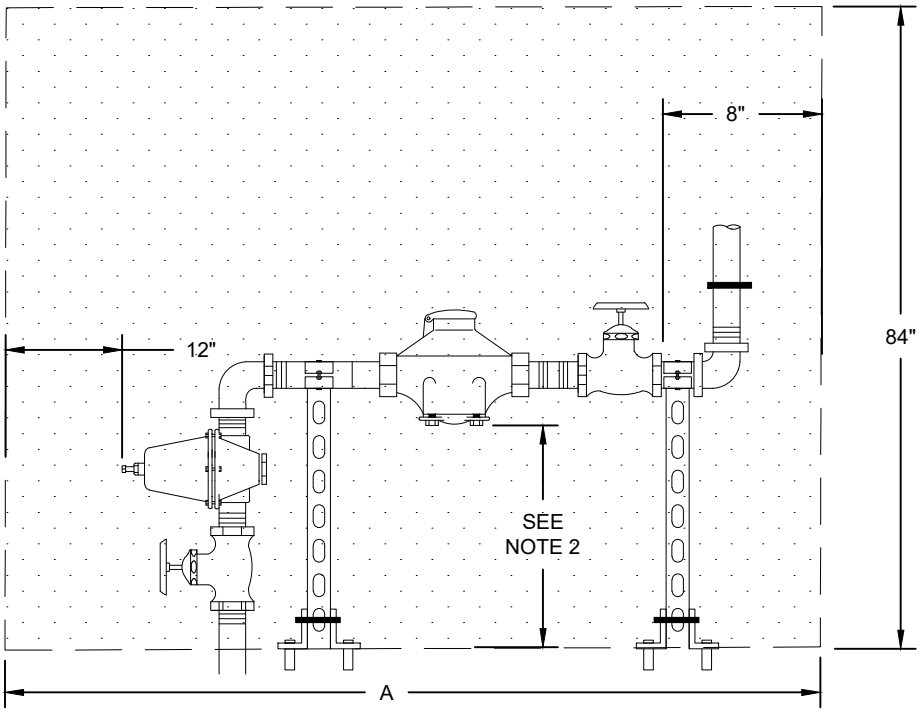
CONFIGURATION 1
VERTICAL - RESIDENTIAL (3/4" AND 1")



1. DRAWING ONLY INTENDED TO SHOW METER CLEARANCES. REFER TO DETAIL DRAWINGS B4-1 AND B4-3 RESPECTIVELY FOR METER DESIGN AND INSTALLATION REQUIREMENTS FOR VERTICAL METER LOOPS.
2. METER LOOP CONFIGURATION NOT PERMITTED WITH BACKFLOW ASSEMBLY DUE TO REQUIRED BACKFLOW OFFSET.
3. NO OBSTRUCTIONS TO BE PRESENT IN METER CLEARANCE AREA.
4. THE WATER SERVICE LINE SHALL NOT BE EXPOSED/ACCESSIBLE PRIOR TO THE METER TO DISCOURAGE TAPPING OF THE SERVICE LINE BEFORE THE METER.
5. STRUCTURE COMPONENTS OF EXTERIOR WALL SHALL HAVE INSULATION TO PROTECT AGAINST FREEZING. IF STRUCTURAL COMPONENTS ARE UN-INSULATED, METER MUST BE OFFSET 12" FROM EXTERIOR WALL.
6. IF CLEARANCE IN FRONT OF THE METER LOOP TO THE DOOR OPENING IS GREATER THAN 12", MINIMUM DOOR DIMENSIONS SHALL BE 2'-6" WIDE BY 80" TALL.

CONFIGURATION 2
HORIZONTAL - SINGLE-FAMILY-RESIDENTIAL
PRV AND INLET VALVE ON VERTICAL RISER WITH NO BACKFLOW





METER LOOP SIZE	A	B	C	D
3/4"	4'-2"	4'-5"	0'-5"	1'-0"
1"	4'-7"	4'-7"	0'-7"	1'-0"

1. DRAWING ONLY INTENDED TO SHOW METER CLEARANCES. REFER TO DETAIL DRAWINGS B4-1 AND B4-3 RESPECTIVELY FOR METER DESIGN AND INSTALLATION REQUIREMENTS.
2. THE MINIMUM METER SET HEIGHT IS 2'-0" AND THE MAXIMUM SET HEIGHT IS 4'-0".
3. NO OBSTRUCTIONS TO BE PRESENT IN METER CLEARANCE AREA.THE ACCESS DOOR SHALL BE A MINIMUM 2 FT WIDE BY 6 FT TALL.
4. FOR SINGLE-FAMILY-RESIDENTIAL METER SETS, THE WATER SERVICE LINE SHALL REMAIN INACCESSIBLE THROUGH THE STRUCTURE BEFORE THE METER TO PREVENT TAPPING OF THE SERVICE LINE BEFORE THE METER.
5. METER LOOP CONFIGURATION NOT PERMITTED WITH BACKFLOW ASSEMBLY. REFER TO DETAIL DRAWINGS B4-19 AND B4-21 IF A BACKFLOW IS REQUIRED.
6. A MINIMUM OF 6" IS REQUIRED BETWEEN APPURTENANCES AND FITTINGS.

