Colorado Springs Utilities

It's how we're all connected

2026

Wastewater

Line extension and service standards

www.csu.org

Legal Notice and Disclaimer

Under no circumstances will Colorado Springs Utilities, its employees or agents be liable for any direct, indirect, punitive or consequential damages that may result in any way from use, misuse, reference in or reliance on any of the information provided in or through this or any other publication or Web site including those sites which are linked herein, or that result from mistakes, errors omissions, interruptions, defects or any failure of performance. COLORADO SPRINGS UTILITIES EXPRESSLY DISCLAIMS ALL WARRANTIES, INCLUDING ANY EXPRESS OR IMPLIED WARRANTIES OF MERCHANT ABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION HEREIN.

While every effort is made to present accurate and reliable information, Colorado Springs Utilities does not endorse, approve, or certify the information provided by others, nor guarantee its accuracy, completeness, or timeliness. Use of the information is voluntary and reliance on it should only be undertaken after the user has independently verified its accuracy, completeness, and timeliness.

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 Wastewater 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 Wastewater 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

Legal Notice and Disclaimer

Under no circumstances will Colorado Springs Utilities, its employees or agents be liable for any direct, indirect, punitive or consequential damages that may result in any way from use, misuse, reference in or reliance on any of the information provided in or through this or any other publication or Web site including those sites which are linked herein, or that result from mistakes, errors omissions, interruptions, defects or any failure of performance.

COLORADO SPRINGS UTILITIES EXPRESSLY DISCLAIMS ALL WARRANTIES, INCLUDING ANY EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION HEREIN.

While every effort is made to present accurate and reliable information, Colorado Springs Utilities does not endorse, approve or certify the information provided by others, nor guarantee its accuracy, completeness or timeliness. Use of the information is voluntary and reliance on it should only be undertaken after the user has independently verified its accuracy, completeness and timeliness.

COLORADO SPRINGS UTILITIES
WASTEWATER LINE EXTENSION AND SERVICE STANDARDS

TABLE OF CONTENTS

Chapter	Title	Page Number
Disclaimer		
Table of Contents		1
Revision Table		3
List of Tables and Figures		5
1	General Information	1-1
2	Development and Design of Wastewater Systems	2-1
3	Submittal Requirements	3-1
4	Approved Materials	4-1
5	Wastewater Construction	5-1
6	High Density Polyethylene Pipe and Trenchless Technologies	6-1
7	Pressurized Wastewater Systems	7-1
8	Groundwater Underdrains	8-1
Appendix C	Detail Drawings	C-1
Appendix D	Detail Drawings	D-1

This page left intentionally blank

COLORADO SPRINGS UTILITIES
WASTEWATER LINE EXTENSION AND SERVICE STANDARDS

REVISION TABLE

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

SECTION(S)	TITLE	REVISION DESCRIPTION
2.6	Separation Criteria	Updated separation criteria for additional clarifications and relocated some sections to improve readability.
2.7	Interior Grease Interceptors	Updated requirements and processes for easier interior installations of grease interceptors
4.2.B.3	Restrained Joint PVC Pipe	Allow restrained joint PVC for open trench and casing pipe applications.
4.2.D.3	Flange Gaskets	Due to diminished lifespan, red rubber is no longer permitted for flange gaskets.
4.2.M.5	Test Stations for Cathodic Protection	Require valve boxes with "WASTEWATER TEST" lids and terminal boards for Cathodic Protection test stations placed in the roadway.
4.2.K, 5.15, 5.22.D.1, 6.6.C, 6.14.E	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.
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.
6.16	CCTV Inspections	Updated CCTV inspection requirements to ensure Contractor provides Colorado Springs Utilities with sufficient quality CCTV video.
Chapter 7	Lift Station Requirements	Overhaul of Lift Station Requirements to match new URRs and Specifications.
Details C2-16 and C2-17	Air and Vacuum Valve Stations	New Wastewater Air and Vacuum Valve Details
Details D2-5, D2-6, & D2-7	Pressurized Service Lines and Mains	New Pressurized Wastewater Service Line and Main Details

This page left intentionally blank

LIST OF TABLES & FIGURES

Table/Figure Number	Caption	Page Number

TABLES

Table 2-1: Minimum Easement/Corridor Width (feet) Requirements for Utility Combinations 2-13
Table 2-2: Wastewater Main Material, Bury Depth, and Slope 2-15
Table 2-3: Clearance Matrix for Typical Colorado Springs Underground Utilities 2-18
Table 2-4: Internal Manhole Diameter Requirements 2-22
Table 2-5: Soil Resistivity and Corrosivity Rating 2-30
Table 2-6: Wastewater Service Line Material, Bury Depth, and Slope 2-32
Table 2-7: Sand/Oil Interceptor Sizing Requirements 2-41
Table 2-8: Average-Daily Design Flows 2-44
Table 2-9: Time Pattern Information 2-45
Table 5-1: Select Bedding Gradation Limits 5-25
Table 5-2: Minimum Manhole Vacuum Testing Times Per Manhole Diameter and Depth 5-40
Table 5-3: Minimum Allowable Time for Wastewater Main Air Test Per Pipe Diameter 5-41
Table 6-1: Coefficients of Linear Thermal Expansion/Contraction 6-6
Table 7-1: General List of Known and Possible Permitting Requirements for Lift Stations 7-39

FIGURES

Figure 51: Uniform Color Code for Underground Utilities 5-15
Figure 6-1: Example of a Heat Fusion Joint Record (typical output for a McElroy Data logger) 6-8
Figure 8-1: Perforated Pipe Hole Configuration 8-5

This page left intentionally blank

TABLE OF CONTENTS

CHAPTER 1
General Information

Paragraph Number	Title	Page Number
1.1	General	1-3
1.2	Authority	1-3
1.2.A	Interpretative Authority	1-3
1.2.B	Inspection Authority	1-3
1.2.C	Conflicts between Approved Construction Plans and these *Wastewater LESS*	1-4
1.3	Applicability	1-4
1.4	Enforcement	1-4
1.5	Effective Date of Standards	1-4
1.6	Organization of these *Wastewater LESS*	1-4
1.7	Errors and Omissions	1-4
1.8	Revisions, Amendments or Additions	1-5
1.9	Requested Changes to Standards	1-5
1.10	Viewing These Standards Online	1-5
1.11	Referenced Standards, Codes, Permits, Plans, Agreements and Specifications	1-5
1.12	Definitions	1-5
1.13	Abbreviations	1-11
1.14	Phone Numbers and Contact Information	1-14
1.15	References	1-15

This page left intentionally blank

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 Wastewater Line Extension and Service Standards (Wastewater LESS)* and how they should be utilized. By adopting and promulgating these *Wastewater LESS*, Colorado Springs Utilities seeks to ensure safe and efficient design, Construction, and operation of the Wastewater 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 *Wastewater LESS* are promulgated by the Colorado Springs Utilities Executive Director (CEO) and approved by the Chief Water Services Officer in accordance with *City Code § 12.1.109*. The interpretation, enforcement, and revision of these *Wastewater LESS* are hereby delegated to the Chief Water Services Officer, or their designated agent.

1.2.A Interpretative Authority

The Chief Water Services Officer of Colorado Springs Utilities, acting either directly or through properly authorized agents, shall have the authority to interpret these *Wastewater LESS*. In case of a dispute, the Chief Water Services Officer shall have final authority to interpret these *Wastewater 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 Water Services Officer during Construction of the proposed Wastewater System to ensure these *Wastewater 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 *Wastewater LESS* criteria, all Contract Documents and any other approved plans and/or reports necessary for the Construction of the proposed Wastewater 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 *Wastewater 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 *Wastewater LESS*, *City Code,* Contract Documents and any other approved plans

and/or reports are followed to ensure Construction of a safe and efficient Wastewater 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 *Wastewater LESS*

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

1.3 Applicability

These *Wastewater LESS* are Colorado Springs Utilities' service standards and regulations relevant to the design, installation, Construction, maintenance, repair or replacement of the Wastewater System and Wastewater Service Lines, provision of Wastewater service to the public.

1.4 Enforcement

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

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 § 7.7.1102*.

1.5 Effective Date of Standards

These *Wastewater LESS* shall be in effect upon approval by the Chief Water Services Officer and shall supersede all previously approved *Wastewater Line Extension & Service Standards*. City Code § 12.1.109. All plans or permits approved prior to the effective date of a new edition of Wastewater LESS shall comply with the previous edition of Wastewater LESS.

1.6 Organization of these *Wastewater LESS*

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

1.7 Errors and Omissions

When there are discrepancies within these *Wastewater 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 *Wastewater 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 when published.

Colorado Springs Utilities may promulgate bulletins as addenda to the *Wastewater 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 *Wastewater LESS*, or to report an error within the *Wastewater 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 *Wastewater LESS*, forms, and drawings are available as Adobe®PDF 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 *Wastewater LESS* Adobe®PDF file.

References to Detail Drawings and other sections of the *Wastewater 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 this *Wastewater 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 *Wastewater LESS*, or in the Detail Drawings, are shown as capitalized and shall have the meanings herein ascribed:

Approved Construction Plans: Plans that are signed and approved by Colorado Springs Utilities for installation within the Colorado Springs Utilities Wastewater 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 Wastewater 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 (AH**J):** 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.

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.

Chief Water Services Officer: Executive level at-will position reporting directly to the Executive Director. The Chief Water Services Office 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*

Collection Line: See Wastewater Main

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*

Common Wastewater Service Line: When 2 or more Wastewater Service Lines come together on a single platted lot.

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 uses. 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. *City Code § 7.2.201*

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 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.

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 Wastewater System, Wastewater Service Lines, or interior plumbing. This includes all Subcontractors, builders, Excavators, and/or Master Plumbers.

Customer: The person or authorized agent of the person designated on 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*

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 C and D.

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 § 7.2.201*

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.

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*

Fat, Oil and Grease (FOG): A semi-solid, viscous liquid organic polar compound derived from animal and/or plant sources that contain multiple carbon chain triglyceride molecules. These substances are detectable and measurable using analytical test procedures established in 40 Code of Federal Regulations (CFR) Part 136, as may be amended.

Food Service Establishment: Any facility engaged in preparing and/or serving food for consumption by the public either on or off Premises, such as but not limited to: restaurants, commercial kitchens, cafeterias, nightclubs, coffee shops, delicatessens, meat cutting-preparations, bakeries, bagel shops, grocery stores, caterers, hotels, schools, churches, hospitals, correctional facilities, day cares and nursing care institutions.

Gravity Grease Interceptor: Plumbing appurtenances that are installed in the sanitary drainage system to intercept free-floating fats, oils, and grease from wastewater discharge. Separation is accomplished by gravity during a retention time of not less than 30 minutes.

Hydromechanical Grease Interceptor: Plumbing appurtenances that are installed in the sanitary drainage system to intercept free floating fats, oils, and grease from wastewater discharge. Continuous separation is accomplished by air entrainment, buoyancy, and interior baffling.

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.

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.

Lift Station: a Wastewater pumping station that pumps the Wastewater to a different point when the continuance of the sewer at reasonable slopes would involve excessive depths of

bury or that pumps Wastewater from areas too low to drain into available sewers. This definition does not include Wastewater pumping stations for single family residences or clusters of 5 or fewer single-family residences or other small buildings, as long as they receive less than two 2,000 gallons per day of domestic Wastewater. Lift stations are appurtenances to domestic Wastewater treatment works. *5 CCR 1002-22*

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 § 7.2.201*

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 *Building Code*. *City Code § 12.5.201*

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

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.

Private Wastewater Main: a Wastewater Service Line that is 8 inch or greater.

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.

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.

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 § 7.2.201*

Sand/Oil Interceptor: A tank that serves one or more fixtures and is remotely located. Sand/Oil Interceptors include, but are not limited to, tanks that capture Wastewater from vehicle maintenance facilities, car washes, or activities with a petroleum wash away byproduct.

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.

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.

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.

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*

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*

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*

Wastewater Main Extension: Extensions to the existing Colorado Springs Utilities' Wastewater System.

Wastewater: The liquid and water-carried Industrial or Domestic Wastes and pollutants from dwellings, commercial buildings, industrial facilities and institutions, including hauled liquid waste and any Groundwater, surface water and storm water that may be present, whether treated or untreated. *City Code § 12.5.201*

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*

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
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

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 Prevention Agency
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
QBD – Quality By Design
RSS – Regulatory Services Section of the EVS
URR – Utilities Rules and Regulations

Wastewater 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
CLSM – Controlled Low Strength Materials
CRA – Concrete Reverse Anchor
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
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
PVC – Polyvinyl Chloride – Plastic Pipe
ROW – Right-of-Way
SU – Standard Units
SWMP – Storm Water Management Plan
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
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
Geomatics Team (Landbase 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 Inspection 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 *Wastewater LESS*:

- American Water Works Association, *AWWA Manual M23 - PVC Pipe Design and Installation*
- American Water Works Association, *AWWA Manual M28 - Rehabilitation of Water Mains*
- American Water Works Association, *AWWA Manual M41 - Ductile –Iron Pipe and Fittings Manual of Water Supply Practices*
- American Water Works Association, *AWWA Manual M55 - PE Pipe-Design and Installation*
- ASTM Standard, *D2321- Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications*
- ASTM Standard, *F1962 - Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings*
- ASTM Standard, *F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings*
- CDPHE, Air Quality Control Commission, *Regulation Number 8 - Control of Hazardous Air Pollutants*,
- CDPHE, Air Quality Control Commission, *Regulation Number 19 - The Control of Lead Hazards*
- 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*
- CDPHE, Water Quality Control Division, *Regulation No. 22 – Site Location and Design Approval Regulations for Domestic Wastewater Treatment Works 5 CCR 1002-22*
- CDPHE, Water Quality Control Division, *State of Colorado Design Criteria for Domestic Wastewater Treatment Works*
- City of Colorado Springs, *City Code*
- City of Colorado Springs*, City Engineering Standard Specification*
- City of Colorado Springs, *Drainage Criteria Manual Volume I and II*
- City of Colorado Springs, *Fire Department Access Information Packet*
- City of Colorado Springs, *Mixed Use Development Design Manual*
- City of Colorado Springs, *Procedure Manual for the Acquisition and Disposition of Real Property Interests*
- City of Colorado Springs, *Small Lot Planned Unit Developments*
- City of Colorado Springs, *Standard Specifications and Traffic Manual*
- City of Colorado Springs, *Traditional Neighborhood Development Design Manual*
- Colorado Springs Utilities, *Electric Line Extension and Service Standards*
- Colorado Springs Utilities, *Fats, Oil, and Grease Policies and Procedures Manual*
- Colorado Springs Utilities, *Gas Line Extension and Service Standards*
- Colorado Springs Utilities, *Water Line Extension and Service Standards*
- Colorado Springs Utilities, *Utilities Rules, and Regulations*
- Great Lakes - Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, *Recommended Standards for Wastewater Facilities*
- HDD Consortium, *Horizontal Directional Drilling – Good Practices Guidelines*

- Hydraulic Institute, *Standard 9.6.4 – American National Standard for Rotodynamic Pumps for Vibration Measurement and Allowable Values*
- Institute of Electrical and Electronics Engineers, *IEEE-1584 - Guide for Performing Arc Flash Hazards Calculations*
- International Code Council, *International Plumbing Code, as adopted*
- Occupational Safety and Health Administration, *OSHA-29 CFR 1910.1001- Asbestos in General Industry Standard*
- Occupational Safety and Health Administration, *OSHA-29 CFR 1926.1101- Asbestos Standard for the Construction Industry*
- Plastic Pipe Institute, *Handbook of Polyethylene Pipe*
- Plastic Pipe Institute, *PPI-TN-42 – Recommended Minimum Training Guidelines for PE Pipe Butt Fusion Joining Operators for Municipal and Industrial Projects*
- Plastic Pipe Institute, *PPI-TR-33 – Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe*
- U.S. Department of Transportation, Federal Highway Administration, *Manual of Uniform Traffic Control Devices*
- U.S. Environmental Protection Agency, *Design Manual, Odor and Corrosion Control in Sanitary Sewerage Systems and Treatment Plant*
- U.S. Environmental Protection Agency, *National Emission Standard for Asbestos (40 CFR Part 61, Subpart M)*
- U.S. Environmental Protection Agency, *Asbestos Worker Protection (40 CFR Part 763, Subpart G)*
- Water Environment Federation, *Manual of Practice No. FD-5 - Gravity Sanitary Sewer Design and Construction*
- Water Environment Federation, *Trenchless Technology Pipeline and Utility Design, Construction and Renewal*

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

TABLE OF CONTENTS

CHAPTER 2
Development and Design of Wastewater Systems

Paragraph Number	Title	Page Number
2.1	General	2-6
2.1.A	Cost Responsibility	2-6
2.1.A.1	Cost Recovery	2-6
2.1.A.2	Wastewater Main Reimbursement	2-6
2.2	Types of Wastewater Facilities	2-6
2.2.A	Public Wastewater Mains	2-6
2.2.B	Private Wastewater Mains and Common Wastewater Service Lines	2-6
2.2.C	Wastewater Service Lines	2-7
2.2.D	Alternate Collection Systems	2-7
2.3	Responsibilities	2-7
2.3.A	Overview	2-7
2.3.B	Responsibility for Design	2-8
2.3.C	Responsibility for Wastewater Main Extensions	2-8
2.3.D	Responsibility for Downstream Expansions	2-8
2.3.E	Responsibility for Pressurized Systems and Lift Stations	2-8
2.3.F	Agreement and Bill of Sale and Warranty	2-9
2.3.G	Responsibility for Ownership, Operation, and Maintenance	2-9
2.3.G.1	Wastewater Mains	2-9
2.3.G.2	Private Wastewater Mains and Wastewater Service Lines	2-9
2.4	Planning	2-10
2.4.A	Wastewater Master Facility Form	2-10
2.4.B	Wastewater Main Sizing	2-11
2.4.C	Preliminary Utility Plan	2-11
2.4.D	Utility Cross Sections and Easement Requirements	2-11
2.4.E	Geological Hazard Identification and Mitigation	2-14
2.5	Wastewater Main Design	2-14
2.5.A	General	2-14
2.5.B	Wastewater Main Materials	2-15
2.5.C	Connection Requirements	2-16
2.5.D	Wastewater Main Horizontal Design Criteria	2-16

2.5.D.1 Pipe Alignment 2-16
2.5.D.2 Separation Criteria 2-16
2.5.D.3 Separation from Structures 2-19
2.5.D.4 ..... Wastewater Mains Parallel to Streams, Drainage Channels, and Detention Ponds 2-19
2.5.D.5 Access Roads 2-19
2.5.D.6 Abandonment of Wastewater Mains, Manholes, andAppurtenances 2-20
2.5.E Manholes 2-20
2.5.E.1 Manhole Spacing and Locations 2-20
2.5.E.2 Existing Manholes 2-21
2.5.E.3 Manhole Sizes 2-22
2.5.E.4 High Velocity Protection 2-22
2.5.E.5 Manhole Invert Elevations 2-22
2.5.E.6 Manhole Rims, Rings and Covers 2-23
2.5.E.7 Manhole Steps 2-23
2.5.E.8 Stub-Outs from Manholes 2-23
2.5.E.9 Drop Manholes 2-23
2.5.E.10 Apex Manholes 2-24
2.5.E.11 Metering Manholes or Vaults 2-24
2.5.F Wastewater Main Vertical Design Criteria 2-24
2.5.F.1 Slopes 2-24
2.5.F.2 Depth of Bury 2-25
2.5.F.3 Utility Crossings 2-25
2.5.F.4 Crossing Beneath Railways and Major Rights of Way 2-26
2.5.F.5 Crossing Roundabouts and Medians 2-26
2.5.F.6 Crossing Above-Ground Structures 2-27
2.5.F.7 Crossing Overhead Structures 2-27
2.5.F.8 Crossings Beneath Streams, Drainage Channels, and Detention Ponds 2-27
2.5.F.9 Aerial Crossings 2-27
2.5.F.10 Inverted Siphons 2-28
2.5.G Cathodic Protection Design Criteria 2-28
2.5.G.1 Coatings and Wraps 2-29
2.5.G.2 Protection of Bolts 2-29
2.5.G.3 Bonding Joints 2-29
2.5.G.4 Insulating Joints 2-29
2.5.G.5 Galvanic Anodes on Metallic Wastewater Mains 2-29
2.5.G.6 Impressed Current 2-30

2.5.G.7 Test Stations 2-30
2.5.G.8 Cathodic Protection of Casing Pipe 2-30
2.6 Wastewater Service Line Design 2-30
2.6.A General Requirements 2-30
2.6.A.1 Wastewater Service Line Serving Single Family Residential with Detached ADU 2-31
2.6.B Wastewater Service Line Sizing, Material, and Taps 2-32
2.6.B.1 Sizing 2-32
2.6.B.2 Wastewater Service Line Materials 2-32
2.6.B.3 Wastewater Service Line Taps 2-32
2.6.C Wastewater Service Line Horizontal Design Criteria 2-33
2.6.C.1 Residential Wastewater Service Line Horizontal Design 2-33
2.6.C.2 Commercial Wastewater Service Line Horizontal Design 2-34
2.6.C.3 ..... Wastewater Service Lines Parallel to Streams, Drainage Channels, and Detention Ponds 2-34
2.6.D Separation Design Alternatives 2-34
2.6.E Cleanouts 2-35
2.6.F Wastewater Service Line Vertical Design Criteria 2-35
2.6.F.1 Depth of Bury 2-35
2.6.F.2 Crossings 2-35
2.6.F.3 Non-Gravity Wastewater Service Lines 2-36
2.6.G Reuse or Repurposing an Existing Wastewater Service Line 2-36
2.6.H Demolition or Remodel of Property 2-36
2.6.I Abandoning an Existing Wastewater Service Line 2-36
2.6.J Individual Service Pumps 2-37
2.7 Wastewater Pretreatment 2-37
2.7.A Grease Interceptors 2-37
2.7.A.1 Grease Interceptor Sizing and Design 2-38
2.7.A.2 Interior Hydromechanical Grease Interceptors 2-39
2.7.A.3 Grease Interceptor Operation and Maintenance 2-40
2.7.A.4 Abandoning Grease Interceptors 2-40
2.7.A.5 Alternative Grease Interceptors 2-40
2.7.B Sand/Oil Interceptors 2-40
2.7.B.1 Sand/Oil Interceptor Sizing 2-41
2.7.B.2 Sand/Oil Interceptor Design 2-41
2.7.B.3 Sand/Oil Interceptor Operation and Maintenance 2-42
2.7.C Lint Interceptor for Laundry Facilities 2-42

2.7.D Swimming Pools (Indoors and Outdoors) 2-43
2.8 Forms 2-43
2.8.A Wastewater Modeling Requirements 2-43
2.8.B SWMM Modeling Parameters/Info 2-44

This page left intentionally blank

CHAPTER 2

Development and Design of Wastewater Systems

2.1 General

The purpose of Chapter 2 of these *Wastewater Line Extension & Service Standards* (*Wastewater LESS)* is to set forth the criteria for designing any proposed gravity Wastewater Main or Wastewater Service Line. Criteria for pressurized systems and Lift Stations can be found in Chapter 7. 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.

2.1.A Cost Responsibility

2.1.A.1 Cost Recovery

An Owner/Developer installing a Wastewater 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 Wastewater Main for service. Requests for cost recovery must be received no later than 365 days after the issuance of final acceptance for the Wastewater 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.

2.1.A.2Wastewater Main Reimbursement

The Owner/Developer may be eligible for Cost Recovery for Wastewater System infrastructure required by Colorado Springs Utilities. Please reference *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 Types of Wastewater Facilities

2.2.A Public Wastewater Mains

Public Wastewater Mains are that portion of the Colorado Springs Utilities Wastewater System that collect and transmit Wastewater from User's Wastewater Service Lines to treatment facilities and are owned, operated, and maintained by Colorado Springs Utilities. Unless designated as a Private Wastewater Main, the term Wastewater Main shall refer to a Public Wastewater Main.

2.2.B Private Wastewater Mains and Common Wastewater Service Lines

Per *City Code §12.5.407,* Private Wastewater Mains and Common Wastewater Service Lines are allowed for multiple buildings located on a single platted lot.

Serving more than one single platted lot with a Private Wastewater Main or a Common Wastewater Service Line is not allowed.

"Multi-family or commercial or industrial complexes having more than one building on a single platted lot may have the individual buildings connected to a single common service line, unless and until the lot is re-subdivided or the buildings otherwise become separately owned in which case independent connections shall be made. Waiver of this requirement for a separate and independent service line, may be granted by the Executive Director upon resubdivision or creation of separate ownership of individual buildings on a single lot. The waiver shall be granted upon showing that the service lines owned in common will be maintained by an entity of the owners of the separate buildings. By regulation, the Executive Director may provide for additional requirements to ensure proper maintenance and repair of the common service lines, and, if necessary, monitoring of effluent quality or quantity. The City and Utilities do not assume any obligation nor acquire any liability for damage to the connecting property or any portion thereof caused by or resulting from any connection to the Wastewater System as aforementioned. "(*City Code §12.5.407*)

Common Wastewater Service Lines that are 8 inches or greater shall be referred to as Private Wastewater Mains and shall be designed as Wastewater Mains per Section 2.5. Common Wastewater Service Lines 8 inches or greater shall be installed with a manhole near the building foundation to serve as a cleanout Common Wastewater Service Lines that are 4 inches or 6 inches in diameter shall be designed as Wastewater Service Lines per Section 2.6.

2.2.C Wastewater Service Lines

Wastewater Service Lines collect and transmit Wastewater from User's Premises to the Wastewater Main and are owned, operated, and maintained by the User.

2.2.D Alternate Collection Systems

Colorado Springs Utilities may collect Wastewater from other Wastewater Systems in which Colorado Springs Utilities will become the wholesale collector of Wastewater flows for treatment. These systems will be evaluated on a case-by-case basis and governed by individual contracts.

2.3 Responsibilities

2.3.A Overview

"Collection lines to collect and intercept wastewater from and throughout areas or additions shall be extended by the owner and/or developer of premises to be served by the lines from the existing collection line to the farthest point or points upgrade of the premises. If the Executive Director determines that extension of collection lines to the farthest point or points up grade is not necessary for efficient expansion of the wastewater treatment system, the Executive Director may waive the requirement of the extension. In any event, collection lines shall be extended by the owner and/or developer of premises to be served by the lines from the existing collection line to a point which permits the shortest possible Wastewater Service Line between the collection line and the property line of the premises served thereby. Thereafter the collection lines shall be extended to adjoining premises in compliance with Utilities collection system standards and other applicable Colorado Springs *Utilities Rules and*

Regulations. Extensions shall not be made unless the applicant requesting the service shall provide for the cost of the extension to the point of service and the extension is approved by the Executive Director." (*City Code §12.5.405*)

Collection Line is defined at *City Code §12.5.201* and will be synonymous with the term Wastewater Main throughout this document.

2.3.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 Wastewater Construction Plans for the proposed Wastewater System and Wastewater Service Lines. Colorado Springs Utilities will review the Design Engineer's plans and reports to ensure that they meet the requirements of these *Wastewater 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 Wastewater Construction Plan. Following approval of the Wastewater Construction Plan, the Owner/Developer will be responsible for hiring a Contractor to install the approved Wastewater System and Wastewater Service Lines 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.

2.3.C Responsibility for Wastewater Main Extensions

All Wastewater Main Extensions to serve properties within the Colorado Springs Utilities' service territory shall be made at the expense of the Owner/Developer.

2.3.D Responsibility for Downstream Expansions

Colorado Springs Utilities will evaluate the proposed development with the Wastewater hydraulic model maintained by Colorado Springs Utilities to determine whether the Wastewater System downstream of the proposed development has sufficient capacity for the proposed flow. If the proposed flow exceeds the downstream capacity, the Owner/Developer will be responsible for the cost of the downstream improvements or expansion of the Wastewater System. Colorado Springs Utilities may enter into a cost-sharing agreement for the downstream expansion based on the determination of benefit to Colorado Springs Utilities. See Section 35 of Colorado Springs *Utilities Rules and Regulations* for additional information.

2.3.E Responsibility for Pressurized Systems and Lift Stations

Refer to Chapter 7 of these *Wastewater LESS* for information on pressurized systems and Lift Stations.

2.3.F Agreement and Bill of Sale and Warranty

The Owner/Developer shall enter into an *Agreement and Bill of Sale* for all Wastewater Main Extensions that the Owner/Developer intends to convey to Colorado Springs Utilities as an extension of the Wastewater System. The *Agreement and Bill of Sale* form shall be provided to the Owner/Developer by Colorado Springs Utilities. The *Agreement and Bill of Sale* shall be signed by the Owner/Developer and submitted to Utilities Development Services prior to approval of any Wastewater plans. An example of an *Agreement and Bill of Sale* can be found at www.csu.org.

The *Agreement and Bill of Sale* shall include a warranty for the Wastewater Main Extension and portions of the Wastewater Service Line to be conveyed to Colorado Springs Utilities 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 Wastewater 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.G Responsibility for Ownership, Operation, and Maintenance

2.3.G.1 Wastewater Mains

Wastewater Mains are owned, operated, and maintained by Colorado Springs Utilities.

2.3.G.2 Private Wastewater Mains and Wastewater Service Lines

"The owner of any premises connected to the wastewater treatment system shall be responsible for the maintenance of the service line and appurtenances thereto, from and including the connection to the collection line to the premises served. The owner shall keep the line in good condition and shall replace, at owner's expense, any portions thereof which, in the opinion of the Executive Director, have become so damaged or disintegrated as to be unfit for further use or permit excessive infiltration of ground water or exfiltration of wastewater. The owner must secure all required permits for construction purposes and shall be responsible for returning the public right of way and the street to City standards. Any drainage from the service line to City roads, storm drains, or natural drains, shall be reported to the Executive Director by the landowner.

In the event that more than one premises is connected to a single service line, the owners of the respective premises shall be jointly and severally responsible for the maintenance and repair requirements imposed by this section.

Prior to repair or alteration of the service line, a permit must be obtained from Utilities. A permit fee shall be imposed to cover the costs of the inspection. This inspection shall assure that ordinances and rules applying to the wastewater system are met. The City or Utilities shall not be subjected to any liability for any deficiency in the repair or alteration of the premises and shall be absolved from liability for the deficiency or defect and any resulting damage or from responsibility to correct the deficiency or defect." (*City Code § 12.5.410*)

The Owner shall keep all Private Wastewater Mains and Wastewater Service Lines and their appurtenances in proper working order and in good repair as to minimize line breaks and leaks, prevent sanitary sewer overflows and contamination of water. The Owner shall only use Approved Materials to conduct repair or replacement of the Private Wastewater Main or Wastewater Service Line. The Owner shall contact Colorado Springs Utilities to inspect any installation, repair, or replacement. In the event of a risk to public health, Colorado Springs Utilities will make emergency repairs and assess billable charges to the Owner.

Where an 8 inch or larger Common Wastewater Service Line connects to the existing Public Wastewater Main at a manhole, the manhole will be owned and maintained by Colorado Springs Utilities.

The Owner/Developer shall record a Notice of Private Wastewater System for the property being served by the Private Wastewater Main or Common Wastewater Service Line and shall show the reception number (or book and page) on the proposed Wastewater Construction Plan(s). The form for this Notice of Private Wastewater System can be found at www.csu.org.

If a Private Wastewater Main or Common Wastewater Service Line is already in existence that serves multiple properties, and the Owner wants to inquire about the possibility of converting the system to a Wastewater Main, they may contact Colorado Springs Utilities Development Services for information and direction. Colorado Springs Utilities, at its discretion, may elect to take Ownership of a Private Wastewater Main or Common Wastewater Service Line provided the criteria of these *Wastewater LESS* have been met and the Private Wastewater Main or Common Wastewater Service Line is installed within a dedicated Easement.

2.4 Planning

2.4.A Wastewater Master Facility Form

A *Wastewater Master Facility Form (WWMFF)* is required with any Development Plan submittal. The *WWMFF* can be found online at https://www.csu.org. Colorado Springs Utilities recommends that the *WWMFF* be submitted with any Annexation, Master Plan, or Concept Plan to preliminarily assess infrastructure needs and modeling requirements. Each *WWMFF* shall be submitted to Colorado Springs Utilities by e-mail at wwmasterplansubmit@csu.org.

A Wastewater Project map shall accompany the *WWMFF* and shall include:

- location and type of development proposed – indicate, for example, single family, schools, multifamily, commercial, etc.
- surrounding existing conditions - utilities, roads, topography
- schematic of the proposed and existing Wastewater Systems including pipe size and material (does not need to include every pipe)
- proposed connection location(s)

The Owner/Developer shall prepare a Wastewater model for developments (not by development phase) that generate peak flows over 16 gpm. Colorado Springs Utilities will calculate peak flows based on the information supplied in the *WWMFF*. For additional Wastewater model requirements refer to the *Wastewater Modeling Requirements* at www.csu.org.

For large Master Planned developments (200 or more acres), additional reporting requirements will be determined on a case-by-case basis.

2.4.B Wastewater Main Sizing

New Wastewater Mains will be sized by the Design Engineer and verified by Colorado Springs Utilities. No Wastewater Main shall be less than 8 inches in diameter. All mains shall be sized large enough to provide for Wastewater service for the entire tributary basin. Colorado Springs Utilities reserves the right to size Wastewater Mains to provide service for Projected future needs. See Section 2.3.F for additional information on Recovery Agreements for oversized lines.

When the size of an existing Wastewater Main must be increased to accommodate additional flow, Colorado Springs Utilities will determine the new size based on Wastewater System modeling.

2.4.C 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 the Wastewater 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 the items found on the *Preliminary Utility Plan Checklist* found at www.csu.org.

2.4.D Utility Cross Sections and Easement Requirements

The preferred location for a Wastewater Main is within a public Right of Way (i.e., public street). See Detail Drawings C1-1 through C1-10 for utility locations within a public street. It is also acceptable to install Wastewater Mains on private property within a utility Easement dedicated to the City of Colorado Springs on behalf of its enterprise Colorado Springs Utilities. Alternatively, Wastewater Mains can be installed within tracts allowing for the installation of public utility infrastructure.

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 prepared by a Professional Land Surveyor licensed to practice in the State of Colorado or someone under their direct supervision. Additionally, there is a page entitled "Joinder and Consent of Holder of Deed of Trust" which must be signed by each of 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 Wastewater 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 Wastewater Main shall have a minimum of 15 feet between the centerline of the Wastewater Main and the edge of the Easement resulting in a minimum Easement width of 30 feet for a Wastewater Main 15 feet deep or less. A minimum Easement width of 40 feet is required when the Wastewater Main is between 15 and 20 feet deep. In each case, the Easement shall be graded to allow for maintenance and is preferred to be centered over the Wastewater Main. Additional Easement width may be required for operation and maintenance needs where the final grade exceeds 10% and is not within a drivable surface.

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 2-3.

Table 2-1 establishes the standard Easement widths for the combination of utilities represented by the cell in the matrix.

Table 2-1: 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 2-1 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 (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 C1-1 through C1-10. 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 C1-11 through C1-13.

2.4.E 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 Wastewater System. Where the Wastewater System is proposed within areas of known geologic hazards appropriate mitigation or avoidance techniques shall be identified by the Owner/Developer as part of the Preliminary Utility Plan submittal. 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 Wastewater 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.

2.5 Wastewater Main Design

2.5.A General

All Wastewater Mains shall be designed in accordance with these *Wastewater LESS* and shall be reviewed and approved by Colorado Springs Utilities. Plan submittal

requirements for Wastewater Main designs can be found in CHAPTER 3 Submittal Requirements.

When designing a Wastewater Main, additional Authorities Having Jurisdiction may need to be involved, such as when crossing a railroad or highway. All conditions of the additional Authorities Having Jurisdiction and Colorado Springs Utilities shall be satisfied. The designs, drawings and calculations that have been submitted to the other agency shall also be submitted to Colorado Springs Utilities for approval. If there is a conflict between these *Wastewater LESS* and the standards of the other Authority Having Jurisdiction, the more stringent standards yielding a higher quality shall prevail.

2.5.B Wastewater Main Materials

The Wastewater Main shall be the same material between manholes.

The materials in Table 2-2 are approved for use within the Wastewater System as gravity Wastewater Mains within the limits listed below. Table 2-2 is based on calculations from *AWWA M23*, *M41*, and *M55*. The calculations assume HS-20 loading on an unpaved road with the Wastewater Main installed in a Type 4 laying condition.

Table 2-2: Wastewater Main Material, Bury Depth, and Slope

Wastewater Main Material	Nominal Size (inch)[1]	Allowable Bury Depth (feet)	Minimum Slope
DIP	8 to 36[2]	1 to 30	0.5%[3]
SDR 26 / PS 115[6]	8 to 36	2 to 24	0.5%[3]
SDR 35 / PS 46[6]	8 to 36	2 to 18	1.04%
DR 11 HDPE	8 to 36	4 to 20[4]	3.0%[5]

[1] Wastewater Mains greater than 36 inch shall be evaluated on a case by case basis.

[2] For DIP Wastewater Mains greater than 20 inch, the Design Engineer must provide calculations to support the proposed pressure class based on *AWWA M41* or *AWWA C150* calculations.

[3] Wastewater mains installed with slopes between 0.5% and 1.04% require select bedding and Colorado Springs Utilities requires SDR 26/PS 115 PVC or DIP, see Section 5.11.D.3.

[4] HDPE is allowed for direct bury applications deeper than 20 feet, but the Design Engineer must provide calculations to support the proposed diameter ratio in accordance with *AWWA M55*.

[5] HDPE may be installed with slopes between 3.0% and 6.0% if the internal beads are removed from the HDPE weld or electrofusion couplings are used (see CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies for additional details)

[6] PVC pipe sizes below 18” in diameter meet both SDR and PS ratings. Pipe sizes 18” in diameter and larger only utilize PS ratings due to irregular dimension ratios.

C900 PVC may be used if the pipe material is clearly identified as Wastewater pipe, see CHAPTER 4 Approved Materials for additional information. If C900 PVC is

used, it may be installed within the parameters listed above for SDR 26 or SDR 35 PVC.

2.5.C Connection Requirements

Connection of Wastewater Mains to the existing Wastewater System must be approved by Colorado Springs Utilities. Unauthorized connections to Colorado Springs Utilities' Wastewater System are a violation of the *City Code* and may be subject to fines, time and material charges, and prosecution. (*City Code §12.5.403 and §12.5.1205*)

Wastewater Mains shall connect at a manhole unless connecting to a Wastewater Main stub-out. See Section 5.12.C of these *Wastewater LESS* for Construction requirements of connections. See Section 2.6.B.3 for connection of Wastewater Service Lines.

2.5.D Wastewater Main Horizontal Design Criteria

2.5.D.1 Pipe Alignment

The typical location of the Wastewater Main is shown on the typical cross section drawings found in Detail Drawings C1-1 through C1-10. The pipe alignment shall be parallel to roadway centerlines as often as practically possible.

Curvilinear sections are curved Wastewater Mains with a common radius point. Curvilinear sections are allowed for PVC Wastewater Mains if 3 degree fittings are utilized and bell and spigot DIP Wastewater Mains (see Detail Drawing C2-2). For maintenance purposes, the minimum radius of a curvilinear section shall be 100'. See Section 5.11.D.3 for Construction requirements of curvilinear sections of Wastewater Main.

2.5.D.2 Separation Criteria

Wastewater Mains shall be separated from utility facilities and shall meet the minimum separation requirements as depicted in Table 2-3. 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 4.2.N, throughout the embedment zone or
- The Water Main or Wastewater 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.

If compliance with these separation requirements, or those set forth in Table 2-3 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 book. 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 C1-1 through C1-10.

Table 2-3: 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 [c]	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 *Water LESS* Section 2.6.F.2 and 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. Wastewater service lines shall meet horizontal and vertical clearances from Mains as defined in Table 2-3 and clearances from other service lines as described in Section 2.6.D

2. Storm Sewer clearances must be verified by City Engineering.
3. See the *Gas LESS*, 2.02c for certain exceptions.

2.5.D.3Separation from Structures

The horizontal distance between a Wastewater Main installed parallel to any Structure or building shall be a minimum of 15 feet.,

Wastewater 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*.

2.5.D.4Wastewater Mains Parallel to Streams, Drainage Channels, and Detention Ponds

When the Wastewater 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 Wastewater Main installation. The Design Engineer shall determine the location of the 100-year water surface elevation using a HEC RAS model, which shall be reviewed by Colorado Springs Utilities Wastewater Planning and Design.

The Design Engineer will determine necessary drainage improvements to protect Wastewater Mains from future erosion and will design all necessary improvements. Colorado Springs Utilities Wastewater Planning and Design will review the design as part of the Wastewater plans submitted to Colorado Springs Utilities Development Services to ensure Wastewater 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 Wastewater Main. At no time shall the Wastewater Collection System be constructed within the 100-year water surface elevation prior to the drainage improvements being constructed.

When the Wastewater Main is installed parallel to a detention pond bank, it shall be installed 10 feet outside the maximum water elevation, outfall structure, and/or berms of the detention pond. Wastewater mains are allowed within a Planned Infiltration Area (PIA) where it can be maintained within standard rehabilitation methods.

2.5.D.5Access Roads

Unrestricted access for operation and maintenance of the Wastewater System shall be provided to all existing and proposed manholes and any additional facilities identified by Colorado Springs Utilities. If the manhole or facility is not located in a dedicated street, parking lot, etc., an access road will be required.

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% (per CSFD *Access Information Packet*). 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 *Standard Specifications and Traffic Manual*. A vehicle turnaround area is required at the end the access road when the back-up distance exceeds 200 feet in length. See Detail Drawing C2-11 for additional information.

2.5.D.6 Abandonment of Wastewater Mains, Manholes, and Appurtenances

When the Project includes the abandonment of an existing Wastewater Main, the Wastewater Main may be abandoned in place and left in the ground, on a case by case basis as approved by Colorado Springs Utilities.

All abandoned metal Wastewater 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. All abandoned PVC or HDPE Wastewater Mains 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 Wastewater Main to be abandoned is located under an existing or proposed Structure, the Wastewater Main shall be removed or drained, filled with sand, grout, or approved flow fill and sealed by grouting and plugging or capping the exposed ends of the pipe. See Section 5.9 these *Wastewater LESS*.

Wastewater Mains and appurtenances to be abandoned in place shall be documented on the Wastewater Construction Plan and in the Colorado Springs Utilities infrastructure mapping system by the Colorado Springs Utilities Inspector.

Manholes to be abandoned shall have all pipes plugged with a watertight/airtight mechanical plug and grouted. The ring and cover as well as the cone section shall be removed. The manhole shall be filled with compacted fill according to Section 5.17.

Grease Interceptors shall be abandoned according to Section 2.7.A.4.
Septic tanks shall be abandoned according to all El Paso County Department of Health requirements.

See Section 5.9.A regarding procedures for salvageable materials.

2.5.E Manholes

2.5.E.1 Manhole Spacing and Locations

At a minimum, manholes shall be located at:

- The end of a Wastewater Main (except stub-outs - see Section 2.5.E.8)

- Wastewater Main intersections
- Changes in material, grade, size, and alignment (except curvilinear sections)
- Distances not greater than 500 feet for straight and curvilinear sections (see curvilinear section exceptions below)

Manholes shall not be located:
- in a cross pan or inverted crown
- within 25 feet of the 100-year water surface elevation

Manholes should be located:
- in drive aisles
- outside the wheel path of vehicles
- outside of landscaped areas

Curvilinear section exceptions:
- Curvilinear sections with a reverse curve (i.e., an "S" curve) shall have a manhole located at the point of reverse curvature. If a straight section of pipe is located between curvilinear sections with a reverse curve, a manhole shall be located at some point along the straight section of pipe.
- A manhole is needed if a curvilinear section, or combination of curvilinear sections, changes the alignment of a Wastewater Main more than 90°.

See Section 2.5.D.1 regarding minimum radius for curvilinear sections.

2.5.E.2 Existing Manholes

a) Existing Manhole Condition Assessment

Before connecting to an existing manhole with new Construction, a manhole assessment shall be completed by the Design Engineer and an Inspector from Colorado Springs Utilities. Contact Colorado Springs Utilities Inspections Department 2 working days prior to the inspection for scheduling.

The assessment shall include observation and recordation of the internal diameter, the structural condition, the depth of the Wastewater Main leaving the manhole, the type of manhole cover, as well as the condition of the sections, access lid, adjustment rings, steps, and base of the manhole (a sample *Manhole Assessment Form* can be found at the end of this Chapter). If the Inspector determines that the existing manhole can be used for the proposed Wastewater Main connection, then the assessment shall also identify any rehabilitation necessary to meet these *Wastewater LESS*.

b) Core Drilling Into an Existing Manhole

Where an existing manhole has active flow through it, the invert of the proposed connection shall be 0.3 feet above the crown of the existing pipe leaving the manhole. See Detail Drawing C3-3

A bypass system may be required by Colorado Springs Utilities during core drilling installation depending on flow, pipe size, pipe material, and other factors. See Section 5.7 for additional detail.

2.5.E.3 Manhole Sizes

No more than 3 Wastewater Mains shall discharge into any 1 manhole. The largest pipe in the manhole shall govern the manhole size and the Design Engineer shall verify the manhole size will accommodate the pipe configuration. The inside diameter of the manhole shall not be less than the requirements shown in Table 2-4.

Table 2-4: Internal Manhole Diameter Requirements

Largest Pipe Size	Internal Manhole Diameter
For straight through manholes, dead end manholes, and deflection angles less than 45 degrees:	
Smaller than 18 inch	4 foot
18 inch to 24 inch	5 foot
30 inch to 36 inch	6 foot
For intersecting pipe manholes i.e., tee, wye, deflection angles equal to or greater than 45 degrees, and manholes deeper than 20’ deep:	
Smaller than 18 inch	5 foot
18 inch to 24 inch	6 foot
30 inch to 36 inch	Design Engineer shall design custom vault

2.5.E.4 High Velocity Protection

Manholes with Wastewater Mains that enter with a slope greater than 15% require additional benching according to Detail Drawing C3-5.

2.5.E.5 Manhole Invert Elevations

Wastewater Mains that change direction between 0 and 30 degrees at a manhole shall have a drop of 0.1 foot through the manhole unless the Wastewater Main is installed at a slope of 1.04% or less, in which case, the drop through the manhole shall match the slope of the pipe.

Wastewater Mains that change direction between 30 and 90 degrees at a manhole shall have a drop of 0.3 foot through the manhole regardless of pipe slope. Changes in the direction of flow at manholes shall not be greater than 90 degrees.

If there is a change in pipe diameter at a manhole, the crown elevation of the smaller pipe shall match the crown elevation of the larger pipe.

2.5.E.6 Manhole Rims, Rings and Covers

Manholes that are installed within dedicated streets, parking lots, trails, sidewalks, or other traffic areas shall have rim elevations set at final grade and have rings and covers conforming to Detail Drawing 3-9.

Manholes that are installed in cross-country or remote areas shall have rim elevations set 6 inches above final grade, be water tight, and equipped with a locking hinged cover and a Wastewater Main line marker conforming to Detail Drawing 3-11.

Inverted manhole ring and covers are not allowed within the Wastewater System.

Grade adjustment rings between the ring and cover and the concrete cone cap shall not exceed 8 inches from the bottom of the ring to the top of the cone.

2.5.E.7 Manhole Steps

Manhole steps are not permitted. When connecting to an existing manhole with steps, the steps shall be removed or cut flush with the wall of the manhole. See Section 4.2.H.1.

2.5.E.8 Stub-Outs from Manholes

Wastewater Main stub-outs from manholes for future connection and extension require a watertight/airtight cap at the upstream end of the Wastewater Main and a watertight/airtight mechanical plug or non-shrink watertight grout installed within the stub-out inside the manhole. See Detail Drawing C3-4. The length of a Wastewater Main stub-out shall be kept to a minimum.

Future extensions of the stub-out shall be of the same material using the same grade and alignment as the previously installed stub-out. See Wastewater Project-Specific Notes in Section 3.6.H.

No Wastewater Service Line connections will be permitted on stub-outs, until the stub-out is extended to the next manhole.

If a previously installed stub-out is no longer usable or no longer intended for future use, then the stub-out shall be removed by the Owner/Developer and/or Contractor, and a watertight/airtight mechanical plug or non-shrink watertight grout installed within the opening inside the manhole. See Detail Drawing C3-4.

2.5.E.9 Drop Manholes

External drop manholes are not allowed within the Wastewater System.
Internal drop manholes are not allowed within the Wastewater System unless the incoming Wastewater Main is 8 inches in diameter and one of the following is true:

- Colorado Springs Utilities verifies that physical obstructions interfere with the Construction of the pipeline at a constant grade from one manhole invert to the next or
- the downstream manhole invert is more than 20 feet below grade

Internal drop manholes with a drop greater than 24 inches require internal piping as shown in Detail Drawing C3-6 and all concrete surfaces within the manhole shall be epoxy coated. The internal diameter of the drop manhole shall be a minimum of 5 feet.

Internal drop manholes with a drop 24 inches or less do not require internal piping but require special benching to accommodate the drop and the incoming pipe slope. See Detail Drawing C3-7

2.5.E.10 Apex Manholes

Apex manholes are allowed per Detail Drawing C3-12.

2.5.E.11 Metering Manholes or Vaults

Commercial and industrial Users may be required to install a metering manhole or vault to measure the volume of Wastewater they contribute to the Wastewater System.

A metering manhole or vault shall be installed in accordance with Detail Drawing C3-8. The metering manhole or vault shall include a corrosion resistant flume and a non-intrusive flow measuring device. The Owner/Developer shall submit operation and maintenance manuals with flow versus depth charts for the flume specified by the Design Engineer. The metering manhole or vault shall be integrated with the Colorado Springs Utilities SCADA system for flow measurement. Coordinate with Colorado Springs Utilities Water and Wastewater Instrumentation and Control group for current requirements with respect to the SCADA system.

The manhole shall be sized to accommodate the flume but shall have no less than a 5 foot inside diameter.

Metering manholes or vaults used to measure Wastewater added to the Wastewater System from other Wastewater Systems in which Colorado Springs Utilities is the wholesale collector of Wastewater flows for treatment, shall be evaluated on a case-by-case basis.

2.5.F Wastewater Main Vertical Design Criteria

2.5.F.1 Slopes

The slope between manholes shall be uniform.

Due to practical constructability and Construction tolerances, the minimum slope of a Wastewater Main shall be 0.5%. Slopes less than 1.04% are not recommended and will be reviewed on a case-by-case basis with consideration given to topography, existing outfall elevation, velocity, and

capacity. Slopes less than 1.04% shall be built with DIP or SDR 26/PS 115 PVC. SDR 26/PS 115 PVC installed with slopes between 0.5% and 1.04% requires select bedding and are subject to additional Construction requirements per Section 5.11.D.3.

See Table 2-2 in Section 2.5.B for the allowable slope of each pipe material.

Colorado Springs Utilities may require the use of restrained joint pipe on sections where the slope of the Wastewater Main is greater than or equal to 10%. See Detail Drawing C2-15.

2.5.F.2 Depth of Bury

Wastewater Mains should be designed deep enough to collect Wastewater by gravity from Users and to prevent freezing, typically at 6 feet or deeper.

For maintenance purposes, the depth of the Wastewater Main should not exceed 20 feet when measuring from proposed final grade to the invert of the pipe. Colorado Springs Utilities will evaluate Wastewater Mains deeper than 20 feet on a case-by-case basis. Wastewater Mains deeper than 20 feet may be subject to additional conditions including, but not limited to, additional Easement width, specific pipe material, select bedding, compaction testing, larger diameter manholes, and special connection requirements.

See Table 2-2 in Section 2.5.B for the allowable bury depth of each pipe material.

2.5.F.3 Utility Crossings

When crossing another utility, minimum vertical separation is required to be maintained according to Table 2-3. When the Water Main crosses a Wastewater Main, it is preferred to lay the Water Main above the Wastewater Main. However, a water lowering may be required to meet depth and vertical separation requirements. See Detail Drawing A7-1 of the *Water LESS* for water lowering details.

Secondary containment shall be provided where a Water Main crosses below a Wastewater Main unless the Water Main is more than 5 feet below the Wastewater Main.

The following methods of installation shall be considered secondary containment by Colorado Springs Utilities for utility crossings:

- The Water Main or Wastewater 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 C2-4, or
- The Water Main or Wastewater Main shall be encased in flow fill throughout the embedment zone per the specification in CHAPTER 4 Approved Materials for 9 feet on both sides of the crossing or
- The Water Main or Wastewater Main is constructed of HDPE or welded steel without joints for 9 feet on either side of the crossing.

Wherever minimum vertical separation cannot be met, flow fill, per CHAPTER 4 Approved Materials, shall be used to achieve acceptable compaction between the upper and lower utility, see Detail Drawing C2-7.

a) Crossing Under Storm Sewers

PVC requires additional support when crossing beneath a storm sewer that is 36 inches and greater. To protect the Wastewater Main from this point load, the Wastewater Main shall be:

- Encased in flow fill with 6 inches of flow fill on all sides of the Wastewater Main extending 2 feet past the storm sewer on each side, or
- Installed in a casing pipe per detail drawing C2-4 and C2-5.

If a Wastewater Main crosses below another, and a geotechnical analysis or field conditions indicate potential settlement that may cause a point load on the Wastewater Main, a safety hazard exists that would compromise maintenance of the Wastewater Main, or adequate separation cannot be attained to prevent a potential point load on the Wastewater Main, then bridging of the Wastewater Main or other utility may be required at the discretion of Colorado Springs Utilities. See Detail Drawings C2-6 and C2-7.

2.5.F.4 Crossing Beneath Railways and Major 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 C2-4 and C2-5 for design and Construction of the casing.

The casing pipe shall be installed at the same slope as the carrier pipe and in accordance with the requirements of Section 5.11.G and the Authority Having Jurisdiction.

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 Wastewater System shall also be submitted to Colorado Springs Utilities for approval.

2.5.F.5 Crossing Roundabouts and Medians

Where the existing or proposed Wastewater Main crosses below roundabouts, medians, or traffic-calming devices the following design criteria apply:

- The Wastewater Main may be installed below a roundabout, median, or traffic-calming devices and is not required to be placed in a casing pipe

- Manholes may be located within a roundabout or median but they must be accessible by Colorado Springs Utilities for operation and maintenance of the Wastewater System per Section 2.5.D.5.

2.5.F.6 Crossing Above-Ground Structures

Wastewater Mains that cross beneath above-ground Structures are discouraged and should be avoided wherever possible. Where the Wastewater Main must cross below an above-ground Structure (such as a retaining wall), the Design Engineer shall design the crossing to protect the Wastewater Main and the Structure.

There may be instances where a casing pipe or Trenchless Technology may be required to limit the disturbance of above-ground Structures. Refer to CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies for Trenchless Technology design requirements.

2.5.F.7 Crossing Overhead Structures

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

- Where a Wastewater 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 Wastewater 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 Wastewater Main and is less than 10 feet in width, no vaults or manholes shall be located within 15 feet of the overhead structure.

2.5.F.8 Crossings Beneath Streams, Drainage Channels, and Detention Ponds

Wastewater Mains that cross below streams, drainage channels, and detention ponds should be avoided if possible.

When a stream or drainage channel crossing is required, the Wastewater Main shall be constructed of ductile iron pipe and shall be encased in reinforced concrete extending 15 feet beyond the 100-year water surface elevation. See Detail Drawing C1-2. Caisson supports for the crossing shall be designed by the Design Engineer to withstand trench loads, flotation, impact resistance, and to act as a free-standing Structure. Drop Structures, designed in compliance with the City of Colorado Springs *Drainage Criteria Manual*, may be required to protect the Wastewater Main from potential exposure due to channel erosion.

2.5.F.9 Aerial Crossings

Wastewater Mains that exit the ground and cross a stream, drainage channel, valley, or similar ground surface depression should be avoided if possible.

When an aerial crossing is required, it shall be constructed in accordance with Detail Drawing C2-10. The size, location, and clearances of each aerial crossing are subject to the City of Colorado Springs and Colorado Springs Utilities' approval.

The bottom of the aerial crossing shall be located above the 100-year flood elevation plus freeboard. Freeboard shall be defined by the following equation:

$H = 1.0+0.025*V*D^{0.33}$
Where:
H = freeboard in feet above the 100-year flood elevation
V = average channel velocity (fps) during the 100-year flood event
D = greatest depth (feet) of the channel during the 100-year flood event

Supports for the aerial crossing shall be designed by the Design Engineer and approved by Colorado Springs Utilities. Drainage improvements, such as grade control Structures or channel hardening, may be required to protect the aerial crossing structural supports from future erosion.

Where necessary, design of Wastewater 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:

- 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 Wastewater Main and its supports,
- access to the Wastewater Main for maintenance,
- provisions for corrosion control,
- the freeze potential of the Wastewater Main,
- expansion joints shall be designed as needed, and
- freeboard as discussed above.

2.5.F.10 Inverted Siphons

Inverted siphons are typically not allowed and will be evaluated on a case-by-case basis.

2.5.G Cathodic Protection Design Criteria

All metallic Wastewater Mains, and any metallic fittings or appurtenances on pressurized systems, 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 Wastewater 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.

2.5.G.1 Coatings and Wraps

The following coatings and wraps are allowed for use in the Wastewater System. The thickness of the 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

2.5.G.2 Protection of Bolts

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

2.5.G.3 Bonding Joints

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

2.5.G.4 Insulating Joints

Insulating joints shall be shown on the Wastewater 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 Lift Stations 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.

2.5.G.5 Galvanic Anodes on Metallic Wastewater Mains

Anode location and size shall be shown on the Wastewater Construction Plan based on the cathodic protection design provided by Colorado Springs Utilities.

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, soluble sulfates, 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 2-5.

Table 2-5: 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.

2.5.G.6 Impressed Current

Metallic pipelines for force mains or Lift Stations that have large current requirements may require the installation of an impressed current system. These systems shall be designed by a qualified Design Engineer.

2.5.G.7 Test Stations

Test Stations shall be shown on the Wastewater Construction Plan and will be required for the following:

- at insulating joints,
- at casing pipes,
- at crossings with other metallic utility infrastructure,
- every 1,000 feet, and
- at locations determined by Colorado Springs Utilities.

2.5.G.8 Cathodic Protection of Casing Pipe

All casing pipes shall be cathodically protected with an approved coating and at a minimum one 17 lbs. high potential magnesium anode. Casing pipes used for boring pipe Projects do not need to be coated but may need to be a greater thickness steel to accommodate potential corrosion.

2.6 Wastewater Service Line Design

2.6.A General Requirements

This section applies to gravity Wastewater Service Lines, Wastewater Service Line taps, Wastewater Service Line Stubs and, where applicable, Wastewater Service Line repairs. For pressurized systems, see Chapter 7.

“The owner of any house, building or property used for human occupancy, employment, recreation or other purposes, situated within the City and abutting on any street, alley or right of way in which there is now located or may in the future be located a collection line of the City, is hereby required at the owner's expense to install suitable wastewater facilities therein, and to connect the facilities directly with the proper collection line in accord with the provisions of this article within ninety (90) days after official notice to do so, provided that the collection line is within four hundred feet (400') (122 m) of the property line. Under unusual circumstances such as unique topographical characteristics, the Executive Director, with El Paso County

Department of Health and Environment approval, may waive the connection requirement herein stipulated." *(City Code § 12.5.401)*

"A separate and independent service line shall be provided for every building. However, where one building stands at the rear of another on an interior lot cannot be subdivided, and for which no line is available nor can be constructed to the rear building through an adjoining alley, court, yard or driveway, the service line of the front building may be extended to the rear building and the whole considered as one service." (*City Code §12.5.407*)

Wastewater 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. Plans will not be approved until the private Easement is executed and recorded.

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 in *Water LESS* and the Wastewater Service Line must be connected to a dump station, see Detail Drawing D1-12 and D1-13.

The number of joints in the Wastewater Service Line and Water Service Line shall be kept to a minimum. The materials and joints of building drains 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. Wastewater service lines shall be installed at least 15 feet from structures.

- Given the difficulty of future operation of private Wastewater Service Lines in close proximity to building foundations and adjacent property, Wastewater Service Lines shall not be installed in the PUE.

- Wastewater service lines shall be a minimum of 7.5' from the structure when running parallel from a structure, and shall be constructed of solvent welded solid wall SCH 40 PVC or HDPE, and shall not be deeper than 7' when the structure has a 36" stem wall. Other allowable depths may be considered as determined by the structure's actual foundation depth to prevent undermining.

2.6.A.1 Wastewater Service Line Serving Single Family Residential with Detached ADU

A Wastewater 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 D1-14 and D1-15.

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

2.6.B Wastewater Service Line Sizing, Material, and Taps

2.6.B.1 Sizing

The Wastewater Service Line shall be sized by the Design Engineer to meet the needs of the User. Wastewater Service Lines shall be 4 inch or 6 inch in diameter. Wastewater Service Lines 8 inches or larger, shall be designed as Wastewater Mains.

2.6.B.2 Wastewater Service Line Materials

The materials shown in Table 2-6 are approved for use within the Wastewater System as gravity Wastewater Service Lines within the limits listed below. Table 2-6 is based on calculations from *AWWA M23, M41*, and *M55*. The calculations assume HS-20 loading on an unpaved road with the Wastewater Service Line installed in a Type 4 laying condition.

Table 2-6: Wastewater Service Line Material, Bury Depth, and Slope

Wastewater Service Line Material	Nominal Size (inch)	Allowable Bury Depth (feet)	Minimum Slope
DIP	4	1 to 30	1.04%
SCH 40 PVC[1]	4	2 to 30	1.04%[2]
SDR 35 PVC	4	2 to 20	2.08%
DR 11 HDPE	4	4 to 20[3]	3.00%[4]
DIP	6	1 to 30	1.04%
SCH 40 PVC[1]	6	2 to 30	1.04%
SDR 35 PVC	6	4 to 20	1.04%
DR11 HDPE	6	4 to 20[3]	3.00%[4]

[1] SCH 40 PVC listed here refers to solid wall material. Foam core SCH 40 PVC may be used as Wastewater Service Line material under the same allowable bury and slope conditions of SDR 35 PVC

[2] 4 inch SCH 40 PVC installed with slopes between 1.04% and 2.08% require select bedding, See Section 5.11.D.3

[3] HDPE is allowed for direct bury applications deeper than 20 feet, but the Design Engineer must provide calculations to support the proposed diameter ratio in accordance with *AWWA M55*.

[4] HDPE may be used for rehabilitation of an existing Wastewater Service Line at slopes less than 3.00%. See CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies for additional information

2.6.B.3 Wastewater Service Line Taps

Wastewater Service Lines shall be tapped into a Wastewater Main a minimum distance of 5 feet from a manhole. Individual Wastewater Service Line taps shall be separated by a minimum of 24 inches. Tapping saddles

shall be installed per Detail Drawing D1-6. Wastewater Service Line Taps shall not be accomplished using tees.

See CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies for criteria regarding Wastewater Service Lines made of HDPE or connecting to a HDPE Wastewater Main.

Wastewater Service Line taps are not allowed for the following:

- On a Wastewater Main larger than 12 inch in diameter
- On a Wastewater Main stub-out
- Directly into a manhole

8 inch and larger Wastewater Service Lines and Private Wastewater Mains shall be connected to the existing main with a manhole. Size-on-size taps are not allowed.

2.6.C Wastewater Service Line Horizontal Design Criteria

All Wastewater Service Lines shall be perpendicular to the Wastewater Main from the Wastewater Main until it crosses the property line, at which point, it may be installed to meet the needs of the property.

Changes in the Wastewater Service Line alignment shall be accomplished with pre-formed bends not to exceed 45 degrees. When changes in direction exceed 45 degrees, a minimum 2-foot section of pipe shall separate the fittings necessary to make the needed change of direction. The horizontal distance between a Wastewater service line installed parallel to any Structure or building shall be a minimum of 15 feet.

Wastewater service lines 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*.

2.6.C.1 Residential Wastewater Service Line Horizontal Design

When designing 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. It is the Owner/Developers' responsibility to determine the location of the Wastewater Service Lines and to show placement on the Wastewater Construction Plan. See Detail Drawing D1-1. See Detail Drawings D3-1 through D3-2 for multifamily configurations.

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 Table 2-3 must be followed.

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

2.6.C.2 Commercial Wastewater Service Line Horizontal Design

Horizontal separation between the Wastewater Service Line and other utility mains shall meet the requirements as stated in Table 2-3. For Wastewater Service Lines 6 inch and less the minimum separation distance between the Wastewater Service Line and gas or electric service lines shall be a minimum of 3 feet outside edge to outside edge.

2.6.C.3 Wastewater Service Lines Parallel to Streams, Drainage Channels, and Detention Ponds

Horizontal separation between the Wastewater Service Line and streams, drainage channels, and detention ponds shall meet the same requirements as Wastewater Mains stated in Section 2.5.D.4.

2.6.D Separation Design Alternatives

Horizontal separation between the Wastewater Service Line and utility mains shall meet the requirements as stated in Table 2-3.

A Wastewater Service Line and a Water Service Line (2 inch in diameter or less) shall be separated with a minimum of 5 feet of undisturbed or compacted earth, or by one 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 D1-5.

- The Wastewater Service Line may be placed in the same trench 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. See Detail Drawing D1-5.

- 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 D1-5.

Where building constraints make installation of the water and/or Wastewater Service Lines 15 feet from the building foundation infeasible, the following may be applied upon approval of Colorado Springs Utilities

- For Single Family Residential Lots, provide equal separation between foundation and the PUE with no less than 7 feet of separation from the 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.

2.6.E Cleanouts

Single-way cleanouts shall be installed every 100 feet (or two-way cleanouts may be installed every 200 feet) along the length of the Wastewater Service Line. All buildings shall install a two-way cleanout located approximately 2 feet outside of the foundation. Cleanouts are not recommended to be installed within patio areas, sidewalks, or other similar areas that impact access or maintenance of the cleanout. See Detail Drawing D1-4.

Cleanouts in driveways or other traffic areas must be traffic rated.

2.6.F Wastewater Service Line Vertical Design Criteria

2.6.F.1 Depth of Bury

Wastewater Service Lines shall be designed according to Detail Drawings D1-2 and D1-3.

Repair to existing shallow Wastewater Service Lines with less than 4 feet of cover do not require flow fill unless previously installed with flow fill.

2.6.F.2 Crossings

Vertical separation between Wastewater Service Lines and other utility mains shall meet the requirements as stated in Table 2-3. If the Wastewater Service Line crosses above a Water Service Line with less than 18 inches of vertical clearance, the Water Service Line shall be installed within a sleeve per the *Water LESS*. The Wastewater Service Line and the Water Service Line sleeve shall be separated by a minimum vertical distance of 6 inches.

a) Crossing Under Storm Sewers

PVC requires additional support when crossing beneath a storm sewer that is 30 inches or greater. To protect the Wastewater Service Line from this point load, the Wastewater Service Line shall be:

- Encased in flow fill with 6 inches of flow fill on all sides of the Wastewater Service Line extending 2 feet past the storm sewer on each side, or
- Installed in a casing pipe per detail drawing C2-4

2.6.F.3 Non-Gravity Wastewater Service Lines

If the vertical design of the Wastewater Main is at an elevation that may prohibit gravity Wastewater service to certain lots of a development, then a Private Pump System may be required to serve an individual lot (See Section 7.10 for additional information).

2.6.G Reuse or Repurposing an Existing Wastewater Service Line

Reuse or repurposing an existing Wastewater Service Line will only be considered by Colorado Springs Utilities when all of the following conditions are met:

- The existing Wastewater Service Line is the appropriate size to provide the capacity needed to service the proposed use
- The Owner/Developer, at their expense, cleans and CCTVs the existing Wastewater Service Line and submits the CCTV footage to Colorado Springs Utilities for review
- The existing Wastewater Service Line has no deficiencies as identified by Colorado Springs Utilities or all identified deficiencies are corrected

Existing Wastewater Service Lines intended for reuse or repurposing will be reviewed for pipe materials, structural integrity, and operational effectiveness. See Section 5.21 for a list of deficiencies identified through the CCTV process. Reuse or repurposing of an existing Service Line is at the Owner/Developer's risk.

Wastewater Service Lines found to be unacceptable for reuse shall be permanently abandoned in accordance with Section 2.6.I.

2.6.H Demolition or Remodel of Property

If Construction or demolition activities will affect the Wastewater Service Line for a property currently receiving Wastewater service, a *Request for Removal of Utilities for Demolition or Construction,* found 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 Wastewater Service Line is not going to be reused in accordance with *City Code*, the Wastewater Service Line shall be abandoned in accordance with Section 2.6.I at the time of disconnection. If the Wastewater Service Line is to be reused, the Contractor shall disconnect and temporarily plug the Wastewater Service Line a minimum of 15 feet outside the limits of demolition to minimize potential damage to the Wastewater Service Line. The *Request for Removal of Utilities for Demolition or Construction* form will identify the date, not to exceed 2 years, when the Wastewater Service Line will be in regular use again. All demolitions shall be inspected by Colorado Springs Utilities.

2.6.I Abandoning an Existing Wastewater Service Line

Where an existing Wastewater Service Line is to be abandoned, the Owner of the property shall be responsible for all expenses.

Wastewater Service Lines to be abandoned shall be capped or plugged with a permanent watertight/airtight plug at the Wastewater Main. The plug may be installed without excavation in the street if non-shrink grout fills the Wastewater Service Line from the Customer side of the plug to the open excavation.

The abandoned Wastewater Service Line shall be identified on the Wastewater Construction Plan by the Design Engineer and inspected by Colorado Springs Utilities. See CHAPTER 5 Wastewater Construction for additional information.

2.6.J Individual Service Pumps

See section 7.10 for information regarding individual service pumps.

2.7 Wastewater Pretreatment

Users who discharge Wastewater that could cause harm to or interference with the Wastewater System or Wastewater Treatment System are required to provide pretreatment according to the sections below.

Unique Wastewaters, not covered by the sections below, including, but not limited to, Wastewaters containing explosive mixtures, noxious materials, radioactive wastes, toxic substances, Wastewater with added color, high heat, and pesticides have additional limitations and requirements that are presented in *City Code §12.5.7.*

If a User is not providing adequate Wastewater pretreatment or is causing harm to, or interference with, the Wastewater System or Wastewater treatment system, Colorado Springs Utilities has the authority to take regulatory actions outlined in *City Code §12.5.8.*

2.7.A Grease Interceptors

A Grease Interceptor is required for new Food Service Establishments or when there is a substantial change in use, including a change in cuisine, food preparation, menu items, seating capacity, or similar operational changes that have the possibility of causing harm to, or interference with, the Wastewater System or Wastewater treatment system.

The criteria below shall be used to design and size new Grease Interceptors. The criteria below shall also be used to evaluate existing Grease Interceptors to determine their adequacy when there is a substantial change in use. Information regarding Grease Interceptor and operation, maintenance, and best management practices can be found in the Colorado Springs Utilities – *Fats, Oil, and Grease (FOG) Policies and Procedures Manual* available at www.csu.org.

Existing Food Service Establishments that received Colorado Springs Utilities approval of having no Grease Interceptor or, or those that received approval of a Grease Interceptor that do not meet current standards, may not be required to improve their system to meet current standards unless they violate the limitations presented in *City Code §12.5.7.*

Grease Interceptors are required for Food Service Establishments. Both Gravity Grease Interceptors and Hydromechanical grease interceptors are allowed exterior to the building, while hydromechanical grease interceptors may be allowed interior to the building in accordance with Section 2.7.A.2

Wastewater containing grease requires a plumbing system separate from the domestic Wastewater plumbing system. Typically, all drains from food preparation areas, , and other areas where Wastewater containing grease may exist shall be connected to the

Grease Interceptor or. Hand washing sinks located in the food preparation area are not required to be connected so long as they are posted, "no food waste" Dishwashers, floor sink and drains, mop sinks, glass rinsing equipment and beverage dispensing equipment with drains must be connected to an appropriately sized interior grease interceptor. If selected drain fixtures will not be connected to the grease interceptor, a variance request will be required. Domestic Wastewater from toilets, showers, or similar fixtures shall not enter the Grease Interceptor.. These 2 independent plumbing systems may combine downstream of the Grease Interceptor prior to connecting to the Wastewater Main. See Detail Drawing C4-1.

Developers of shopping centers and "shell only" Construction with unknown future uses should consider installing 2 separate Wastewater Service Lines for each unit: 1 for domestic Wastewater and 1 for Wastewater containing grease. Each unit that becomes a Food Service Establishment will be required to connect to a Grease Interceptor.

2.7.A.1 Grease Interceptor Sizing and Design

a) Gravity Grease Interceptor Sizing Requirements

The minimum volume of a Gravity Grease Interceptor shall be 325 gallons. The Design Engineer shall size the Gravity Grease Interceptor based on the restaurant categories described below and using the Grease Interceptor Sizing form found at www.csu.org. Every Food Service Establishment may not fit clearly within one category; therefore, it may be necessary to combine characteristics from more than one category to determine the appropriate size.

- Low Volume:

This category includes facilities which serve food prepared offsite or food that requires minimal preparation and/or warming. Examples include, but are not limited to, sandwich shops, convenience stores (no kitchen), hotel breakfast bar, frozen yogurt, coffee shops, take & bake pizza, bars (limited food service), cafeteria (no prep), grocery meat department, and sushi (no grill).

Expected size range of Gravity Grease Interceptor: 325 – 1,250 gallons

- Medium Volume:

This category includes facilities which serve food from a limited menu and/or with a limited amount of onsite preparation. Examples include, but are not limited to, pizza parlors, ice cream parlors, caterers, Greek, Japanese, Vietnamese (Pho), grocery store (no fryer), cafeteria (limited prep), and low category restaurants with fryer.

Expected size range of Gravity Grease Interceptor: 1,000 – 3,000 gallons

- High Volume:

This category includes facilities which serve a full menu of food prepared onsite. Examples include, but are not limited to, American traditional, hamburger (with grill), BBQ, Mexican, Italian, steak/seafood house, hibachi, buffet, fast food fried chicken, baker/donut shop (with fryer), Chinese, Indian, grocery store (with fryer), cafeteria (full prep), and medium category restaurants with fryer.

Expected size range of Grease Interceptor: 2,500 – 5,000 gallons

b) Grease Interceptor Design

The Grease Interceptor shall be located within 50 feet of the exterior building wall for each Wastewater Service Line to be connected to the Grease Interceptor measured from the Grease Interceptor inlet to the point where each Wastewater Service Line exits the building. Grease Interceptors shall be located outside of the building and should be located out of drive-through areas to be readily accessible for inspection, cleaning, and maintenance. Grease interceptors are not permitted in public utility Easements. No trees shall be allowed within 15 feet of the interceptor.

In vehicle traffic areas, the Grease Interceptor shall be designed to have adequate reinforcement and cover meeting HS-20 traffic loading Specifications. See Detail Drawing C4-2.

Shopping centers and "shell only" properties may have multiple units connected to a common Grease Interceptor if the Grease Interceptor has adequate capacity according to the Grease Interceptor sizing form and or the manufacturers sizing recommendations at www.csu.org.
Grease interceptors shall be installed per the International Plumbing Code and manufacturer requirements. No garbage disposals will be permitted unless served by a gravity or hydromechanical interceptor equal to or greater than 500-gallon capacity. (Colorado Plumbing Code (eff. Date 12/15/2023) 1.2.E.1.a.ww)

c) Hydromechanical Grease Interceptor Sizing Requirements

The Design Engineer shall size the Hydromechanical Grease Interceptor based on the restaurant categories described in the previous section and using the Grease Interceptor Sizing form found at www.csu.org.

Every Food Service Establishment may not fit clearly within one category; therefore, it may be necessary to combine characteristics from more than one category to determine the appropriate size. Minimum interior hydromechanical grease interceptor size shall be 50 GPM, 100 lb. grease sludge capacity.

2.7.A.2 Interior Hydromechanical Grease Interceptors

Approved hydromechanical grease interceptors listed in Chapter 4.3.F of this Standard may be installed within the interior of the building. If

conditions change (such as change in menu, the installation of additional kitchen fixtures or improper maintenance to the interceptor), an exterior, appropriately sized grease interceptor may be required.

2.7.A.3 Grease Interceptor Operation and Maintenance

The Owner and/or lessee shall be responsible for the regular inspection, cleaning, and maintenance of the Grease Interceptor. The Grease Interceptor shall be completely cleaned when oil, grease, and solids occupy 25% of the holding capacity. Grease Interceptors are required to be inspected by the Owner and/or lessee monthly or more often as necessary. Maintenance records for the last 3 years shall be kept on site and made available to Colorado Springs Utilities upon request. Colorado Springs Utilities may perform unannounced inspections to verify compliance. See the *FOG Policies and Procedures Manual* for additional information. Property Owners connected to a common Grease Interceptor are jointly and severally responsible for the operation and maintenance of the common Grease Interceptor.

2.7.A.4Abandoning Grease Interceptors

Grease Interceptors that will be abandoned in-place shall abandoned in accordance with all manufacturer's specifications and this section. Grease Interceptors shall be cleaned of all grease, oil, and debris. The inlet and outlet pipes shall be plugged at each end and the interceptor filled with gravel. The access area shall be sealed to prohibit any entry. See Detail Drawing C4-4.

2.7.A.5 Alternative Grease Interceptors

Grease interceptors not approved in Chapter 4 of this Standard may be approved by Colorado Springs Utilities Industrial Pretreatment (IPT) on a case-by-case basis. A Grease Interceptor Variance Request Form (found at www.csu.org) shall be submitted to Colorado Springs Utilities IPT identifying the grease control pretreatment device requested. The Food Service Establishment is required to notify Colorado Springs Utilities IPT in writing within 30 days of any substantial change in menu, use, or number or type of kitchen fixtures that could change the nature of the Wastewater discharge. The Grease Interceptor will be sized per the Colorado Springs Utilities' Grease Interceptor Sizing Form. Colorado Springs Utilities shall be the final authority on the size of interceptor required.

2.7.B Sand/Oil Interceptors

To protect the Wastewater System, Sand/Oil Interceptors shall be installed on Wastewater Service Lines serving facilities that may introduce sand, grit, metals, petroleum, and/or oil into the Wastewater System. This includes, but is not limited to, car wash facilities, automotive shops, machine shops, and parking garages.

Existing facilities that received Colorado Springs Utilities approval of having no Sand/Oil Interceptor, or those that received approval of a Sand/Oil Interceptor that does not meet current standards may not be required to improve their system to meet current standards unless they violate the limitations presented in *City Code §12.5.7.*

2.7.B.1 Sand/Oil Interceptor Sizing

Sand/Oil Interceptors shall be sized per Table 2-7 with a minimum liquid capacity of 6 cubic feet or 45 gallons. The Sand Oil Interceptor sizing form can be found at www.csu.org.

Table 2-7: Sand/Oil Interceptor Sizing Requirements

Type of Facility	Treatment Capacity per Cubic Foot of Sand/Oil Interceptor
Car Wash, Trucks or Heavy Equipment	15 Square Feet
Car Wash, Automatic Bay, or Conveyor	50 Square Feet
Car Wash, Hand Held Spray	75 Square Feet
Automotive Shop or Machine Shops	100 Square Feet
Parking Garage	4,000 Square Feet

2.7.B.2 Sand/Oil Interceptor Design

Sand/Oil Interceptors shall be located outside of the building and should be readily accessible for inspection, cleaning, and maintenance.

a) Car Wash Facilities

Car wash facilities shall be isolated from the Potable Water System with the appropriate backflow prevention device. See Chapter 2 of the *Water LESS* for additional information.

Car wash facilities shall have a backwater valve downstream of the Sand/Oil Interceptor according to Detail Drawings C4-7 and C4-8. The backwater valve shall have the same flow through capacity as the Wastewater Service Line.

Portions of the car wash facility that are exposed to precipitation shall not be connected to the Wastewater System. Portions of the car wash facility that are covered and have floor drains shall be directed to a Sand/Oil Interceptor and then to the Wastewater System.

- Car Wash Facility without Recycled Water:
  The car wash facility shall be connected to a potable water supply and shall have floor drains directed to a Sand/Oil Interceptor before connection to the Wastewater Main.

- Car Wash Facility with Recycled Water:
  The car wash facility shall be connected to a potable water supply and the car wash water shall be recycled onsite utilizing a closed loop system. A Sand/Oil Interceptor shall be installed after the recycle water system to protect Colorado Springs Utilities wastewater system;

however, an additional optional interceptor may be installed as needed upstream per the design requirements of the system.

Hose bibs are not allowed on recycled water piping systems.

Drinking water sources, playgrounds, eating areas, and similar facilities shall be protected from recycled water use and over-spray per Chapter 8 of the *Water LESS*.

Signage indicating recycled water usage is required at the point of use to inform workers and/or the public.

Recycled water pipes, valves, valve boxes, and fittings shall be properly color coded and labeled "NONPOTABLE WATER - DO NOT DRINK" in English and any other dominant language that may be spoken at the site. These markings shall conform to Chapter 8 of the *Water LESS*.

b) Automotive Shops or Machine Shops

For automotive shops and machine shops, the Sand/Oil Interceptor shall have a minimum depth of 2 feet below the invert of the outlet pipe and the outlet pipe shall have a minimum water seal of 18 inches.

c) Parking Garages

Portions of a parking garage that are exposed to precipitation shall not be connected to the Wastewater System. This includes, but is not limited to, the roof of the parking garage and trench drains placed at the entrance and exit of the parking garage. Portions of a parking garage that are covered and have floor drains shall be directed to a Sand/Oil Interceptor and then to the Wastewater System.

2.7.B.3 Sand/Oil Interceptor Operation and Maintenance

The Owner and/or lessee shall be responsible for the regular inspection, cleaning, and maintenance of the Sand/Oil Interceptor. The Sand/Oil Interceptor shall be completely cleaned when solids are within 8 inches of the bottom of the outlet tee. Maintenance records for the last 3 years shall be kept on site and made available to Colorado Springs Utilities upon request. Colorado Springs Utilities may perform unannounced inspections to verify compliance. Additional Sand/Oil Interceptor operation and maintenance guidance can be found at www.csu.org.

2.7.C Lint Interceptor for Laundry Facilities

Commercial laundry facilities shall be equipped with an interceptor that uses a wire basket, or similar device, to prevent passage of solids ½ inch or larger, strings, rags, buttons, or other materials detrimental to the Wastewater System. The wire basket, or similar device, shall be removable for cleaning and shall be maintained by the Owner and/or lessee of the laundry facility.

2.7.D Swimming Pools (Indoors and Outdoors)

All non-residential swimming pools shall discharge indirectly into a Wastewater Service Line per Pikes Peak Regional Building Department Plumbing Code Requirements. Swimming pools shall be discharged at a rate that does not exceed 100 gallons per minute or at a rate that does not cause the downstream system, or any appurtenance, to surcharge, whichever is less. Pool deck drains that are exposed to precipitation shall not be connected to the Wastewater System (*City Code §12.5.702)*. A swimming pool may not discharge through a Grease Interceptor. A detailed drawing of the proposed outlet/drainage design shall be shown on the Approved Wastewater Construction Plan as well as the location of the connection to the Wastewater Main or Wastewater Service Line.

2.8 Forms

2.8.A Wastewater Modeling Requirements

Based on the information contained in the *Wastewater Master Facility Form* (*WWMFF*), see Section 2.4.A, Colorado Springs Utilities may require a hydraulic model to supplement the *WWMFF*. The goal of the model is to produce an output hydrograph(s) that can be input into the Master Model to evaluate downstream impacts. Colorado Springs Utilities Wastewater Planning Staff will validate the engineer's model and use the results to input the estimated flows (hydrograph) into the master model to evaluate the capacity of the downstream Wastewater System.

The model shall meet the following requirements:

- The model should be EPA SWMM (version 5.0 or later) - or equal- prepared by the Owner's engineer.
- The limits of the applicant's responsibility for modeling shall include all areas of the Project that contribute flow to the Wastewater System up to the proposed connection point (existing manhole)
- The model shall include basin delineations and detail to accurately represent the anticipated contribution to the Wastewater System. The model does not need to include every pipe.
- The model shall use time patterns (unit hydrographs) to represent the proposed development (see Table 2-9).
- Flow units shall be gpm.
- The model shall accurately correspond to the Wastewater Project map (refer to 2.4.A for map requirements).
- The output volumes shall match the anticipated cumulative volumes based on the information supplied in the *WWMFF*.
- The model shall not contain any surcharged pipes unless the pipe is planned to be used as a force main.
- The model shall use slopes based on the topography & these *Wastewater LESS*.
- The model shall use typical Lift Station wet well sizing and pumping rates.
- The output sent to WWPD shall be:
  - The .inp SWMM file
  - Any background images used in the model
  - A .txt output hydrograph

- Changes in the Development Plan (locations, types of housing i.e., Single Family to Multifamily, density etc.), even if the changes do not alter the number of Users, shall be updated in the model.

2.8.B SWMM Modeling Parameters/Info

Table 2-8: Average-Daily Design Flows

Land Use	Average-Daily Design Flow	SWMM Input
Single-Family (2.5 persons per unit)	65 gallons per person per day	Population/Persons
Multi-Family (1.9 persons per unit)	65 gallons per person per day	Population/Persons
Commercial (includes elementary and middle schools)	1,300 gallons per acre per day	Average Flow (gpm)
Industrial (includes high schools)	2,000 gallons per acre per day	Average flow (gpm)
Infiltration/Inflow (VCP pipe)	500 gallons per acre per day	Average Flow (gpm)
Infiltration/Inflow (PVC pipe)	200 gallons per acre per day	Average Flow (gpm)

CONTINUED ON NEXT PAGE

Table 2-9: Time Pattern Information

TIME	TIME PATTERN #107 (TYPICAL RESIDENTIAL POPULATION)	TIME PATTERN #13 (TYPICAL COMMERCIAL)
	FACTOR (gal/(person*min))	FACTOR (gpm/average gpm)
12 am	0.016701389	0.0
1 am	0.009930556	0.0
2 am	0.008125000	0.0
3 am	0.006770833	0.0
4 am	0.007222222	0.0
5 am	0.011284722	0.6
6 am	0.029791667	2.2
7 am	0.092534722	2.2
8 am	0.083958333	2.2
9 am	0.068611111	2.2
10 am	0.058229167	2.2
11 am	0.050555556	2.2
12 pm	0.046493056	2.2
1 pm	0.044236111	2.2
2 pm	0.043784722	2.2
3pm	0.044236111	2.2
4 pm	0.045590278	2.2
5 pm	0.048750000	2.2
6 pm	0.055069444	2.0
7pm	0.063194444	1.6
8 pm	0.072222222	1.0
9 pm	0.076736111	0.3
10 pm	0.065451389	0.0
11 pm	0.033854167	0.0

Additional patterns may be requested and/or supplied by Colorado Springs Utilities

TABLE OF CONTENTS

CHAPTER 3
Submittal Requirements

Paragraph Number	Title	Page Number
3.1	General	3-3
3.2	Construction Plan Preparation	3-3
3.2.A	Quality Guidelines	3-3
3.2.B	Required Information	3-4
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	3-5
3.2.D	Profile Guidelines	3-6
3.3	Wastewater Master Facility Form Process	3-6
3.4	GIS Maps	3-6
3.5	Utilities Addressing Plan and Utilities Design CAD File	3-6
3.5.A	Utilities Addressing Plan	3-6
3.5.A.1	Conditions Requiring a Utilities Addressing Plan	3-7
3.5.A.2	Utilities Addressing Plan Submittal	3-7
3.5.B	Utilities Design CAD File	3-8
3.5.B.1	Conditions Requiring a Utilities Design CAD File	3-8
3.5.B.2	Purpose of the Utilities Design CAD File	3-8
3.5.B.3	Utilities Design CAD File Submittal	3-8
3.6	Signature Blocks, Forms, and Notes	3-10
3.6.A	Colorado Springs Utilities Signature Blocks	3-10
3.6.B	Underdrain Review Statement	3-11
3.6.C	Owner/Developer Signature Block	3-11
3.6.D	Utility Grade Review Signature Block	3-12
3.6.E	Swimming Pool Discharge Note	3-12
3.6.F	Plan Information Block	3-12
3.6.G	Wastewater Plan Notes	3-13
3.6.H	Wastewater Project - Specific Notes	3-14
3.6.I	Utility Service Plan Notes	3-15
3.6.J	Utility Design CAD File Feature Data	3-16
3.7	Callouts and Abbreviations	3-17
3.7.A	Callouts	3-17
3.7.B	Abbreviations	3-18

This page left intentionally blank

CHAPTER 3

Submittal Requirements

3.1 General

Construction Plans to install, repair, or retrofit Wastewater Mains and Wastewater 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 Wastewater Plans and Utility Service Plans. Wastewater Plans are prepared for all Wastewater Main and Private Wastewater Main Extensions. Utility Service Plans are prepared for all Wastewater Service Lines that connect the Premises to the Wastewater Main (except for single family Wastewater Service Lines not part of a Wastewater 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 Wastewater Plans shall be prepared under the supervision of a professional engineer registered in the State of Colorado and each sheet of the final Wastewater 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 Private Wastewater Main. The cover sheet of all final Wastewater Plans shall also be approved and signed by the Owner/Developer, and other required signatories prior to approval by Colorado Springs Utilities unless specific signature blocks are required on additional sheets.

Construction Plans that include a public Wastewater Main Extension also require that the Bill of Sale be signed by the Owner/Developer and submitted to Utilities Development Services prior to approval of those plans.

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 *Wastewater LESS* in effect at the time of re-submittal.

3.2 Construction Plan Preparation

3.2.A Quality Guidelines

This section sets forth items for the Design Engineer to consider in preparation of Wastewater 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 tapping, operation, and maintenance. 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 *Wastewater LESS* are available online in AutoCAD downloadable format. These details can be used for Construction clarification and include 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 details are 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 Wastewater Plan Notes or Utility Service Plan Notes and applicable signature blocks, which can be found in Section 3.6.A. The Utility Grade Review signature block shall be included whenever a Wastewater 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 number for which the Wastewater Main or manhole connection is being made
- GIS map number, 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. 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 Wastewater Mains to include the location of all appurtenances such as bends and manholes
- The stations of all manholes and fittings
- 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 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
- 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 sheets 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 Wastewater 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 Wastewater System" for the lot served by the extension and show the reception number on the Wastewater Plan.
- If applicable, Grease Interceptors and Sand/Oil Interceptors shall be shown on the Utility Service Plan. For any proposed Grease Interceptors, also provide one copy of the complete kitchen mechanical and plumbing plans showing the number of fixtures i.e., 3-comp sink, dishwasher, hand sink, floor drains, etc. Such plans shall also include the calculation of the size, type, and location of the interceptor.

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 Wastewater Mains and Private Wastewater Mains shall have both plan and profiles submitted as part of the Wastewater Plan set.

3.3 Wastewater Master Facility Form Process

A *Wastewater Master Facility Form (WWMFF)* is required with any Development Plan submittal. See Section 2.4.A for additional information.

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

A 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 at www.csu.org. 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, multifamily residential 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 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.

The digital file submittal must contain the appropriate data to perform CAD based system design and analysis on new service system extensions. Residential Projects contain most of the features on the Wastewater Plan. Commercial, multifamily, 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 Utility Design CAD File Recommended Feature Data found on www.csu.org. 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.J shall be followed. Single-Family-Residential subdivision Projects shall include pertinent elements checked under the "Residential" column. All other development types (commercial, multifamily residential, 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 residential Projects, the UDCF will contain the same feature data as the Wastewater 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 Underdrain Review Statement

Link to AutoCAD

UNDERDRAIN REVIEW STATEMENT

REVIEW BY CITY ENGINEERING DIVISION IS FOR SYSTEM SEPARATION AND DISCHARGE TO OPEN DRAINAGE OR STORM SEWER. THE PUBLIC WORKS DEPARTMENT AND COLORADO SPRINGS UTILITIES ARE NOT RESPONSIBLE FOR UNDERDRAIN SYSTEM MAINTENANCE.

REVIEWED BY: _____ DATE: _____

3.6.C 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.D 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.E Swimming Pool Discharge Note

Link to AutoCAD

SWIMMING POOL DISCHARGE NOTE

THE SIZE FOR A SWIMMING POOL DISCHARGE TRAP SHALL BE CALCULATED BASED ON A RESTRICTED DISCHARGE OF ONE HUNDRED (100) GALLONS PER MINUTE ENTERING THE WASTEWATER SERVICE LINE.