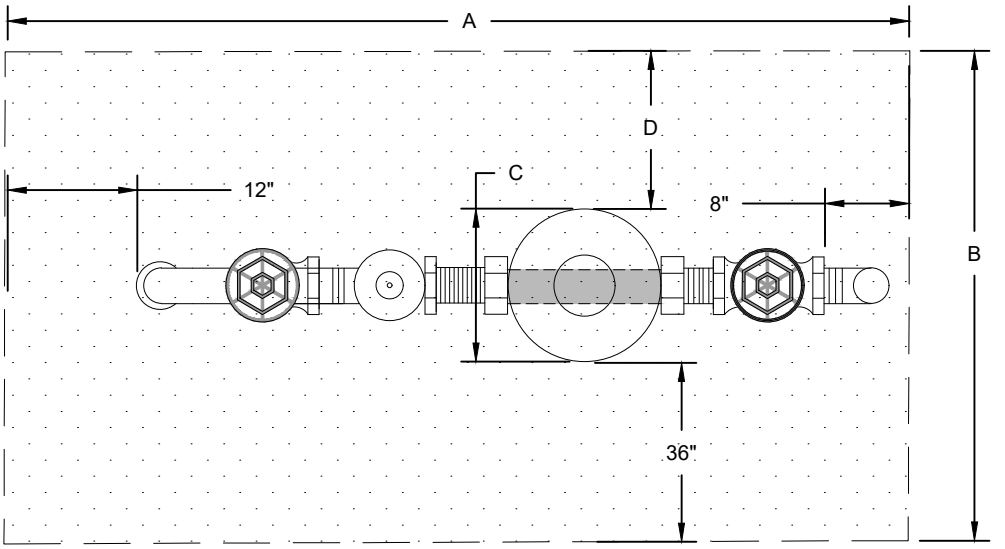
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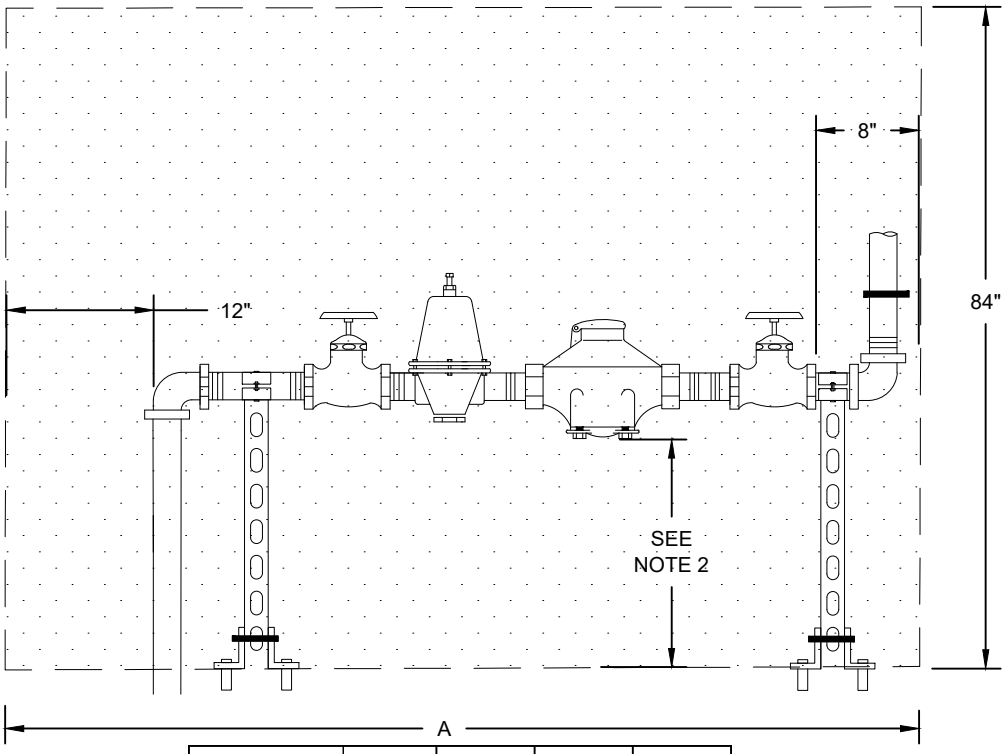
MINIMUM METER CLEARANCES
ALLOWABLE CONFIGURATION 2

B4-17

DATED 07/2022

CONFIGURATION 3
HORIZONTAL - SINGLE-FAMILY-RESIDENTIAL
PRV AND INLET VALVE INLINE WITH NO BACKFLOW





METER LOOP SIZE	A	B	C	D
3/4"	5'-6"	4'-5"	0'-5"	1'-0"
1"	5'-11"	4'-7"	0'-7"	1'-0"

1. DRAWING ONLY INTENDED TO SHOW METER CLEARANCES. REFER TO DETAIL DRAWINGS B4-1 AND B4-3 RESPECTIVELY FOR METER DESIGN AND INSTALLATION REQUIREMENTS.
2. THE MINIMUM METER SET HEIGHT IS 2'-0" AND THE MAXIMUM SET HEIGHT IS 4'-0".
3. NO OBSTRUCTIONS TO BE PRESENT IN METER CLEARANCE AREA. THE ACCESS DOOR SHALL BE A MINIMUM 2 FT WIDE BY 6 FT TALL.
4. FOR SINGLE-FAMILY-RESIDENTIAL METER SETS, THE WATER SERVICE LINE SHALL REMAIN INACCESSIBLE THROUGH THE STRUCTURE BEFORE THE METER TO PREVENT TAPPING OF THE SERVICE LINE BEFORE THE METER.
5. METER LOOP CONFIGURATION NOT PERMITTED WITH BACKFLOW ASSEMBLY. REFER TO DETAIL DRAWING B4-20 AND B4-22 IF A BACKFLOW IS REQUIRED.
6. A MINIMUM OF 6" IS REQUIRED BETWEEN APPURTENANCES AND FITTINGS.

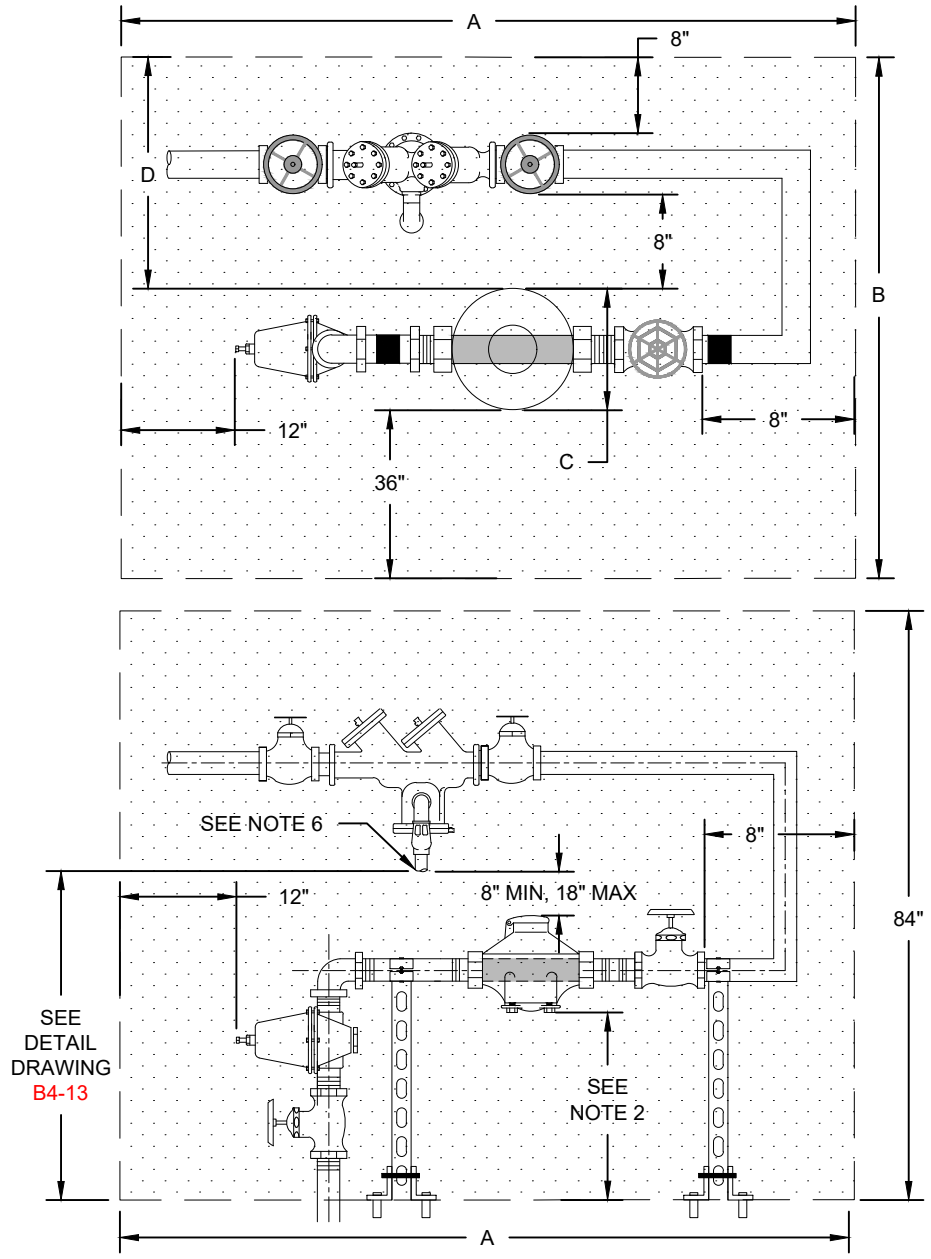
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MINIMUM METER CLEARANCES
ALLOWABLE CONFIGURATION 3