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 Wastewater Plan Notes

Link to AutoCAD

WASTEWATER PLAN NOTES

THE CONTRACTOR SHALL NOTIFY COLORADO SPRINGS UTILITIES' INSPECTIONS OFFICE (NORTH: 668-4396 OR SOUTH: 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 LINE EXTENSION AND SERVICE STANDARDS* (WASTEWATER STANDARDS).
2. THE CONTRACTOR SHALL OBTAIN LOCATES PRIOR TO ANY EXCAVATION.
3. COLORADO SPRINGS UTILITIES DOES NOT GUARANTEE THE ACCURACY OF LOCATIONS OF EXISTING PIPELINES, MANHOLES 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 WASTEWATER 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 WASTEWATER STANDARDS.
7. THE CONTRACTOR SHALL ENSURE THAT WASTEWATER SERVICE TO ADJACENT PROPERTIES IS MAINTAINED DURING CONSTRUCTION.
8. ALL MANHOLES LOCATED WITHIN THE PROJECT LIMITS SHALL BE ADJUSTED TO FINISH GRADE. IF MANHOLES ARE IN POOR CONDITION OR IF THE DISTANCE BETWEEN THE RING/COVER AND CONE OF THE MANHOLE EXCEEDS THE WASTEWATER STANDARDS, THE CONTRACTOR MAY BE REQUIRED TO REPLACE PART OR ALL OF THE EXISTING MANHOLES.
9. REUSE OR SALVAGE OF ANY MATERIAL IS LEFT TO THE DISCRETION OF THE COLORADO SPRINGS UTILITIES INSPECTOR.
10. ALL TRENCH BACKFILL AND COMPACTION SHALL BE IN ACCORDANCE WITH SECTION 206 OF THE *CITY OF COLORADO SPRINGS STANDARD SPECIFICATIONS MANUAL.*

3.6.H Wastewater Project - Specific Notes

Link to AutoCAD

WASTEWATER PROJECT - SPECIFIC NOTES

	APPLICABLE	NON–APPLICABLE	
1.	☐	☐	CORROSION PROTECTION IS REQUIRED FOR ALL DUCTILE IRON PIPE. ALL PROTECTION SHALL COMPLY WITH THE WASTEWATER STANDARDS.
2.	☐	☐	THIS PROJECT IS CONNECTING TO AN EXISTING MANHOLE. A MANHOLE ASSESSMENT HAS BEEN COMPLETED FOR THIS PROJECT. THE FOLLOWING CHECKED ITEMS ARE REQUIRED: ☐ THE CONTRACTOR SHALL PROVIDE A BYPASS PUMPING PLAN FOR APPROVAL BY COLORADO SPRINGS UTILITIES AND COMPLY WITH ALL THE REQUIREMENTS THEREIN. ☐ REPAIR THE EXISTING MANHOLE (REFER TO PLAN AND PROFILE FOR REQUIREMENTS). ☐ REPLACE THE EXISTING MANHOLE (REFER TO PLAN AND PROFILE FOR REQUIREMENTS.
3.	☐	☐	MANHOLES ARE BEING ABANDONED, THE CONTRACTOR SHALL: • PLUG THE "IN" AND "OUT" INVERTS WITH A WATERTIGHT MECHANICAL PLUG AND GROUT WITH APPROVED MATERIAL. • REMOVE AND DISPOSE OF THE CONE SECTION. • REMOVE THE RING AND COVER AND RETURN THEM TO COLORADO SPRINGS UTILITIES. • FILL THE MANHOLE WITH APPROVED MATERIAL.
4.	☐	☐	WASTEWATER MAINS EXISTS UNDERNEATH A PROPOSED STRUCTURE, CONTRACTOR SHALL: ☐ REMOVE IT ☐ GROUT IT FULL
5.	☐	☐	WASTEWATER MAIN TO BE ABANDONED EXISTS WITHIN RIGHT–OF–WAY, THE CONTRACTOR SHALL: ☐ REMOVE IT ☐ GROUT IT FULL
6.	☐	☐	PIPELINES LESS THAN 1.04% GRADE ARE PROPOSED. THE CONTRACTOR SHALL COMPLY WITH THE ADDITIONAL REQUIREMENTS AS SPECIFIED WITHIN THE WASTEWATER STANDARDS.
7.	☐	☐	THIS PROJECT IS UTILIZING EXISTING WASTEWATER STUB(S) IN AN "AS–IS" CONDITION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT THE STUB(S), CONNECTION, AND SUBSEQUENT EXTENSION MEET ALL CURRENT WASTEWATER STANDARDS AND DO NOT HAVE ANY DEFECTS.
8.	☐	☐	COLORADO SPRINGS UTILITIES DOES NOT GUARANTEE THE ACCURACY OF THE DEPTH, LOCATION, OR CONDITION OF ANY EXISTING STUB(S) SHOWN ON ANY "AS CONSTRUCTED" DRAWINGS. FURTHER, THE EXISTING STUB SHALL BE INCLUDED IN THE TWO–YEAR WARRANTY PERIOD FOR THIS PROJECT.
9.	☐	☐	A WASTEWATER STUB OR STUBS ARE PROPOSED WITH THIS PROJECT. COLORADO SPRINGS UTILITIES WILL INSPECT THE CONSTRUCTION BUT DOES NOT GUARANTEE THAT THE DESIGN OR INSTALLATION OF THE PROPOSED STUB(S) WILL MEET FUTURE DEVELOPMENT REQUIREMENTS. FURTHER, THE PROPOSED STUB(S) WILL NOT BE INCLUDED IN THE TWO–YEAR WARRANTY PERIOD FOR THIS PROJECT AND WILL NOT BE ACCEPTED OR OWNED BY COLORADO SPRINGS UTILITIES.
10.	☐	☐	UNDERDRAIN REVIEW BY THE CITY ENGINEERING DIVISION IS FOR SYSTEM SEPARATION AND DISCHARGE TO OPEN DRAINAGE OR STORM SEWER. THE PUBLIC WORKS DEPARTMENT AND COLORADO SPRINGS UTILITIES ARE NOT RESPONSIBLE FOR UNDERDRAIN SYSTEM MAINTENANCE

3.6.I 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.J 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

3.7 Callouts and Abbreviations

3.7.A Callouts

Link to AutoCAD

CONSTRUCTION NOTES TO BE USED FOR ALL WASTEWATER PLANS:

MANHOLE - PLAN VIEW
STA 0+00.00 =
STA 0+00.00 [REFERENCE STATION FOR INTERSECTING MANHOLE]
MH-XX INSTALL X' DIA. MANHOLE

MANHOLE - PROFILE VIEW
STA 0+00.00 =
STA 0+00.00
MH-XX INSTALL X' DIA. MANHOLE
INV IN (N,S,E,W) = 0000.00
INV OUT (N,S,E,W) ELEV = 0000.00
DEPTH = XX.XX'

TAP
STA 0+00.00
INSTALL X"xX" TAP
INV ELEV = 0000.00

CURVILINEAR
STA 0+00.00 (PC/PT)
Δ = XX°XX'XX"
R = XX.XX'
L = XX.XX'
BEGIN/END CURVILINEAR PIPE
ELEV = 0000.00

CROSSING - PROFILE VIEW
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'

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)

This page left intentionally blank

TABLE OF CONTENTS

CHAPTER 4
Approved Materials

Paragraph Number	Title	Page Number
4.1	General	4-5
4.2	Materials and Testing	4-5
4.2.A	Select Bedding	4-5
4.2.B	Pipe	4-6
4.2.B.1	Ductile Iron Pipe - Slip Joint	4-6
4.2.B.2	Ductile Iron Pipe Restrained Joint	4-8
4.2.B.3	Polyvinyl Chloride (PVC)	4-9
4.2.B.4	High Density Polyethylene Pipe (HDPE)	4-16
4.2.B.5	Steel Pipe	4-18
4.2.C	Casing Pipe, Spacers and End Seals	4-20
4.2.C.1	Casing Pipe	4-20
4.2.C.2	Metallic Casing Spacers (Insulators)	4-21
4.2.C.3	Non-Metallic Casing Spacers (Insulators)	4-22
4.2.C.4	End Seals	4-23
4.2.D	Wastewater Main Fittings	4-24
4.2.D.1	SDR 35 PVC 3 Degree Bends	4-24
4.2.D.2	High Density Polyethylene (HDPE) Pipe Fittings:	4-25
4.2.D.3	Flange Gaskets	4-28
4.2.D.4	Mechanical Joint Pipe Restraints	4-29
4.2.D.5	Bolts and Nuts for Mechanical Joints	4-32
4.2.D.6	Mechanical Coupling(s)	4-33
4.2.E	Wastewater Valves	4-35
4.2.E.1	Wastewater Check Valves:	4-35
4.2.E.2	Eccentric Plug Valves:	4-36
4.2.E.3	Air and Vacuum Valves	4-37
4.2.E.4	Stainless Steel Ball Valve	4-38
4.2.F	Concrete for Thrust Restraint Blocks, Concrete Reverse Anchors and Vaults	4-39
4.2.G	Safety Ladders – (Ladder Up)	4-42
4.2.H	Manholes	4-43
4.2.H.1	Manhole	4-43
4.2.H.2	Inside Drop Manhole Assembly	4-44

4.2.I Manhole Ring and Covers 4-45
4.2.I.1 Standard Manhole Ring and Covers 4-45
4.2.I.2 Hinged Manhole Lid 4-46
4.2.I.3 Adjustment Rings 4-47
4.2.I.4 Pavement Riser Ring Cast or Steel - 24” with Set Screws 4-48
4.2.J Manhole Pipe Seals 4-49
4.2.K Tracer Wire 4-50
4.2.K.1 Tracer Wire Connectors 4-51
4.2.K.2 Tape Wrapping of Tracer Wire or Corrosion Wire Leads 4-53
4.2.K.3 Tracer Wire Ground Rod with Wire Lead 4-54
4.2.L Marking Tape 4-54
4.2.M Cathodic Protection 4-55
4.2.M.1 Coatings and Wraps 4-55
4.2.M.2 Wax Tape 4-56
4.2.M.3 High Potential Magnesium Anodes 4-57
4.2.M.4 Zinc End Cap 4-58
4.2.M.5 Test Stations 4-59
4.2.N Controlled Low Strength Materials (CLSM) (a.k.a Flow Fill/Flash fill) 4-61
4.3 Wastewater Service Lines 4-62
4.3.A Wastewater Service Tapping Saddles 4-62
4.3.A.1 PVC Tapping Saddle 4-62
4.3.A.2 Rubber Tapping Saddle 4-63
4.3.A.3 Three Piece Tapping Service Connection 4-64
4.3.A.4 HDPE Electrofusion (EF) Tapping Saddle: 4-65
4.3.B Wastewater Service Line Pipe 4-67
4.3.B.1 SDR 35 PVC 4-67
4.3.B.2 Schedule 40 PVC - Solid Wall 4-67
4.3.B.3 Schedule 40 PVC - Cellular (Foam Core) Pipe 4-68
4.3.B.4 HDPE Wastewater Service Line Pipe or Pressurized Wastewater Main 4-69
4.3.C Wastewater Service Line Fittings 4-71
4.3.C.1 SDR 35 and Schedule 40 PVC Service Line and Cleanout Fittings 4-71
4.3.C.2 Ductile and Gray Iron Waterworks Fittings 4-73
4.3.C.3 Flexible Sewer and Transition Couplings 4-74
4.3.C.4 HDPE Electrofusion Couplings and Fittings: 4-75
4.3.C.5 HDPE Butt Fusion Transitions to PVC Pipe: 4-76
4.3.C.6 Grey Iron Box for Clean Outs 4-78

4.3.D Backwater (Backflow) Valve for Wastewater Service Lines. 4-79
4.3.E Wastewater Meter Flume 4-80
4.3.F Plastic Grease Traps 4-81
4.3.G Plastic Sand Oil Interceptors (Striem) 4-83
4.4 Miscellaneous 4-84
4.4.A Pipeline Utility ID Post and Labels 4-84
4.4.B Post Labels: 4-85
4.5 Rehabilitation Materials 4-86
4.5.A Manhole Liners 4-86
4.5.A.1 Cementitious Lining: 4-86
4.5.A.2 Epoxy Coating: 4-87
4.5.A.3 Polyurea Coating 4-87
4.6 Pump Systems 4-87
4.6.A Lift Station Pumps 4-87
4.6.B Private Pressurized Systems 4-88
4.6.B.1 Pumps 4-88
4.6.B.2 Pressurized Service Line 4-89
4.6.B.3 Lateral Valve Kit 4-90
4.6.B.4 Frost Proof Pit 4-90

This page left intentionally blank

CHAPTER 4

Approved Materials

4.1 General

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

All material to be used within the Colorado Springs Utilities Wastewater System shall be designed and constructed in accordance with these *Wastewater LESS*, and all applicable industry standards including but not limited to *AWWA, ANSI,* and *ASTM*.

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 (MSDS) 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 material not listed, must first be verified that it has been tested and approved by Colorado Springs Utilities, before being used in the Wastewater Collection System.

If Colorado Springs Utilities deems that a new Wastewater 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.

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

4.2.A Select Bedding

General: The bedding material shall be in accordance with ASTM D2321 Class I, II or III:

Where the Wastewater Main is laid at slopes less than 1.04% the Wastewater Main shall be bedded and compacted in maximum 6 inch lifts with select bedding. Additionally, bell holes shall be dug and compacted at each joint to minimize sags at joints. Select bedding shall be hard, clean, non-corrosive, angular ¾" crushed rock.

Materials derived from recycled concrete will not be allowed. Select bedding shall have the following gradation limits when tested by means of laboratory sieves:

Sieve Size	Total Percent Passing by Weight
1”	100
¾”	90-100
3/8”	20-55
#4	0-10
#200	0-5

4.2.B Pipe

4.2.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 for slip joint pipe:

Size(s): This specification shall cover ductile iron pipe in 4, 6, 8, 12, 18, 20, 24, 30, and 36-inch nominal diameters. Note that 3, 10, 15 and 16 inch pipe sizes are not allowed for use in Colorado Springs Utilities Wastewater System.

Pressure Class: Pipes 4 inch thru 36 inch shall conform to pressure class as defined in the following chart and *AWWA C150*, *C151*.

Size	Pressure Class	Equivalent Thickness (in.)
4” Diameter	Class 350	0.25
6” Diameter	Class 350	0.25
8” Diameter	Class 350	0.25
12” Diameter	Class 350	0.28
18” Diameter	Class 300	0.34
20” Diameter	Class 300	0.36
24” Diameter	Class 250	0.37
30” Diameter	Class 200	0.38
36” Diameter	Class 200	0.42

For Public Force Mains see the *Water LESS* requirements.

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.

4.2.B.2 Ductile Iron Pipe Restrained Joint



Approved Manufacturer(s):

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

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, 18, 20, 24, 30, and 36-inch nominal diameters.

Pressure Class: Pipes 4 inch thru 36 inch shall conform to pressure class as defined in *AWWA C150* and *C151*. See chart above in Ductile Iron Pipe -Slip Joint.

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

Class and Type. Pipe furnished under this specification shall conform to the pressure classes as shown in *AWWA C150* and *C151.*

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 shall 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.

4.2.B.3 Polyvinyl Chloride (PVC)

a) SDR 26 Pipe



Approved Manufacturer(s): N/A

- **Diamond Plastics Corporation**
- **JM Eagle Manufacturing**
- **Vinyltech**
- **Westlake Pipe & Fittings**
- **Pipelife Pipe**
- **Cresline**

General: All SDR 26 PVC pipe shall be manufactured in accordance with *ASTM D3034,* with the following additional requirements or exceptions:

Size(s): This specification shall cover SDR26 PVC pipe in 4, 6, 8, and 12 inch nominal diameters.

Material(s): PVC Pipe materials shall be made from class 12454 or 12364 virgin compounds as defined in *ASTM D1784*.

Pipe Length. Each length of pipe will be a standard laying length of 14 and 20 feet depending on diameter of pipe.

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 D3212* or *ASTM F477*.

Dimensions (Average)

Nominal Pipe Size (In.)	Outside Dia. (In.)	Minimum Wall Thickness (In.)
4”	4.215	0.162
6”	6.275	0.241
8”	8.400	0.323
12”	12.500	0.481

Color(s): Green-Wastewater

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.

b) SDR 35 Pipe

Approved Manufacturer(s): N/A



- **Diamond Plastics Corporation**
- **JM Eagle Manufacturing**
- **Vinyltech**
- **Westlake Pipe & Fittings**
- **Pipelife Pipe**
- **Cresline**

General: All SDR 35 PVC pipe shall be manufactured in accordance with *ASTM D3034,* with the following additional requirements or exceptions:

Size(s): This specification shall cover SDR35 PVC pipe in 4, 6, 8, and 12 inch nominal diameters.

Material(s): PVC Pipe materials shall be made from class 12454 or 12364 virgin compounds as defined in *ASTM D1784*.

Pipe Length. Each length of pipe will be a standard laying length of 14 and 20 feet depending on diameter of pipe.

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 D3212* or *ASTM F477*.

Dimensions (Average)

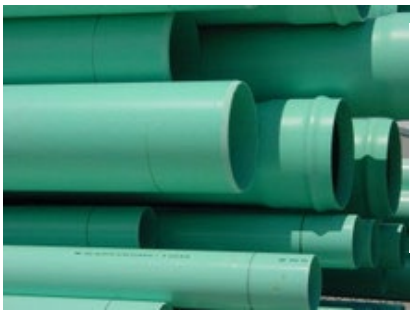
Nominal Pipe Size (In.)	Outside Dia. (In.)	Minimum Wall Thickness (In.)
4”	4.215	0.120
6”	6.275	0.180
8”	8.400	0.240
12”	12.500	0.360

Color(s): Green-Wastewater

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.

c) PS 115 Pipe



Approved Manufacturer(s):

- **Diamond Plastics Corporation**
- **JM Eagle Manufacturing**
- **Vinyltech**
- **Westlake Pipe & Fittings**

General: All PS 115 PVC pipe shall be manufactured in accordance with *ASTM F679* with the following additional requirements or exceptions:

Size(s): This specification shall cover PS 115 PVC pipe in 18, 21, 24, and 30, 36-inch nominal diameters. Pipe larger than 36-inch diameter shall be reviewed and approved on a case-by-case basis.

Material(s): PVC Pipe materials shall be manufactured in accordance with *ASTM F679*, made from class 12364 or 12454 virgin compounds as defined in *ASTM D1784*. PVC compounds must equal or exceed the requirements of the above listed minimum cell classification number.

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*.

Dimensions (Average)

Nominal Pipe Size (In.)	Outside Dia. (In.)	Minimum Wall Thickness (In.)
18”	18.701	0.671
21”	22.047	0.791
24”	24.803	0.889
30” CIOD	32.000	1.148
36” CIOD	38.300	1.373

Color(s): Green-Wastewater

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.

d) PS 46 Pipe



Approved Manufacturer(s):

- **Diamond Plastics Corporation**
- **JM Eagle Manufacturing**
- **Vinyltech**
- **Westlake Pipe & Fittings**

General: All PS 46 PVC pipe shall be manufactured in accordance with *ASTM F679* with the following additional requirements or exceptions:

Size(s): This specification shall cover PVC pipe in 18, 21, 24, and 30, 36-inch nominal diameters. Pipe larger than 36-inch diameter shall be reviewed and approved on a case-by-case basis.

Material(s): PVC Pipe materials shall be manufactured in accordance with *ASTM F679*, made from class 12364 or 12454 virgin compounds as defined in *ASTM D1784*. PVC compounds must equal or exceed the requirements of the above listed minimum cell classification number.

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*.

Dimensions (Average)

Nominal Pipe Size (In.)	Outside Dia. (In.)	Minimum Wall Thickness (In.)
18”	18.701	0.499
21”	22.047	0.588
24”	24.803	0.661
30” CIOD	32.000	0.853
36” CIOD	38.300	1.021

Color(s): Green-Wastewater

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

e) C900 Pressure Pipe DR 14



Approved Manufacturer(s): N/A

- **Diamond Plastics Corporation** Diamond
- **JM Eagle Manufacturing**
- **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 Wastewater Systems

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.*

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)

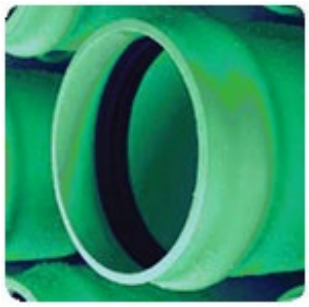
Nominal Pipe Size (In.)	Outside Dia. (In.)
4"	4.80
6"	6.90
8"	9.05
12"	13.20
16"	17.40
18"	19.50
20"	21.60
24"	25.80

Color(s): Green-Wastewater

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' Wastewater Collection System

f) C900 Pressure Pipe DR 18



Approved Manufacturer(s):

Only with Approval from Colorado Springs Utilities, Preference is to use DR14 Pressure Pipe

- **JM Eagle Manufacturing**
- **Westlake Pipe & Fittings**
- **Northern Pipe Products**
- **Vinyltech**

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 18, 20, 24, and 30 inch nominal diameters with equivalent Cast Iron Outside Diameters (CIOD).

Pressure Class: 18, 20, 24, and 30 inch PVC pipe shall be Class 235 (DR-18)
Note: DR-18 C900 PVC pipe is to be used only to 170 psi in the Colorado Springs Wastewater Systems.

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* as well as be *NSF 61* approved.

Specification: 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.)
18"	19.50
20"	21.60
24"	25.80
30"	32.00

Color(s): Green- Wastewater

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.

g) Restrained Joint Polyvinyl Chloride (PVC) Wastewater Pipe



Approved Manufacturer(s):

- **Westlake**
  Certa-Flo RJIB PVC restrained joint municipal Wastewater pipe.

General: Restrained joint PVC pipe may be used for open trench and casing pipe applications only. No field bending may be applied to PVC piping. All PVC pipe shall be manufactured in accordance with *ASTM D2241*, with the following additional requirements or exceptions:

Size(s): This specification shall cover restrained joint PVC pipe in 4, 6, 8 and 12-inch diameters.

Pressure Class: Pipe shall be SDR21 200psi rated for 4"-8" and SDR26 100 psi rated for 12" per manufactured in accordance with *ASTM D2241*.

Material:
PVC Pipe materials shall be made from class 12454 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 *ASTM D2837*, pipe locking splines are completely non-metallic.

Specification: Only to be used manhole to manhole.
Joint Type. Pipe joints shall be non-metallic restrained joint design by utilizing precision-machined grooves on the pipe and in the coupling. When aligned, a nylon spline is inserted, resulting in a fully circumferential restrained joint that locks the pipe and coupling together. A flexible elastomeric seal (o-ring) in the coupling provides a hydraulic pressure seal. Elastomeric Gaskets shall conform to *ASTM F477*.

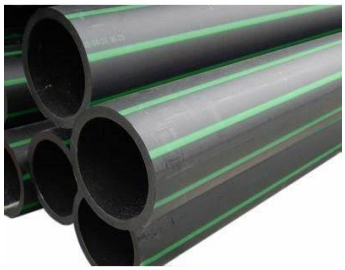
Pipe Length. Each length of pipe will be a standard laying length of 10 or 20 feet. Random lengths shall not be acceptable, unless approved by the Inspector.

Nominal Pipe Size (In.)	SDR	Outside Dia. (In.)	Inside Dia. (In.)
4"	21	4.50	3.824
6"	21	6.625	5.608
8"	21	8.625	7.303
12"	26	12.75	11.468

Color. Green

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.

4.2.B.4 High Density Polyethylene Pipe (HDPE)



Approved Manufacturers:

- **CPChem™ – Performance Pipe** – Driscoplex™ 4000
- **WL Plastics Corporation**
- **Pipeline Plastics, LLC**
- **Dura-Line , Inc**. – PolyPipe
- **+GF+ 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 DR11 HDPE pipe in 4, 6, 8, 12, 18, 20, 24, 30 and 36 inch nominal diameter with ductile iron pipe size (DIPS) equivalent outside diameters.

Pressure Class: All HDPE pipe shall be DIPS DR11 PE4710.
Note: DR-11 HDPE pipe is to be used only to a maximum Working Pressure of 160 psi in the Colorado Springs Wastewater 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.

Specification: 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 wastewater applications. The manufacturer shall certify that the materials. to manufacture pipe and fittings meet these requirements. 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, electrofusion, 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.

CONTINUED ON NEXT PAGE

Pipe Dimensions. (Average) DR11 Matching DIPS Outside Diameters

Size of pipe	Nominal DIPS OD (in)	Minimum Wall (in)	Average ID (in)
4”	4.80	0.436	3.876
6”	6.90	0.627	5.571
8”	9.05	0.823	7.305
12”	13.20	1.200	10.656
18”	19.50	1.773	15.741
20”	21.60	1.964	17.436
24”	25.80	2.345	20.829
30”	32.00	2.909	25.833
36”	38.30	3.482	30.918

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. 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 Wastewater Collection System:

- Green for Wastewater

Preference is for the manufacturer to supply black pipe with the appropriate colored stripes, alternate option is to have the pipe identification information print line in printed in the appropriate reference color.

Note: Plain Black HDPE Pipe without color code markings may not be used in the Colorado Springs Wastewater Collection System.

4.2.B.5 Steel Pipe



Approved Manufacturer(s):

Vendor 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.

Approval: 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.

Specifications:
Protective Coatings. All steel pipe, fittings, and specials shall be prepared, primed, lined, coated, painted, or wrapped as hereinafter specified. (To be read in conjunction with CHAPTER 5 Wastewater Construction)

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 mil. Primer shall be Tnemec 37 Chem Prime 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.

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.

4.2.C Casing Pipe, Spacers and End Seals

4.2.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	0.250
16	0.312
22	0.375
24	0.500
30	0.500
36	0.625
42	0.625

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.

4.2.C.2Metallic Casing Spacers (Insulators)

Approved Manufacturer(s):



- **Garlock Sealing Technologies**
- **PSI Pipeline Seal and Insulator, Inc.**
- **Advance Products and Systems, Inc.**
- **PowerSeal Pipeline Products Corporation**
- **CCI Pipeline Systems**
- **BWM Company**
- **Cascade Waterworks Mfg. Co.**

General: Casing spacers center Wastewater 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
Specification:
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
Specification:
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

4.2.C.3Non-Metallic Casing Spacers (Insulators)

Approved Manufacturer(s):



- **Garlock Sealing Technologies**
  PSI 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.

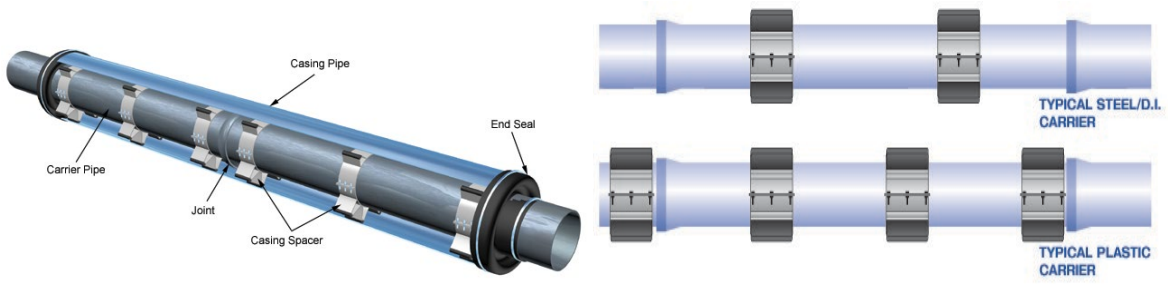
Specification:
The casing spacer polymer shall contain ultraviolet inhibitors and shall have a minimum compressive strength of 3,000 psi, an 800 volts/mil dielectric strength and impact strength of 1.5 ft.-lbs. /inch. Each casing spacer shall have full length, integrally molded skids extending beyond 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 C2-4.



4.2.C.4End Seals



Approved Manufacturers:

- **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 a thick synthetic rubber end seals.

Size(s):
Shall be designed for carrier-casing combination.

Material:
1/8" thick seamless synthetic rubber end seals.

Specification:
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:

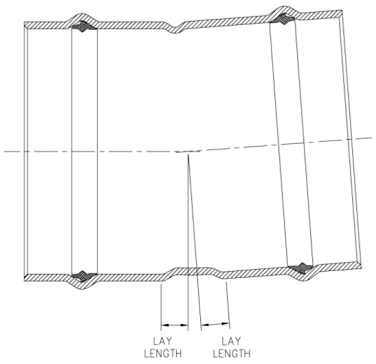
- Prepare outside surfaces by removing dirt from casing and carrier pipe.
- After carrier pipe is inserted into casing, slide small end of end seal over the carrier pipe with stainless steel banding clamp. Large end should face casing.
- Position large end of end seal over the casing pipe.
- Position 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.)

4.2.D Wastewater Main Fittings

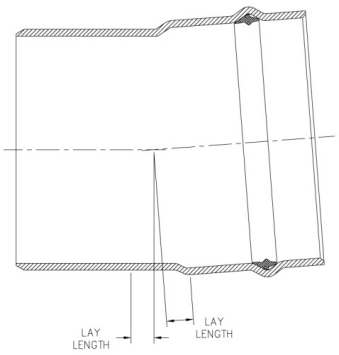
4.2.D.1 SDR 35 PVC 3 Degree Bends

Approved Manufacturers:

- **Multi Fittings**
- **HARCO**



PVC 3 Degree Bend Coupling



PVC 3 Degree Bend Spigot X Bell

General: 3 Degree bends are used to achieve gradual deflections in curvature when placing SDR 35 PVC pipe. Each coupling is manufactured with a deflection of 3 degrees.

Size(s): 6, 8, 12, 18-inch

Material(s): PVC Pipe materials shall be made from class 12454 or 12364 virgin compounds as defined in *ASTM D1784.*

Pressure Class: SDR35

Specification: 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 D3212* or *ASTM F477*.

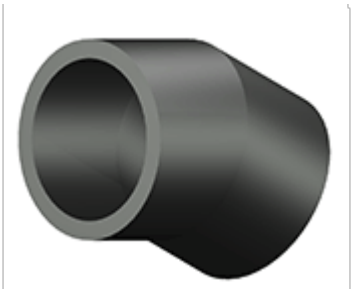
4.2.D.2 High Density Polyethylene (HDPE) Pipe Fittings:

Approved Manufacturers:

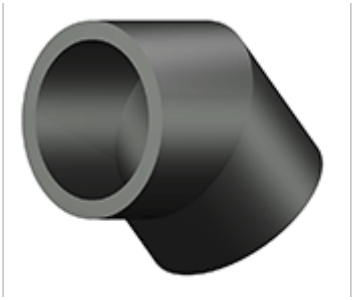
- **Plasson USA**
- **ISCO Industries, Inc.**
- **George Fischer Central Plastics, LLC Company**
- **Secor, Inc.**

HDPE Elbows

22-1/2°



45 °



Electrofusion



Currently, HDPE electrofusion fittings are allowed for use in the Colorado Springs Utilities Wastewater Collection System.

Wall Anchors



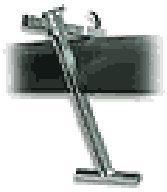
Wall anchors shall be manufactured according to *AWWA C906* with the PE 4710 cell classification and shall be manufactured as one piece, compatible to the HDPE pipe being placed and shall be rated for internal pressure service at least equal to the full-service pressure rating of the mating pipe. The HDPE wall anchor shall be fused to the pipe and supported to allow for the placement of a concrete reverse anchors (CRA).

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): 6, 8, 12, 18, 20, 24, 30, and 36-inch DIPS, fittings upon Colorado Springs Utilities approval.

Pressure Class: Fittings shall be DIPS DR11 PE4710 200 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.

Specification(s): 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:

- Manufacturers name or trademark
- Fitting description
- Material designations (DIPS DR11 PE4710)
- All applicable standards designations
- Date of manufacture
- Fitting size

A. 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.

B. Molded HDPE Fittings. Molded fittings shall be manufactured and tested in accordance with *ASTM D 3261, AWWA C906* and shall be so marked.

C. 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 DR11 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 Specification additional costs will be incurred for the additional material, manufacturing, and freight costs.

D. Fittings shall be butt fused to the HDPE pipe unless otherwise stated.

4.2.D.3 Flange Gaskets





Approved Manufacturers:

- **Specification Rubber Products**
  EPDM Flat Gasket
- **Garlock**
  3000 Series

General: Full faced gaskets are used to seal metal flanges together.

Specification: All gaskets shall 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.
- 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.

4.2.D.4 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): 3-inch up to 36-inch Diameter Ductile Iron Pipe (DIP) and 6, 8, and 12-inch Diameter PVC Pipe.

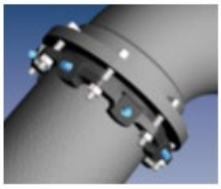
Pressure Class: Mechanical pipe joint restraint devices shall have minimum Working Pressures not less than the Working Pressure ratings of the pipe.

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 Manufacturers:

a) Ductile Iron Pipe MJ Restraint



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”)

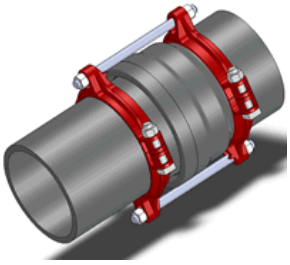


SIP Industries
EZ Grip
(3”-24”)

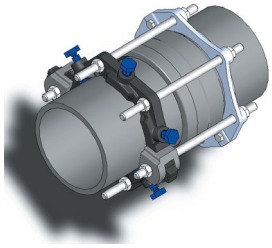
b) DIP Slip Joint Restraint



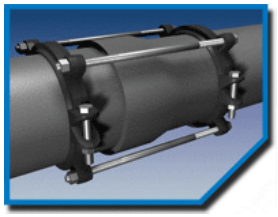
Ford Meter Box
Company
Series 1450 Series
for DIP
(3”-36”)



Sigma
PV- Lok series PWP
for DIP
(4”-12”)

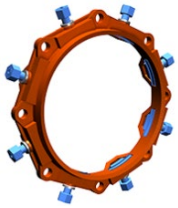


Sigma
One Lok Series SLDEH
for DIP
(3” – 8” @ 350 psi, 10”-
16” @ 300 psi,
18” – 36” @ 200 psi)



EBAA Iron, Inc.
Megalug, Series 1500TD
for Joint Restraints
for DIP
(4”- 12”)

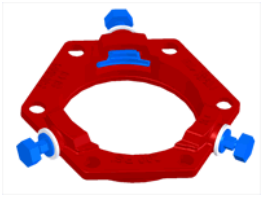
c) PVC MJ Restraint



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”)

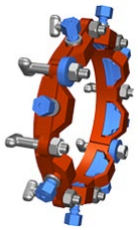
d) PVC Slip Joint Restraint

Slip joint restraints are not allowed on PVC within Colorado Springs Utilities' Wastewater Collection System. See restrained joint PVC in Section 4.2.B.3g).

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

4.2.D.5 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*.

Specification: 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*.

4.2.D.6 Mechanical Coupling(s)

Flexible Shielded Repair Couplings





Approved Manufacturer(s):
Fernco – RC Series 1000 or 5000
Mission Rubber – Flex Seal
GripperGasket – Maxadaptor Coupling

General: Coupling must be of an elastomeric PVC or EPDM gasket incorporating a corrosion resistant shear ring, tension bands, and tightening mechanism. Used to repair Clay, Cast Iron, PVC, Asbestos Cement, Ductile Iron, Cement pipes on a non-pressure system only.

Size(s): 4" thru 24" Couplings will vary depending upon pipe materials that it is attaching to

Material: flexible gasket PVC or EPDM material and Stainless Steel

Specification: Coupling flexible gasket material shall be manufactured in accordance with *ASTM C1173*. The Stainless Steel Band shall be in accordance with *ASTM A240*. The correct coupling must be used according to size and types of pipe that it is being applied to. A concrete collar must be poured to keep the coupling in place.

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 Standard Length



JCM
Style 242
3-16 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

Reducing Coupling(s)



Romac
Style RC501
3- 24 Inch



Romac
Style RC400
12-Inch and larger

Dismantling Joint



Romac
Style DJ405
Class E Flange
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. Mechanical couplings are primarily used in Lift Station and pressure pipe applications, or point repair on DIP, C900 PVC.

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
Insulating Coupling		
Dresser Style 39	4-14	300
Romac IC 501	4-14	260
Transition Coupling		
Romac XR501	4-12	260
Reducing Coupling		
Romac RC501	3-24	260
Romac RC400	12-96	500
Dismantling Joint		
Romac DJ405	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.

4.2.E Wastewater Valves

4.2.E.1 Wastewater Check Valves:

Approved Manufacturer(s):

- **Dezurik**
- **Mueller**





General: Check valves along a force main shall be utilized to stop the reversal of flow in the event of a change in pressure in the main.

Sizes: 2” through 12”

Material: Ductile Iron according to *ASTM A536* or Cast Iron according to *ASTM A126* Class B

Specification: Valve Body and disc shall be manufactured and tested in accordance with *ASTM A536/A126* and *AWWA C508*, with ANSI Class 125 Flanges, and is 150 psi rated, single seated, cushioned swing check with outside lever and weight or spring-loaded with position indicator, bronze seat capable of closing drip tight when pressure reversal occurs. Prefer Green or Gray color.

4.2.E.2 Eccentric Plug Valves:





Approved Manufacturer(s):

- **Dezurik**
- **Mueller/Pratt**
- **Val-Matic**

General: Eccentric plug valves along the force main shall be suitable for water or Wastewater service.

Sizes: 3” through 12”

Material: Ductile Iron in accordance with *ASTM A536* or Cast Iron in accordance with *ASTM A126 Class B*

Specification: Valve Body and plug shall be manufactured and tested in accordance with *ASTM A536/A126* and *AWWA C517/C111*, with *ANSI B16.1 Class 125* Flanges, and is 150 psi rated, resilient seated, bidirectional, capable of closing bubble tight.

- Open left (counterclockwise)

4.2.E.3 Air and Vacuum Valves



Approved Manufacturer(s):

- **A.R.I.**
  Combination Air Valve
  Series D-025 or D-026

- **A.R.I.**
  Air Release Valve
  Series S-020 or S-025

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.

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. Orifice sealing shall be affected by the face of the control float seating against the valve body. 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 six-inch (6”) valve shall have a six-inch (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 or flanged end connections.

4.2.E.4 Stainless Steel Ball Valve



Approved Manufacturer: Merit – V-108

General: Stainless steel ball valve for isolating an air vacuum valve.

Size(s): 2”

Material: 316 Stainless Steel body

Specification: Valve Body shall be manufactured and tested in accordance with ASME/ANSI B16.34. Valve body, insert, and stem shall be 316 Stainless Steel with a minimum 304 Stainless Steel handle and Teflon seat ring. Valve shall have NPT threaded connections and be rated for a minimum of 150 psi.

4.2.F 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 not have 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 A615*, 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.

4.2.G 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 Ladder UP safety post is to aid personnel to enter and exit a vault in a safe manner.

Materials: Steel

Specification: The existing ladder must be structurally sound and securely anchored. Ladder UP 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 Ladder UP 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).

4.2.H Manholes

4.2.H.1 Manhole

Approved Manufacturer(s):

- **Lindsay Precast**



General. All Manholes shall have a minimum 4" wall thickness, consist of a base, barrel section and cone with ring and lid. Barrel sections and adjustment rings may be added as needed. See Detail Drawing C3-1.

Size(s):

Manhole Diameter Size (in)
48
60
72

Materials: Cement materials used in the manufacture of manholes shall be per *ASTM C478*.

Specifications: All concrete shall have a minimum compressive strength of not less than 4000 PSI @ 28days, per *ASTM C478*, and H-20 load rated. Concrete shall be mechanically vibrated. Concrete shall not be dropped at a distance of more than 5 feet unless approved by Colorado Springs Utilities. ¾" crushed rock is required under the base of the manhole to a depth of 6 inches up to the spring line of the pipe and 2 to 3 feet radius around the base. See Detail Drawing C3-1.

Steps: Manhole steps shall be removed or cut flush with the wall of the manhole after Construction is completed. Manholes can be ordered from the precast manufacturer with removable or no steps. Check with the Manufacturer on step removal process. All holes shall be grouted full and smooth with the inside manhole wall. When steps are cut off the remaining exposed rebar ends shall be sealed with a Rustoleum Enamel Paint and then grouted over smooth with the inside manhole wall.

4.2.H.2 Inside Drop Manhole Assembly



Approved Manufacturer(s):

- **Reliner**

General: Drop manhole assembly is a plastic composite collection device that facilitates the controlled drop of effluent into the main stream flow of a Wastewater manhole. The drop bowl permits easy inspection and cleaning without the need to enter the Structure.

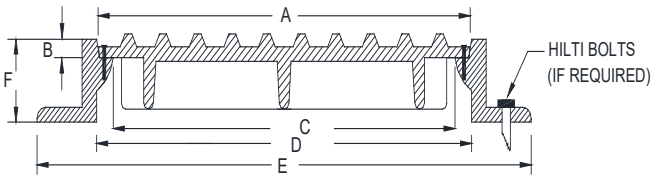
Specification: All new and/or existing manhole Structures employing inside drops shall be outfitted with inside drop components. The bowl size shall be determined by incoming pipe size and drop pipe shall be the same size as the incoming pipe. The bowl shall be installed as per manufacturer's instructions using stainless steel fasteners. The appropriately sized drop pipe of SDR 35 PVC, Schedule 40 or other shall be securely attached to the manhole wall using stainless steel adjustable clamping brackets and stainless-steel fasteners. Bracket interval shall be 4 feet maximum (minimum of 2 brackets). The connection of the drop bowl to drop pipe shall be by flexible external pipe coupler. The turn-out at the base end of the drop pipe shall be accomplished with an appropriately angled PVC pipe elbow. An optional cover on the Drop Manhole assembly may be used. See Detail Drawing C3-6.

4.2.I Manhole Ring and Covers

4.2.I.1 Standard Manhole Ring and Covers

Approved Manufacturer(s):





Manufacturer and Model	A	B	C	D	E	F
D & L 1071 (A1161 Lid)	24	1-1/16	22-1/4	24-3/4	31-5/8	4-1/4
Deeter 1256	24	1	22-5/16	24	32	4
Neenah 1585	24	1-1/2	22	24	31-3/4	4-1/2

General: All twenty-four (24") inch manhole ring and covers shall be heavy duty and manufactured to meet HS-20 traffic load conditions and have a minimum inside ring clearance of twenty-one (21") inches. Detail Drawing C3-9.

Material: All ring and covers shall be cast iron, manufactured according to *ASTM A48*, Class 35B for gray iron, or better.

Specification: All manhole assemblies shall be stamped with the name and model identification of the Manufacturer. The Cover shall be stamped with the word "WASTEWATER." The manhole lid shall be drilled with a one-half (1/2") inch hole six (6") inches off center to the right of the word "WASTEWATER", with a rubber plug inserted into the drilled hole to prevent infiltration. See Detail Drawing C3-9.

Depending on the location of the manhole (outside of pavement area), Colorado Springs Utilities will require "Self- Sealing" gaskets, or "Self-Sealing" gaskets with bolt down lids, using a secured locking device. See Detail Drawing C3-10 for bolt hole placement details.

4.2.I.2 Hinged Manhole Lid

Approved Manufacturer(s):



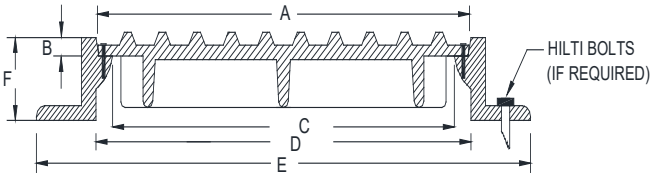
Neenah
R-1650-LM

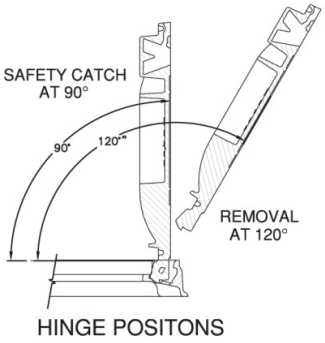


PAMREX-CertainTeed
CDPA60EHSSE



EJ Ergo Assembly
00104173L02





Manufacturer	A	B	C	D	E	F
Neenah	25-7/8	1-1/2	24-1/8	26-3/4	34	4
PAMREX	25	1-1/2	24	24-1/2	33-1/2	4
EJ	26	1-5/16	24	27-11/16	34	4

General: All hinged twenty-four (24") inch manhole ring and covers shall be gasketed, watertight, heavy duty and manufactured to meet HS-20 traffic load conditions and have a minimum inside ring clearance of twenty-one (21") inches. Detail Drawing C3-11.

Material: All ring and covers shall be cast iron, manufactured according to *ASTM A48 & A536*, Class 35B for gray iron, or better.

Specification: All manhole assemblies shall be stamped with the name and model identification of the Manufacturer. The Cover shall be stamped with the word "WASTEWATER." Lids shall include a Cam Lock bolt locking System or Locking D bolt. Detail Drawing C3-11.

4.2.I.3 Adjustment Rings





Approved Manufacturer:

- **Lindsay Precast** – Concrete
- **EJ Infra-riser** – Rubber composite ring
- **Ladtech, Inc.** – High density polyethylene

General: Adjustment rings are used to raise a manhole ring and cover to meet changes in grade.

Material: High Density Polyethylene and is to Manufactured to *AASHTO HS20* and *ASTM D4976* or Rubber composite.

Size(s): 24-inch ID ring for Wastewater Manholes

Common Sizes	
1-1/4 inch x 24 inch	Flat
1-1/2 inch x 24 inch	Flat
2 inch x 24 inch	Flat
4 inch x 24 inch	Flat
3/4inch x 1-1/2 inch x 24 inch	Slope

Additional sizes available and can be used as needed with Inspector approval

Specification: In lieu of round concrete rings, all castings may be raised using round injection molded-recycled HDPE or Rubber Composite rings. The adjustment rings shall be manufactured from polyethylene plastic as in *ASTM D4976*. The adjustment rings shall be tested to assure compliance with impact and loading requirements per the *AASHTO* Standard Specification for Highway Bridges. Installation shall be per manufacturer's recommendations only. The annular space between the rings and cone basin, the rings, and the rings and cover frame shall be sealed utilizing an approved butyl sealant. All adjustments for matching road grade shall be made utilizing a molded and indexed slope ring.

4.2.I.4 Pavement Riser Ring Cast or Steel - 24” with Set Screws



Approved Manufacturer:

- **EJ** – CI 2490H
- **Castings Inc.** – CI MHERCI
- **American Highway Products** – Steel Solid Type 2
- **Sigma** – CI MH2401(2,3,4) DSS-35

General: This product applies to adjustments of Sanitary Sewer Manhole rings and covers after milling and during paving within streets where the Colorado Springs Wastewater Collection System is located. To be used only with approval of Colorado Springs Utilities.

Material: Class 35B Cast made to *ASTM A48* or Steel.

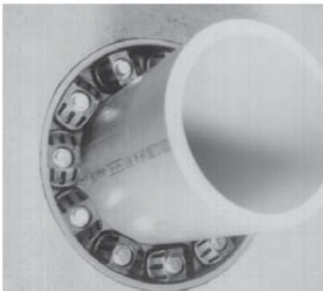
Size(s): 24-inch ID ring for Wastewater Manholes.

Riser Ring Height to accommodate Pavement lift and a 24” Manhole Lid
1 inch
1-1/2 inch
2 inch
2-1/2 inch
3 inch

Specification: The Riser Rings shall be manufactured from cast iron as in *ASTM A48 Class 35B,* or Steel. The ring shall be tested to assure compliance with impact and loading requirements per the *AASHTO* Standard Specification for Highway and Bridges. Installation shall be per manufacturer's recommendations only. Each ring shall have a minimum of 3 set screws that are a minimum of 3/8 inch in size, Riser Ring shall accommodate a 24” Wastewater Manhole Lid, The riser ring shall not exceed 3 inches in height and only one riser ring is allowed per ring and cover.

4.2.J Manhole Pipe Seals





Approved Manufacturer(s):

- **Press-Seal Gasket Corp** – PSX Direct Drive
- **Trelleborg-NPC** – Kor-N-Seal 1 & 2
- **Link-Seal** – HDPE Thermoplastic Model CS with EPDM seal

General: Manhole seals are for sealing the space between the manhole and the Wastewater Main.

Material: Nitrile, EPDM, HDPE, or polyisoprene Rubber. Series 300 Stainless Steel.

Size(s): To be determined by the Design Engineer.

Specification: Synthetic Flexible Rubber with series 300 stainless steel expansion and tightening rings and bolts. Seals are to be watertight and manufactured and tested to ASTM C923/ D412/ ASTM D624, method B, D1171/D746 and D573.

4.2.K Tracer Wire



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 installations for location of the pipe for future Construction.

Wire insulation will be colored **green** for Wastewater in accordance with the *American Public Works Association (APWA) uniform color code* to signify a Wastewater application. 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 dead end. See 4.2.K.3 Grounding Rods and 4.2.M.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.



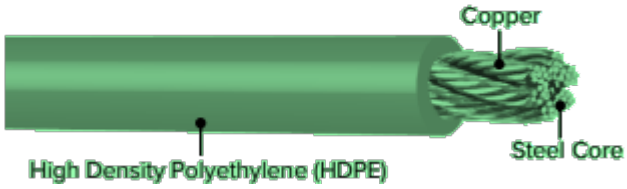
Boring Applications

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 mill 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.



4.2.K.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

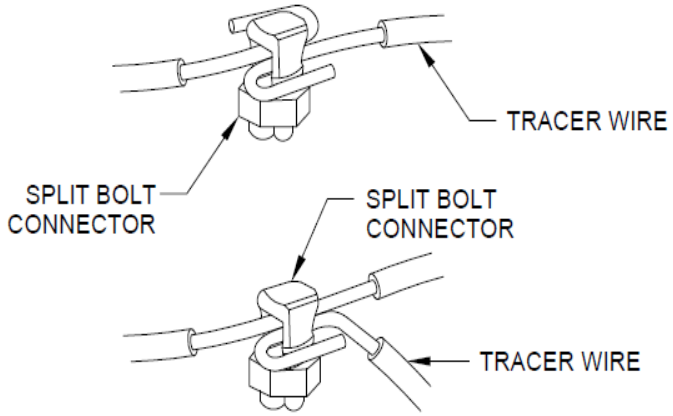


Split Bolt
Approved Manufacturer(s): Burndy

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: 8-14 AWG wire, 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 4.2.K.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.

CONTINUED ON NEXT PAGE



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
Sealant: Dielectric Silicone Gel
Wire Range:
#8 - 1/0 (.363" - .625" O.D.)
#12 - #4 (.305" - .443" O.D.)
Amperage not to exceed maximum temperature of the conductor

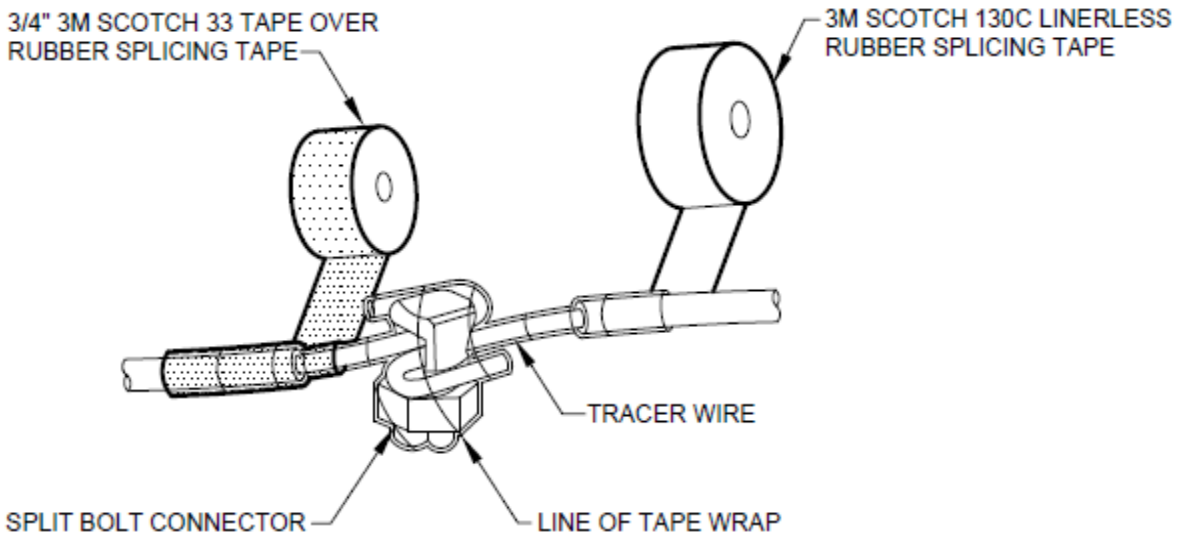
B. Direct Bury Lug with Housing



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
Sealant: Dielectric Silicone Gel
Wire Range:
#14-6 Stranded copper - (.124" - .408" O.D.)
#14-10 Steel core tracer wire - (.124" - .408" O.D.)
Amperage not to exceed maximum temperature of the conductor

4.2.K.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.

4.2.K.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.

4.2.L Marking Tape

Trench Marking Tape (Green for Wastewater)



Wastewater Trench Marking Tape may be used when directed by Colorado Springs Utilities.

General: Marking tape is utilized in trenches as additional cautionary measure for buried Wastewater lines. Trench marking tape can be used when Wastewater pipe has minimal green color markings.

Specifications: Marking tape shall be non-traceable, poly-vinyl, 3 to 6 inches in width.
The Wastewater marking tape shall be green and shall be printed with “Caution Buried Sewer Line Below” or “Caution Buried Colorado Springs Wastewater Line Below.”

Installation: One tape shall be laid in place over the indicated length of the Wastewater 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.

4.2.M Cathodic Protection

4.2.M.1 Coatings and Wraps



Approved Manufacturer(s): N/A- Must meet Specifications V-Bio with corrosion prevention additive layer

Polyethylene Encasement Material.

General: Polyethylene encasement (Low Density AWWA Polywrap) is used to deter corrosion on metal pipe and fittings.

Specification: 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.

4.2.M.2 Wax Tape

Approved Manufacturer:

Trenton:
Wax Tape Primer Brown
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 belowground 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.

4.2.M.3 High Potential Magnesium Anodes

Approved Manufacturer(s): N/A



General:
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. See Section 4.2.K

4.2.M.4 Zinc End Cap



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.

4.2.M.5 Test Stations

a) 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 bonding’s
- Caps come in green for Wastewater, green for wastewater and will be printed in white letters and shall be the same as the graphics in material specification 346-100-031. Contact the Wastewater 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.

b) Ground Level CP Test Station (Non-Roadway)

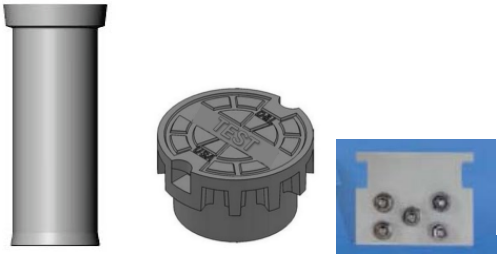
Approved Manufacturer(s): Bingham and Taylor P525



General: The Wastewater CP Test Station may not be used in roadways or street pavement. Each 5-1/4 inch lid shall be painted Green and shall have "Wastewater 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.

c) 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 Green and the text "Wastewater 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.

4.2.N Controlled Low Strength Materials (CLSM) (a.k.a Flow Fill/Flash fill)

General: 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.

4.3 Wastewater Service Lines

4.3.A Wastewater Service Tapping Saddles

4.3.A.1 PVC Tapping Saddle



Approved Manufacturer(s):

GPK Products, INC.
Multi Fittings Co.
IPEX USA LLC
Plastic Trends by Royal Building Products

General: All saddle connections must have an internal locating/centering ring to insert into drilled hole, see Detail Drawing D1-6.

Size: 4 and 6 inch outlet only

Material: SDR 35 injection molded sewer fittings shall be manufactured in accordance with *ASTM D3034,* and *ASTM F1336*. They shall be constructed from virgin PVC compound having a cell classification of 12454 or 13343 as defined in *ASTM D1784*. SDR 35 Sewer fittings shall be molded to fit 4" through 12" SDR 35 PVC Wastewater Mains for a 4" or 6" Wastewater service connection. Injection molded fittings shall have a minimum skirt of 80 square inches.

SDR 35 fabricated sewer fittings shall be manufactured in accordance with *ASTM D3034, ASTM F1336,* and *ASTM F679.* They shall be constructed from virgin PVC compound having a cell classification of 12454, 13343, or 12364 as defined in *ASTM D1784*. SDR 35 fabricated sewer fittings shall fit 4" through 36" SDR 35 PVC Wastewater Mains for a 4" or 6" Wastewater service connection. Fabricated saddle tees shall have a minimum skirt of 160 square inches.

Stainless steel bands shall be 300 series, full 9/16" width band with a cadmium plated carbon steel 5/16" shouldered hex head slotted screw.

Specification: SDR 35 sewer fittings shall be listed by the *National Sanitation Foundation (NSF)* or by the *International Association of Plumbing and Municipal Officials (IAPMO)* to meet *ASTM D 3034.*

SDR 35 sewer fitting shall be connected to the main with a gasket. Gaskets shall be manufactured in accordance with *ASTM F 477* or *ASTM F 913*. Gaskets shall be firmly seated in fitting in order to ensure proper installation and to prevent dislocation or misalignment during system assembly. Gasket joints must comply with *ASTM D 3212* Internal Pressure Test (exfiltration) and Vacuum Test (infiltration) at 5 degrees of gasket joint deflection.

Installation: The size of the drilled hole into the Wastewater Main shall be 4 ½" for a 4" service and 6 ½" for a 6" service. The saddle shall be installed with the centering ring residing flush to the inner wall of the Wastewater Main per NASSCO regulations.

All new Wastewater services to be connected to an existing or proposed SDR 35 Wastewater Main, 4 inch through 12 inch diameter, shall be made with an SDR 35 injection molded sewer fitting. SDR 35 sewer fittings shall be connected to the Wastewater Main with 300 series stainless steel bands, full 9/16” width with a cadium plated carbon steel and 5/16” shouldered hex head slotted screw.

Taps on a VCP or truss pipe Wastewater Main 4 inch through 12 inch in diameter shall be made with an SDR 35 fabricated sewer fitting with a minimum skirt of 160 square inches. SDR 35 fittings to be used on VCP or Truss shall be upsized one size from the diameter of the VCP or Truss Wastewater Main. SDR 35 fittings may be attached to VCP with a 2-part epoxy rated for use on VCP and PVC in addition to stainless steel bands.

4.3.A.2 Rubber Tapping Saddle

Approved Manufacturer(s):

Mission Rubber Company LLC



General: Saddle Taps may be an EPDM rubber gasket with locating/centering ring with corrosion resistant Series 300 austenitic stainless steel apron fastened with 300 series stainless steel bands, full 9/16” width band with a cadium plated carbon steel 5/16” shouldered hex head slotted screw.

Taps on DIP or C900 Wastewater Mains, 4 inch through 12 inch in diameter may be accomplished with a rubber gasket saddle tap.

4.3.A.3Three Piece Tapping Service Connection

Approved Manufacturer(s):

- **ADS -INSERTA Fitting Co.**



By Colorado Springs Utilities approval only

General: A three piece service connection may be utilized on DIP or C900 Wastewater Mains, and only with Colorado Springs Utilties Approval.

Size: 4" and 6" only

Material: SDR 26 injection molded sewer fittings shall be manufactured in accordance with *ASTM D3034*
Rubber seal manufactured to *ASTM F477*

Specification: A three piece service connection may be made utilizing a SDR 26 PVC hub to accommodate a SDR35 service line pipe and is manufactured in accordance with *ASTM D3034*, the rubber gasket shall be manufactured in accordance with *ASTM F477* and include a series 300 Stainless Steel band, screw, and housing. If a different service line pipe material is to be used then the Contractor must be sure to order the correct hub to accommodate the service line pipe.

Installation: Three piece service connections must be ordered for type of pipe being tapped and size. Also, the hub of the service connection is dependent upon the type of service line pipe being inserted into it.

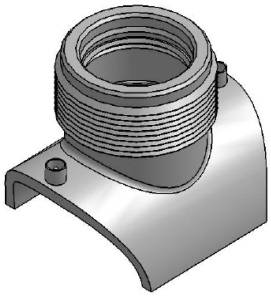
Caution must be used to not over insert the three piece service connection into the Wastewater Main.

A concrete collar may be required to stabilize the rubber gasket saddle tap or three piece service connections at the discretion of the Inspector. All taps must be appropriately sized to match the Wastewater Main outer diameter and material. Top taps may be required.

4.3.A.4HDPE Electrofusion (EF) Tapping Saddle:

Approved Manufacturer(s):

- **Plasson USA**
- **Georg Fischer Central Plastics**



EF Saddle, 4” outlet with PSM Gasket for SDR35 or Schedule 40 PVC pipe



EF Saddle, 6” outlet with PSM Gasket for SDR35 or Schedule 40 PVC pipe



EF Saddle, 6” Flexible outlet electrofused to HDPE service line pipe

General: Electrofusion (EF) tap saddles shall be molded from HDPE materials

Size(s): DIPS HDPE Saddle for tapping 8 or 12 HDPE DIPS pipe with a 4 or 6 inch outlet

Pressure Class: Fittings shall be DIPS DR11 PE4710 200 psi Working Pressure rated and shall be electrofused to the HDPE pipe.

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*. The manufacturer shall certify that the materials used to manufacturer pipe and fittings meet these requirements.

Specification(s): All tap saddles shall have a PSM gasket for the insertion of SDR 35 or Schedule 40 PVC pipe.

All electrofusion must be done in accordance to manufacturer instructions. HDPE fittings shall be manufactured in accordance with the current version of: *AWWA C906, ASTM F714, D3350, D4976, and D3261.*

Marking: HDPE Fittings shall be marked on the pipe either with a tag or imprinted with the following information: Manufacturers name or trademark, fitting description, material designations (DIPS DR11 PE4710), all applicable standards designations, date of manufacture, and fitting size.

A. 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.
B. Molded HDPE Fittings. Molded fittings shall be manufactured and tested in accordance with *ASTM D 3261, AWWA C906 and D3350* and shall be so marked.

Installation: Fittings shall be electrofused to the HDPE pipe per manufacturer recommendations unless otherwise stated. Care shall be taken when tapping the HDPE pipe once the electrofusion tap saddle is in place. A smaller hole saw may be required to accommodate the opening within the tap saddle to tap the Wastewater Main. The Contractor shall take care to avoid damage to the gasket within the saddle.

4.3.B Wastewater Service Line Pipe

4.3.B.1 SDR 35 PVC

See SDR 35 PVC information listed in the Wastewater Main Section 4.2.B.3b)

4.3.B.2 Schedule 40 PVC - Solid Wall



Approved Manufacturer(s): N/A

General: Schedule 40 PVC must be solid wall ASTM D1785 for joint trench applications

Material: PVC

Specification: Pipe shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 as identified in *ASTM D1784*. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to *ASTM D1785* and *ASTM D2665*.

Nominal Pipe Size (in.)	Outside Dia. (in.)	Inside Dia. (in.)
3 [a]	3.50	3.284
4	4.50	4.263
6	6.625	6.345

[a] 3" size is only approved when building sewer branches from existing building drain. See Detail Drawings D1-14and D1-15. 3" size WILL NOT be approved for any other application.

Installation: Installation shall conform to all applicable plumbing, fire, and building code requirements. Buried pipe shall be installed in accordance with ASTM D2321 and ASTM F1668. Solvent cement joints shall be made in a two-step process with primer conforming to ASTM F656 and solvent cement conforming to ASTM D2564.

4.3.B.3 Schedule 40 PVC - Cellular (Foam Core) Pipe



Approved Manufacturer(s): N/A

General: Schedule 40 cell core PVC must be manufactured to *ASTM D1784*. Schedule 40 cell core shall not be used in a joint trench application or when the service line grades are less than 2.08%.

Size: 4 and 6 inch only

Material: PVC

Specification: Pipe shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 11432 as identified in *ASTM D4396*. Fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 as identified in *ASTM D1784*.

PVC cellular core pipe shall be Iron Pipe Size (IPS) conforming to *ASTM F891*.

Nominal Pipe Size (In.)	Outside Dia. (In.)	Inside Dia. (In.)
3 [a]	3.50	3.284
4	4.50	4.263
6	6.625	6.345

[a] 3" size is only approved when building sewer branches from existing building drain. See Detail Drawings D1-14 and D1-15. 3" size WILL NOT be approved for any other application.

Installation: Installation shall conform to all applicable plumbing, fire, and building code requirements. Buried pipe shall be installed in accordance with ASTM D2321 and ASTM F1668. Solvent cement joints shall be made in a two-step process with primer conforming to ASTM F656 and solvent cement conforming to ASTM D2564.

4.3.B.4 HDPE Wastewater Service Line Pipe or Pressurized Wastewater Main



Approved Manufacturer(s):

- **CPChem™ Performance Pipe** – Driscoplex™ 4000 Piping for Wastewater Collection and Transmission
- **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 DR11 HDPE pipe in 4 and 6 inch nominal diameter with iron pipe size (IPS) equivalent outside diameters. IPS HDPE is allowed for Wastewater Service Lines only.

Pressure Class: HDPE service line pipe shall be IPS DR11 PE4710.

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.

Specification: 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 Wastewater applications. The manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements. 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, electrofusion.

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) DR11 Matching IPS Outside Diameters

Size of pipe	Nominal IPS OD (in)	Minimum Wall (in)	Average ID (in)
4”	4.50	0.436	3.633
6”	6.625	0.0767	5.348

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. 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 Wastewater Collection System:

- Green for Wastewater

Preference is for the manufacturer to supply black pipe with the appropriate colored stripes, alternate option is to have the pipe identification information print line in printed in the appropriate reference color.

Note: Plain Black HDPE Pipe without color code markings may not be used in the Colorado Springs Wastewater Collection System.

4.3.C Wastewater Service Line Fittings

4.3.C.1 SDR 35 and Schedule 40 PVC Service Line and Cleanout Fittings

General: PVC Service Line fittings are used to construct PVC Service Lines and cleanout assemblies. Fittings may be solvent welded or gasketed. Cleanouts are generally solvent welded together.

Size(s): 4 or 6 Inch

Material: SDR 35 or Schedule 40 PVC

Specification: SDR 35 injection molded sewer fittings shall be manufactured in accordance with *ASTM D3034,* and *ASTM F1336.* They shall be constructed from virgin PVC compound having a cell classification of 12454 or 13343 as defined in *ASTM D1784*. Gaskets shall be manufactured in accordance with *ASTM F477* or *ASTM F913* and shall comply with *ASTM D3212* pressure testing.

6" Solvent Weld SDR35 fittings must comply with *ASTM D2665*.

Schedule 40 Solvent Weld fittings shall be in compliance to *ASTM F1866* and *D2665*.

Clean outs: The clean out shall be the same size as the host pipe (i.e., 4 inch Wastewater Service Line requires a 4 inch clean-out). All clean outs shall be constructed with standard fittings and have a screw cap located at the ground or paving surface. Reference Wastewater Construction detail D1-4, Typical Wastewater Service Clean Out Detail and Section 2.6.E).

a) SDR 35 Gasketed Fittings



SDR 35 Street 45° Bend



SDR 35 Gasketed 45° Bend



SDR 35 Gasketed Wye



SDR 35 Gasketed 3° Bend

b) SDR 35 or Schedule 40 Solvent Weld Fittings



Street 45° Bend



22-1/2° Bend



Hub Coupling



Wye



Schedule 40 to SDR 35 Hub



Wye with Street 45° Bend for Cleanout

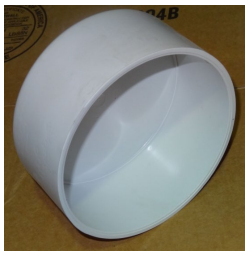
c) SDR 35 or Schedule 40 Caps



Threaded Top



Screw in Cap



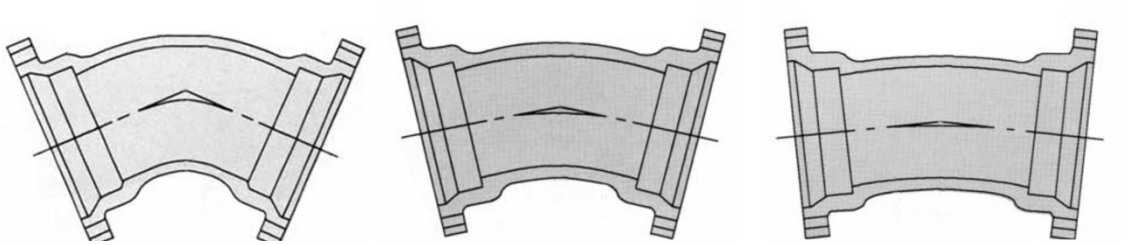
End Cap

4.3.C.2Ductile and Gray Iron Waterworks Fittings

Approved Manufacturers:

- **Tyler Union**
- **Star**
- **Sigma**
- **SIP**

Bends
MJ and MJ
45° **22.5°** **11.25°**



General: Ductile and gray iron fittings are used to make connections, change angles, make reductions, and secure pipes in piping systems.

Size(s): This specification shall cover ductile iron fittings in 4, 6 inch nominal diameters.

Pressure Class: All fittings 4" and 6"shall be rated to 350 psi Working Pressure and shall conform to the dimensions and weights shown in the tables of referenced in *AWWA* and *ANSI* Standards.

Material: All fittings shall be made from ductile or gray iron, which meet 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*.

Specification(s):
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*: *C-104, 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 specification.

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 where used shall be in accordance with *ANSI/AWWA C116/A21.16*.

4.3.C.3 Flexible Sewer and Transition Couplings



Approved Manufacturers:

- **Fernco Series –**
  1000 series or 5000 Shielded
- **Mission Rubber –**
  Sewer grade couplings or
  Flex Seal(Shielded)
- **Indiana Seal**
- **GripperGasket –**
  Maxadaptor Coupling

General: Flexible couplings allow seals on plastic, cast iron, Asbestos cement, clay, concrete, truss, steel, copper, and ductile iron. All couplings are clearly marked with part number, size, and pipe materials that the coupling will connect.

Size(s): Varies depending on pipe material the coupling is used on.

Material: Rubber sleeves conforming to *ASTM C425, ASTM C1173.*

Specification(s): All flexible rubber couplings shall be manufactured according to *ASTM C 425, ASTM C 1173,* and shall have Clamp Bands 316 Series stainless steel with nut and bolt or a worm drive take-up.

Shielded rubber couplings shall have a .012" thick, 300 Series stainless steel shear ring, Width manufactured according to coupling width (1.50", 2.13", or 4"), Length manufactured according to coupling diameter, 305 stainless steel clamp screw, clamps spot welded in place. Manufactured to *ASTM C1173 and D5926.*

Installation: All Flexible couplings with the exception of shielded couplings shall be reinforced with a concrete collar to keep the coupling in place once installed.

4.3.C.4 HDPE Electrofusion Couplings and Fittings:

Approved Manufacturer(s):

- **IPF-Plasson**
- **Georg Fischer-Central Plastics**



HDPE to HDPE Coupling



HDPE to PVC Coupling



HDPE Flex Restraint

General: Electrofusion Couplings shall be molded from HDPE materials

Size(s): HDPE DIPS DR11 coupling for like size HDPE DIPS DR11 pipe 4, 6, 8 inch pipe.

Pressure Class: Fittings shall be DIPS DR11 PE4710 200 psi Working Pressure rated and shall be electrofused to the HDPE pipe.

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*. The manufacturer shall certify that the materials used to manufacturer pipe and fittings meet these requirements.

Specification(s): All tap saddles shall have a PSM gasket for the insertion of SDR 35 or Schedule 40 PVC pipe.

All electrofusion must be done in accordance to manufacturer instructions. HDPE fittings shall be manufactured in accordance with the current version of: *AWWA C906, ASTM F714, D3350, D4976, and D3261.*

Marking: HDPE Fittings shall be marked on the pipe either with a tag or imprinted with the following information: Manufacturers name or trademark, fitting description, material designations (DIPS DR11 PE4710), all applicable standards designations, date of manufacture, and fitting size.

A. 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.
B. Molded HDPE Fittings. Molded fittings shall be manufactured and tested in accordance with *ASTM D 3261, AWWA C906 and D3350* and shall be so marked.
C. Fittings shall be electrofused to the HDPE pipe unless otherwise stated.

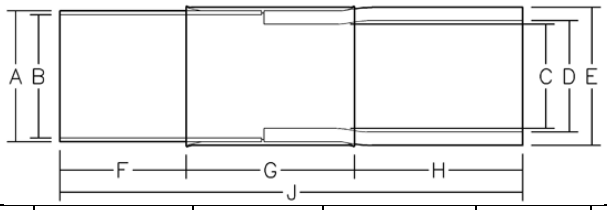
4.3.C.5 HDPE Butt Fusion Transitions to PVC Pipe:



Approved Manufacturer(s):
POLY-CAM 731 – HDPE to SDR 35 PVC
Or approved equal

General: The transition fitting is constructed out of PVC material, Epoxy coated Carbon Steel, HDPE PE3408 or PE4710 pipe. The PVC and HDPE materials are joined together by hydraulically pressing the HDPE pipe into the Epoxy coated carbon steel coupling. The coupling portion of the transition fitting is machined with a multi-level patented barb system that provides a leak free radial compressed joint. The HDPE and PVC portions of the transition fitting are cut to a specific length and is pressed into the coupling

Size(s): HDPE DIPS DR11 coupling for like size HDPE DIPS DR11 pipe 4 & 6 inch pipe to SDR 35 PVC.



Nominal Size	PVC, O.D. "A"	PVC I.D. "B"	DR11 HDPE MIN. I.D. "C"	DR11 HDPE I.D. "D"	HDPE, CS/SS O.D. "E"	PVC Length "F"	CS/SS Length "G"	HDPE Length "H"	Total Length "J"
4	4.22	3.975	APROX. 3.3	3.633	4.5	4.5	6	4.5	15
6	6.28	5.709	APROX. 5.0	5.349	6.625	6	8	8	22

Material: Carbon steel coupling, PVC SDR 35, HDPE DR11 PE3408 or PE4710.

Specification(s): Carbon steel coupling manufactured of *ASTM A53* grade carbon steel pipe. Epoxy coating (IF 194T Red Iron Oxide) is fusion bonded to the metal, complies with *NSF 61, FDA 175.300, AWWA C116-01, C213-01, UL 262* and *FM 1120/1130*, carbon steel epoxy POLY-CAM threaded transition fitting complies with *AWWA* and *NSF 61* material requirements. PVC SDR 35 conforms to *ASTM D-3034*, HDPE DR11 PE3408 or PE4710 according to *ASTM D3350*.

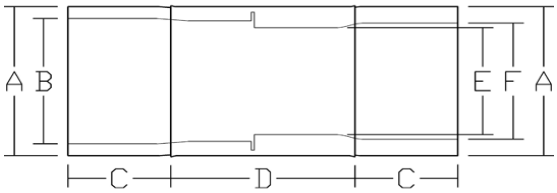
Installation: HDPE pipe end- Install transition fitting so as to comply with the pipe manufacturer's recommended procedures. All fusions shall be accomplished in accordance with PPI's fusion procedures for butt fusion or electrofusion. PVC coupling- Install the PVC coupling so as to comply with the pipe manufacturer's recommended procedures for solvent cement. Medium bodied, medium set multi-purpose cement designed for use on PVC pipe and fittings and meets *ASTM D2564*.



Poly-Cam 730 – HDPE to Schedule 40 PVC
Or approved equal

General: The transition fitting is constructed out of PVC material, Epoxy coated Carbon Steel, HDPE PE3408 or PE4710 pipe. The PVC and HDPE materials are joined together by hydraulically pressing the HDPE pipe into the Epoxy coated carbon steel coupling. The coupling portion of the transition fitting is machined with a multi-level patented barb system that provides a leak free radial compressed joint. The HDPE and PVC portions of the transition fitting are cut to a specific length and is pressed into the coupling

Size(s): HDPE DIPS DR11 coupling for like size HDPE DIPS DR11 pipe 4 & 6 inch pipe to Schedule 40 PVC.



Nominal Size	PVC, SS/CS, HDPE O.D. "A"	PVC I.D. "B"	PVC, HDPE Length "C"	Coupling Length "D"	Minimum I.D. "E"	HDPE I.D. "F"
4	4.5	3.786	5	6	APROX 3.3	3.633
6	6.625	5.709	9	8	APROX 5.0	5.349

Material: Carbon steel coupling, PVC Schedule 40, HDPE DR11 PE3408 or PE4710. Specification(s): Carbon steel coupling manufactured of *ASTM A53* grade carbon steel pipe. Epoxy coating (IF 194T Red Iron Oxide) is fusion bonded to the metal, complies with *NSF 61, FDA 175.300, AWWA C116-01, C213-01, UL 262* and *FM 1120/1130*, carbon steel epoxy POLY-CAM threaded transition fitting complies with *AWWA* and *NSF 61* material requirements. PVC Schedule 40 conforms to *ASTM D-1785/D1784*, HDPE DR11 PE3408 or PE4710 according to *ASTM D3350*.

Installation:
HDPE pipe end - Install transition fitting so as to comply with the pipe manufacturer's recommended procedures. All fusions shall be accomplished in accordance with PPI's fusion procedures for butt fusion or electrofusion.

PVC coupling - Install the PVC coupling so as to comply with the pipe manufacturer's recommended procedures for solvent cement. Medium bodied, medium set multi-purpose cement designed for use on PVC pipe and fittings and meets *ASTM D2564*.

4.3.C.6 Grey Iron Box for Clean Outs

Approved Manufacturer(s): N/A



Typical 4 Inch


Typical 6 inch

General: Cleanout Box is for use in Traffic areas to protect the PVC Cleanout assembly.
Size(s): Covers 4 and 6 inch cleanout assemblies, size varies depending upon Manufacturer

Material: Grey Iron CL 35B

Specification(s): Heavy Duty Grey Iron CL 35B manufactured to *ASTM A48, AASHTO M105 AND M306,* H20 load rating.

4.3.D Backwater (Backflow) Valve for Wastewater Service Lines.

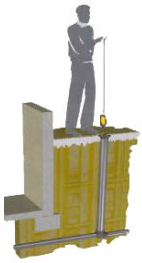
Approved Manufacturer(s):





- **Clean Check™, Inc.** – Extendable Backwater Valve
  4" PVC – 96924, 6"PVC- 96926





- **Canplas Inc** – Extendable Backwater Valve
  6" PVC- 223275W

General: Backwater Valve is direct buried and prevents sewage backup into a Premises, gate flapper is easily removed for cleaning or in the event the drains need to be snaked.

Size(s): 4 or 6 inch

Material: PVC

Specification(s): Backwater valve shall be in conformance with *ASME A112.14.1-03, UPC US 8.096.318, IAPMO* and *IPC.* Backwater valve has a body that is extendible to whatever depth required by gluing a riser of PVC pipe into the valve body and extending to ground level. The 6" valve uses an 8" diameter riser and the 4" valve uses a 6" diameter riser. The cut-to-size on site riser is to be capped with an air-tight cap.

Installation: Check manufacturer installation guidelines prior to installation for material and placement requirements.

4.3.E Wastewater Meter Flume

Approved Manufacturer(s): N/A

Palmer Bowlus Flume





General:
For measuring Wastewater in open channels or pipelines that are not under pressure.
Some of the Palmer Bowlus' most important characteristics include measurement accuracy, low head loss, minimum flow restriction, and ease of installation in pipelines. The Palmer Bowlus flumes are normally installed in a "U" shaped channel fed by a pipeline such as storm drains and sewers. This convenient flume requires little redesign or special modification of circular conduits for installation. The Palmer Bowlus flumes in channel liner are provided in a Size(s): one piece 4' x pipe diameter configuration in sizes up to 15 inches in diameter.

Palmer Bowlus Flume Accuracy:
The accuracy of the Palmer Bowlus flumes is comparable to that of Parshall or other types of Venturi flumes. Research indicates that within the normal range of flows (from under 10% to 90% of flume capacity), measured flow rate is usually within $\pm$ 3% of theoretical flow rate.

Flume Flow Data

Size (inches)	4	6	8	10	12	15
Max MGD	0.104	0.210	0.459	0.931	1.344	2.209
Max GPM	72.1	145.6	318.9	646.8	933.2	1534
Max CFS	0.161	0.324	0.711	1.441	2.079	3.418

4.3.F Plastic Grease Traps

Approved Manufacturer(s):

1. Schier Products - Great Basin (GB) Series





Hydromechanical Grease Interceptor		
Model	**Flow Rate (GPM)**	**Grease Storage (lbs.)**
GB-2	35-50	127-130
GB-3	50-75	175-272
GB-50	50-75	287-439
GB-75	75	861
GB-250	100-200	1,196-1,895
GB-500	100	3,048
GB-1000	100-200	4,959-5,495
GB-1500	100-200	9,446-10,061

2. Canplas - Endura XL



Endura XL Hydromechanical Grease Interceptor		
Model	**Liquid processing (GPM)**	**Grease Storage (lbs.)**
XL50	50	122
XL75	75	559
XL100	100	1,058
XL150	150	1,097

4.3.G Plastic Sand Oil Interceptors (Striem)

Approved Manufacturer(s): Striem





Striem Sand Oil Interceptors				
Sand Oil Interceptors		Striem Sand Oil Interceptors		
Liquid Holding Equivalent (Gallons)	**Model**	**Liquid processing (GPM)**	**Oil Storage (Gallon)**	**Sand Storage (Gallon)**
21	OS-25	25	5.25	6
57	OS-50	50	14.25	7
110	OS-75	75	27.5	11
250	OS-100	100	62.5	95
350	OS-350	100	87.5	114
562	OT-500	314	285	162
750	OT-750	314	323	295
1000	OT-1000	314	370	477
1500	OT-1500	314	488	825
2000	OT-2000	314	638	1077

4.4 Miscellaneous

4.4.A Pipeline Utility ID Post and Labels

Utility Marker Post:



Approved Manufacturer(s):

- **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: **Green** post and label for Wastewater lines.

4.4.B Post Labels:



General: Line markers are to be installed with Colorado Springs Utilities decal and telephone number.

Line marker post labels for Wastewater are available for pick-up from Colorado Springs Utilities LYSC warehouse.

4.5 Rehabilitation Materials

4.5.A Manhole Liners

General: Liners shall be applied to the wall, cone riser and bench as required by Colorado Springs Utilities based on the condition of the manhole. Liners shall be applied per the manufacturer's recommendations. Liners shall be epoxy and/or cementitious. Application of all lining products shall be by manufacturer-certified applicators.

4.5.A.1 Cementitious Lining:

Approved Manufacturer(s):

- Portland Cement with silica fume

1. Quadex QM 1-S Restore
2. Strong Seal MW-2A

- Calcium Aluminate

1. Quadex Aluminaliner
2. Strong Seal MW-2C
3. A.W. Cook- CemTec Hydraulic Cement
4. A.W. Cook-Cam Hot Set

Specification: All Cementitious lining materials shall be specifically designed for the rehabilitation of manhole Structures, under damp conditions, which produce a one pass, monolithic liner, a minimum of ½" thick, that is impervious to the flow of water, resistant to sulfide attack, and restores structural integrity to the existing manhole walls.

The material shall be in compliance with *ASTM C10/C109/C496/C348/C321/C596*, and a density of 125 pounds per cubic foot when applied. The Cementitious lining system shall result in a monolithic Structure conforming to the interior shape and contour of the existing manhole and covering all interior surfaces, including bench and channel. The lining system shall be watertight and free of any joints or openings other than pipe inlets, pipe outlets, and the rim opening. The junction of the lining material with the pipe material at the inlets and outlets shall be watertight.

The Cementitious lining system shall allow rehabilitation of a concentric, eccentric, or flat top manhole without removing the manhole frame casting and top section or corbel. The Cementitious lining shall have a smooth trowel and brush finish.

4.5.A.2 Epoxy Coating:

Approved Manufacturer(s):

- **Raven Lining Systems** - Raven 405
- **Stag Technologies** - Red Dog Zycote 100/150
- **Sherwin Williams** - DuraPlate 235
- **Sherwin Williams** - Cor-Cote SC Plus
- **Sherwin Williams** - SherFlex
- **Warren Environmental** - S301-14

Specification: The protective coating material shall be 100% solids, solventless, two-component epoxy resin system that is resistant to hydrogen sulfide attack.

The material shall be in compliance with *ASTM D695/D790/D638/D2240,* with bond strength greater than the tensile strength of concrete.

Protective epoxy coating material shall be applied at manufacturer's recommended thickness with manufacturer's recommended equipment. All finishes shall be even and smooth.

Where color options are available, color must be approved by Colorado Springs Utilities prior to installation.

4.5.A.3 Polyurea Coating

Approved Manufacturer(s):

- **SpectraShield Liner Systems** - Barrier Coat
- **Custom Linings** - 911 Coating

Specification: The protective coating material shall be 100% solids, two-component spray polyurea system that is resistant to hydrogen sulfide attack.

The material shall be in compliance with *ASTM D412/D624/D2240.*

Protective Polyurea coating material shall be applied at manufacturer's recommended thickness with manufacturer's recommended equipment. All finishes shall be even and smooth.

Where color options are available, color must be approved by Colorado Springs Utilities prior to installation.

4.6 Pump Systems

4.6.A Lift Station Pumps

Approved Manufacturer(s):

- **Smith & Loveless**
- **Flygt**

Others will be evaluated on a case-by-case basis

General: Pump model shall be selected by the Design Engineer based on the hydraulic conditions of each Project.

4.6.B Private Pressurized Systems

4.6.B.1 Pumps

Approved Manufacturer(s): E-One or approved equivalent

D Series



Model
DH/DR 71
1 pump
HDPE tank
70 gallons
capacity
700 GPD



Model
DH/DR 151
1 pump
HDPE tank
150 gallons
capacity
1500 GPD



Model
DH/DR152
2 pump
HDPE tank
150 gallons
capacity
3000 GPD



Model
DH/DR272
2 pump
FRP tank
270 gallons
capacity
5000 GPD

W Series



Model
WH/WR 101
1 pumps
HDPE tank
100 gallons
capacity
GPD varies

General: Pump model shall be selected by the Design Engineer based on the hydraulic conditions of each Project.

4.6.B.2 Pressurized Service Line





General: All High-Density Polyethylene Pipe (HDPE) pipe shall be manufactured in accordance with *AWWA C901*, and *ASTM F714*, with the following additional requirements or exceptions:

Size(s): This specification shall cover HDPE SDR11 Service Tubing.
SDR11 HDPE pipe in 1-1/4 inch to 2 inch nominal diameter with iron pipe size (IPS) equivalent outside diameters. IPS HDPE is allowed for Wastewater Service Lines only. Size of pump service line will be determined by pump size.

Pressure Class: HDPE service line pipe shall be IPS DR11 PE4710.

Material: Black PE materials used for the manufacture of HDPE pipe and fittings shall be PE47108 high density polyethylene meeting *ASTM D3350* cell classification 445474C and the Manufacturer shall be listed in the Plastic Pipe Institute (PPI) TR-4.

Specification: HDPE pipe or tubing shall be green or black with green stripe. 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 Wastewater applications. The manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

Joint Type. HDPE pipe shall be joined by thermal butt fusion or electrofusion.

Pipeline Identification. 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. 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 Wastewater Collection System:

- Green for Wastewater

Note: Plain Black HDPE Pipe without color code markings may not be used in the Colorado Springs Wastewater Collection System.

4.6.B.3 Lateral Valve Kit

Approved Manufacturer(s): E-One



General: Lateral valves along pressurized private systems shall be suitable for wastewater service.

Size(s): 1-1/4 through 2-inch

Pressure: Rated to 235 psi working pressure

Material: 316 Stainless Steel

Specification: Integrated full-port ball valve, check valve, and clean out constructed of 316 stainless steel. Valve shall have compression type connections suitable for HDPE SDR11 pressurized service line pipe.

4.6.B.4 Frost Proof Pit

Approved Manufacturer(s):

- **Castings, Inc.**
- **Star Pipe Products**
- **EJ Iron Works**



General: Valve box top section and lid shall be used where frost proof pits are required on private pressurized systems. Valve boxes shall be rated for traffic service.

Size(s): 26-inch top section and 5-1/4 inch lid with 1, 1-1/2, or 2-inch skirt

Material: Heavy Duty Cast or Gray Iron

Specification: Frost proof pit shall consist of a 26" valve box top section without a flange and a heavy duty 5-1/4" drop lid containing the inscription "SEWER" cast on the top surface. Gray iron castings shall be manufactured from iron conforming to ASTM48 Class 35B and shall meet *Federal Specification A-A60005 (formerly RR-F-621E)*. All castings shall fit together properly and be fully interchangeable. 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.

This page left intentionally blank

TABLE OF CONTENTS

CHAPTER 5
Wastewater Construction

Paragraph Number	Title	Page Number
5.1	General	5-6
5.2	New Construction Procedures	5-6
5.3	Applicability of Standards to Repairs	5-7
5.4	Safety & Health	5-7
5.4.A	Contractor Responsibilities	5-7
5.4.B	Safety Representative	5-7
5.4.C	Hazard Communication Programs	5-8
5.4.D	Emergencies	5-8
5.4.E	Traffic Control and Public Access	5-8
5.4.F	Safety of Colorado Springs Utilities Employees and Construction Site	5-8
5.5	Surveying and Construction Staking	5-8
5.5.A	General	5-8
5.5.B	Wastewater Mains	5-9
5.5.C	Wastewater Service Lines	5-9
5.6	Inspection	5-9
5.6.A	Inspector Overtime	5-10
5.7	Bypass System Requirements	5-10
5.7.A	Design Requirements	5-11
5.7.B	Submittal Requirements	5-11
5.7.C	Construction Requirements	5-12
5.7.C.1	Responsibility for Overflows or Spills	5-12
5.7.C.2	Bypass System Materials	5-12
5.7.C.3	Delivery, Storage and Handling of Materials	5-13
5.7.C.4	Site Preparation	5-13
5.7.C.5	Bypass Pumping System Installation	5-13
5.7.C.6	Hydrostatic Pressure Test	5-13
5.7.C.7	Cleanup and Bypass Removal	5-14
5.8	Excavation & Trenching	5-14
5.8.A	Locates	5-14
5.8.B	Exploratory Excavation	5-15
5.8.C	Excavation to Line and Grade	5-15

5.8.D Excavation & Trenching 5-15
5.8.D.1 Pavement and Road Surfaces 5-16
5.8.D.2 City Parks and Trails 5-16
5.8.D.3 Trench Width 5-16
5.8.D.4 Trench Stability 5-16
5.8.D.5 Excavated Material 5-16
5.8.D.6 Frost 5-17
5.8.E Excavation for Structures 5-17
5.8.F Excavation in Poor Soil 5-17
5.8.G Protection of Existing Structures and Utilities 5-17
5.8.H Surplus Excavation Material 5-17
5.8.I Blasting 5-17
5.8.J Dewatering 5-18
5.9 Removal or Abandonment of Existing Main 5-19
5.9.A Salvageable Materials Procedure 5-19
5.9.B Asbestos Material 5-20
5.10 Trench Backfill 5-21
5.10.A Foundation (Zone 1) 5-21
5.10.B Pipe Embedment (Zone 2) 5-21
5.10.C Installation of Backfill (Zone 3) 5-22
5.11 Pipe and Fittings 5-22
5.11.A Hauling, Handling and Storage of Materials 5-22
5.11.B Inspection of Materials 5-23
5.11.C Plugging Wastewater Mains During Construction 5-23
5.11.D Installation of Pipe 5-23
5.11.D.1 Sanitary Requirements 5-23
5.11.D.2 Lowering of Material into the Trench 5-23
5.11.D.3 Laying of Pipe 5-24
5.11.E Repair to Existing Pipe Lines 5-28
5.11.F Bridging and Encasement 5-28
5.11.G Casing Pipe 5-28
5.12 Manholes 5-29
5.12.A New Manhole Installation 5-29
5.12.B Manhole Channels 5-30
5.12.C Coring into Existing Manholes 5-30
5.12.D Manhole Rehabilitation 5-30

5.12.D.1 Manhole Rehabilitation Planning 5-31
5.12.D.2 Manhole Rehabilitation Construction 5-31
5.13 Wastewater Main Stub-Outs 5-34
5.14 Wastewater Service Line Stubs 5-34
5.15 Tracer Wire 5-35
5.16 Cathodic Protection 5-35
5.16.A Coatings and Wraps 5-35
5.16.B Protection of Bolts and Rods 5-36
5.16.C Insulating from Concrete 5-36
5.16.D Holiday Testing and Detection (Jeeping) for Coated Pipe 5-36
5.16.E Bonding Joints 5-37
5.16.F Insulating Joint 5-37
5.16.G Galvanic Anodes 5-37
5.16.H Impressed Current Systems 5-37
5.16.I Test Stations 5-38
5.17 Backfill and Compaction 5-38
5.17.A Systems Installed within City right-of-way 5-39
5.17.B Systems installed outside of City right-of-way: 5-39
5.18 Cleaning 5-39
5.19 Vacuum Testing for Wastewater Manholes 5-40
5.20 Air Testing 5-41
5.21 CCTV Inspection 5-42
5.22 Wastewater Service Lines 5-43
5.22.A Inspection 5-43
5.22.B Application for Wastewater Service 5-43
5.22.C Tapping Wastewater Mains 5-44
5.22.C.1 Responsibility 5-44
5.22.C.2 Excavation 5-44
5.22.C.3 Tapping Procedures 5-44
5.22.C.4 Tapping HDPE Pipe 5-46
5.22.C.5 Tapping Asbestos Pipe 5-46
5.22.D Wastewater Service Line Extensions 5-46
5.22.D.1 Installation 5-46
5.22.D.2 Water and Wastewater Joint Trench 5-47
5.22.D.3 Crossing Other Utilities 5-47
5.22.D.4 Boring Wastewater Service Lines 5-48

5.22.D.5 Clean Outs 5-48
5.22.D.6 Additional Requirements for 4 inch Service Lines Laid at Less Than 2.08% 5-48
5.22.D.7 Warranty 5-48
5.22.E Reuse of an Existing Wastewater Service Line 5-48
5.22.F Repair, Disconnection, Rehabilitation or Replacement Wastewater Service Lines 5-49
5.22.F.1 Responsibility 5-49
5.22.F.2 Materials 5-49
5.22.F.3 Size 5-49
5.22.F.4 Protection of Water Service Lines 5-49
5.22.F.5 4 Inch Replacements Installed at Less Than 2.08% 5-50
5.22.F.6 Clean Outs 5-50
5.22.F.7 Replacements Across Property Boundaries 5-50
5.22.F.8 Trenchless Rehabilitations 5-50
5.22.G Backwater Valve for Wastewater Service Lines 5-50
5.22.G.1 Size and Location: 5-50
5.22.G.2 Layout 5-50
5.22.G.3 Installation 5-50
5.22.G.4 Backfill and Compaction 5-51
5.22.H Grease Interceptors and Sand/Oil Interceptors 5-51
5.23 Pipe Line Markers 5-51
5.24 Surface Restoration and Maintenance 5-51
5.24.A Cleanup 5-51
5.24.B Surfaced Areas 5-51
5.24.C Un-surfaced Areas 5-52
5.24.D Damaged Surfaces and Property 5-52
5.25 Manhole Adjustments Before Paving and Final Grading 5-52
5.26 Manhole Adjustments After Paving and Final Grading 5-52
5.27 Forms 5-54
5.27.A Sample of CCTV Re-Inspection Form 5-54
5.27.B Wastewater Bypass System Plan Cover Sheet 5-56
5.27.C Environmental Plan Statement 5-57
5.27.D Spill Response Plan Example 5-58

This page left intentionally blank

CHAPTER 5

Wastewater Construction

5.1 General

The purpose of Chapter 5 of the *Wastewater Line Extension & Service Standards* (*Wastewater LESS*) is to set forth the criteria to be used when constructing both Public and Private Wastewater Mains and Wastewater Service Lines to serve a proposed or an existing development. The Owner/Developer is responsible for hiring a qualified Contractor who will construct the Wastewater System and Service Lines per the Approved Construction Plans and these *Wastewater LESS*. The Owner/Developer is ultimately responsible for all requirements identified in these *Wastewater LESS*. Colorado Springs Utilities will inspect the Construction of the Wastewater Main and Wastewater Service Line 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.
- 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.
- When existing Wastewater flows are interrupted, or when determined necessary by Colorado Springs Utilities, the Contractor shall submit a *Bypass System Plan* to Colorado Springs Utilities for review and approval per Section 5.7.
- 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 Wastewater Mains, Public Wastewater Mains still under warranty, existing Wastewater Mains damaged as a result of Construction, and Wastewater Service Lines are subject to these *Wastewater LESS* and shall be inspected by Colorado Springs Utilities. Colorado Springs Utilities shall be notified of any repairs immediately. Reference Sections 5.11.E and 5.22.F 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 Wastewater Mains

For Wastewater Mains the following shall be identified with offset hubs and stakes with stationing per the Approved Construction Plans:

- Wastewater Main centerline (a maximum distance of 25 feet apart on straight lines and 10 feet apart on curvilinear sections),
- 3 degree bends (at the Inspectors discretion),
- Grade to the pipe flow line elevation,
- Points of curvature (P.C.) and points of tangency (P.T.) of curvilinear sections,
- Manholes (location, rim, and inverts),
- Vault corners, and
- Any other appurtenance necessary for Construction as identified by the Inspector.

5.5.C Wastewater Service Lines

For Wastewater Service Lines the following shall be identified with offset hubs and stakes per the approved Utility Service Plans:

- Wastewater Service Line tap,
- Grade to the pipe invert elevation,
- Wastewater Service Line plug),
- Clean outs (Commercial Wastewater Service Lines only),
- Horizontal and vertical bends identified with two hubs and stakes to triangulate the location of the bend (Commercial Wastewater Service Lines only),
- Vault corners including Grease Interceptors and Sand/Oil Interceptors (Commercial Wastewater Service Lines only), and
- Any other appurtenance necessary for Construction as identified by the Inspector.