B4-18

DATED 07/2022

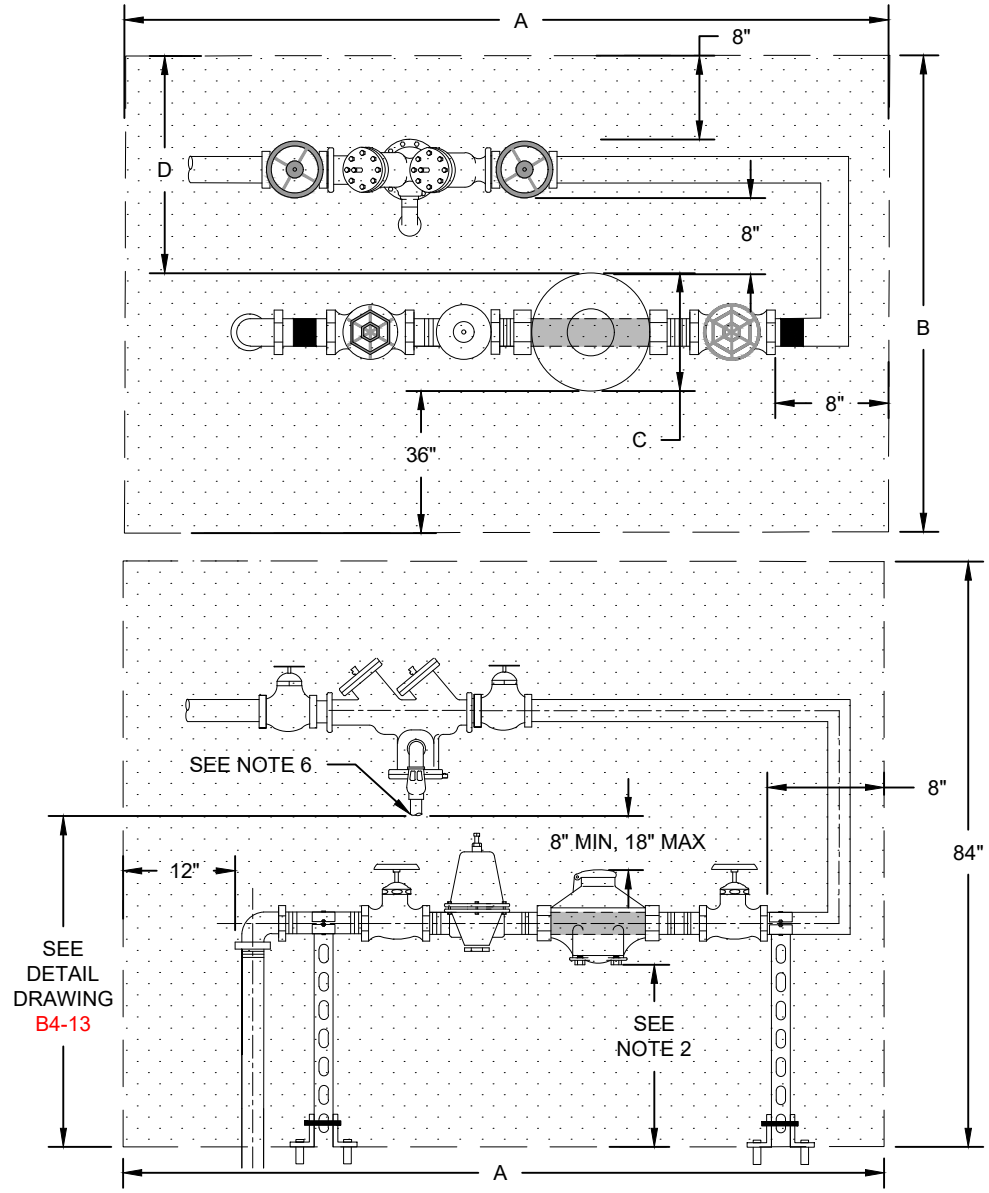
CONFIGURATION 4
HORIZONTAL - NON-SINGLE-FAMILY-RESIDENTIAL
PRV AND INLET VALVE ON VERTICAL RISER WITH STACKED BACKFLOW



METER LOOP SIZE	A	B	C	D
3/4"	4'-10"	4'-10"	0'-5"	1'-5"
1"	5'-3"	5'-0"	0'-7"	1'-5"
1-1/2"	5'-8"	5'-3"	0'-9"	1'-6"
2"	6'-3"	5'-4"	0'-10"	1'-6"

1. DRAWING ONLY INTENDED TO SHOW METER CLEARANCES. REFER TO DETAIL DRAWINGS B4-4, B4-5 AND B4-8 RESPECTIVELY FOR METER DESIGN AND INSTALLATION REQUIREMENTS.
2. THE MINIMUM METER SET HEIGHT IS 2'-0" AND THE MAXIMUM SET HEIGHT IS 4'-0". ALL BACKFLOW ASSEMBLY CLEARANCES SHOWN IN DETAIL DRAWING B4-13 MUST ALSO BE MET.
3. NO OBSTRUCTIONS TO BE PRESENT IN METER CLEARANCE AREA. THE ACCESS DOOR SHALL BE A MINIMUM 2 FT WIDE BY 6 FT TALL.
4. THE METER SHALL BE LOCATED WITHIN 5 FEET OF AN EXTERIOR WALL IMMEDIATELY FOLLOWING THE WATER SERVICE LINE'S POINT OF ENTRY, PER SECTION 2.7.F.1 AND 2.7.F.2.
5. A MINIMUM OF 6" IS REQUIRED BETWEEN APPURTENANCES AND FITTINGS.
6. BACKFLOW DRAIN PIPING SHALL NOT IMPEDE CLEARANCE BEHIND METER.

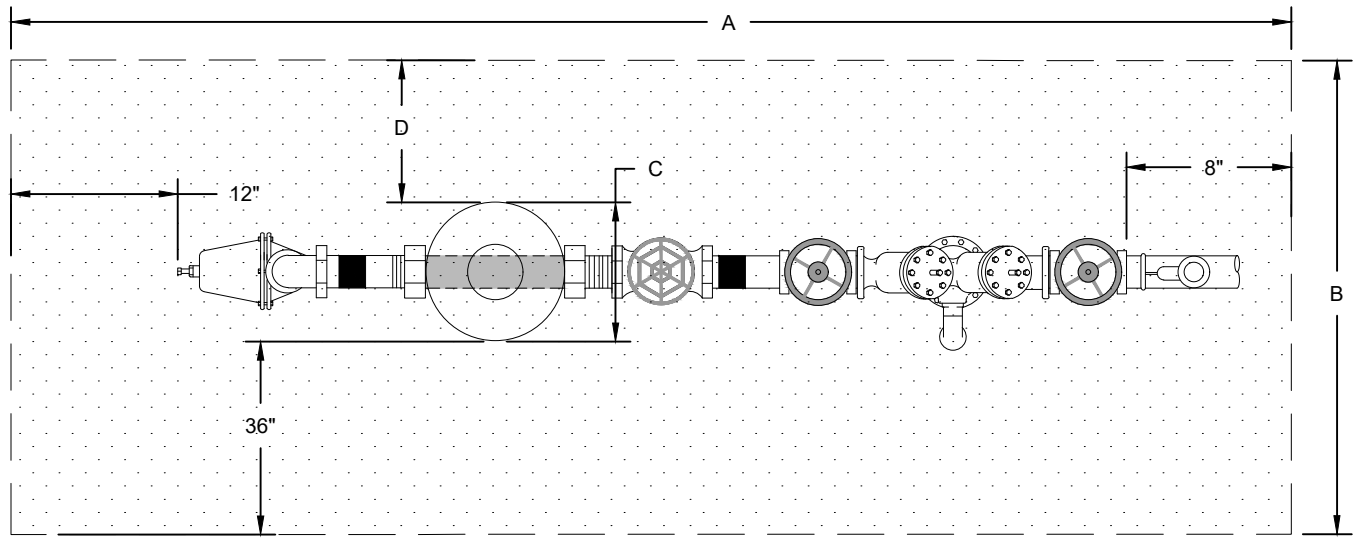
CONFIGURATION 5
HORIZONTAL - NON-SINGLE-FAMILY-RESIDENTIAL
PRV AND INLET VALVE INLINE WITH STACKED BACKFLOW