5.6 Inspection

All work for both Public and Private Wastewater Mains and Service Lines, including new installation, replacement, relocations, or repairs of existing facilities shall be inspected by a Colorado Springs Utilities' Inspector who shall have the authority to halt Construction if, in their opinion, these *Wastewater LESS* are not being followed. Whenever any portion of these *Wastewater 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 Plans to address any conflicts between Construction, these *Wastewater 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 *Wastewater 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 Inspector Overtime

Overtime work shall be defined as work performed on Saturdays, Sundays, and Colorado Springs Utilities observed holidays set forth in *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 for inspection 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' Inspectors 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, Juneteenth, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the day following Thanksgiving Day, Christmas Eve, 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 Bypass System Requirements

When Construction requires the shutdown of an existing Wastewater Main, a bypass system shall be required to ensure the uninterrupted operation of the Wastewater System. A bypass system can include the use of pumps with piping or hauling or gravity piping. When required by Colorado Springs Utilities, the Contractor shall be responsible for submitting a *Bypass System Plan* to Colorado Springs Utilities Wastewater Planning and Design, for review and approval, a minimum of 10 days prior to Construction of the bypass. The need for a *Bypass System Plan* will be determined by Colorado Springs Utilities given Wastewater flow, pipe material and condition, location, and risk of failure. The Contractor shall have a copy of the approved *Bypass System Plan* on the Construction site at all times and shall provide a copy to the Inspector.

The Contractor shall be responsible for protecting the bypass system throughout the duration of the Project. The Contractor shall be responsible for any damage caused by their failure to

provide adequate protection to the bypass system. Bypass pumps shall be attended at all times while operating.

5.7.A Design Requirements

The Contractor shall design the bypass system according to the following requirements:

- The bypass system shall have sufficient capacity to convey peak flows. The Contractor may request theoretical peak flow information from Colorado Springs Utilities but is ultimately responsible for field verifying flow conditions.
- The bypass system shall be designed to convey infiltration and inflow during storm events in addition to peak flows.
- The bypass system shall be designed to address any surface runoff in a manner that will prevent surcharging of the Wastewater System and damage or flooding to public or private property.
- The bypass system shall be designed to maintain vehicular and non-vehicular access while avoiding damage to existing landscaping.
- Bypass piping shall be placed in trenches and covered with temporary pavement or metal traffic covers when traffic conditions dictate the need for protection of the piping.
- The bypass system shall be designed to minimize noise from pumps and equipment.
- All pipeline plugs shall be of adequate size to provide a water tight seal of the existing Wastewater System to be isolated.
- Bypass pumping systems shall include one standby pump for each pump utilized, providing 100% redundancy. The standby equipment shall be available and ready for immediate operation and use in the event of emergency or breakdown.
- The bypass system shall meet the requirements of all codes and regulatory Agencies Having Jurisdiction.
- The bypass system shall be designed to protect water resources, wetlands, and other natural resources.
- Colorado Springs Utilities may specify additional design requirements based on specific site conditions.

5.7.B Submittal Requirements

The *Bypass System Plan* shall include the following information for each bypass system:

- Wastewater Bypass System Plan cover sheet, see Section 5.27.B,
- Environmental Plan Statement, see Section 5.27.C,
- A detailed plan identifying the location of any pumping equipment, temporary discharge piping, pumping and discharge manholes, redundant pumps and piping, the location of nearby waterways or drainages, and the method for diverting runoff around the site,
- A detailed traffic plan showing how vehicular and non-vehicular traffic will be diverted around the site and how the bypass system will be secured from damage by the public,
- An emergency response plan developed to minimize the impacts of a spill or release including containment, cleanup and rinse water collection, see Section 5.27.D for guidance,

- Availability of the required materials and equipment for emergency response,
- The Contractors schedule for Construction, operation, and removal of the bypass system,
- Record of measurement or verification of Wastewater flow rates and calculations for peak Wastewater bypass flows,
- Equipment and material information including sizing and selection data,
- Copies of all permits and Easements required to perform the work.
- Records of trained personnel, when fusing and installing of HDPE pipe are required. (The Contractor shall maintain records of trained personnel, and shall certify that training was received no more than 12 months before commencing Construction),
- Records that all personnel on the site have been trained in all aspects of operation and maintenance of the bypass system to include spill and storm response,
- 24 hr. emergency contact information, and
- Site specific information necessary for Construction as determined by Colorado Springs Utilities.

The *Bypass System Plan* shall be updated per changes in site conditions and personnel and may need to be re-reviewed and approved by Colorado Springs Utilities at the discretion of the Inspector.

5.7.C Construction Requirements

5.7.C.1 Responsibility for Overflows or Spills

The Contractor shall not cause or contribute to any incidence of overflows or spills of Wastewater from the Wastewater System. In the event that the Contractor's activities contribute to overflows or spills, the Contractor shall immediately take the appropriate action to contain and stop the overflow, and notify Colorado Springs Utilities Dispatch, and the Design Engineer and Inspector. Clean up shall include rinse water collection and disinfection of the area affected by the spill.

The Contractor shall be liable for cleanup, civil or criminal charges, third party claims and or other claims as a result of any spill or release of Wastewater associated with the Contractor or their activities.

The Contractor shall indemnify and hold harmless Colorado Springs Utilities for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the Owner/Developer in defending such fines and claims.

5.7.C.2 Bypass System Materials

The Contractor shall use High Density Polyethylene (HDPE), PVC, or flexible piping as approved by Colorado Springs Utilities. Materials shall be in compliance with CHAPTER 4 Approved Materials. All piping shall have a minimum working pressure rating of 100 psi.

HDPE pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint in accordance with CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies of these *Wastewater LESS*.

Flexible piping and associated couplings and connectors shall be abrasion resistant, suitable for the intended service and shall be rated for the external and internal loads anticipated, including test pressures. External loading design shall incorporate all anticipated traffic loadings, including traffic impact loading.

All piping shall be homogenous throughout and shall be free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.

5.7.C.3 Delivery, Storage and Handling of Materials

The Contractor shall transport, handle, and store all pumps, pipes, fittings, and appurtenances as recommended by the manufacturer. If any pump, pipe, fitting, or appurtenance becomes damaged before or during installation, it shall be repaired as recommended by the manufacturer or replaced as required by the Inspector, before proceeding further.

5.7.C.4 Site Preparation

The Contractor is responsible for locating any existing utilities within the bypass system site. The Contractor shall locate bypass pipelines to minimize disturbance to existing utilities.

The Contractor is responsible for obtaining any permits and/or permission for placement of the temporary pipeline within public and private property.

5.7.C.5 Bypass Pumping System Installation

A primary and secondary plugging device may be required when plugging or blocking existing Wastewater flow. All plugs shall be labeled with the Contractor's name. All plugs using air pressure shall have monitoring gauges at the surface so that they can be visually monitored at all times. When a plugging device is no longer required, it shall be removed in a manner that permits flows to slowly return to normal without causing a surcharge in the Wastewater System or Wastewater Service Lines.

5.7.C.6 Hydrostatic Pressure Test

Each bypass pumping system shall be hydrostatically tested using potable water prior to use. Unless otherwise indicated, water for testing bypass pipelines shall be furnished by the Owner/Developer however, the Contractor shall obtain all required permits and shall make all necessary provisions for conveying the water to the site.

The bypass pumping system may require air release valves to release air that may become trapped in the bypass system piping. The bypass pumping system shall be filled at a rate which will not cause any surges or exceed the rate at which air can be released through the air valves. The differential

pressure across the orifices in the air release valves shall not be allowed to exceed 5 psi at any time during filling. Once the system has been successfully filled and all air purged, the piping system exclusive of the pump(s) shall be pressurized to 150% of the calculated working pressure, or 40 psi, whichever is greater, measured at the lowest point along the alignment, and hydrostatically tested for a minimum of 30 minutes.

During the test, the entire system shall be visually inspected for leaks and monitored for pressure drop. Any leaks encountered shall be repaired at the Contractors' cost, and the hydrostatic pressure test restarted until the system successfully passes the test. Potable water used during the test shall be discharged to the Wastewater System at a controlled rate to prevent surcharging of the Wastewater System and Wastewater Service Lines.

5.7.C.7 Cleanup and Bypass Removal

Prior to dismantling the bypass system, the Contractor shall remove all Wastewater from the bypass system using pipeline pigs and water flushes. Wastewater removed may be discharged into the Wastewater System at a controlled rate to minimize surcharging of the collection system, or by other methods approved by Colorado Springs Utilities.

Upon completion of the bypass operations, the Contractor shall remove all piping, restore all property to pre-Construction condition, and restore all pavement to the Specifications of the Authority Having Jurisdiction.

The Contractor shall not divert flow to any new sewer or manhole prior to completion and acceptance of the new Wastewater System, unless approved by Colorado Springs Utilities.

5.8 Excavation & Trenching

This section sets forth the requirements for excavation and trenching operations and is not intended to outline or review excavation and trenching safety.

5.8.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 Wastewater Mains or Private 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.

5.8.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.

5.8.C Excavation to Line and Grade

All excavations shall be made to the lines and grades as established by the Approved Construction Plans. Pipe trenches shall be excavated to the depth required to provide a uniform and continuous bearing and support for the pipe utilizing appropriate bedding. 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 *Wastewater LESS*. Deviation from line and grade may be allowed when approved by the Inspector, in accordance with these *Wastewater LESS*, and shall be coordinated by the Contractor with the Owner/Developer, Colorado Springs Utilities and the Design Engineer.

5.8.D Excavation & Trenching

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. Open-cut trenches 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 5.9.B.

5.8.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.

5.8.D.2 City Parks and Trails

For areas of excavation in and around City Parks and trails, see protection requirements in Park Standard Specifications.

5.8.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 pipes 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.

5.8.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.

5.8.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.

5.8.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.

5.8.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 *Wastewater LESS*.

5.8.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.

5.8.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 Contractor's expense.

5.8.H Surplus Excavation Material

All surplus excavation material shall be removed from the job site and disposed of properly.

5.8.I Blasting

In general, blasting will be allowed in order to expedite the work 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 of any blasting 3 working days in advance.

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.

5.8.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 to Groundwater or surface water, a certification under the *Construction Dewatering (CDW) General Permit* is required from the CDPHE Water Quality Control Division (Division) before discharge can occur. Uncontaminated Groundwater may be discharged to land in accordance with the conditions outlined in the *Low Risk Discharge Guidance for Discharges of Uncontaminated Groundwater to Land*. If the site is covered by a *Permit for Discharge of Stormwater Associated with Construction* permit and the conditions in Section I.C.3.c of the permit are met, a separate CDW permit will not be required for a discharge to the ground.

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 *EPS Region 8 - Underground Injection Control (UIC) Program* for permitting information.

If contaminated Groundwater or soils are present 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 that will be discharged to Groundwater or surface waters. Contaminated Groundwater may be assessed for disposal at a Certified Centralized Wastewater Treatment Facility.

There are several methods to obtain preliminary Groundwater contamination information:

- 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://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.

Internal sump pumps (within Structures) that are used to discharge ground water are not permitted to be connected to the Wastewater System.

5.9 Removal or Abandonment of Existing Main

Wastewater Mains shall be removed or abandoned as indicated on the Approved Construction Plan and in accordance with Section 2.5.D.6 of these *Wastewater LESS*. Materials to be removed from the site may be re-used as a part of the new Construction at the discretion of the Inspector.

5.9.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 Wastewater Main and will not be reusing the pipe or appurtenances on the current Project, then the salvageable materials must 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, two 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, cleanings, and delivering the salvageable materials to the GVP yard.

5.9.B Asbestos Material

If any suspected Asbestos-containing materials (ACM) are encountered on Colorado Springs Utilities Wastewater Mains, appurtenances, or Wastewater 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, Operational 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 *Wastewater LESS*.

The possible types of ACM 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 Wastewater 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. Remove the minimum amount of coating that may contain Asbestos 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.

5.10 Trench Backfill

Trench backfill shall conform to the specification of the Authority Having Jurisdiction and ASTM D2321.

5.10.A Foundation (Zone 1)

The trench bottom shall be firm, stable and uniform. The Inspector may require a foundation of rock no less than 1 inch in diameter (See Detail Drawing C2-1) if unstable conditions are encountered in the bottom of the trench. Unstable conditions include the presence of muck, peat, high plasticity clays, inorganic silts, and other ASTM D2321 Class V materials. When directed by the Inspector, the Contractor shall place the rock until the Inspector determines that the foundation is stable, but at a thickness no less than 6 inches. The foundation shall be compacted with appropriate methods. If a rock foundation is required, the pipe shall be bedded with Class I or II soil as described below.

5.10.B Pipe Embedment (Zone 2)

Zone 2 bedding shall be ASTM D2321 Class I, II or III. If the bedding material contains excessive fine-grained material (clay, silt, and sand), compaction testing of the bedding material may be required by the Inspector. Material greater than 3/4 inches in size shall not be placed in Zone 2. Materials derived from recycled concrete will not be allowed. If in situ material meets these requirements they may be utilized in Zone 2.

The limits of Zone 2 bedding shall be from 6 inches below the bottom of the pipe to 12 inches above the top of the pipe. Hand tamping of bedding is required from 6 inches below the pipe to 12 inches above the top of the pipe. Hand tamping may be jumping jack or plate tamped. Tamped lifts shall not exceed 6 inches. Contractor shall simultaneously deposit bedding material on each side of the pipe, fittings, and appurtenances for its full width of the trench to avoid lateral pipe movement.

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.

All bedding for Wastewater pipes at slopes less than 1.04% from 6 inches below the pipe to the bottom of the pipe shall be plate tamped.

5.10.C Installation of Backfill (Zone 3)

Using approved mechanical methods, the Contactor shall backfill the trench from 12 inches above the pipe to the grade shown on the plans or specified herein.

All backfill shall be in conformance with Section 5.17 of these *Wastewater LESS.*

5.11 Pipe and Fittings

5.11.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.

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.

5.11.B Inspection of Materials

All material used within the Wastewater System shall be in conformance with the Approved Materials identified in 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 these *Wastewater LESS* 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 *Wastewater 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.

5.11.C Plugging Wastewater Mains During Construction

The Contractor shall prevent dirt and debris from entering active systems by means of a watertight plug. The Contractor shall mark all watertight plugs and tools used in the active manhole with the Contractor's name on a waterproof tag or label. The Inspector must approve all temporary plugs and verify the Contractor's tag prior to installation. The Contractor shall provide all temporary plugs and tags. Plugs must be secured and anchored to prevent them from coming out. The Contractor shall remove all temporary plugs upon completion of the Wastewater Main and prior to the CCTV.

5.11.D Installation of Pipe

5.11.D.1 Sanitary Requirements

The Contractor shall prevent environmental contamination (e.g., ground water, storm water, animals, insects, etc.) from entering the Wastewater System and Wastewater Service Lines. Precautions shall be taken to protect the interior of pipes, fittings, and manholes from foreign materials and contaminants.

Installed pipe shall be sealed or closed at the end of work each day or when the pipe is left unattended.

5.11.D.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,

handling, and lowering the materials into the trench. Under no circumstances shall Wastewater Main materials be dropped or dumped into the trench.

If damage occurs to any pipe, manhole, or Wastewater Main appurtenance 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.

5.11.D.3 Laying of 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 bedding material and tamped. No blocking shall be left at any point under the pipeline.

The pipe shall be laid according to the manufacturer's Specifications and the following criteria:

a) Pipe Alignment and Grade

Pipe, manholes and appurtenances shall be installed at staked locations and elevations per the Approved Construction Plans. 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. The Contractor shall inspect PVC for any bowing that may impact the design grade of the Wastewater Main. Any bowing shall be utilized to create horizontal curvature of the Wastewater Main per Section 2.5.D.1. Pipes with bowing shall be installed to allow the straightest grade along each section of pipe. Pipe with excessive bowing may be rejected by the Inspector.

Any field changes in alignment and/or grade must be authorized by Colorado Springs Utilities and coordinated with the Contractor and Design Engineer.

b) Pipes Installed at Slopes Less Than 1.04%

Where the Wastewater Main is laid at slopes less than 1.04% the Wastewater Main shall be bedded and compacted in maximum 6 inch lifts with select bedding. Additionally, bell holes shall be dug and compacted at each joint to minimize sags at joints. Select bedding shall be hard, clean, noncorrosive, angular ¾" crushed rock. Materials derived from recycled concrete will not be allowed.

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 ≥ 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.
Select bedding shall have the gradation limits shown in Table 5-1 when tested by means of laboratory sieves:

Table 5-1: Select Bedding Gradation Limits

Sieve Size	Percent Passing
1”	100
3/4”	90-100
3/8”	20-55
#4	0-10
#200	0-5

The gradation limits shown in Table 5-1 are equivalent to the Size 67 gradation listed in ASTM C33. In addition to the above gradation requirements, a minimum of 80% of the particles shall have at least 2 fractured faces, and the weight loss of the material when tested for resistance to abrasion in accordance with ASTM C 131 shall be 40% or less.

The Contractor shall verify each joint is laid to the elevations as shown or calculated from the Approved Construction Plan by 2 independent methods including but not limited to laser level, transit, and string line. Regardless of the methodology used to ensure proper grade, it shall be the responsibility

of the Contractor to repair any defects identified by Colorado Springs Utilities per these *Wastewater LESS* thru the warranty period.

Each manhole invert in and out shall be verified by a Professional Land Surveyor licensed to practice in the State of Colorado or someone under their direct supervision, and manhole inverts shall be recorded on the Record Drawings by the Inspector. The Contractor shall submit a record of the survey data to Colorado Springs Utilities to obtain Preliminary Acceptance.

c) Assembly of Slip Joint SDR 26, SDR 35 PVC/PS-46, C900 PVC, and DIP

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. SDR 26, SDR 35 PVC/PS-46 and C900PVC will typically come with the gasket installed. For DIP, the rubber gasket shall be flexed in such a manner so to correctly insert and seat into the gasket recess of the bell socket.

The gasket, bell, and spigot end of the pipe shall be cleaned so that no foreign material interferes with the proper seating of the gasket. Lubrication of the gasket is not recommended for slip joint SDR 26, SDR 35 PVC/PS-46 and C900. Lubricate the spigot end of the pipe with manufacturer approved lubricant only. For DIP, a thin film of approved gasket lubricant shall be applied to both the inside face of the gasket and the spigot end of the pipe in accordance with the manufacturer's recommendations. Joint and gasket lubricant shall be per the pipe manufacturer's Specifications. Joint lubricant must be non-toxic, and water-soluble.

The spigot end of the pipe shall be placed in the bell end with care to prevent the spigot from contacting the ground. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot end of the pipe is inserted to the full depth of the joint.

Insert the beveled spigot end of the pipe into the bell so that it is in contact with the gasket. Hold the pipe close to the ground to keep the lengths in proper alignment. Brace the bell while inserting the spigot end of the pipe to prevent previously completed joints from becoming over-inserted. Push the spigot end of the pipe until the reference mark on the spigot end is flush with the end of the bell. 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. Stabbing is not recommended and should be avoided to prevent damage to the gasket and joint.

If the joint is over-inserted or pushed past the reference mark causing the spigot end of the pipe to jam into the neck of the bell, flexibility of the joint is lost. Uneven settlement of the trench may cause the joint to leak or crack. If a spigot is over-inserted the joint must be disassembled and the gasket

checked. If the gasket is twisted or pushed out of the seat, the pipe must be replaced and the joint re-assembled.

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.

d) 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.

Push the spigot end until the reference mark on the spigot end of the pipe is flush with the end of 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.

e) Joint Deflection for Slip Joint SDR 26, SDR 35 PVC/PS-46, C900 PVC, and DIP

No joint deflection is allowed for SDR 35 PVC/PS-46. Where curvature of the Wastewater Main is proposed, deflection shall be made through the use of 3 degree elbows. The minimum allowable pipe length between elbows shall be 5 feet, full length sticks are recommended.

If C900 is utilized, deflections are not permitted. High deflections couplings are not allowed as the gap between the beveled ends of pipe allows for the buildup of sediment.

Whenever it is necessary to deflect ductile iron slip joint pipe, the amount of deflection shall not exceed 80% of the maximum deflections specified by the manufacturer see Detail Drawing C2-2.

f) 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 sizes of pipes. All tools used in cutting pipe shall meet manufacturers' Specifications.

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.

5.11.E Repair to Existing Pipe Lines

Repairs to existing gravity Wastewater Mains may be accomplished with a new piece of pipe joined to the existing pipe with a flexible Wastewater coupling per CHAPTER 4 Approved Materials. All flexible couplings shall be reinforced with a concrete cradle. The minimum repair piece shall be 18 inches in length. The joints shall be made up to match flow lines.

Where the Wastewater Main is constructed of restrained joint or pressure rated pipe, a solid sleeve coupling with mechanical joint restraints will be required. The use of repair clamps or wraps may be used at the discretion of the Inspector.

A 17 lb. high potential anode shall be attached to all DIP/steel pipe repairs, and/or metal appurtenances. Where a PVC repair is installed a 17 lb. 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.

5.11.F Bridging and Encasement

Bridging and encasement may be required at the discretion of the Inspector with coordination and design by the Design Engineer per Section 2.5.F.3.

5.11.G Casing Pipe

Where the Wastewater Main is required to be installed in a casing pipe, the Contractor shall use steel casing pipe which the Contractor shall jack or place by an approved method underneath the Structure, utility, or Right-of-Way being crossed. The Contractor shall place the steel casing pipe at the grade of the Wastewater Main. The Contractor shall only use casing pipe sizes that are shown on the Approved Plans. Prior to inserting any Wastewater Main into the casing pipe, the Contractor shall provide casing spacers for each joint of the Wastewater Main per Detail Drawing C2-4. A casing spacer shall be placed at the reference mark of the pipe to prevent over insertion of the bell. The Wastewater Main does not need to be restrained within the casing pipe. The Contractor shall seal the ends of any casing pipe with an end cap per Detail Drawing C2-5.

Casing pipe shall be installed as level as possible, not to exceed a 3% slope. Installations greater than 3% will be reviewed and approved on a case-by-case basis.

Sags may occur at the entrance and exit of casing pipe where compaction of the trench is more difficult. Special care shall be taken when installing the Wastewater Main in and out of casing pipe. The Contractor shall ensure the trench is properly compacted to provide a solid foundation for the Wastewater Main in and out of the casing pipe.

Additional compaction tests may be required by the Inspector around the casing pipe. Regardless of the compaction test results, it shall be the responsibility of the Contractor to repair any defects identified by Colorado Springs Utilities per these *Wastewater LESS* thru the warranty period.

5.12 Manholes

5.12.A New Manhole Installation

Manhole bases shall be precast or cast in place per Detail Drawing C3-1.

The Contractor shall construct manholes to the elevations and grades indicated on the Approved Construction Plan. When placing manholes, the trench should be over-excavated a minimum of 3 feet in each direction to allow for proper placement and alignment of the manhole. The trench bottom shall be firm, stable and uniform.

The material for foundations shall be select bedding per Section 5.11.D.3. The minimum thickness of foundation material shall be 6 inches. The foundation shall be compacted with appropriate methods. The manhole shall be made watertight after installation or Construction by approved methods.

The manhole shall be backfilled in lifts not to exceed 6 inches and compacted per the City of Colorado Springs Standard Specifications or the Specifications of the Authority Having Jurisdiction. Backfill material shall be non-swelling, well graded, and free from stones larger than 3 inches. The backfill shall be placed along the full height of the manhole. The Contractor may use material excavated from the job that meets the Specifications described above.

The Contractor shall not backfill in freezing weather unless authorized by the Inspector. The Contractor shall not use additional backfill over any frozen backfill material already in the trench.

During backfill, the Contractor shall not place any detrimental substance, rock, or stone larger than that allowed by the sieve analysis, within 3 feet of the manhole.
The manhole shall be rotated such that the opening is centered above the outlet pipe of the manhole. Manhole covers shall be constructed per Detail Drawing C3-9.

Sags often occur at the entrance and exit of manholes where materials for the manhole foundation can differ from the pipe trench. Therefore, special care shall be taken when installing the Wastewater Main in and out of manholes. The Contractor shall ensure that the pipe is bedded and compacted per Section 5.10.B to provide a solid foundation for the Wastewater Main in and out of the manhole. Where the manhole foundation material does not have sufficient fines to impede the migration of the finer grained pipe bedding material, a filter fabric may be required by the Inspector. Additional compaction tests may be required by the Inspector within the pipe trench around the base of the manhole. Regardless of the compaction test results, it shall be the responsibility of the Contractor to repair any defects identified by Colorado Springs Utilities per these *Wastewater LESS* thru the warranty period.

The manhole rim and cover shall be placed at the elevation as indicated on the Approved Construction Plans. Manhole covers that are not at grade after the final pavement mat is placed will need to be adjusted per Section 5.26.

The Contractor must maintain access to off-site or cross county manholes for maintenance and cleaning per Detail Drawing C2-11. The rim and cover on cross country manholes shall be located 6 inches above final grade. Manhole covers on cross country manholes shall be self-sealing lockable lids per Detail Drawings C3-11.

5.12.B Manhole Channels

The completed flow channel shall be U-shaped coming up as high as the crown of the largest pipe. At intersections with other Wastewater Mains, the flow channels shall be formed with a curve to minimize turbulence of the Wastewater, see Detail Drawing C3-2.

The flow channel through a cast-in-place manhole base shall conform in slope and shape to that of the Wastewater Main. Wherever possible, the lower one-half of the pipe should be used as the flow channel.

If the manhole is a straight-through manhole, the pipe going through shall not have a pipe bell section laid within the manhole's design slope.

5.12.C Coring into Existing Manholes

Where an existing manhole will be the point of connection for the proposed Wastewater Main, the Contractor shall take care when drilling the core hole to ensure correct alignment and grade for the proposed Wastewater Main connection. The core drill shall be made to the elevation and grade as established in the Approved Construction Plan and per Detail Drawing C3-3. Core drilling is the only acceptable method for connecting to an existing manhole.

A Bypass System may be required to accommodate existing Wastewater flow during the core drilling, see Section 5.7 for Bypass System requirements.

Once drilled, the cored hole shall be fitted with a flexible watertight pipe-to-manhole connector per Section 4.2.J. Additional benching must be constructed according to Detail Drawing C3-3.

5.12.D Manhole Rehabilitation

The Contractor shall perform Wastewater Manhole rehabilitation, when required by Colorado Springs Utilities, including but not limited to:

- Elimination of active infiltration using cementitious or chemical grout (as appropriate) materials to seal or plug infiltration sources
- Cleaning and patching of holes and voids
- Bench and invert repair
- Application of fiber reinforced structural cementitious liner to the wall, cone riser and bench surfaces of brick, concrete, or other masonry materials
- Application of an epoxy coating liner

All work, materials and equipment for the rehabilitation of Wastewater manholes shall be the responsibility of the Contractor. All work and materials shall be in accordance with these *Wastewater LESS,* applicable ASTM standards, and the manufacturer's recommendations. Only rehabilitation materials identified in CHAPTER 4 Approved Materials may be utilized.

5.12.D.1 Manhole Rehabilitation Planning

The Contractor shall submit the following plans to Colorado Springs Utilities prior to rehabilitation, including but not limited to:

- A manhole assessment form
- A *Bypass System Plan* per Section 5.7
- A traffic control plan
- A *Rehabilitation Plan* including how the manhole will be cleaned, all Approved Materials to be utilized in the rehabilitation, how the rehabilitation will be completed, and how disposal of excess material will occur

5.12.D.2 Manhole Rehabilitation Construction

a) Inspection

Prior to beginning work, each manhole (including invert) shall be thoroughly inspected and areas of hazardous structural damage shall be reported to Colorado Springs Utilities. If Colorado Springs Utilities deems the manhole to be structurally damaged beyond repair at any time during the rehabilitation process the manhole shall be replaced by the Contractor.

b) Manhole Steps

The Contractor shall remove all manhole steps prior to cleaning. Manhole steps shall be removed or cut flush with the manhole wall. See Section 4.2.H.1.

c) Cleaning

All concrete and masonry surfaces to be rehabilitated shall be cleaned prior to the application of rehabilitation products. All grease, oil, laitance, coatings, loose or defective bricks, grout, mortar, concrete, protruding ledges and steps and other foreign materials shall be completely removed to provide an even surface for rehabilitation.

Water blasting utilizing proper nozzles shall be the primary method of cleaning. Water blasting shall have sufficient pressure to adequately clean the surface.

When grease and oil are present within the Structure, an approved detergent or muriatic acid may be used integrally with the high-pressure cleaning water.

Other methods such as concrete cleaners, degreasers and/or mechanical means may be required to properly clean the surface. All surfaces on which these methods are used shall be thoroughly rinsed, scrubbed, and neutralized to remove cleaning agents and their reactant products.

Debris resulting from cleaning shall not be washed downstream but shall be removed from the manhole and disposed of offsite at the Contractor's expense.

d) Stopping Infiltration

After surface preparation and prior to the application of mortars and coatings, infiltration shall be stopped by use of an approved water stop compound or chemical grout.

All missing mortar shall be removed from the area to be patched or repointed, exposing a sound substrate. All large holes or voids around cut out steps, joints or pipes, all spalled areas and all holes caused by missing or cracked brick shall be patched. All cracks not subject to movement and greater than 1/16 inch in width shall be grouted with approved non-shrink patching mortar.

e) Rehabilitation

Precautions must be taken to ensure that operations do not cause backups, surcharges, overflows, or damage to public or private property. The Contractor shall be liable for private property damages caused by sewer blockages resulting from rehabilitation activities.

The Contractor shall not allow sand, debris, Construction materials, or stormwater runoff to enter the Wastewater System. If manhole rehabilitation products inadvertently fall into the manhole invert the Contractor shall promptly remove the product and ensure invert flow is maintained. The Contractor shall properly dispose of sludge, sand, debris, grit, and liquid wastes resulting from rehabilitation of the manhole.

Any damage to the Wastewater System as a result of the manhole rehabilitation shall be repaired by the Contractor.

No repairs or application of liners shall be made to frozen surfaces or if freezing is expected to occur within 24 hours after application of product. It shall be the responsibility of the Contractor to provide heating or other means to ensure conditions for curing are in accordance with the manufacturer's requirements.

f) Bench Repairs

The existing bench shall be inspected and reformed when necessary for proper slope of the bench surface to allow water and debris to properly drain. The bench shall be coated with Approved Materials when required by Colorado Springs Utilities.

g) Invert Channel Repairs

The existing invert shall be inspected for proper grade, depth, and width to ensure adequate flow through manhole. The invert shall also be inspected for deficiencies including the presence of voids, bulges, restrictions, severe changes in elevation, or other deficiencies, which may inhibit flow, cause

debris/sediment buildup, or restrict sewer maintenance equipment access. Invert repair shall be performed on all inverts with visible deficiencies, damage, or infiltration. Where directed by Colorado Springs Utilities, inverts shall be repaired per the following:

- Trim all Wastewater pipes that enter or exit the manhole so that edges are smooth and flush with manhole wall.
- Build up the bench to the crown of the largest outgoing pipe size per Detail Drawing C3-1.
- The manhole invert channel shall be reformed at intersecting manholes per Detail Drawing C3-2.
- If invert channels do not exist within the manhole, the inverts shall be constructed per Detail Drawing C3-2.
- All invert channels shall be smooth and free of ridges, protrusions, and concrete droppings.

Flow through manhole shall be controlled to allow sufficient setting time for material used.

h) Application of Liners and Coatings

Liners are cementitious materials that provide Structure to degraded manhole surfaces. Coatings are applied to protect the manhole liner and surfaces from corrosion due to high levels of hydrogen sulfide gas. Liners shall be applied to the wall, cone riser and bench as required by Colorado Springs Utilities based on the condition of the manhole. Coatings shall be applied per these *Wastewater LESS* and as required by Colorado Springs Utilities based on the corrosive potential of the manhole environment. Liners and coatings shall be approved per these *Wastewater LESS*, as listed in CHAPTER 4 Approved Materials.

Application of all lining products shall be by manufacturer-certified applicators. The Contractor shall provide certification from each manufacturer that the applicator is certified to apply the product. Certifications shall remain current throughout the duration of the rehabilitation.

i) Manhole Rehabilitation Acceptance Testing

At completion of manhole rehabilitation, the Contractor shall provide Colorado Springs Utilities with documentation verifying installation of the minimum thickness of the liner and or coating. The finished surface shall be free of blisters, “runs,” “sags,” or other indications of uneven lining thickness. There shall be no evidence of visible leaks. Testing performed shall have written verification of passing or failing and shall be submitted to Colorado Springs Utilities. The Contractor shall repair any deficiencies prior to final acceptance.

Vacuum testing of manholes and Structures shall be performed following proper curing of the lining per Section 5.19. Any visible leakage in the manhole or Structure, before, during, or after the test shall be repaired regardless of the test result.

Manholes rehabilitated utilizing an epoxy coating shall be tested per the following methods:

- Spark Test: The Contractor shall test the entire coated surface for holidays at 100 volts/mil of minimum specified coating thickness in accordance with *ASTM D 4787*. The Contractor shall grind defects and holidays a minimum of 2-inches in all directions from the defect and make repairs according to the manufacturer's recommendations.

- Pull Off Test: The Contractor shall test the adhesion of the coating the substrate utilizing a pull off test in accordance with *ASTM D4541*.

Manholes rehabilitated utilizing a cementitious liner shall be tested per the following method:

- 4 individual 2-inch cubes of the cementitious liner product shall be cast from the pallet of product used. Samples shall be properly packaged and labeled for compressive strength testing in accordance with *ASTM C109*.

j) Cleanup

Following final inspections, the Contractor shall clean up the entire Project area. Reference Section 5.24.A.

5.13 Wastewater Main Stub-Outs

Wastewater Main stub-outs shall be constructed to the line and grade indicated on the Approved Construction Plans. All stub-outs shall be fitted with a watertight plug or cap at the end of the pipe. Wastewater stub-outs shall be plugged inside the manhole with a watertight plug anchored to the manhole wall per Detail Drawing C3-4.

Wastewater Main stub-outs that are to be abandoned shall be mechanically plugged at the manhole and the pipe grouted per Section 2.5.E.8.

There shall be no Wastewater Service Line connections to Wastewater Main stub-outs prior to the extension of the stub-out to the next manhole.

The Contractor connecting to a Wastewater Main stub-out shall be responsible for any repairs or retrofits to the stub-out that are identified during Construction, inspection, and/or testing of the proposed Wastewater Main.

5.14 Wastewater Service Line Stubs

Wastewater Service Line stubs are typically installed at the same time as the Wastewater Main prior to preliminary acceptance testing. See Section 5.22 for installation requirements.

All Wastewater Service Line stubs shall be extended a minimum of 9 feet inside the property or 2 feet inside the Easement line and be marked/located with a 2 inch by 4 inch by 12 foot steel or wooden post per Detail Drawing D1-3. Where co-located with an underdrain service the underdrain service shall be stubbed to the same point as the Wastewater Service Line. Wastewater service stubs shall be located and the elevation verified prior to Construction to ensure correct grade and drainage of the service line.

5.15 Tracer Wire

Colorado State Regulations require all Underground Facilities to be electronically locatable. Tracer wire shall be installed on all PVC, HDPE, and DIP Wastewater 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 the tracer wire at 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 Wastewater Mains, tracer wire shall be terminated in each manhole. Wire shall run up the outside of the manholes and enter under the lid ring. A small slot shall be made in the top of the manhole cone or adjustment ring to accommodate the tracer wire and shall be covered with ram neck once the wire is placed to protect it.

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 4.2.K.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 4.2.K.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 Drawing 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.

5.16 Cathodic Protection

5.16.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 2.5.G.

Where polyethylene tubing is specified, it shall be installed per Detail Drawing C5-1 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.

5.16.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.

5.16.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.

5.16.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.

5.16.E Bonding Joints

All 8 inch and larger ductile iron pipelines requiring cathodic protection shall be bonded at every joint and fitting (except at Insulating Joints). Two coated copper wires or one bonding strap for cathodic protection shall be thermite welded to DIP pipe at each joint and fitting. The size of the wire and the weld shall be per the Approved Construction Plans, manufacturers' recommendations, and Detail Drawing C5-1 and C5-2. 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.

5.16.F Insulating Joint

Insulating joints shall be installed per the Approved Construction Plans, Section 2.5.G.4 of these *Wastewater LESS*, and Detail Drawing C5-3. 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.

5.16.G Galvanic Anodes

Anodes shall be high potential magnesium and shall be supplied and installed by the Contractor in conformance with Detail Drawing C5-2.

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 4.2.K.2.

5.16.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.

5.16.I Test Stations

Cathodic Protection test stations shall be installed per Section 2.5.G.7, and Detail Drawings C5-4 through C5-8. 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.

5.17 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 Wastewater Main, Wastewater Main appurtenance or Wastewater 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 the *Water LESS* 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 4.2.N 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 *Wastewater 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 "Flashfill" materials used in public ROWs or in off-site applications i.e., under Structures must be in accordance with Section 4.2.N.

5.17.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.

5.17.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.

5.18 Cleaning

Prior to preliminary CCTV inspection of the Wastewater Main, the Contractor shall clean the Wastewater Main and manholes of all dirt and debris by approved methods including jetting and balling the Wastewater Main. Balling will not be allowed for Wastewater Mains greater than or equal to 24 inches.

Dirt and debris shall be captured and removed at the next downstream manhole. The manhole must be plugged per Section 5.11.C to ensure dirt or debris does not migrate downstream into the existing Wastewater Collection System.

5.19 Vacuum Testing for Wastewater Manholes

All manholes shall be vacuum tested prior to CCTV inspection operation and acceptance by the Colorado Springs Utilities Inspector. The Contractor shall notify the Inspector 1 working day in advance of testing.

This test method covers procedures for testing proposed and existing pre-cast concrete manhole sections using the vacuum test method, to demonstrate the integrity and condition of the manhole as installed. This test method is used for testing concrete manhole sections with mortar, mastic or gasketed joints.

Each manhole shall be vacuum tested after backfilling according to the following procedure:

(1) All lift holes and any pipes entering the manhole are to be plugged and sealed.
(2) Care shall be taken to create a seal between the vacuum base and the manhole rim.
(3) All pipes entering the manhole shall be temporally plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.
(4) The test head gauge shall be placed at the top of the manhole or in accordance with the manufacturer's recommendations.
(5) A vacuum of 10 in. of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. of mercury.
(6) The manhole shall pass if the time for the vacuum reading to drop from 10 in. of mercury to 9 in. of mercury meets or exceeds the values indicated in Table 5-2.
(7) If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test result is obtained.

Table 5-2: Minimum Manhole Vacuum Testing Times Per Manhole Diameter and Depth

Depth of Manhole (feet)	Diameter of Manhole (feet)		
	4	5	6
Up to 8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30+	74	98	121

* All times are in Seconds

5.20 Air Testing

An air test shall be performed after the Wastewater Main has been cleaned according to Section 5.20 and prior to CCTV inspection. The Contractor shall notify the Inspector 1 working day in advance of testing. The Contractor shall perform the test with equipment specifically designed for air testing Wastewater Mains. The pressure gauge shall be suitable for air pressure with a 15 P.S.I.G. maximum reading. The gauge shall be located at the surface.

Each Wastewater Main section shall be air tested after backfilling according to the following procedure:

(1) The pipe or section of pipe to be tested may be wetted before the air test.
(2) The line shall be plugged at each manhole with pneumatic plugs.
(3) Low pressure air shall be introduced into the plugged line until the internal air pressure reaches 4.0 P.S.I.G.
(4) At least 2 minutes shall be allowed for the air temperature to stabilize before readings are taken and the timing started.
(5) The portion of main, including stubs, being tested shall pass if it does not lose air at a rate to cause the pressure to drop from 3.6 to 3.0 P.S.I.G. (greater than the average back pressure of any ground water that may submerge the pipe) in less time than listed in Table 5-3.
(6) If the installation fails this test, the testing equipment may be used to determine the location of the pipe leak. All service line plugs shall be secured in place to prevent displacement during testing operations.

Table 5-3: Minimum Allowable Time for Wastewater Main Air Test Per Pipe Diameter

Pipe Diameter (inches)	Minimum Allowable Time (Minutes: Seconds) 3.6-3.0 P.S.I.G.
4	0:50
6	1:10
8	1:40
10	2:00
12	2:20
15	3:00
18	3:40
21	4:10

If results of these tests are not satisfactory, the Contractor shall make the necessary repairs or pipe replacement until the installation passes the air test.

5.21 CCTV Inspection

Colorado Springs Utilities requires inspection of the Wastewater Main and appurtenances with closed circuit television (CCTV) prior to preliminary acceptance and prior to final acceptance of the Wastewater Main. Colorado Springs Utilities will schedule the CCTV inspection within 10 working days after the following have been completed by the Contractor:

- All manholes are raised,
- All Wastewater Mains and manholes are cleaned in accordance with Section 5.18 (for preliminary acceptance only),
- All performance testing is completed, and
- Completion is noted by the Inspector.

Colorado Springs Utilities shall schedule the CCTV inspection and shall notify the Contractor of the CCTV inspection date and time no less than 48 hours in advance of the inspection. The Contractor shall give Utilities 48 hours advanced notice for any cancellations. The Contractor shall meet Colorado Springs Utilities at the site and shall provide and introduce water into the pipeline at the time of the CCTV inspection. The Contractor shall ensure that the Wastewater pipeline and manholes are clean, complete, and accessible prior to inspection. If the Wastewater System is not ready for the CCTV inspection or if the Contractor misses their scheduled appointment the CCTV inspection shall be rescheduled by the Inspector after the necessary work has been completed. If the Contractor is not ready for the inspection at the scheduled time and/or has not given 48 hours' notice of cancellation, the Contractor shall be charged time and materials costs incurred by Colorado Springs Utilities for the missed appointment.

Colorado Springs Utilities will provide the CCTV results within 5 working days of the successful completion of the CCTV inspection.

The CCTV is Colorado Springs Utilities means for assessing Wastewater Mains for pipe deflections, deformations, and deficiencies. The following shall be considered deficiencies that shall be corrected by the Contractor prior to preliminary and final acceptance:

- Any connection intrusions (service taps) where the connection or gasket extends past the inside diameter of the pipe
- Connections that are drilled larger than the required hole size
- Over Insertion of the bell
- Due to unacceptably high operation and maintenance costs and poor system reliability, pipelines 12 inches in diameter or less with sags exceeding ½-inch in depth will not be accepted, see Detail Drawing C2-13. Pipeline Sags that are less than ½-inch in depth shall be noted at time of preliminary acceptance and if at the time of CCTV for final acceptance the sag has increased in size the Contractor shall repair the sag. This determination shall be made solely by Colorado Springs Utilities Wastewater engineering staff. Pipelines greater than 12 inches in diameter will be evaluated on a case by case basis.
- Any debris
- Out of round more than 5% of the pipe diameter
- Any Deformations such as rock dimples, pipe kinks, etc.
- Any joint defects such as rolled or improperly compressed gaskets and joint gaps
- Any material damage such as cracks or gouges

- Any other defect as identified by Colorado Springs Utilities that may cause future operation and maintenance issues

Any necessary repairs shall be completed according to these *Wastewater LESS* and shall be inspected, tested and CCTV'd by Colorado Springs Utilities. Time and Materials shall be charged to the Contractor or the Owner/Developer for expenses incurred by Colorado Springs Utilities for CCTV inspections required after the initial inspection to address deficiencies.

The Contractor or the Owner/Developer shall be charged Time and Materials for expenses incurred by Colorado Springs Utilities for CCTV inspection requests outside of normal business hours including holidays, weekends, after hours and emergencies (less than 48 hours' notice).

Any pavement or surface improvements installed over the Wastewater Main before the issuance of preliminary and final acceptance are subject to removal if deficiencies are found in the Wastewater System that require open cut repair. The Contractor shall be responsible for the removal and restoration of improvements.

5.22 Wastewater Service Lines

Wastewater Service Lines 4 inch and 6 inch in diameter shall be installed per the following sections. Wastewater Service Lines 8 inches in diameter and greater shall be installed as Wastewater Mains. Wastewater Service Lines 8 inches and greater must be installed in accordance with Sections 5.10 thru 5.21.

5.22.A Inspection

All Wastewater Service Line taps, new installations, repairs, rehabilitations, disconnections, replacements, and reuse shall be inspected by Colorado Springs Utilities. The inspection shall include the Wastewater Service Line from the Wastewater Main to the Structure. Wastewater Service Line Stubs installed with new Wastewater Mains shall be inspected as part of the Wastewater Main Inspection per Section 5.14. The Contractor shall contact the Colorado Springs Utilities, Inspections office two working days prior to new commercial Construction, see Section 1.14.

Contractor shall not backfill a Wastewater Service Line, nor permit bedding or spoils from obscuring the Inspector's view, until inspection is complete and the Contractor has remedied all deficiencies. Contractor will ensure that Inspector has a clear line of sight on all connections and other Structures associated with the Wastewater Service Line. A reinspection/return trip fee may be assessed per *URRs Section 33*. The Inspector will note any deficiencies on the *PPRBD Building Permit*. After the Contractor has made all corrections to the satisfaction of the Inspector, the Inspector will sign off on the *PPRBD Building Permit*. As soon as practicable thereafter the Contractor shall commence backfilling in accordance with these *Wastewater LESS*.

5.22.B Application for Wastewater Service

Wastewater Service Permit Fees must be paid before any Wastewater Service Line is connected to a Wastewater Service Line Stub or a new tap is made on an existing Wastewater Main. Development charges shall be paid prior to building permit or any User's connection to a Wastewater Service Line Stub or Wastewater Main.

Any disconnection, relocation, upsizing or downsizing of Wastewater taps and repairs to existing Wastewater Service Lines are subject to a Wastewater service permit fee per *URRs Section 33*.

In the event of a risk to public health and safety, including non-compliant Wastewater Service Lines, Colorado Springs Utilities will repair and assess billable charges to the Contractor on a time and material basis per *URRs Section 33*.

Application, payment, and scheduling shall be conducted at the Customer Contract Administration Office, 2880 International Circle, Colorado Springs, CO 80910. Permits for taps shall only be issued to a licensed Master Plumber as set forth in *City Code § 12.5.402*. Wastewater Service Permits must be applied and paid for at least 72 hours prior to connection of the Wastewater Service Line or tap.

5.22.C Tapping Wastewater Mains

5.22.C.1 Responsibility

The Contractor shall be responsible for all costs involving tapping the Wastewater Main. On new Wastewater Main Construction Wastewater Service taps shall be inspected as part of the Wastewater Mainline inspection per Section 5.14.

For taps on existing Wastewater Mains, the Contractor shall contact the Colorado Springs Utilities, Inspections office, LYSC, 1521 Hancock Expressway, Colorado Springs, CO 80903 before 9:00 am to reserve inspection the day of excavation. The Contractor shall complete the tap and call for inspection before 2:00 pm or the inspection will need to be rescheduled for the following working day.

No Wastewater service taps shall be made unless property corners are clearly marked so measurements of tap can be made at the time of tapping.

5.22.C.2 Excavation

Excavation, safety, and backfilling, to include proper compaction of Wastewater Service Line ditches, are the responsibility of the Contractor, in accordance with these *Wastewater LESS* and the Authority Having Jurisdiction, (i.e., City of Colorado Springs, El Paso County or State of Colorado).

5.22.C.3 Tapping Procedures

Taps on the Colorado Springs Utilities' Wastewater 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.

Wastewater taps shall be constructed with a Colorado Springs Utilities approved Wastewater service tapping saddle, rubber gasket saddle tap, or a three piece service connection. Only 4 inch and 6 inch Wastewater Service Lines may be tapped into a Wastewater Main.

All taps must be appropriately sized to match the Wastewater Main outer diameter and material. Top taps may be required.

Size on size taps are typically not allowed and shall be evaluated on a case-by-case basis by Wastewater Planning and Design per Section 2.6.B.3.

All new Wastewater services to be connected to an existing or proposed SDR 35 PVC Wastewater Main, 4 inch through 12 inch diameter, shall be made with an SDR 35 PVC injection molded sewer fitting. All SDR 35 PVC fitting shall have a centering ring.

Taps on a VCP Wastewater Main 12 inches in diameter or less shall be made with an SDR 35 PVC fabricated sewer fitting with a minimum skirt of 160 square inches. SDR 35 PVC fittings to be used on VCP shall be upsized one size from the diameter of the VCP Wastewater Main. SDR 35 PVC fittings may be attached to VCP with a 2 part epoxy rated for use on VCP and PVC.

Taps on DIP or C900 PVC Wastewater Mains, 12 inches in diameter or less may be accomplished with a rubber gasket saddle tap. A three piece service connection may be used as a service connection on a main 12 inches and less with the approval of Colorado Springs Utilities. A concrete collar may be required to stabilize these connections at the discretion of the Inspector.

Taps on Wastewater Mains greater than 12 inches must be approved by Colorado Springs Utilities. Taps may be made with a fabricated SDR 35 PVC fitting, a rubber gasket saddle tap, or a three piece service connection. A concrete collar may be required to stabilize the rubber gasket saddle tap or three piece service connections at the discretion of the Inspector.

All tapping procedures shall comply with the following requirements:

- The service line shall be connected to the Wastewater Main at a minimum distance from the manhole of 5 feet.
- Service lines less than 8 inches shall not be connected directly into a manhole.
- Individual service line taps shall be a minimum of 24 inches apart center to center.
- Service taps shall be made above the spring line of the Wastewater Main.
- No pre-manufactured wye or tee fittings are to be installed in-line.
- The tapping saddle shall be installed as per Wastewater Construction Detail D 1-1.
- No “side taps” shall be allowed without approval of the Colorado Springs Utilities.

After the Contractor backfills the Wastewater tap, Colorado Springs Utilities will CCTV the Wastewater Main to inspect the tap. If the Wastewater tap fails to pass inspection, the Inspector will immediately notify the Contractor of the deficiencies needing correction. All deficiencies must be corrected before a re-inspection may be requested and scheduled.

Colorado Springs Utilities will schedule the re-inspection with the Contractor as appropriate. Fees for re-inspection will apply per Section 5.21.

If the Contractor is suspected to have performed an illegal, unapproved Wastewater tap into the Colorado Springs Utilities' system or any Private Wastewater Main the tap shall be investigated and the Contractor may be fined in accordance with *Utilities' Rules and Regulations Section 33*.

5.22.C.4 Tapping HDPE Pipe

Refer to CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies for connections to HDPE pipe.

5.22.C.5 Tapping Asbestos Pipe

When tapping Asbestos Wastewater Mains for service connections, the Wastewater Main shall be kept wet at all times. The pipe shall be tapped using a 4 ½ inch or 6 ½ inch hole saw. All Asbestos removal must be in accordance with Section 5.9.B. The appropriate safety equipment shall be utilized at all times when tapping Asbestos pipe.

5.22.D Wastewater Service Line Extensions

A Wastewater Service Line may be constructed from the existing Wastewater Service Line Stub or Tap to the Premises when:

- The Wastewater Main and all appurtenances have been approved for preliminary acceptance.
- Utility Service Plans have been reviewed and approved by Colorado Springs Utilities (commercial Projects only)
- All Applicable Fees have been paid.

5.22.D.1 Installation

Wastewater Service Lines shall be constructed of a Colorado Springs Utilities Approved Material (Reference CHAPTER 4 Approved Materials). The Wastewater Service Line shall be constructed per the Approved Construction Plans, these *Wastewater LESS* and the manufacturer's recommendations.

The standard location for the Wastewater Service Line will be per the Approved Construction Plans and Wastewater Detail Drawing D1-1. Both horizontal and vertical bends of 11.25°, 22.5°, and 45° may be used to accomplish the proposed alignment. A minimum length of 2 feet shall be provided between bends. Deflections of the pipe joints shall not be permitted. 90° bends are not allowed.

a) Tracer Wire

Colorado State Regulations require all Underground Facilities to be electronically locatable. Tracer wire shall be installed on Wastewater Service Lines from the Wastewater Main to the clean out just outside the Structure. Fore Water Service Lines, tracer wires shall be brought above ground and wrapped around the clean out.

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 4.2.K.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 4.2.K.2

See Section 5.15 for locating requirements.

Wastewater Service Lines shall be bedded and backfilled in accordance with Section 5.10.

5.22.D.2 Water and Wastewater Joint Trench

Where the Water Service Line is 2 inches in diameter 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 D1-5.
- 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. The water service line shall be a maximum of 7 feet deep. See Detail Drawing D1-5.

The number of joints in the 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.

5.22.D.3 Crossing Other Utilities

Utility crossings shall be constructed per the Approved Construction Plans.

Where the Wastewater Service Line crosses under a Water Service Line and less than 18 inches of clearance is maintained, the Wastewater Service Line shall be backfilled with flow fill at the discretion of the Inspector. See Section 2.5.D.2 regarding secondary containment for services that do not have adequate separation.

Where a sleeve is required, the ends shall be sealed to prevent the infiltration of debris and Groundwater.

5.22.D.4 Boring Wastewater Service Lines

Boring, or micro-tunneling of Wastewater service pipelines require prior approval by Colorado Springs Utilities per CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies.

5.22.D.5 Clean Outs

Wastewater Service Line cleanouts shall be located per the Approved Construction Plans and Section 2.6.E. All Wastewater Service Lines shall have a single-way clean out located every 100 feet at a minimum or a two-way cleanout located every 200 feet at a minimum. The clean out shall be the same size as the host pipe (i.e., 4 inch Wastewater Service Line requires a 4 inch clean-out. All clean outs shall be constructed with standard fittings and have a screw cap located at the ground or paving surface. All residential and commercial buildings shall install a two-way clean out, located approximately 2 feet outside the house foundation. (Reference Detail Drawing D1-4)

Clean outs on Wastewater Mains and 8 inch and greater Wastewater Service Lines are prohibited.

5.22.D.6 Additional Requirements for 4 inch Service Lines Laid at Less Than 2.08%

4 inch Wastewater Service Lines laid at less than 2.08% shall be solid wall Schedule 40 PVC or DIP. Select bedding shall be hard, clean, non-corrosive, angular ¾" crushed rock. Materials derived from recycled concrete will not be allowed. The well-graded sand shall have the gradation limits listed in Table 5-1 when tested by means of laboratory sieves; poorly graded materials will not be allowed.

4 inch PVC services laid at less than 2.08% shall be CCTV'd. The CCTV video/DVD shall be submitted to the Wastewater Planning and Design Section for review and approval prior to acceptance. Service Lines shall not be installed at grades less than 1.04%.

5.22.D.7 Warranty

The Contractor shall be responsible for the Wastewater Service Line until 2 years after final approval by the Inspector. After the warranty time period has ended, the property Owner shall assume responsibility for repair and maintenance of the Wastewater Service Line.

5.22.E Reuse of an Existing Wastewater Service Line

An existing Wastewater Service Line may be reused if in acceptable condition as determined by Colorado Springs Utilities. Prior to reuse the Owner/Developer shall:

- CCTV the existing Wastewater Service Line to assess the condition prior to connection.
- Repair all deficiencies per these *Wastewater LESS* prior to reuse.
- Pay all applicable fees prior to reuse of Wastewater Service Line.
- Ensure Utility Service Plans have been reviewed and approved by Colorado Springs Utilities (commercial Projects only)

5.22.F Repair, Disconnection, Rehabilitation or Replacement Wastewater Service Lines

Wastewater Service Line repairs, disconnections, rehabilitations, and replacements shall be made with Colorado Springs Utilities Approved Materials in accordance with these *Wastewater LESS*. All repairs and replacements require a Wastewater 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. 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.

5.22.F.1 Responsibility

The property Owner is responsible for the repair and maintenance of the Wastewater Service Line from the Structure being served to the public main, including the Wastewater service tap.

The Contractor shall make the necessary excavations and barricade all excavations in accordance with the barricading instructions of the Authority Having Jurisdiction. The Contractor shall make all the necessary repairs, rehabilitations, or replacements including the installation of a two-way cleanout at the discretion of Colorado Springs Utilities.

5.22.F.2 Materials

The Contractor shall use the same material as the existing pipe material if possible. If the existing pipe material is no longer approved for use the Contractor shall utilize Approved Materials for Wastewater Service Line installation as outlined in Section 2.6.B.2.

Repair clamps are not permitted on Wastewater Service Line Repairs. Rubber couplings may be used on repairs with the Inspector's approval. All Wastewater Service Line rubber couplings shall have the "UPC" designation and be made for the pipeline materials used and be encased with 6 inches of concrete around the coupling.

5.22.F.3 Size

The Contractor shall use the same size pipe as the existing pipe.

5.22.F.4 Protection of Water Service Lines

Where the water service line is preexisting below the Wastewater Service Line in the same trench one of the following conditions must be met at the Inspectors discretion:

- The water service line is constructed of joint-less pipe and the Wastewater Service Line shall be constructed of schedule 40 PVC, or
- The Wastewater Service Line shall be sleeved with schedule 40 PVC (or equivalent), or
- Either the Wastewater Service Line or the water service line shall be encased in flow fill.

5.22.F.5 4 Inch Replacements Installed at Less Than 2.08%

4 inch replacements installed at less than 2.08% shall be made according to Section 5.22.D.6.

5.22.F.6 Clean Outs

Clean outs shall be installed per Section 2.6.E. For repairs, clean outs shall be installed at the repair location where the above criteria is not met. Where clean outs cannot be located per the above criteria due to site conditions including topography, conflict with Structure location, Easements, and property boundaries the Contractor shall locate clean outs at the closest reasonable location.

5.22.F.7 Replacements Across Property Boundaries

Where a Wastewater Service Line replacement occurs across a property boundary the Owner is responsible for securing a private agreement with all impacted private property Owners prior to inspection by Colorado Springs Utilities.

5.22.F.8 Trenchless Rehabilitations

For information on trenchless rehabilitations, see CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies.

5.22.G Backwater Valve for Wastewater Service Lines

Backwater valves shall be installed at the discretion of Colorado Springs Utilities based on documented instances of backflow from the Wastewater Main on gravity Wastewater Service Lines only. The backwater valve shall be made up of:

1. Backwater Valve, and
2. Extendable clean-out for maintenance.

5.22.G.1 Size and Location

Backwater valves, when fully opened, shall have a capacity at least that of the pipes in which they are installed.

Backwater valves may be installed in the branches of the building Wastewater Service Lines, which are below grade. Backwater valves shall be installed to be accessible for maintenance.

5.22.G.2 Layout

The backwater valve shall have an extendable clean out for maintenance; see Detail Drawing C4-6.

5.22.G.3 Installation

The installation of the backwater valve shall be per the manufacturer's recommendations. All installations shall be able to be accessed by a Wastewater cleaning truck and shall not be blocked by walls, landscaping, or other Structures. A licensed plumbing or pipeline Contractor shall do all installations. After significant rainfall events or at least once every 6 months the backwater valve should be inspected.

5.22.G.4 Backfill and Compaction

The Wastewater Service Line trench shall be backfilled and compacted per Section 5.17.

5.22.H Grease Interceptors and Sand/Oil Interceptors

Grease Interceptors and Sand/Oil Interceptors shall be precast per Detail Drawings C4-2 and C4-5.

The granular material for foundations shall be of soil class I or II. The minimum thickness of foundation material shall be 6 inches.

Grease Interceptors and Sand/Oil Interceptors shall be backfilled in lifts not to exceed 6 inches and compacted per the City of Colorado Springs Standard Specifications or the Specifications of the Authority Having Jurisdiction. Backfill material shall be non-swelling impervious, well graded, and free from stones larger than 3 inches. The backfill shall be placed along the full height of the interceptor. The Contractor may use material excavated from the job that meets the Specifications described above.

The Contractor shall not backfill in freezing weather unless authorized by the Inspector. The Contractor shall not use additional backfill over any frozen backfill material already in the trench.

During backfill, the Contractor shall not place any detrimental substance, rock, or stone larger than that allowed by the sieve analysis, within 3 feet of the interceptor.

5.23 Pipe Line Markers

Utility line markers are to be used on all cross-country Wastewater Mains and on Wastewater Mains where development has not yet been established to locate the existing/proposed Wastewater Main. 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.

5.24 Surface Restoration and Maintenance

5.24.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.

5.24.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 materials.

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 supporting the pavement. See Section 5.17 of these *Wastewater LESS* for backfill and compaction of backfill requirements.

For areas of Construction in and around City Parks and trails, see protection requirements in Park Standard Specifications.

5.24.C Un-surfaced Areas

The Owner/Developer shall be responsible for providing 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.

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

5.24.D Damaged Surfaces and Property

If any pavement, street, vegetation, landscaping, streetscaping, hardscaping, 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.

5.25 Manhole Adjustments Before Paving and Final Grading

Following the Construction of curb and gutter in new streets, or completion of manholes in streets with existing curb and gutter, and manholes within un-surfaced areas before final grade has been achieved, the Contractor shall measure and certify all manhole rim elevations for proper grade.

The Contractor shall promptly adjust any manhole rims that do not meet proper grade. At no time shall the total height of grade adjustment rings exceed 8 inches. If grade adjustments exceed 8 inches an additional barrel shall be installed.

Where a paving Contractor plans to pave over an existing Wastewater Main (out of warranty), the paving Contractor shall contact Colorado Springs Utilities to lower the existing manholes impacted by the proposed paving a minimum of two working days prior to paving. After paving is complete the Contractor shall contact Colorado Springs Utilities to raise the manhole.

5.26 Manhole Adjustments After Paving and Final Grading

The Contractor shall clean all manholes and complete all manhole adjustments to finished pavement and final grade within 30 days, prior to placing the line into service and following placement of paving. If the Contractor has not completed street paving or has not adjusted the manholes within 2 years of the preliminary acceptance date, then Colorado Springs Utilities will extend the warranty period until work is completed as detailed above.

The Contractor shall obtain a *Facility Access Permit* for adjustment work from Colorado Springs Utilities 2 working days prior to beginning work, and must notify the Inspector designated on the permit when the work is ready for inspection. Colorado Springs Utilities will attempt to provide surface location of manholes requiring adjustment within 2 working days of request for location. The Inspector will perform the inspection within 2 working days of the request for inspection and will provide the permit a "Notice of Acceptance" or "Rejection" of the work. The Contractor must complete the correction of rejected items in accordance with the requirements and within the time frame noted by the Inspector or Colorado Springs Utilities shall:

- Withhold approval of additional Connection Permits within the Project area; and/or
- Unilaterally extend of the warranty period until Applicant completes the adjustments; and/or
- At the Contractors sole expense, perform the necessary manholes adjustments and cleaning work by contract or with Colorado Springs Utility personnel and bill the costs plus administration, legal, overhead, and other applicable expenses to the Contractor.

5.27 Forms

5.27.A Sample of CCTV Re-Inspection Form

Colorado Springs Utilities
It's how we're all connected

SERVICE CONTRACT FOR CCTV RE-INSPECTION OF WASTEWATER LINES

Date of request: _____ *Requested date of Inspection:* _____

Project or Subdivision Name: _____
Project No. _____ RMS No._____
Contractor/Developer: _____
(Print or Type and circle, Name of Contractor/Developer)

Address: _____

Reason for Inspection: ☐ Third Inspection ☐ Additional Inspection (4th, 5th)

Comments: _____

As provided in the Wastewater Line Extension and Service Standards, a fee shall be charged for any additional inspections (i.e., a third trip or more), that are scheduled to be made by the Colorado Springs Utilities Inspector to inspect Wastewater lines that have not been corrected of all deficiencies found during the original or second Closed Circuit Television (CCTV) Inspection. The fee shall be charged to the Contractor/Developer for expense incurred by the Colorado Springs Utilities for these services (Section 5.21). The following terms and conditions shall apply.

1. Time will be charged for time and materials at the rate of $85.00 per hour (Charges include administration, truck/equipment, and crew charges).
2. There will be a minimum charge for 4 hours per Project inspection (includes travel time) of $340.00, payable with this submittal of this Service Contract.
3. Colorado Springs Utilities will calculate total charge for Time and Materials for CCTV Inspection and will invoice Contractor/Developer.
4. Receipt for the minimum charge must be presented to CCTV inspector prior to commencement of services.
5. CCTV services will be provided on normal business days and hours and no earlier than receipt of this contract and minimum payment.
6. The Contractor/Developer agrees to make payment of the total charge for Time and Materials for CCTV Inspection for the above, upon receipt of billing. Service charges for unpaid bills or late payments, at the rate of (defined in the Colorado Springs Utilities tariffs) will occur 30 days after receipt of billing.
7. The City of Colorado Springs and Colorado Springs Utilities shall not be subjected to any liability for any deficiency or defect which is not discovered by inspection nor shall the Owner or Developer of the Premises be absolved from liability for the deficiency or defect and any resulting damage or from responsibility to correct the deficiency or defect.

8. Additional terms and conditions:

_____

The undersigned representative for the Contractor/Developer represents that he/she has the legal authority to bind the Contractor/Developer for purposes of this Service Contract.

FOR THE CONTRACTOR/DEVELOPER	FOR COLORADO SPRINGS UTILITIES
_____	_____
(i) Signature	*Signature*
_____	_____
Printed or typed name and position	Printed or typed name and position
_____	_____
Date	Date
_____	_____
Telephone number	Telephone number
Contact Name if different than above:	
_____	

5.27.B Wastewater Bypass System Plan Cover Sheet



Wastewater Bypass System Plan

DATE: _____ Project Number _____

Contractor: _____
Contact Person: _____ Phone: _____
Address: _____

Owner Developer: _____
Address: _____
Phone: _____

Project Name: _____
Project Location: _____

Scheduled date and time of Bypass system Operation: _____

The Wastewater flow rate at the above location is estimated at: _____gpm.
Two _____ inch pumps will be used. Each pump will provide adequate pumping capacity to handle peak flows at the location above.

The Contractor shall meet all of the requirements as outlined in the 2021 Wastewater Line Extension and Service Standards.

The Contractor shall be liable for cleanup, civil or criminal charges, third party claims and or other claims as a result of any spill or release of Wastewater associated with the Contractor or their activities.

This Plan is not Transferable. If the Owner or Contractor shown above changes a new Wastewater Bypass system Plan will be required.

The Contractor shall indemnify and hold harmless Colorado Springs Utilities for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the Owner/Developer in defending such fines and claims.

_____ _____
Contractor Date Colorado Springs Utilities Date

_____ _____
Contractor (Print Name) Colorado Springs Utilities (Print Name)

Please attach the following to the Wastewater Bypass System Plan:

1) The emergency spill plan that includes containment, and cleanup plans for a Wastewater spill resulting from the pumping operation.

2) A schedule of work along with a description of pumps, by-pass lines, setup, staffing and execution of the bypass system operation.

3) A map showing the location of pumps, bypass piping, and manholes to be used along with spill containment areas.

5.27.C Environmental Plan Statement

ENVIRONMENTAL PLAN STATEMENT
Spill Prevention Plan
Spill prevention is prudent both economically and environmentally because spills increase operating costs and lower productivity. This Spill Prevention Plan specifies materials handling procedures and storage requirements and identifies spill cleanup procedures for areas and processes in which spills may potentially occur. The plan standardizes process operating procedures and employee training in an effort to minimize accidental pollutant release that could contaminate the environment.

Our goal through this Spill Prevention Plan is to establish our commitment to a ZERO TOLERANCE OF SPILLS system. Our commitment extends to all our activities, wherever they take place, which have the potential to adversely affect the environment. We aim to eliminate environmental harm throughout the range of sewer bypass activities in which we are engaged.

We recognize our business activities have direct and indirect environmental impact and that we have a duty to manage these in a responsible manner. We are committed to continuous improvement to minimize our impacts on the environment. Compliance with all environmental legislation pertinent to our activities is a minimum requirement and an integral part of our plan.

The requirements of this ENVIRONMENTAL PLAN are mandatory for all employees. Employees are expected to work toward the ZERO TOLERANCE OF SPILLS goal and are required to advise his or her supervisor promptly of any situation that may be in conflict with this Plan.

I have read and understand this ENVIRONMENTAL PLAN. I am committed to abide by the Plan.

_____

Contractor *DATE*

_____

Print Name

5.27.D Spill Response Plan Example

SPILL RESPONSE PLAN
INTRODUCTION

In the event of an accidental leak, spill, or uncontrolled release of sewage the actions outlined should be taken by all employees and/or Subcontractors so as to help minimize harming public health or the environment. Individual circumstances surrounding each spill will dictate the order in which these guides are applied.

Procedures will proceed in order of priority with many activities taking place concurrently.

SPILL RESPONSE PROCEDURES

1. Stop leak at the source by turning off pump.
2. If pump cannot be shut off, switch to redundant pumps and hose system, and control and contain the leak
3. Grab adequate supplies from spill kit.
4. Call for assistance from other employees and resources, if required.
5. Contain and clean the spill.
6. Protect all storm sewers with containment booms
7. Divert spills away from potential waterway
8. Use Containment booms to divert back towards the downstream manhole
9. Wash Area with Potable water into the sewer unless otherwise approved by Colorado Springs Utilities and/or Engineer. NOTE: avoid using chlorine or bleach unless otherwise approved.
10. Sanitize the area, if required
11. If Soil is contaminated the supervisor, Project Manager, and or engineer will direct removal and replacement, if required
12. Any other actions as required by Colorado Springs Utilities Environmental Regulatory Services personnel.
13. Repair or replace hoses or connections.
14. Report spill.

EMERGENCY PHONE NUMBERS

Emergency Phone Numbers: The emergency phone numbers to be used in order are:

Colorado Springs Utilities Dispatch: (719) 448-4800
Colorado Springs Utilities dispatch will notify in-house resources for incident investigation and additional resource deployment as determined necessary

SPILL RESPONSE KIT

A Spill Response Kit shall be kept near bypassing operations at all times. The kit will be in a clearly marked barrel with the contents of kit shall consist of:

2 pairs Rubber gloves
2 pairs Splash goggles
Containment Booms
1 box Spill pads
Paper towels
Stainless Steel Hose Repair Clamps
Wet/dry shop vacuum
Garden sprayer
Kitty litter
55 gallon drum for kit
Hand sanitizer
Surface disinfectant

SPILL REPORTING

All spills or leaks shall be reported immediately. Give sufficient details so a correct assessment can be made of the situation.

The Foreman is responsible for the accuracy and shall ensure that the Information is forwarded to management. As a minimum the information on the form shall include:

- Location of spill;
- Time and date of spill
- Cause of spill (e.g., broken coupler, etc.);
- Duration of spill (start and stop dates and times);
- Estimated number of gallons spilled;
- Public or private properties potentially impacted by spill;
- Surface or Groundwater bodies impacted or potentially impacted by spill (even if remote);
- Steps taken to contain the spill or decontaminate the area;
- Estimated time of clean-up and repair completion;

ONSITE SPILL REPORT

Date of Incident:_____ Time of the Incident:_____

Site of Incident:_____

Cause of the Spill:_____
_____
_____

Response to the Spill:_____
_____
_____

Duration of the Spill: _____

Volume of Spill:_____

Remediation: _____
_____
_____

Time that cleanup was complete:_____

Were any waterways affected by the Spill?_____
Describe the inlet, stream, or lake affected:_____
_____
_____

Tests taken at site:_____
By whom:_____
_____

Initial plans to prevent a reoccurrence:_____
_____
_____

Superintendent:_____ Date:_____
Bypass Foreman:_____ Date:_____

This page left intentionally blank

TABLE OF CONTENTS

CHAPTER 6
High Density Polyethylene Pipe and Trenchless Technologies

Paragraph Number	Title	Page Number
6.1	General	6-5
6.2	HDPE Wastewater System Planning	6-5
6.2.A	Sizing of HDPE Wastewater Mains	6-5
6.2.B	HDPE Connection Requirements	6-5
6.3	HDPE Site/Horizontal Design Criteria	6-5
6.3.A	Expansion and Contraction	6-6
6.3.B	Pressure Requirements	6-6
6.3.C	Curvilinear Wastewater Mains	6-6
6.4	HDPE Vertical Design	6-6
6.4.A	Plan and Profile Requirements and Depth of Bury	6-6
6.4.B	Minimum Percent of Grade	6-6
6.4.C	Aerial Crossings	6-6
6.5	HDPE Wastewater Service Line Design	6-7
6.5.A	HDPE Wastewater Taps and Service Line, Sizing and Material	6-7
6.5.B	HDPE Wastewater Service Line Design Criteria	6-7
6.5.B.1	HDPE Wastewater Service Line Horizontal Design Criteria	6-7
6.5.B.2	HDPE Wastewater Service Line Vertical Design Criteria	6-7
6.6	Wastewater HDPE Construction	6-7
6.6.A	Fusion Qualification	6-7
6.6.B	Fusion Records	6-7
6.6.C	Tracer Wire	6-9
6.6.D	Trench Placement of HDPE Pipe	6-9
6.6.E	Butt Fusion Joining	6-9
6.6.F	Bead Removal from HDPE Pipe	6-10
6.6.G	Stainless Steel HDPE Stiffener Insert for HDPE pipe	6-10
6.7	HDPE Wastewater Inspection	6-10
6.8	HDPE Wastewater Service Line Tap Connections and HDPE Wastewater Service Line Pipe	6-10
6.8.A	Tap Connections	6-10

6.8.B HDPE Wastewater Service Line Pipe 6-11
6.9 Repair of HDPE Wastewater Mains and Wastewater Service Lines 6-11
6.10 Trenchless Technology Applications 6-11
6.11 Trenchless Planning and Design 6-12
6.11.A Geotechnical Requirements 6-12
6.11.B Horizontal Directional Drilling (HDD) Site Design Criteria 6-12
6.11.C Micro Tunneling Boring Method (MTBM) 6-13
6.11.D Tunneling Boring Method (TBM) 6-13
6.11.E Guided Boring Method (GBM) 6-13
6.11.F Auger Boring Method (ABM) 6-13
6.12 Trenchless Materials 6-13
6.13 Trenchless Construction Plan Submittals 6-13
6.14 Trenchless Mains Construction 6-14
6.14.A Planning 6-14
6.14.A.1 Construction Work Plan 6-14
6.14.A.2 Equipment Plan 6-14
6.14.A.3 Drilling Fluid Plan 6-15
6.14.A.4 Inadvertent Fluid Release (IFR) Plan 6-15
6.14.A.5 Other Permits as Necessary 6-15
6.14.A.6 Personnel Qualifications 6-15
6.14.B Drill Path Survey 6-15
6.14.C Inspections 6-16
6.14.D Locates and Visual Verification 6-16
6.14.E Tracer Wire 6-16
6.14.F Pipe Placement 6-16
6.15 Trenchless Wastewater Service Line Construction 6-16
6.15.A Record Keeping 6-16
6.15.B Site Restoration 6-16
6.16 Inspection 6-17
6.17 Rehabilitation of Wastewater Mains and Wastewater Service Lines 6-17
6.17.A Cured in Place Pipe. 6-17
6.17.B Sliplining 6-17
6.17.B.1 CIPP and Sliplining Design Criteria 6-17
6.17.C Pipe Bursting 6-18

6.17.C.1 Pipe Bursting Design Criteria 6-18
6.18 CIPP, Sliplining and Pipe Bursting Construction……..…….6-19
6.18.A CIPP Construction 6-19
6.18.B Sliplining Construction..... 6-20
6.18.C Pipe Bursting Construction 6-20
6.18.D Sealing and Benches in Manhole 6-21
6.18.E Service Reconnections 6-21

This page left intentionally blank

CHAPTER 6

High Density Polyethylene Pipe and Trenchless Technologies

6.1 General

The purpose of Chapter 6 is to provide the criteria for design and Construction of Wastewater Mains and Wastewater Service Lines when High Density Polyethylene Pipe (HDPE) and/or Trenchless Technologies will be utilized for new Construction or rehabilitation of existing infrastructure. All Construction Plans for HDPE and Trenchless Technologies shall be in accordance with criteria specified in these *Wastewater LESS*. Additional information regarding HDPE and Trenchless Technologies design and Construction may be found in *AWWA Manual M55, PE Pipe Design and Installation, AWWA M28 Rehabilitation of Water Mains, HDD Consortium Horizontal Directional Drilling Good Practices Guidelines, and the Plastics Pipe Institute (PPI), www.plasticpipe.org*.

6.2 HDPE Wastewater System Planning

HDPE may be utilized with the approval of Colorado Springs Utilities where the Wastewater Main will be constructed:

- in open cut trenches
- in directional drilling applications
- in highly corrosive soils
- in areas with known soil movement
- in sliplining applications
- in pipe bursting applications

Planning and responsibility of a HDPE Wastewater Main System Extension shall be in accordance with CHAPTER 2 Development and Design of Wastewater Systems. It is highly recommended that when an HDPE Wastewater Main is being proposed, the Design Engineer and Contractor be experienced with HDPE and work closely together during design to ensure a quality Wastewater System Extension is designed and constructed. Geotechnical research is required for Construction of HDPE Wastewater Mains in open cut or directional drilling applications. See Trenchless Technology Applications beginning with Section 6.10.

6.2.A Sizing of HDPE Wastewater Mains

The difference in wall thickness between DR 11 HDPE and SDR 26, SDR 35 PVC, C900 PVC, and DIP is nominal. Because of this, HDPE Wastewater Mains do not need to be upsized as is the standard in the *Water LESS*. Refer to Section 2.4.B for sizing requirements.

6.2.B HDPE Connection Requirements

HDPE Wastewater Mains shall be constructed from manhole to manhole.

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. For all information regarding approved HDPE pipe and materials please see CHAPTER 4 Approved Materials.

HDPE piping shall not be installed in soils where contamination, e.g., hydrocarbons, incompatible with HDPE exists.

6.3.A Expansion and Contraction

HDPE expansion and contraction must be accounted for in the design and Construction of HDPE Wastewater Mains (see Section 6.6.D). HDPE materials will expand and contract until placed in the trench and stabilized with ambient ground temperatures.

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)	Coefficient of Linear Thermal Expansion, ASTM D696 (in/in-F)	Resultant Pipe Expansion (inches/100 feet- 10°F)
PE, High Density (PE 4710)	9.0×10^{-5}	1.10

6.3.B Pressure Requirements

See section 7.12 regarding pressurized Wastewater Mains.

6.3.C Curvilinear Wastewater Mains

HDPE pipe may be cold field bent without affecting the working pressure rating of the pipe. The minimum cold bend radius for HDPE pipe is no less than 100 feet.

6.4 HDPE Vertical Design

This section is to be read in conjunction and applied with CHAPTER 2 Development and Design of Wastewater Systems of these *Wastewater LESS*.

6.4.A Plan and Profile Requirements and Depth of Bury

All HDPE Wastewater Mains and Wastewater Service Lines 8 inch and greater shall have both a plan and profile submitted as part of the Wastewater Construction Plan set. In addition, all HDPE Construction Plans will be in compliance with Section 2.5.F.2 of these *Wastewater LESS*. Vertical curves are allowed with HDPE pipe and shall be designed and included in the plan and profile.

6.4.B Minimum Percent of Grade

The minimum grade with the use of butt fusion shall be 6 % for HDPE Wastewater Mains unless the internal beads are removed, in which case the minimum grade may be 3%. The minimum grade with the use of electrofusion couplings shall be 3% for HDPE Wastewater Mains.

6.4.C Aerial Crossings

Use of HDPE on a bridge or an aerial crossing is not allowed.

6.5 HDPE Wastewater Service Line Design

The design of HDPE Wastewater Service Lines shall be in accordance with Section 2.6 of these Wastewater LESS.

6.5.A HDPE Wastewater Taps and Service Line, Sizing and Material

Gravity HDPE Service Line taps and sizes shall be a minimum of 4 inches. See Section 2.6.B.1 for additional information on sizing gravity Wastewater Service Lines. See Section 7.11 for sizing requirements of pressurized Wastewater Service Lines.

6.5.B HDPE Wastewater Service Line Design Criteria

6.5.B.1 HDPE Wastewater Service Line Horizontal Design Criteria

When designing HDPE Wastewater Service Lines refer to the information listed in Section 2.6.C.

Due to the flexibility of 4 and 6 inch HDPE Wastewater Service Lines, pipe bends are usually not required.

For joint trench installation refer to section 5.22.D.2.

6.5.B.2 HDPE Wastewater Service Line Vertical Design Criteria

The minimum grade with the use of butt fusion or electrofusion shall be 3% for HDPE Wastewater Service Lines.

For rehabilitation applications, such as pipe bursting or slip lining, electrofusion shall not be used and butt fusion may be installed at the existing slope of the Wastewater Service Line even if it is less than 3%.

6.6 Wastewater HDPE Construction

This section shall be read in conjunction with CHAPTER 5 Wastewater Construction in regard to the Construction of HDPE Wastewater Mains and Wastewater Service Lines.

6.6.A Fusion Qualification

The Contractor shall ensure that persons making butt or electrofusion 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/certification for said person shall be available, for inspection by the Colorado Springs Utilities Inspector, if required. The Contractor shall maintain records of trained personnel and shall confirm that training was received within twelve months before commencing Construction. Only a qualified operator shall be permitted to weld, fuse, and install HDPE Wastewater 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 (Water/Wastewater Standards Department

via the Inspector) 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.

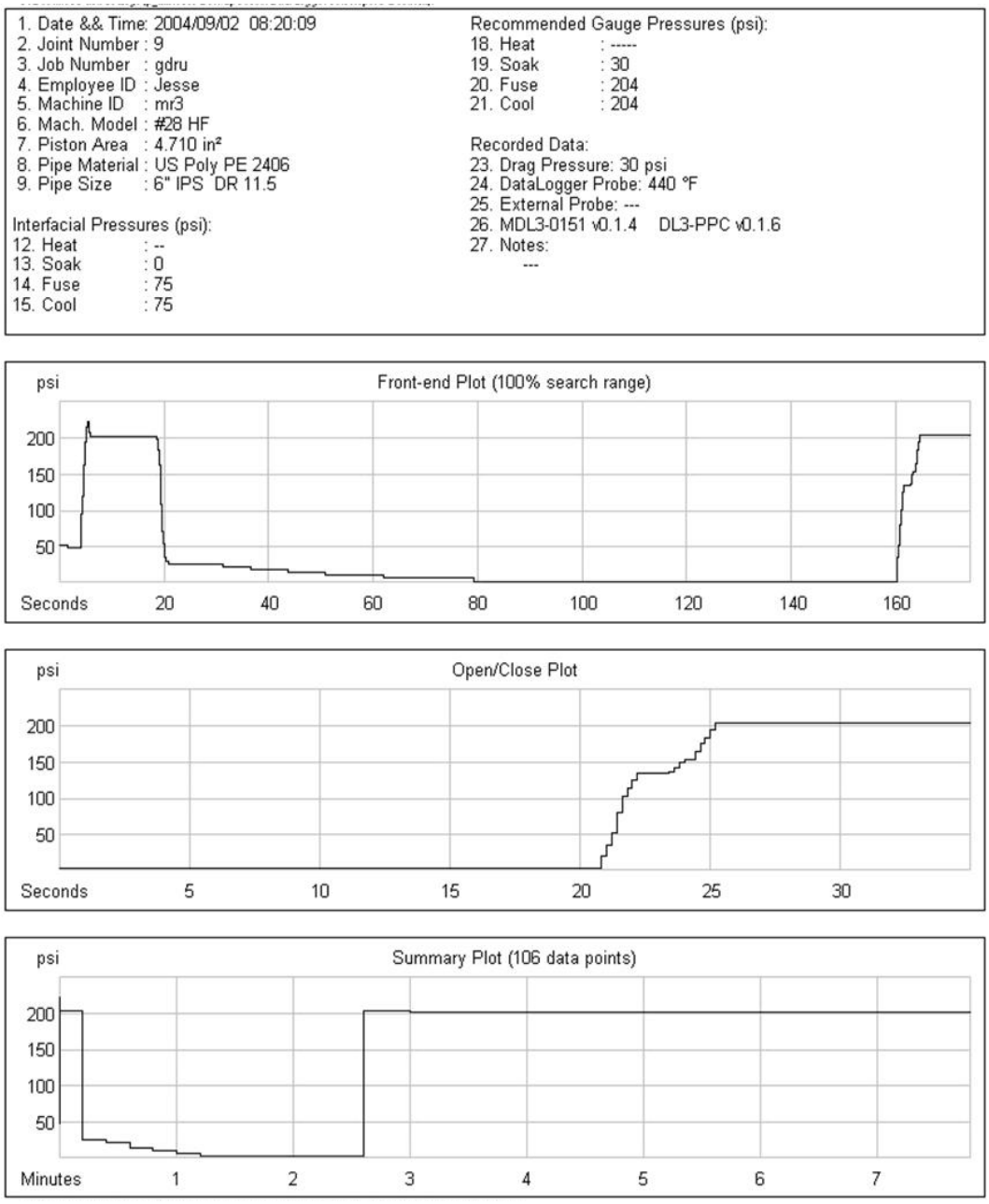


Figure 6-1: Example of a Heat Fusion Joint Record (typical output for a McElroy Data logger)

6.6.C Tracer Wire

Tracer wire shall be installed on all Wastewater Mains and Wastewater Service Lines. (Reference Section 5.15 of these *Wastewater LESS* for installation and testing and Section 4.2.K for tracer wire materials.)

In a directional drilling and/or pipe bursting application, 4 individual tracer wires or 1 stranded copper clad steel cable rated for the applied pull force shall be pulled in along with the pipe. In the event that 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 above the HDPE Wastewater Main. Additional documentation will need to be referenced on the Record Drawing regarding the separately bored in tracer wire so that future locates can be made aware of the difference in depth and location to the actual Wastewater Main placed.

6.6.D Trench Placement of HDPE Pipe

HDPE pipe shall not be dragged over the ground as it may be susceptible to damage from sharp objects. Pipe rollers shall be used to pull HDPE pipe to the site. 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. 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.

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 ground, the end sections can then be connected to the manhole or existing pipe. Reference *PPI TR-33* and *TN-42* for information regarding installation of HDPE pipe when temperatures drop below 32 degrees Fahrenheit.

6.6.E Butt Fusion Joining

The butt fusion shall be made in accordance with the pipe and fitting manufacturers' recommendations (reference *PPI TR-33/TN42* and *ASTM F2620*).

The butt-fused joint shall have true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to or greater than that of the pipe.

All joints shall be subject to acceptance by Colorado Springs Utilities prior to installation. Defective areas of the pipe shall be cut out and the pipe joint butt-fused again in accordance with the procedures stated above.

Trial fusion tests of the pipe shall be performed as requested by Colorado Springs Utilities. The trial fusion shall be allowed to cool completely, and then fusion test straps shall be cut out. The test strap shall be 12 inches minimum or 30 times the wall thickness in length with

the fusion in the center, and 1 inch minimum or 1.5 times the wall thickness in width. The Contractor shall bend the test strap until the ends of the strap touch. If the fusion fails at the joint, the Contractor shall perform a new trial fusion to be cooled completely and tested. The Contractor shall not commence installation of pipe until a trial fusion has passed the bent strap test or as directed by the Colorado Springs Utilities Inspector.

Any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing or handling as determined by Colorado Springs Utilities shall be discarded and not used.

6.6.F Bead Removal from HDPE Pipe

All internal beads shall be removed on Wastewater Mains for slopes less than 6% unless otherwise specified. The internal beads shall be removed using a bead-removing tool suitable for HDPE pipe after the necessary cooling time. The bead removal tool shall not induce any slits, gouges or other defects in the pipe wall as required by the manufacturer.

6.6.G 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.

6.7 HDPE Wastewater Inspection

All Construction shall be inspected by a Colorado Springs Utilities Inspector with the authority to halt Construction if, these *Wastewater LESS* are not met. Whenever any portion of the *Wastewater LESS* is violated, Colorado Springs Utilities may order further Construction to cease until all deficiencies are corrected.

Colorado Springs Utilities will require that all new and replacement HDPE Wastewater Mains be CCTV inspected per Section 5.21.

6.8 HDPE Wastewater Service Line Tap Connections and HDPE Wastewater Service Line Pipe

All HDPE Wastewater Service Line taps off of a HDPE Wastewater Main be the same size tap as the proposed Wastewater Service Line. The HDPE Wastewater Service Tap shall be installed at a 45° angle. The saddle tap must be selected to accommodate the type of service line pipe material connected to it. See CHAPTER 4 Approved Materials for all Approved Materials referenced in this section.

6.8.A Tap Connections

- HDPE Wastewater Service Line pipe connecting to a HDPE Wastewater Main will require an electrofusion tap saddle that will allow for the HDPE service line to be electrofused to the tap saddle.
- SDR 35 Wastewater Service Line pipe connecting to a HDPE Wastewater Main will require an electrofusion tap saddle with a PSM gasket outlet for SDR 35 PVC fitting insertion.

- Schedule 40 Wastewater Service Line pipe connecting to a HDPE Wastewater Main will require an electrofusion tap saddle with a Schedule 40 gasket outlet for Schedule 40 PVC fitting insertion.
- HDPE Wastewater Service Line taps onto a DIP or PVC Wastewater Main shall be accomplished with an approved tapping saddle specific to the type of pipe, see CHAPTER 5 Wastewater Construction.
- All taps made on HDPE Wastewater Mains through an electrofusion saddle shall be made according to manufacturer recommendations; Tap holes made after saddle placement may require a smaller hole saw to avoid damage to internal gaskets in the electrofused tap saddle.

6.8.B HDPE Wastewater Service Line Pipe

HDPE Wastewater Service Line pipe shall be 4 or 6 inch DIPS DR11 PE4710 pipe, HDPE service line pipe shall be laid with slight horizontal snaking in an open cut application to allow for expansion and contraction of the HDPE pipe. For pipe bust applications of Wastewater Service Line pipe, the Contractor shall leave the two end sections exposed to allow for any expansion or contraction of the pipe. After a period of 24 hours, or once the pipe has reached ambient temperature of the ground, then the pipe may be connected to the service tap saddle.

A transition to PVC pipe for attachment to a cleanout or to a PVC tap saddle shall be made with a fused on transition coupling or a flexible rubber coupling. If a flexible rubber coupling is used it must be encased in a concrete collar with an electrofused flex restraint or mechanical pipe restraint applied to the HDPE Wastewater Service Line pipe to prevent pullout of the transition.

6.9 Repair of HDPE Wastewater Mains and Wastewater Service Lines

Repair to HDPE Wastewater Service Lines shall be in accordance with general guidelines in *ASTM F2620, PPI Handbook of Polyethylene Pipe* Chapter 15. Colorado Springs Utilities recommends that repairs be made by butt fusion, electrofusion, or mechanical couplings. Reference Approved Manufacturer's heat fusion joining procedures and *PPI TR-33 - Table* 2.

Mechanical couplings are required to be encased in concrete and are only allowed with the approval of Colorado Springs Utilities.

6.10 Trenchless Technology Applications

The purpose of this section of CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies is to provide the criteria for designing and constructing the Wastewater System utilizing Trenchless Technology applications (Trenchless). See Section 6.17 for information on Trenchless rehabilitation below.

Horizontal Directional Drilling (HDD), Tunnel Bore Method (TBM), Guided Bore Method (GBM), Micro Tunnel Boring Method (MTBM), 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 or rehabilitate a Wastewater 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 Wastewater 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*

6.11 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.

6.11.A Geotechnical Requirements

The Design Engineer is required to 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 Wastewater 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.

6.11.B 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 Underground Facilities 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.

6.11.C Micro Tunneling Boring Method (MTBM)

Micro tunneling is a digging technique used to construct small tunnels with remotely operated micro tunnel boring machines (MTBMs). 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 6.11.B. Due to the uniqueness of this method, 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.

6.11.D 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.

6.11.E 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 6.11.B.

6.11.F 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.

6.12 Trenchless Materials

Specifications on all materials proposed for Construction must comply with this *Wastewater LESS*; see CHAPTER 4 Approved Materials.

6.13 Trenchless Construction Plan Submittals

The Design Engineer shall submit to Colorado Springs Utilities copies of the Construction Plan and geotechnical report that applies to the trenchless site 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

6.14 Trenchless Mains Construction

Colorado Springs Utilities' approval of any aspect of any Trenchless Construction covered by this *Wastewater LESS*, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the Construction.

Horizontal line accuracy tolerances when constructing any Trenchless method Project shall be plus or minus 3 inches. Accuracy may be impacted by the environment, subsurface 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 2.5.D.2).

The Contractor shall notify Colorado Springs Utilities 2 working days in advance prior to the start of Construction. All Trenchless Construction shall be in compliance with CHAPTER 5 Wastewater Construction and include the following:

6.14.A Planning

The Contractor shall develop the following Plans. All of these plans shall be made available to Colorado Springs Utilities upon request:

6.14.A.1 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.

6.14.A.2 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 including traffic and private property access. Guidance systems must be calibrated prior to using the system and calibration records shall be kept for 24 months.

6.14.A.3 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.

6.14.A.4 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.

6.14.A.5 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.

6.14.A.6 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 or manufacturer's authorized training entity for the equipment being used. 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 complete. 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.

6.14.B Drill Path Survey

The entire drill path shall be accurately surveyed and staked by a Professional Land Surveyor licensed to practice in the State of Colorado, or their authorized representative. Staking shall be done in accordance with Section 5.5 or as required by the scope of work.

6.14.C 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.

6.14.D Locates and Visual Verification

All Utilities shall be located prior to the start of Construction per Section 5.8.A. Colorado Springs Utilities reserves the right to require the Contractor to expose Utility crossings to verify and monitor required separations.

6.14.E Tracer Wire

A total of 4 individual tracer wires or 1 stranded copper clad steel cable must be placed with all pipe materials and shall be rated for directional drilling applications, refer to Section 6.6.C and CHAPTER 4 Approved Materials. Tracer Wire is to be terminated in the manholes. Wire will run up the outside of the manholes and enter under the lid ring. A small slot is to be made in the top of the manhole cone or adjustment ring to accommodate the tracer wire and shall be covered with ram neck once the wire is placed to protect it.

6.14.F Pipe Placement

The Wastewater 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 5.11.B. During pull in of pipe for placement, pipe ends must be secured to prevent drilling fluids from entering the pipe.

6.15 Trenchless Wastewater Service Line Construction

Wastewater Service Lines may be placed by HDD or Sliplining application. For HDPE Wastewater Service Line information, see Section 6.5. When a HDPE Service line is pulled into place the Contractor must allow time for the HDPE pipe expansion and contraction to adjust to ambient ground temperatures before the Wastewater Service Line pipe is connected to the service saddle and the connection at the Premises, see Section 6.8.B.

6.15.A Record Keeping

The Contractor shall maintain a daily Project log of Construction operations which shall be provided to Colorado Springs Utilities upon request.

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.

6.15.B Site Restoration

Following the Trenchless Construction and demobilization, the Contractor shall restore the work-site per Section 5.24 All excavations shall be backfilled and compacted to the required density per Section 5.17. All Construction debris and materials shall be disposed of by the Contractor, see Section 5.24.

6.16 Inspection

The Contractor shall CCTV the Wastewater Service Line for all rehabilitations. A CCTV video of a quality sufficient to review the details of the service line shall be submitted to the Wastewater Planning and Design Section for review within 48 hours of Inspection prior to acceptance of the repair. The inspection shall include an inspection of the Wastewater Service Line from the Structure being served to the public main, including the tap. The Contractor shall clean the service line before performing the CCTV. If Colorado Springs Utilities has not received the CCTV video within 48 hours or the quality of the video is not of sufficient quality, Colorado Springs Utilities reserves the right to perform the CCTV and the Contractor shall be charged time and materials costs incurred by Colorado Springs Utilities in accordance with Utilities Rules and Regulations.