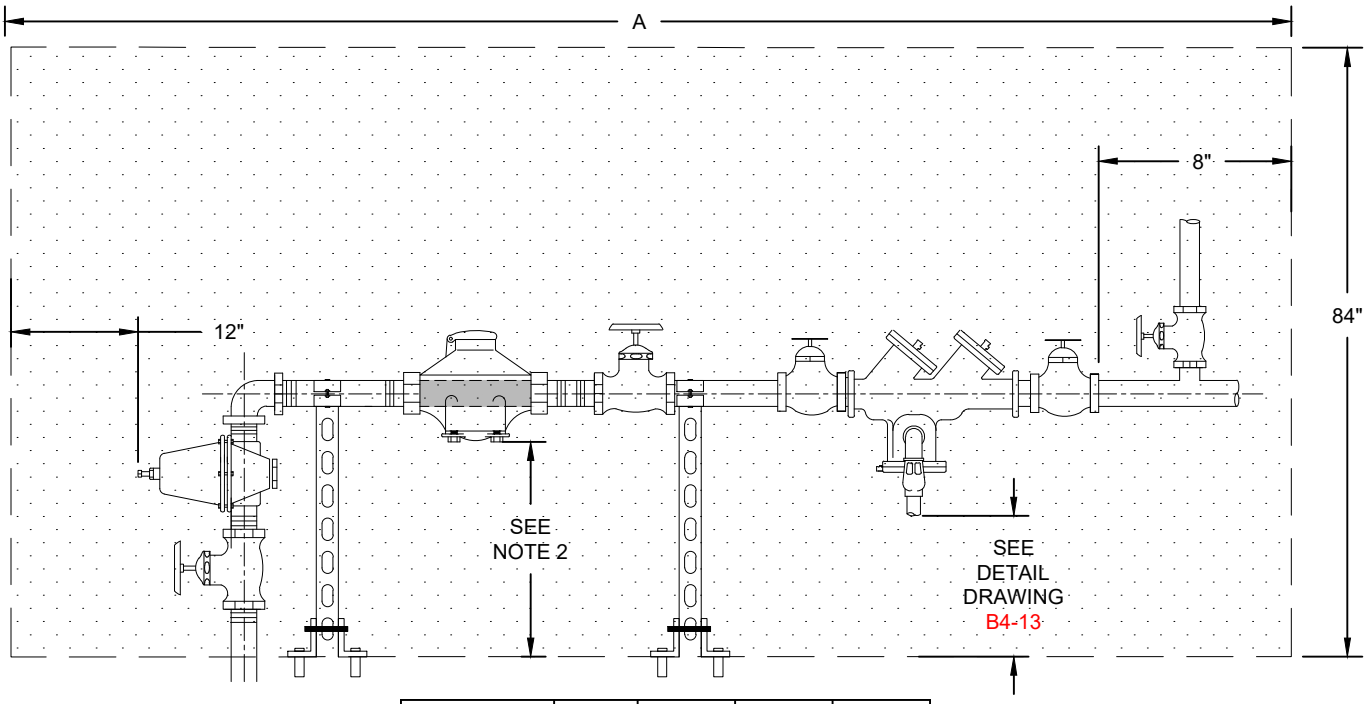


METER LOOP SIZE	A	B	C	D
3/4"	6'-2"	4'-10"	0'-5"	1'-5"
1"	6'-8"	5'-0"	0'-7"	1'-5"
1-1/2"	7'-4"	5'-3"	0'-9"	1'-6"
2"	8'-0"	5'-4"	0'-10"	1'-6"
3"	9'-6"	5'-3"	0'-8"	1'-7"
4"	11'-7"	5'-6"	0'-10"	1'-8"
6"	14'-9"	5'-9"	0'-11"	1'-10"

1. DRAWING ONLY INTENDED TO SHOW METER CLEARANCES. REFER TO DETAIL DRAWINGS B4-4, B4-5 AND B4-8 RESPECTIVELY FOR METER DESIGN AND INSTALLATION REQUIREMENTS.
2. THE MINIMUM METER SET HEIGHT IS 2'-0" AND THE MAXIMUM SET HEIGHT IS 4'-0". ALL BACKFLOW ASSEMBLY CLEARANCES SHOWN IN DETAIL DRAWING B4-13 MUST ALSO BE MET.
3. NO OBSTRUCTIONS TO BE PRESENT IN METER CLEARANCE AREA. THE ACCESS DOOR SHALL BE A MINIMUM 2 FT WIDE BY 6 FT TALL.
4. THE METER SHALL BE LOCATED WITHIN 5 FEET OF AN EXTERIOR WALL IMMEDIATELY FOLLOWING THE WATER SERVICE LINE'S POINT OF ENTRY, PER SECTION 2.7.F.1 AND 2.7.F.2.
5. A MINIMUM OF 6" IS REQUIRED BETWEEN APPURTENANCES AND FITTINGS, OR 2X's THE DIAMETER OF METER, WHICHEVER IS GREATER.
6. BACKFLOW DRAIN PIPING SHALL NOT IMPEDE CLEARANCE BEHIND METER.