6.17 Rehabilitation of Wastewater Mains and Wastewater Service Lines

It is the intent of this section to define the approved methods and materials for trenchless rehabilitation of existing Wastewater Mains and Wastewater Service Lines.

Wastewater Main rehabilitation will be reviewed on a case-by-case basis depending on the conditions of the pipe and the requirements of the Wastewater Collection System. The Contractor is responsible for proper and accurate installation of the new pipe regardless of the methods proposed.

6.17.A Cured in Place Pipe

The Cured in Place Pipe (CIPP) rehabilitation of Wastewater Mains shall be done by the installation of a resin-impregnated flexible tube. When cured, the CIPP shall extend the full length of the original pipe and provide a structurally-sound, jointless and water-tight pipe.

Repair of Wastewater Mains can also be accomplished by inserting a CIPP sleeve utilizing CCTV for placement of the sleeve and creating a tight fitting pipe patch internally.

6.17.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. Cleaning and CCTV assessment of the host pipe is required prior to placement of a slipliner. Sliplining can be used to restore structural integrity to an existing pipe. Sliplining will need to be designed from manhole to manhole and where there are no bends or Wastewater Service Lines attached to the pipe. All rehabilitation sliplining of WW service lines will conduct CCTV inspections in accordance with section 6.16 Inspection.

6.17.B.1 CIPP and Sliplining Design Criteria

The Contractor shall provide structural design calculations for each cured-in-place liner or sliplining segment to be installed. The design calculations shall provide a cured-in-place liner/slipliner, which shall withstand all loadings subject to the sewer independent of the existing pipeline. The submittal shall provide documentation supporting the basis of the values used in the design calculations.

The calculations shall be prepared under and stamped by a Registered Professional Engineer in the State of Colorado.

The Contractor must submit a work plan, with the Construction Plan to Colorado Springs Utilities prior to the start of Construction including but not limited to the following:

- Preferred hours of operation, sequencing of work description, number of shifts, number of crews, and expected time to complete the work for each rehabilitation method proposed. The Contractor may also be directed by the Owner to perform the cured-in-place pipelining operations outside the restricted working hours if the Contractor determines a better product will result.
- A description of any surface activities that will be required and any mitigating measures that will be used to reduce surface impacts as part of each rehabilitation method proposed including Construction methods and equipment, process description, access and staging locations, inversion/installation and receiving manhole locations, and/or dewatering methods and design calculations to assure that the work can be accomplished as specified.
- Contractor shall physically inspect the work site and shall submit shop drawings, details, and descriptions including manhole connection details, end seals for the cured-in-place or sliplining system, water source(s), method of water discharge, cleaning methods, and pre-Construction video documentation shall be provided to the Design Engineer.
- The Contractor shall submit a traffic control plan.
- A plan to protect existing utilities and the Construction site.
- The Contractor shall provide a *Bypass System Plan* for continuous Wastewater flow around the section(s) of pipe designated for the installation of replacement pipe. The Bypass System shall be of adequate capacity and size to handle the flow in accordance with these *Wastewater LESS*. Reference Section 5.7 and Detail Drawing C2-12.

6.17.C Pipe Bursting

The Pipe Bursting Trenchless pipe replacement process is the rehabilitation of Wastewater Main or Wastewater Service Line by bursting the host pipe while inserting new HDPE pipe without the need for a traditional Construction trench. Launching and receiving pits shall be sized to allow the new pipe to be pulled in place through the existing pipe. The HDPE pipe shall extend the full length of the existing pipe to be replaced and shall provide a structurally sound, impermeable, jointless pipe.

6.17.C.1 Pipe Bursting Design Criteria

The Design Engineer/Contractor shall plan for launching and receiving pits to allow the new Wastewater Main to be pulled in place through the existing Wastewater Main with a bursting head. The Design Engineer/Contractor shall design the Project from manhole to manhole and shall include allowance for the expansion of materials and soil due to the insertion of the new Wastewater Main.

The Construction Plans shall include at a minimum but not be limited to:

- geotechnical surveys and reports reference Section 6.11.A
- a plan and profile drawing showing the dimensions of the launching and receiving pits
- a detailed description of the proposed techniques and procedures for rehabilitating the existing piping and reestablishing Wastewater services. The Contractor shall submit details to the Design Engineer for approval prior to beginning work.
- proposed line replacement, and Approved Materials to be used, See CHAPTER 4 Approved Materials
- area needed for the footprint of equipment and layout of the pipe prior to pipe bursting
- identification and location of all existing utilities within the scope of the Project
- depth of the pipe, and separation from all existing utilities, Structures, and obstacles
- a plan for traffic control to protect existing utilities and the Construction site
- the Contractor shall provide a *Bypass System Plan* for continuous Wastewater flow around the section(s) of pipe designated for the installation of replacement pipe. The Bypass System shall be of adequate capacity and size to handle the flow in accordance with these *Wastewater LESS*. Reference Section 5.7 and Detail Drawing C2-12.

6.18 CIPP, Sliplining and Pipe Bursting Construction

The Contractor is responsible for proper and accurate installation of the new pipe regardless of the methods described herein. It is the responsibility of the Contractor to obtain all available records, and CCTV the line to locate all appurtenances on the existing pipeline prior to Construction. The Contractor shall provide post-Construction video documentation for each pipe segment rehabilitated.

6.18.A CIPP Construction

The Contractor shall provide detailed plans, labor, equipment, and materials necessary for completing cured-in-place pipe (CIPP). Work shall include cleaning and videotaping the existing sewer lines, flow handling and/or bypass pumping of existing flows, and all restoration work required to Structures, pipes, or surface features as specified in the Contract Documents. Recent CCTV and television inspection logs for piping in the rehabilitation area may be made available to the Contractor by Colorado Springs Utilities upon request if records are available.

The rehabilitation of pipelines shall be done by the installation of a resin-impregnated flexible liner which when cured; the entire length of the finished liner shall be continuous and tight-fitting. The CIPP shall extend the full length of the original pipe and provide a structurally sound, jointless and water-tight pipe.

The Contractor shall notify the Owner/Developer and Colorado Springs Utilities identify any by-products produced as a result of the operations. The Contractor shall test and monitor the levels and comply with any and all local waste discharge requirements. The Contractor shall cleanup, restore existing surface conditions and Structures, and repair any defective work,

reference Section 5.24 of these *Wastewater LESS.* The Contractor shall conduct operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property Owners or tenants. It shall be the responsibility of the Contractor to perform the required work in a manner that does not cause or contribute to incidence of overflows or spills.

6.18.B Sliplining Construction

Sliplining of pipelines shall be performed by the installation of an approved liner or pipe material and shall be continuous and tight-fitting unless otherwise approved. The liner pipe shall extend the full length of the original pipe and provide a structurally sound and water-tight pipe.

All existing Wastewater Service Line connections shall be excavated to allow for reconnection once the sliplined pipe has been installed.

The finished replacement pipe shall be continuous over the entire length from manhole to manhole and be free from deficiencies per Section 5.21. The replacement pipe passing through or terminating in a manhole shall be carefully cut out in a shape and manner approved by the Design Engineer. The invert and benches shall be streamlined and improved for smooth flow. The replacement pipe shall meet the testing requirements of Section 5.19 and 5.20. Any defect which will affect the integrity or strength of the pipe discovered during the warranty period shall be repaired at the Contractor's expense.

6.18.C Pipe Bursting Construction

It is the responsibility of the Contractor to obtain all available geotechnical reports, records, and Record Drawings from the Design Engineer that will apply to the Construction of the Project. Prior to Construction the Wastewater Main must be CCTV'd to locate all taps and fittings on the existing pipeline prior to Construction.

The Contractor shall be fully trained by the manufacturer or the manufacturer's representative of the pipe bursting system being used. The Contractor is to provide to the Inspector, upon request, documentation that they are fully trained and certified User by the Manufacturer of the pipe bursting system.

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 pipe burst crosses existing Colorado Springs Utilities facilities.

The pipe bursting Project should avoid heaving of the ground and shall leave no voids. If heaving or voids occur, the Contractor shall be responsible for restoring the surface to pre-Construction conditions.

All active Wastewater Service Line connections shall be excavated to allow for reconnection once the replacement pipe is installed.

The finished replacement pipe shall be continuous over the entire length from manhole to manhole and be free from deficiencies per Section 5.21. The replacement pipe passing through or terminating in a manhole shall be carefully cut out in a shape and manner approved by the Design Engineer and the Inspector. The invert and benches shall be streamlined and improved for smooth flow. The replacement pipe shall meet the testing requirements of Section 5.19 and 5.20. Any defect which will affect the integrity or strength of the pipe discovered during the warranty period shall be repaired at the Contractor's expense.

6.18.D Sealing and Benches in Manhole

The replacement pipe shall be installed with a tight-fitting seal with the existing manholes to prevent inflow and infiltration. The top half of the pipe within the manhole shall be neatly cut off and not broken or sheared off, within 4 inches from the manhole walls. The channel in the manhole shall be a smooth continuation of the pipe(s) and shall be merged with other lines or channels, if any. Channel cross-section shall be U-shaped with a minimum height to springline of pipe diameter 8 inch, and 2 inch above springline for 10 inch diameter pipe and larger (Reference detail drawing C3-1). The replacement pipe in the manhole shall be sealed and tested as specified in CHAPTER 5 Wastewater Construction before proceeding on to the next manhole section and all manholes shall be individually inspected for replacement pipe cut-offs, benches and sealing works.

6.18.E Service Reconnections

The exact location and number of service connections shall be determined from CCTV Inspection and/or by field verification prior to Construction. The Contractor shall reestablish all Wastewater Service Line connections to the replacement pipe including those from unoccupied, abandoned, or vacant lots, unless directed otherwise by Colorado Springs Utilities Inspector. The Contractor shall be responsible for restoring/correcting, without any delay, all missed or faulty reconnections, as well as for any damage caused to property Owners for not reconnecting the Wastewater Service Lines soon enough or for not giving notice to the Owners. All Wastewater Service Lines, which are reconnected to replacement pipe, shall be shown on the Record Drawings with the exact distance from the nearest downstream manhole.

A Wastewater Service Line reconnection by excavation shall consist of the removal and replacement of any cracked, offset, or leaking existing service line up to a distance of 8 feet from the center of the new liner measured horizontally. All 8 inch diameter Wastewater Service Lines shall be connected to the lined Wastewater Main by the Construction of a new manhole.

Wastewater Service Lines reconnected to a HDPE Wastewater Main may only be made following a period of 48 hours or once the pipe has reached ambient ground temperature.

This page left intentionally blank

TABLE OF CONTENTS

CHAPTER 7
Pressurized Wastewater Systems

Paragraph Number	Title	Page Number
7.1	General	7-6
7.2	Types of Pressurized Systems	7-6
7.3	Cost Responsibilities	7-7
7.3.A	Design and Construction	7-7
7.3.B	Cost Recovery	7-7
7.3.B.1	Advance Cost Recovery or Participation	7-8
7.3.C	Operations and Maintenance	7-8
7.3.C.1	Public Facilities	7-8
7.3.C.2	Private Facilities	7-8
7.4	Planning	7-8
7.4.A	Wastewater System Plan	7-8
7.4.B	Lift Station Siting and Force Main Alignment	7-9
7.4.C	Lift Station and Force Main Sizing	7-9
7.4.D	Public Planning Process	7-9
7.4.E	Other Documents	7-9
7.5	Land Entitlement and Easements	7-9
7.5.A	Easements and Property Titles	7-9
7.5.B	Environmental Compliance	7-9
7.5.B.1	Existing Asbestos or Lead Materials	7-10
7.5.B.2	Contaminated Soils	7-10
7.5.B.3	Cultural	7-11
7.5.B.4	Endangered and Threatened Species	7-11
7.5.B.5	Migratory Birds	7-11
7.5.B.6	Other Environmental Assessments	7-11
7.6	Permitting	7-11
7.6.A	General Permit Procedures	7-12
7.6.B	Permits Initiated by Colorado Springs Utilities and Contractor Obtained	7-12
7.7	Design Criteria for Public Lift Stations and Force Mains	7-12
7.7.A	Basis of Design Report (BODR)	7-12
7.7.B	Preliminary Design Report	7-14
7.7.C	Geotechnical Hazards Study	7-15
7.7.D	Design Submittals and Contract Documents	7-15

7.7.D.1 Design Schedule and Budget 7-15
7.7.D.2 Design and Contract Document Submittals 7-16
7.7.D.3 Design Review and Value Engineering Workshop 7-16
7.7.E Health and Safety 7-17
7.7.F Applicable Codes 7-17
7.7.G Architectural 7-17
7.7.G.1 Visual Aesthetics 7-17
7.7.G.2 Architectural Program 7-18
7.7.G.3 Truck Bay and Rollup Door 7-18
7.7.G.4 Roof Design 7-18
7.7.G.5 Building Materials 7-19
7.7.G.6 Lighting 7-19
7.7.H Site Civil Engineering 7-19
7.7.H.1 Location 7-19
7.7.H.2 Accessibility 7-20
7.7.H.3 Security 7-20
7.7.H.4 Knox Box 7-20
7.7.I Wet Well7-20
7.7.I. Wet Well Access 7-21
7.7.I.2 Bouyancy 7-21
7.7.J Lift Station Access and Equipment Removal 7-21
7.7.K Pumps 7-21
7.7.K.1Dry Well 7-23
7.7.L Electrical, Instrumentation, and Controls 7-23
7.7.L.Electrical Equipment 7-23
7.7.L.2 Variable Frequency Drives and Soft Starters 7-23
7.7.L.3 Arc Flash Hazards 7-24
7.7.L.4 Backup Power Supply 7-24
7.7.L.5 Instrumentation and Controls 7-25
7.7.M Heating, Ventilation, and Air Conditioning (HVAC_ 7-25
7.7.M.1 Ventilation 7-25
7.7.N Valves and Bypass Assembly 7-26
7.7.O Odor Control 7-27
7.7.P Corrosion Protection 7-27
7.7.Q Public Force Mains 7-27
7.7.Q.1 Velocity 7-27
7.7.Q.2 Minimum Size 7-28

7.7.Q.3 Public Force Main Materials 7-28
7.7.Q.4 Minimum Depth 7-28
7.7.Q.5 Design Pressure 7-28
7.7.Q.6 Deflection 7-28
7.7.Q.7 Air and Vacuum Relief Valves and Drain Valves on Public Force Mains 7-28
7.7.Q.8 Termination 7-29
7.7.Q.9 Separation from Other Utilities 7-29
7.7.Q.10 Identification 7-29
7.7.Q.11 Check Valves 7-29
7.7.Q.12 Plug Valves 7-29
7.8 Construction and Inspection of Public Lift Stations and Public Force Mains 7-30
7.9 Commissioning and Startup of Public Lift Stations and Public Force Mains 7-30
7.9.A Commissioning and Startup Plan 7-30
7.9.B Testing and Acceptance 7-30
7.10 Design Criteria for Private Pump Systems 7-32
7.10.A Private Pump System Design 7-32
7.10.A.1 Pump Reservoir 7-32
7.10.A.2 Grinder Pump 7-33
7.10.A.3 Anti-Flotation Collar 7-33
7.10.A.4 Pump Reservoir Backfill 7-33
7.10.A.5 Electric Panel 7-33
7.10.A.6 Control Panel 7-33
7.10.A.7 Alarm Panel 7-33
7.10.A.8 Installation and Maintenance 7-33
7.11 Pressurized Wastewater Service Lines 7-33
7.11.A Horizontal and Vertical Alignment 7-34
7.11.B Connecting to a Gravity Wastewater Main 7-34
7.11.C Connecting to a Pressurized Wastewater Main 7-34
7.12 Pressurized Wastewater Main 7-34
7.12.A Sizing 7-34
7.12.B Deflection 7-35
7.12.C Air Relief Valves and Drain Valves on Pressurized Wastewater Mains 7-35
7.12.D Cleanouts 7-35
7.12.E Connection to the Gravity Wastewater System 7-35
7.12.F Installation 7-35
7.12.G Hydrostatic Testing 7-35

7.13 Pressurized System Evaluation 7-37
7.14 Forms 7-38
7.14.A Notice of Private Wastewater Pump System 7-38
7.14.B Example Recorded Document for Wastewater Service Lines that May or May Not Provide Gravity Wastewater Service 7-39
7.15 Possible Permitting Requirements for Lift Stations 7-39

This page left intentionally blank

CHAPTER 7

Pressurized Wastewater Systems

7.1 General

The purpose of Chapter 7 of these Wastewater Line Extension & Service Standards (*WW LESS*) is to set forth the minimum criteria for design and Construction of pressurized Wastewater Systems.

A gravity-based Wastewater System is preferred as it provides the most reliable and lowest life cycle cost for Colorado Springs Utilities and the Customer. The use of pressurized Wastewater Systems shall be evaluated on a case-by-case basis to see if they are an appropriate alternative to gravity Wastewater Systems. Where a pressurized Wastewater System is required, it shall be designed to permit an eventual connection into a gravity system.

7.2 Types of Pressurized Systems

The following terms are used throughout this Chapter:

- Public Lift Station:
  A Wastewater pump system that receives Wastewater from more than 1 User . See Sections 7.3 through 7.9 for requirements.

- Public Lift Station:
  Public Lift Stations that receive 2,000 gallons per day or more are subject to review and approval by the Colorado Department of Public Health and Environment (CDPHE) and the Pikes Peak Area Council of Governments (PPACG) Water Quality Management Committee. See Sections 7.3 through 7.9 for requirements

- Public Force Main:
  Any Wastewater Main under pressure leaving a Public Lift Station. See Sections 7.3 through 7.9 for requirements

- Private Pump System:
  A Wastewater pump system that receives Wastewater from only 1 User. See Section 7.10 for requirements.

- Pressurized Wastewater Service Line:
  A Wastewater Service Line that transfers Wastewater from a Private Pump System to a gravity Wastewater Main or to a Pressurized Wastewater Main. See Section 7.11 for requirements.

- Pressurized Wastewater Main:
  Any Wastewater Main under pressure that receives Wastewater from 2 or more Private Pump Systems. See Section 7.10 for requirements.

7.3 Cost Responsibilities

7.3.A Design and Construction

The responsibility for permitting, designing and constructing Lift Stations shall be in accordance with Utilities Rules and Regulations. Colorado Springs Utilities may elect to design, permit and construct the Lift Station and if so, 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 Public Lift Station as well as all documents necessary to receive approval from the Colorado Department of Public Health and Environment (CDPHE) and the Pikes Peak Area Council of Governments (PPACG) Water Quality Management Committee (see Section 7.4.E). Colorado Springs Utilities will review the Design Engineer's reports and Construction Plans to ensure that they meet the requirements of these *Wastewater LESS*.

The responsibility of the cost and acquisition of the necessary land, easements; and cost of, design, permitting and construction of public lift stations and associated force mains shall be in accordance with Colorado Springs *Utilities Rules and Regulations.*

7.3.B Cost Recovery

Where it appears that more area or lands may be served by the Public Lift 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 and force main capacity than necessary to service the initial development in accordance with Utilities long range plans. If the construction of the lift station and force main 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 gravity system if applicable.

See Colorado Springs *Utilities Rules and Regulations* for additional details regarding Recovery Agreements.

7.3.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.

7.3.C Operations and Maintenance

7.3.C.1 Public Facilities

Colorado Springs Utilities will assume responsibility for Ownership, operation, and maintenance of Public Lift Stations and Public Force Mains following final completion, commissioning, startup, and acceptance. A two-year warranty is required for all construction after Lift Station commissioning is complete.

7.3.C.2 Private Facilities

All Private Pump Systems and Pressurized Wastewater Service Lines shall be owned and maintained by the property Owner. This Ownership begins at the tap in the Public Wastewater Main (pressurized or gravity) and includes all items upstream of that connection. Colorado Springs Utilities requires a *Notice of Private Wastewater Pump System* form, see Section 7.10.E (also located at www.csu.org), to be recorded prior to approval of a Private Pump System.

7.4 Planning

Lift station projects require compliance with the City of Colorado Springs Land Use Review process. Colorado Springs Utilities shall notify the Owner/Developer if a lift station is required for their development as part of this process. The Owner/Developer shall be responsible for indicating the location of the proposed lift station and associated force main on their Land Use Review plans and Plats; the Design Engineer shall be responsible for zoning the lift station property and be responsible for the Development Plan.

7.4.A Wastewater System Plan

Colorado Springs Utilities shall be responsible for drafting and periodically updating the Wastewater System Plan that identifies conceptual system layouts for future trunk mains, interceptors, and lift stations based on anticipated land use and prevailing topography.

7.4.B Lift Station Siting and Force Main Alignment

The proposed lift station site and force main alignment shall be reviewed during the Land Use Review process and shall be compatible with the current Wastewater System Plan. A siting and routing study may be performed by Colorado Springs Utilities to determine the most suitable location and alignment for the lift station and force main to serve the proposed development and any future development the lift station may be required to serve.

7.4.C Lift Station and Force Main Sizing

Colorado Springs Utilities shall determine the preliminary size of the proposed lift station and associated force main in accordance with the current Wastewater System Plan.

7.4.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.

7.4.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.

7.5 Land Entitlement and Easements

Property and Public Utility Easement boundaries and dimensions for the lift station and associated force 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 7.5.A. Land and easements associated with State Regulated Public Lift Stations shall be acquired prior to permitting (see Section 7.6).

7.5.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.springsgov.com. 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.

7.5.B Environmental Compliance

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 in a report.

7.5.B.1 Existing Asbestos or Lead Materials

If an existing building is involved in the design of a new Public Lift Station, a Certified Building Inspector shall inspect and/or test existing items planed for demolition for Asbestos and lead-based paint. CDPHE's *5 CCR 1001- 10; Regulation No. 8 – Part B* and CDPHE's *5 CCR 1001-23; Regulation No. 19 – Part A* contain procedures and requirements for the accreditation of lead-based paint activity 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 Wastewater Construction for additional information.

If Asbestos or lead-based paints are present, the Design Engineer, in conjunction with a Certified Industrial Hygienist (CIH), shall develop hazardous material removal and disposal safety plans specific to the site. Verification that each safety plan has been reviewed and approved by a CIH is required.

The Contractor shall whether ACM man-made materials are present on site before any site disturbance, especially when the Project site is located near a waterway. If ACM is found to present on site they shall be handled in accordance with Section 5.9.B.

7.5.B.2 Contaminated Soils

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 Environmental Services Department of Colorado Springs Utilities (EVS).

Additional information for contaminated soils can be found at the following websites:

1. Brownfield Sites: https://www.colorado.gov/pacific/cdphe/brownfields
   https://www.colorado.gov/pacific/ops/PetroleumMaps
2. Site Contamination: https://www.colorado.gov/pacific/cdphe/hm
3. 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
4. Voluntary Clean-Up Sites:
   https://www.colorado.gov/pacific/cdphe/voluntary-cleanup
5. National Priority List:
   https://www.epa.gov/superfund/superfund-national-priorities-list-npl

7.5.B.3 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).

7.5.B.4 Endangered and Threatened Species

To ensure compliance with the Endangered Species Act, all properties selected for lift 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.

7.5.B.5 Migratory Birds

To ensure compliance with the Migratory Bird Treaty Act, all properties selected for lift 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.

7.5.B.6 Other Environmental Assessments

Other environmental assessments can include but are not limited to:

- 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.

7.6 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 7.15 at the end of this Chapter.

7.6.A General Permit Procedures

The Design Engineer will obtain the required permits for the lift 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 lift 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.

7.6.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.

7.7 Design Criteria for Public Lift Stations and Force Mains

The following design criteria shall be applied to Public Lift Stations and their associated force mains. See Section 7.8.A regarding Private Pump Systems for individual Users.

In general, Lift Stations shall be designed in accordance with Hydraulic Institute (HI) Standards, Colorado Springs Utilities' Specifications, and Colorado Springs Utilities' Wastewater System Plan.

7.7.A Basis of Design Report (BODR)

A Basis of Design Report (BODR) shall be prepared by the Design Engineer and submitted to Colorado Springs Utilities for review. and shall contain at a minimum:

1) Design Flows
   a) Maximum month average daily flow projection (MMADF)
   b) Peak hourly flow in any given day
   c) Phased (if applicable) flow considerations
2) Force main type, and quantity
   a) Size
   b) Material
   c) Length
3) Receiving sewer
   a) Manhole #'s with elevations showing elevation loss along the path
   b) Size and slope of discharge line
      i) Mannings equation

ii) Minimum velocity
iii) Number pump cycles to minimize sludge age

4) Wet well design
   a) Length, Width, Depth
   b) High water level elevation
   c) Low water level elevation
   d) Wet well active volume
   e) # pump starts per hour for
      i) Low flow (start up)
      ii) MMADF
      iii) Peak Hourly Flow (PHF)
5) Emergency Storage Design
   a) Min emergency storage vol of 60 min of PHF (include volume)
   b) Include dimensions and emergency storage capacity % excess
6) Pump Design
   a) Minimum conveyance capacity
   b) System curve
      i) Suction Piping design
         (1) Dimensions
         (2) Predicted flow per pump
         (3) Material type
         (4) Valve type and locations
      ii) Minimum submergence
         (1) Reference HI standard 9.8.7-1
            (a) Calculate min submergence and the elevation in correspondence
         (2) Net positive suction head (NPSH)
            (a) Suction pipe loss calcs based on x pump flow
            (b) Assumed water temp
            (c) Vapor pressure in atmospheres
            (d) Minimum NPSHa (net positive suction head available)
            (e) HI standard 9.6.1.4.5
         (3) Discharge piping design
            (a) Dimensions and material
            (b) Valve types and locations
            (c) Connection types and locations
            (d) Bypass type and location
   c) Hydraulic Transient Analysis
7) Architectural Design
8) Structural Design
9) Other Mechanical Design
10) Electrical Design
11) Instrumentation and Controls Design
12) Civil Design
   a) Yard Piping
   b) Landscaping

c) Stormwater

7.7.B 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 lift 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 lift station and its appurtenances
- Show a preliminary Site layout including the lift station, process piping, yard piping, electric conduit, telecommunication conduit, chemical feed, sewer pipe, storm pipe, vaults, appurtenances, backup generator, and any wet/dry wells as applicable
- Identify alternative layouts of the lift station's interior with a recommended layout
- Indicate operating conditions, maximum and minimum flow capacity of the lift 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 wastewater to the pump station and a hydraulic grade line for the system
- Prepare lift 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 lift 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 lift stations or modifications to existing lift 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

7.7.C Geotechnical Hazards Study

The Design Engineer shall create and submit a *Geotechnical Hazards Study.* A geotechnical investigation for the selected lift 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 lift station facilities, including wet/dry wells 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

7.7.D Design Submittals and Contract Documents

The following criteria are minimum requirements for design submittals. A review meeting between Colorado Springs Utilities, the Owner/Developer, as applicable, and the Design Engineer the appropriate project representatives will be held following the completion of each design submittal.

7.7.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.

7.7.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. 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.

7.7.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' Waste*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.

7.7.E Health and Safety

The Public Lift Station shall meet all Colorado Springs Utilities and OSHA health and safety requirements. Consideration to 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
- 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
- Lifting assistance for heavy items, such as overhead cranes, jib cranes, or hoists
- Code mandated clearance around electrical equipment, such as transformers, switches, switchgears, and drives
- Identification of confined space areas as applicable

7.7.F Applicable Codes

For work in El Paso County, the Public Lift Station 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.

The Public Lift Station shall meet all applicable fire codes of the Authority Having Jurisdiction (AHJ) where the Public Lift Station is located.

7.7.G Architectural

The Contractor shall ensure that materials containing Asbestos are not used in the Construction of the work. Upon completion of the Project, Colorado Springs Utilities shall receive a letter signed by the Contractor responsible for Construction stating, “No Asbestos Containing Building Materials (ACBM) were specified as a building material, and to the best of my knowledge, no ACBM was used as a building material.” *Refer to Regulation Number 8, Control of Hazardous Air Pollutants*, by the CDPHE Air Quality Control Commission.

7.7.G.1 Visual Aesthetics

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.

7.7.G.2 Architectural Program

The design of the lift station shall include an architectural program, developed in cooperation with Colorado Springs Utilities and the Owner/Developer, as applicable, to facilitate discussion and document all decisions regarding various spaces within the lift station. The program may include some or all of the following spaces, depending on specific Site needs (if applicable):

- Mechanical Room
- Electrical Room
- Generator Enclosure
- Control Room
- Communications Room
- HVAC Room
- Restroom *
- Maintenance Area *
- Battery Area/Room *
- Space for equipment dismantling, repair, etc. *

* *only applies to some lift stations*

7.7.G.3 Truck Bay and Rollup Door

Where applicable a truck bay shall be incorporated in the design and sized to accommodate a service truck capable of carrying the largest single piece of lift station equipment.

7.7.G.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 lift station.

7.7.G.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.

7.7.G.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 lift 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).

All lighting shall be maintainable and operable in a safe and efficient manner.

7.7.H Site Civil Engineering

7.7.H.1 Location

Public Lift Stations shall be located outside the 100-year floodplain and should be located outside of traffic areas.

7.7.H.2 Accessibility

The Public Lift Station site shall have an all-weather access road from the nearest street (or a Colorado Springs Utilities' approved location) to the Public Lift Station. The road shall, at a minimum, support HS-20 loading and accommodate a WB-50 design vehicle such as a semi-trailer with 50 foot wheelbase. This allows for the delivery/pick-up of pumps, motors, other essential equipment, and access for fire fighting vehicles. If the Public Lift Station has pumping equipment components that require a larger vehicle, adjust the road design accordingly.

In residential areas, the access road may resemble a driveway, however, it shall still be designed for HS-20 loading.

Colorado Springs Utilities will provide a remote location sign that gives address information of the Public Lift Station.

7.7.H.3 Security

The Public Lift Station shall be protected from unauthorized entry with the use lockable Structures and, where possible, site fencing.

7.7.H.4 Knox Box

A Knox Box shall be located on the site so the Fire Department can access the Public Lift Station during an emergency. Contact Colorado Springs Fire Department for additional information.

7.7.I Wet Well

The wet well shall meet the following requirements:

1. The minimum internal diameter shall be 6 feet
2. The liquid capacity and pump controls shall be designed such that the holding period does not exceed 30 minutes at the minimum design flow at complete build out
3. The high water level shall be at least 6 inches below the invert elevation of the lowest influent pipe.
4. The minimum water level shall meet the requirements of the pump but shall not be less than 18 inches above the floor of the wet well
5. The minimum water level shall also be above the pump inlet elevation
6. The floor of the wet well shall be sloped at 45 degrees toward a hopper bottom with the horizontal area of the bottom being no greater than necessary for proper installation and function of the pump suction
7. The wet well shall be designed to prevent vortexing or air binding at the pump suction
8. Wet wells shall be lined with an epoxy coating

Where continuous operation is required, Colorado Springs Utilities may require dividing the wet well into 2 sections, properly interconnected, to facilitate repairs and cleaning without taking the Public Lift Station out of service.

7.7.I.1 Wet Well Access

Suitable and safe means of access shall be provided to the wet well for installation and maintenance of equipment. Physical access to the wet well shall not be through the dry well.

7.7.I.2 Bouyancy

The Design Engineer shall evaluate all below ground Structures for buoyancy and provide adequate protections, as necessary.

7.7.J Lift Station Access and Equipment Removal

Suitable and safe means of access shall be provided for operation, maintenance, or removal of equipment. Stairways are preferred over ladders for access to large Public Lift Stations.

The minimum clear distance between the equipment and the wall of the dry well shall be 36 inches.

Lift Stations that will be placed in locations of known or suspected high Groundwater shall evaluate the following:

1. Relocating the dry well away from Groundwater path,
2. Installing a sump pump to a still basin and land apply pump,
3. Installing a sump pump discharging to sanitary sewer system (with Utilities Industrial Pre-treatment Section approval),
4. Installing a sump pump and discharging to street/curb or surface water, this requires consultation with Utilities Water Resources Management Section for determination of whether a *Well Dewatering Permit* from the State of Colorado Division of Water Resources, and a *Subterranean Dewatering Permit* from CDPHE will be required.

7.7.K Pumps

Each Public Lift Station shall have a minimum of 2 pumps. Public Lift Stations that receive more than 1,000 gallons per minute at peak flow or are not equipped with an overflow tank shall have at least 3 pumps.

The pumps shall be designed to accommodate the initial low flows and peak flows from the fully developed contributing areas. These flows shall be determined as part of the required *Wastewater Master Facilities Form* process described in CHAPTER 2 Development and Design of Wastewater Systems.
The Lift Station shall have the capability of pumping the designed peak flow at maximum computed total dynamic head with the largest pump out of service.

Pump operation shall be automatic with the ability for it to run under manual control. The Lift Station shall be designed such that the pumps start no more than 6 times per hour. Provisions shall be made to provide automatic alternation of the pumps in use.

Pumps shall operate within the Preferred Operating Range (POR) according to Hydraulic Institute standards.

Each pump shall be equipped with temperature and vibration monitoring equipment that is capable of communicating with the Colorado Springs Utilities SCADA system. Contact the Colorado Springs Utilities Instrumentation and Controls group for current Specifications and equipment requirements. Pump vibration shall not exceed the limits set forth in Hydraulic Institute *Standard 9.6.4*.

a) Pump Operating and System Head Curves

The operating point of the pump shall be within 5% of the pump's best efficiency. Each pump shall have the capability of pumping the design peak flow at the maximum computed total dynamic head (TDH) with the pipe friction loss calculated by the Hazen-Williams formula. Design "C" values shall not exceed 140 for PVC pipe and shall not exceed 110 for DIP. Static heads shall be calculated utilizing the worst case condition.

Pump operating curves shall be plotted against the system head curve illustrating the operating capability at each of the following conditions:

1. All pumps running
2. All pumps running with the largest out of service
3. All unique combinations of pumps running

For pumps equipped with variable frequency drives, show the operating point, including speed, at peak, average and minimum anticipated flows plotted against the system head curve.

b) Pumps Specifications

The Public Lift Station pumps shall be self-priming centrifugal pumps.

1. Pump Openings

Pumps shall be capable of passing spheres of at least 3 inches in diameter unless equipment is provided to prohibit such solids from entering the suction side of the pump. Pump suction and discharge openings shall be at least 4 inches in diameter for conventional non- clogging pumps.

2. NPSH

NPSHa: Net positive suction head available NPSHr : Net positive suction head required NPSH Margin = NPSHa – NPSHr
NPSH Margin Ratio = NPSHa / NPSHr

The NPSH Margin shall be a minimum of 5 feet. The NPSH Margin Ratio shall be a minimum of 1.2.

3. Pump Manufactures

Smith and Loveless, Flygt, and other pump manufacturers on a case-by- case basis.

4. Spare Parts

A complete set of impellers, seals and other common spare parts as determined by Colorado Springs Utilities shall be provided for each Public Lift Station prior to acceptance.

c) Dry Well Dewatering

A separate sump pump shall be provided in the dry well to remove leakage or drainage. The sump pump shall discharge to the wet well above the high water level of the wet well. All floor and walkway surfaces within the dry well must drain to the sump pump.

7.7.K.1 Dry Well

Lift Stations that receive 250,000 gallons per day or more shall have separate dry and wet wells. Common walls between the wet well and dry well, if applicable, must be gas tight.

7.7.L Electrical, Instrumentation, and Controls

7.7.L.1 Electrical Equipment

Electrical equipment in enclosed places where gas may accumulate, shall comply with the latest National Fire Protection Association (NFPA) Codes or the latest National Board of Fire Underwriters' Specifications for hazardous or submersible locations. Classified areas shall be identified in accordance with NFPA Standards. Equipment shall be suitable for and compatible with the area classification. Electrical equipment shall not operate into service factor under any operating conditions.

Electrical consumption shall be monitored using a power quality meter (PQM) by General Electric or equal. A PQM shall monitor consumption from the primary electrical supply and any backup power supply.

7.7.L.2 Variable Frequency Drives and Soft Starters

Pumps that are smaller than 10 horsepower can be equipped with a soft start or variable frequency drive (VFD). Pumps that are 10 horsepower or larger shall be equipped with a soft start or VFD. 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). Soft starts and VFDs shall be compatible with the motor selected.

VFDs shall vent to the exterior of the Public Lift Station and shall be screened to prevent rodent entry.

7.7.L.3 Arc Flash Hazards

An *Arc Flash Hazard Analysis* shall be performed in accordance with *NFPA-70E, Article 130* for all applicable equipment supplied. This analysis shall be included as part of the Short Circuit and Coordination Study. The calculations shall comply with *NFPA-70E 2004*, and *IEEE-1584-2002*. All electrical enclosures shall be labeled with warning signs that include the equipment name, flash hazard boundary at the applicable working incident energy exposure level in calories/cm distance, PPE level requirements, shock hazard (volts), and the limited, restricted, and prohibited approach distances. The analysis shall include upstream equipment. Calculated values and requirements shall be used in lieu of tables.

The power system model and electronic database file(s) used in the analysis shall be provided to Colorado Springs Utilities and will be fully compatible with ESA/EasyPower arc flash software.

7.7.L.4 Backup Power Supply

Each Public Lift Station shall have a primary source of power and a backup power generator located on the site.

The backup generator shall include an engine generator set. The generator shall be sized to automatically start and operate all pumps and controls without loading the unit to more than 85% of its rated capacity and with a maximum voltage drop of 15%. The generator shall be located in an enclosed, ventilated, and lockable Structure at grade and shall include fuel systems, automatic transfer switch, and Public Lift Station controls. These items can be located within an independent Structure or the same building as the dry well, although the backup power generator shall not be located in the same room as the pumps.

Oil and petroleum storage shall comply with federal, state, and local regulations established by the Authority Having Jurisdiction. 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 Wastewater drain. Containment capacities should consider any precipitation volumes, if applicable.

Any buildings that contain a diesel tank must have an NFPA 704 placard/label attached signifying that there is diesel stored inside. A 15 inch placard shall be placed on the door on the outside of the building. In addition, a 6 inch sticker should be placed on the diesel tank itself signifying its hazards. Kits containing the proper quantities and sizes of spill booms, pads, pillows, etc. to control spills shall be provided within the building.

The following additional items shall be considered during design:

1. Compatibility of container, piping, and related components (elbows, couplings, unions, valves, fittings, epoxies) with the liquid stored and the conditions of storage
2. Overfill prevention devices and alarms
3. Separation and barriers with non-compatible or reactive materials
4. Protection from vehicle impact, static build-up, and lightning
5. Security of controls, valves, and appurtenances
6. Ventilation of storage and use areas
7. Proximity of eyewash stations and safety showers

7.7.L.5 Instrumentation and Controls

The Design Engineer shall coordinate with Colorado Springs Utilities to develop Instrumentation and Controls Specifications for each lift station. For details of specific devices and model numbers refer to Standard Requirements for Instrumentation, Control and Electrical document. In general, Lift Stations require the minimum number and type of the following instrumentation and controls:

1. Station Instrumentation
    a. One magnetic flow meter
    b. Two level devices
2. Digital Devices
    a. Entry switches on doors and hatches
    b. Flood switch alarm
    c. Flood switch shunt trip
3. Controls
    a. MCC (Motor Control Center) Grear
    b. Backup generator control module
    c. Soft start or VFD control module
    d. Pump down control module
4. Communication and PLC (Colorado Springs Utilities provided and programmed)
    a. PLC (Programmable Logic Controller)
    b. HMI (Human Machine Interface)
    c. Radio
    d. Antenna

7.7.M Heating, Ventilation, and Air Conditioning (HVAC_

7.7.M.1 Ventilation

Ventilation for wet wells, dry wells, and generator enclosures shall meet or exceed all applicable State, NFPA, and OSHA requirements. Wet well vents shall be provided, but if screens or mechanical equipment that requires maintenance or inspection are located in the wet well, it shall be mechanically ventilated. There shall be no interconnection between the wet well and dry well ventilating systems.

In wet wells and dry wells over 15 feet deep, multiple vents are preferred. Dampers should not be used on exhaust or fresh air ducts, and fine screens or other obstructions in the air ducts should be avoided to prevent clogging.

Switches for operation of ventilation equipment should be marked and conveniently located. Consideration should be given to automatic controls where intermittent operation is practiced. Where excessive moisture or low temperatures are a problem, consideration should be given to installing heating and/or dehumidification equipment.

a) Wet Wells

Ventilation may be either continuous or intermittent. For continuous operation, at least 12 complete air changes per hour should be provided. For intermittent operation, at least 30 complete air changes per hour should be provided.

b) Dry Wells

Ventilation may be either continuous or intermittent. For continuous operation, at least 6 complete air changes per hour should be provided. For intermittent operation, at least 30 complete air changes per hour should be provided.

c) Backup Generator

Any enclosures containing backup power generators shall have suitable ventilation for proper operation of the device.

7.7.N Valves and Bypass Assembly

All lift station sites shall be provided with the necessary piping, fittings, and valves to allow for bypassing of the lift station and wet well. Utilities will use the bypass assembly to bypass the lift station and wet well using portable pumping equipment. The following provisions shall be provided to accomplish the bypass:

1. A full-closing full-port eccentric plug shut-off valve shall be provided in the yard (in an epoxy coated vault) that allows the lift station to be completely isolated from the force main.
2. A bypass connection assembly consisting of a wye and riser extending above grade with a plug valve matching the sizing of the force main piping and a stainless steel bauer fitting.
3. Where a riser is provided that extends above grade, a concrete slab on grade shall be provided around the riser with bollards for protection. The vertical portion of the riser shall be restrained with threaded rod from the upper 90-degree bend to the buried lower 90-degree bend.
4. Where a riser is provided that extends above grade, a concrete slab on grade shall be provided around the riser with bollards for protection. The vertical portion of the riser shall be restrained with threaded rod from the upper 90-degree bend to the buried lower 90-degree bend.
5. Bypass location must not impede access to the wet well.

6. A wet well bypass manhole shall be located a maximum of 25 feet away from the wet well influent and within the fence line to allow the wet well to be completely isolated for maintenance. The invert out of this manhole shall provide the influent penetration for sanitary sewer into the wet well.
7. A schematic of a typical bypass pumping configuration shall be included in the construction drawing submittal. The schematic shall include proposed means of access to the lift station while bypass pumping is taking place.

A pigging and bypass assembly shall be located on the Public Force Main just downstream of the Public Lift Station according to Detail Drawing C2-14.

7.7.O Odor Control

All Public Lift Stations shall have an odor control mitigation system. This system typically has 2 components: a component for treating foul air from the head space in the wet well and a component for preventing odors in the discharge manhole of the Public Force Main. Odor control can be accomplished by chemical, oxygen injection, or air filtration.

Odor limits shall be as follows:

- Less than 5 odor units per cubic foot at the property line of the facility
- 1 ppm H2S within the discharge manhole of the Public Force Main

Odor units are defined by the *1985 EPA Design Manual – Odor and Corrosion Control in Sanitary Sewerage Systems and Treatment Plant*. Parts per million H2S can be measured with traditional confined space equipment.

Chemical storage shall comply with federal, state, and local regulations established by the Authority Having Jurisdiction. Chemical storage, handling, and delivery areas shall have containment for accidental spills or overflows if necessary. 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.

7.7.P Corrosion Protection

The Design Engineer shall assess the corrosivity of the site and design a cathodic protection system appropriate for the protection of the metallic tanks, pipes, and appurtenances above and below ground.

7.7.Q Public Force Mains

Public Force Mains are pressurized Wastewater Mains that leave Public Lift Stations. All Public Force Mains shall be approved by CDPHE and Colorado Springs Utilities. The criteria within this section apply to Public Force Mains; see Section 7.8.B for the requirements of Pressurized Wastewater Service Lines.

7.7.Q.1 Velocity

Public Force Mains shall be sized, in conjunction with the pumps, to maintain velocities of at least 2 feet per second in the Public Force Main. If a Public Force

Main's length is such that the Wastewater within the pipe cannot travel the entire distance from the pump to the discharge manhole in 1 pump cycle, then the velocity during each pump cycle shall be a minimum of 3.5 feet per second to re-suspend solids during pump operations.

7.7.Q.2 Minimum Size

The minimum diameter of a Public Force Main shall be 4 inches.

7.7.Q.3 Public Force Main Materials

The materials listed in Table 7-1 are approved for use within the Wastewater System as Public Force Mains within the limits listed.

Table 7-1: Public Force Main Material, Bury Depth, and Maximum Working Pressure

Public Force Main Material	Allowable Bury Depth (feet)	Maximum Working Pressure Allowed (psi)
DIP	6 to 30	250
C900 PVC	6 to 20	170
DR 9 HDPE	6 to 20	250

7.7.Q.4 Minimum Depth

Public Force Mains shall be buried with a minimum cover of 6 feet.

7.7.Q.5 Design Pressure

The Public Force Main and fittings, including thrust blocks, shall be designed to withstand 1.5 times the normal pressure.

7.7.Q.6 Deflection

Pressurized 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.

7.7.Q.7 Air and Vacuum Relief Valves and Drain Valves on Public Force Mains

Air and vacuum relief valves shall be located by the Design Engineer at high points along the Public Force Main. The Design Engineer shall run a transient analysis and create a Surge Report; and shall be responsible for sizing, quantity and locations of air and vacuum valves to Colorado Springs Utilities for approval.

Air and Vacuum relief valves shall meet the requirements of Detail Drawing C2-16.

Drain Valves shall also be located by Colorado Springs Utilities at low points along the Public Force Main to facilitate repair or maintenance of the line.

See Section 4.2.E.3 for detailed information regarding air and vacuum valves.

7.7.Q.8 Termination

Public Force Mains shall connect to the gravity Wastewater System at a manhole. All concrete surfaces within the terminating manhole shall be epoxy coated in accordance with Section 5.12.D.2.

The crown elevation of the Public Force Main shall match the crown elevation of the Wastewater Main leaving the manhole.

7.7.Q.9 Separation from Other Utilities

See Section 2.5.D.2 and Table 2-3 and of these *Wastewater LESS* for minimum separation from other utilities.

7.7.Q.10 Identification

To clearly identify that the Public Force Main carries Wastewater, identification tape shall be run in the trench along the Public Force Main, and carsonite markers shall be installed at air and vacuum relief valves, drain valves, and each side of stream or drainage channel crossings.

7.7.Q.11 Check Valves

Check valves shall be located at the discharge of each pump and at any other locations deemed necessary by Colorado Springs Utilities.

To ensure access for maintenance and repair, all check valves shall be installed in a manhole or vault.

7.7.Q.12 Plug Valves

Plug Valves shall be used as isolation valves along the Public Force Main, and shall be located:

1. On each pump discharge just downstream of each check valve.
2. At the discharge of the public lift station.
3. On each side of the bypass assembly.
4. At any other location deemed necessary by Colorado Springs Utilities.

All direct-buried plug valves shall be installed with a valve box and lid. These valves normally remain completely open. All Wastewater valves must be opened LEFT.

7.8 Construction and Inspection of Public Lift Stations and Public Force Mains

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.

7.9 Commissioning and Startup of Public Lift Stations and Public Force Mains

7.9.A Commissioning and Startup Plan

Due to varying complexities of Public Lift Stations, the Design Engineer shall develop procedures in the Contract Documents for the testing, commissioning, and startup of the Public Lift Station that is appropriate for the complexity of the Public Lift Station. The startup plan shall be submitted for review. A two year warranty is required for all construction to begin after Lift Station commissioning is complete

7.9.B Testing and Acceptance

All materials furnished shall be new and undamaged. Everything necessary to complete the installation in accordance with the standards of Colorado Springs Utilities shall be furnished and installed whether shown on approved drawings or not, and all installations shall be completed as fully operable, functioning parts of Colorado Springs Utilities Wastewater System.

Material Safety Data Sheets (MSDS) shall be supplied with all materials. An MSDS book should be present inside the Public Lift Station, and should contain information on all products at the site.

Prior to entering the Public Lift Station into service, a complete test will be performed to evaluate the inter-operability and proper functioning of all systems including, but not limited to:

1. Pump operations
2. Emergency power generation
3. Automatic transfer switching
4. Instrumentation
5. Remote and manual control

Under no circumstances will the Public Lift Station accept Wastewater flows from any upstream facility until allowed by Colorado Springs Utilities. The Public Lift Station acceptance test shall be coordinated with Colorado Springs Utilities. .

Preliminary acceptance will not be granted, nor will Colorado Springs Utilities accept the Public Lift Station for operation until all deficiencies have been corrected.

Colorado Springs Utilities shall be supplied with a minimum of 2 complete sets of equipment operation and maintenance instructions, including emergency procedures, maintenance procedures, tools, and such spare parts as may be considered necessary. All emergency power generation equipment should also be provided with operation and maintenance instructions indicating the routine starting and running of units at full load.

If required, when the Public Lift Station passes the acceptance tests Colorado Springs Utilities will sign the preliminary acceptance on the *Bill of Sale*. The Contractor shall do a final read on the electric meter so that the account can be moved to Colorado Springs Utilities, and Colorado Springs Utilities will start operation of the Public Lift Station. A two-year warranty period shall apply to the Contractor once the lift station commissioning is complete.

7.10 Design Criteria for Private Pump Systems

Private Pump Systems may be used when a conventional gravity Wastewater System is not feasible. Private Pump Systems pump into a Pressurized Wastewater Service Line. See Section 7.8.B for Pressurized Wastewater Service Line design criteria.

If the vertical design of the Wastewater Main is at an elevation that may prohibit gravity Wastewater service to certain lots of a development, then the Design Engineer shall submit a form that shows the elevation of the Wastewater Service Line stub. An example document has been included in Section 7.10.F. This form shall be recorded with the County Clerk and Recorder's Office and a copy provided to Colorado Springs Utilities. Where the lot cannot be served by gravity, a Private Pump System will be required.
Following the installation of a Private Pump System, a *Notice of Private Wastewater Pump System* shall be recorded with the County Clerk and Recorder's Office and a copy provided to Colorado Springs Utilities, see Section 7.10.E.

Due to the inability of Private Pump Systems to pump for extended periods of time, swimming pools shall not discharge to Private Pump Systems.

7.10.A Private Pump System Design

The manufacturer shall supply system design, layout, and sizing information for pumps and Pressurized Wastewater Service Lines. Two copies of the design must be submitted with the Construction Plans and Specifications.

Colorado Springs Utilities accepts E/One products for Private Pump Systems. Equivalent systems can be submitted for review and may be approved on a case by case basis as long as it meets the requirements listed below.

The Private Pump System shall include the following features at a minimum:

7.10.A.1 Pump Reservoir

The pump reservoir shall be sized to contain a minimum of one half day of Wastewater generation using the average daily design flow.

For example, a single family residence shall have enough volume in the pump reservoir to contain:
(1 unit) x (2.5 persons/unit) x (65 gal/person/day) x (0.5 Day) = 81.25 gal

The Wastewater generation for commercial applications will be reviewed on a case by case basis.

The pump reservoir shall also include a level sensor for automatic operation of the pump, a vent, and a check valve on the pump discharge to prevent backflow when the pump is off.

7.10.A.2 Grinder Pump

The Private Pump System shall be equipped with 1 grinder pump for residential applications and 2 grinder pumps for commercial applications.

7.10.A.3 Anti-Flotation Collar

The Contractor shall determine where an anti-flotation collar is required. Anti-flotation collars shall be designed to counteract buoyancy forces that may be encountered in wet conditions. The collar shall be made of concrete. Where required, the size of the collar shall be designed by the Contractor in accordance with the manufacturer's recommendations.

7.10.A.4 Pump Reservoir Backfill

The pump reservoir shall be backfilled in accordance with Section 5.17 using backfill material consistent with the materials specified in CHAPTER 4 Approved Materials. If the Inspector determines the native soils are not appropriate as a foundation material for the pump reservoir, then foundation material per Section 5.17 shall be provided by the Contractor. The foundation material shall be placed with a minimum thickness of 6 inches
and extending 6 inches beyond the outside edge of the pump reservoir, or as determined by the Colorado Springs Utilities Inspector.

7.10.A.5 Electric Panel

All electric panels shall have the capacity to be connected to an alternate power source (generator or other) in the event of an extended power outage.

7.10.A.6 Control Panel

A control panel shall be included to allow manual operation of the pump.

7.10.A.7 Alarm Panel

Each Private Pump System shall be equipped with an alarm panel that is capable of notifying the resident when Wastewater in the pump reservoir reaches the high water level alarm set point.

7.10.A.8 Installation and Maintenance

Installation and maintenance must be performed by a manufacturer-certified plumber according to the requirements of the manufacturer. Contact the manufacturer for a list of approved plumbers in Colorado Springs and the surrounding areas.

7.11 Pressurized Wastewater Service Lines

Pressurized Wastewater Service Lines shall be identified on the Utility Service Plan and must include details and Specifications of all appurtenances including manufacturers of all valves, curb stops, service connection tee's, fittings, and cleanouts. Pressurized Wastewater Service Lines may discharge to a gravity Wastewater Main or a Pressurized Wastewater Main. A Pressurized Wastewater Service Line shall not connect to a Public Force Main.

Pressurized Wastewater Service Lines may be constructed of DR11 HDPE or solvent welded SCH 40 PVC, although HDPE is preferred. The Pressurized Wastewater Service Line shall be sized by the manufacturer and installed with tracer wire per Section 5.22.D.1. The minimum diameter for a Pressurized Wastewater Service Line shall be 1.25 inches. See CHAPTER 6 High Density Polyethylene Pipe and Trenchless Technologies for information on using HDPE pipe.

7.11.A Horizontal and Vertical Alignment

The horizontal and vertical separation criteria shall meet the requirements of Table 2-3. The Pressurized Wastewater Service Line shall have a minimum of 6 feet of cover.

7.11.B Connecting to a Gravity Wastewater Main

Pressurized Wastewater Service Lines may be connected to a gravity Wastewater Main with a saddle tap. See Detail Drawing D2-4 for additional information. The connection shall be a minimum of 5 feet from a manhole.

7.11.C Connecting to a Pressurized Wastewater Main

Pressurized Wastewater Service Lines may be connected to other Pressurized Wastewater Service Lines using a tee connection. Everything downstream of that connection will be called a Pressurized Wastewater Main (see Section 7.9). Other connections may be approved by Colorado Springs Utilities on a case-by-case basis. These connections will be designed by the Design Engineer.

When Pressurized Wastewater Service Lines are connected to a Pressurized Wastewater Main, curb stop valves and check valves shall be provided at the property line of each Pressurized Wastewater Service Lines (See Detail Drawing D2-3). Valves shall be mechanically joined to the Pressurized Wastewater Service Line.

7.12 Pressurized Wastewater Main

When 2 or more Pressurized Wastewater Service Lines are combined from different properties, it shall become a Pressurized Wastewater Main and it will be owned, operated, and maintained by Colorado Springs Utilities. The horizontal location of the Pressurized Wastewater Main shall correspond to the location of gravity Wastewater Mains shown on Detail Drawings C1-1 through C1-10. Pressurized Wastewater Mains will be identified on the Construction Plans. All Construction Plans that have pressurized Wastewater Mains shall also include the overall system site plan with details showing pipeline configuration and appurtenances (valves, cleanouts, drains and air relief valves) as needed.

7.12.A Sizing

Pressurized Wastewater Mains will be sized by Design Engineer based on the flow characteristics of the connecting Private Pump Systems. Sizing should ensure low detention times to minimize septic conditions and hydrogen sulfide (H_2S) generation. Future connections in the area shall be taken into consideration during sizing. Wastewater main shall be constructed of approved materials per CHAPTER 4 Approved Materials and will typically be IPS HDPE DR 11 or PVC C900.

7.12.B Deflection

Pressurized HDPE pipe may be cold field bent without affecting the working pressure rating of the pipe. The minimum cold bend radius for DR11 HDPE pipe installed in an open cut trench is 25 times the pipe OD.

7.12.C Air Relief Valves and Drain Valves on Pressurized Wastewater Mains

Air and vacuum relief valves shall be located by the Design Engineer as necessary along the Pressurized Wastewater Main. The Design Engineer shall run a transient analysis and provide Colorado Springs Utilities with the Surge Report. The Design Engineer shall provide sizing, quantity and locations of air and vacuum valves to Colorado Springs Utilities for approval.

Air and vacuum relief valves shall mee the requirements of Detail Drawing C2-16 and C2-17. Drain Valves shall also be located by the Design Engineer at low points along the Pressurized Wastewater Main to facilitate draining, repair, or maintenance of the line.

See Section 4.2.E.3 for detailed information regarding these valves.

7.12.D Cleanouts

Cleanouts shall be installed for the purpose of flushing the Pressurized Wastewater Main. Cleanouts shall be designed per Detail Drawing D2-7 and placed in the following locations:

1. The upstream end of a Pressurized Wastewater Main
2. Where a Pressurized Wastewater Main connects with another Pressurized Wastewater Main
3. Every 1,000 feet

7.12.E Connection to the Gravity Wastewater System

Pressurized Wastewater Mains shall connect to the gravity Wastewater System at a manhole. See Section 7.6.H for details on this connection.

7.12.F Installation

Installation of a Pressurized Wastewater Main must be performed by a Private Pump System manufacturer-certified plumber.

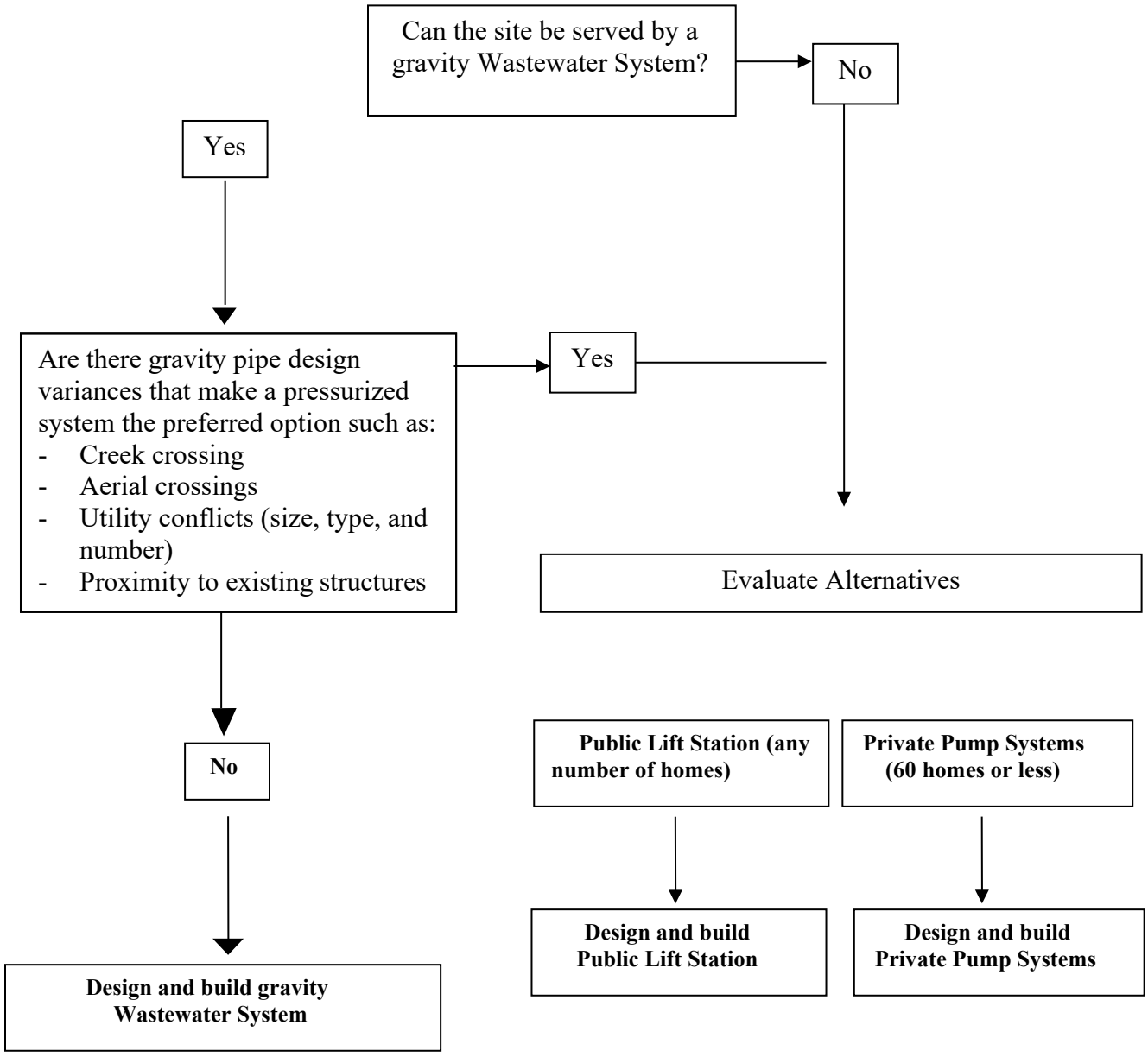
7.12.G Hydrostatic Testing

Pressurized Wastewater Mains shall be hydrostatic pressure tested for at least 1 hour at 1.5 times working pressure, but not less than 50 psi. There shall be no loss of pressure during the test. Leakage may be determined by loss-of-pressure, soap solution, chemical indicator, or another method approved by Colorado Springs Utilities.

The curb stop for each Pressurized Wastewater Service Line shall be closed during the test to prevent damage to upstream appurtenances. Any other fixtures, devices, or

accessories connected to the Combined Pressurized Wastewater Service Line that would be damaged if subjected to the specified test pressure shall be protected during the test. If any leaks are found, they shall be repaired and the test restarted. W

7.13 Pressurized System Evaluation



7.14 Forms

7.14.A Notice of Private Wastewater Pump System

This Notice of Private Wastewater Pump System ("Notice"), dated_____ , 20____ , the receipt of which is acknowledged upon execution of this Notice by_____ , as the present Owner(s) of Lot(s)_____, El Paso County, Colorado, as reflected on the plat recorded at reception number _____ whose address(es) is _____ with the Clerk and Recorder of El Paso County, Colorado (hereinafter referred to as the "Property" or the "land").

All parties who now have, or who may hereafter acquire, an interest in the Property, or any portion thereof, are hereby notified that the Private Wastewater Pump System, which services the Property, is privately owned by the Owner(s) of the Property, or any portion thereof, and the Ownership of such system shall continue to run with the land upon the sale of other transfer of all or any portion of the Property.

The Private Wastewater Pump System, for purposes of this notice, shall include, but is not limited to, all Wastewater Service Lines and pipes, valves, conduits, pump reservoir, mechanical devices (including the pump and all appurtenances), control panels and any other items which are necessary, in order to enable Wastewater to be transferred from the Property to a Wastewater Main owned and maintained by Colorado Springs Utilities, an enterprise of the City of Colorado Springs, a Colorado home rule City and municipal corporation.

Owner(s) of the Property are collectively responsible for all matters regarding the Private Wastewater Pump System, including, but not limited to all repairs, maintenance, and complying with all applicable federal and state laws, the Code of the City of Colorado Springs, and all applicable rules and regulations.

The Owner(s) hereby agrees to release, discharge, indemnify and hold harmless the City of Colorado Springs, Colorado Springs Utilities, the Colorado Springs City Council, Utilities Board, and their officers, directors, employees and agents, from and against any and all liability for any damages, injuries to the person or property of the undersigned or any third party, causes of action, demands, or actions of whatsoever kind or nature, including all claims and demands for unpaid labor or material relating to the Construction of said facilities, that may arise out of, or are related in any way to, the Private Wastewater Pump System. Nothing contained herein requires the Owner(s) of the Property to be responsible for any Colorado Springs Utilities' Wastewater Mains, Lift Stations, or its other appurtenances.

This Notice shall be deemed to run with the land and touch and concern the land.
Executed as of the date first written above.

Signer

STATE OF COLORADO)
) § COUNTY OF EL PASO)

The foregoing instrument was acknowledged before me this day of , 20 by

_____

Witness my hand and official seal.

_____

Notary Public My Commission Expires:

7.14.B Example Recorded Document for Wastewater Service Lines that May or May Not Provide Gravity Wastewater Service

Recorded document to be submitted along with Construction Plans at time of Wastewater Service Approval. Reception number to be added to the Construction Plans.
NOTICE: This notice is given to all interested parties, including, but not limited to, builders and individual landowners of lots in "Subdivision Name" recorded under Reception No. records of El Paso County, Colorado

The following is a list of lots and the elevation of the Wastewater Service Line stub at the property line that may or may not allow gravity collection of Wastewater from the lot. All elevations are referenced to the Colorado Springs Utilities GIS Datum.

Lot No.	Elevation of Wastewater Service Line Stub	Address
Lot 10	6795.21	
Lot 11	6792.15	
Lot 15	6788.48	
Lot 19	6795.23	

7.15 Possible Permitting Requirements for Lift Stations

Table 7-1 shows a general list of known and possibly required permits and plan approvals for a lift 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 Lift 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
	Preble's' 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
	Traffic Plan	Contractor
El Paso County (EPC) cont.:	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 (PPRBD)	Building Permit and others as required	Contractor
	Floodplain Development Permit (If in 100 Year Floodplain designation)	Developer/Owner
	Wrecking Permit	Contractor
Local Municipality Authorizations		
	Approval of Location (if in City Jurisdiction	Developer/Owner/Contractor

City of Colorado Springs, • City Engineering • Land Use Review Division office • Real Estate Office • Other Cities/towns should be considered	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	Bulk Material, New Chemical or Product Review and Approval	Contractor
	Job Hazard Analysis and Site-Specific Safety Plan	Contractor

Colorado Springs Utilities, Environment, Safety & Health cont.	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

CHAPTER 8
Groundwater Underdrains

Paragraph Number	Title	Page Number
8.1	General	8-3
8.2	Underdrain Design Criteria	8-3
8.2.A	Sizing Criteria	8-3
8.2.B	Active and Passive System Design	8-3
8.2.C	Pipe Alignment	8-3
8.2.D	Separation Criteria	8-4
8.2.E	Slope	8-4
8.2.F	Underdrain Installations at Wastewater Manholes	8-4
8.2.G	Trench Dams	8-4
8.2.H	Underdrain Service Lines	8-4
8.2.I	Outfalls	8-4
8.3	Plan Submittal Requirements	8-4
8.4	Materials	8-5
8.5	Construction	8-5
8.5.A	Construction Inspection	8-5
8.5.B	Underdrain Bedding	8-5
8.5.C	Joining Pipe	8-5

This page left intentionally blank

CHAPTER 8

Groundwater Underdrains

8.1 General

The purpose of Chapter 8 of these *Wastewater Line Extension and Service Standards (Wastewater LESS)* is to set forth criteria to be used when designing and constructing Groundwater underdrains that share the same trench with a Public or Private Wastewater Main including outfall and service points. The Owner/Developer is responsible for hiring a qualified Design Engineer who will design the Groundwater underdrain. Colorado Springs Utilities will review the Construction Plans and inspect the Construction of the underdrain to ensure it meets these criteria.

Colorado Springs Utilities review, design approval of Construction Plans and inspection of installations that include Groundwater underdrains are strictly for conformance with these Standards in order to minimize any impacts to the Wastewater collection and treatment system. Any Groundwater underdrain installed shall not be owned or maintained by Colorado Springs Utilities.

The purpose of the underdrain system is to provide a method for conveying subterranean Groundwater away from utilities and Structures via gravity to an acceptable discharge point in a drainage channel or storm drain. Only subterranean Groundwater may be collected by or discharged into the underdrain system. No person shall discharge or cause to be discharged any stormwater, surface water, roof runoff, cooling water, domestic or industrial Wastewater, or industrial process waters of any kind to the underdrain system.

8.2 Underdrain Design Criteria

8.2.A Sizing Criteria

The size and extent of Groundwater underdrains shall be established by a Design Engineer, registered in the State of Colorado, based on anticipated underdrain service line flow and Groundwater flow in the Wastewater Main trench if applicable. The minimum size of a main line Groundwater underdrain system shall be 6 inches. The underdrain service line shall be 3 inches in diameter to minimize any chance of confusion and cross-connection with Wastewater Service Lines. The design shall include consideration of existing and potential future upstream and downstream connected underdrain mains within the drainage area.

8.2.B Active and Passive System Design

Active underdrains are typically installed where Groundwater is encountered during Construction or as directed by the Design Engineer, based on geotechnical information, Inspector, or these *Wastewater LESS*.

8.2.C Pipe Alignment

Groundwater underdrain mains shall be located horizontally and vertically parallel to the Wastewater Main, opposite to the Water Main see Detail Drawings C1-1 through C1-10.

Changes in the underdrain alignment shall be accomplished with preformed bends not to exceed 45 degrees.

8.2.D Separation Criteria

A minimum separation of 12 inches outside diameter to outside diameter shall be met. The crown of the Groundwater underdrain pipe shall be located at approximately the flow-line of the Wastewater Main as shown on Detail Drawing C6-3.

8.2.E Slope

The slope of the Groundwater underdrain main shall be a minimum of 0.5%.

8.2.F Underdrain Installations at Wastewater Manholes

Passive Systems shall be laid with solid pipe with one 10-foot section of active pipe downstream of each manhole. A trench dam shall be installed at the transition from active to passive system see Detail Drawing C6-2. Clean outs shall be constructed outside a Wastewater manhole as shown on Detail Drawing C6-1.

8.2.G Trench Dams

Trench dams shall be installed downstream of the active system wherever there is a transition to a passive system.

8.2.H Underdrain Service Lines

Where underdrain service lines are proposed they shall be extended per Section 5.14 and properly capped and plugged if not immediately connected to a perimeter drain at a foundation. The underdrain service line shall be laid with approved non-perforated pipe from the tap point at the main underdrain to the plug. The underdrain service lines located in the same trench as the Wastewater Service Line shall be installed per Detail Drawing D1-5. The underdrain service line shall parallel the grade and elevation of the Wastewater Service Line where located within the same trench.

8.2.I Outfalls

The outfalls shall discharge into a drainage way or storm drain as approved by the City of Colorado Springs. Multiple outfalls are encouraged for extensive underdrain systems.

8.3 Plan Submittal Requirements

The extent of any Groundwater underdrain shall be shown on the plan and profiles in the Wastewater Construction Plans and submitted to the Colorado Springs Utilities for approval prior to Construction. Such plans shall include the following:

- underdrain alignments,
- the size and material of the underdrain,
- the extents of passive and active underdrains,
- the location of trench dams,
- grade of the underdrain,
- and the outfall locations of all Groundwater underdrains.

City Engineering Department shall review and approve each Groundwater underdrain for Construction prior to Colorado Springs Utilities approval. The underdrain review statement per Section 3.6.B shall appear on all Construction Plans that propose a Groundwater underdrain system.

8.4 Materials

Passive sections (non-perforated) for Mains and Services shall be constructed of approved SDR 35 or SCH 40 PVC.

Active sections (perforated) for Mains and Services shall be constructed of perforated PVC pipe SDR 35 or SCH 40. The perforations on the pipe shall be located at approximately the 4 o'clock and 8 o'clock positions (120 degrees apart). The pipe shall be installed with the perforations in the down position.

Filter cloth for underdrain trenches shall be Mirafi 160N, or equal that conforms to the requirements of AASHTO M 21313 as approved by Colorado Springs Utilities, as shown on Wastewater Construction Drawing C6-3.

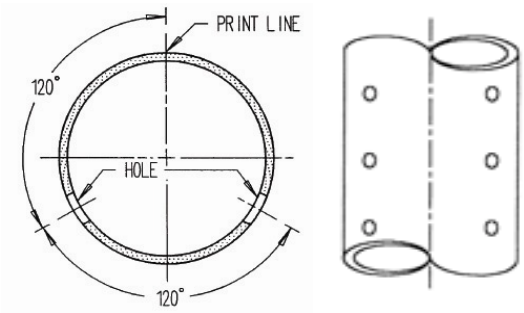


Figure 8-1: Perforated Pipe Hole Configuration

8.5 Construction

Groundwater underdrains shall be constructed in accordance with the criteria in CHAPTER 5 Wastewater Construction and the following.

8.5.A Construction Inspection

Colorado Springs Utilities will inspect all underdrain mains, taps, stub-ins, outfalls, and service lines.

No work shall be backfilled until Construction and connection have been inspected and accepted by the Inspector. Acceptance shall not constitute a guarantee of the Contractor's work.

8.5.B Underdrain Bedding

The pipe shall be installed in compacted select bedding per Section 5.11.D.3.

8.5.C Joining Pipe

The pipe sections shall be joined securely with the appropriate coupling bands or fittings.

This page left intentionally blank

ALL RED TEXT IS HYPER LINKED TO THE PDF	
ALL BLUE TEXT IS HYPER LINKED TO THE AUTOCAD DRAWING FILE	
SHEET NO.	SHEET TITLE
SECT C1	UTILITY CROSS SECTIONS
C1-1	STREET CROSS SECTION GUIDELINES APPLICATION PHILOSOPHIES
C1-2	PRINCIPAL ARTERIAL 6–LANE, TYPE II (6 LANES) CROSS SECTION
C1-3	PRINCIPAL ARTERIAL 4–LANE, TYPE I (4 LANES) CROSS SECTION
C1-4	MINOR ARTERIAL CROSS SECTION
C1-5	INDUSTRIAL/MAJOR COLLECTOR CROSS SECTION
C1-6	COLLECTOR (W/GAS IN STREET) CROSS SECTION
C1-7	COLLECTOR W/JOINT TRENCH UNDER SIDEWALK CROSS SECTION
C1-8	RESIDENTIAL (LOCAL) (>20 LOTS) DETACHED SIDEWALK CROSS SECTION
C1-8B	ANGLE OF REPOSE ANALYSIS – RESIDENTIAL DETACHED SIDEWALK
C1-9	MINOR RESIDENTIAL (LOCAL) (<21 LOTS), ATTACHED SIDEWALKS CROSS SECTION
C1-9B	MINOR RESIDENTIAL (LOCAL) (<21 LOTS), DETACHED SIDEWALKS CROSS SECTION
C1-10	HIGH DENSITY RESIDENTIAL CROSS SECTION
C1-11	PRIVATE STREET WITH PUBLIC UTILITIES GUIDELINES
C1-12	PRIVATE STREET WITH PUBLIC UTILITIES CROSS SECTION
C1-13	PRIVATE STREET WITH PUBLIC UTILITIES PLAN VIEW
C1-14	RESIDENTIAL, LOCAL DETACHED SIDEWALK PLAN VIEW
C1-15	MINOR RESIDENTIAL (LOCAL) (<21 LOTS) ATTACHED SIDEWALKS PLAN VIEW
C1-16	HIGH DENSITY RESIDENTIAL PLAN VIEW

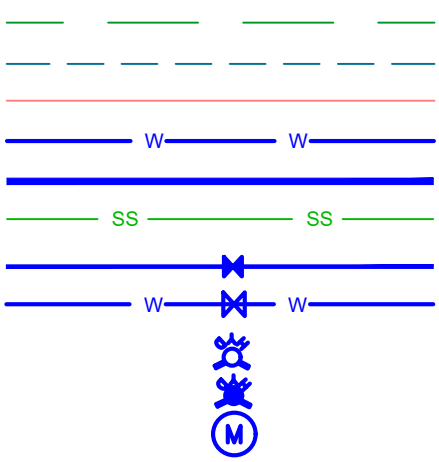
SHEET NO.	SHEET TITLE
SECT C2	GENERAL WASTEWATER MAIN DRAWINGS
C2-1	TYPICAL TRENCH SECTION
C2-2	MINIMUM RADIUS FOR DIP AND PVC PIPE
C2-3	TRACER WIRE ON PVC OR HDPE PIPE
C2-4	TYPICAL STEEL CASING INSTALLATION
C2-5	TYPICAL STEEL CASING INSTALLATION (CONTINUED)
C2-6	PIPE BRIDGING DETAIL W/HELICAL PIERS
C2-7	PIPE BRIDGING DETAIL W/CONCRETE CRADLES
C2-8	TYPICAL CREEK CROSSING
C2-9	PIPE ENCASEMENT DETAIL
C2-10	TYPICAL AERIAL PIPELINE CROSSING
C2-11	TYPICAL ACCESS
C2-12	SCHEMATIC OF TYPICAL BY-PASS SYSTEM
C2-13	MAXIMUM SAG DEPTH FOR WASTEWATER MAINS
C2-14	PUBLIC LIFT STATION SCHEMATIC
C2-15	STEEP SLOPE BELL RESTRAINTS
C2-16	TYPICAL AIR AND VACUUM VALVE
C2-17	AIR AND VACUUM VALVE VAULT DIP/PVC
C2-18	AIR AND VACUUM VALVE VAULT HDPE
SECT C3	WASTEWATER MANHOLES
C3-1	STANDARD CONCRETE MANHOLE
C3-2	TYPICAL MANHOLE LAYOUTS AND INTERSECTIONS
C3-3	CORE DRILLING INTO AN EXISTING MANHOLE
C3-4	WASTEWATER MAIN STUB-OUT FROM MANHOLE
C3-5	HIGH VELOCITY PROTECTION FOR INCOMING SLOPES; 15% OR GREATER
C3-6	INTERNAL DROP MANHOLE WITH DROP GREATER THAN 24"
C3-7	DROP MANHOLE LESS THAN 24"
C3-8	METERING VAULT
C3-9	STANDARD MANHOLE RING AND COVER IN TRAFFIC AREAS
C3-10	BOLT DOWN AND LOCKING MANHOLE RING AND COVER IN TRAFFIC AREAS
C3-11	HINGED MANHOLE RING AND COVER IN NON TRAFFIC AREAS
C3-12	APEX MANHOLE

SHEET NO.	SHEET TITLE
SECT C4	GREASE & SAND/OIL INTERCEPTORS
C4-1	RESTAURANT CONNECTION SCHEMATIC
C4-2	TYPICAL GREASE INTERCEPTOR
C4-3	TYPICAL RESTAURANT GREASE INTERCEPTOR
C4-4	ABANDONING GREASE TRAPS AND GREASE INTERCEPTORS
C4-5	TYPICAL SAND & OIL INTERCEPTOR
C4-6	BACKWATER VALVE
C4-7	SCHEMATIC OF A NON–WATER RECYCLING CAR WASH SYSTEM
C4-8	SCHEMATIC OF A WATER RECYCLING CAR WASH SYSTEM
C4-9	GB–75 GREASE INTERCEPTOR INSTALLATION
C4-10	GB–250 INTERCEPTOR INSTALLATION
C4-11	PLASTIC SAND AND OIL INTERCEPTOR
C4-12	INTERCEPTOR TRAFFIC AREA COVER
SECT C5	CATHODIC PROTECTION
C5-1	POLYETHYLENE TUBING
C5-2	BONDING JOINT AND ANODE INSTALLATION
C5-3	INSULATOR INSTALLATION
C5-4	INSTALLATION OF CATHODIC PROTECTION TEST STATION AT AN INSULATING JOINT
C5-5	INSTALLATION OF CATHODIC PROTECTION TEST STATION AT A CASING PIPE
C5-6	INSTALLATION OF CATHODIC PROTECTION TEST STATION AT AN ANODE
C5-7	INSTALLATION OF CATHODIC PROTECTION TEST STATION
C5-8	INSTALLATION OF CATHODIC PROTECTION TEST STATION WITH A CORROSION COUPON
C5-9	TEST STATION FLUSH MOUNT
SECT C6	UNDERDRAINS
C6-1	PASSIVE GROUNDWATER UNDERDRAIN SCHEMATIC
C6-2	UNDERDRAIN TRENCH DAM
C6-3	PREFERRED COMMON TRENCH UNDERDRAIN WITH WASTEWATER MAIN

SHEET NO.	SHEET TITLE
SECT D1	WASTEWATER SERVICE LINES
D1-1	TYPICAL SERVICE LOCATIONS TO A RESIDENTIAL DWELLING
D1-2	EXAMPLE OF A SERVICE WITH A BASEMENT
D1-3	SCHEMATIC OF A DEEP SERVICE CONNECTION
D1-4	TYPICAL WASTEWATER SERVICE LINE WITH TRACER WIRE AND CLEAN–OUTS
D1-5	TYPICAL COMMON SERVICE TRENCH SECTION
D1-6	TYPICAL WASTEWATER SERVICE LINE TAPPING METHOD
D1-7	ALTERNATIVE WASTEWATER SERVICE LINE TAPPING METHODS
D1-8	TAPPING AN HDPE WASTEWATER MAIN WITH AN ELECTROFUSION TAPPING SADDLE
D1-9	HDPE SERVICE LINE CONNECTION TO PVC/DIP/VCP WASTEWATER MAIN
D1-10	TYPICAL HDPE WASTEWATER SERVICE LINE CLEAN–OUT DETAIL
D1-11	FLEXIBLE COUPLING CONCRETE COLLAR
D1-12	TYPICAL RECREATIONAL VEHICLE DUMP STATION DETAIL
D1-13	RECREATIONAL VEHICLE SEWAGE DUMP STATION
D1-14	SINGLE–FAMILY RESIDENTIAL WITH DETACHED ADU OPTION 1
D1-15	SINGLE–FAMILY RESIDENTIAL WITH DETACHED ADU OPTION 2
SECT D2	PRESSURIZED WASTEWATER SERVICE LINES
D2-1	MIXED GRAVITY AND PRESSURIZED WASTEWATER SYSTEM SCHEMATIC
D2-2	PRIVATE PUMP SYSTEM SCHEMATIC
D2-3	PRESSURIZED WASTEWATER SERVICE LINE CONNECTION TO A PRESSURIZED WASTEWATER MAIN
D2-4	PRESSURIZED WASTEWATER SERVICE LINE CONNECTION TO A GRAVITY WASTEWATER MAIN
D2-5	RETROFIT PRESSURIZED WASTEWATER SERVICE LINE WITH TRACER WIRE AND CLEAN–OUTS
D2-6	PRESSURIZED MAIN CONNECTION TO EXISTING MANHOLE
D2-7	FLUSHING CONNECTION TO EXISTING PRESSURIZED MAIN, 2”
SECT D3	DUPLEX, TRIPLEX, FOURPLEX UTILITY SERVICE OPTIONS
D3-1	DUPLEX, TRIPLEX OR FOURPLEX UTILITY SERVICE OPTION #1
D3-2	DUPLEX, TRIPLEX OR FOURPLEX UTILITY SERVICE OPTION #2

NOTE: ALL DETAIL DRAWINGS NOT TO SCALE (NTS) UNLESS OTHERWISE NOTED.

LEGEND



EASEMENT LINE
EXISTING ROW/PROPERTY LINE
EXISTING CURB LINE
EXISTING WATER
PROPOSED WATER
PROPOSED WASTEWATER
VALVE (PROPOSED)
VALVE (EXISTING)
EXISTING FIRE HYDRANT
PROPOSED FIRE HYDRANT
EXISTING/PROPOSED METER PIT

NOTES FOR APPLYING STREET CROSS SECTION TEMPLATES

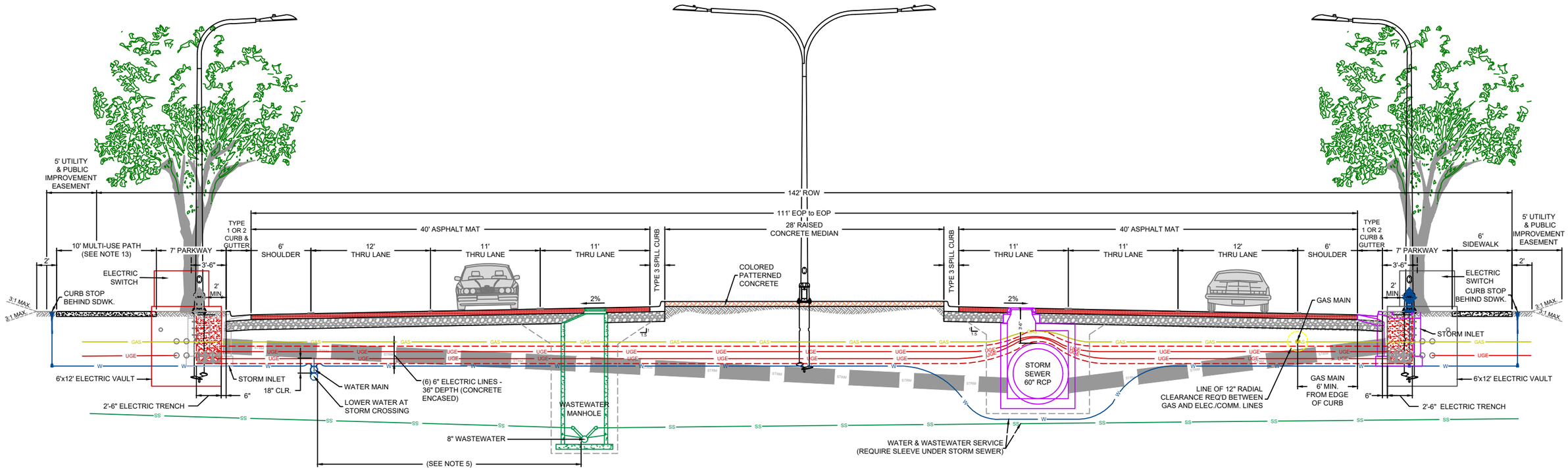
DETAIL DRAWINGS C1-2 THROUGH C1-10 ARE INTENDED TO GIVE THE DEVELOPMENT COMMUNITY ADDITIONAL DESIGN OPTIONS TO ASSIST IN CONSTRUCTING MAINTAINABLE STREETS AND UTILITIES. THESE DRAWINGS ARE MEANT TO BE USED IN CONJUNCTION WITH THE LATEST VERSION OF THE CITY OF COLORADO SPRINGS TRAFFIC DESIGN MANUAL AND 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.
D. SPACE IS ALLOWED ON EITHER SIDE OF THE ROAD FOR GAS AND ELECTRIC LINES AS SHOWN ON THE CROSS SECTIONS. THE TELECOMMUNICATIONS LINES CAN BE INSTALLED BETWEEN THE SIDEWALK AND THE GAS AND ELECTRIC LINES.



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

Colorado Springs Utilities
It's how we're all connected

PRINCIPAL ARTERIAL TYPE 2 (6 LANES) CROSS SECTION

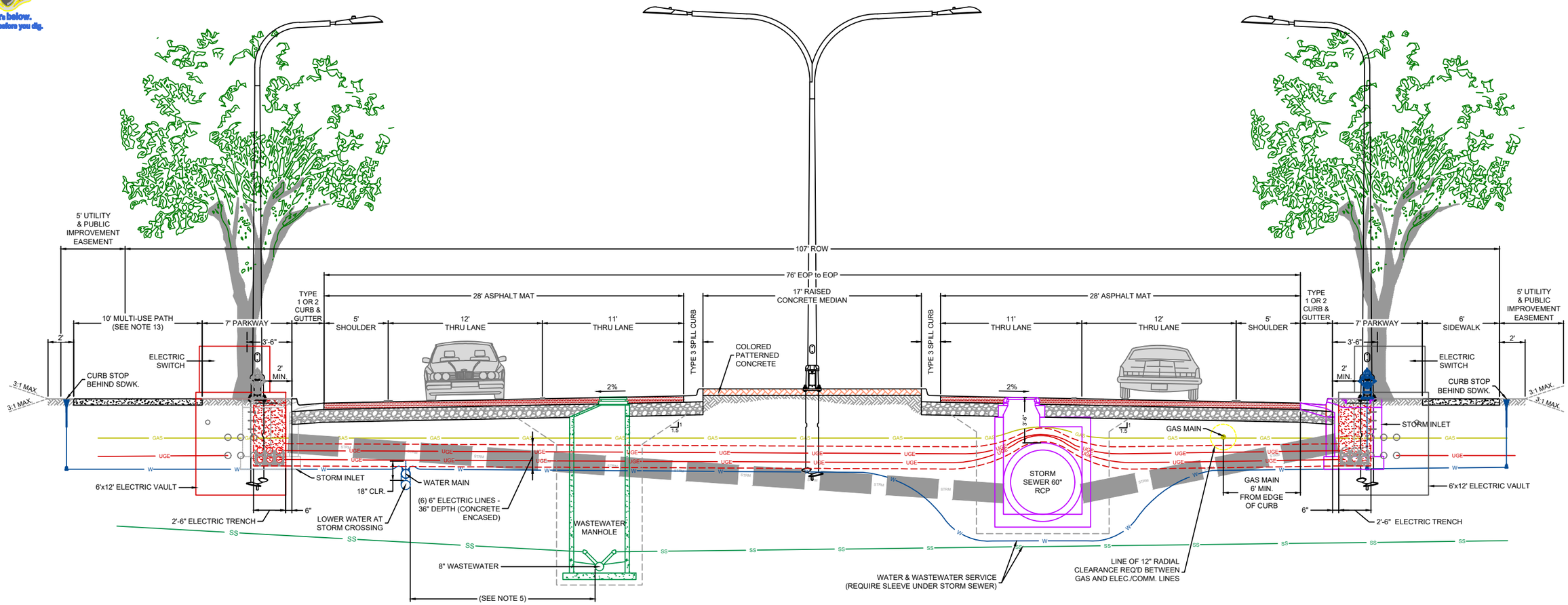
APPROVED:

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-2

DATED: 11/2025

User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WW_LESS DETAILS\STREET SECTIONS.DWG - Layout: C1-2



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

Colorado Springs Utilities
It's how we're all connected

PRINCIPAL ARTERIAL TYPE 1 (4 LANES) CROSS SECTION

APPROVED:

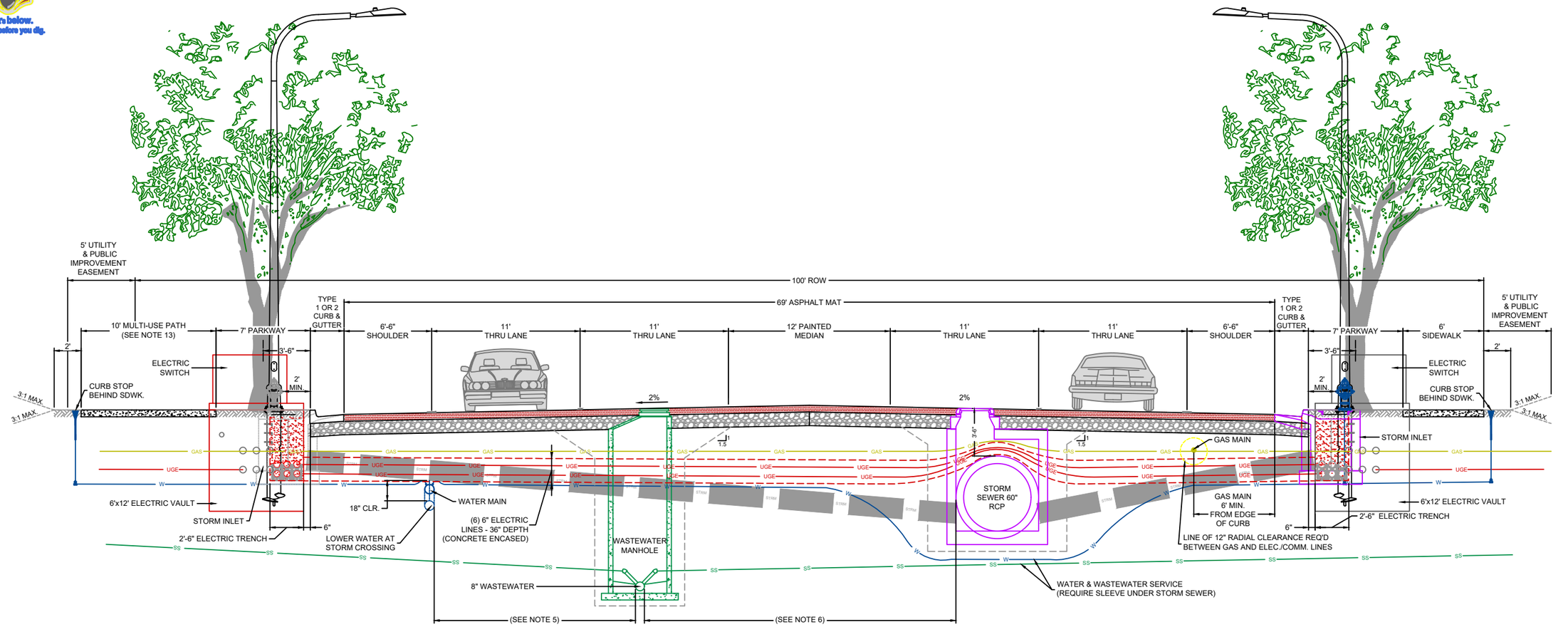
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-3

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WWLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-3



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

Colorado Springs Utilities
It's how we're all connected

MINOR ARTERIAL
CROSS SECTION

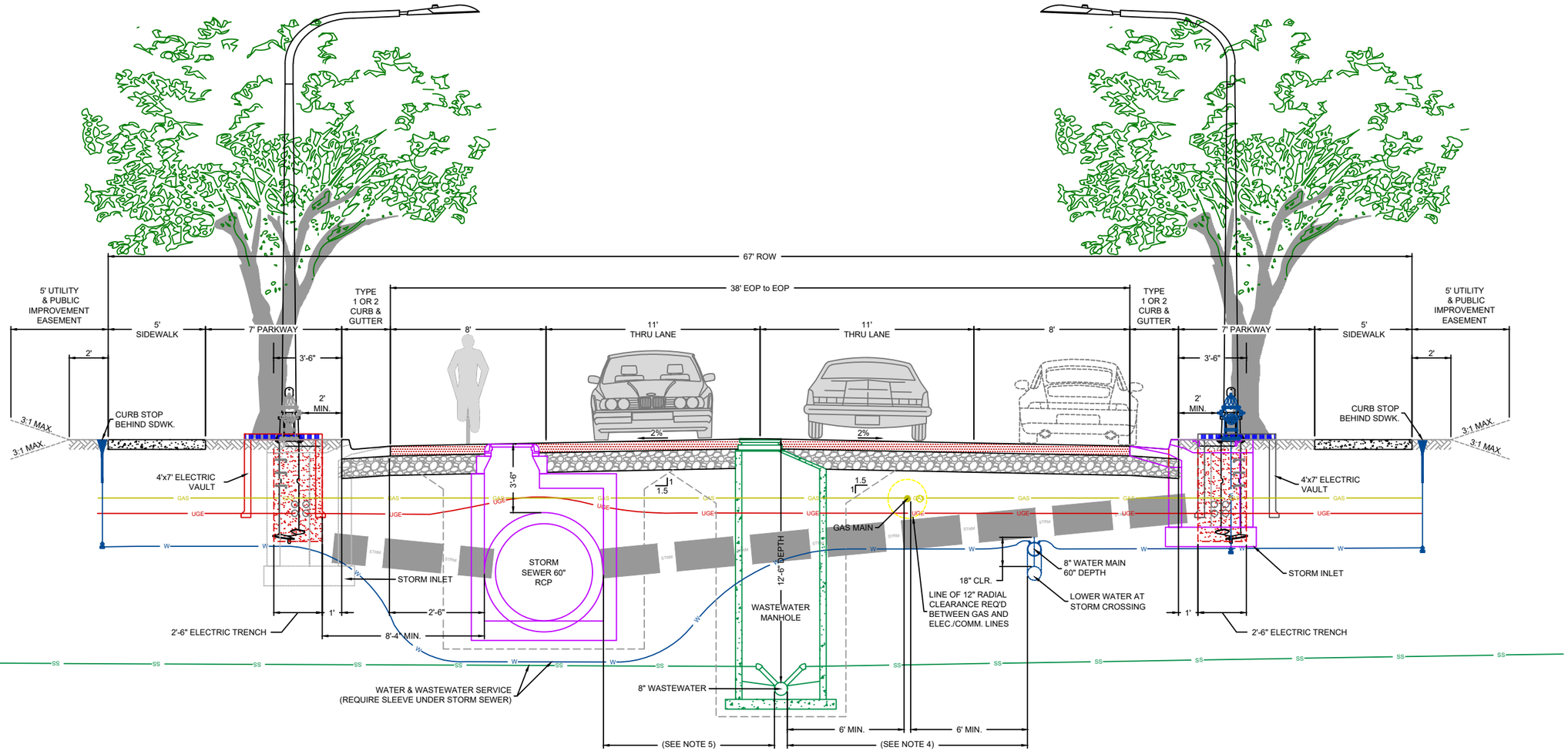
APPROVED:

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-4
DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026\VERSION02 - WASTEWATER\WWLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-4



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
It's how we're all connected

COLLECTOR (w/ GAS IN STREET) CROSS SECTION

APPROVED:

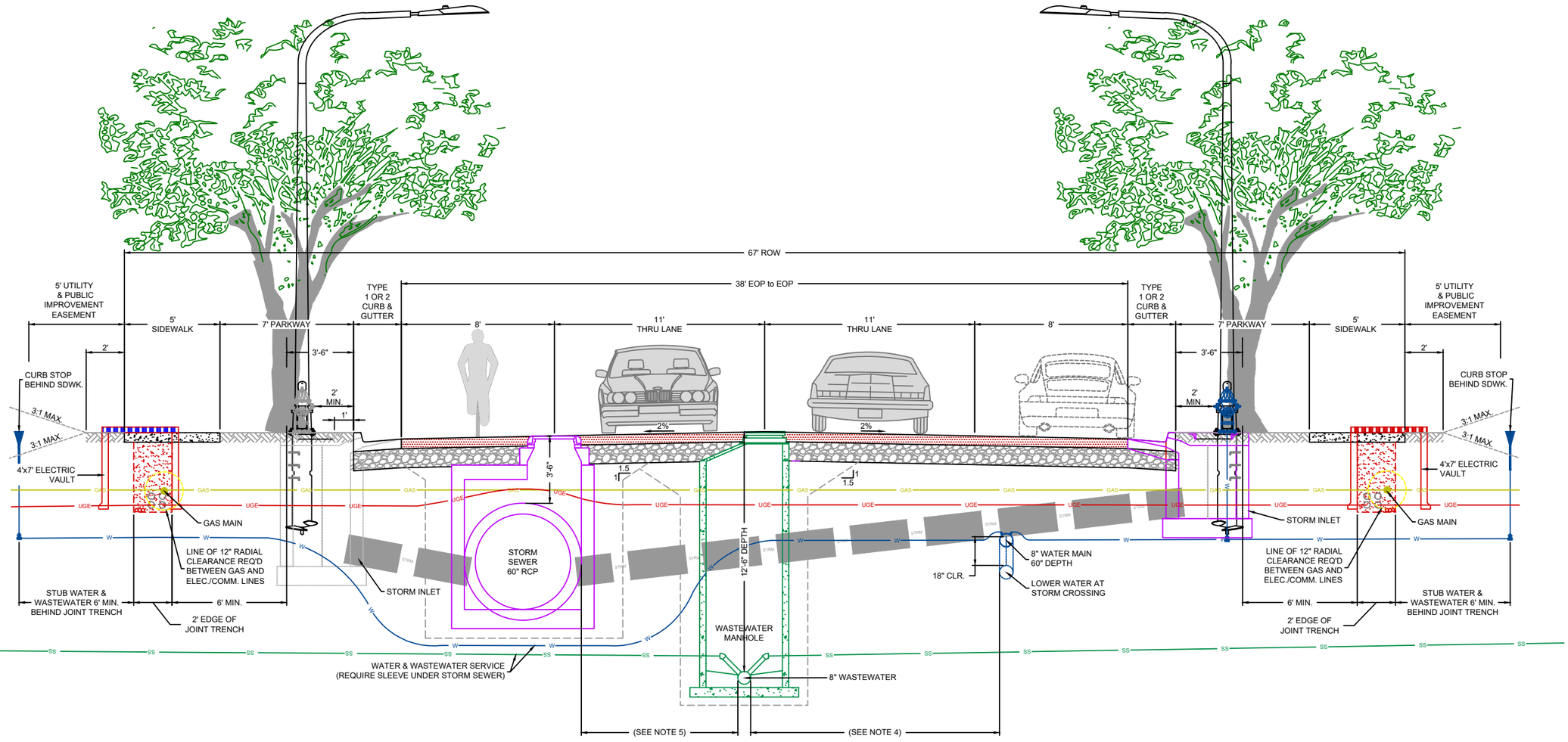
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-5

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WW DETAILS\STREET SECTIONS.DWG - Layout: C1-5



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. ELECTRIC AND GAS JOINT TRENCH IS TO BE EITHER UNDER THE SIDEWALK (AS SHOWN) OR GAS IN THE STREET. IN SOME AREAS IT IS NOT POSSIBLE TO HAVE THE JOINT TRENCH UNDER THE SIDEWALK, WHICH WILL REQUIRE NO TREES.
13. 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.
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

Colorado Springs Utilities
It's how we're all connected

COLLECTOR w/ JOINT TRENCH UNDER SIDEWALK CROSS SECTION

APPROVED:

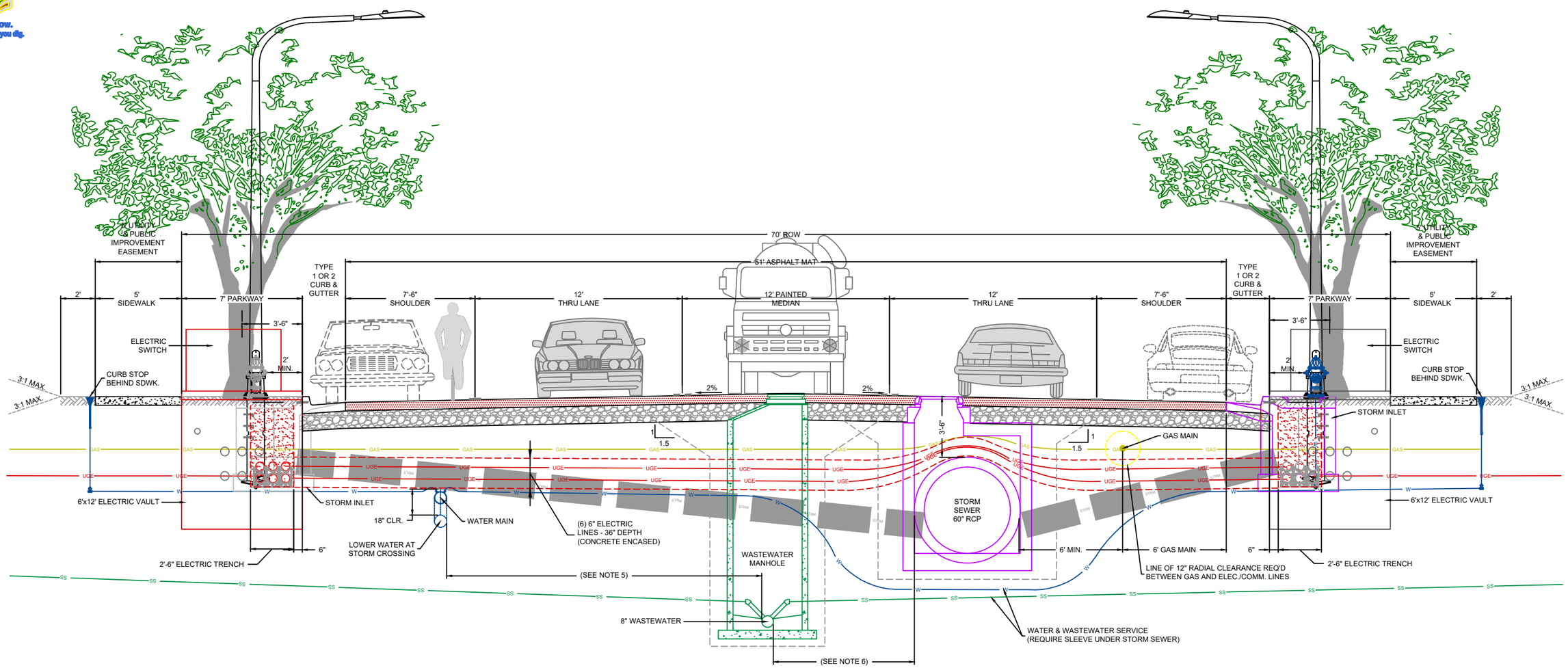
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-6

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WWLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-7



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

Colorado Springs Utilities
It's how we're all connected

INDUSTRIAL/ MAJOR COLLECTOR CROSS SECTION

APPROVED:

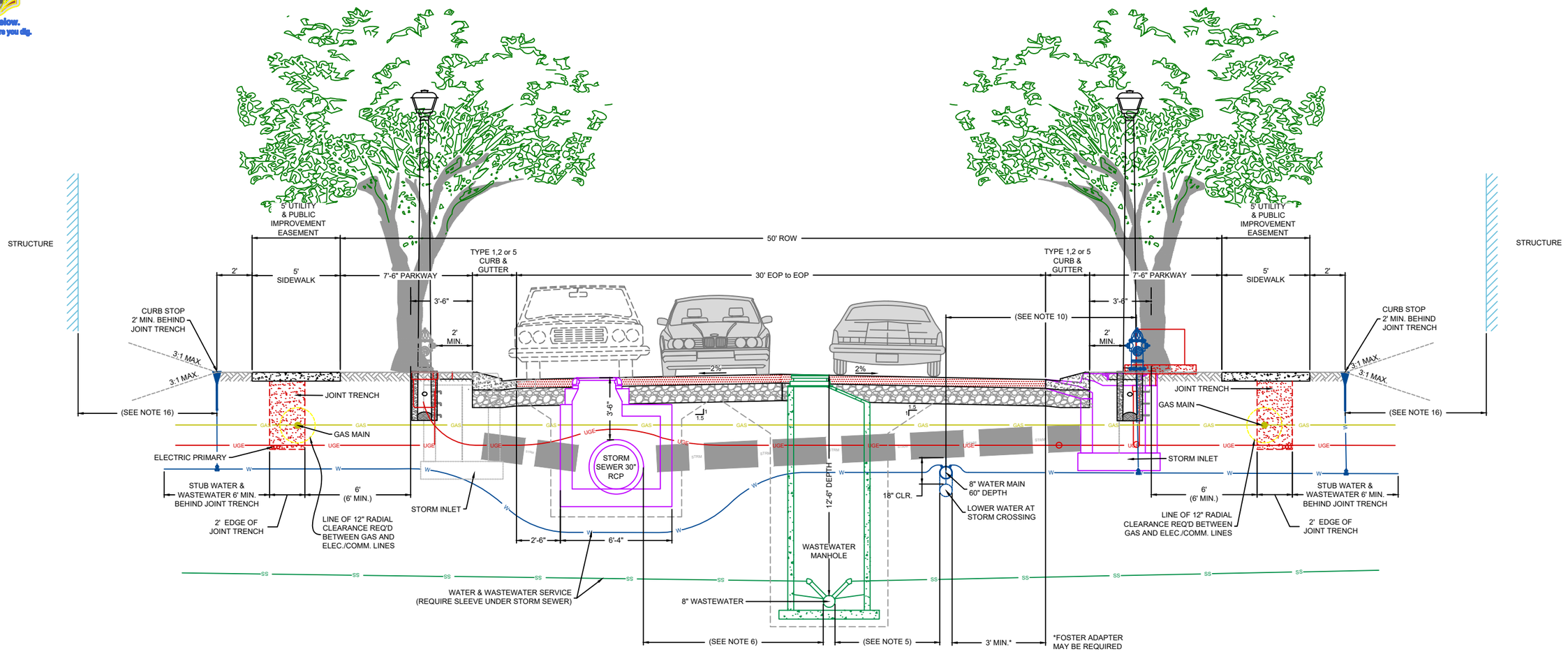
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-5

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-5



NOTES:

1. THIS PROFILE DRAWING DOES NOT APPLY TO TOWNHOME DEVELOPMENTS.
2. 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.
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 (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
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. PRIMARY ELECTRIC SHALL HAVE 6-10 FEET OF CLEARANCE PER THE ELECTRIC LESS CLEARANCE MATRIX.
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. SEPARATION REQUIREMENTS BETWEEN TREES AND UTILITIES SHALL COMPLY WITH ALL UTILITY LESS.
13. SIDEWALKS SHALL BE FREE OF OBSTRUCTIONS (E.G. VAULTS, RISERS), AND SHALL MEANDER AROUND OBSTACLES.
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. ELECTRIC AND GAS JOINT TRENCH IS TO BE EITHER UNDER THE SIDEWALK (AS SHOWN) OR GAS IN THE STREET. IN SOME AREAS IT IS NOT POSSIBLE TO HAVE THE JOINT TRENCH UNDER THE SIDEWALK, WHICH WILL REQUIRE NO TREES.
16. 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.
17. 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
It's how we're all connected

RESIDENTIAL
(LOCAL) (>20 LOTS)
DETACHED SIDEWALK
CROSS SECTION

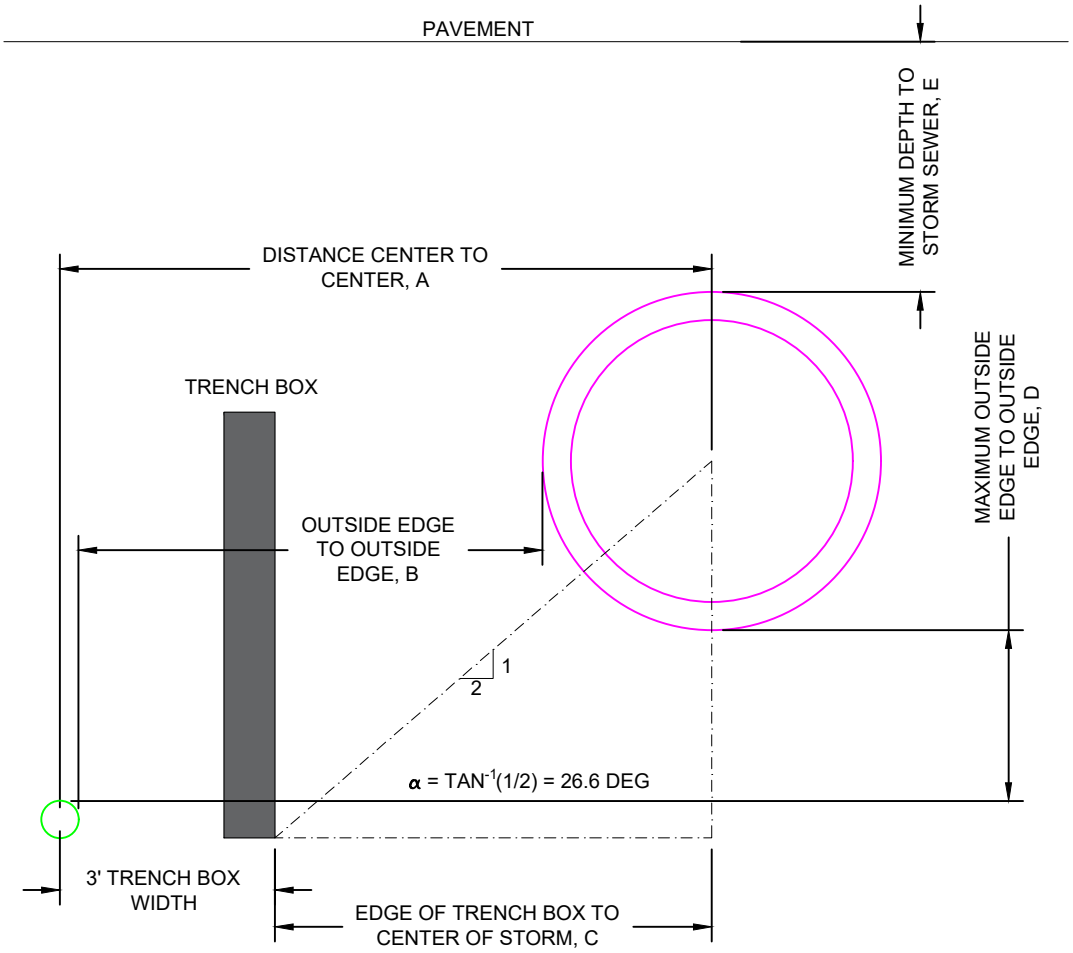
APPROVED:

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-8
DATED: 11/2025

811 Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WWLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-8



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:

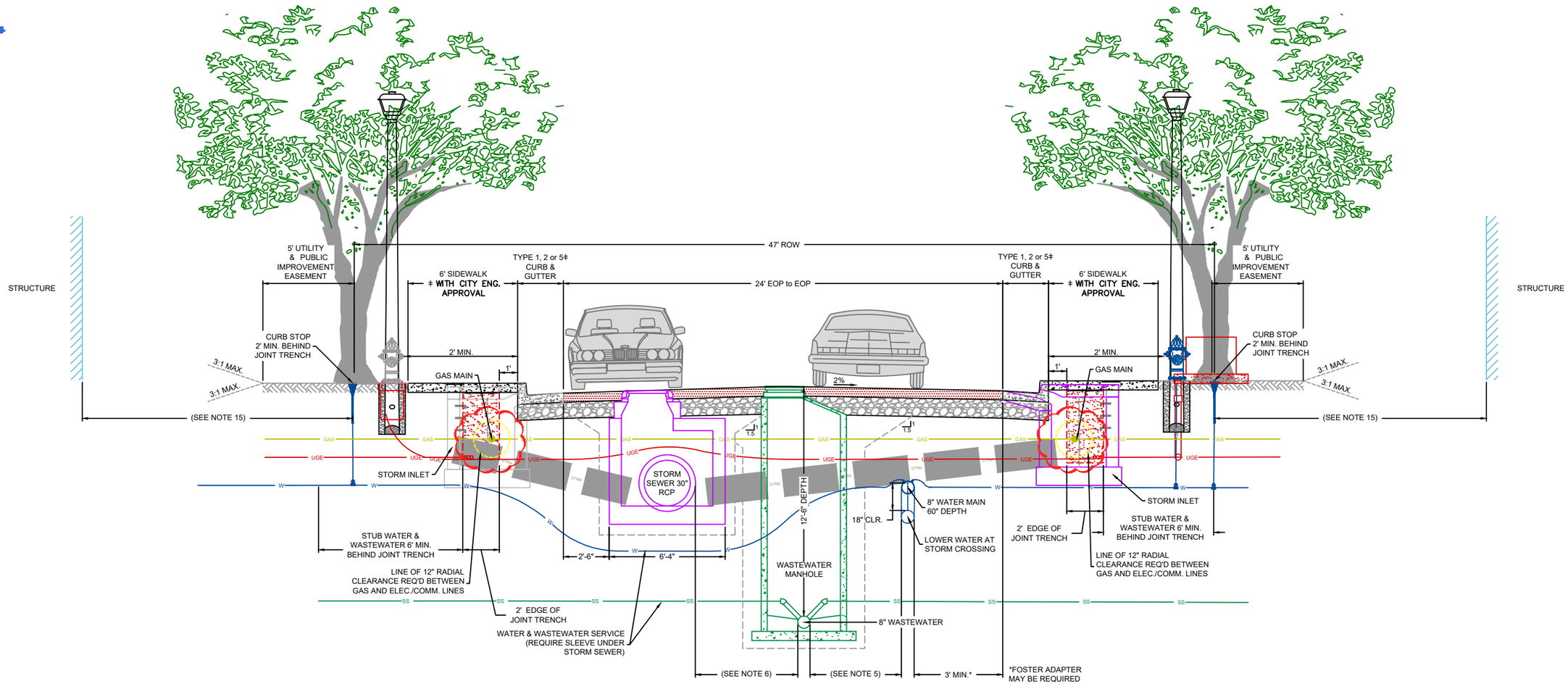
1. THIS DRAWING SHALL ONLY BE USED WITH DETAIL DRAWING C1-8 (RESIDENTIAL (LOCAL, >20 LOTS) DETACHED SIDEWALK STREET SECTION). THIS ANALYSIS DOES NOT APPLY TO ANY OTHER STREET SECTION DRAWINGS.
2. THE MINIMUM DISTANCE FROM OUTSIDE EDGE OF WASTEWATER TO OUTSIDE EDGE OF STORM SEWER IS 8 FT IF THE ANGLE 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.

Colorado Springs Utilities
It's how we're all connected

ANGLE OF REPOSE ANALYSIS - RESIDENTIAL (LOCAL) (>20 LOTS) DETACHED SIDEWALK CROSS SECTION

C1-8B

DATED 11/2022



NOTES:

1. THIS PROFILE DRAWING DOES NOT APPLY TO TOWNHOME DEVELOPMENTS.
2. 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.
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 (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
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. PRIMARY ELECTRIC SHALL HAVE 6-10 FEET OF CLEARANCE PER THE ELECTRIC LESS CLEARANCE MATRIX.
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. SEPARATION REQUIREMENTS BETWEEN TREES AND UTILITIES SHALL COMPLY WITH ALL UTILITY LESS.
13. SIDEWALKS SHALL BE FREE OF OBSTRUCTIONS (E.G. VAULTS, RISERS), AND SHALL MEANDER AROUND OBSTACLES.
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. ELECTRIC AND GAS JOINT TRENCH IS TO BE EITHER UNDER THE SIDEWALK (AS SHOWN) OR GAS IN THE STREET. IN SOME AREAS IT IS NOT POSSIBLE TO HAVE THE JOINT TRENCH UNDER THE SIDEWALK, WHICH WILL REQUIRE NO TREES.
16. 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.
17. 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
It's how we're all connected

MINOR RESIDENTIAL (LOCAL) (<21 LOTS) ATTACHED SIDEWALKS CROSS SECTION

APPROVED:

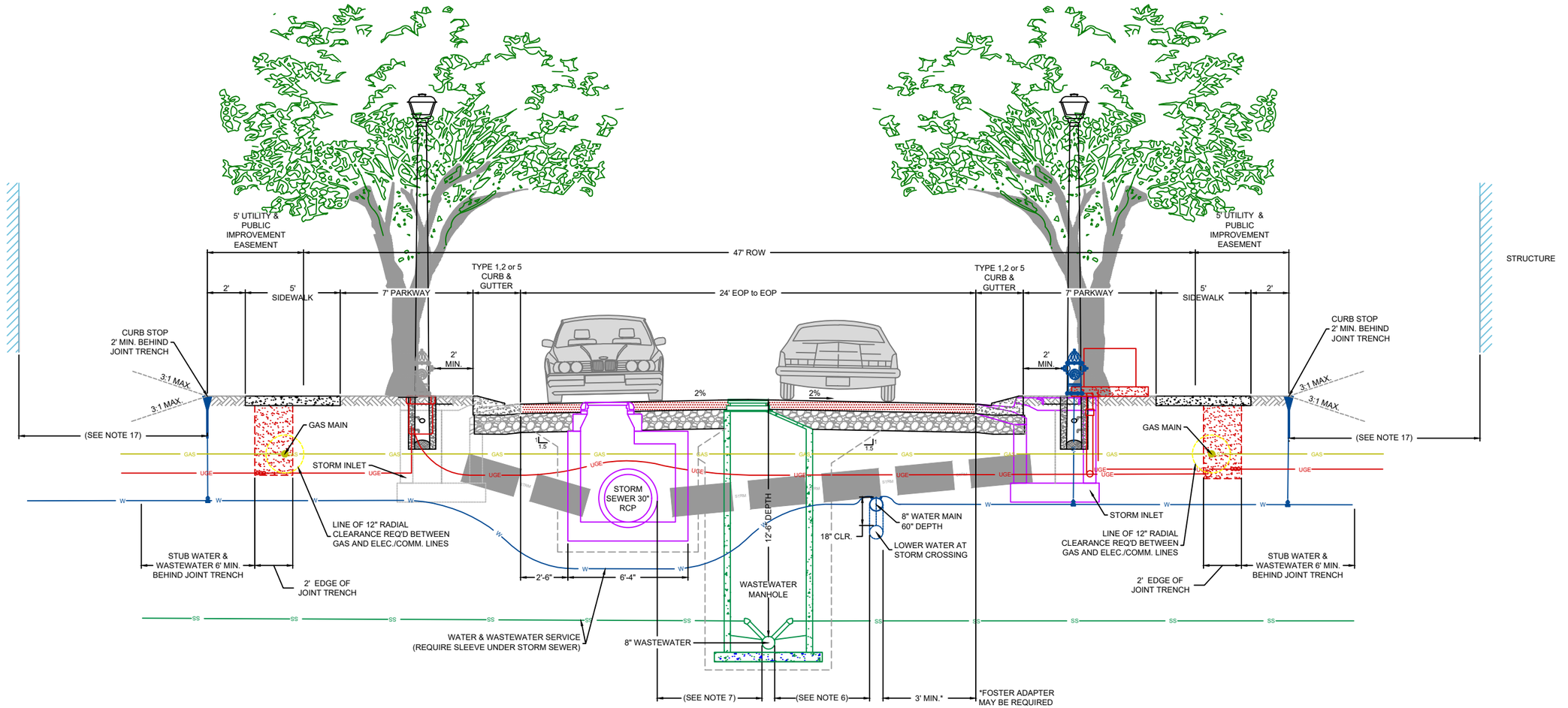
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-9

DATED: 11/2025

811 Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-9



NOTES:

1. THIS PROFILE DRAWING DOES NOT APPLY TO TOWNHOME DEVELOPMENTS.
2. 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.
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. 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
7. WHEN SEPARATION BETWEEN WASTEWATER AND STORM SEWER IS BETWEEN 5 TO 10-FEET, SECONDARY CONTAINMENT WILL BE REQUIRED.
8. SEPARATION REQUIREMENT FROM EXISTING UTILITIES ARE OUTLINED IN THE CSU LINE EXTENSION STANDARDS.
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. SEPARATION REQUIREMENTS BETWEEN TREES AND UTILITIES SHALL COMPLY WITH ALL UTILITY LESS.
13. SIDEWALKS SHALL BE FREE OF OBSTRUCTIONS (E.G. VAULTS, RISERS), AND SHALL MEANDER AROUND OBSTACLES.
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. ELECTRIC AND GAS JOINT TRENCH IS TO BE EITHER UNDER THE SIDEWALK (AS SHOWN) OR GAS IN THE STREET, IN SOME AREAS IT IS NOT POSSIBLE TO HAVE THE JOINT TRENCH UNDER THE SIDEWALK, WHICH WILL REQUIRE NO TREES.
16. 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.
17. 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
It's how we're all connected

MINOR RESIDENTIAL (LOCAL) (<21 LOTS) DETACHED SIDEWALKS CROSS SECTION

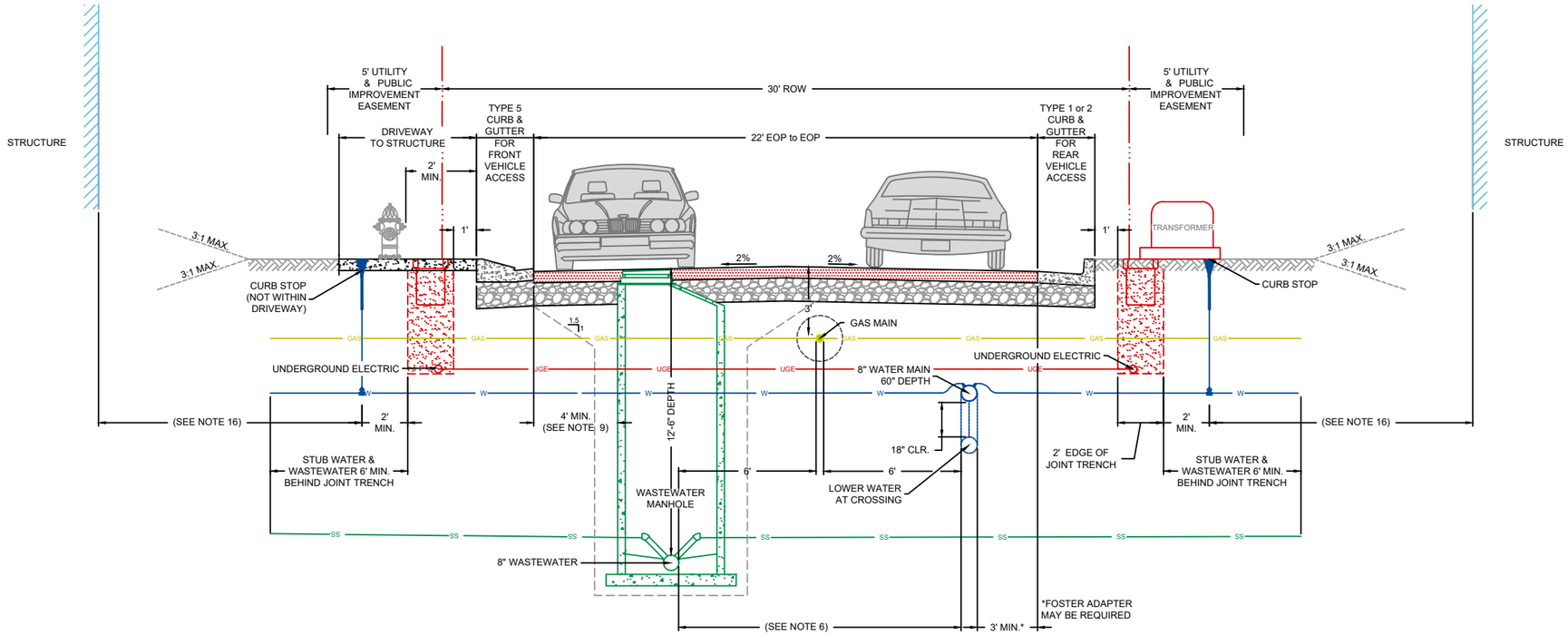
APPROVED:

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-9B

DATED: 11/2025

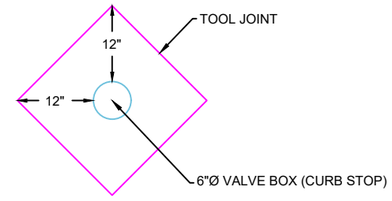
User: BSHANER Dec 11, 2025 - 2:40pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WW DETAILS\STREET SECTIONS.DWG - Layout: C1-9B



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.
5. ALL DEPTH DIMENSIONS ARE FROM FINISHED GRADE TO TOP OF PIPE.
6. HDPE PIPE SHALL BE USED FOR WATER MAIN IF SEPARATION FROM THE WASTEWATER IS BETWEEN 5 TO 10-FEET. IN NO CASE SHALL THERE BE NO LESS THAN 5-FEET OF SEPARATION BETWEEN THE WATER MAIN AND OTHER WET UTILITIES.
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 6-FEET IS REQUIRED FROM CENTER 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.
16. 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.



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
It's how we're all connected

HIGH DENSITY SINGLE-FAMILY RESIDENTIAL CROSS SECTION

APPROVED:

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-10

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:41pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WWLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-10

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:

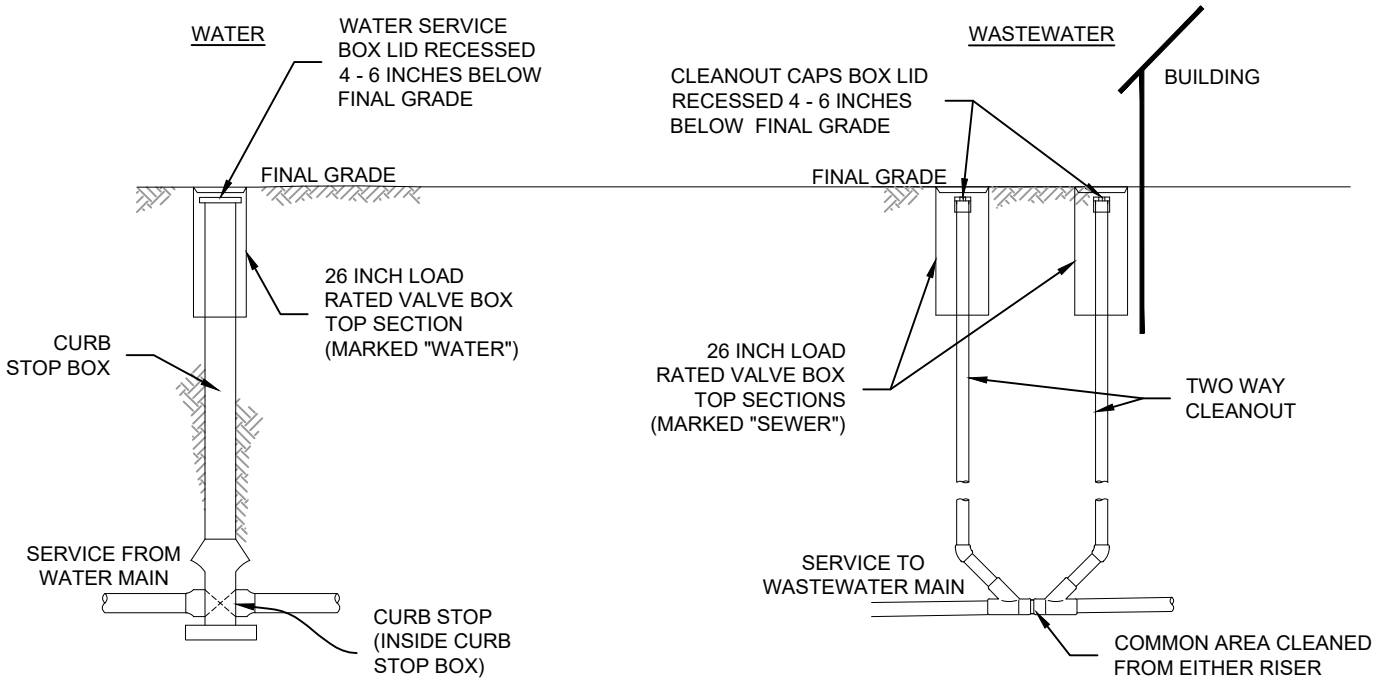
1. THE DIAMETER OF THE WASTEWATER MAIN SHALL NOT BE GREATER THAN 8 INCHES.
2. THE MAXIMUM DEPTH OF THE WASTEWATER MAIN SHALL NOT BE GREATER THAN 14 FEET MEASURED FROM FINAL GRADE (PAVEMENT) TO THE WASTEWATER PIPE INVERT.
3. COLORADO SPRINGS UTILITIES-APPROVED, LOAD-RATED, SLIP TYPE VALVE BOX TOP SECTIONS 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:

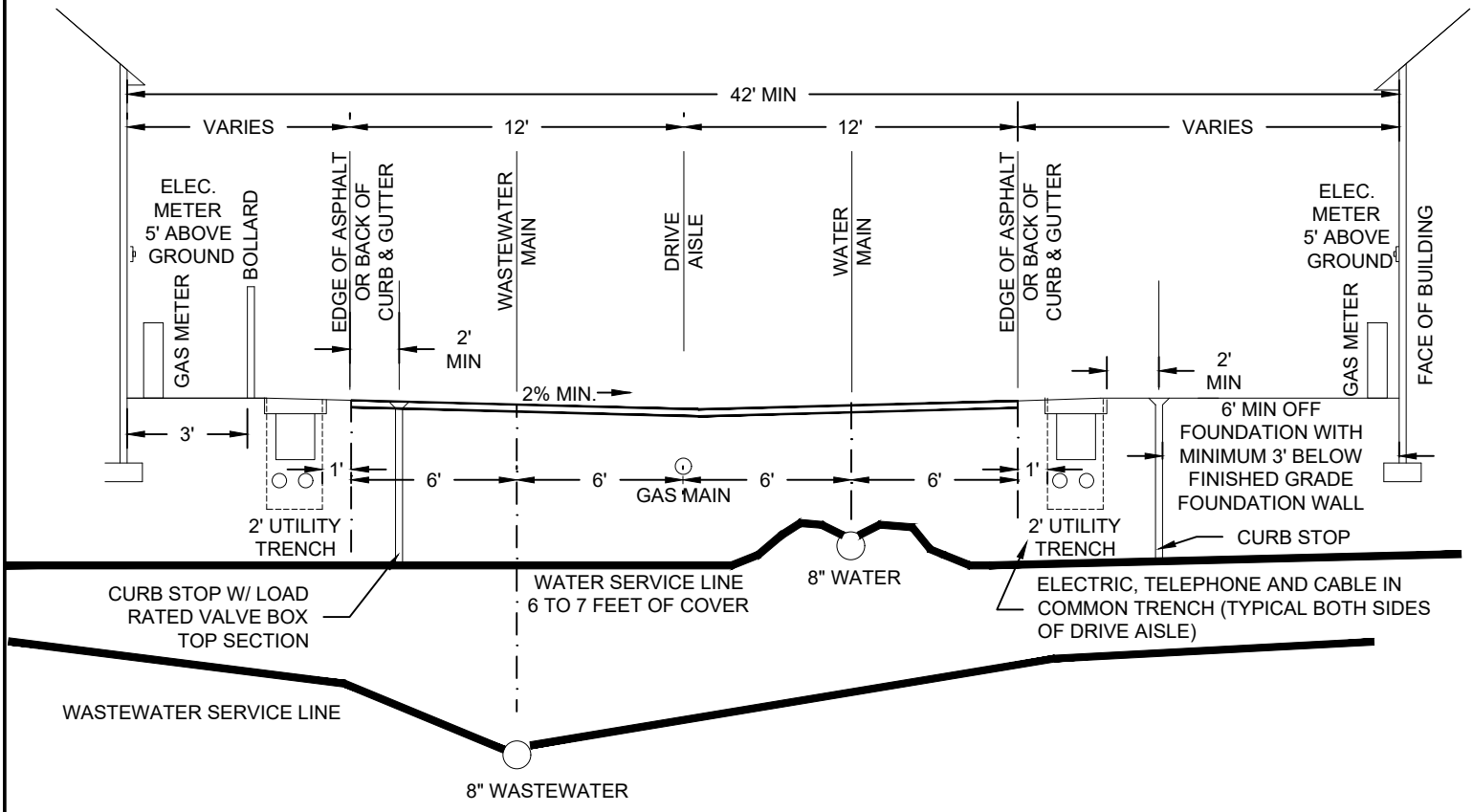
1. THE DIAMETER OF THE WATER MAIN SHALL NOT BE GREATER THAN 8 INCHES.
2. COLORAOD SPRINGS UTILITIES-APPROVED, LOAD-RATED, SLIP TYPE VALVE BOX TOP SECTION ARE REQUIRED OVER STANDARD WATER STOP BOXES. CURB STOP LID SHALL BE RECESSED 3-4 INCHES BELOW FINAL GRADE. VALVE BOX TOPS TO BE MARKED WITH "WATER". 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 C1-12 AND C1-13. 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 C1-11 AND C1-13

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. THE CURB STOP MAY BE LOCATED BEHIND THE CURB AND GUTTER OR EDGE OF ASPHALT WHERE THERE IS A MINIMUM OF 6 FEET FROM THE FURTHERMOST BUILDING FOUNDATION WALL WITH A MINIMUM 3 FOOT CUTOFF WALL AND A MINIMUM OF 2 FEET FROM THE BACK OF CURB, EDGE OF ASPHALT AND CLOSEST EDGE OF THE JOINT TRENCH.
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.

Colorado Springs Utilities
It's how we're all connected

PRIVATE STREET WITH PUBLIC UTILITIES
UTILITIES CROSS SECTION
CURB STOP LOCATIONS A AND B

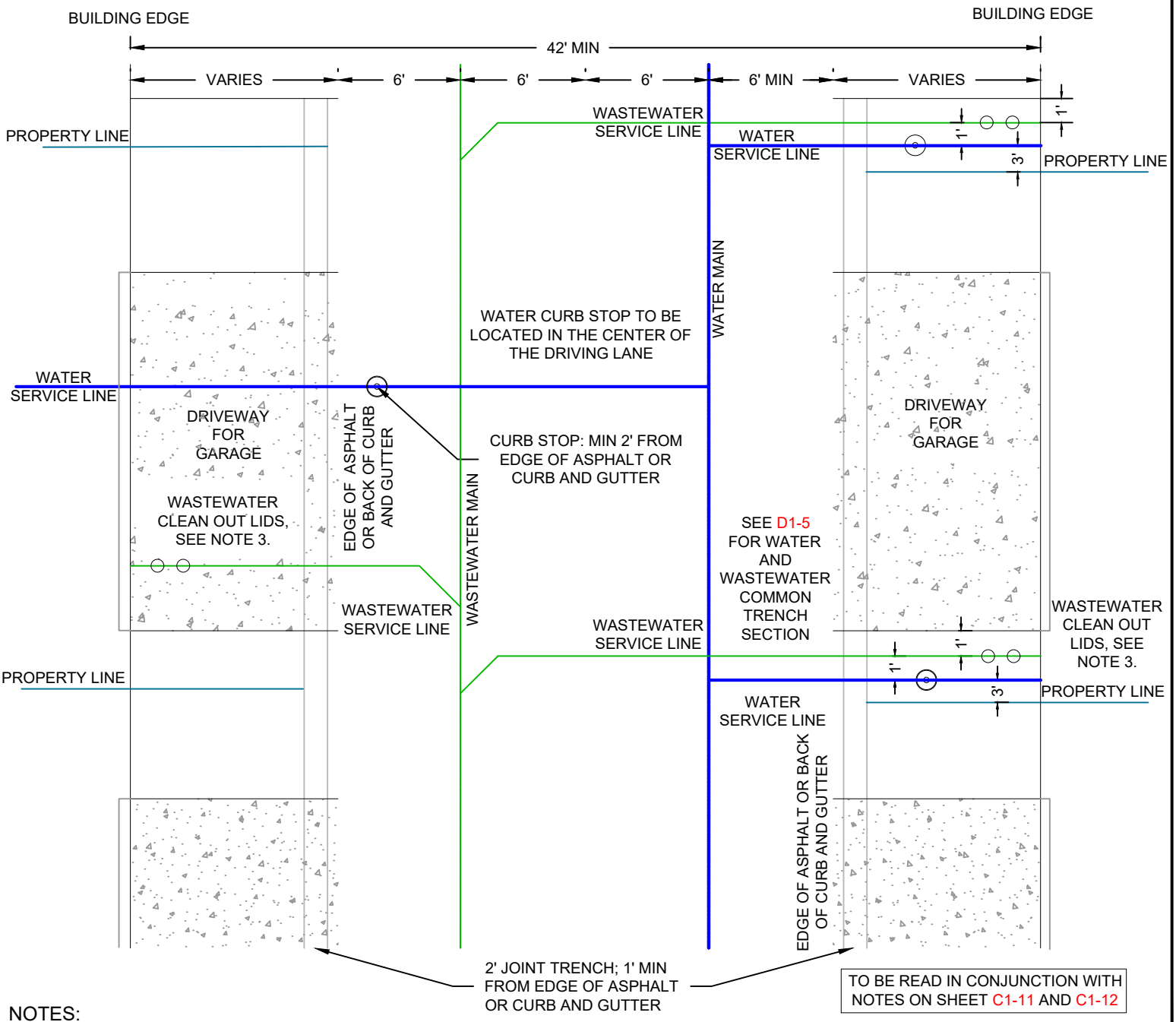
C1-12

DATED 07/2022

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 C1-11 AND C1-12

NOTES:

1. THE MINIMUM HORIZONTAL CLEARANCE BETWEEN THE WATER SERVICE AND GAS OR ELECTRIC SERVICE LINE MUST BE 3 FEET.
2. THE CURB STOP MAY BE LOCATED BEHIND THE CURB AND GUTTER OR EDGE OF ASPHALT WHERE THERE IS A MINIMUM OF 6 FEET FROM THE FURTHERMOST BUILDING FOUNDATION WALL WITH A MINIMUM 3 FOOT CUTOFF WALL AND A MINIMUM OF 2 FEET FROM THE BACK OF CURB, EDGE OF ASPHALT AND CLOSEST EDGE OF THE JOINT TRENCH.
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.

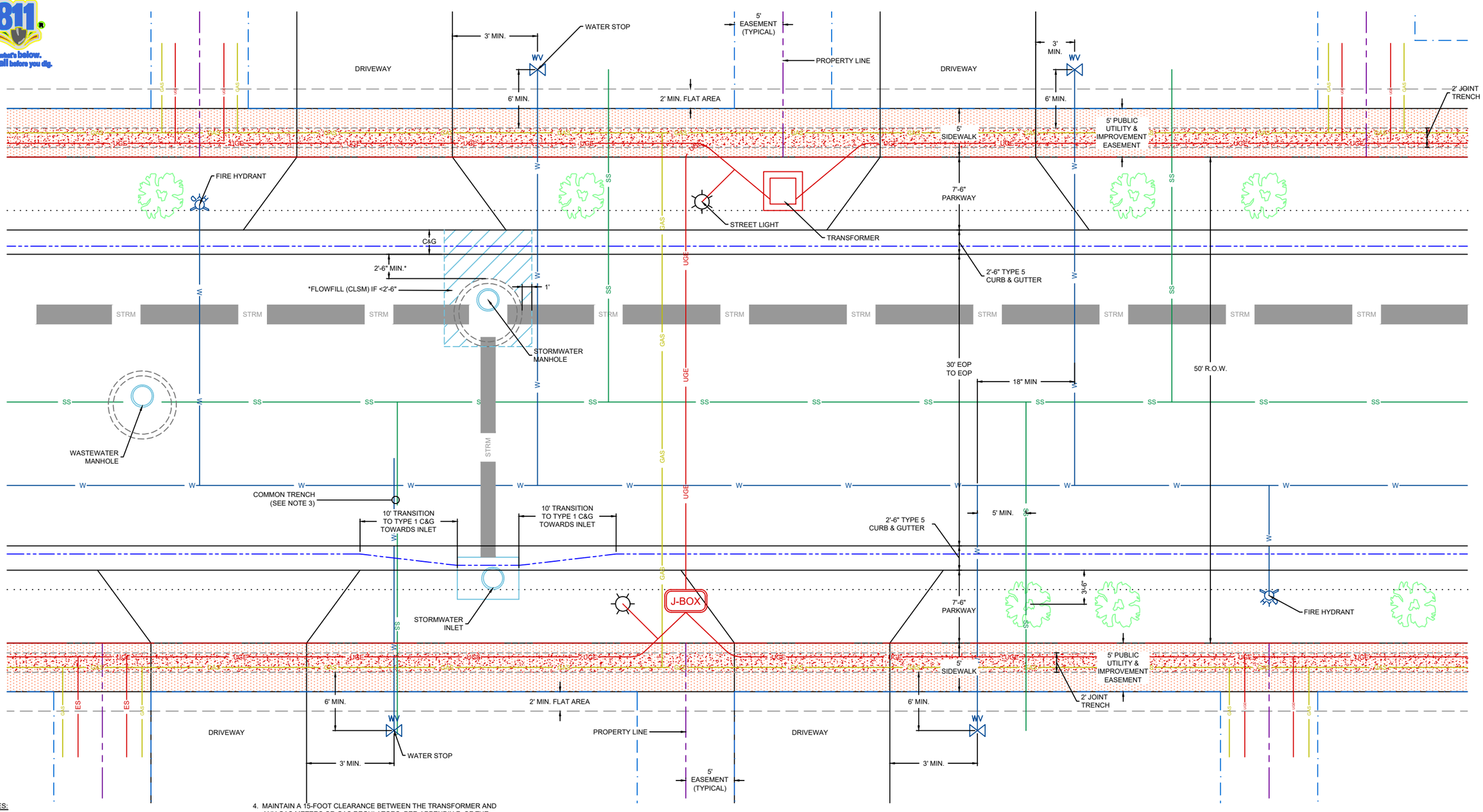
Colorado Springs Utilities
It's how we're all connected

PRIVATE STREET WITH PUBLIC UTILITIES
PLAN VIEW

C1-13

DATED 11/2022

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

Colorado Springs Utilities
It's how we're all connected

RESIDENTIAL, LOCAL DETACHED SIDEWALK PLAN VIEW

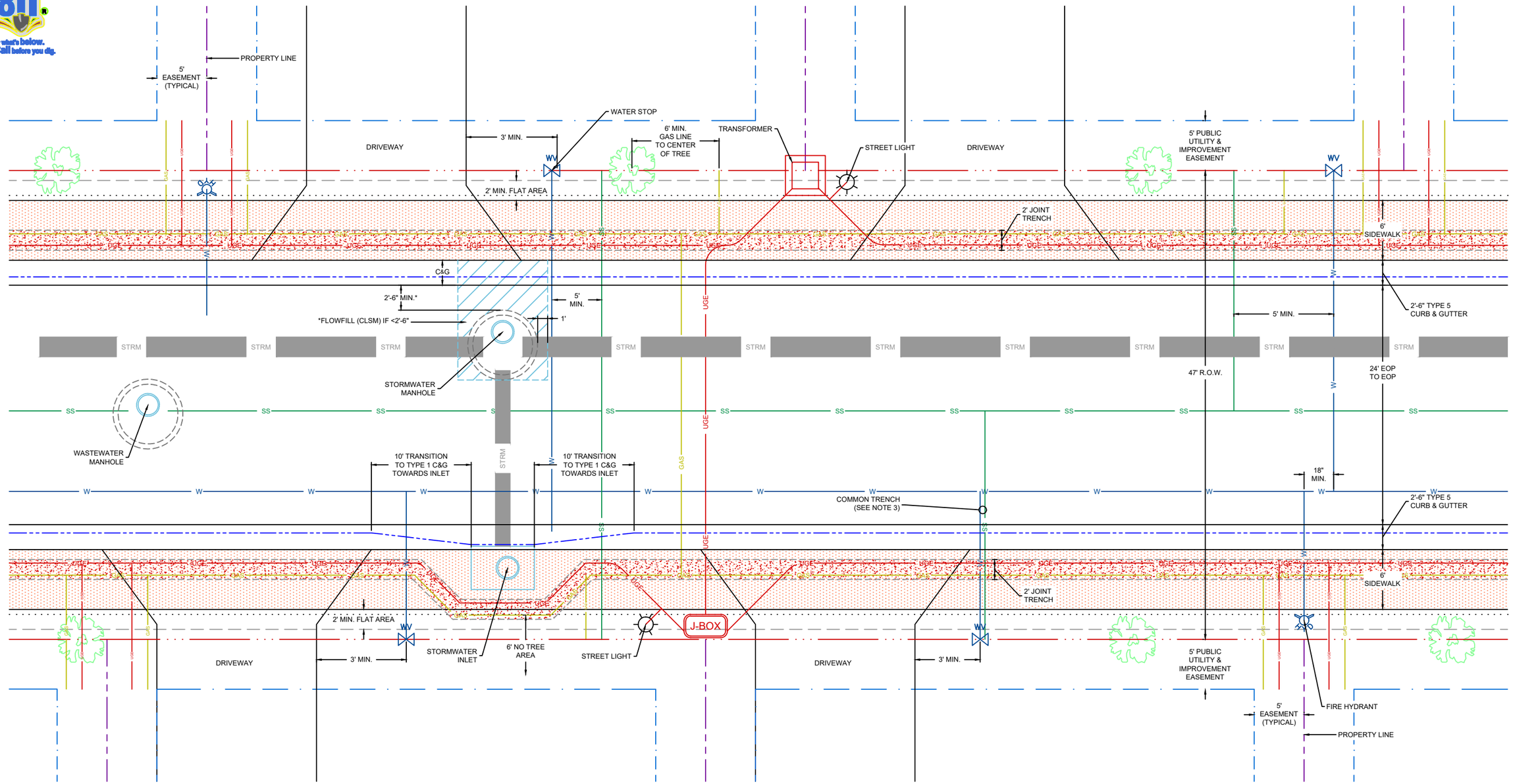
APPROVED:

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-14

DATED: 11/2025

User: BSHANER Dec 11, 2025 - 2:41pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-14



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

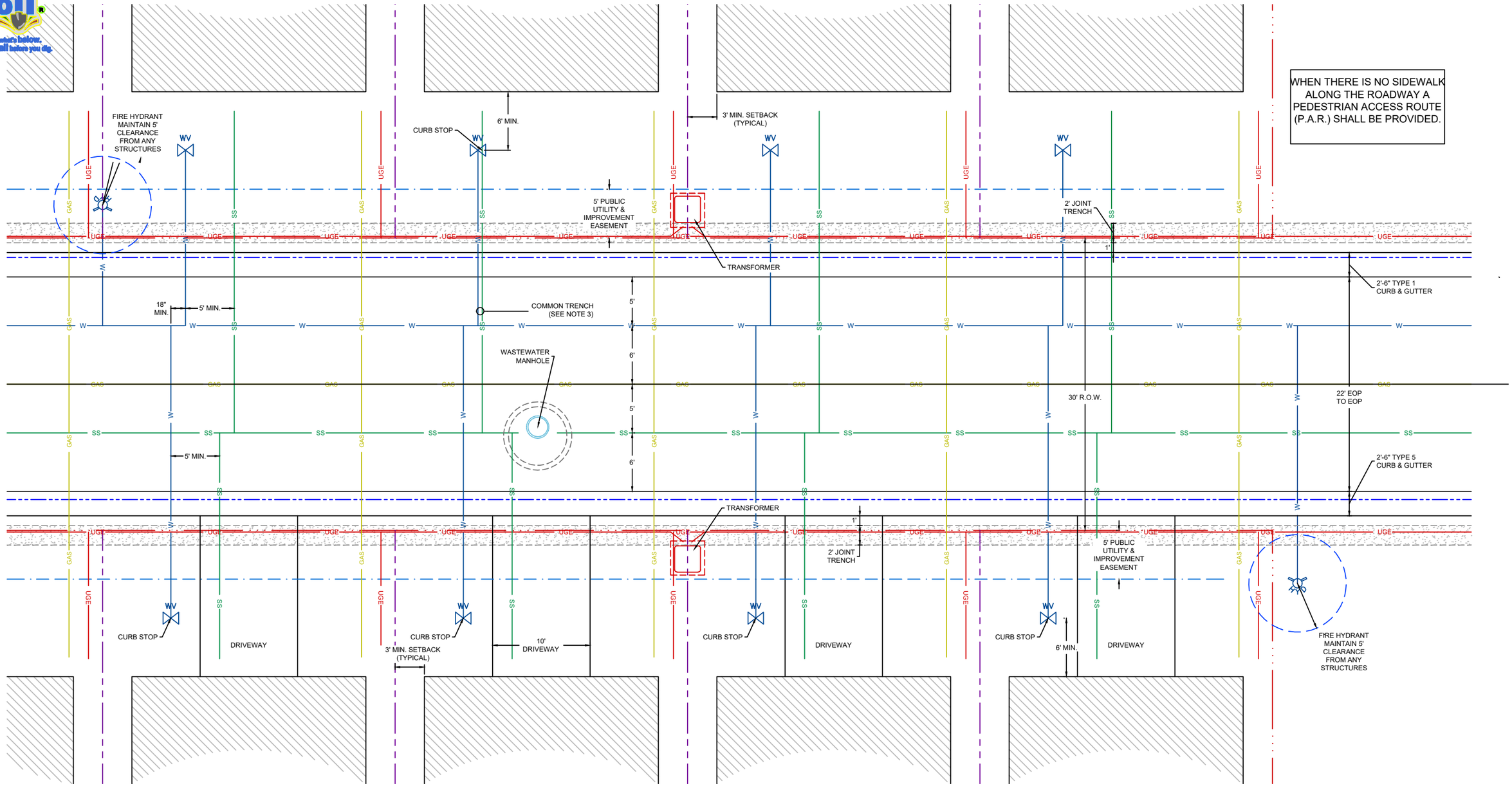
Colorado Springs Utilities
It's how we're all connected

MINOR RESIDENTIAL (LOCAL) (<21 LOTS) ATTACHED SIDEWALKS PLAN VIEW

CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-15
DATED: 11/2025

User: BSHANER Dec 11, 2025 - 2:41pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WWLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-15



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
It's how we're all connected

HIGH DENSITY RESIDENTIAL PLAN VIEW

APPROVED:

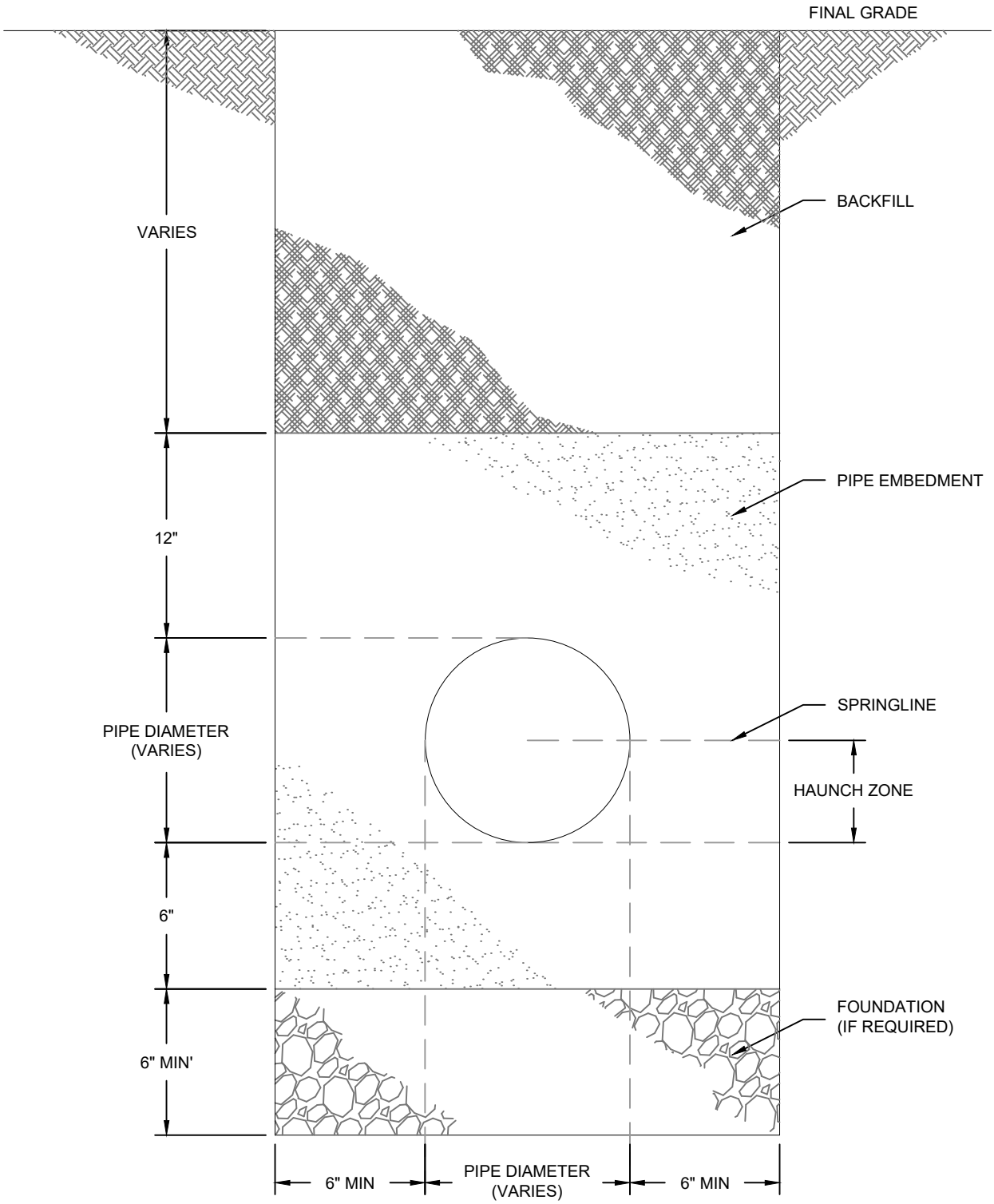
CHIEF SYSTEM PLANNING & PROJECTS OFFICER

C1-16

DATED: 11/2025

Know what's below. Call before you dig.

User: BSHANER Dec 11, 2025 - 2:41pm
Drawing: L:\WATER AND WASTEWATER DESIGN\WATER WASTEWATER STANDARDS\01 - LINE EXTENSION AND SERVICE STANDARDS WORKING\2026 VERSION\02 - WASTEWATER\WWLESS DETAILS\STREET SECTIONS.DWG - Layout: C1-16



NOTE:

1. TRENCH BACKFILL SHALL CONFORM TO THE SPECIFICATIONS OF THE AUTHORITY HAVING JURISDICTION AND ASTM D2321.

Colorado Springs Utilities
It's how we're all connected

TYPICAL TRENCH SECTION

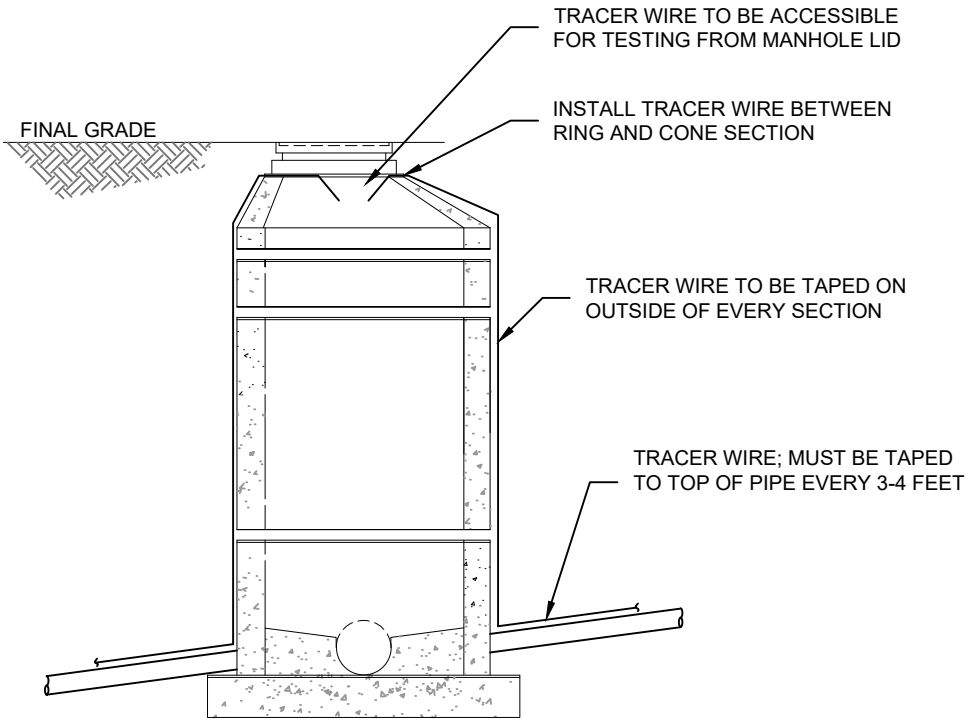
C2-1

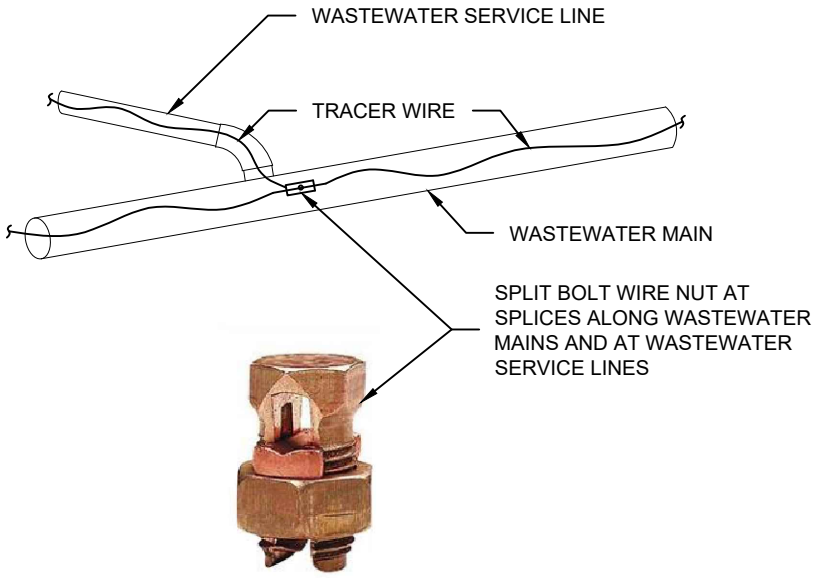
DATED 5/2015

PIPE SIZE AND MATERIAL	ALLOWABLE DEFLECTION	PIPE LENGTH AND CORRESPONDING RADIUS								
		20'	18'	16'	14'	12'	10'	8'	6'	4'
4" - 12" DIP	4°00'	286'	258'	229'	200'	172'	143'	115'	100'	100'
14" - 16" DIP	3°12'	358'	322'	287'	251'	215'	179'	143'	107'	100'
18" - 36" DIP	2°24'	477'	430'	382'	334'	286'	239'	191'	143'	100'
4" - 36" SDR 35 PVC	3°00'	382'	344'	306'	267'	230'	191'	153'	115'	100'

NOTES:

1. COLORADO SPRINGS UTILITIES USES A 1.25 SAFETY FACTOR FOR DIP SLIP JOINT DEFLECTION FROM THE MANUFACTURER'S ALLOWABLE DEFLECTION.
2. SDR 35 PVC SHALL NOT BE DEFLECTED WITHOUT THE USE OF FABRICATED 3° BENDS.
3. MINIMUM RADIUS FOR DIP AND SDR 35 PVC SHALL BE 100'.



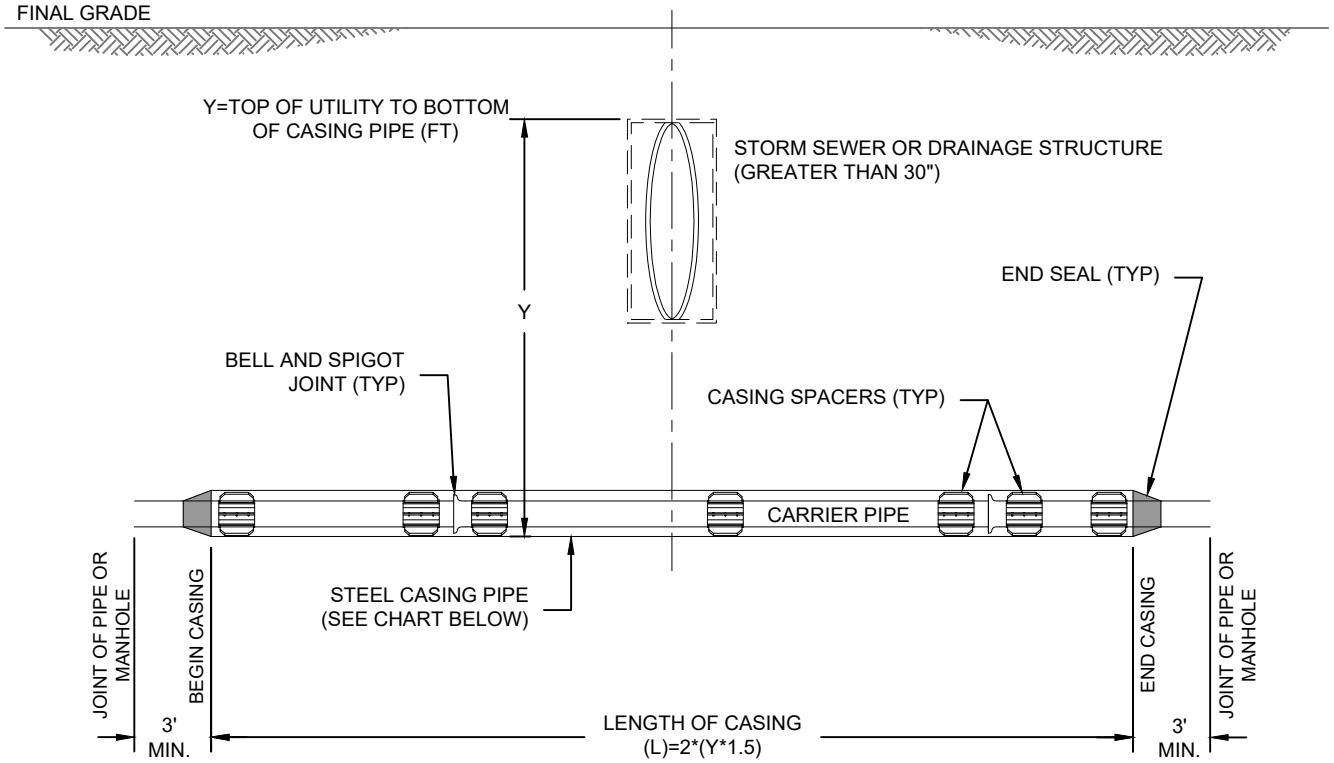


Colorado Springs Utilities
It's how we're all connected

TRACER WIRE ON PVC OR HDPE PIPE

C2-3

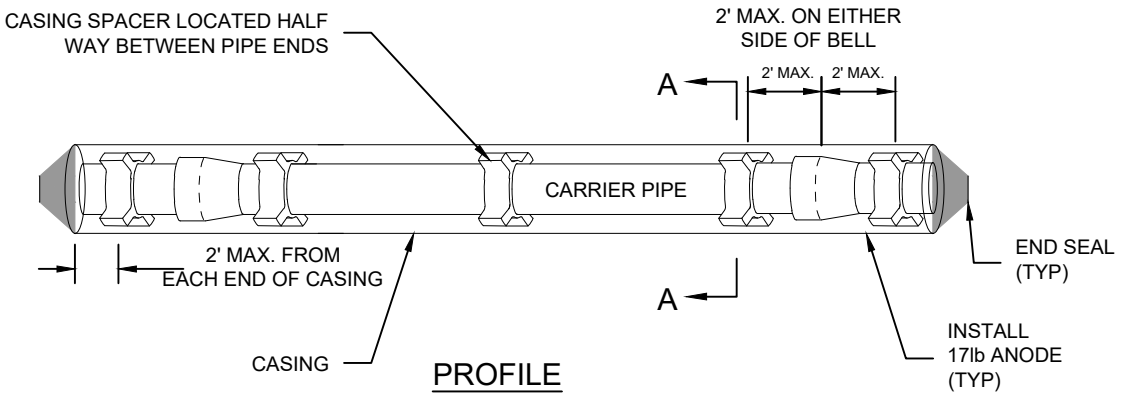
DATED 5/2015



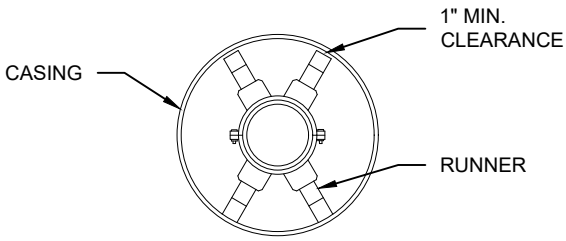
CARRIER PIPE SIZE (INCH)	MIN. CASING PIPE SIZE (INCH)	MIN. CASING WALL THICKNESS (INCH)
8	12	0.250
12	16	0.312
18	22	0.375
20 & 21	24	0.500
24	30	0.500
30	36	0.625
36	42	0.625

NOTES:

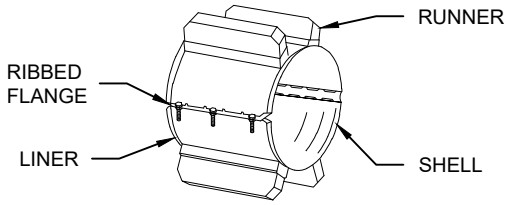
1. THE DESIGN ENGINEER SHALL VERIFY THAT THE SIZE OF THE CASING PIPE WILL MEET THE NEEDS OF THE PROJECT.
2. CASING WALL THICKNESS BASED ON E80 LOADING.
3. CASING SHALL BE STEEL PIPE WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI.
4. SEE DETAIL DRAWING C2-5 FOR CASING SPACER DETAILS.
5. WHERE THE WASTEWATER MAIN CROSSES ABOVE A WATER MAIN, SEE SECTION 2.5.F.3.
6. WHERE THE WASTEWATER MAIN CROSSES UNDER A RAILWAY OR MAJOR ROADWAY, THE LENGTH OF CASING AND ITS PROPERTIES SHALL BE DETERMINED BY THE AUTHORITY HAVING JURISDICTION.



PROFILE



SECTION A-A



SPACER DETAIL

CARRIER PIPE:

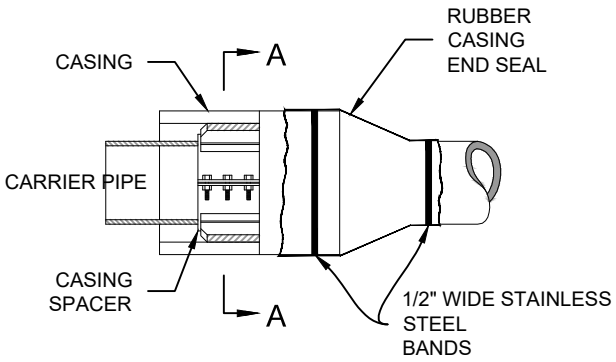
1. CARRIER PIPE SHALL BE CENTERED WITHIN CASING BY USE OF APPROVED CASING SPACERS. (SEE CHAPTER 4)

PLACEMENT OF SPACERS ON CARRIER PIPE:

1. CASING SPACERS SHALL BE PLACED MAX. 2' FROM EACH END OF CASING AND ON EITHER SIDE OF EACH BELL. WHEN CARRIER PIPE IS PVC, CASING SPACER SHALL BE PLACED AT THE HOME MARK TO PREVENT OVER-BELLING. SPACERS SHALL ALSO BE PLACED HALF WAY BETWEEN PIPE ENDS, 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.

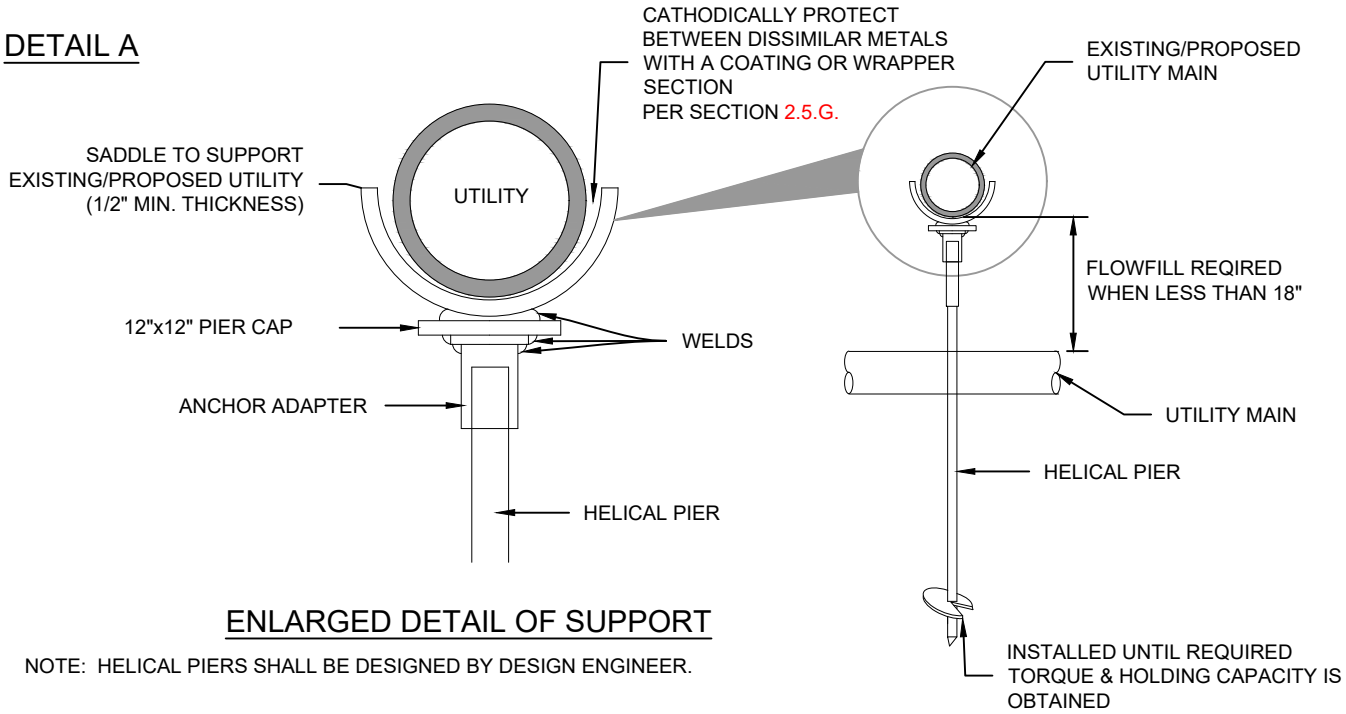


END SEAL DETAIL

CATHODIC PROTECTION:

1. CASING SHALL BE CATHODICALLY PROTECTED USING A 17 LB HIGH POTENTIAL ANODE AND AN APPROVED COATING. SEE SECTION 2.5.G.

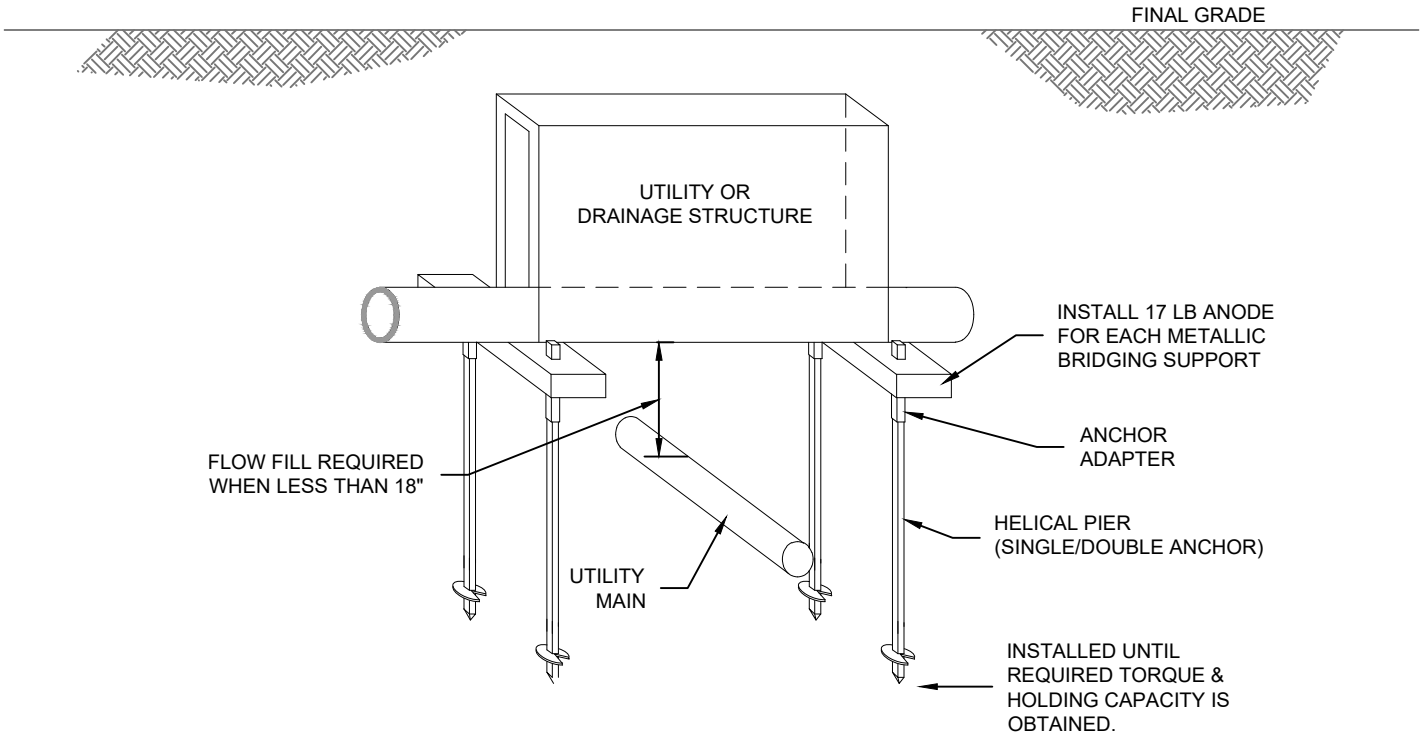
DETAIL A



ENLARGED DETAIL OF SUPPORT

NOTE: HELICAL PIERS SHALL BE DESIGNED BY DESIGN ENGINEER.

DETAIL B



NOTES:

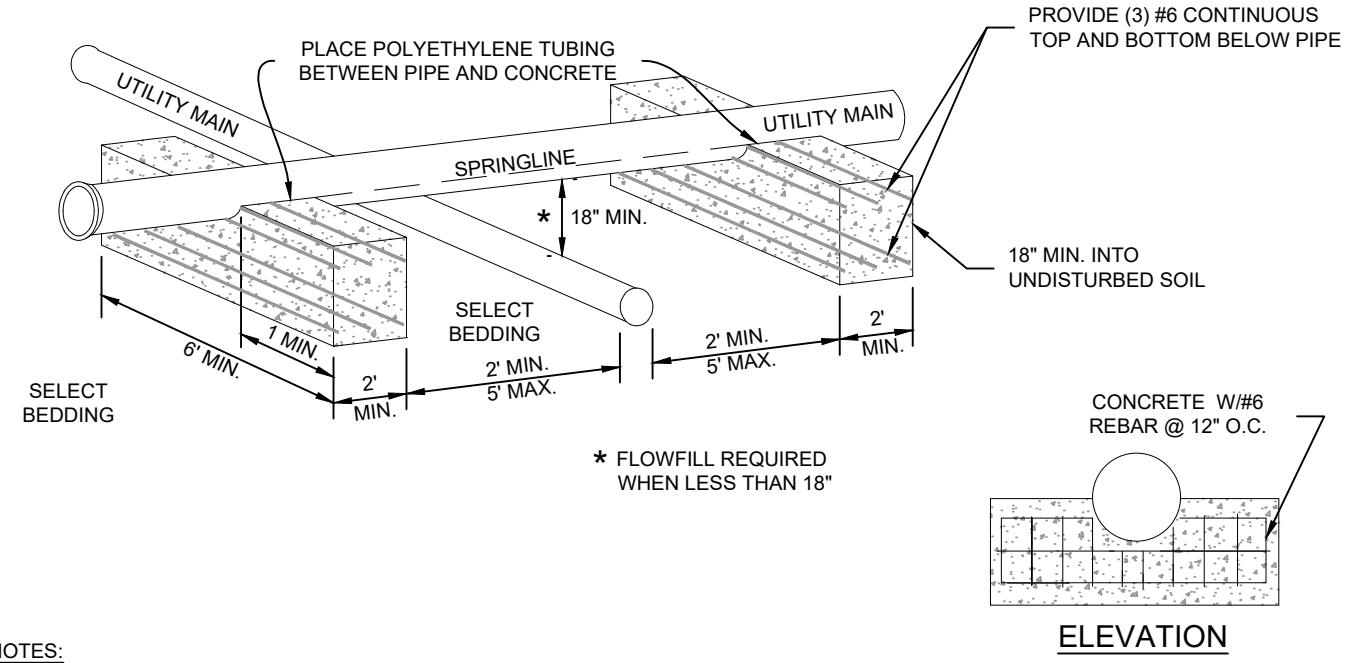
1. ALL METALLIC STRUCTURE AND PIPE SHALL BE CATHODICALLY PROTECTED PER SECTION 2.5.G.

Colorado Springs Utilities
It's how we're all connected

PIPE BRIDGING DETAIL
W/HELICAL PIERS

C2-6

DATED 5/2015



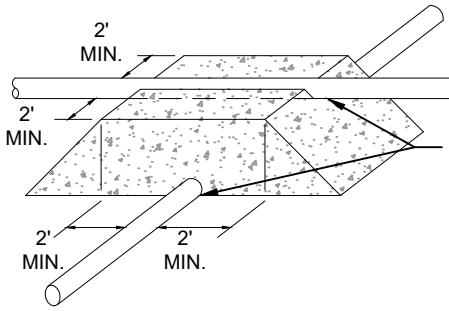
ELEVATION

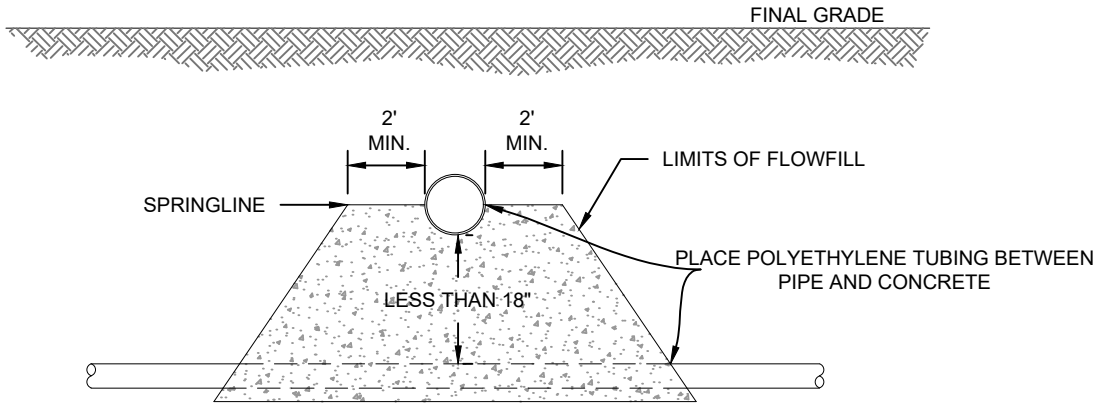
NOTES:

1. NO JOINTS OF UTILITY MAIN SHALL BE ALLOWED BETWEEN CONCRETE BRIDGING BLOCKS.
2. CONCRETE AND REINFORCEMENT MATERIALS SHALL BE IN ACCORDANCE WITH CHAPTER 4.

FLOWFILL DETAIL

(WHEN VERTICAL CLEARANCE IS LESS THAN 18")





NOTES:

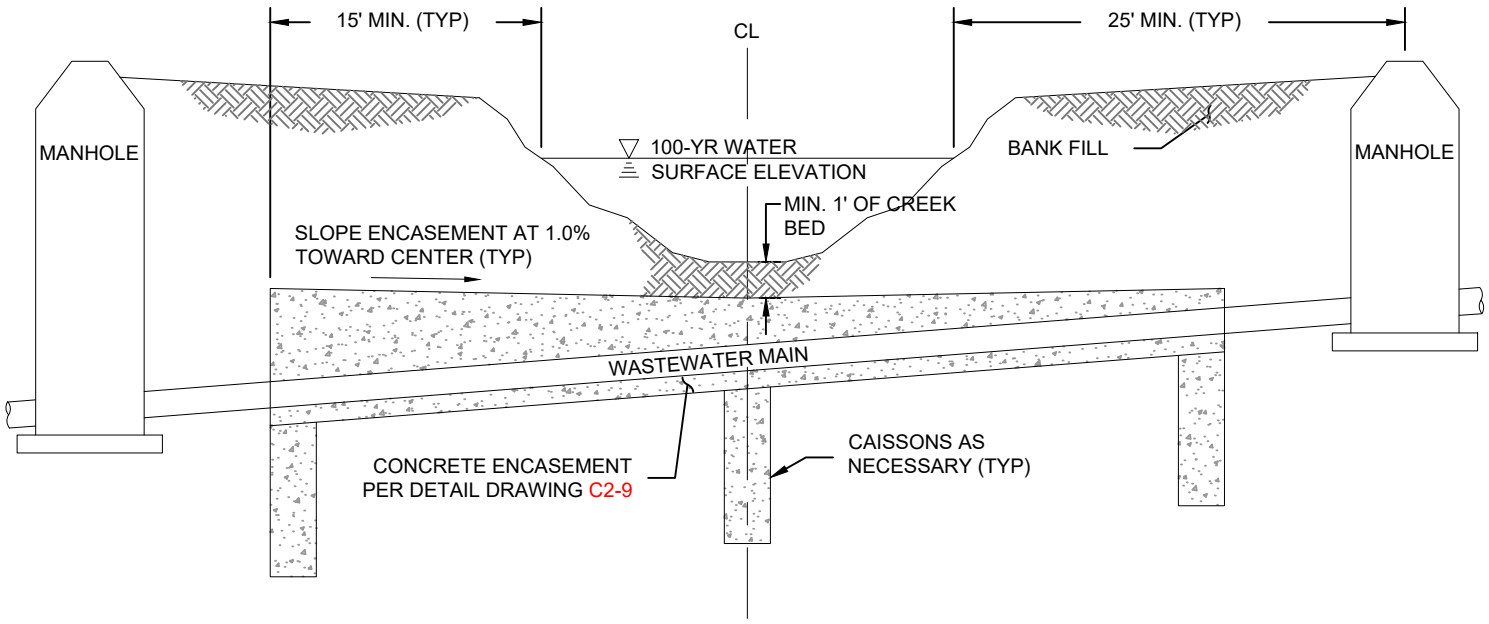
1. ALL FLOWABLE-FILL SHALL BE IN CONFORMANCE WITH CHAPTER 4.
2. SEE SECTION 2.5.F.3 FOR UTILITY CROSSING REQUIREMENTS.

Colorado Springs Utilities
It's how we're all connected

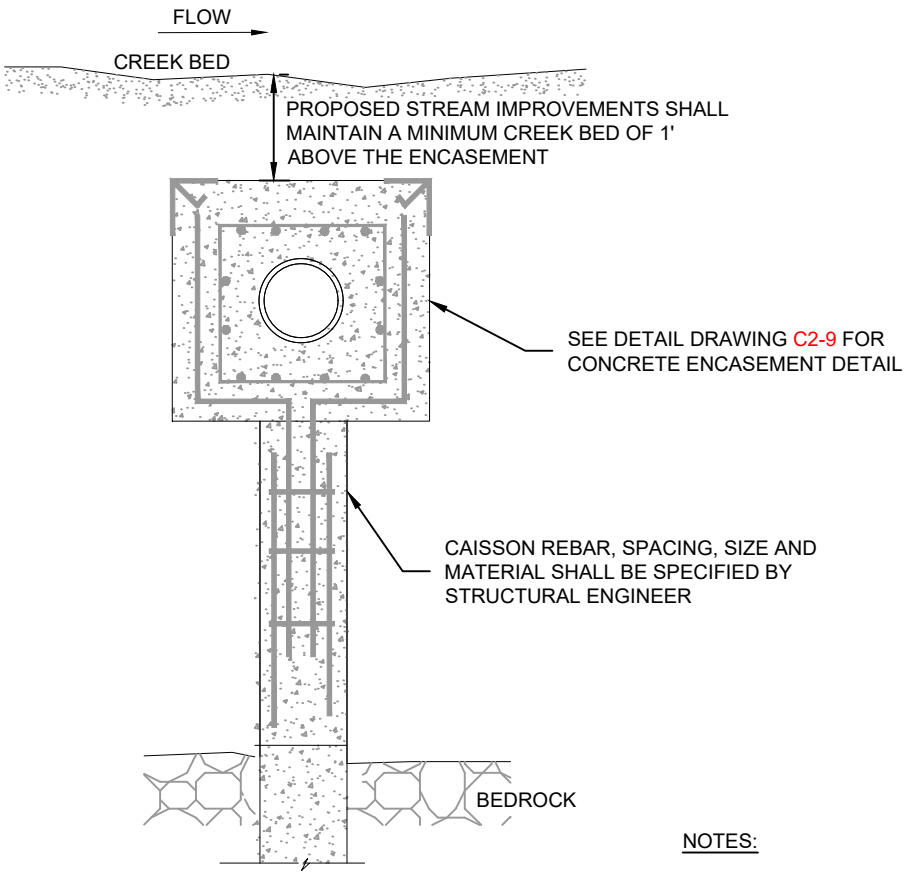
PIPE BRIDGING DETAIL
W/CONCRETE CRADLES

C2-7

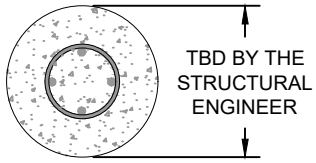
DATED 5/2015



TYPICAL STREAM CROSSING CROSS SECTION



CONCRETE ENCASEMENT DETAIL WITH CAISSON



CAISSON CROSS SECTION

NOTES:

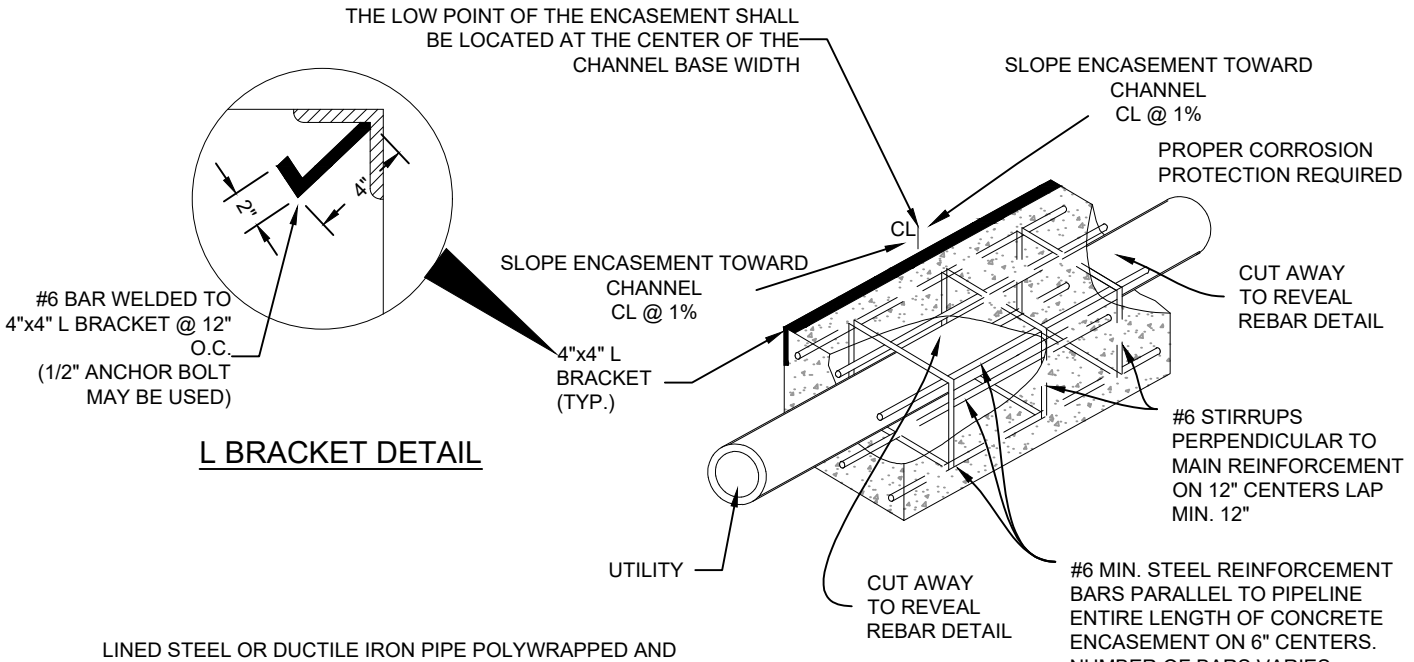
1. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES' REQUIREMENTS.
2. ALL STREAM CROSSINGS SHALL BE REVIEWED AND APPROVED BY THE CITY ENGINEER.