CONFIGURATION 6
HORIZONTAL - COMMERCIAL
PRV AND INLET VALVE ON VERTICAL RISER WITH BACKFLOW INLINE





METER LOOP SIZE	A	B	C	D
3/4"	5'-9"	4'-5"	0'-5"	1'-0"
1"	6'-4"	4'-7"	0'-7"	1'-0"
1-1/2"	7'-2"	4'-9"	0'-9"	1'-0"
2"	7'-11"	4'-10"	0'-10"	1'-0"

1. DRAWING ONLY INTENDED TO SHOW METER CLEARANCES. REFER TO DETAIL DRAWINGS B4-4, B4-5 AND B4-8 RESPECTIVELY FOR METER DESIGN AND INSTALLATION REQUIREMENTS.
2. THE MINIMUM METER SET HEIGHT IS 2'-0" AND THE MAXIMUM SET HEIGHT IS 4'-0". ALL BACKFLOW ASSEMBLY CLEARANCES SHOWN IN DETAIL DRAWING B4-13 MUST ALSO BE MET.
3. NO OBSTRUCTIONS TO BE PRESENT IN METER CLEARANCE AREA. THE ACCESS DOOR SHALL BE A MINIMUM 2 FT WIDE BY 6 FT TALL.
4. THE METER SHALL BE LOCATED WITHIN 5 FEET OF AN EXTERIOR WALL IMMEDIATELY FOLLOWING THE WATER SERVICE LINE'S POINT OF ENTRY, PER SECTION 2.7.F.1 AND 2.7.F.2.
5. A MINIMUM OF 6" IS REQUIRED BETWEEN APPURTENANCES AND FITTINGS.