Colorado Springs Utilities
It's how we're all connected

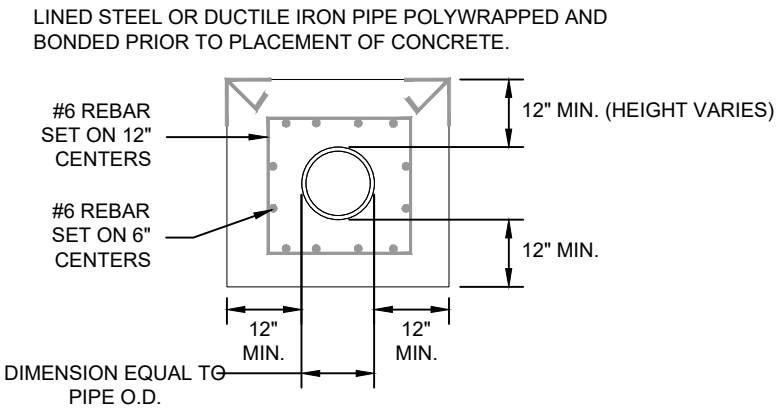
TYPICAL CREEK CROSSING

C2-8

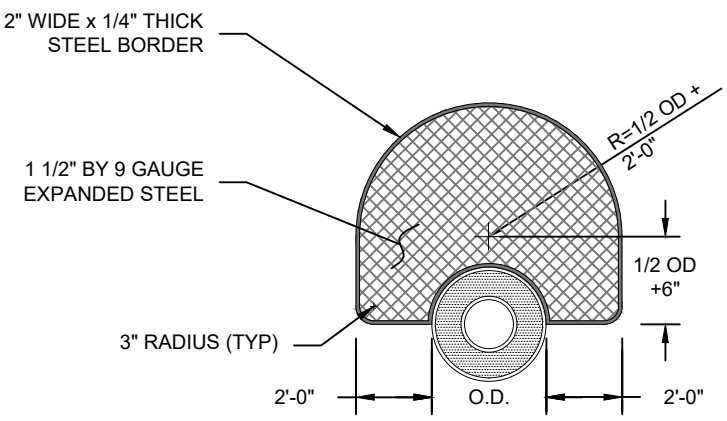
DATED 5/2015



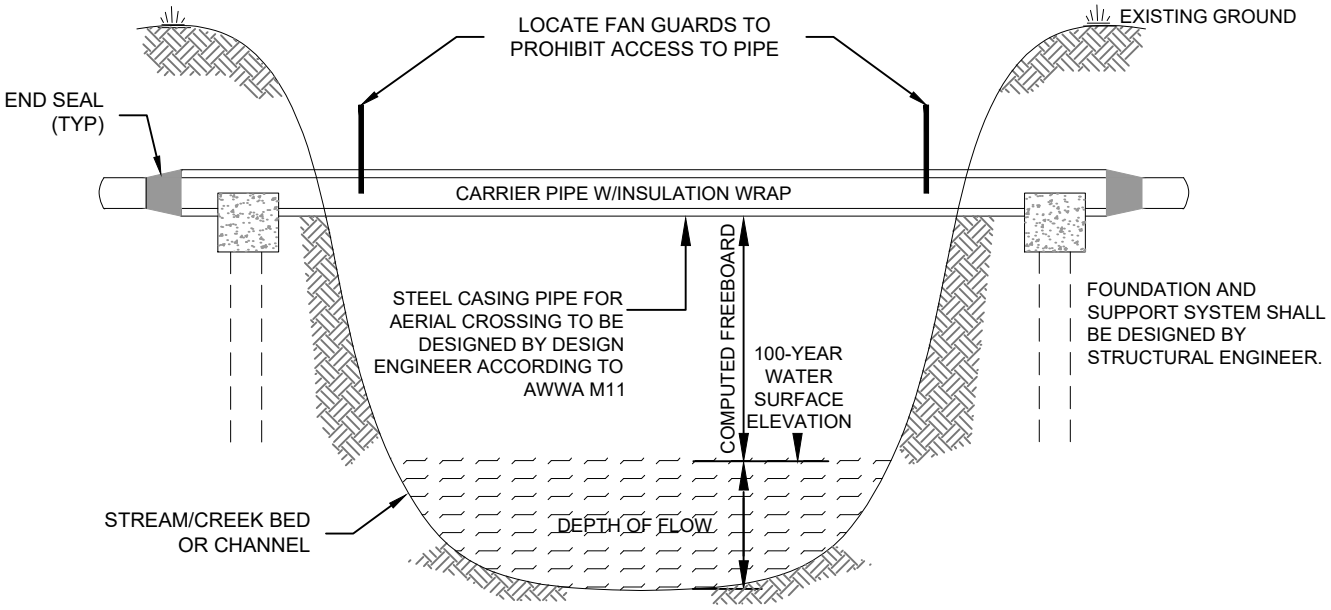
L BRACKET DETAIL



CONCRETE ENCASEMENT DETAIL WITHOUT CAISSON

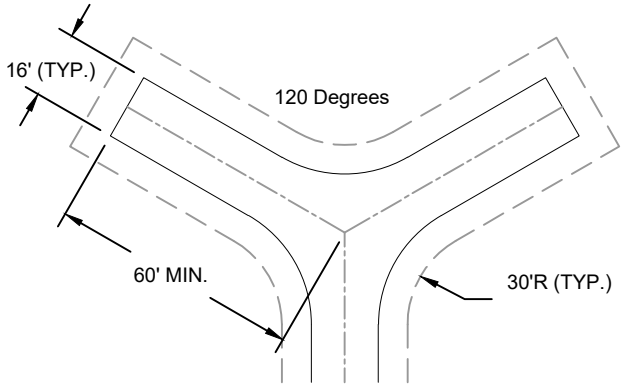


FAN GUARD DETAIL

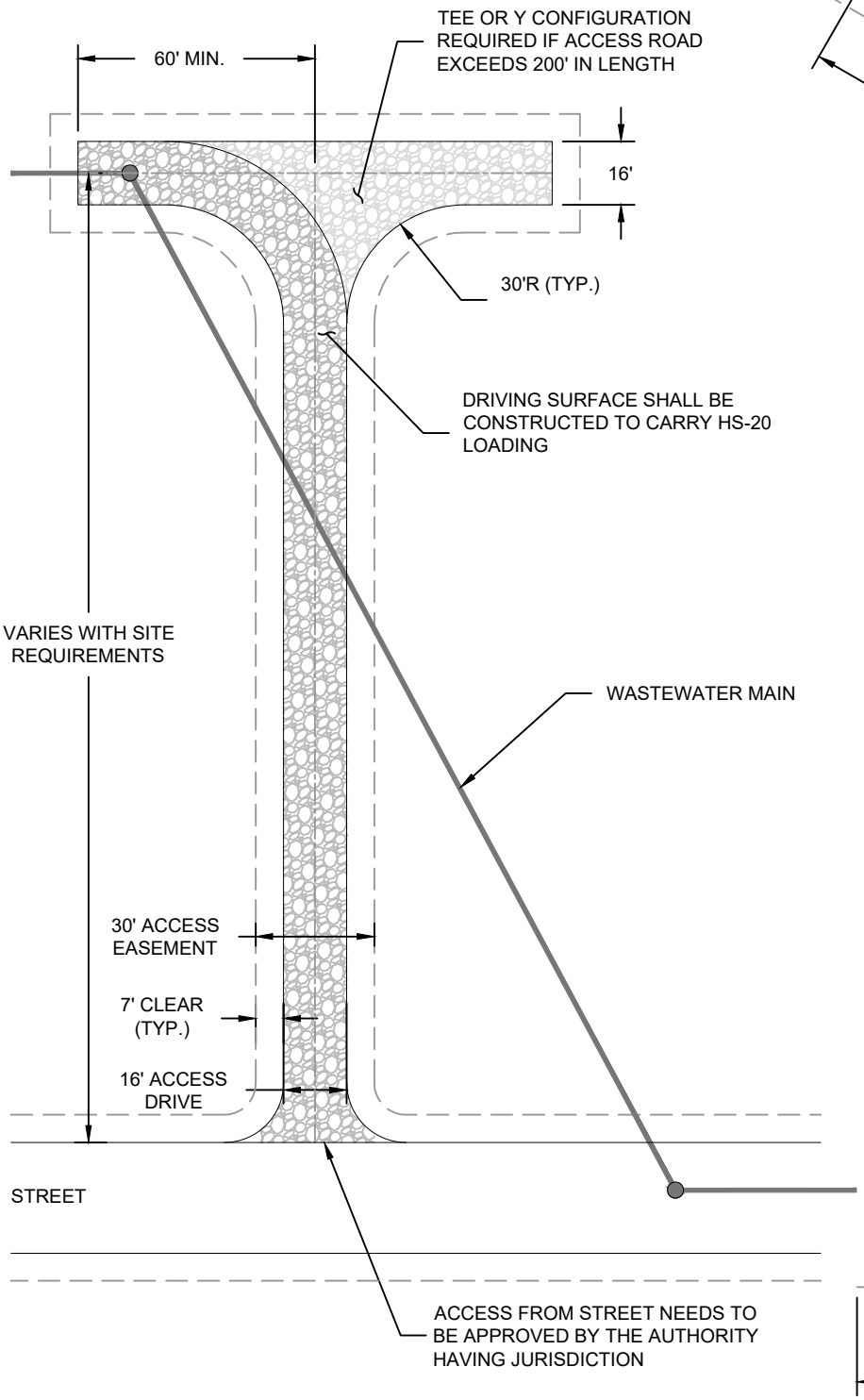


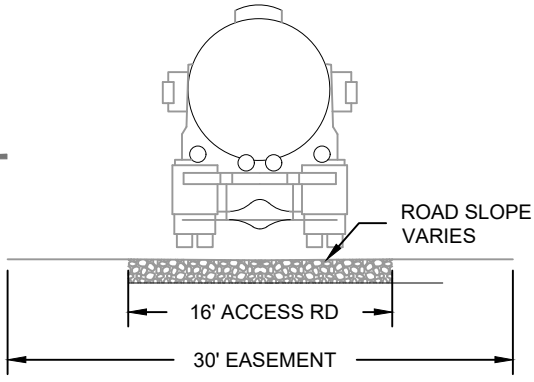
NOTES:

1. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES' REQUIREMENTS.
2. SEE CHAPTER 2 FOR COMPUTATION OF FREEBOARD.
3. ALL PIPES SHALL BE LOCATED ABOVE THE 100-YEAR WATER SURFACE ELEVATION PLUS THE COMPUTED FREEBOARD.
4. AERIAL CROSSINGS ABOVE A DRAINAGE WAY SHALL ALSO BE REVIEWED AND APPROVED BY CITY ENGINEERING.
5. ALL EXPOSED STEEL SHALL BE COATED WITH 25 MILS OF A POLYURETHANE COMPLYING WITH AWWA C-222 AND 3-6 MILS OF AN ALIPHATIC COATING THAT MATCHES THE SURROUNDING ENVIRONMENT.



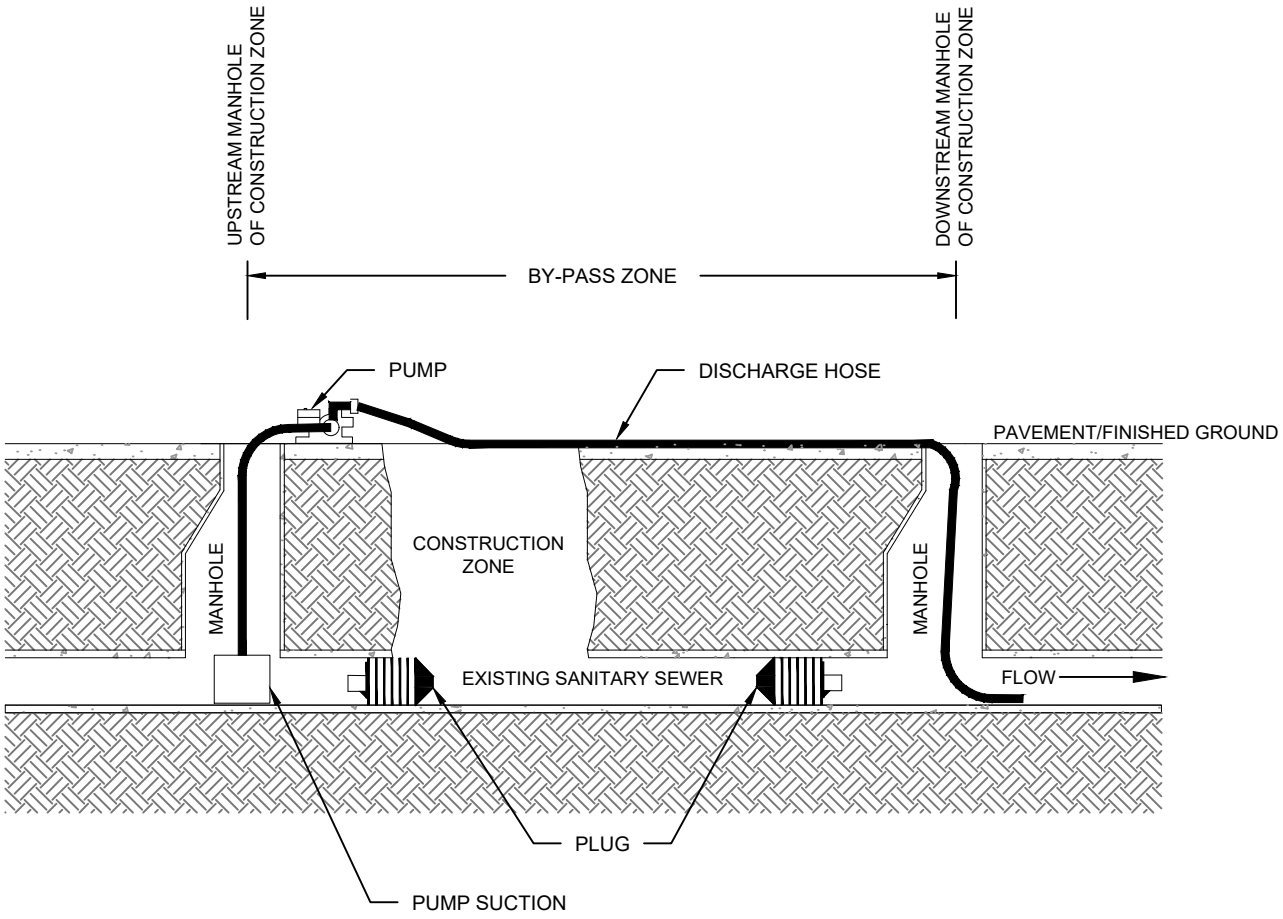
ALTERNATE "Y" CONFIGURATION FOR TURNAROUND





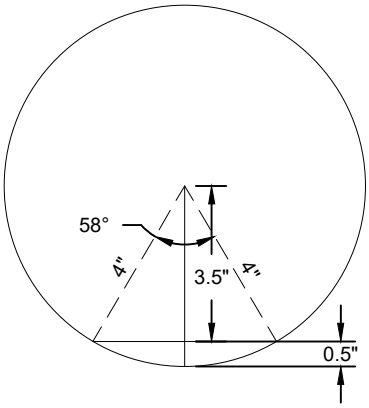
TYPICAL ACCESS ROAD CROSS SECTION

Colorado Springs Utilities It's how we're all connected	TYPICAL ACCESS	C2-11 DATED 5/2015

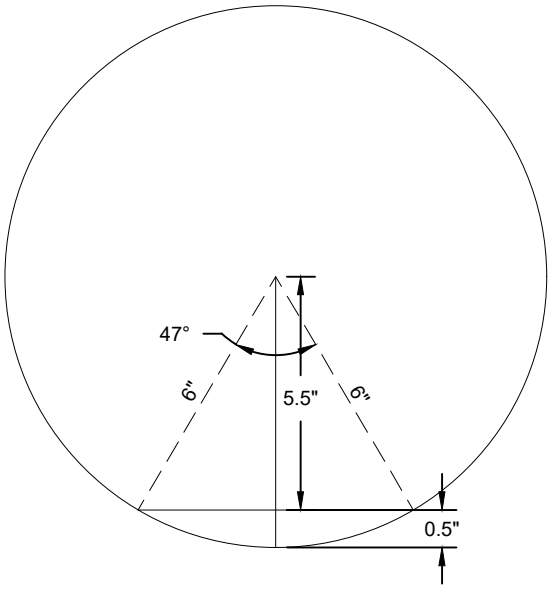


NOTES:

1. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES INSPECTORS' DIRECTIONS.
2. IF A BY-PASS SYSTEM PLAN OR FLOW MANAGEMENT PLAN IS NEEDED, IT SHALL BE REVIEWED AND APPROVED BY COLORADO SPRINGS UTILITIES, PRIOR TO DESIGN APPROVAL. THE CONTRACTOR SHALL HAVE 100% REDUNDANT PUMPING CAPACITY WITH 24 HOUR SUPERVISION DURING ALL PUMPING OPERATIONS.
3. SEE CHAPTER 5 FOR ADDITIONAL INFORMATION ON BYPASS SYSTEM REQUIREMENTS



8" SDR 35 PIPE
MAXIMUM SAG DEPTH



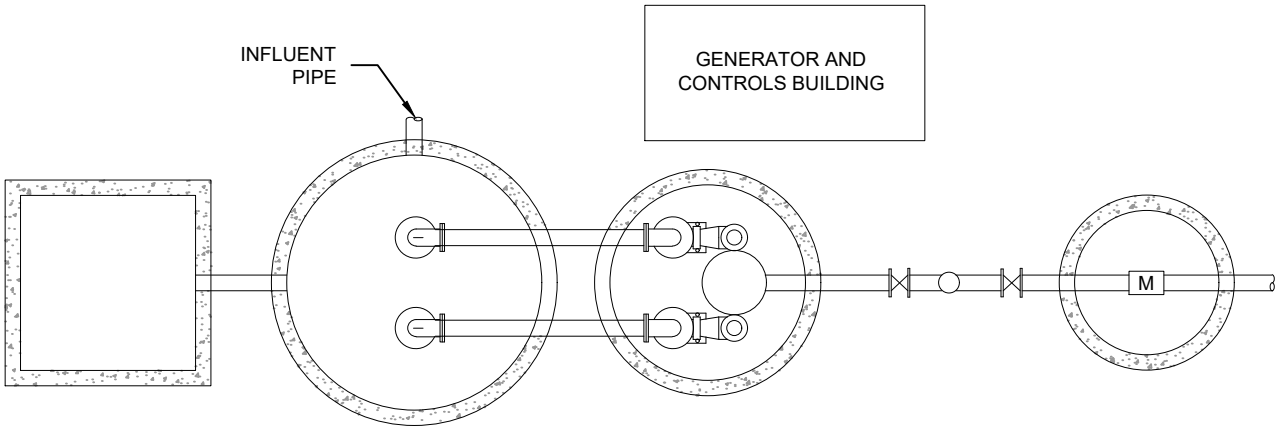
12" SDR 35 PIPE
MAXIMUM SAG DEPTH

Colorado Springs Utilities
It's how we're all connected

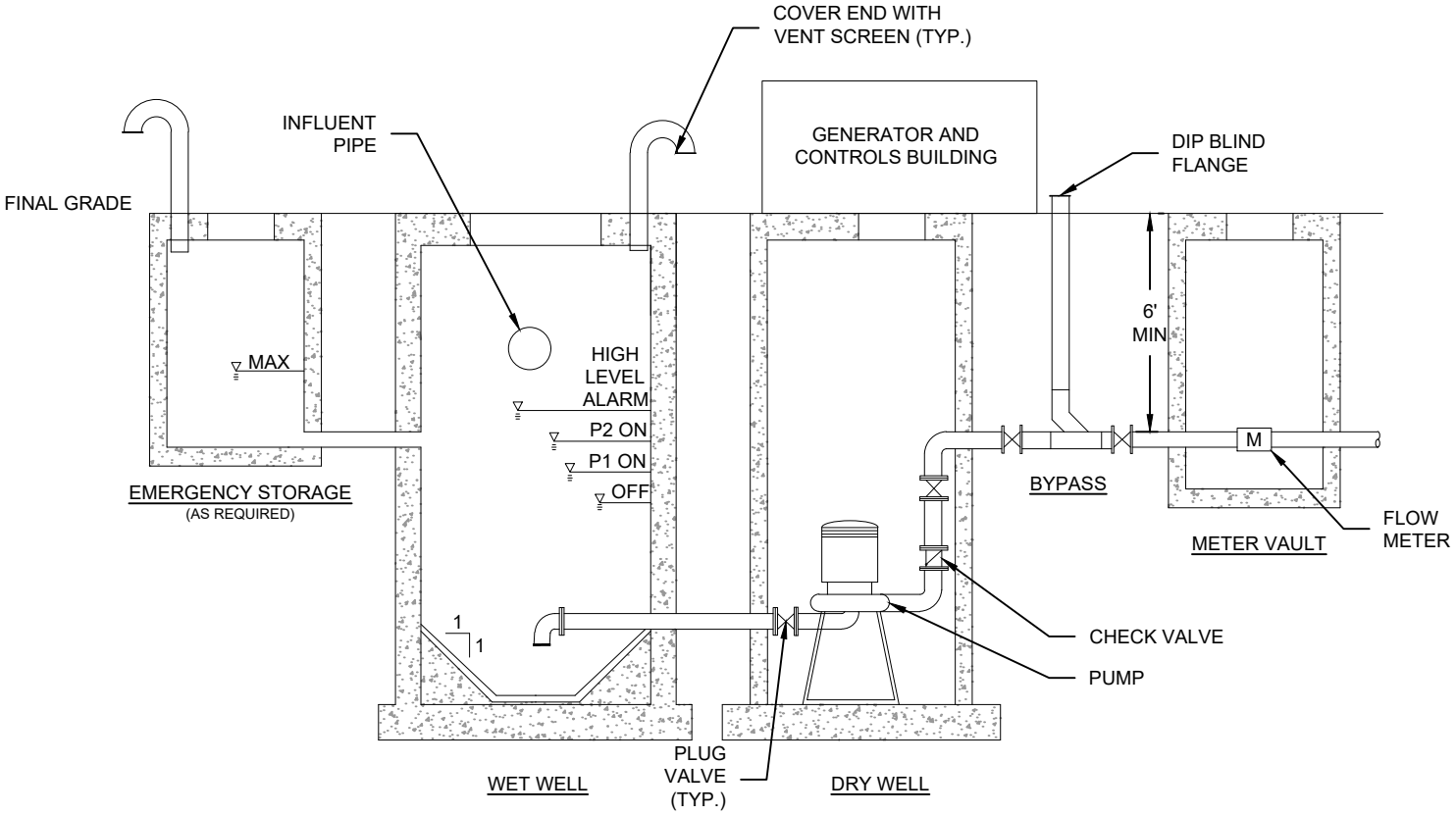
MAXIMUM SAG DEPTH FOR
WASTEWATER MAINS

C2-13

DATED 5/2015



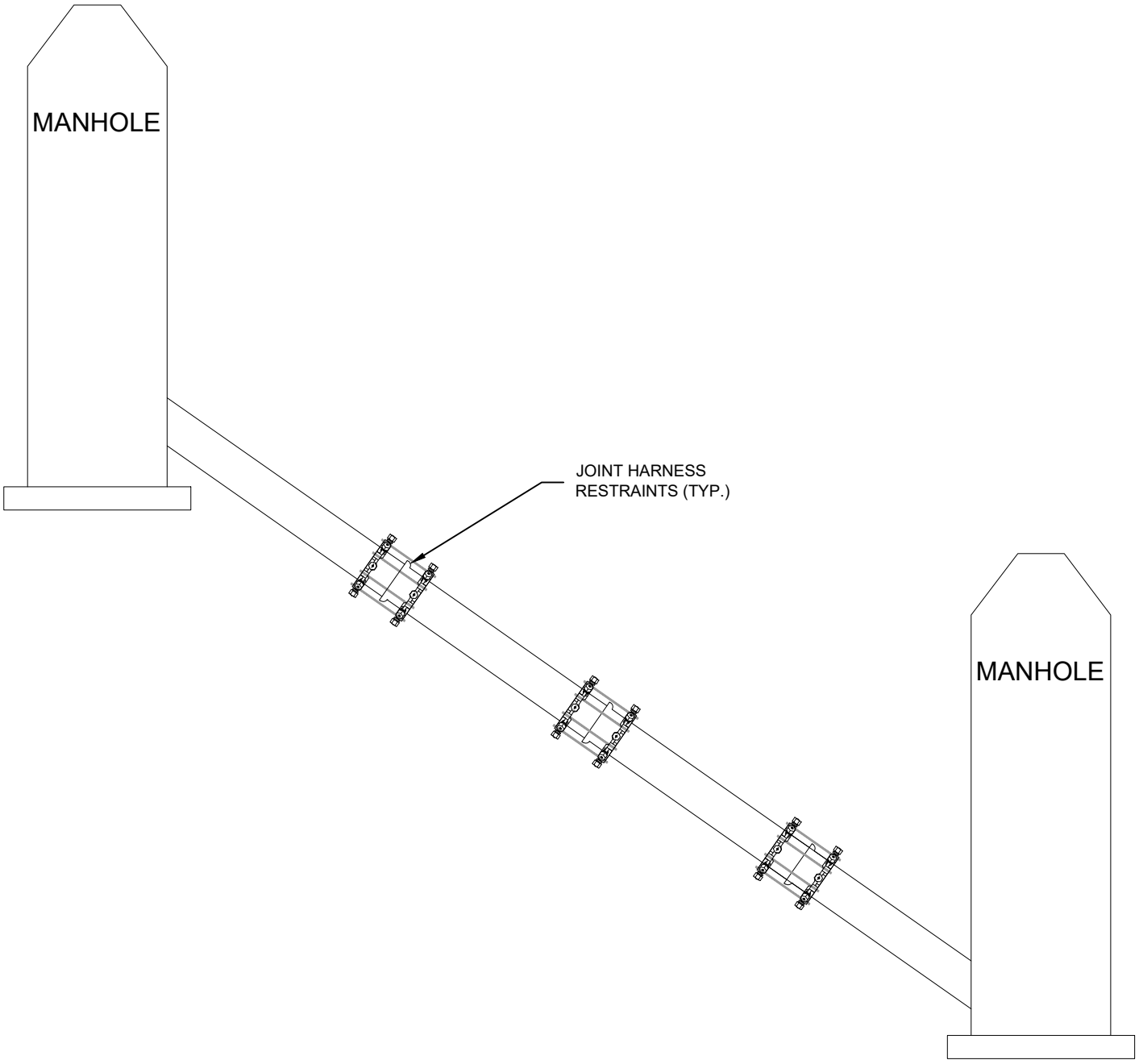
PLAN VIEW



PROFILE VIEW

NOTES:

1. DRAWING IS FOR SCHEMATIC PURPOSES ONLY. SEE CHAPTER 7 FOR ADDITIONAL DETAILS.
2. SUBMERSIBLE PUMPS MAY BE CONSIDERED BY COLORADO SPRINGS UTILITIES ON A CASE BY CASE BASIS FOR PUBLIC LIFT STATIONS THAT RECEIVE LESS THAN 250,000 GALLONS PER DAY.



NOTES:

1. APPROVED METHODS OF RESTRAINED PIPE SHALL BE IN ACCORDANCE WITH CHAPTER 4.
2. RESTRAINED PIPE SHALL BE USED ON STEEP AND/OR UNSTABLE SLOPES OUT OF A PAVED AREA IN ACCORDANCE WITH SECTION 2.5.F.1 OR AS DETERMINED BY COLORADO SPRINGS UTILITIES.

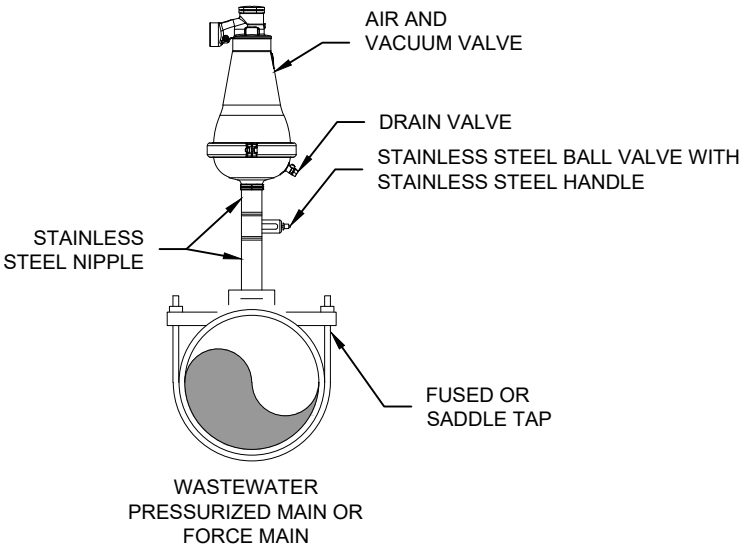
Colorado Springs Utilities
It's how we're all connected

STEEP SLOPE JOINT RESTRAINTS

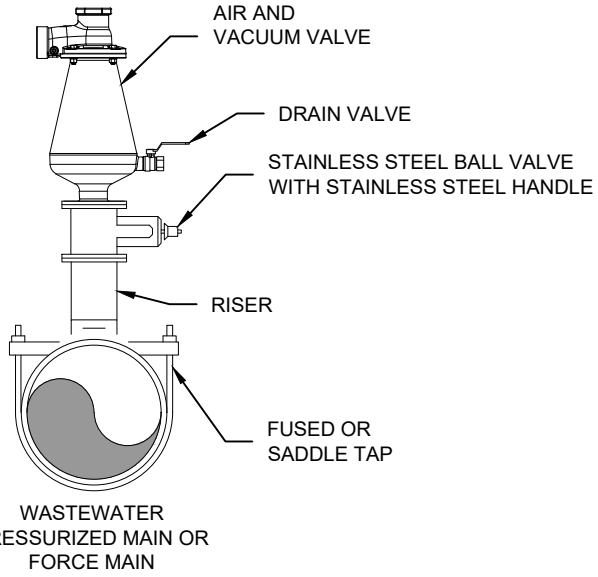
C2-15

DATED 07/2025

THREADED

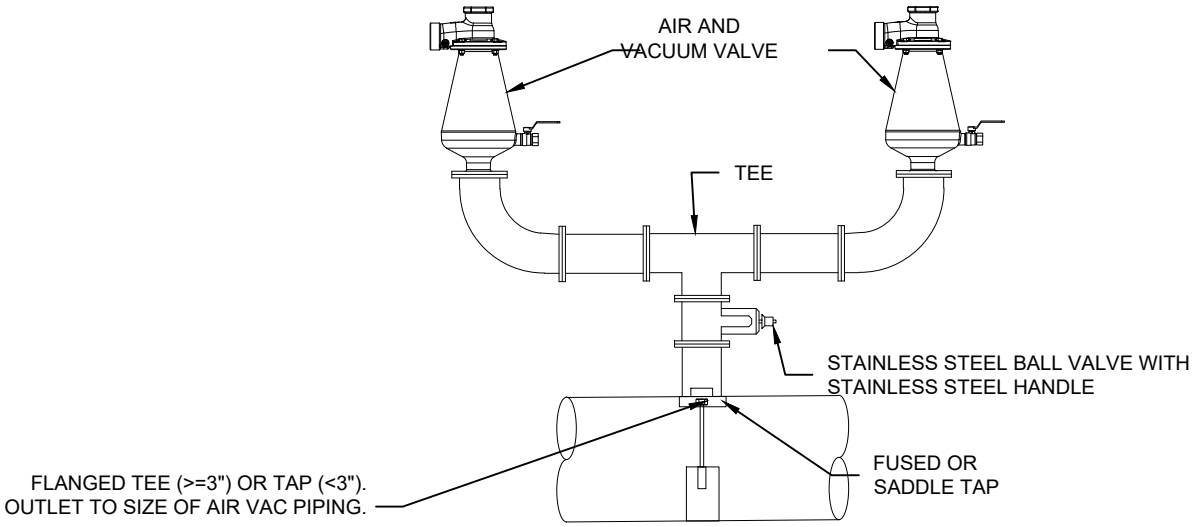


FLANGED



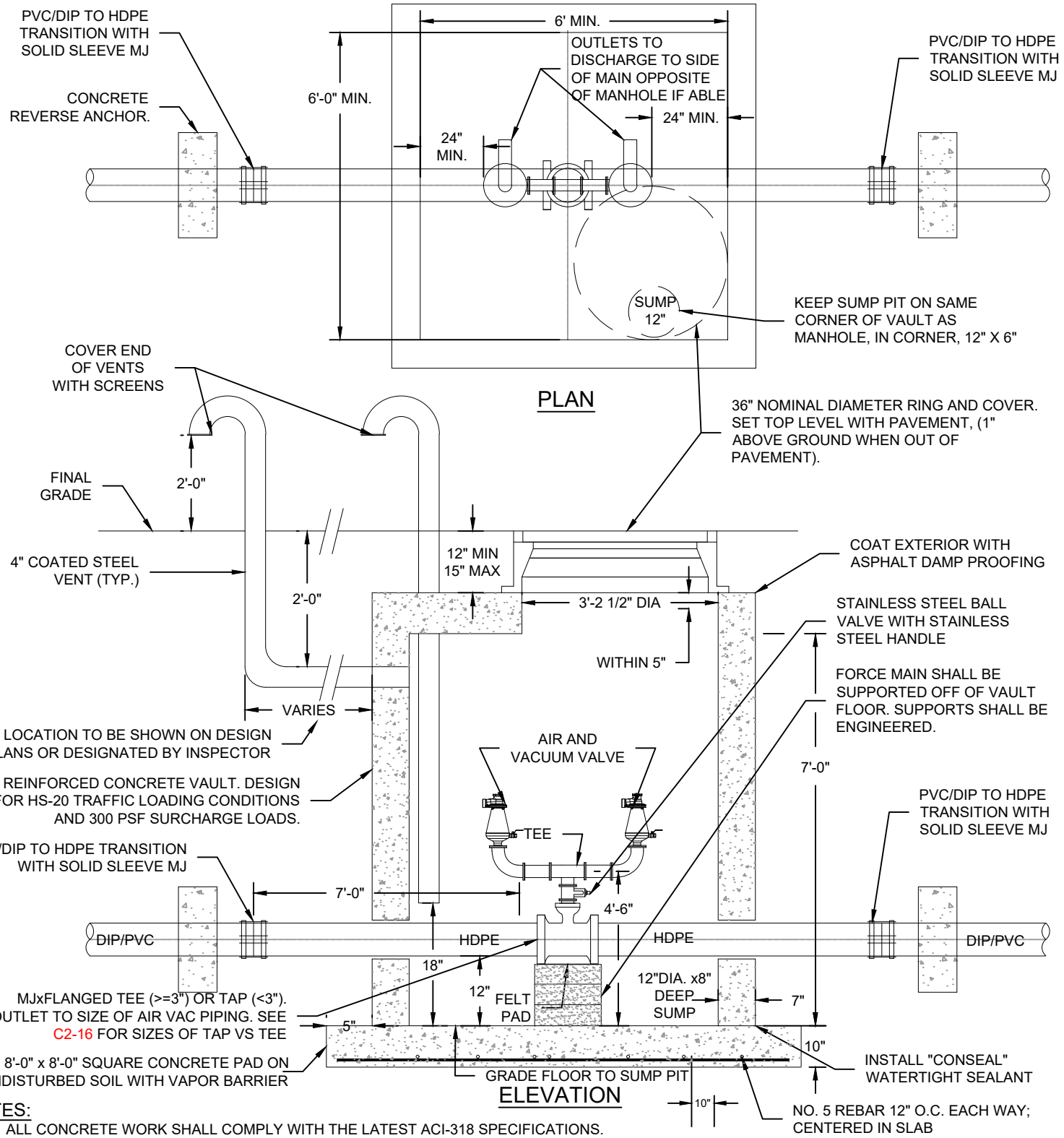
TWO ARVS ON ONE LINE

TWO AIR AND VACUUM VALVES MAY BE REQUIRED.
PIPING AND CONNECTIONS MUST BE THREADED OR
FLANGED (SHOWN).



NOTES:

1. A SINGLE AIR AND VACUUM VALVE SHALL BE LOCATED IN A MANHOLE WITH A MINIMUM DIAMETER OF 4 FEET. IF TWO AIR AND VACUUM VALVES ARE REQUIRED, THE MANHOLE DIAMETER MUST BE A MINIMUM OF 6 FEET.
2. SEE SECTION 4.2.E.3 FOR APPROVED AIR AND VACUUM VALVES.
3. REFER TO AIR AND VACUUM VALVE DESIGN CRITERIA IN SECTION 7.7.Q FOR PUBLIC FORCE MAINS AND 7.12 FOR PRESSURIZED WASTEWATER MAINS.
4. FOR 3" AND LARGER AIR AND VACUUM VALVES, USE A FLANGE CONNECTION.
5. FUSED TAP SHALL BE USED ON HDPE FORCE MAIN, SADDLE TAP SHALL BE USED OTHERWISE



NOTES:

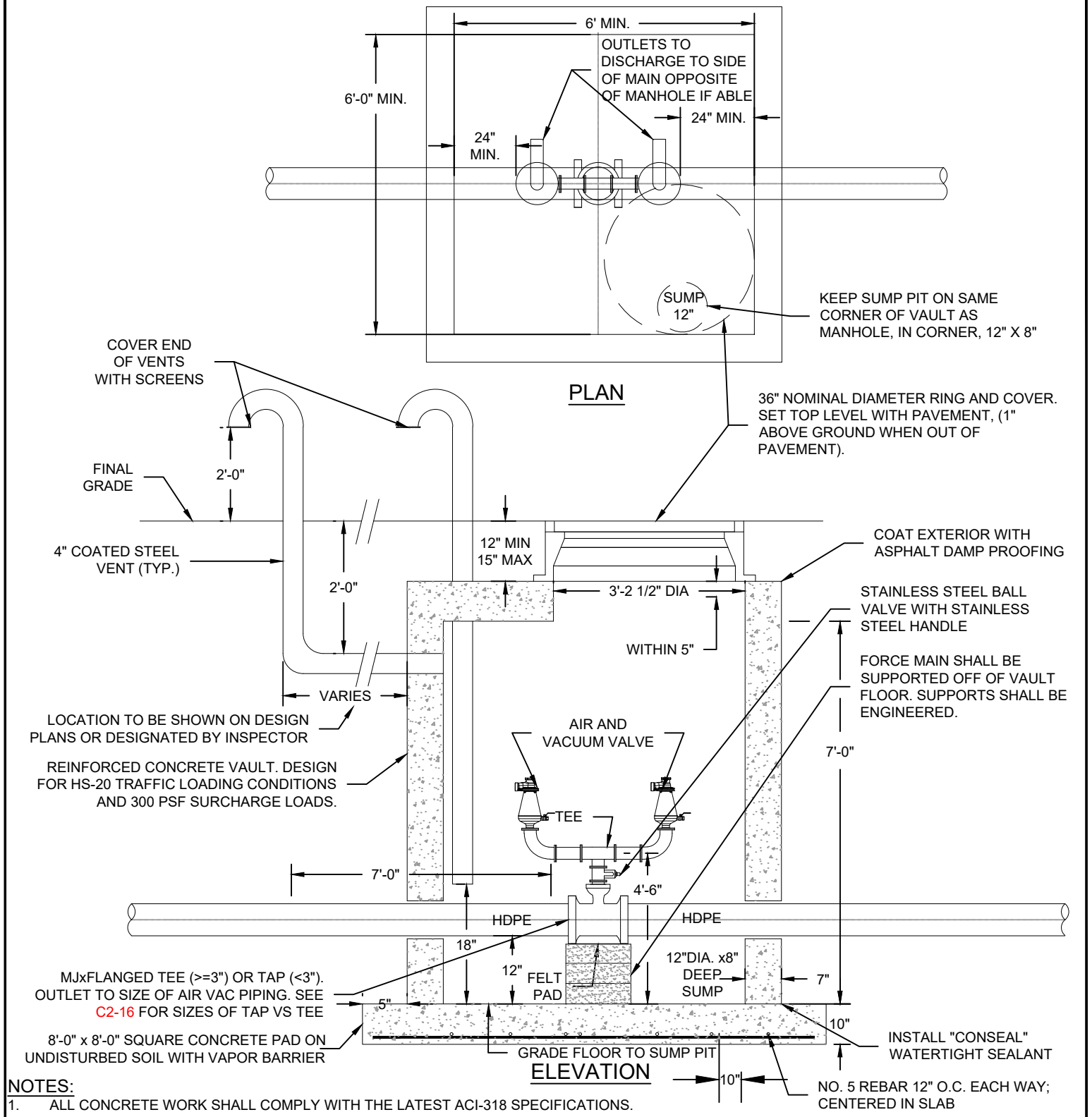
1. ALL CONCRETE WORK SHALL COMPLY WITH THE LATEST ACI-318 SPECIFICATIONS.
2. ALL LADDER RUNGS MUST LINE UP BOTH HORIZONTALLY AND VERTICALLY.
3. CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD WITH A CAST IN PLACE FOUNDATION AS SHOWN.
4. AIR VAC ASSEMBLIES SHALL BE AVOIDED WHERE POSSIBLE. REALIGNMENT OF FORCE MAIN MAY BE REQUIRED.
5. AIR VAC ASSEMBLY BRANCH PIPING SHALL BE CONSTRUCTED PER DETAIL C2-16.
6. FORCE MAIN THROUGH VAULT SHALL BE HDPE WITH PROPER TRANSITIONS TO PVC/DIP MADE OUTSIDE OF VAULT.
7. AIR VACS FOR FORCE MAINS >12" SHALL BE ENGINEERED
8. CRAS SHALL BE REQUIRED ON FORCE MAIN OUTSIDE OF VAULT

Colorado Springs Utilities
It's how we're all connected

AIR AND VACUUM VALVE VAULT DIP/PVC

C2-17

DATED 07/2025



NOTES:

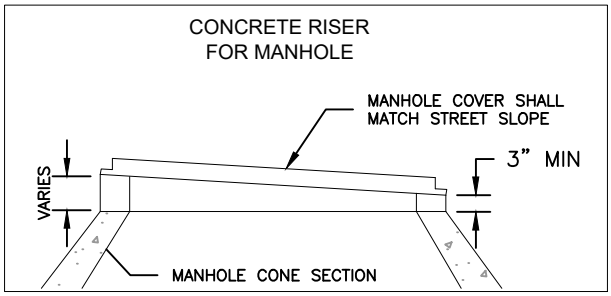
1. ALL CONCRETE WORK SHALL COMPLY WITH THE LATEST ACI-318 SPECIFICATIONS.
2. ALL LADDER RUNGS MUST LINE UP BOTH HORIZONTALLY AND VERTICALLY.
3. CONCRETE VAULTS SHALL BE DESIGNED FOR HS-20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD WITH A CAST IN PLACE FOUNDATION AS SHOWN.
4. AIR VAC ASSEMBLIES SHALL BE AVOIDED WHERE POSSIBLE. REALIGNMENT OF FORCE MAIN MAY BE REQUIRED.
5. AIR VAC ASSEMBLY BRANCH PIPING SHALL BE CONSTRUCTED PER DETAIL C2-16.
6. FORCE MAIN THROUGH VAULT SHALL BE HDPE WITH PROPER TRANSITIONS TO PVC/DIP MADE OUTSIDE OF VAULT.
7. AIR VACS FOR FORCE MAINS >12" SHALL BE ENGINEERED

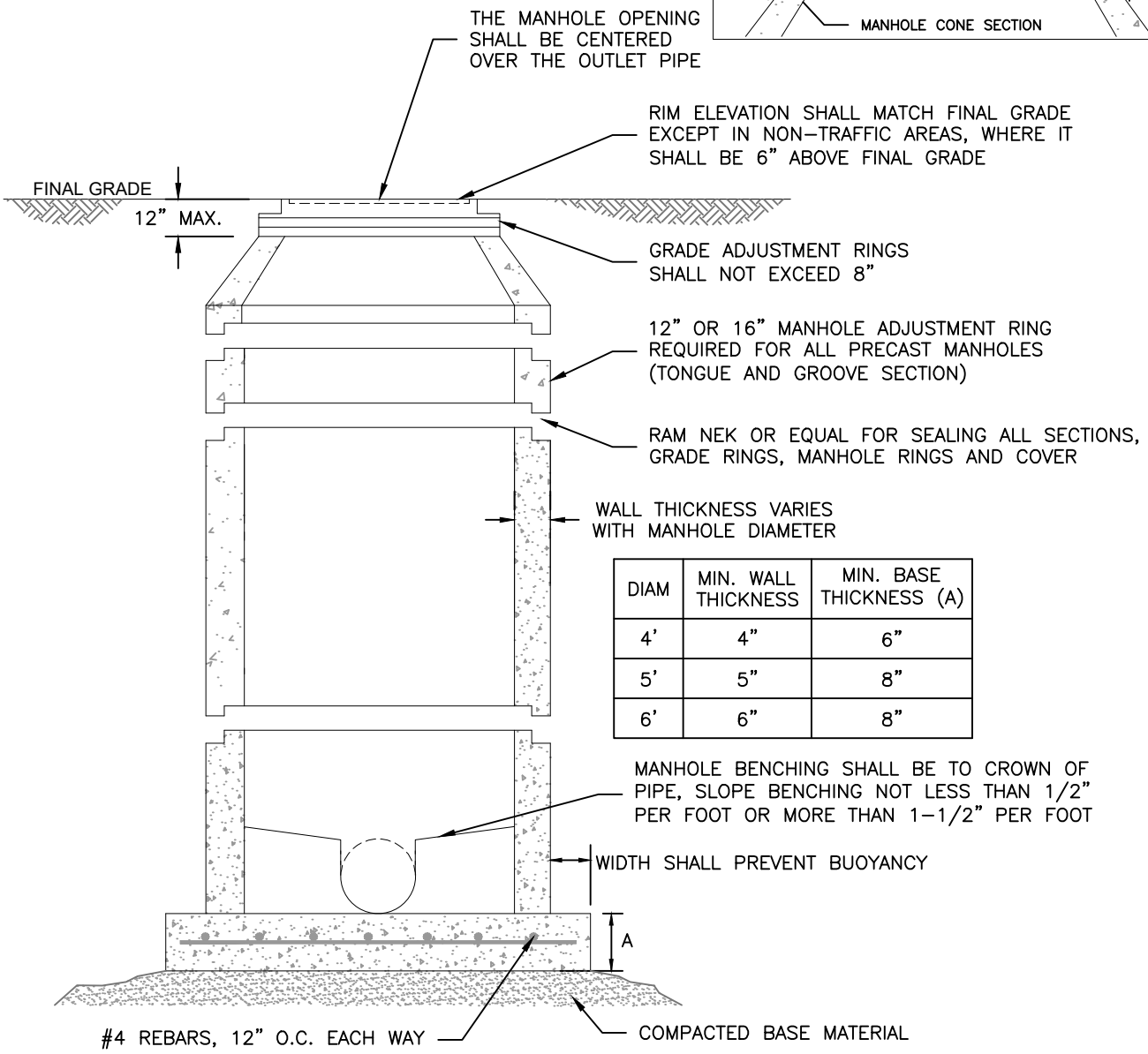
Colorado Springs Utilities
It's how we're all connected

AIR AND VACUUM VALVE VAULT HDPE

C2-18

DATED 07/2025





DIAM	MIN. WALL THICKNESS	MIN. BASE THICKNESS (A)
4'	4"	6"
5'	5"	8"
6'	6"	8"

NOTES:

1. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF NOT LESS THAN 4000 PSI @ 28 DAYS AND DESIGNED FOR HS-20 LOADING CONDITIONS.
2. ALL CONCRETE SHALL BE MECHANICALLY VIBRATED.
3. FOR CAST IN PLACE MANHOLES, DO NOT DROP CONCRETE A DISTANCE OF MORE THAN 5' UNLESS APPROVED BY COLORADO SPRINGS UTILITIES.
4. 3/4" CRUSHED ROCK REQUIRED UNDER BASE TO A DEPTH OF 6" UP TO SPRINGLINE OF PIPE, 2'-3' RADIUS AROUND BASE.
5. ALL STEPS SHALL BE REMOVED FOLLOWING CONSTRUCTION.
6. STRUCTURAL REINFORCEMENT SHALL COMPLY TO ASTM C-478. ASTM C-478 SHALL BE STAMPED ON THE OUTSIDE OF THE MANHOLE.

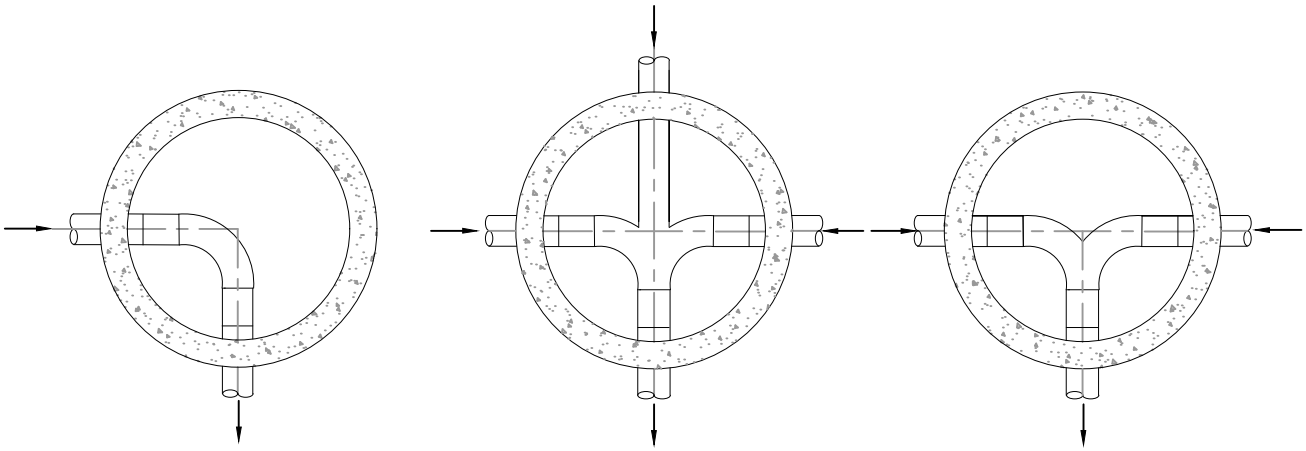
Colorado Springs Utilities
It's how we're all connected

STANDARD CONCRETE MANHOLE

C3-1

DATED 5/2015

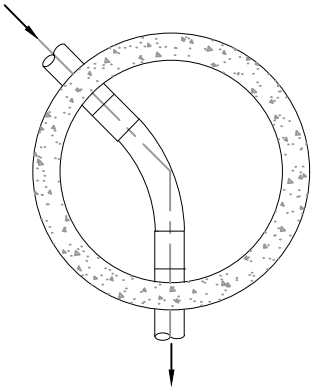
TYPICAL INTERSECTING PIPE MANHOLE LAYOUTS



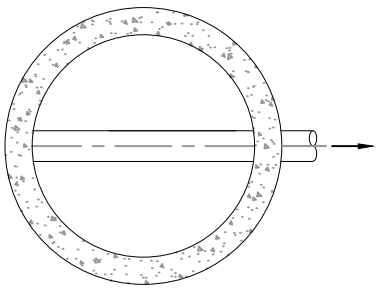
90 ° MANHOLE

CROSS MANHOLE

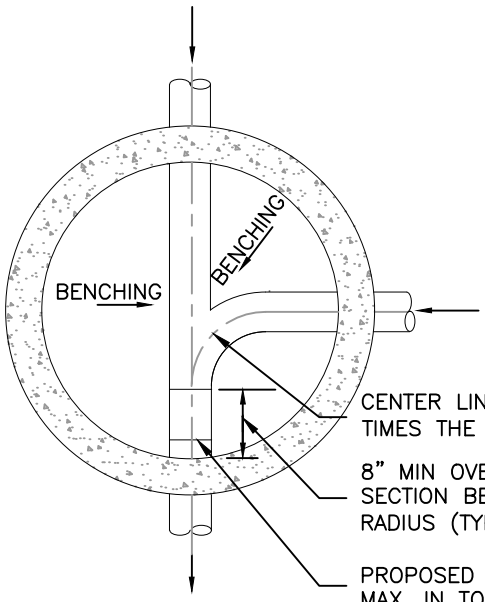
Y TYPE MANHOLE



0°-90° MANHOLE



DEAD END MANHOLE



CENTER LINE RADIUS SHALL BE 1.5 TIMES THE PIPE DIAMETER (TYP.)

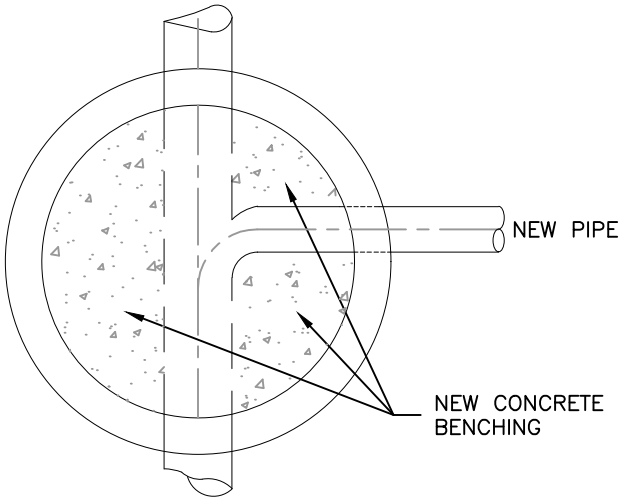
8" MIN OVERALL INTERNAL STRAIGHT SECTION BEFORE INTERSECTING PIPE RADIUS (TYP.)

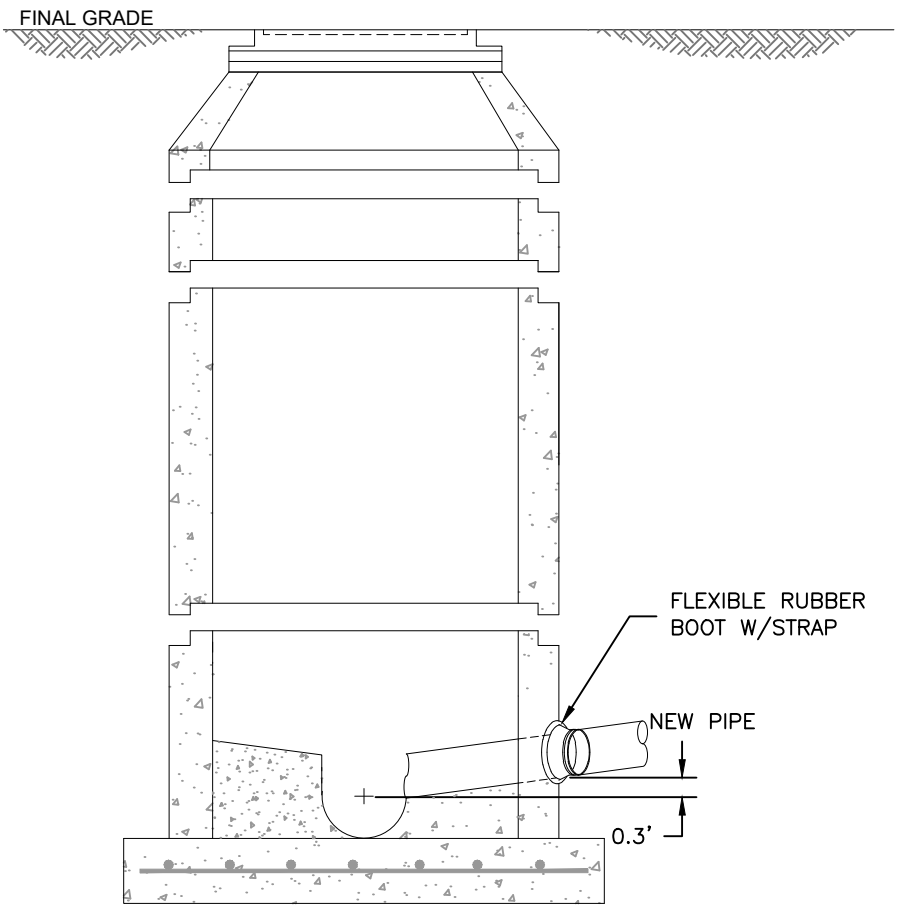
PROPOSED PIPE SHALL PENETRATE 2" MAX. IN TO MANHOLE

TEE MANHOLE

NOTES:

1. SEE DETAIL DRAWING C3–1 FOR MANHOLE REQUIREMENTS.
2. LAYOUTS SHOWN ARE FOR 8"–12" PIPES; LAYOUTS FOR LARGER DIAMETER PIPELINES AND MANHOLES SHALL BE DESIGNED BY THE DESIGN ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
3. TO BE READ IN CONJUNCTION WITH CHAPTER 2, MANHOLE SIZES.





NOTES:

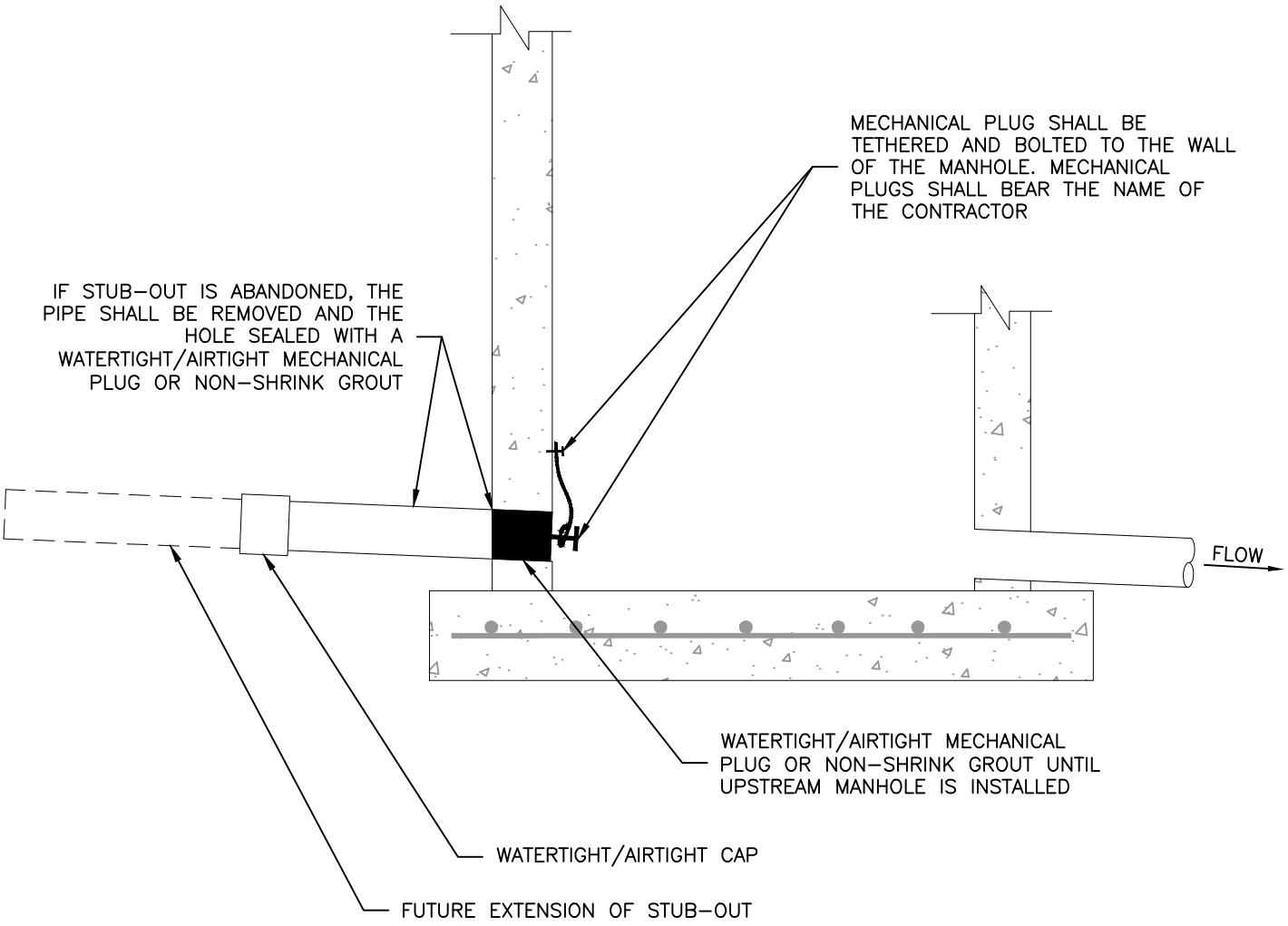
1. SEE DETAIL DRAWING C3–1 FOR MANHOLE REQUIREMENTS.

Colorado Springs Utilities
It's how we're all connected

CORE DRILLING INTO AN EXISTING MANHOLE

C3–3

DATED 7/2020

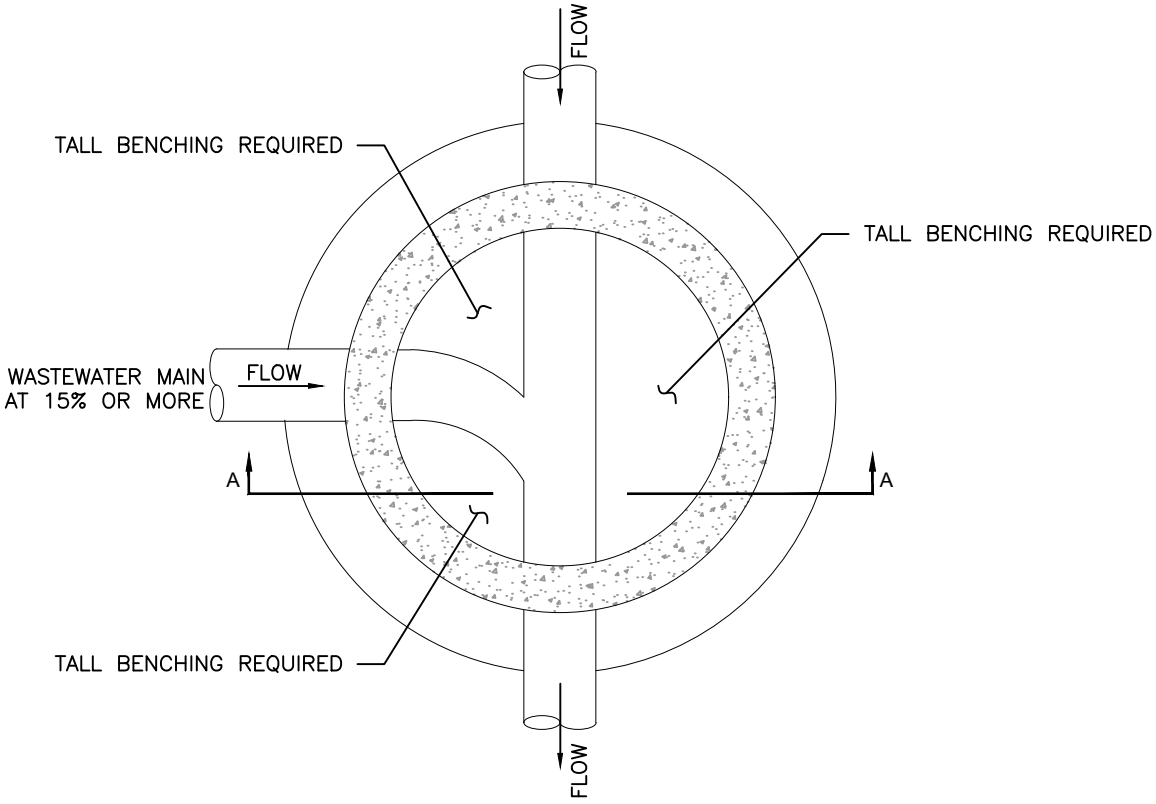


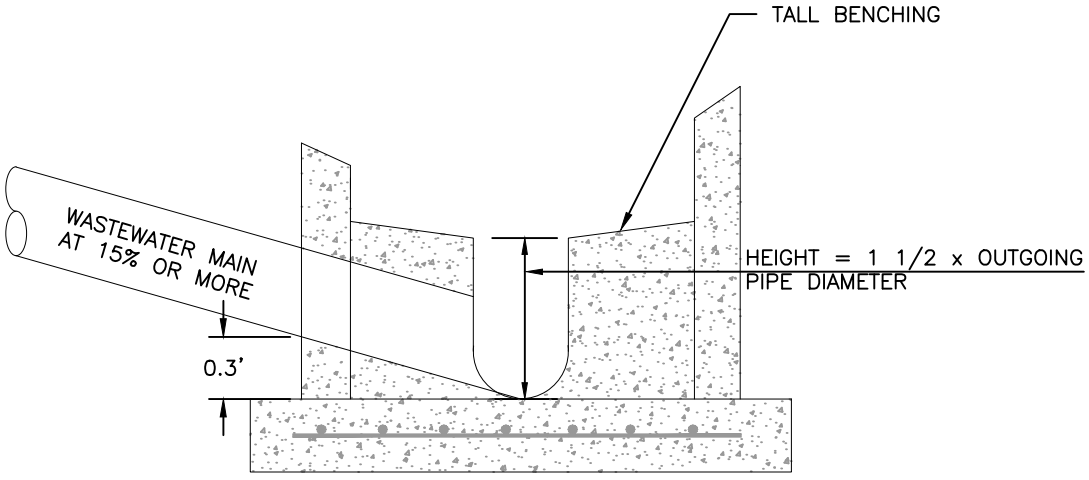
Colorado Springs Utilities
It's how we're all connected

WASTEWATER MAIN
STUB–OUT FROM MANHOLE

C3–4

DATED 5/2015





SECTION A-A

NOTES:

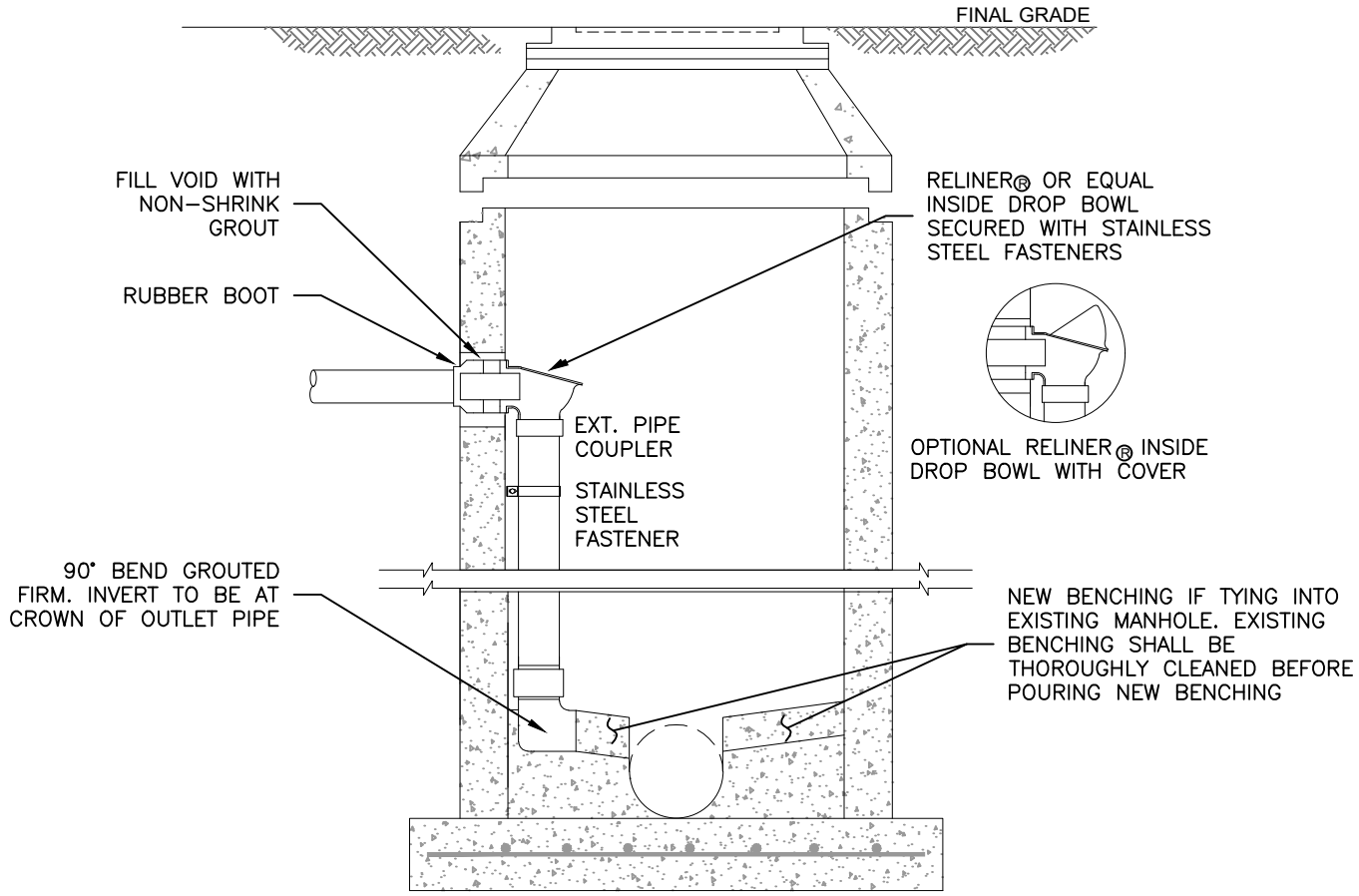
1. SEE DETAIL DRAWING C3–1 FOR MANHOLE REQUIREMENTS.
2. STRAIGHT THROUGH MANHOLES THAT HAVE A PIPE COMING IN AT 15% OR MORE REQUIRE TALL BENCHING ON BOTH SIDES.

Colorado Springs Utilities
It's how we're all connected

HIGH VELOCITY PROTECTION FOR INCOMING SLOPES; 15% OR GREATER

C3–5

DATED 5/2015



NOTES:

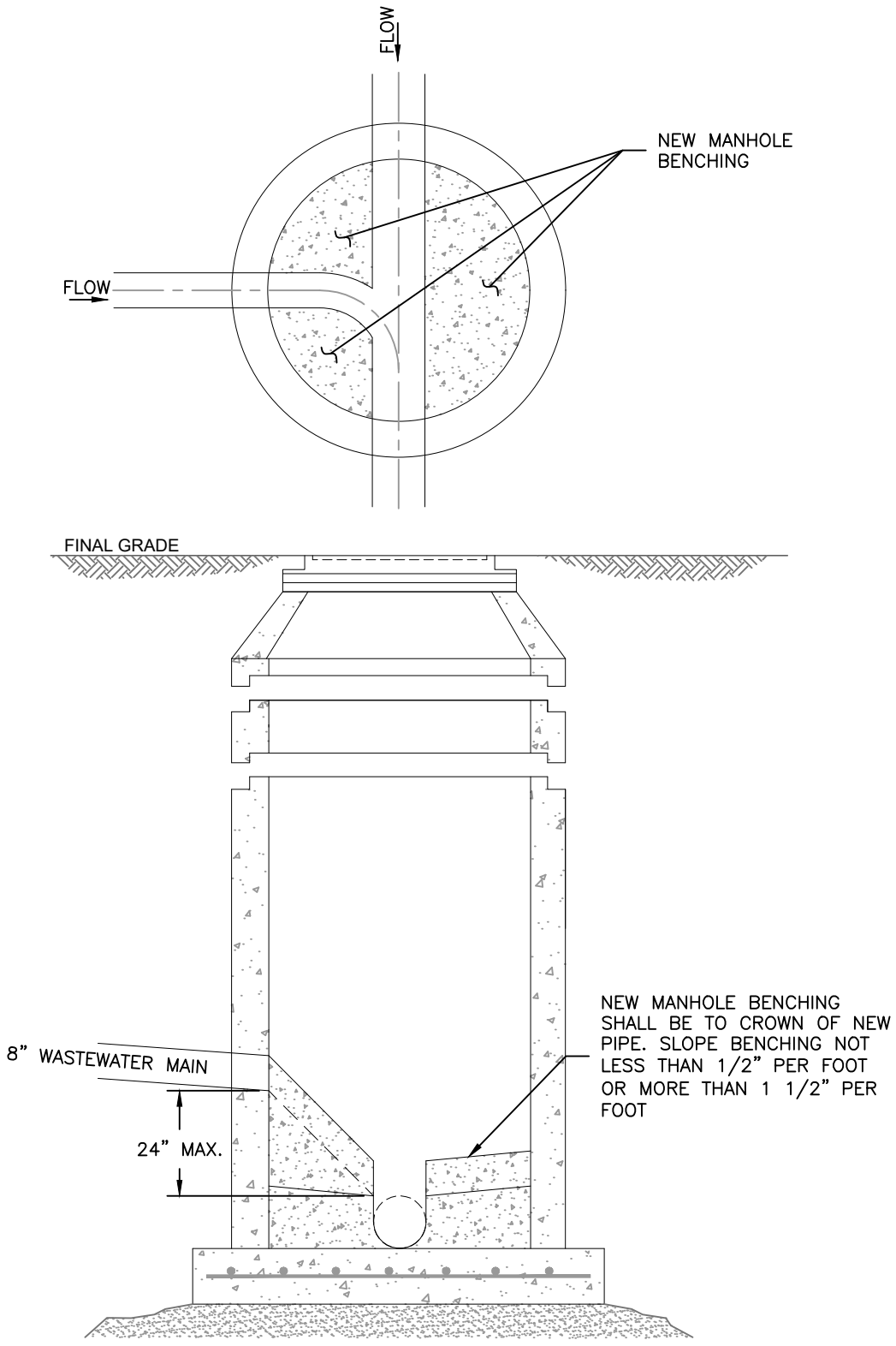
1. SEE DETAIL DRAWING C3-1 FOR MANHOLE REQUIREMENTS.
2. DROP MANHOLES ARE NOT ALLOWED ON 10" AND LARGER PIPELINES. DROP MANHOLES SHALL BE REVIEWED AND APPROVED ON A CASE BY CASE BASIS BY WASTEWATER PLANNING AND ENGINEERING STAFF.
3. ALL INTERIOR CONCRETE SURFACES SHALL BE EPOXY COATED. CONCRETE SHALL BE FULLY CURED PRIOR TO COATING (TYPICAL 30 DAYS).
4. MINIMUM SIZE FOR A DROP MANHOLE IS 5' DIAMETER MANHOLE.
5. MANHOLES WITH 8' OR LESS OF INTERNAL DROP SHALL HAVE ONE STRAP AT THE TOP AND ONE AT THE BOTTOM OF THE DROP SECTION.
6. 1/4" – 2" STRAPS TO BE ANCHORED WITH 1/2" GALVANIZED LUG BOLTS IN TO WALL (TYP).

Colorado Springs Utilities
It's how we're all connected

INTERNAL DROP MANHOLE WITH DROP GREATER THAN 24"

C3-6

DATED 1/2017



NOTES:

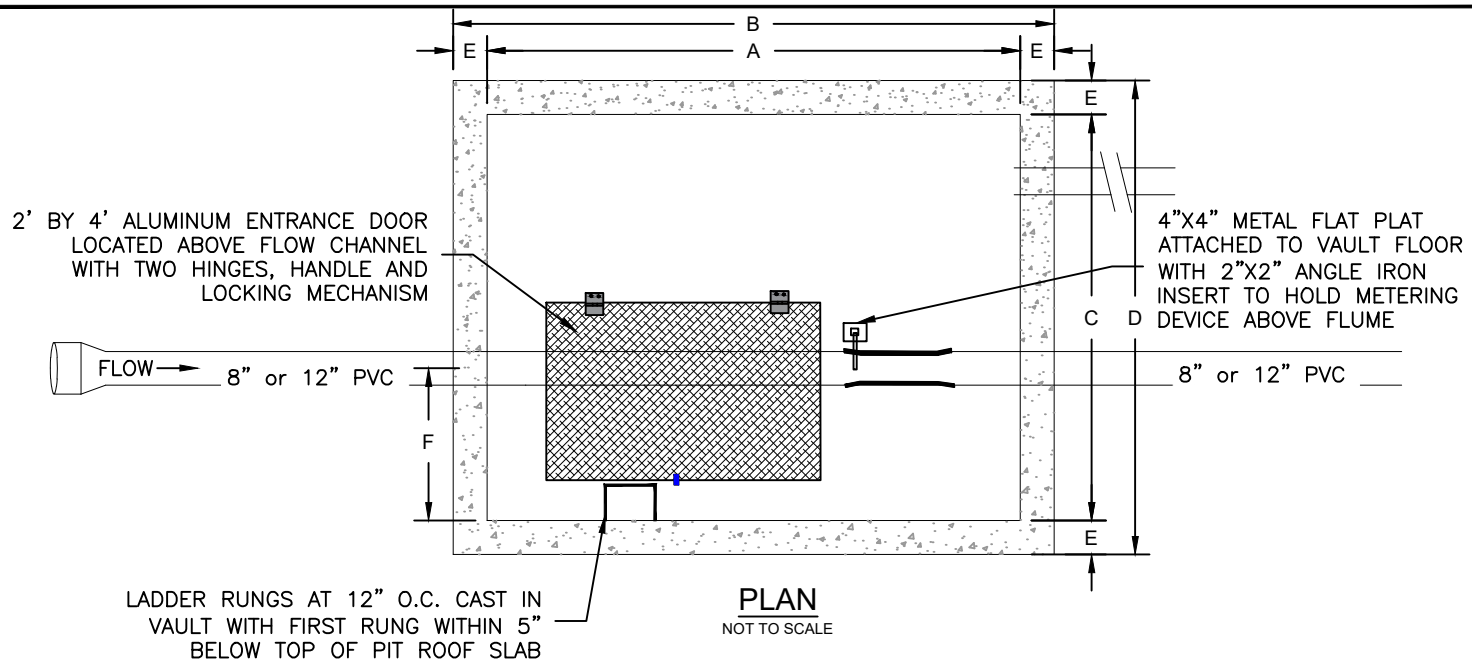
1. SEE DETAIL DRAWING C3-1 FOR MANHOLE REQUIREMENTS.

Colorado Springs Utilities
It's how we're all connected

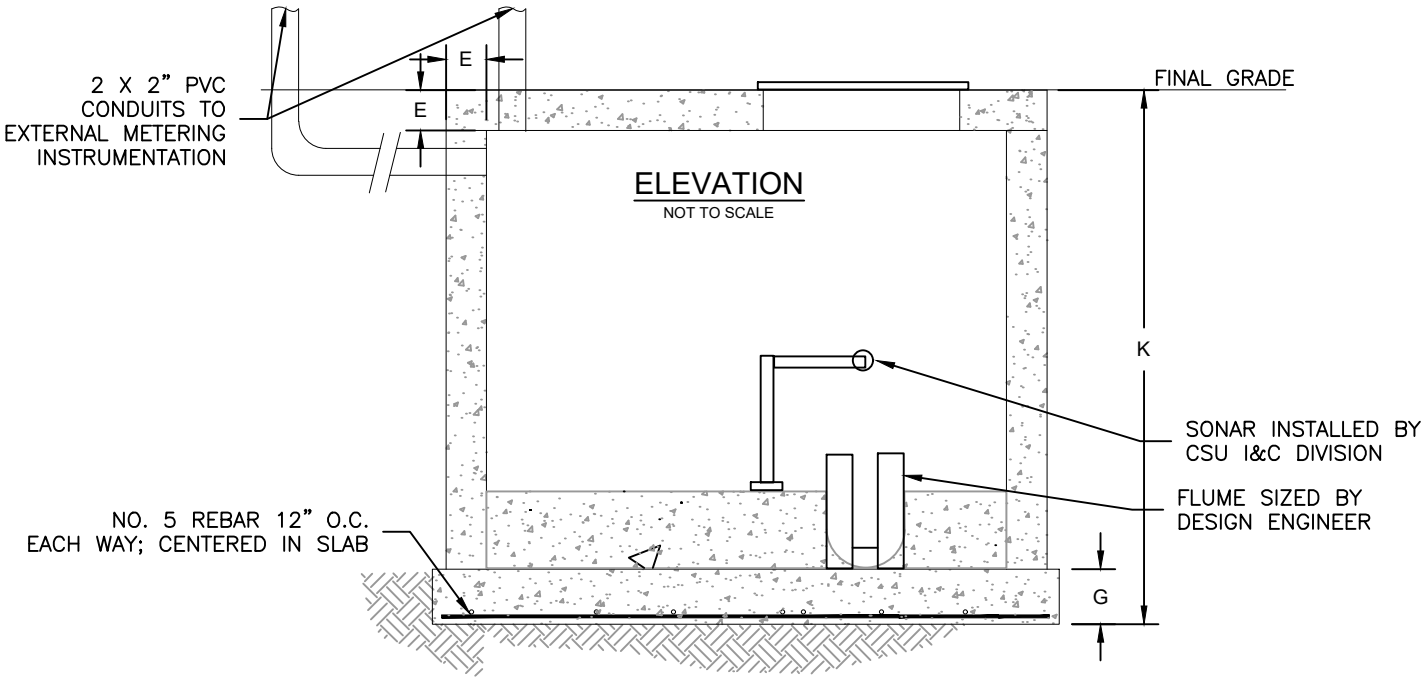
DROP MANHOLE LESS THAN 24"

C3-7

DATED 5/2015



	A	B	C	D	E	F	G	H	J	K
Size	12'–6"	13'–10"	8'–0"	9'–4"	0'–8"	3'–0"	0'–10"	3'–2"	3'–6"	VARIES



NOTES:

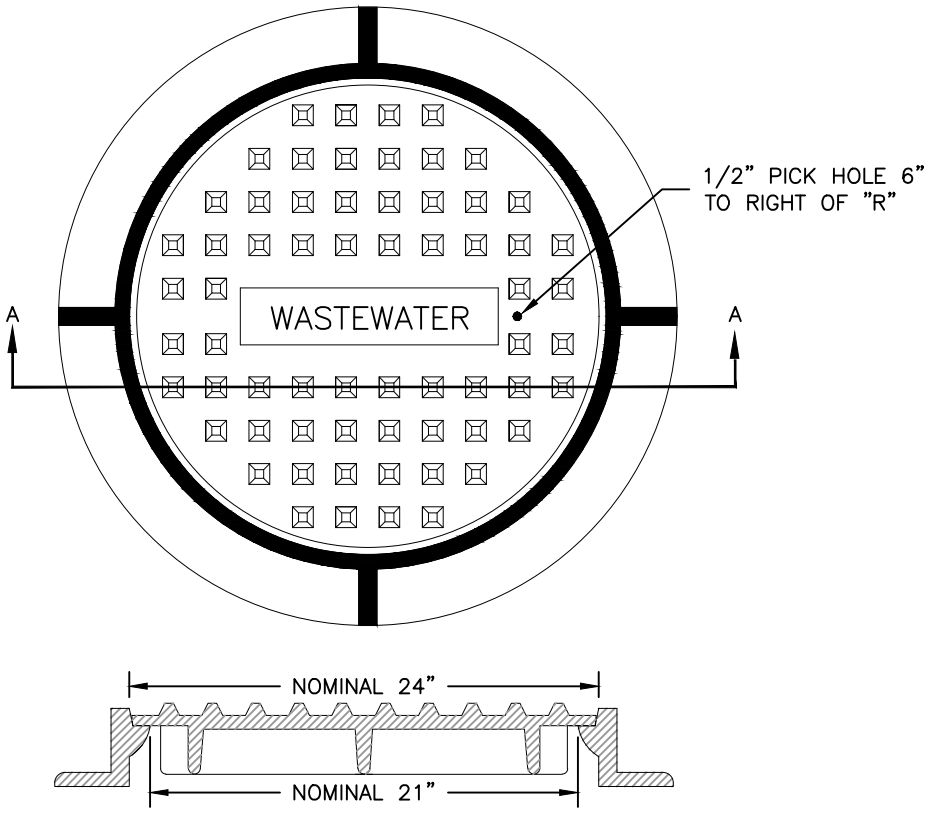
1. ALL CONCRETE WORK SHALL COMPLY WITH COLORADO SPRINGS UTILITIES STANDARD SPECIFICATIONS AND THE LATEST ACI–318 CODE.
2. ALL CONCRETE VAULTS SHALL BE DESIGNED FOR HS–20 TRAFFIC LOADING CONDITIONS AND 300 PSF SURCHARGE LOAD.
3. SHOP DETAIL DRAWINGS FOR ALL VAULTS ARE REQUIRED AND WILL BE APPROVED BY COLORADO SPRINGS UTILITIES.

Colorado Springs Utilities
It's how we're all connected

WASTEWATER METER VAULT

C3–8

DATED 05/2019



SECTION A-A
COVER SECTION

NOTES:

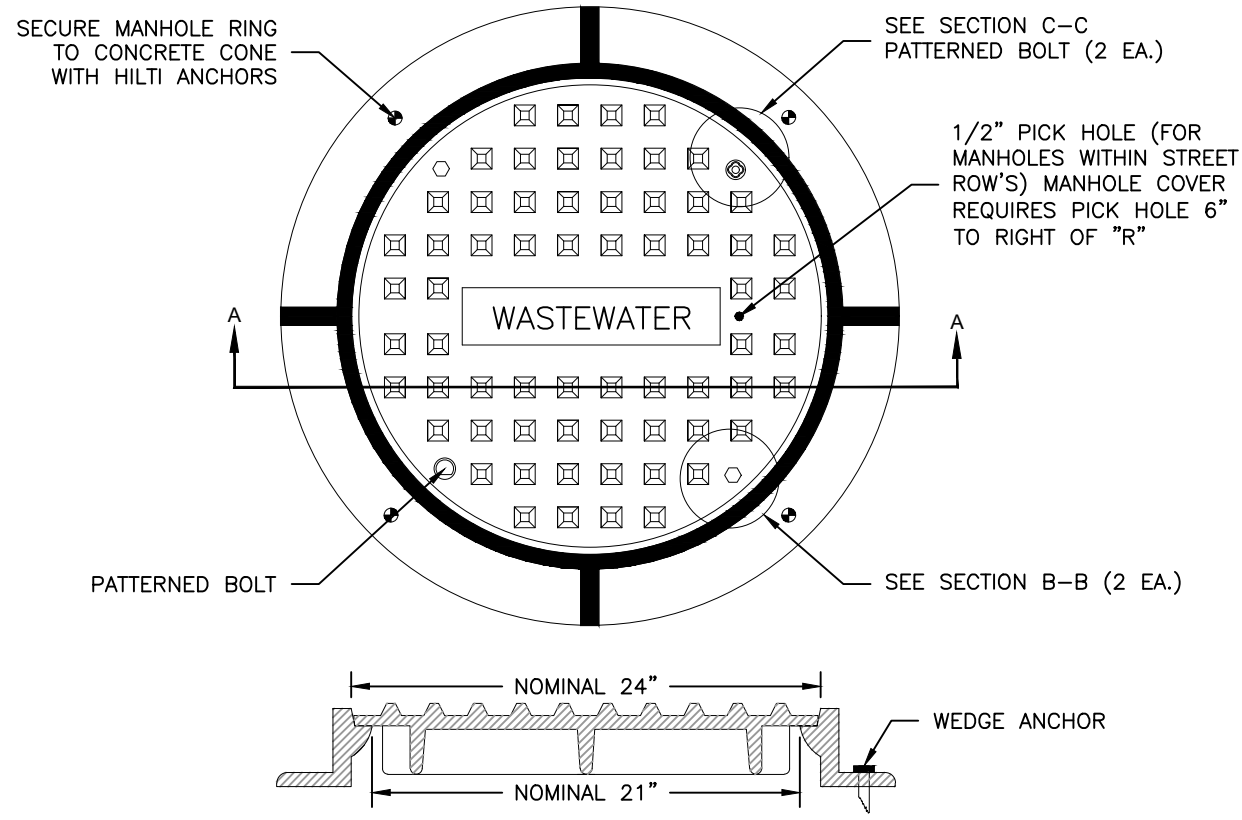
1. SEE CHAPTER 4 FOR ADDITIONAL INFORMATION AND SPECIFIC DIMENSIONS.

Colorado Springs Utilities
It's how we're all connected

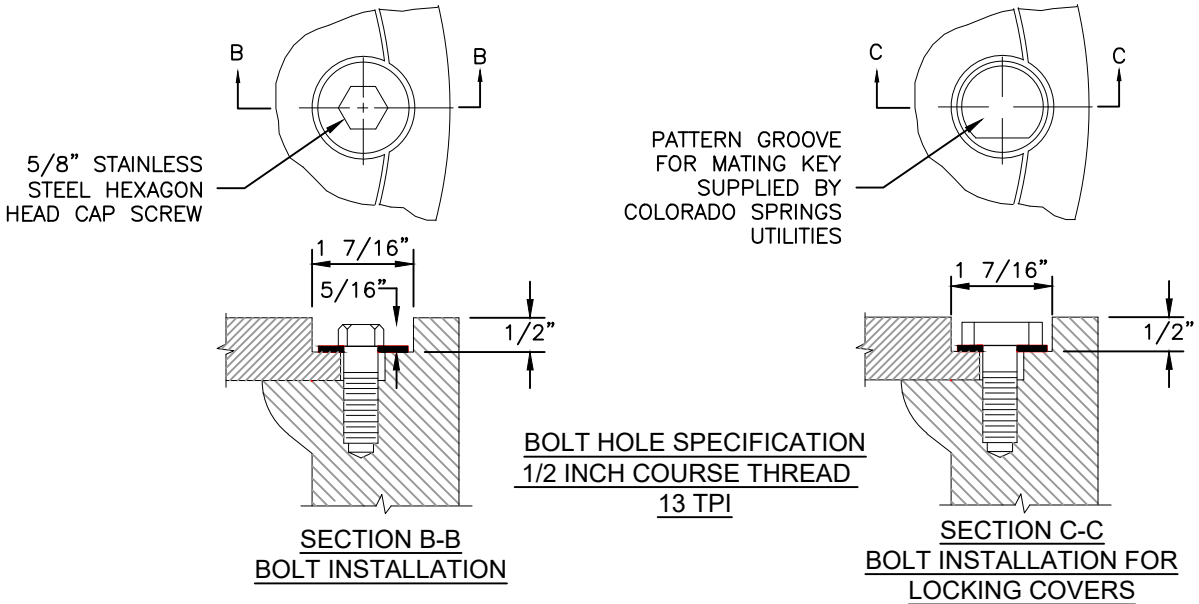
STANDARD MANHOLE RING AND COVER
IN TRAFFIC AREAS

C3–9

DATED 5/2015



SECTION A-A
COVER SECTION



SECTION B-B
BOLT INSTALLATION

BOLT HOLE SPECIFICATION
1/2 INCH COURSE THREAD
13 TPI

SECTION C-C
BOLT INSTALLATION FOR
LOCKING COVERS

NOTES:

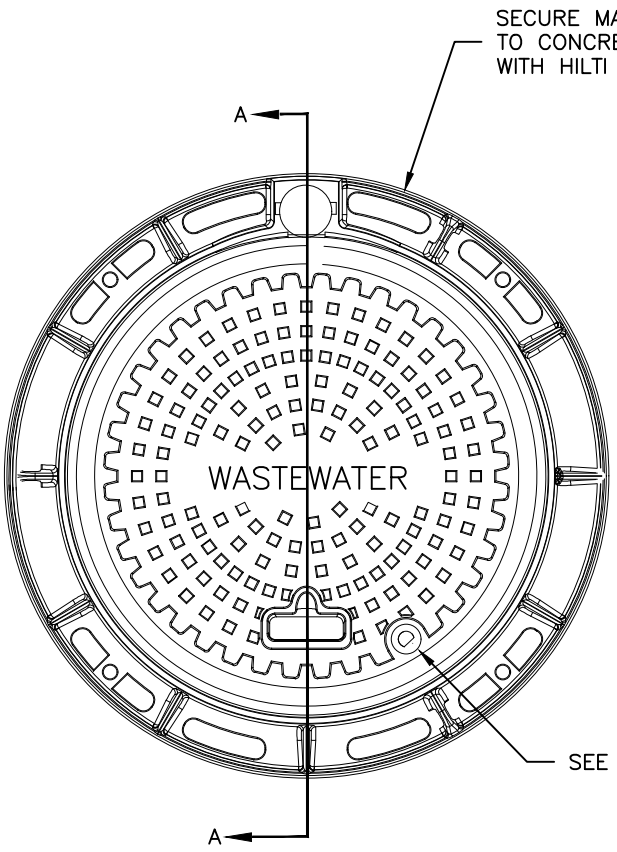
1. SEE CHAPTER 4 FOR ADDITIONAL INFORMATION AND SPECIFIC DIMENSIONS.
2. BOLT DOWN AND LOCKING MANHOLE RING AND COVERS SHALL ONLY BE INSTALLED IN LOCATIONS APPROVED BY COLORADO SPRINGS UTILITIES.
3. LOCKDOWN BOLTS PROVIDED BY COLORADO SPRINGS UTILITIES.

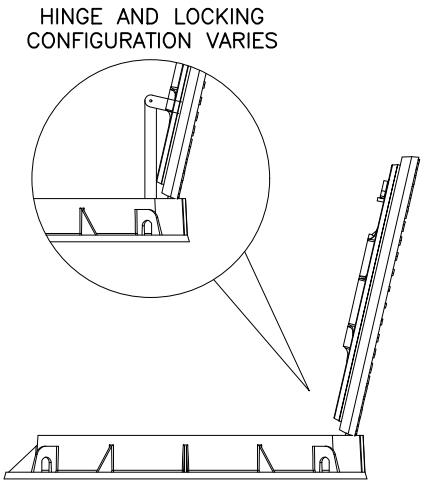
Colorado Springs Utilities
It's how we're all connected

BOLT DOWN AND LOCKING MANHOLE RING AND COVER IN TRAFFIC AREAS

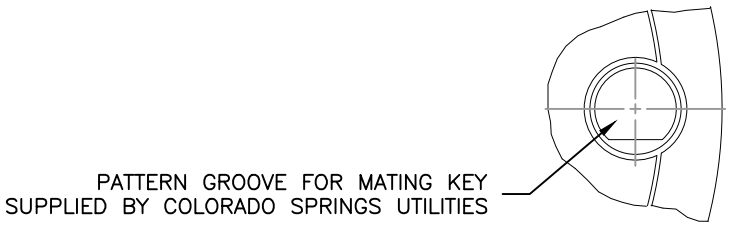
C3–10

DATED 5/2015





SECTION A-A
RING AND COVER SECTION



DETAIL B-B
BOLT INSTALLATION

NOTES:

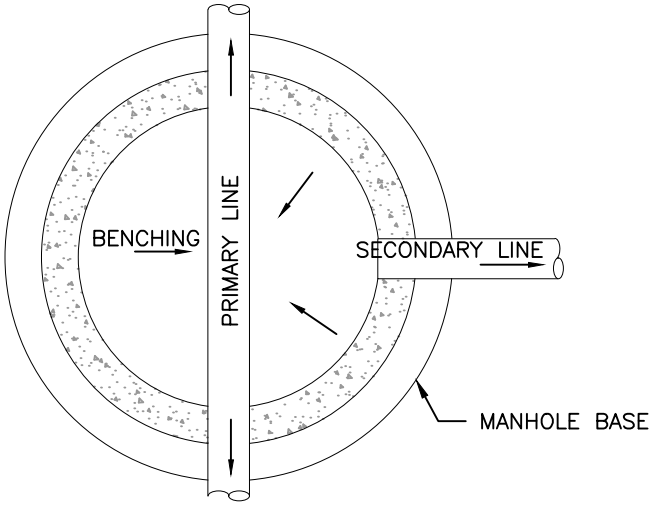
1. SEE CHAPTER 4 FOR ADDITIONAL INFORMATION AND SPECIFIC DIMENSIONS.
2. COVER TO BE MARKED WITH THE WORD "WASTEWATER".
3. HINGED MANHOLE RING AND COVER MAY VARY FROM DETAIL DRAWING, REFERENCE APPROVED MANUFACTURER'S SPECIFICATIONS.