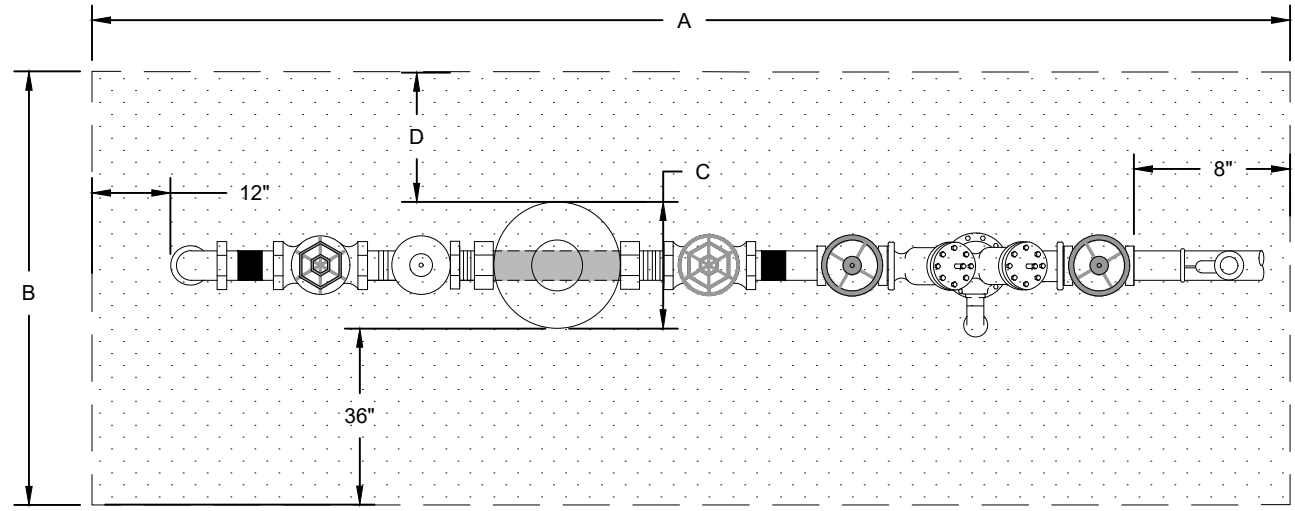
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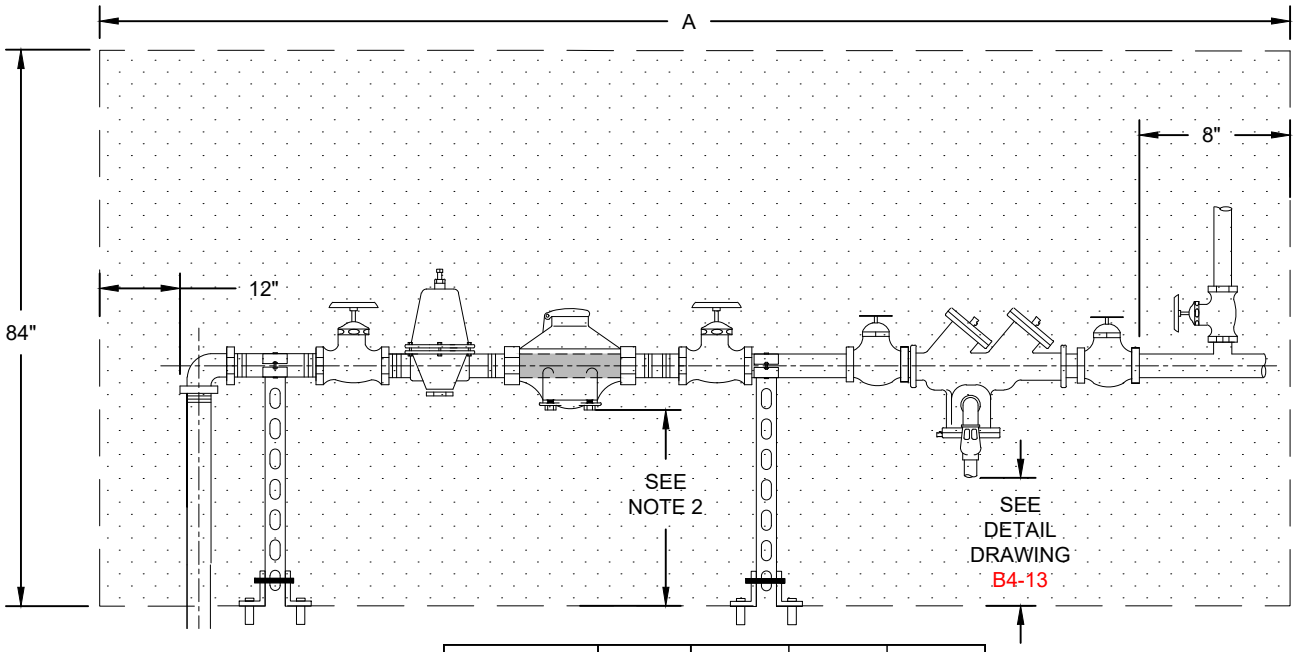
MINIMUM METER CLEARANCES
ALLOWABLE CONFIGURATION 6

B4-21

DATED 07/2022

CONFIGURATION 7
HORIZONTAL - COMMERCIAL
PRV, INLET VALVE, AND BACKFLOW INLINE





METER LOOP SIZE	A	B	C	D
3/4"	7'-1"	4'-5"	0'-5"	1'-0"
1"	7'-9"	4'-7"	0'-7"	1'-0"
1-1/2"	8'-9"	4'-9"	0'-9"	1'-0"
2"	9'-8"	4'-10"	0'-10"	1'-0"
3"	12'-4"	5'-2"	0'-8"	1'-6"
4"	14'-12"	5'-4"	0'-10"	1'-6"
6"	19'-1"	5'-5"	0'-11"	1'-6"

1. DRAWING ONLY INTENDED TO SHOW METER CLEARANCES. REFER TO DETAIL DRAWINGS B4-4, B4-5 AND B4-8 RESPECTIVELY FOR METER DESIGN AND INSTALLATION REQUIREMENTS.
2. THE MINIMUM METER SET HEIGHT IS 2'-0" AND THE MAXIMUM SET HEIGHT IS 4'-0". ALL BACKFLOW ASSEMBLY CLEARANCES SHOWN IN DETAIL DRAWING B4-13 MUST ALSO BE MET.
3. NO OBSTRUCTIONS TO BE PRESENT IN METER CLEARANCE AREA. THE ACCESS DOOR SHALL BE A MINIMUM 2 FT WIDE BY 6 FT TALL.
4. THE METER SHALL BE LOCATED WITHIN 5 FEET OF AN EXTERIOR WALL IMMEDIATELY FOLLOWING THE WATER SERVICE LINE'S POINT OF ENTRY, PER SECTION 2.7.F.1 AND 2.7.F.2.
5. A MINIMUM OF 6" IS REQUIRED BETWEEN APPURTENANCES AND FITTINGS, OR 2X's THE DIAMETER OF METER, WHICHEVER IS GREATER.


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