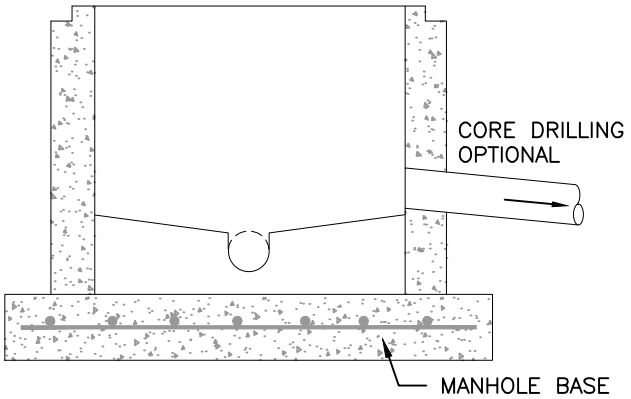
Colorado Springs Utilities
It's how we're all connected

HINGED MANHOLE RING AND COVER
IN NON TRAFFIC AREAS

C3–11

DATED 5/2015



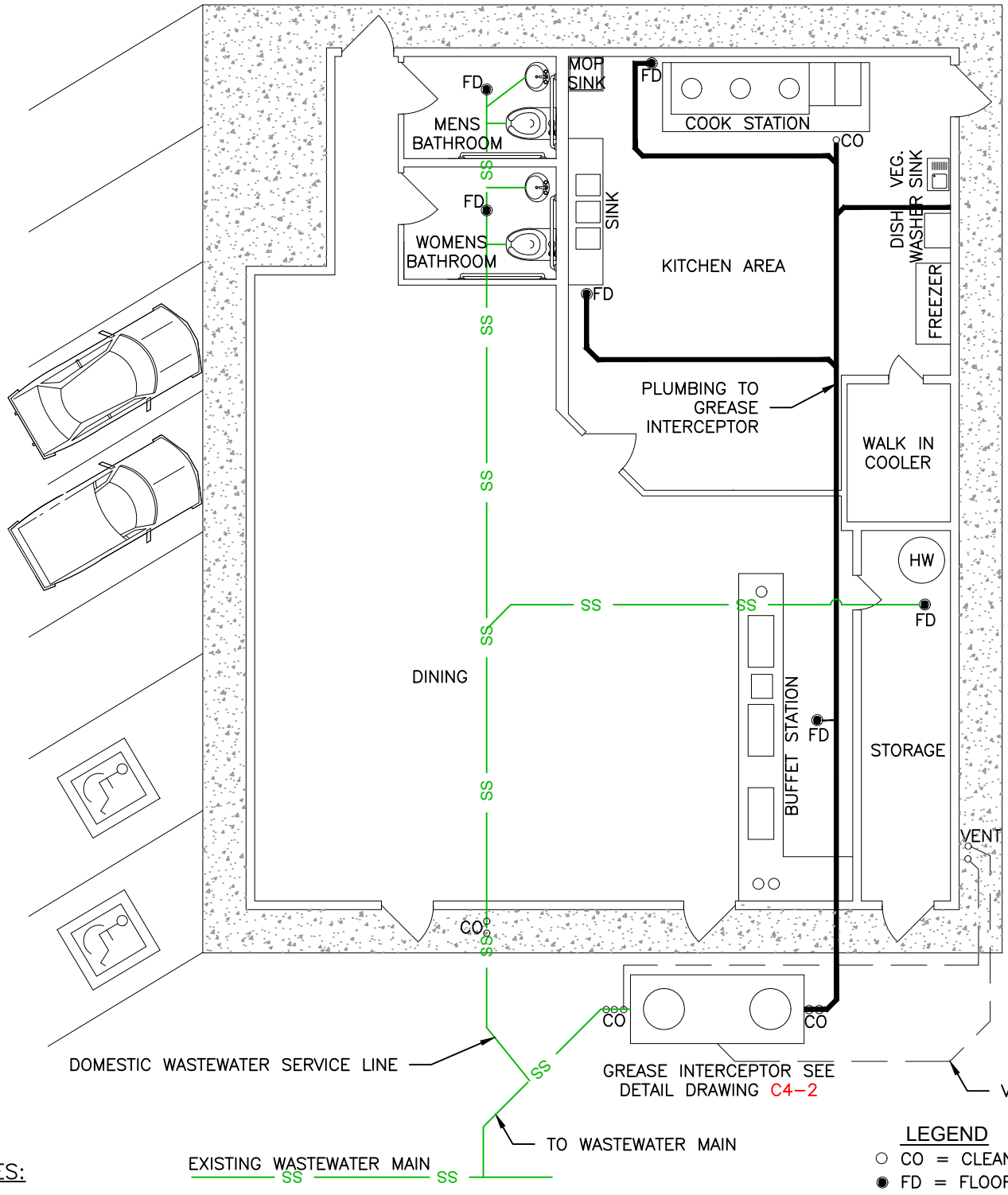


Colorado Springs Utilities
It's how we're all connected

APEX MANHOLE

C3–12

DATED 1/2017



LEGEND

○ CO = CLEAN OUT

◉ FD = FLOOR DRAIN

NOTES:

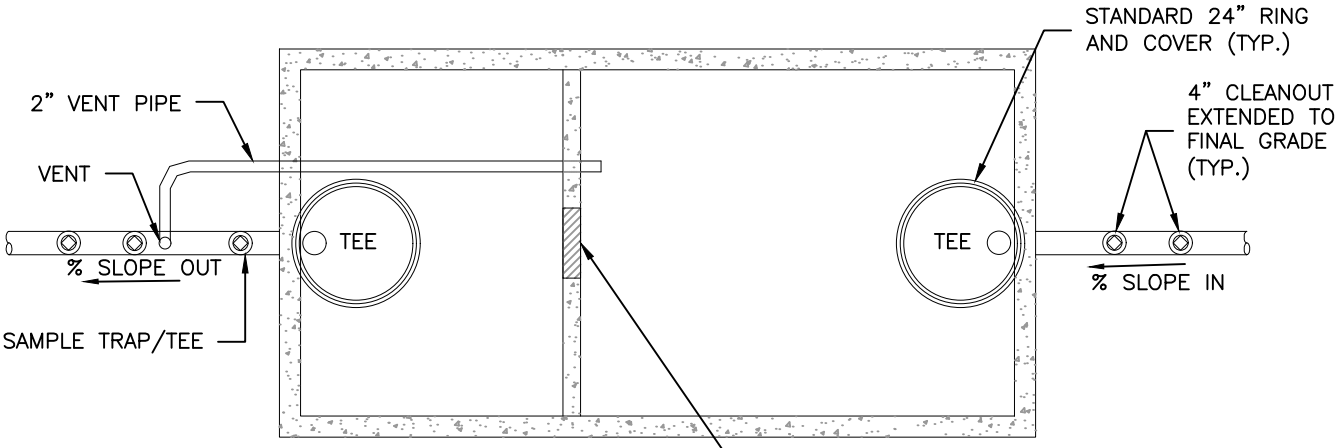
1. SIZE OF GREASE INTERCEPTOR TO BE DETERMINED BY DESIGN ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
2. TO BE READ IN CONJUNCTION WITH CHAPTER 2.
3. TO BE READ IN CONJUNCTION WITH THE INTERNATIONAL PLUMBING CODE.
4. THE GREASE INTERCEPTOR SHALL BE INSTALLED A MAXIMUM OF 50' FROM THE LAST FIXTURE.

Colorado Springs Utilities
It's how we're all connected

RESTAURANT CONNECTION SCHEMATIC

C4–1

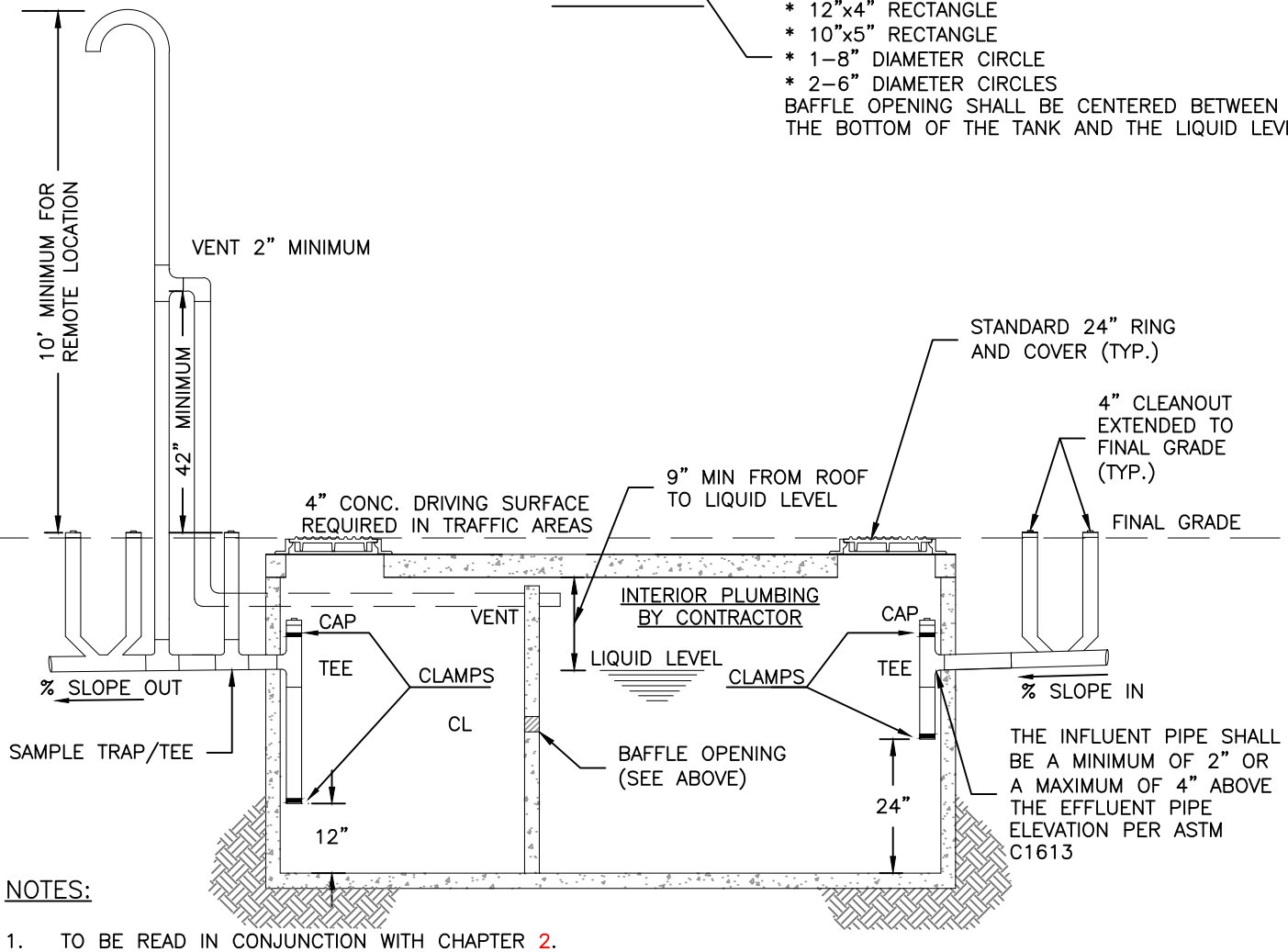
DATED 1/2017



PLAN VIEW

BAFFLE OPENING MAY BE MADE USING;
* 12"x4" RECTANGLE
* 10"x5" RECTANGLE
* 1–8" DIAMETER CIRCLE
* 2–6" DIAMETER CIRCLES

BAFFLE OPENING SHALL BE CENTERED BETWEEN THE BOTTOM OF THE TANK AND THE LIQUID LEVEL



NOTES:

1. TO BE READ IN CONJUNCTION WITH CHAPTER 2.
2. TO BE READ IN CONJUNCTION WITH INTERNATIONAL PLUMBING CODE.
3. WHENEVER PRACTICAL, THE TWO VENTS SHALL BE RUN UNDERGROUND TO THE BUILDING AND UP THROUGH THE ROOF. VENTS SHALL BE LOCATED AWAY FROM BUILDING AIR INTAKES.
4. INTERIOR PIPING TO BE STRAPPED AT TOP AND BOTTOM WITH GALVANIZED CLAMPS OR EQUAL.
5. SIZE OF GREASE INTERCEPTOR TO BE DETERMINED BY DESIGN ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
6. UNLESS SPECIFICALLY NOTED HERE, GREASE INTERCEPTORS SHALL CONFORM TO ASTM C1613.
7. RING AND COVER SHALL BE PROVIDED EVERY 10' FOR GREASE INTERCEPTORS LONGER THAN 20'.

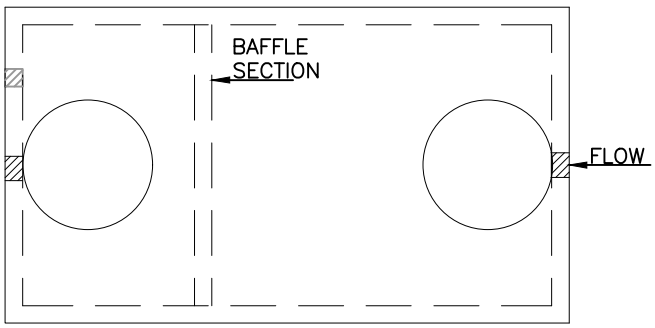
Colorado Springs Utilities
It's how we're all connected

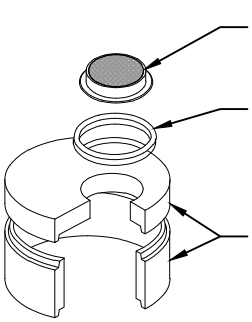
TYPICAL GREASE INTERCEPTOR

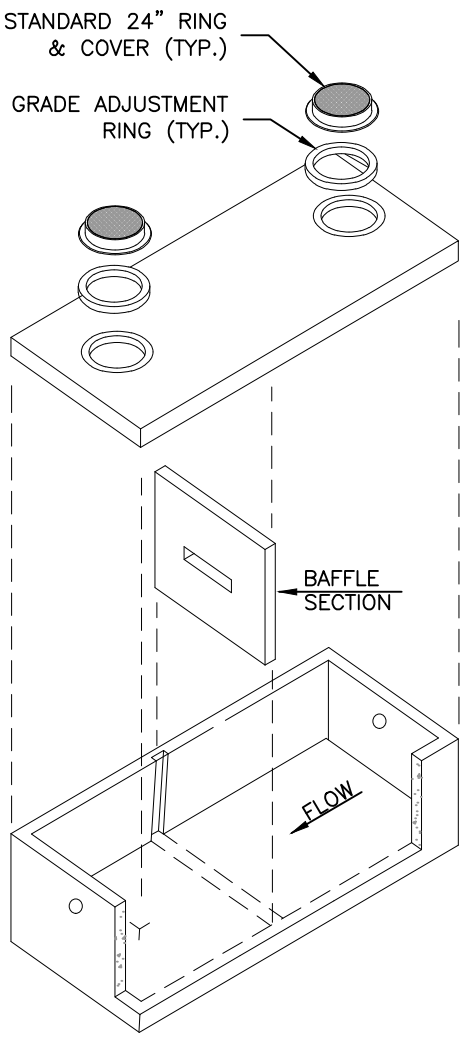
C4–2

DATED 5/2019

PLAN OF TOP SECTION







ISOMETRIC VIEW OF INTERCEPTOR

TYPICAL GREASE INTERCEPTORS

SIZE GALLONS	USE	LENGTH	WIDE	HIGH
1000 GALLON	NON-TRAFFIC	102"	58"	72"
1000 GALLON	TRAFFIC	96"	72"	86.5"
1250 GALLON	NON-TRAFFIC	120"	60"	72"
1500 GALLON	NON-TRAFFIC	126"	68"	72"
1500 GALLON	TRAFFIC	156"	84"	66"
2250 GALLON	NON-TRAFFIC	144"	78"	78"
2500 GALLON	TRAFFIC	156"	84"	89"
3000 GALLON	TRAFFIC	156"	84"	100"
3500 GALLON	TRAFFIC	156"	84"	112"
5000 GALLON	TRAFFIC	156"	84"	149"

APPROX. SIZE OF GREASE INTERCEPTORS
CHECK WITH MANUFACTURER FOR CORRECT DIMENSIONS AND INVERTS

NOTES:

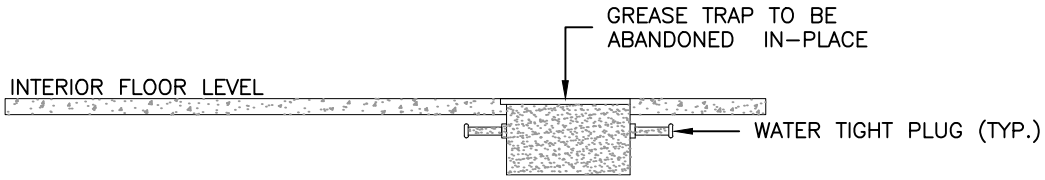
1. TO BE READ IN CONJUNCTION WITH CHAPTER 2.
2. TO BE READ IN CONJUNCTION WITH INTERNATIONAL PLUMBING CODE.

Colorado Springs Utilities
It's how we're all connected

TYPICAL RESTAURANT GREASE INTERCEPTOR

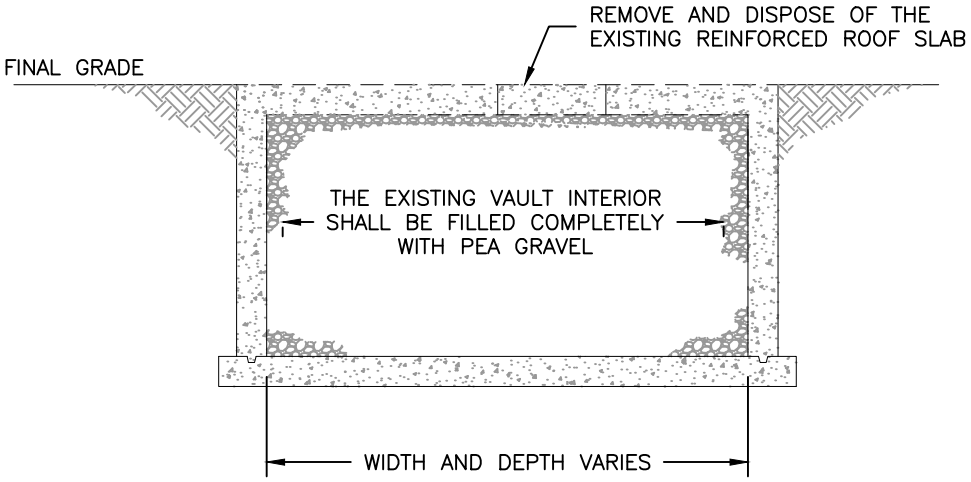
C4-3

DATED 5/2015



NOTE:
GREASE TRAP TO BE ABANDONED IN-PLACE TO BE CLEANED AND PIPES PLUGGED, THEN FILLED WITH GRAVEL, SEE CHAPTER 2

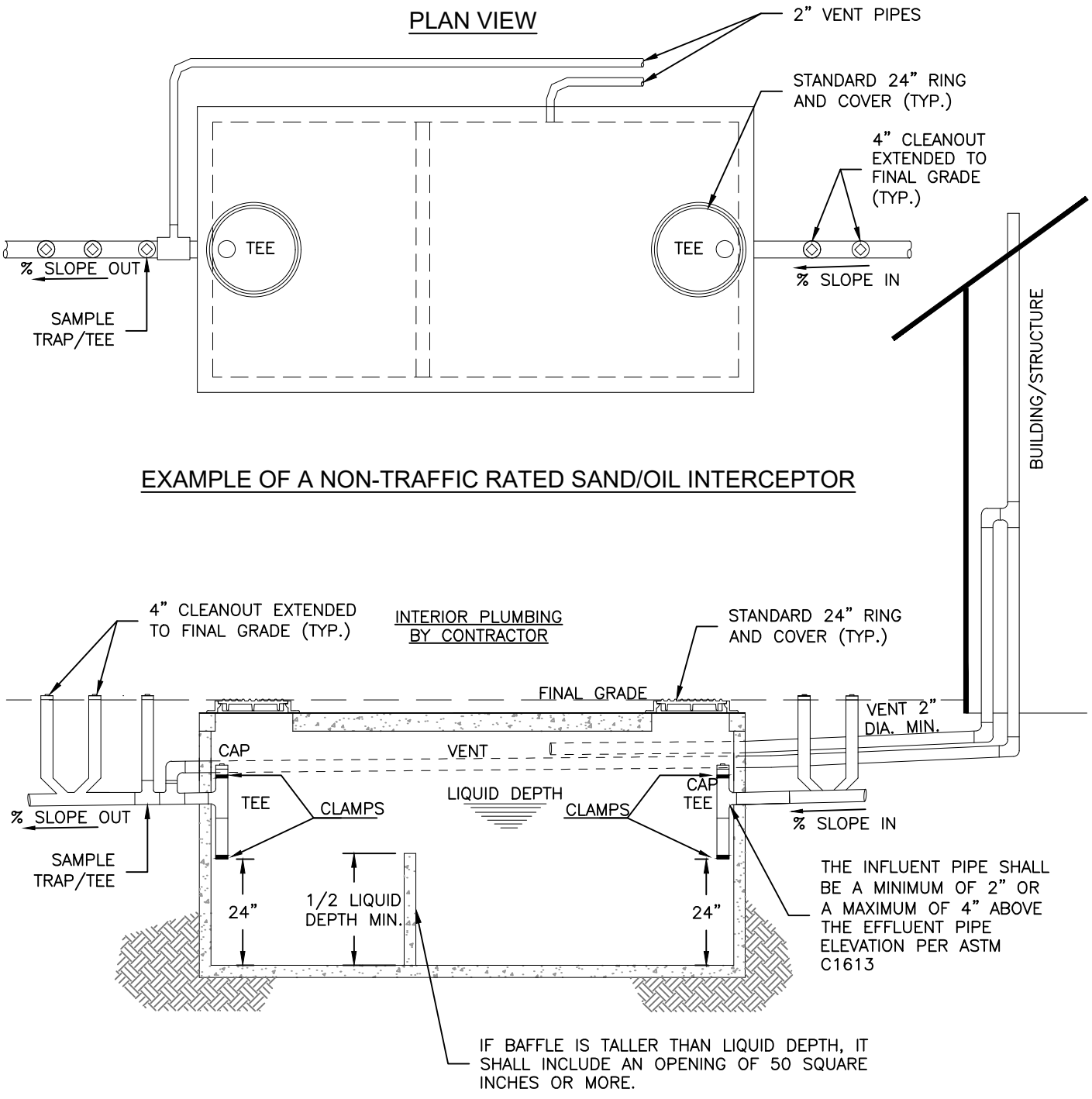
GREASE TRAP TO BE ABANDONED



GREASE INTERCEPTOR TO BE ABANDONED

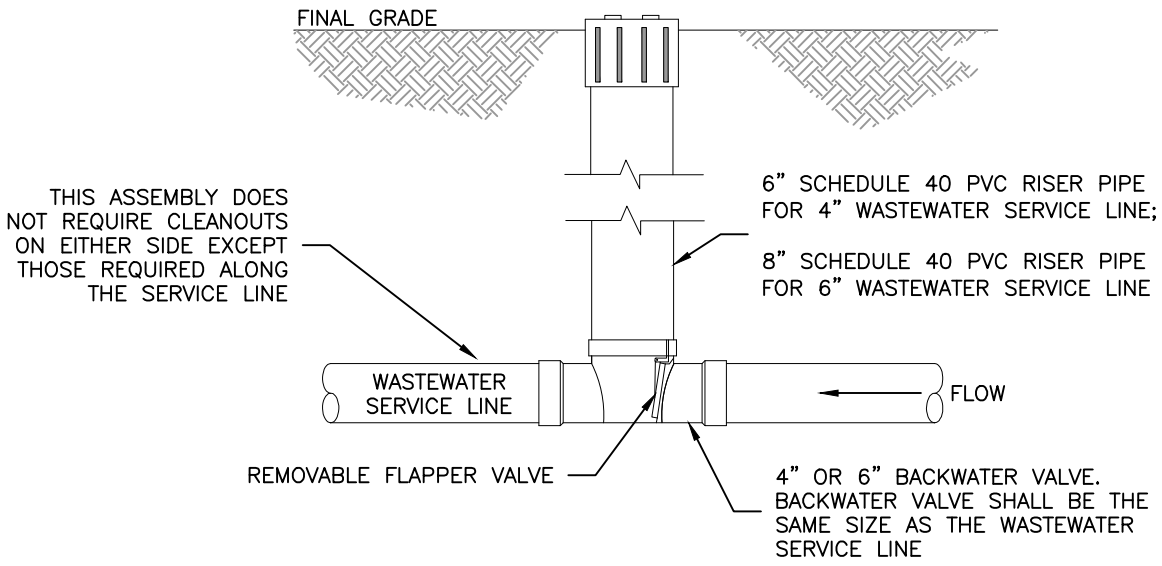
NOTES:

1. TO BE READ IN CONJUNCTION WITH CHAPTER 2.
2. TO BE READ IN CONJUNCTION WITH INTERNATIONAL PLUMBING CODE.

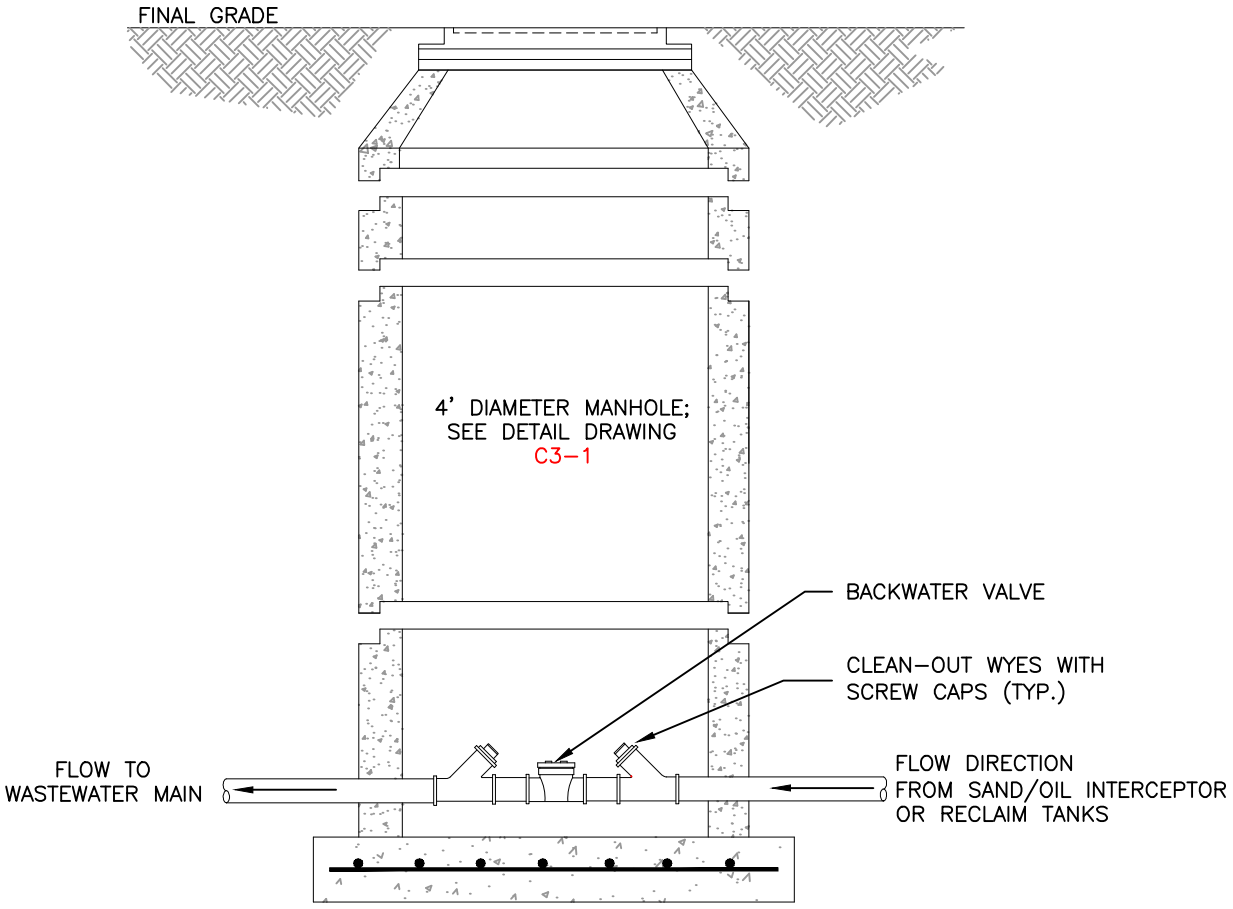


NOTES:

1. IF THE TOP OF THE SAND & OIL INTERCEPTOR IS MORE THAN 12" BELOW FINISHED GRADE, A 4' DIAMETER MANHOLE BARREL SECTION(S) WILL BE REQUIRED TO BRING RING AND COVER TO GRADE.
2. SIZE OF SAND/OIL INTERCEPTOR TO BE DETERMINED BY THE DESIGN ENGINEER AND APPROVED BY COLORADO SPRINGS UTILITIES.
3. INTERIOR PIPING TO BE STRAPPED AT THE BOTTOM WITH GALVANIZED CLAMPS, UNISTRUT, OR EQUAL.
4. WHENEVER PRACTICAL, THE TWO VENTS SHALL BE RUN UNDER GROUND TO THE BUILDING AND UP THROUGH THE ROOF. VENTS SHALL BE LOCATED AWAY FROM BUILDING AIR INTAKE.
5. VENTS SHALL BE CONSTRUCTED ON THE OUTSIDE OF THE TANK.
6. TO BE READ IN CONJUNCTION WITH CHAPTER 2 OF THE WASTEWATER LINE EXTENSION AND SERVICE STANDARDS.
7. RING AND COVER SHALL BE PROVIDED EVERY 10' FOR SAND/OIL INTERCEPTORS LONGER THAN 20'.



TYPICAL BACKWATER VALVE ASSEMBLY

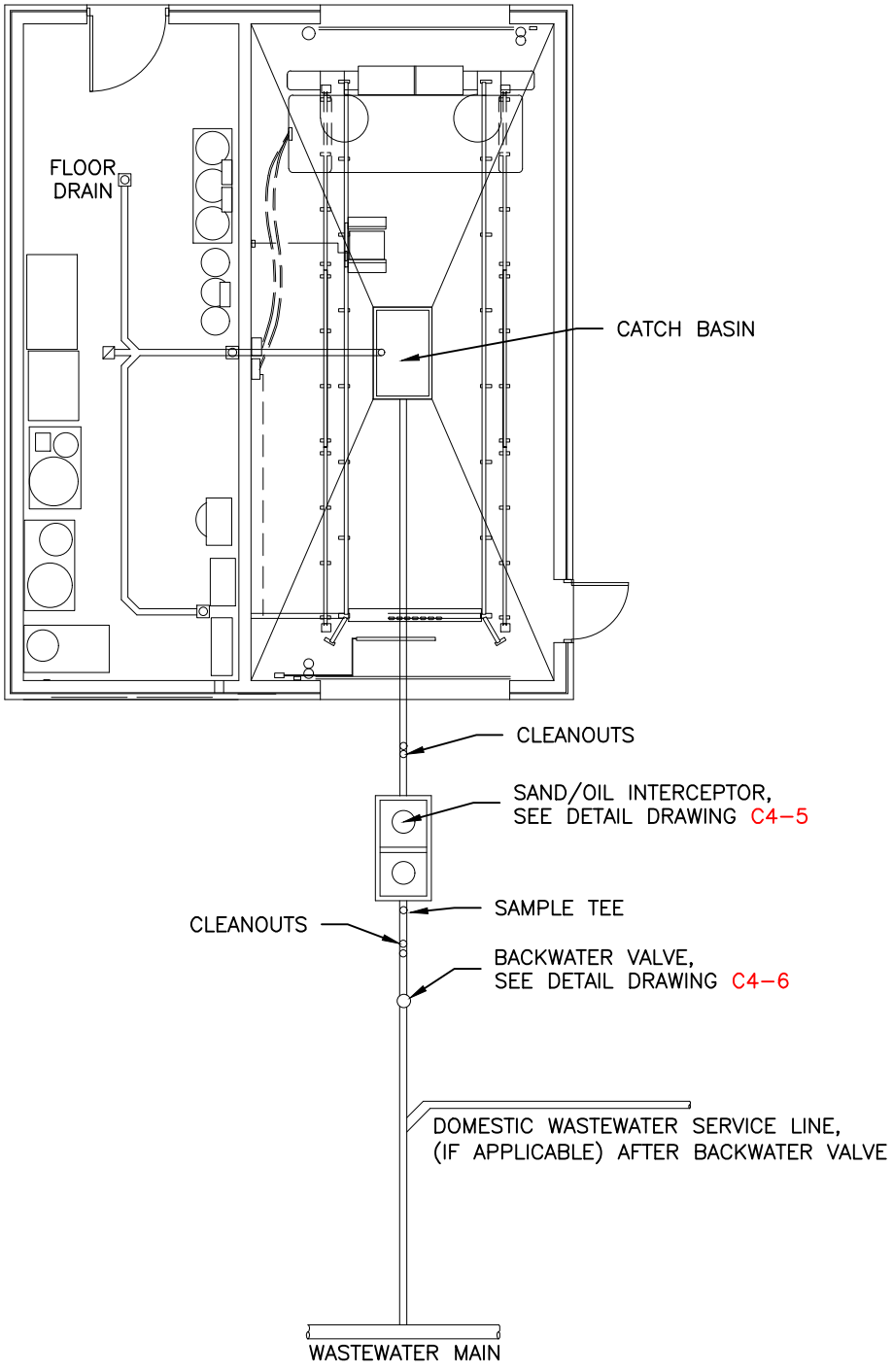


ALTERNATE BACKWATER VALVE MANHOLE

NOTES:

1. CAR WASH RECYCLE/SAND-OIL INTERCEPTOR TO BE READ IN CONJUNCTION WITH CHAPTER 2.
2. BACKWATER (BACKFLOW) VALVE FOR WASTEWATER SERVICE LINE, SEE CHAPTER 4.

SINGLE/AUTO BAY UNIT



NOTES:

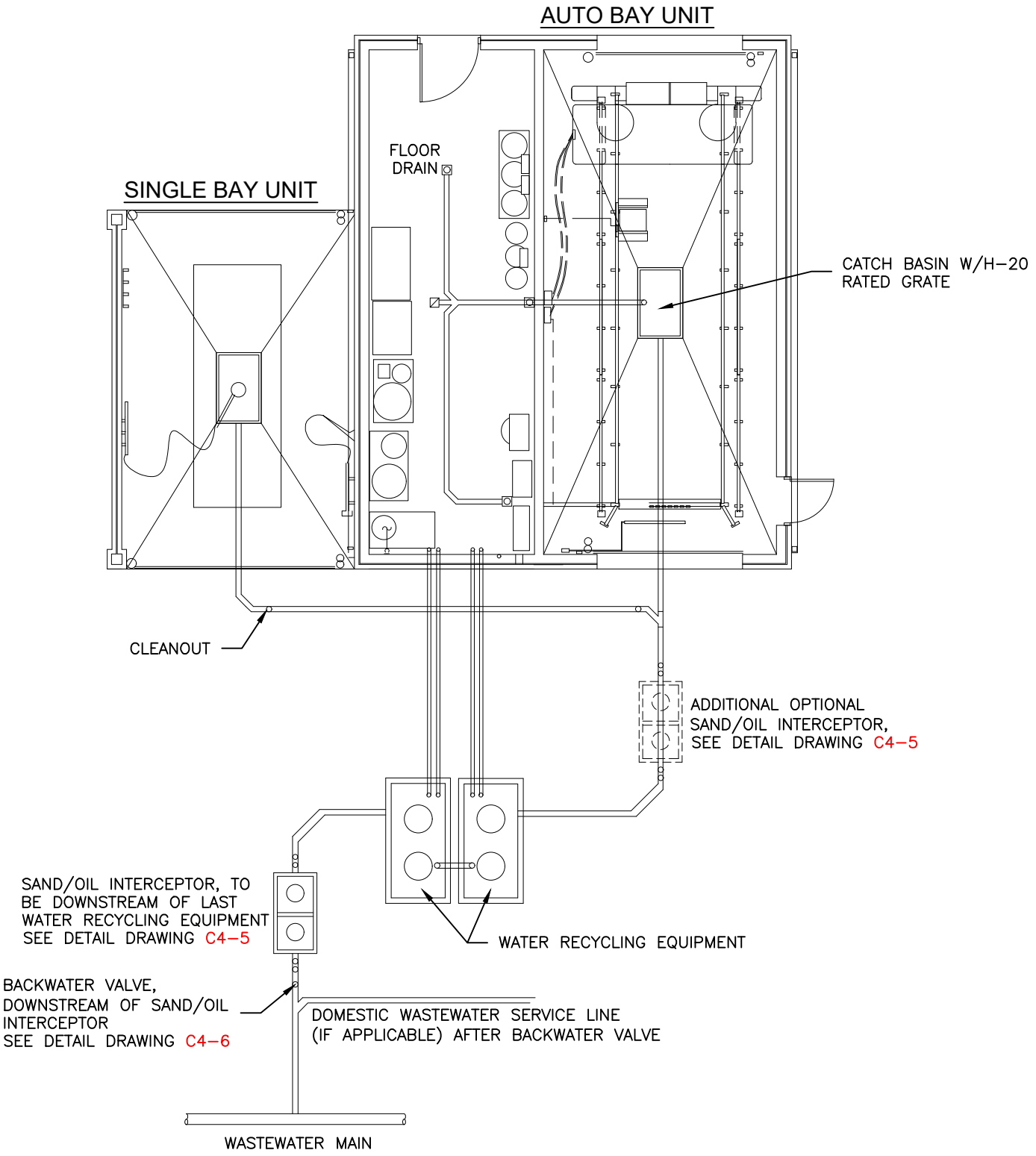
1. DRAWING IS JUST A SCHEMATIC AND CONFIGURATION OF CAR-WASH LAYOUT MAY VARY FROM THIS DRAWING.

Colorado Springs Utilities
It's how we're all connected

SCHEMATIC OF A NON-WATER RECYCLING CAR WASH SYSTEM

C4-7

DATED 5/2015



NOTES:

1. DRAWING IS JUST A SCHEMATIC AND CONFIGURATION OF CAR-WASH LAYOUT MAY VARY FROM THIS DRAWING.
2. WATER RECYCLING EQUIPMENT AND PUMP SIZES TO BE DETERMINED BY MECHANICAL CONTRACTOR/PLUMBING SUPPLIER/VENDOR.

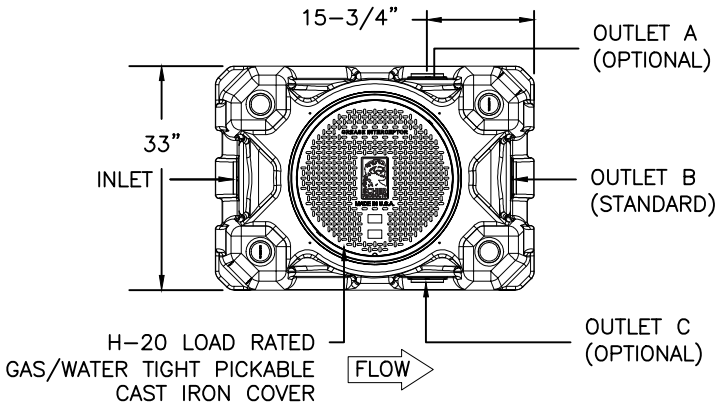
Colorado Springs Utilities
It's how we're all connected

SCHEMATIC OF A WATER RECYCLING CAR WASH SYSTEM

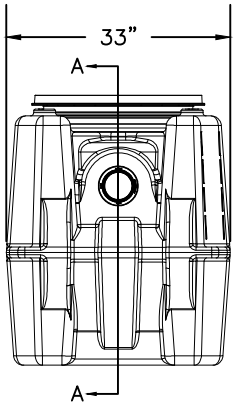
C4-8

DATED 5/2015

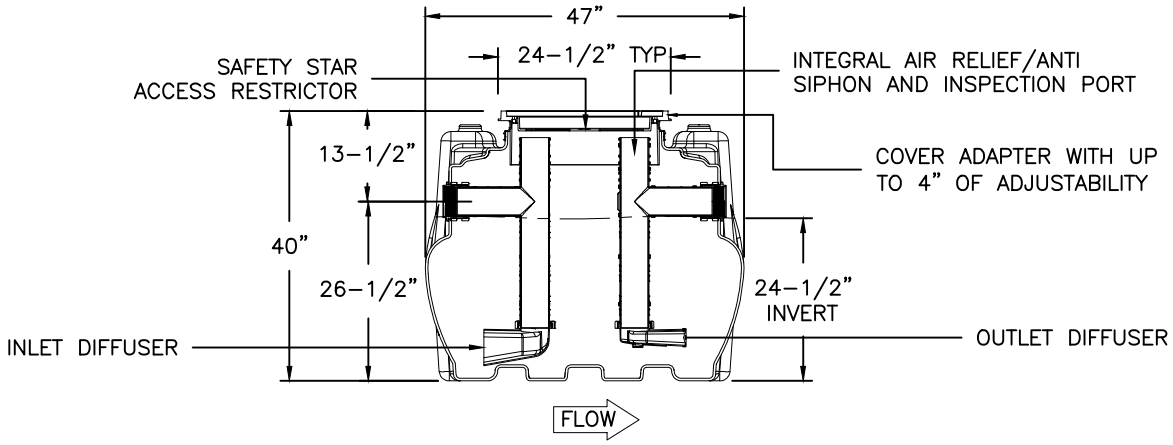
GB–75 INLET TOP VIEW



GB–75 INLET END VIEW



GB–75 SECTION A–A



GB-75

NOTES:

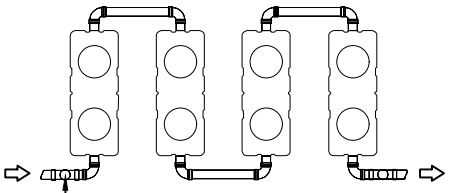
1. 4" FPT WITH 4" PLAIN END ADAPTERS, SINGLE INLET AND TRIPLE OUTLET.
2. UNIT WEIGHT – W/CAST IRON COVER: 190 LBS. W/COMPOSITE COVER; 135 LBS. (FOR WET WEIGHT, ADD 1,403 LBS.).
3. MAXIMUM OPERATING TEMPERATURE; 150° F CONTINUOUS.
4. CAPACITIES – LIQUID; 125 GAL; GREASE; 861 LBS.
5. THIS UNIT DOES NOT REQUIRE FLOW CONTROL.
6. FOR GRAVITY DRAINAGE APPLICATIONS ONLY.
7. DO NOT USE FOR PRESSURE APPLICATIONS.
8. ENGINEERED INLET AND OUTLET DIFFUSERS ARE REMOVABLE TO INSPECT/CLEAN PIPING.
9. FLOW RATE IS BASED ON 2–MINUTE DRAIN TIME.
10. SAFETY STAR ACCESS RESTRICTOR BUILT INTO COVER ADAPTER, PREVENTS ACCIDENTAL ENTRY TO TANKS (450 LB RATING).
11. ONLY FOR EXTERIOR INSTALLATION, CANNOT INSTALL INDOORS.

SERIES INSTALLATIONS

FOR LOWER FLOW RATES AND HIGHER GREASE STORAGE REQUIREMENT. PIPING BETWEEN UNITS AND TWO-WAY CLEAN-OUT TEES BY OTHERS.

NOTE:
WHEN THE FLOW CONTROL CARTRIDGE IS REQUIRED, IT SHOULD ONLY BE INSTALLED ON THE FIRST UNIT IN THE SERIES.

TOP VIEW OF 4 GB-250 UNITS PIPED IN SERIES

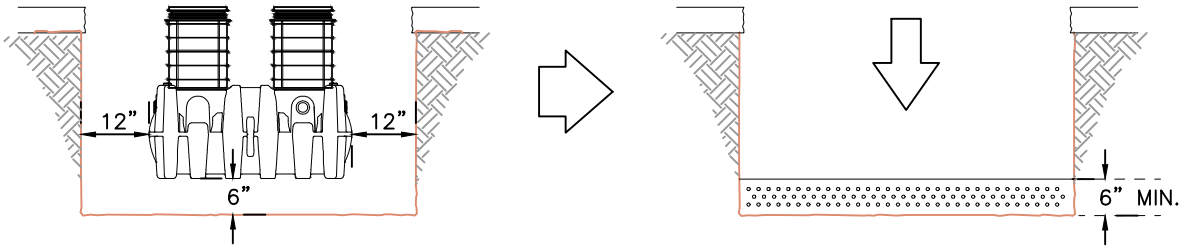


TWO-WAY CLEAN-OUT TOP EXTENDED TO GRADE (PROVIDED BY OTHERS)

RATED GREASE CAPACITIES FOR UNITS PIPED IN SERIES

NO. OF UNITS IN SERIES	REMOVAL EFFICIENCY	
	100 GPM	200 GPM
	96.7%	93.5%
2	3,790 LBS.	2,392 LBS
3	5,685 LBS.	3,588 LBS
4	7,580 LBS.	4,784 LBS

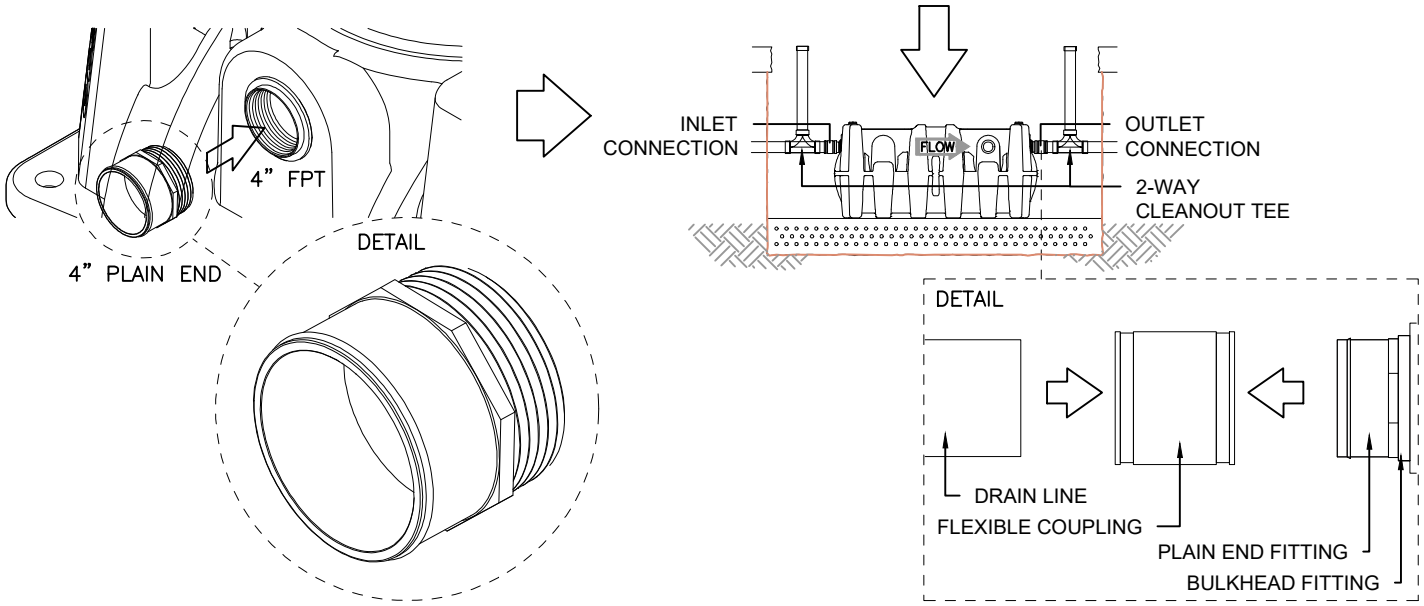
EXCAVATE BURIAL PIT



EXCAVATE HOLE AT LEAST 12" LARGER THAN INTERCEPTOR ON ALL SIDES AND 6" DEEPER THAN TANK BOTTOM.

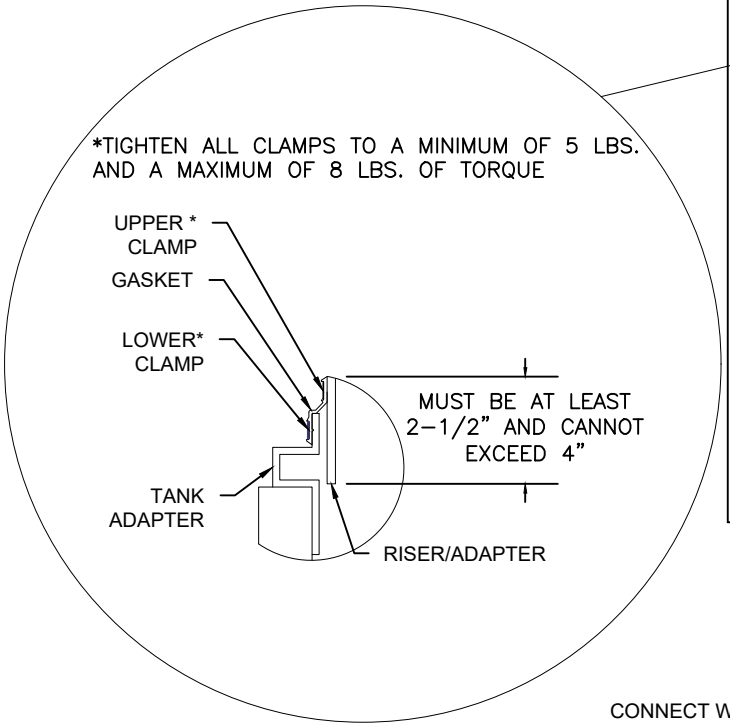
LAY A LEVEL BED OF WELL-PACKED, CRUSHED AGGREGATE (APPROXIMATELY 3/4" SIZE ROCK OR SAND, WITH NO FINES) IN THE BASE OF THE HOLE.

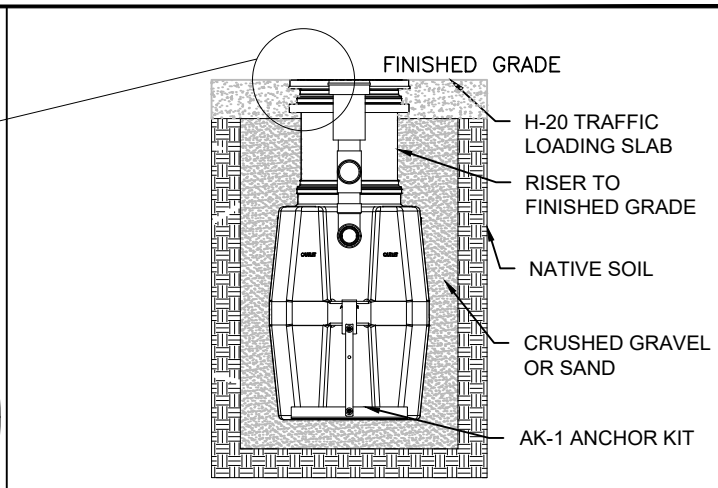
CONNECT PIPING



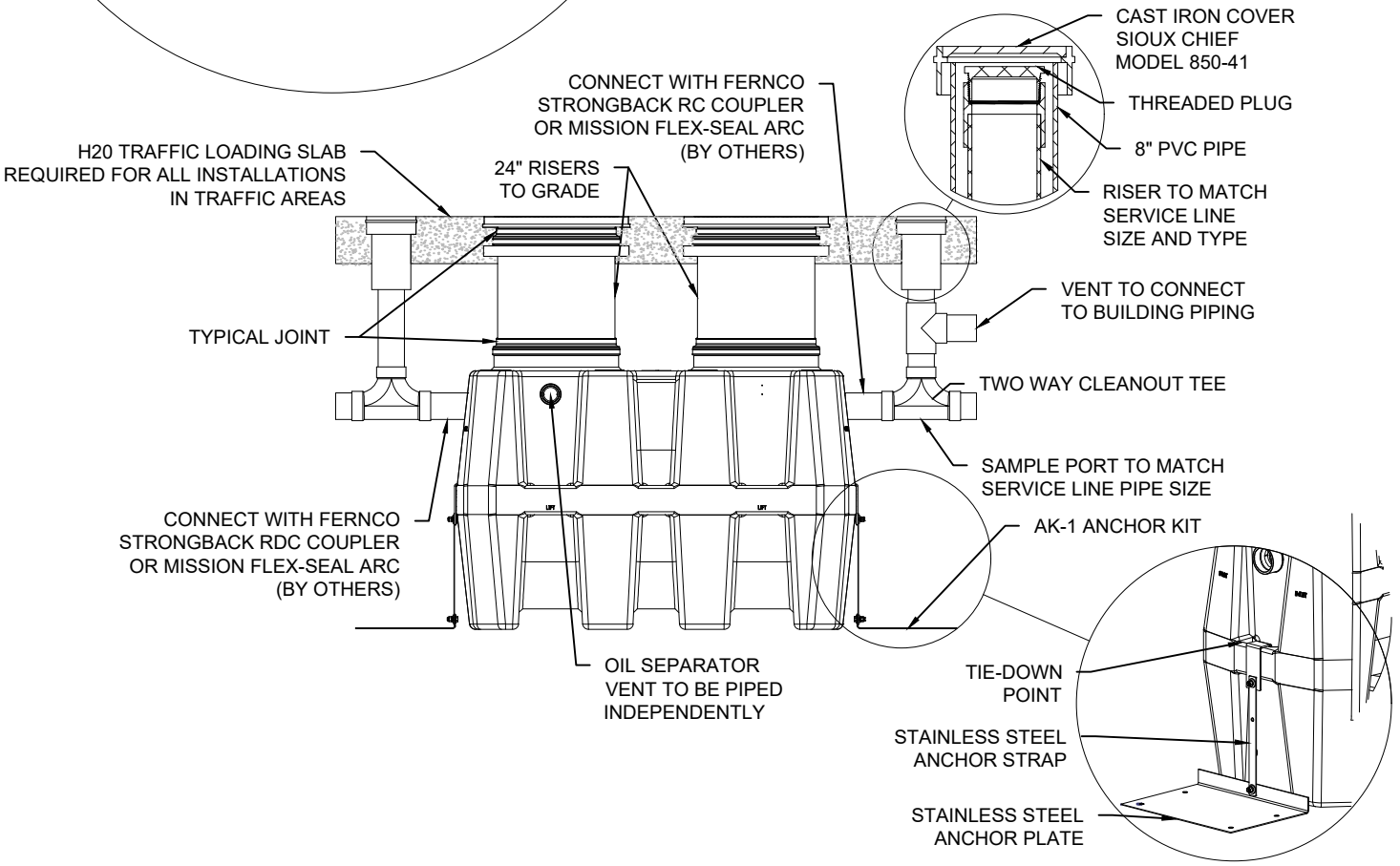
NOTES:

1. INSTALLATION IN TRAFFIC LOADING AREAS MUST INSTALL MANUFACTURER REQUIRED CONCRETE CAP, SEE C4-12.
2. CAPACITIES FOR IN SERIES PLASTIC INTERCEPTORS ARE SET BY APPROVED MANUFACTURERS, REFERENCE MANUFACTURERS CAPACITIES AND SECTION 4.3.F FOR DETERMINING INTERCEPTOR CAPACITIES.. INSTALL RISER TO MAN HOLES TO MEET FINAL GRADE IF REQUIRED, SEE MANUFACTURER INSTRUCTIONS FOR RISER INSTALLATION.





EXCAVATION AND BACKFILL DETAIL



INSPECTION REQUIREMENTS:

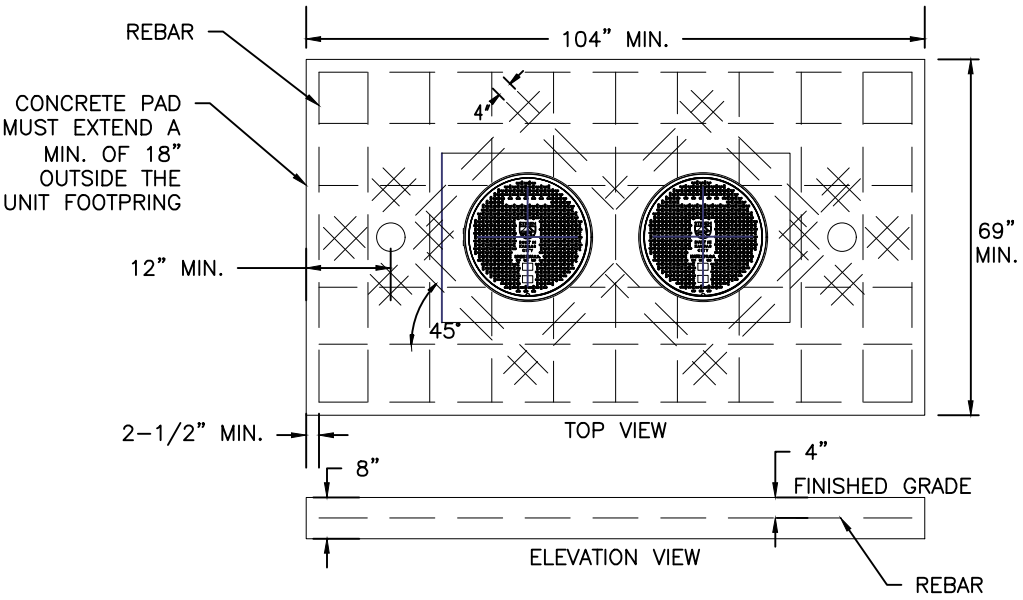
1. INTERIOR SAND/OIL PLUMBING INSPECTION; THE SAND/OIL PLUMBING AND FIXTURES INSIDE THE BUILDING SHALL BE INSPECTED PRIOR TO POURING THE INTERIOR SLAB.
2. SAND/OIL SEPARATOR INSPECTION; PARTIAL INSPECTION #1: EXCAVATION, SEPARATOR, RISER(S) AND ANCHOR KIT (IF APPLICABLE) SHALL BE INSPECTED PRIOR TO BACKFILL; PARTIAL INSPECTION #2: HAUNCHED PIPE, BACKFILL CLEAN–OUT AND SAMPLING PORT SHALL BE INSPECTED PRIOR TO PIPE BACKFILL.
3. FOR VENTING DETAILS; REFER TO C4–5.

Colorado Springs Utilities
It's how we're all connected

PLASTIC SAND AND OIL INTERCEPTOR

C4–11

DATED 8/2020



INTERCEPTOR CONCRETE SLAB DETAIL

BACKFILLING & FINISHED CONCRETE SLAB:

1. PREPARATION OF SUB GRADE PER GEOTECH RECOMMENDATIONS.
2. STABILIZE AND COMPACT SUB GRADE TO 95% PROCTOR.
3. FILL TANK WITH WATER BEFORE BACKFILLING TO PREVENT FLOAT OUT DURING PIPING INSTALLATION.
4. BEFORE BACKFILLING AND POURING OF SLAB, SECURE COVERS AND RISERS (IF NECESSARY) TO THE UNIT.
5. BACKFILL USING CRUSHED AGGREGATE MATERIAL APPROXIMATELY 3/4" SIZE ROCK, OR SAND, WITH NO FINES.
6. PLACE 6" AGGREGATE BASE UNDER SLAB. AGGREGATE SIZE SHOULD BE 3/4" SIZE ROCK, OR SAND, WITH NO FINES.
7. CONCRETE TO BE 28 DAY COMPRESSIVE STRENGTH TO 4000 PSI WITH 6%+/-1% AIR ENTRAINMENT.
8. NO. 4 REBAR (SIZE 1/2") GRADE 60 STEEL PER ASTM A615: CONNECTED WITH TIE WIRE.
9. REBAR TO BE 2-1/2" FROM EDGE OF CONCRETE.
10. REBAR SPACING 12" GRID, 4" SPACING AROUND ACCESS OPENINGS.

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.

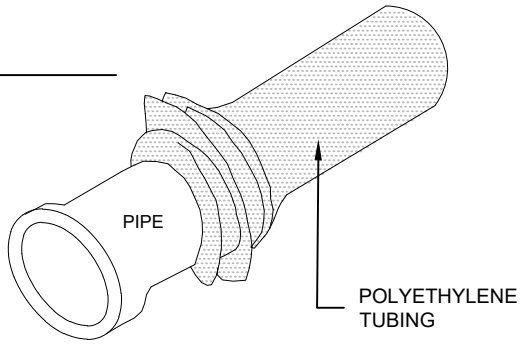
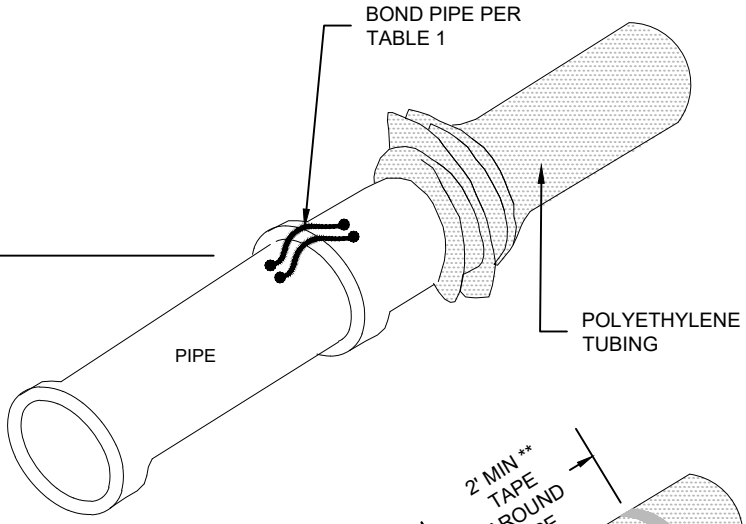


TABLE 1		
SUITABLE CONDUCTOR SIZES FOR JOINT BONDING OF DUCTILE IRON PIPE		
PIPE SIZE (IN)	QUANTITY - SIZE OF BOND	SIZE OF CHARGE (G)
3 TO 14	1 - #8 STRANDED OR SOLID	25
16 to 36	2 - #8 STRANDED OR SOLID	25
	1 - BONDING STRAP	15
42 TO 64	2 - #4 STRANDED OR SOLID	32
	4 - #8 STRANDED OR SOLID	25

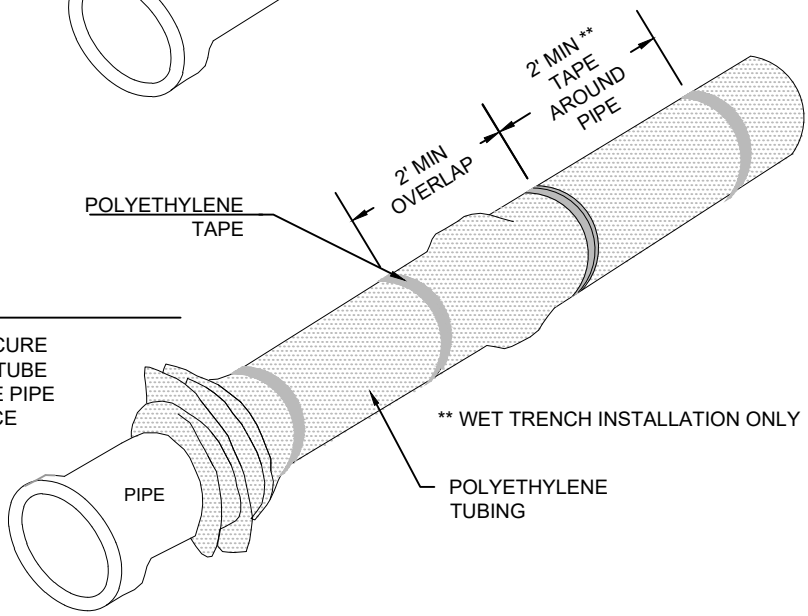
STEP 2:

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.



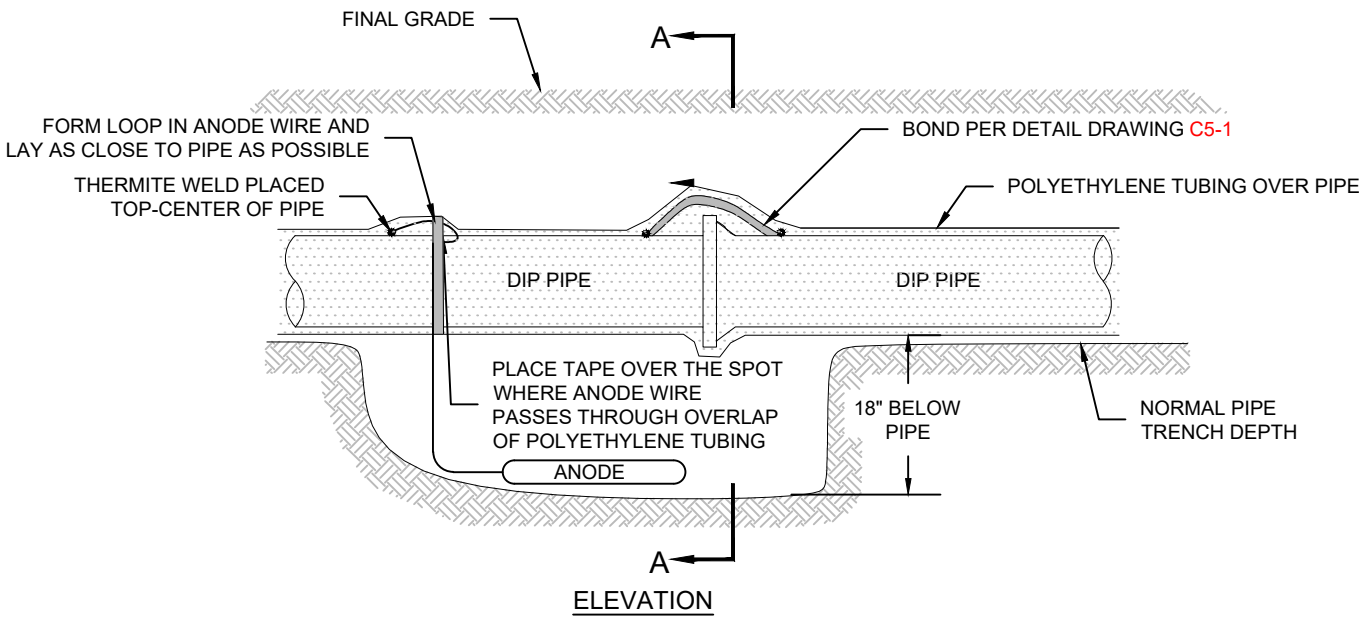
STEP 3:

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

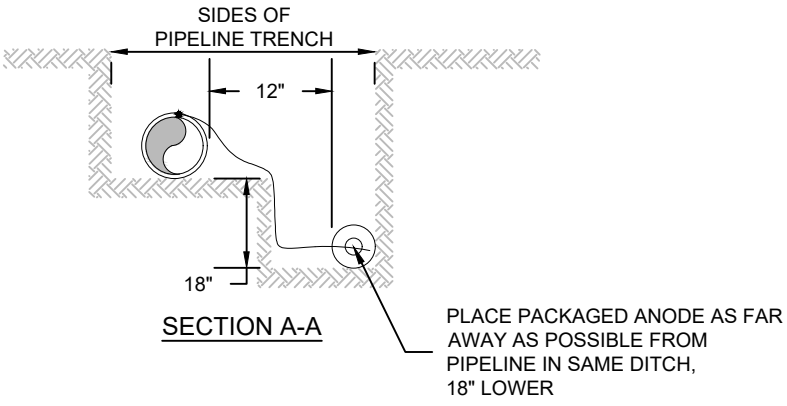


NOTES:

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

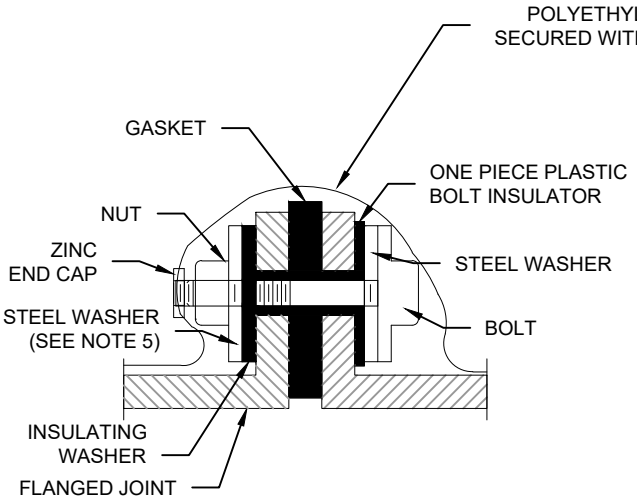


SECTION A-A

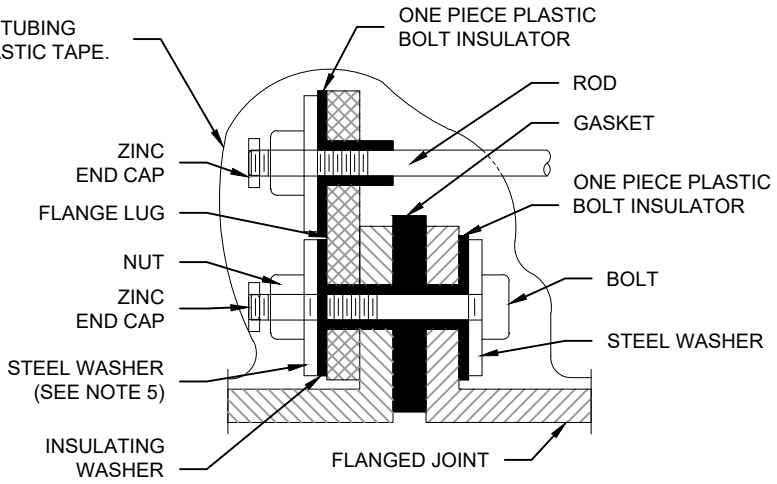
NOTES:

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 C5-1.

Colorado Springs Utilities It's how we're all connected	BONDING JOINT AND ANODE INSTALLATION	C5-2 DATED 5/2015

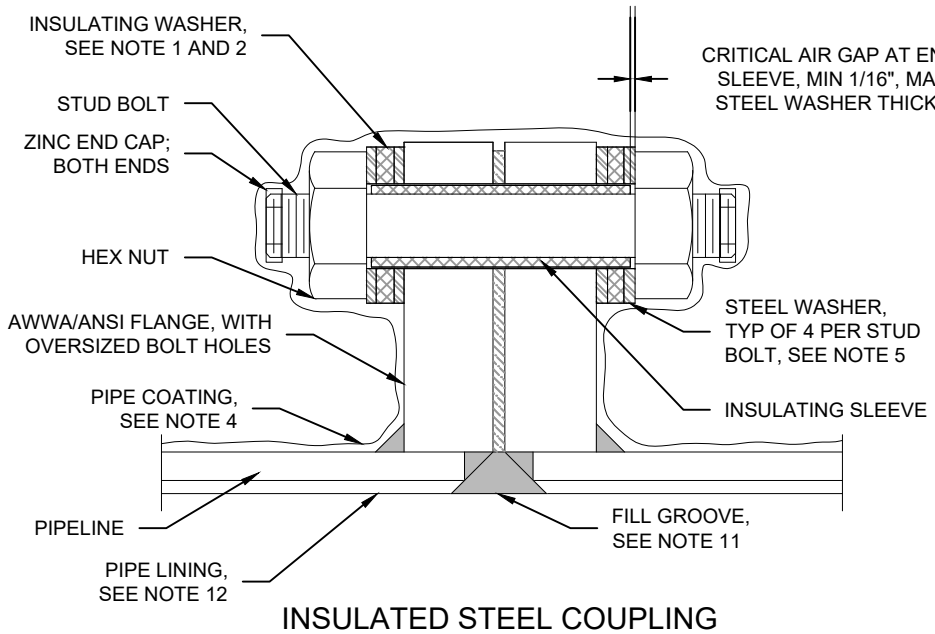


INSULATED FLANGE JOINT



INSULATED TIE BACK ROD

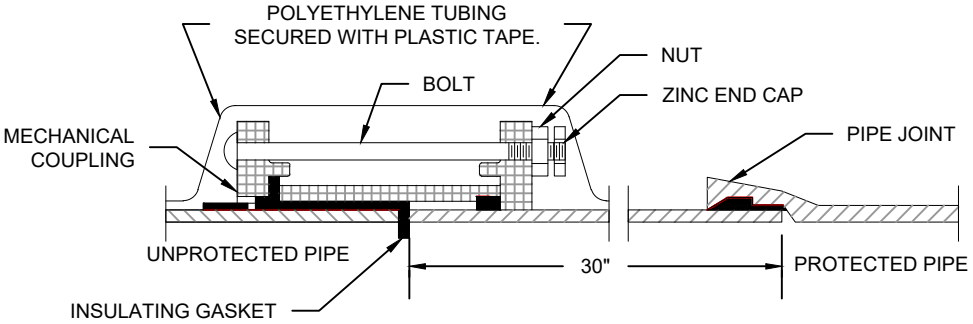
(WITH APPROVAL OF COLORADO SPRINGS UTILITIES)



INSULATED STEEL COUPLING

NOTES:

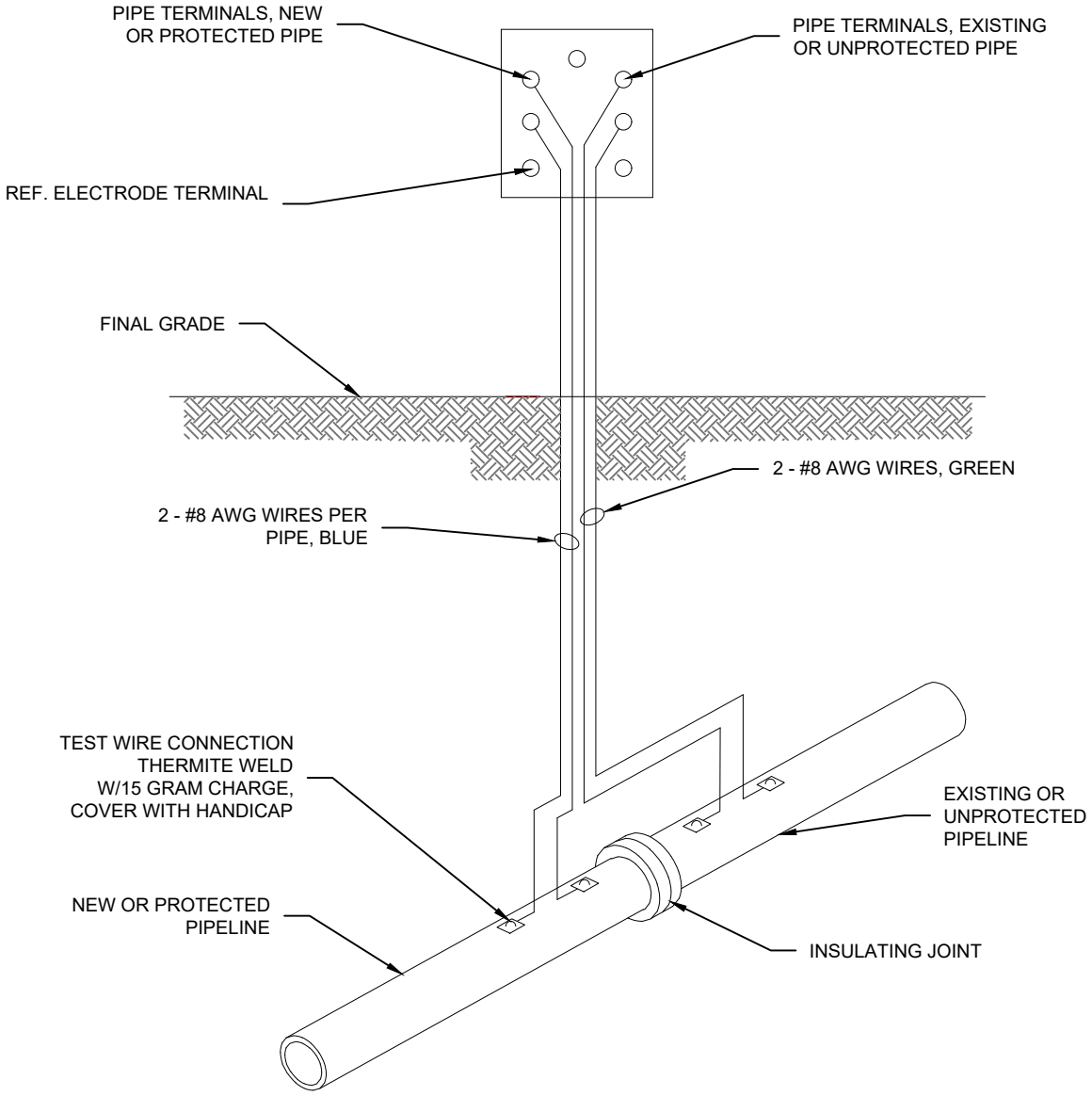
1. PROVIDE INSULATING KIT FOR APPLICABLE FLANGE TYPE AND PRESSURE RATING.
2. INSTALL DOUBLE INSULATING WASHER SET FOR VAULT OR EXPOSED FLANGES.
3. INSTALL SINGLE INSULATING WASHER SET FOR BURIED OR SUBMERGED FLANGES WITH INSULATORS OR WRAP ON UNPROTECTED SIDE OF FLANGE.
4. COAT BURIED OR IMMERSED INSULATING 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 C5-4.
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.



INSULATED MECHANICAL COUPLING

Colorado Springs Utilities It's how we're all connected	INSULATOR INSTALLATION	C5-3 DATED 5/2015

TERMINAL BOARD WIRING DIAGRAM



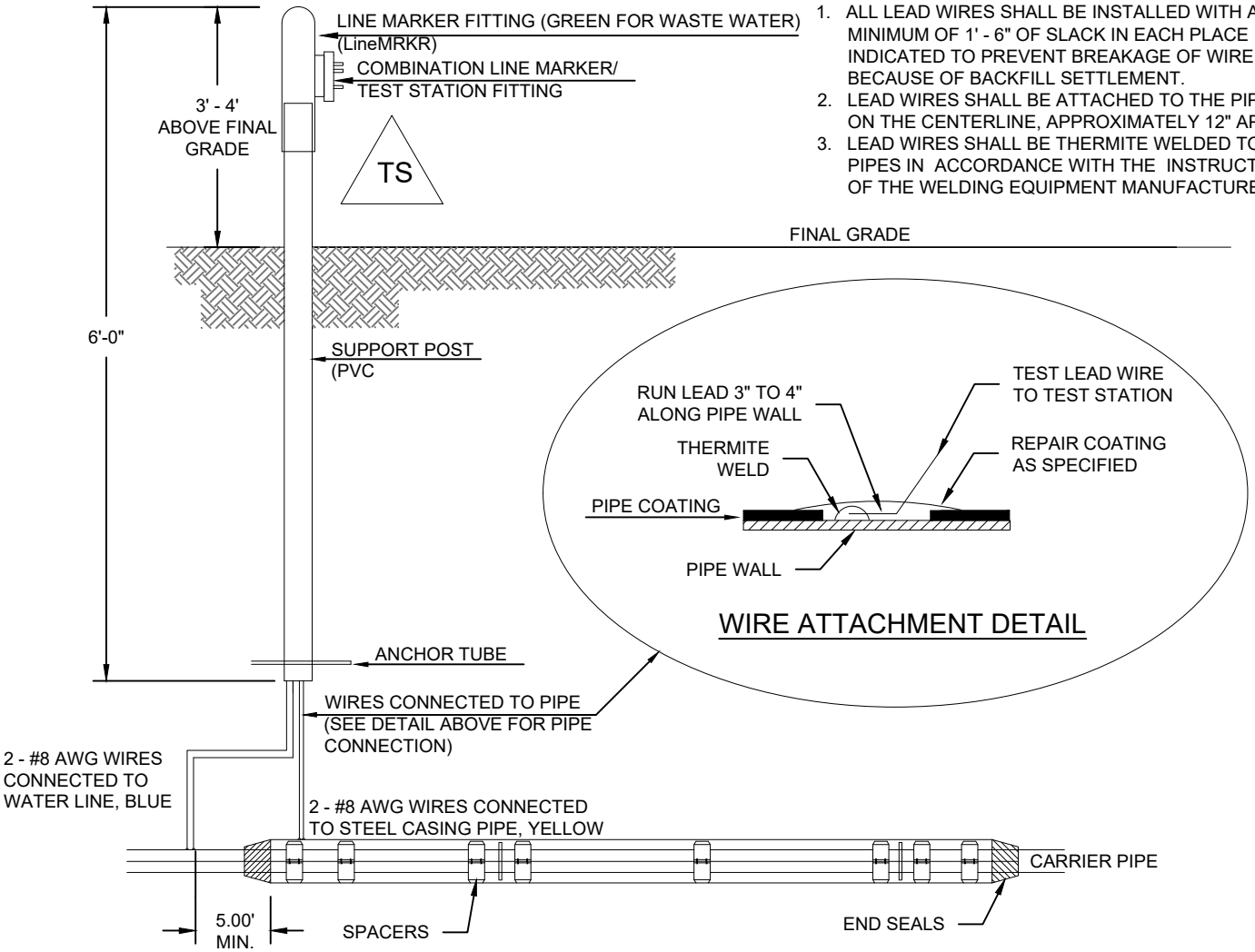
NOTES:

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.

Colorado Springs Utilities It's how we're all connected	INSTALLATION OF CATHODIC PROTECTION TEST STATION AT AN INSULATING JOINT	C5-4 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 WELDED TO PIPES IN ACCORDANCE WITH THE INSTRUCTIONS OF THE WELDING EQUIPMENT MANUFACTURER.

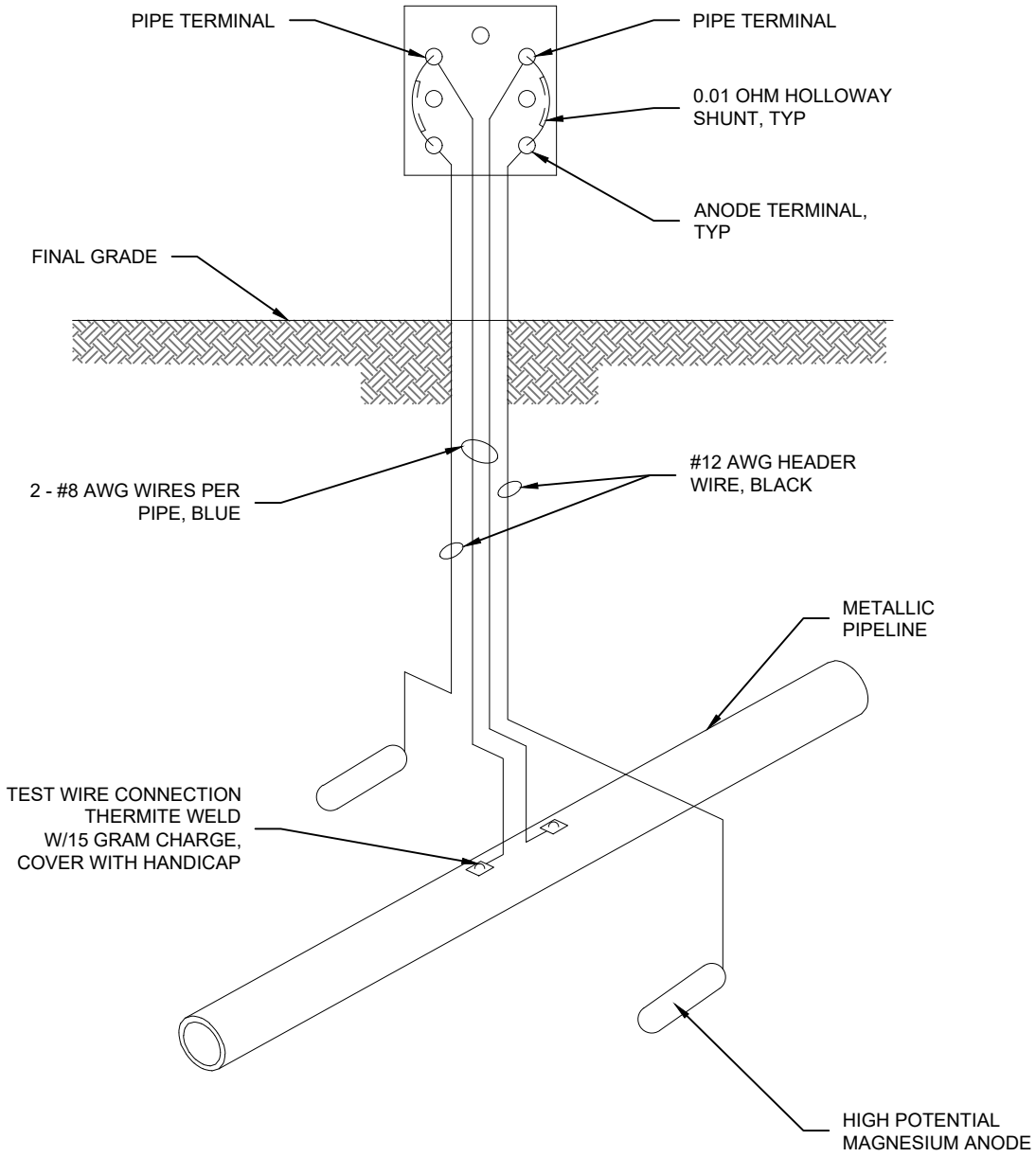


TYPICAL DETAIL FOR TEST STATION WITH STEEL SLEEVE INSTALLATION

NOTES:

1. THE CASING SHALL BE CATHODICALLY PROTECTED UNDER THE DIRECTION OF THE COLORADO SPRINGS UTILITIES INSPECTOR. SEE SECTION 2.5.G.
2. EXAMPLE CAN VARY DUE TO SITE CONDITIONS AND COLORADO SPRINGS UTILITIES INSPECTORS' DIRECTION.
3. SEE STANDARD DETAIL DRAWING C2-4 - STEEL CASING INSTALLATION.
4. CONTRACTOR TO COORDINATE W/ COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
5. THERMITE WELD WIRES TO PIPE W/ 15 GRAM CHARGE. INSTALL COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
6. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
7. CONTRACTOR TO VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.

TERMINAL BOARD WIRING DIAGRAM

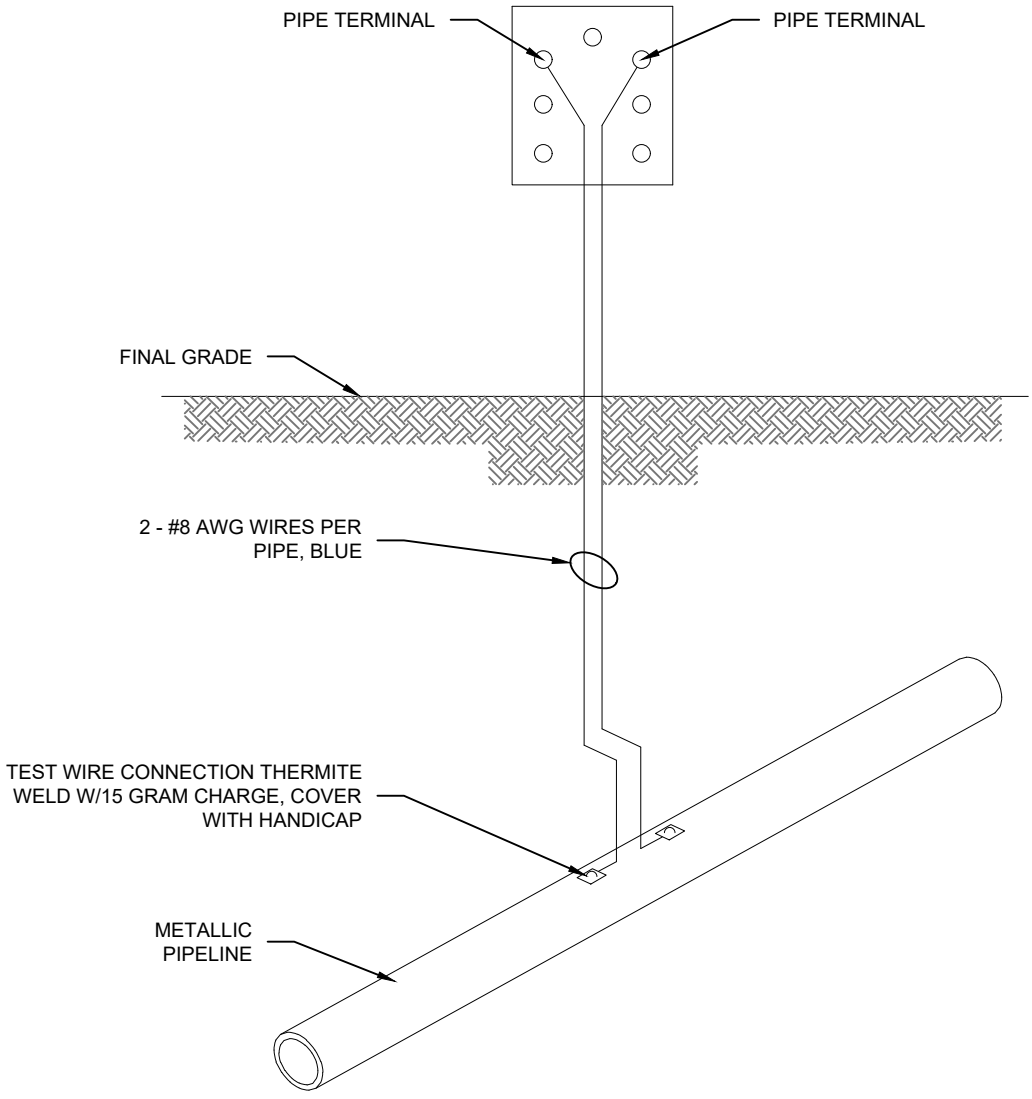


NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO PIPE WITH A 15 GRAM CHARGE. 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. 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	C5-6 DATED 07/2022

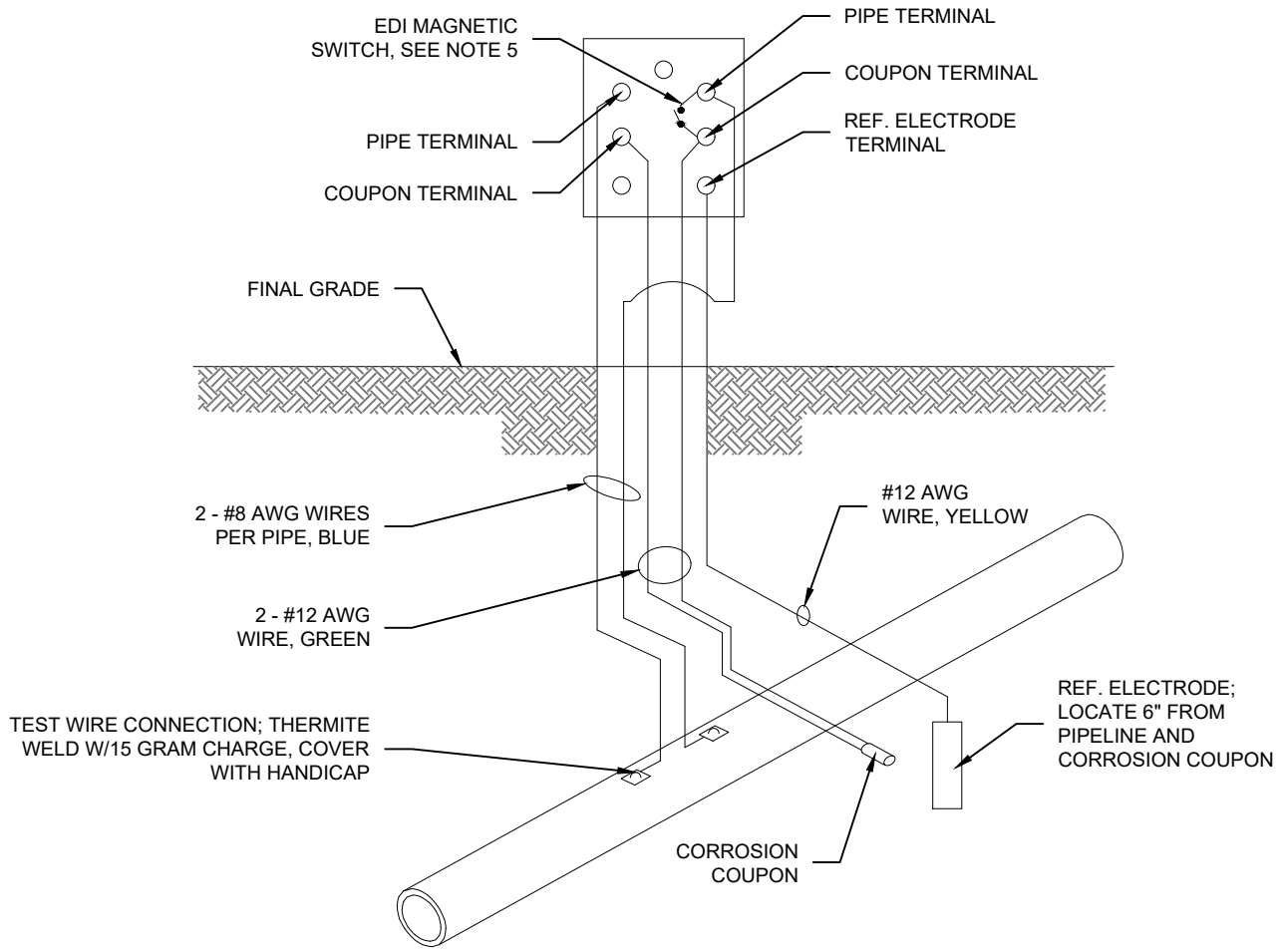
TERMINAL BOARD WIRING DIAGRAM



NOTES:

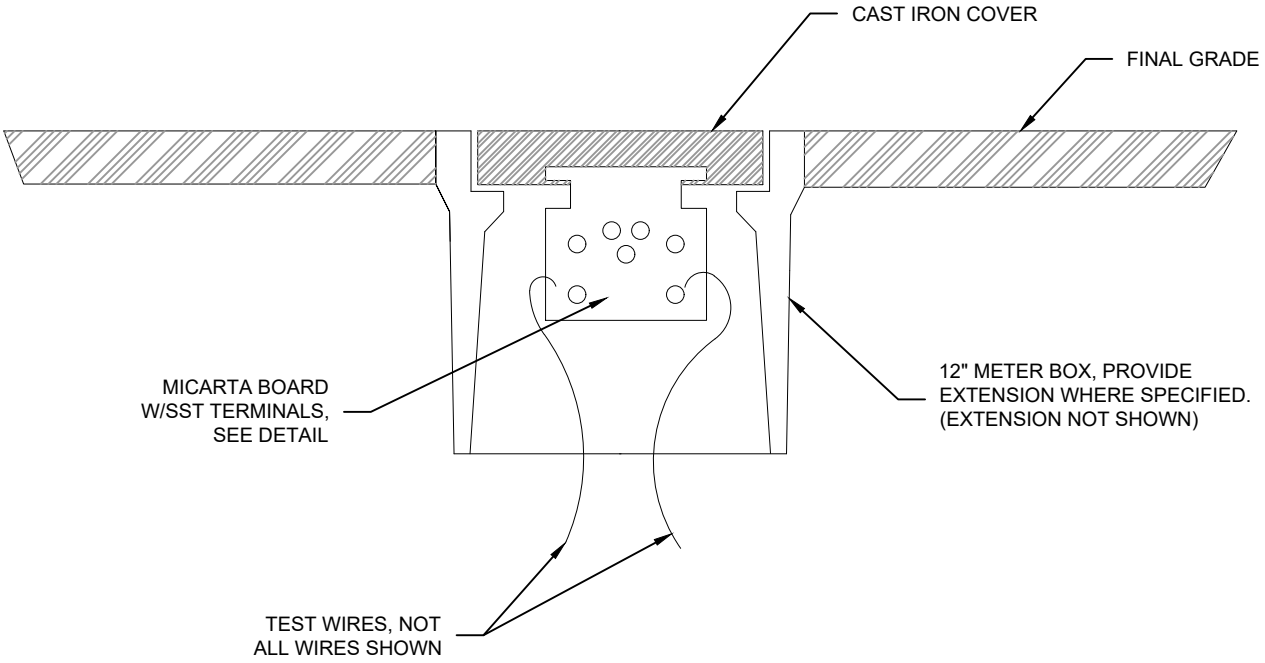
1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO PIPE WITH A 15 GRAM CHARGE. INSTALL A COPPER SLEEVE WHEN WIRE IS #10 AWG OR SMALLER.
3. THERMITE WELD CONNECTIONS AND ANY BARE METAL SHALL BE COVERED WITH PRIMERLESS HANDICAP OR CORROSION TAPE.
4. THE CONTRACTOR SHALL VERIFY CONTINUITY OF ALL WIRES TO TERMINAL BOARD PRIOR TO FINAL ACCEPTANCE.

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. 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.
5. REMOVE MAGNETIC SWITCH FOR A REMOTE TERMINAL UNIT (RTU).

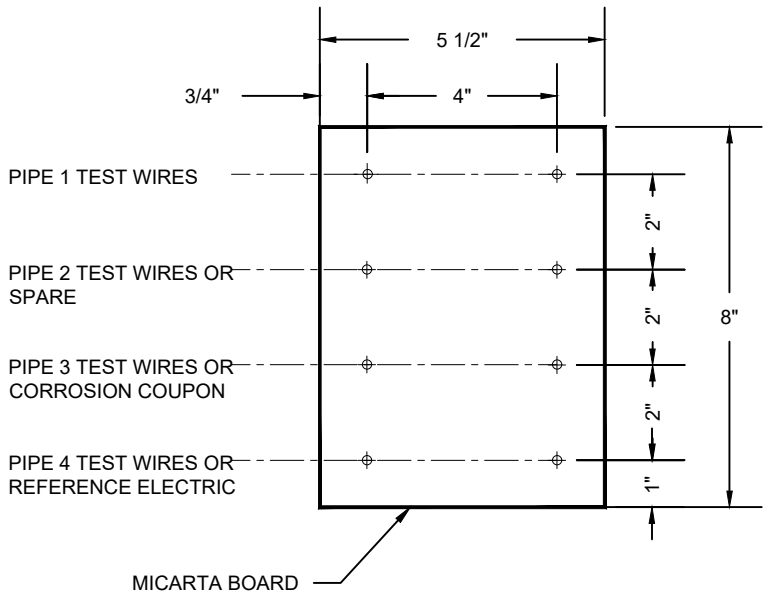


NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH COLORADO SPRINGS UTILITIES TO WIRE TERMINAL BOARD.
2. THERMITE WELD WIRES TO 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.
5. COLOR CODE WIRE INSULATION AS SHOWN IN APPLICABLE TEST STATION DETAILS. CONNECT EACH TEST WIRE TO SEPARATE TERMINAL.
6. WIRE CONFIGURATION FOR FLUSH MOUNT STYLE TEST STATIONS SIMILAR TO POST MOUNT STYLE TEST STATIONS.
7. 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.

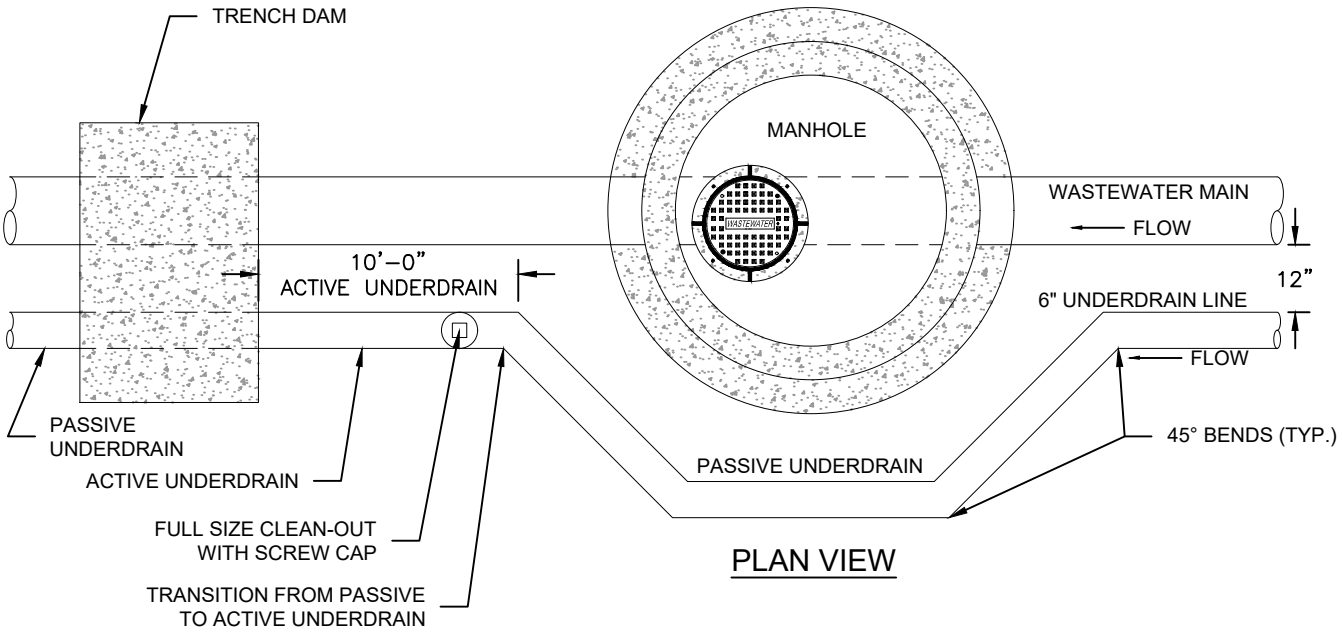


Colorado Springs Utilities
It's how we're all connected

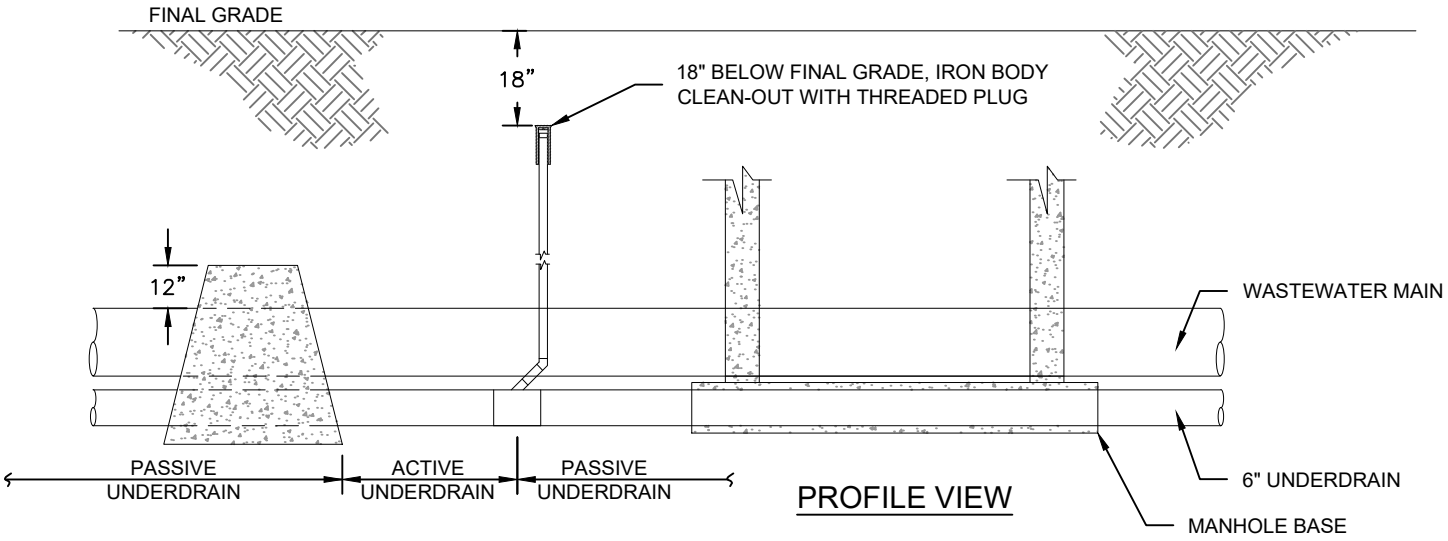
TEST STATION
FLUSH MOUNT

C5-9

DATED 5/2015



PLAN VIEW



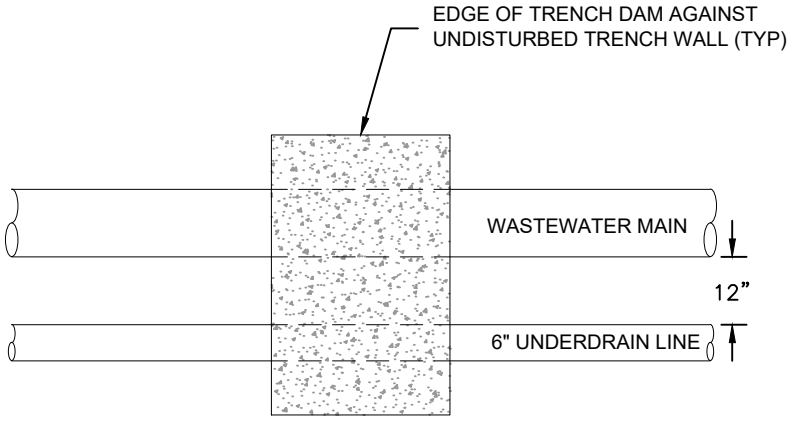
PROFILE VIEW

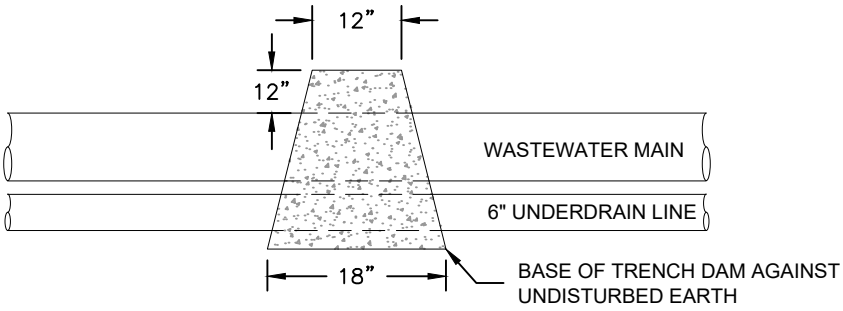
Colorado Springs Utilities
It's how we're all connected

PASSIVE GROUNDWATER UNDERDRAIN SCHEMATIC

C6–1

DATED 5/2015





NOTES:

1. TRENCH DAMS ARE REQUIRED AT THE TRANSITION FROM ACTIVE UNDERDRAINS TO PASSIVE UNDERDRAINS.

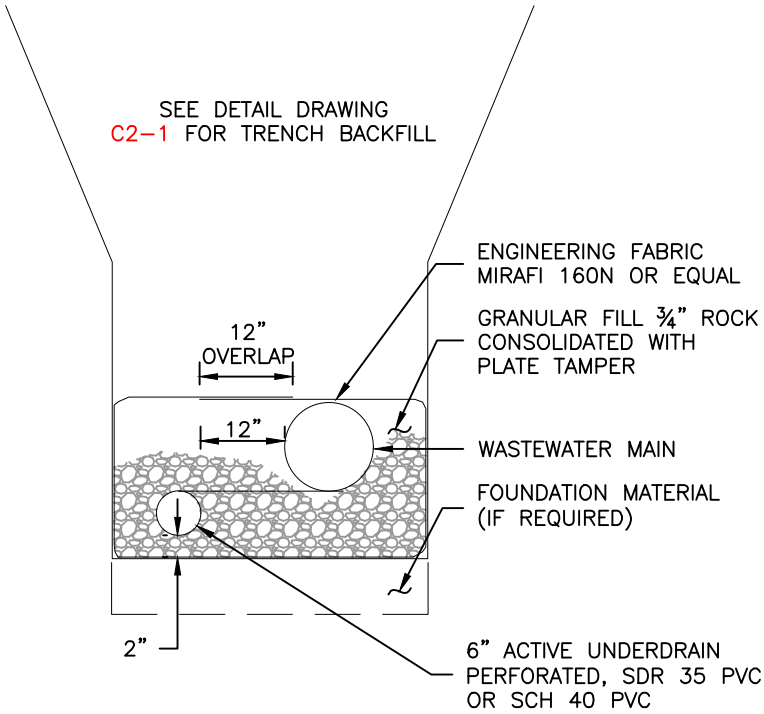
Colorado Springs Utilities
It's how we're all connected

UNDERDRAIN TRENCH DAM

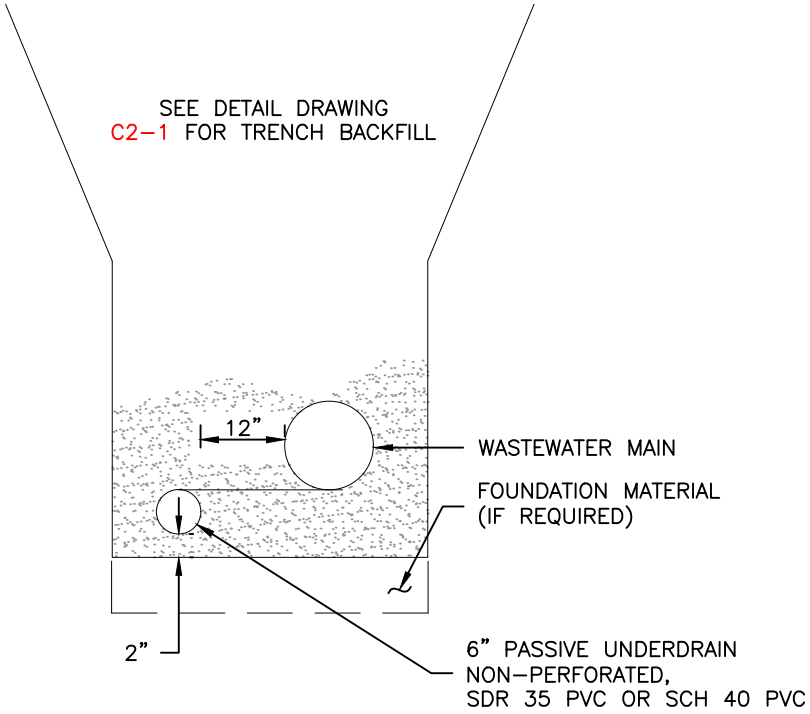
C6–2

DATED 5/2015

ACTIVE UNDERDRAIN PIPE



PASSIVE UNDERDRAIN PIPE



NOTES:

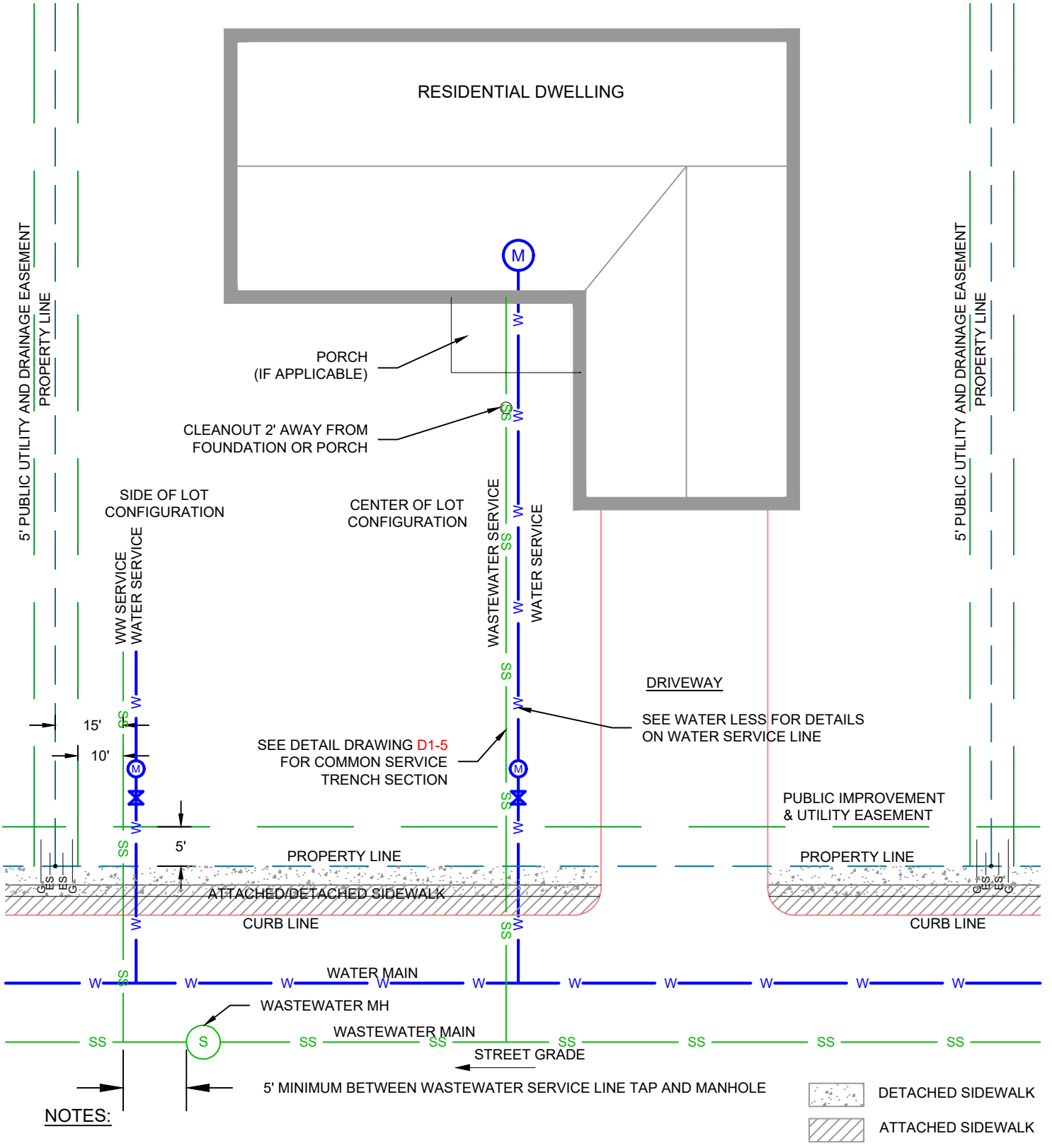
1. ACTIVE UNDERDRAIN PIPE REQUIRED FOR 10' DOWNSTREAM OF EACH MANHOLE WHERE UNDERDRAINS ARE INSTALLED.

Colorado Springs Utilities
It's how we're all connected

PREFERRED COMMON TRENCH
UNDERDRAIN WITH WASTEWATER MAIN

C6–3

DATED 5/2015



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 OUT OF THE DRIVEWAY WHEN THE CENTER-OF-LOT CONFIGURATION IS CHOSEN, 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 WATER LESS DETAIL DRAWING B2-3.

Colorado Springs Utilities
It's how we're all connected

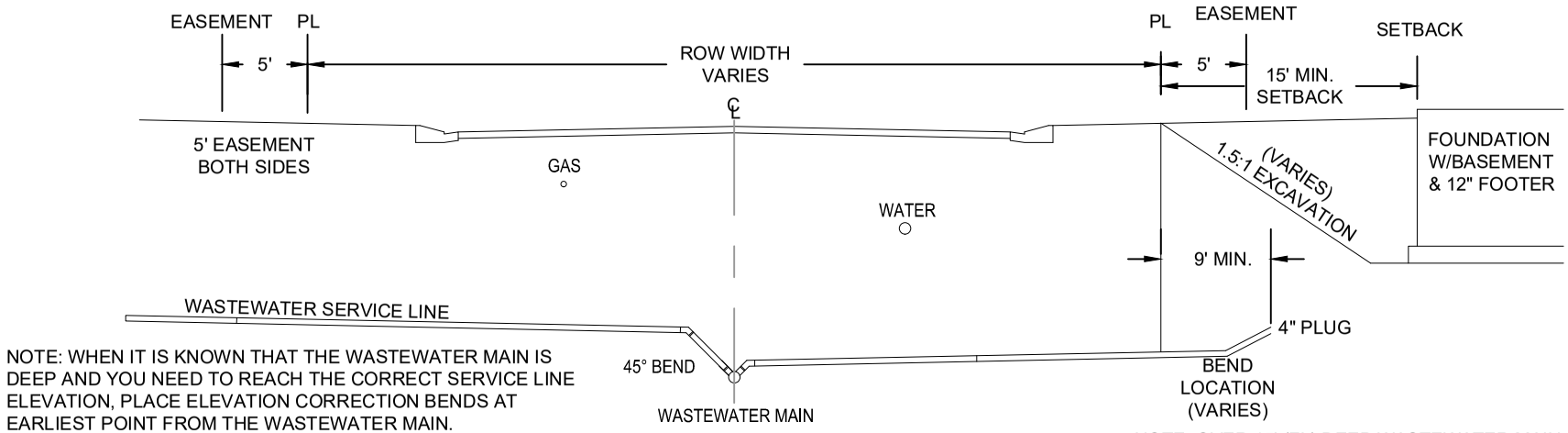
TYPICAL SERVICE LOCATIONS TO A RESIDENTIAL DWELLING

D1-1

DATED 5/2015

Colorado Springs Utilities

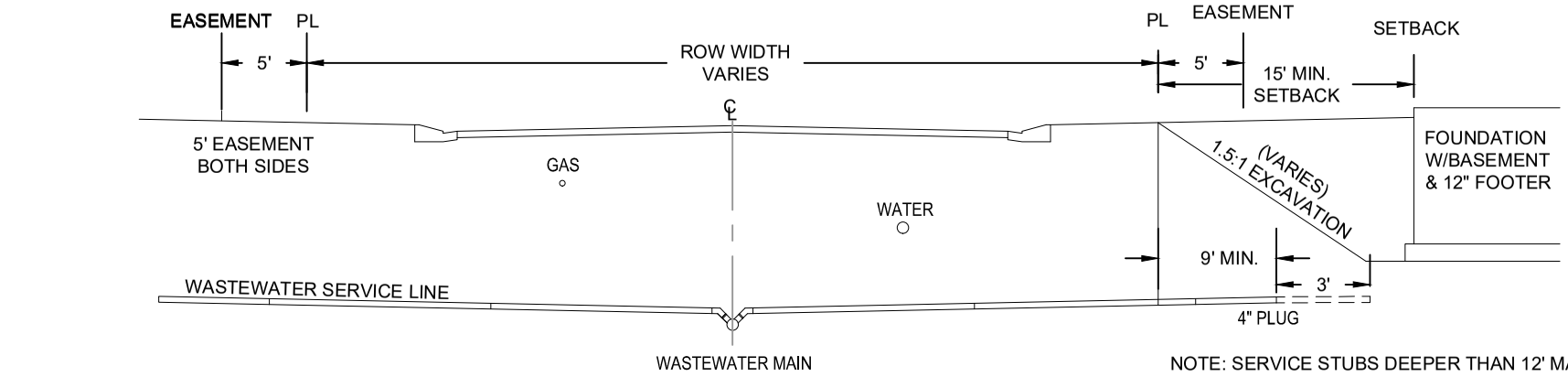
EXAMPLE OF A SERVICE WITH A BASEMENT



NOTE: WHEN IT IS KNOWN THAT THE WASTEWATER MAIN IS DEEP AND YOU NEED TO REACH THE CORRECT SERVICE LINE ELEVATION, PLACE ELEVATION CORRECTION BENDS AT EARLIEST POINT FROM THE WASTEWATER MAIN.

NOTE: OVER 15' (FL) DEEP WASTEWATER MAIN USE 45° BEND INSTEAD OF 22.50° BEND

EXAMPLE WASTEWATER SERVICE CONNECTION DETAIL WITH OPTIONAL BENDS



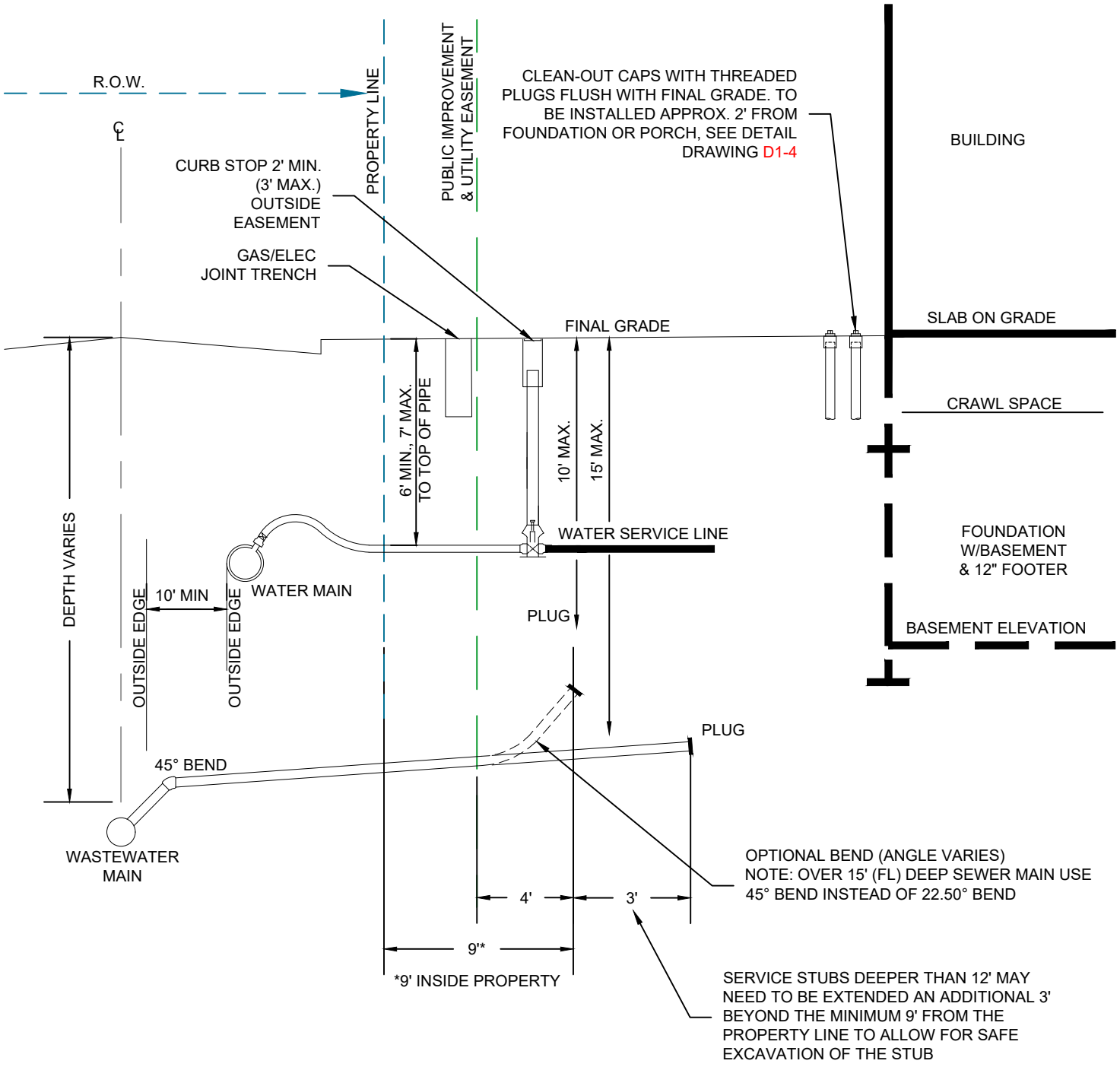
NOTE: SERVICE STUBS DEEPER THAN 12' MAY NEED TO BE EXTENDED AN ADDITIONAL 3' BEYOND THE MINIMUM 9' FROM THE PROPERTY LINE TO ALLOW FOR SAFE EXCAVATION OF THE STUB

EXAMPLE WASTEWATER SERVICE CONNECTION DETAIL WITHOUT OPTIONAL BENDS

NOTES:

1. SERVICE LINE MAY VARY IN DEPTH DUE TO SITE CONDITIONS OR THE CONSTRUCTION OF CRAWL SPACE/BASEMENT UNDER THE HOUSE.
2. DEPTH OF SERVICE LINE TO BE LABELED ON CONSTRUCTION PLANS WHEN KNOWN.
3. DIMENSIONS MAY VARY ACCORDING TO WIDTH OF RIGHT OF WAY (ROW).

DATED 5/2015



NOTES:

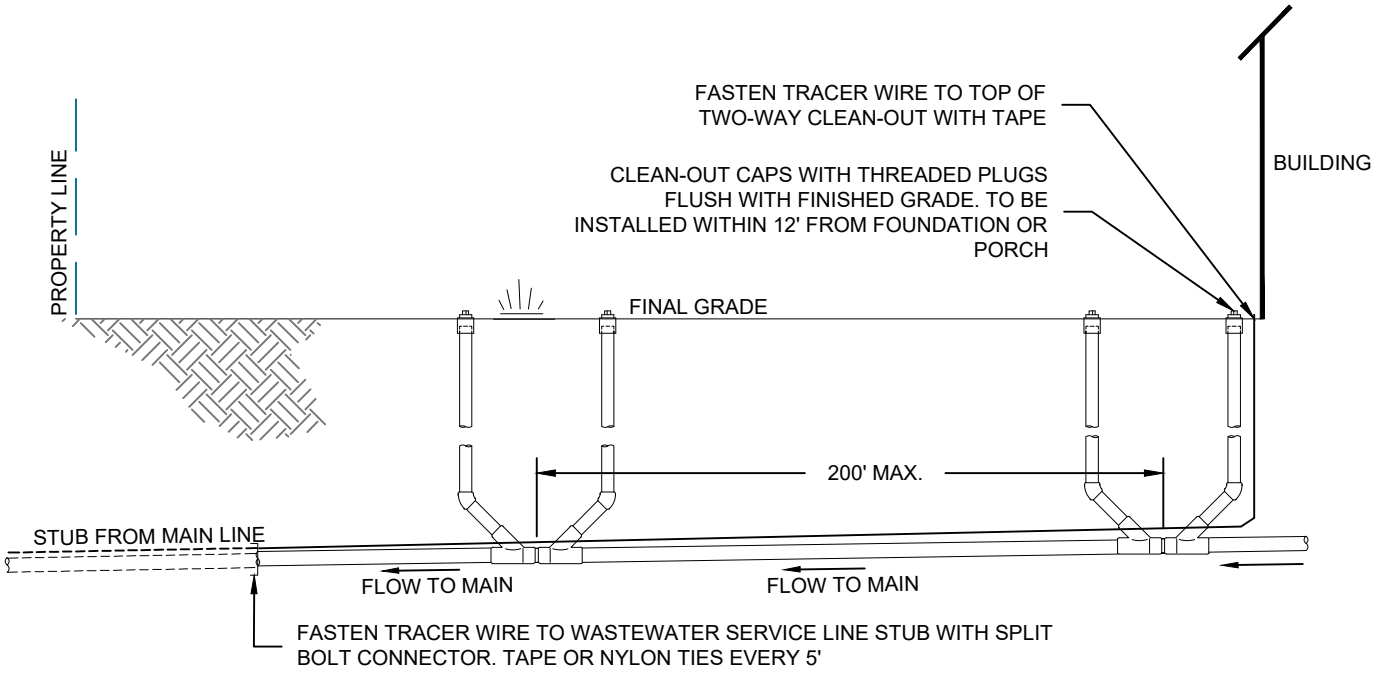
1. SEE CHAPTER 2 FOR MINIMUM SLOPES OF WASTEWATER SERVICE LINES.
2. TO BE READ IN CONJUNCTION WITH DETAIL DRAWINGS D1-1 AND D1-2.
3. A BEND MAY BE USED TO EXTEND THE SERVICE LINE UPWARD, DEPENDING ON BUILDING FINISHED FLOOR OR BASEMENT ELEVATION AND PER PROPERTY OWNER/DEVELOPERS' DISCRETION.
4. FOR BASEMENT, THE SERVICE LINE SHALL BE EXTENDED TO DRAIN THE FINISHED FLOOR ELEVATION, A BEND MAY BE UTILIZED, SEE DETAIL DRAWING D1-2.
5. SLOPING, BENCHING AND SHORING SHALL BE PERFORMED FOR ALL EXCAVATIONS IN COMPLIANCE WITH OSHA REGULATIONS.
6. WHERE UNDERDRAIN SERVICE LINES ARE INSTALLED WITH THE WASTEWATER SERVICE LINE, BOTH SHALL BE BROUGHT TO THE SAME ELEVATION ONCE ENTERING THE PROPERTY.

Colorado Springs Utilities
It's how we're all connected

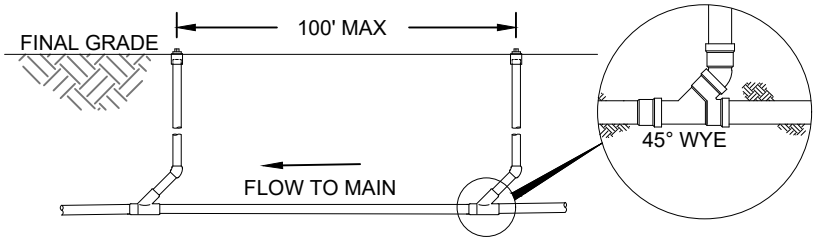
SCHEMATIC OF A DEEP SERVICE CONNECTION

D1-3

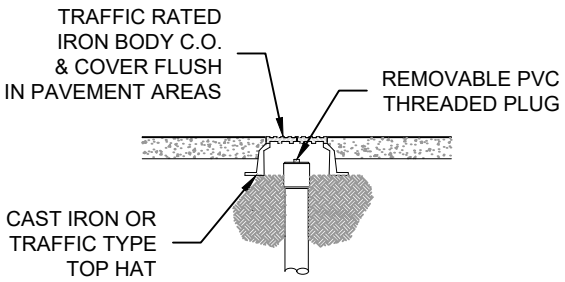
DATED 5/2015



TWO-WAY CLEAN-OUT INSTALLATION



SINGLE CLEAN-OUT INSTALLATION

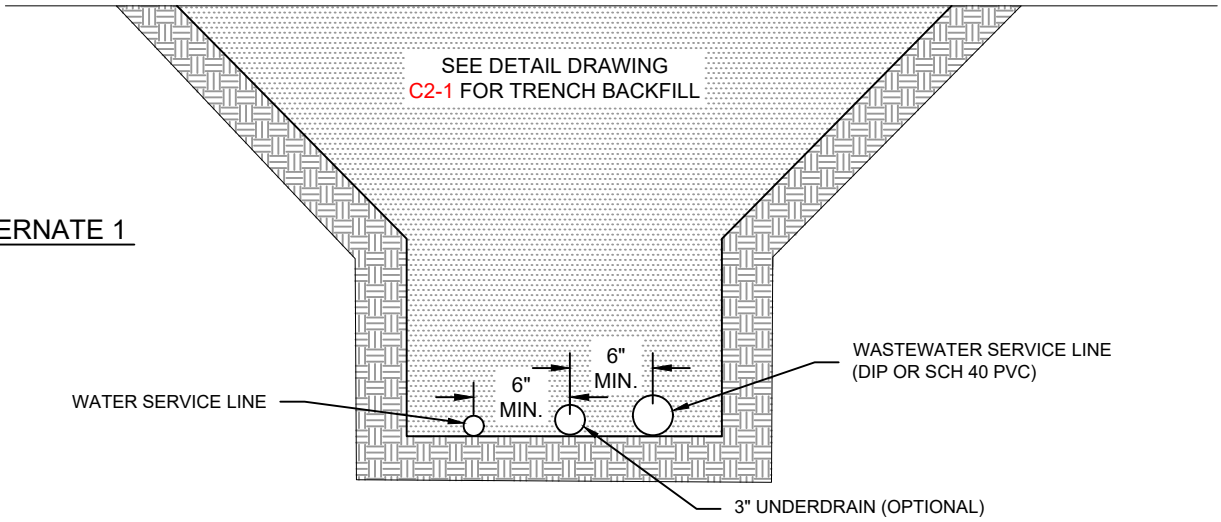


CLEAN-OUT INSTALLATION IN PAVEMENT

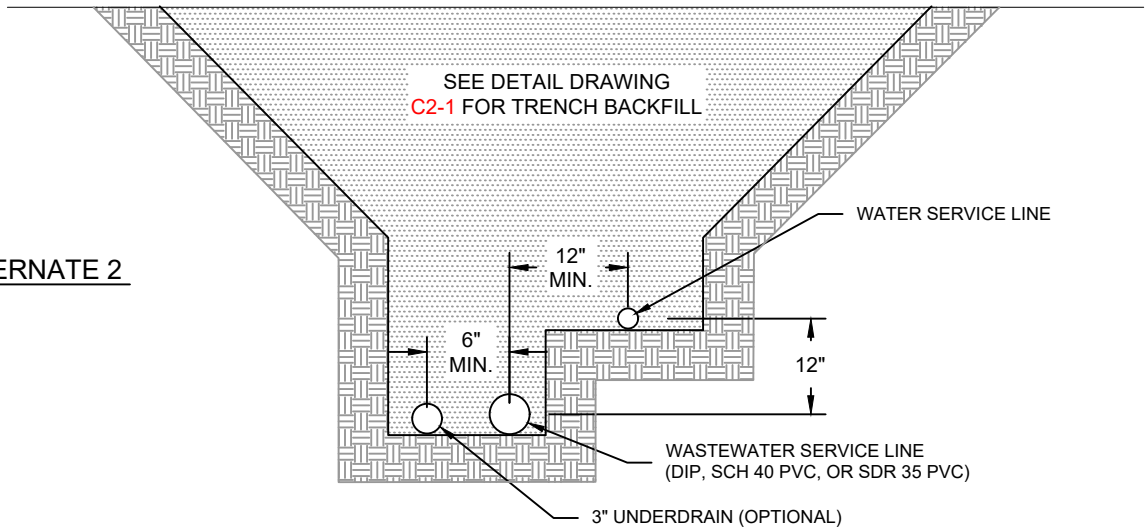
NOTES:

1. SINGLE CLEAN-OUT TO BE PLACED AT 100' INTERVALS, TWO-WAY CLEAN-OUTS AT 200' INTERVALS (100' EACH WAY CLEANING).
2. TRACER WIRE TO BE CONTINUOUSLY CONNECTED FROM THE MAIN LINE TO THE CLEAN-OUT LOCATED AT THE BUILDING.

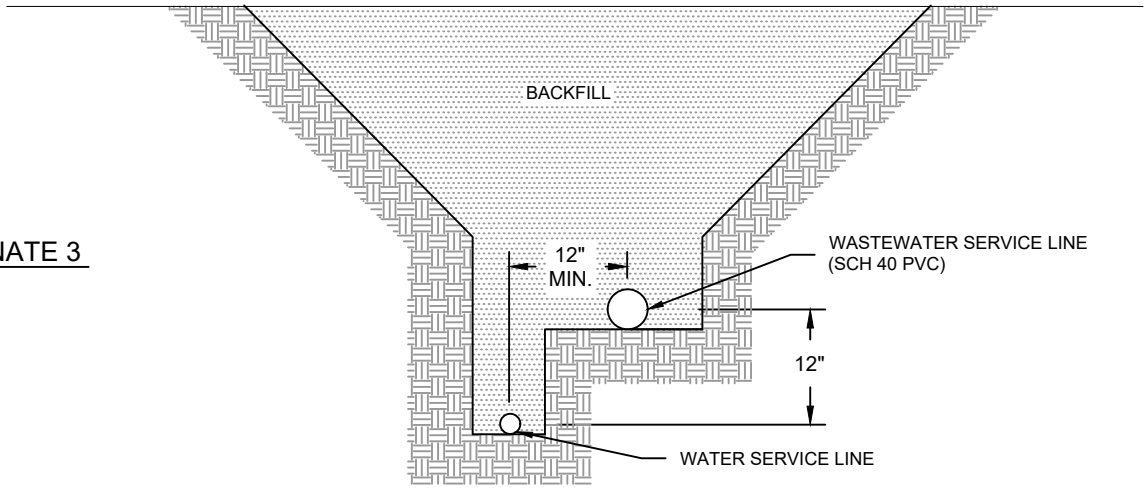
ALTERNATE 1



ALTERNATE 2



ALTERNATE 3

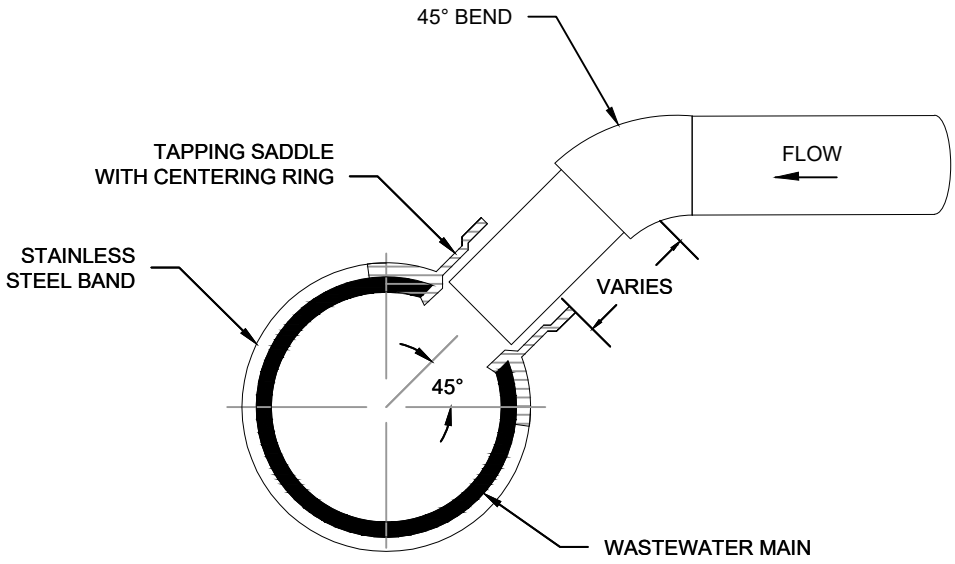


Colorado Springs Utilities
It's how we're all connected

TYPICAL COMMON SERVICE TRENCH SECTION

D1-5

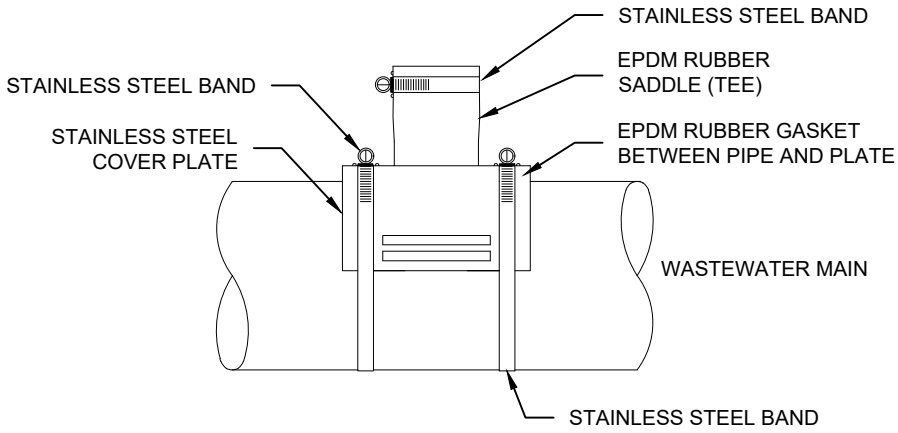
DATED 07/2022



TYPICAL WASTEWATER SERVICE TAPPING SADDLE

NOTES:

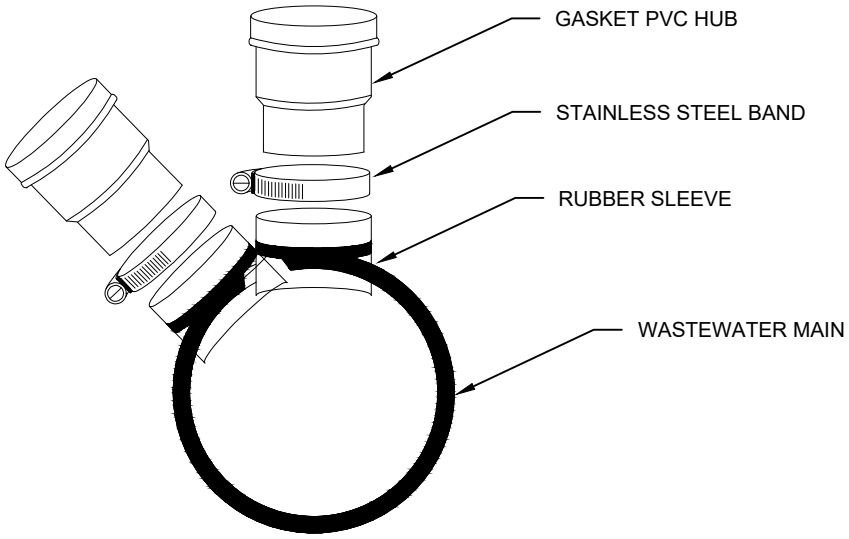
1. WHEN THE WASTEWATER MAIN IS VCP, USE THE SDR 35 PVC SADDLE WITH A LARGER SKIRT. SADDLE SHALL BE ONE NOMINAL SIZE LARGER THAN THE WASTEWATER MAIN.
2. PIPE WILL BE CUT WITH AN O.D. HOLE SAW OR TAPPING MACHINE. A 4-1/2" O.D. HOLE SAW SHALL BE USED FOR 4" TAPS AND A 6-1/2" O.D. HOLE SAW SHALL BE USED FOR 6" TAPS.
3. ONLY 4" AND 6" TAP SIZES ARE ALLOWED.
4. WASTEWATER TAPPING SADDLES SHALL HAVE A CENTERING RING.
5. A GASKET SHALL BE USED TO ENSURE AN AIRTIGHT SEAL BETWEEN THE SADDLE AND THE PIPE.



RUBBER GASKET SADDLE - 4" & 6"

RUBBER GASKET NOTE:

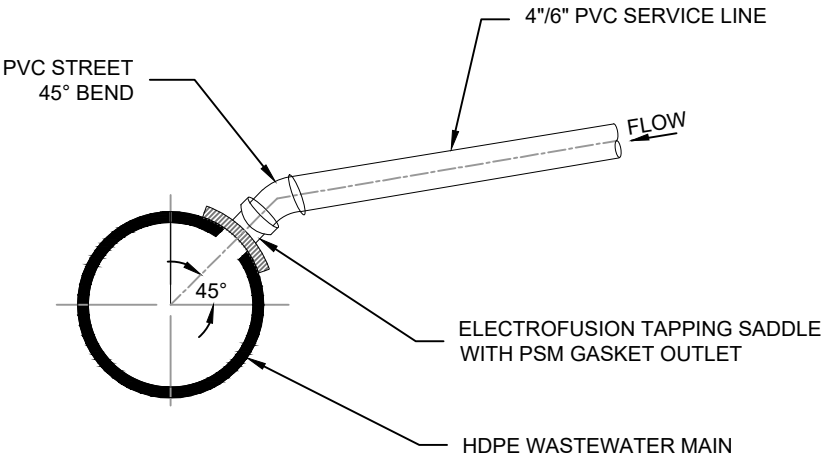
1. ALL ELASTOMERIC SEALS (RUBBER GASKETS) SHALL COMPLY WITH ASTM F477.
2. PIPE WILL BE CUT WITH AN O.D. HOLE SAW OR TAPPING MACHINE. A 4-1/2" O.D. HOLE SAW SHALL BE USED FOR 4" TAPS AND A 6-1/2" O.D. HOLE SAW SHALL BE USED FOR 6" TAPS.



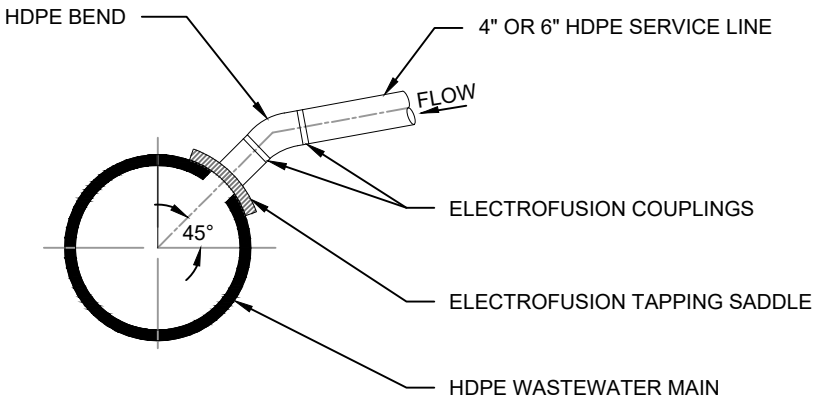
3 PIECE TAPPING SERVICE CONNECTION

3 PIECE TAP NOTES:

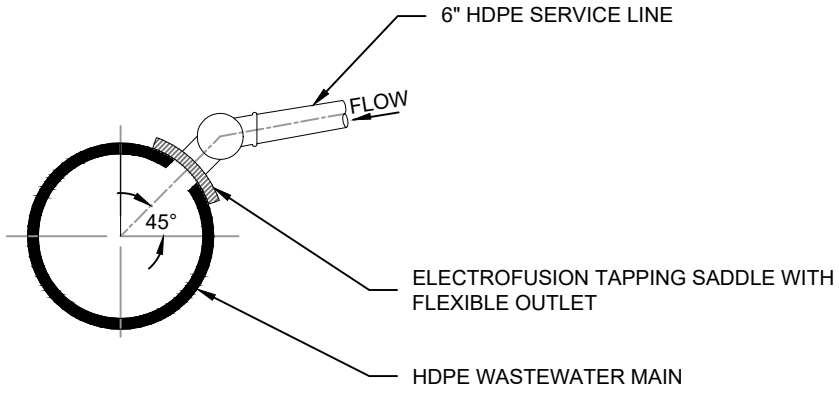
1. 3 PIECE TAPS MAY BE ALLOWED ON WASTEWATER MAINS WITH APPROVAL FROM COLORADO SPRINGS UTILITIES. 3 PIECE TAPS SHOULD ONLY BE USED FOR WASTEWATER MAINS GREATER THAN 12".
2. THE CONTRACTOR SHALL ENSURE THAT THE CORRECT 3 PIECE TAP HAS BEEN ORDERED TO FIT THE MATERIAL AND DIAMETER OF THE MAIN AND THE MATERIAL AND DIAMETER OF THE TAP. THE 3 PIECE TAP SHALL BE PROVIDED TO THE INSPECTOR FOR APPROVAL PRIOR TO INSTALLATION.
3. 3 PIECE TAPS FOR WASTEWATER MAINS 12" AND LESS WILL REQUIRE THAT THE SERVICE BE CCTV'D AFTER BACKFILL OF THE SERVICE LINE. IF THE INSERT PROTRUDES INTO THE WASTEWATER MAIN GREATER THAN 1/4", THEN THE TAP WILL BE REJECTED AND WILL NEED TO BE REMOVED, REINSTALLED AND RE-CCTV'D.



PVC SERVICE LINE TO HDPE WASTEWATER MAIN



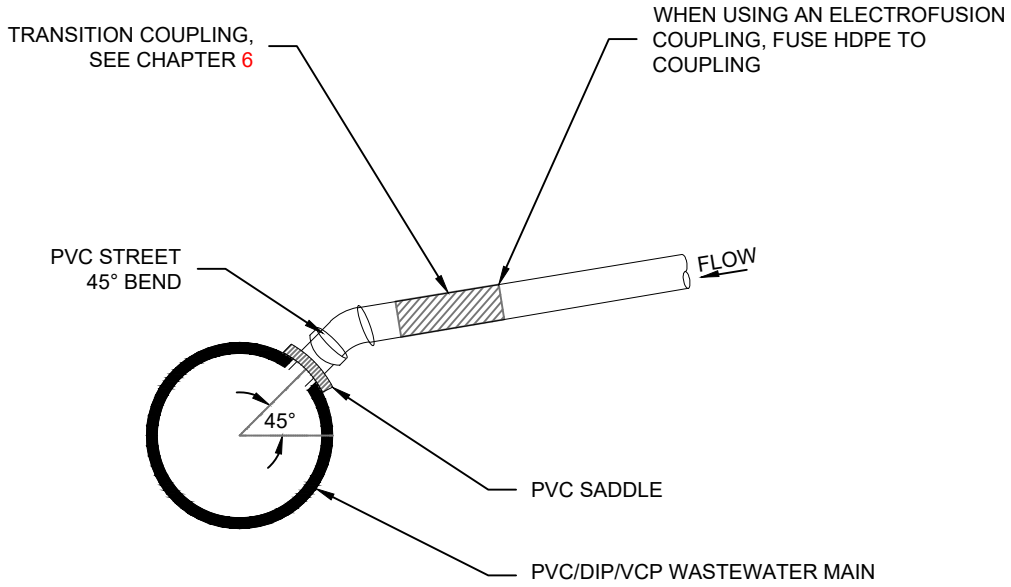
4" OR 6" HDPE SERVICE LINE TO HDPE WASTEWATER MAIN



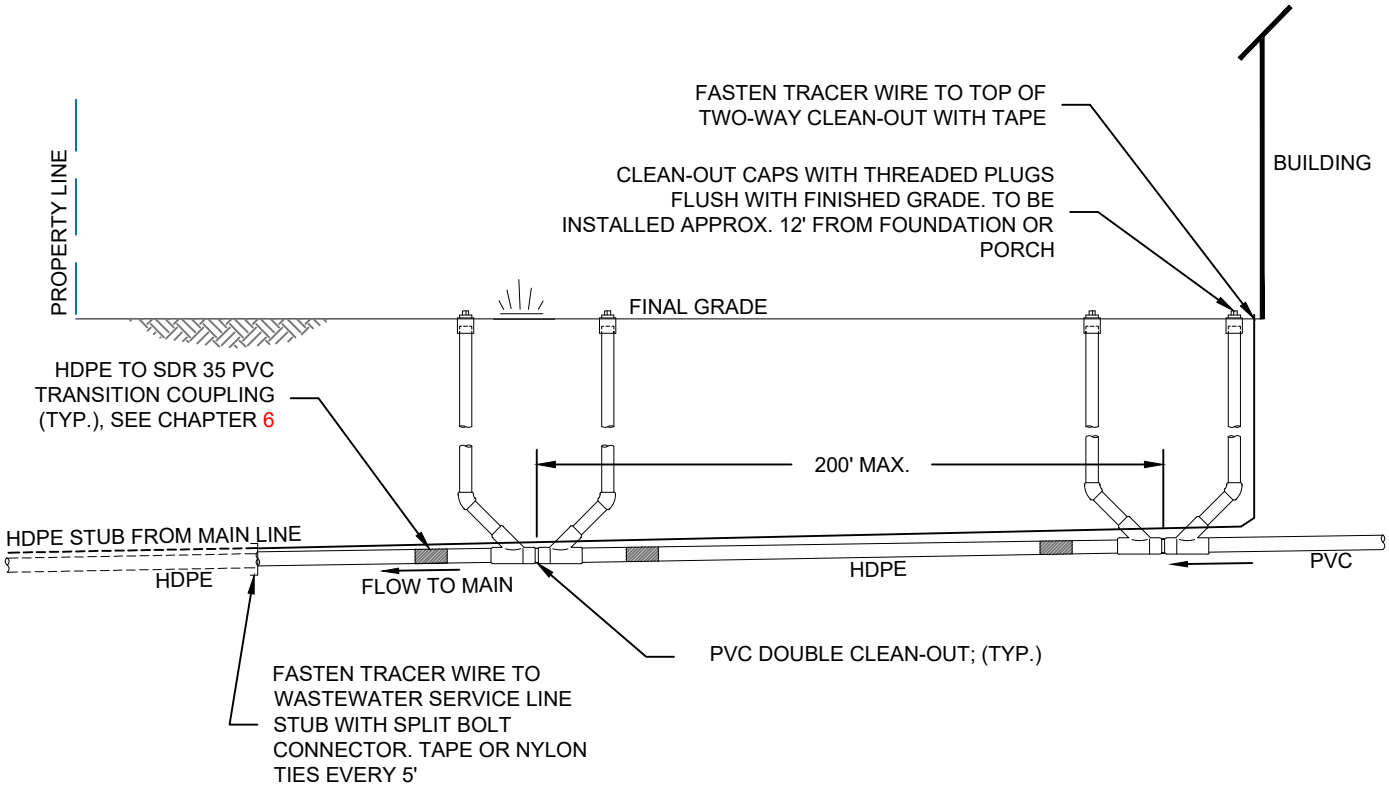
OPTION FOR 6" HDPE SERVICE LINE TO HDPE WASTEWATER MAIN

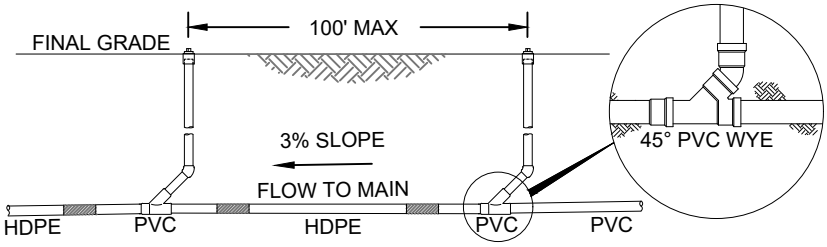
NOTES:

1. CONNECTION FROM HDPE TO HDPE CAN BE ACCOMPLISHED USING BUTT FUSION OR ELECTROFUSION COUPLINGS.

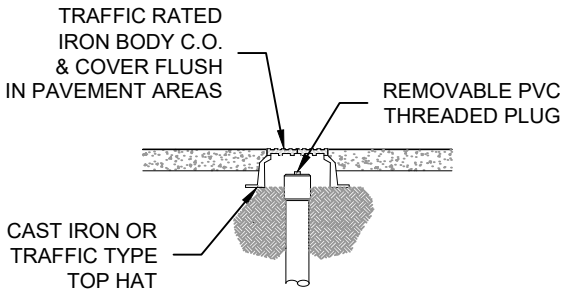


HDPE SERVICE LINE TO PVC/DIP/VCP WASTEWATER MAIN





SINGLE CLEAN-OUT INSTALLATION



CLEAN-OUT INSTALLATION IN PAVEMENT

NOTES:

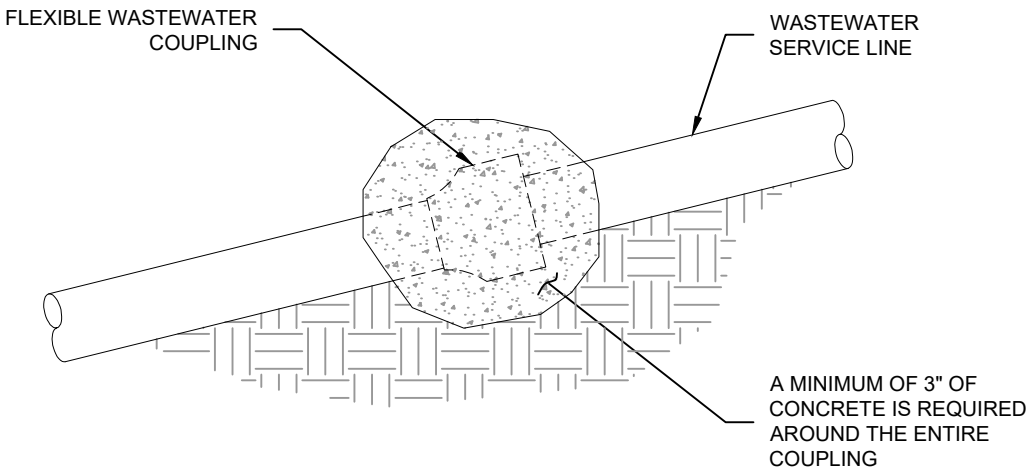
1. SINGLE CLEAN-OUT TO BE PLACED AT 100' INTERVALS, TWO-WAY CLEAN-OUTS AT 200' INTERVALS (100' EACH WAY CLEANING).
2. TRACER WIRE TO BE CONTINUOUSLY CONNECTED FROM THE MAIN LINE TO THE CLEAN-OUT LOCATED AT THE BUILDING.
3. SEE CHAPTER 2 FOR MINIMUM SLOPES OF HDPE WASTEWATER SERVICE LINES.

Colorado Springs Utilities
It's how we're all connected

TYPICAL HDPE WASTEWATER SERVICE LINE CLEAN-OUT DETAIL

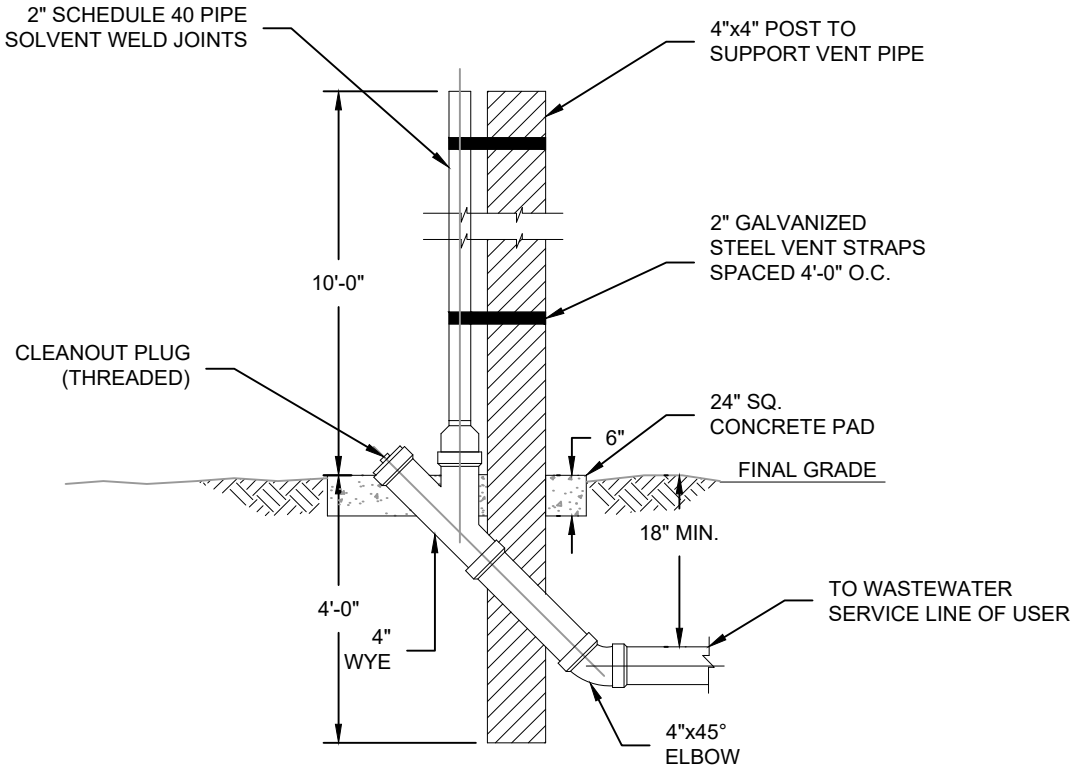
D1-10

DATED 5/2015



NOTES:

1. IF THE FLEXIBLE COUPLING IS "SHIELDED" VARIETY PER CHAPTER 4, NO CONCRETE IS REQUIRED AROUND THE COUPLING.



CLEAN-OUT & VENT

NOTES:

1. THIS DRAWING IS FOR RESIDENTIAL HOME OWNERS WHO WANT TO HAVE A CONNECTION TO THEIR SERVICE LINE.

Colorado Springs Utilities
It's how we're all connected

TYPICAL RECREATIONAL VEHICLE
DUMP STATION DETAIL

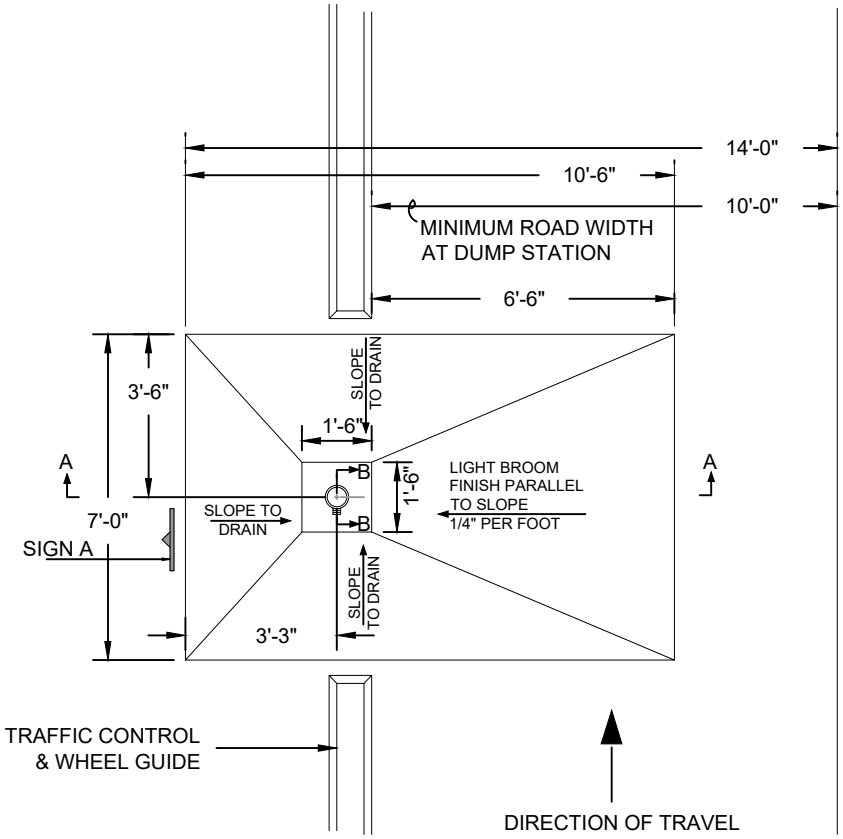
D1-12

DATED 5/2015

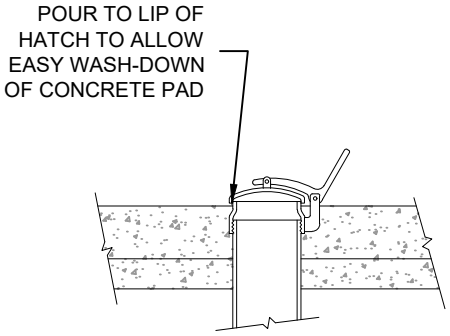
HOLDING TANK DISPOSAL INSTRUCTIONS

CONNECT HOSE TO HOLDING TANK-PLACE END SECURELY IN DRAIN OPENING WHILE HOLDING COVER OPEN WITH FOOT-OPEN TRAILER TANK VALVE-FLUSH TANK WITH WATER HOSE-FLUSH AWAY ANY SPILLAGE IN TO DRAIN.

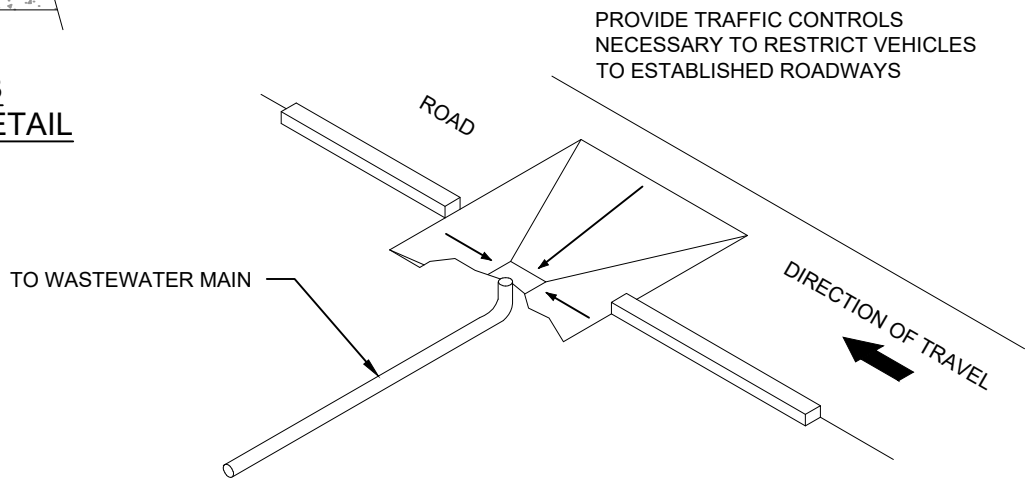
SIGN "A"



PLAN VIEW



SECTION B-B
DRAIN HATCH -DETAIL



SCHEMATIC VIEW

NOTES:

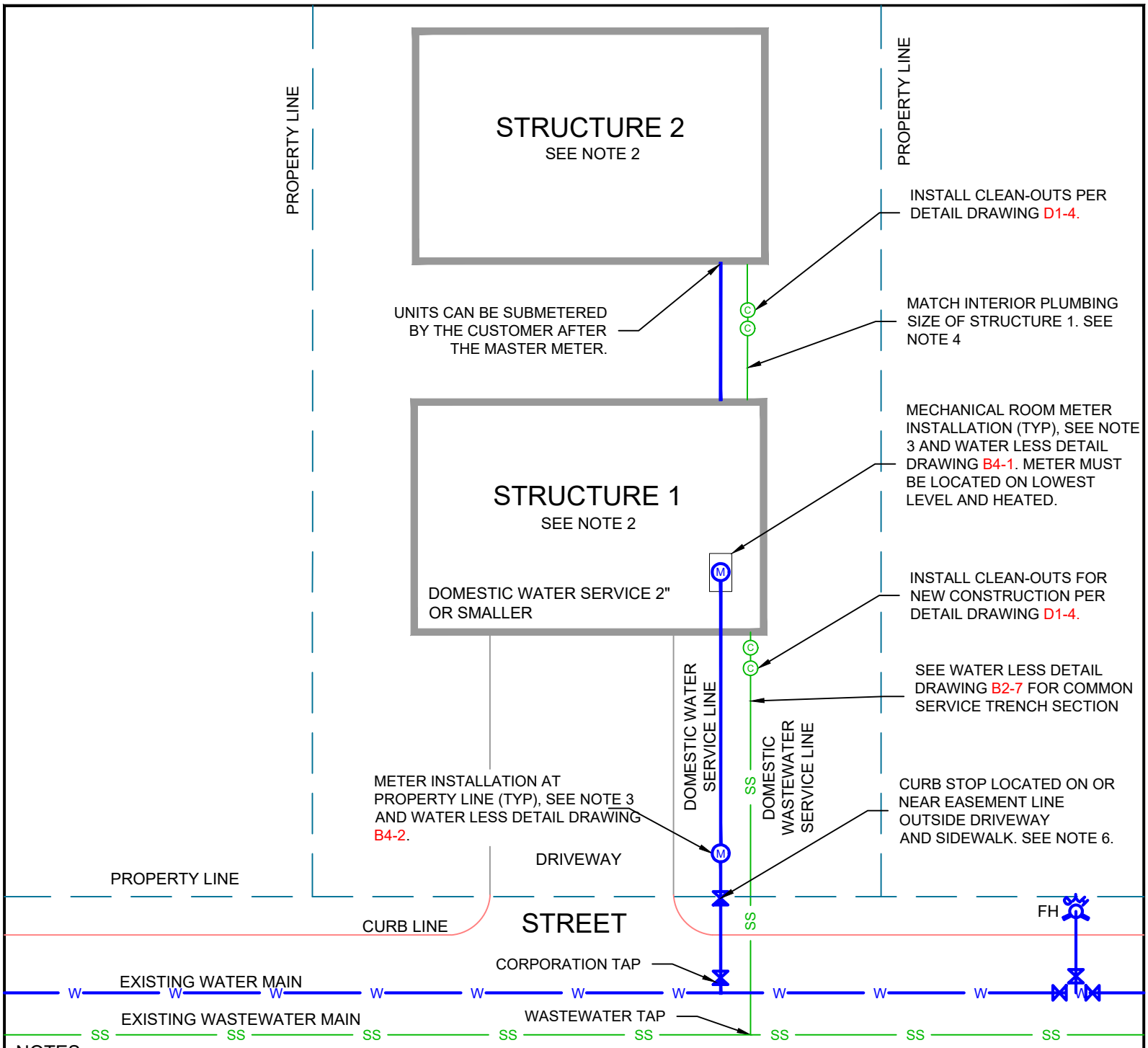
1. WITH APPROVAL OF COLORADO SPRINGS UTILITIES.

Colorado Springs Utilities
It's how we're all connected

RECREATIONAL VEHICLE SEWAGE DUMP STATION

D1-13

DATED 5/2015



NOTES:

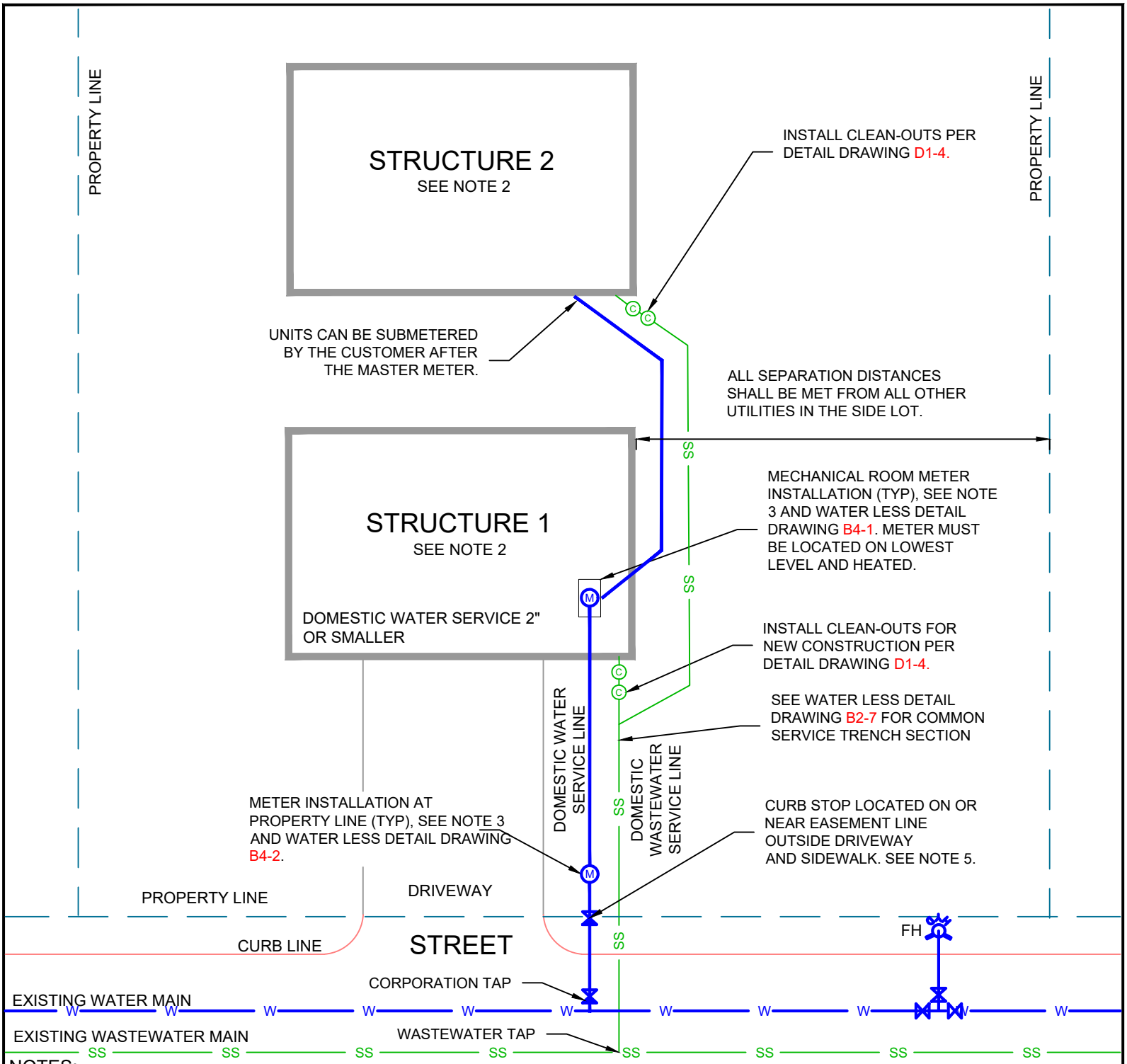
1. THIS DETAIL DRAWING APPLIES TO A SINGLE PLATTED LOT WITH A PRIMARY RESIDENCE AND AN ACCESSORY DWELLING UNIT (ADU) WITH ONE WATER SERVICE LINE CONNECTION TO THE WATER MAIN. IF THE LOT IS SUBDIVIDED, INDIVIDUAL SERVICE LINES SHALL BE PROVIDED BY THE OWNER/DEVELOPER FOR EACH INDIVIDUALLY PLATTED LOT.
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 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.

Colorado Springs Utilities
It's how we're all connected

SINGLE-FAMILY RESIDENTIAL WITH DETACHED ADU OPTION 1

D1-14

DATED 7/2022



NOTES:

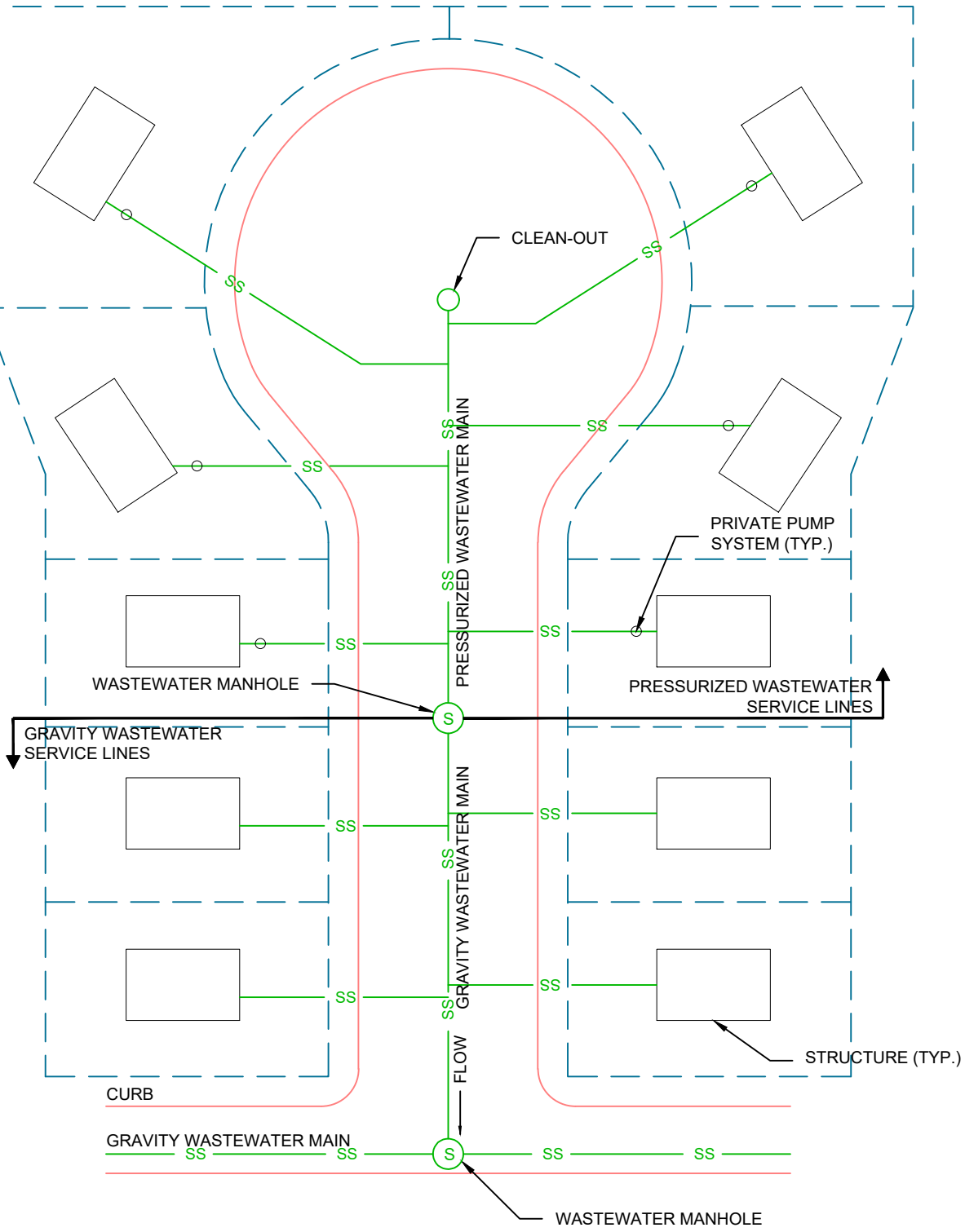
1. THIS DETAIL DRAWING APPLIES TO A SINGLE PLATTED LOT WITH A PRIMARY RESIDENCE AND AN ACCESSORY DWELLING UNIT (ADU) WITH ONE WATER SERVICE LINE CONNECTION TO THE WATER MAIN. IF THE LOT IS SUBDIVIDED, INDIVIDUAL SERVICE LINES SHALL BE PROVIDED BY THE OWNER/DEVELOPER FOR EACH INDIVIDUALLY PLATTED LOT.
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.

Colorado Springs Utilities
It's how we're all connected

SINGLE-FAMILY RESIDENTIAL WITH DETACHED ADU OPTION 2

D1-15

DATED 7/2022



NOTES:

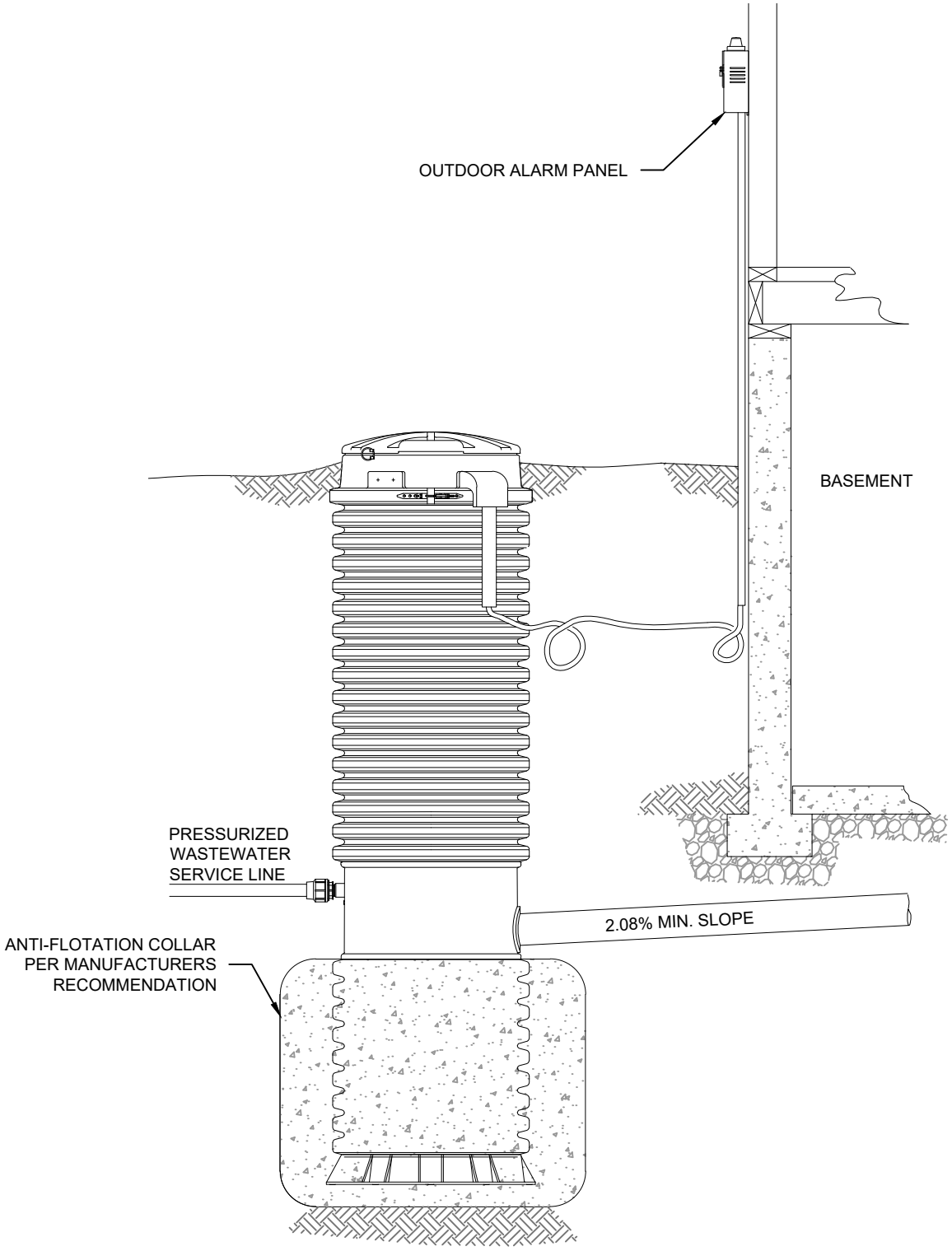
1. THIS SCHEMATIC CAN BE APPLIED TO RESIDENTIAL OR COMMERCIAL DEVELOPMENTS.
2. PRESSURIZED WASTEWATER SERVICE LINES MAY DISCHARGE TO A GRAVITY WASTEWATER MAIN OR PRESSURIZED WASTEWATER MAIN.

Colorado Springs Utilities
It's how we're all connected

MIXED GRAVITY AND PRESSURIZED WASTEWATER SYSTEM SCHEMATIC

D2-1

DATED 5/2015

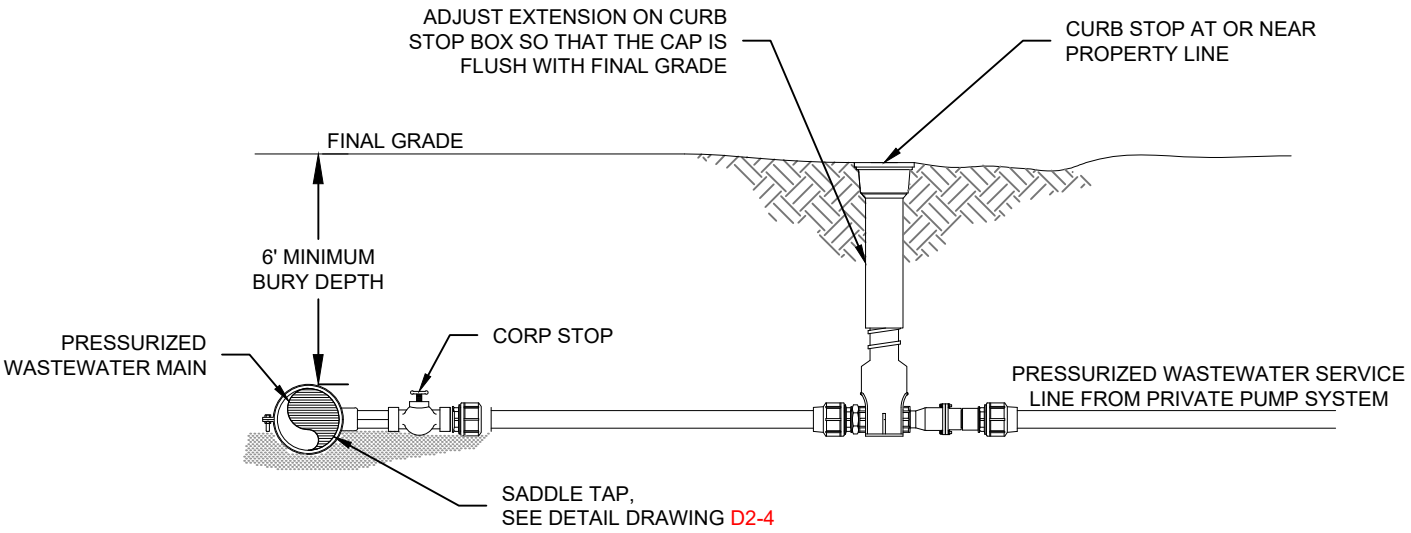


Colorado Springs Utilities
It's how we're all connected

PRIVATE PUMP SYSTEM SCHEMATIC

D2-2

DATED 5/2015



NOTES:

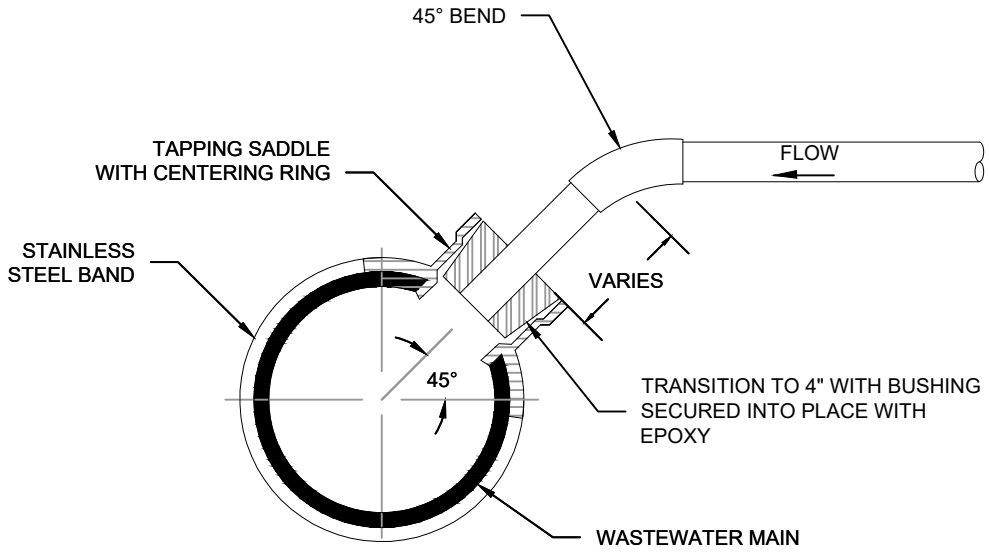
1. CORP STOP AND CURB STOP SHALL BE STAINLESS STEEL.
2. OTHER APPURTENANCES MAY BE REQUIRED BY THE PRIVATE PUMP SYSTEM MANUFACTURER.

Colorado Springs Utilities
It's how we're all connected

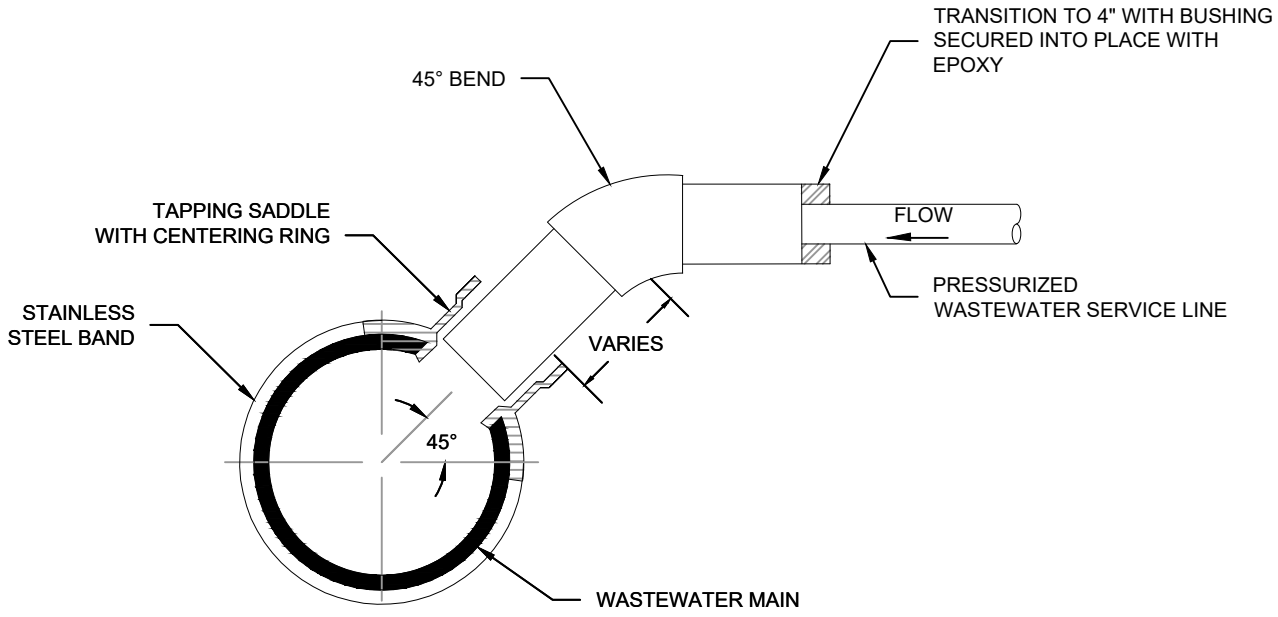
PRESSURIZED WASTEWATER SERVICE LINE CONNECTION TO A PRESSURIZED WASTEWATER MAIN

D2-3

DATED 5/2015



OPTION #1

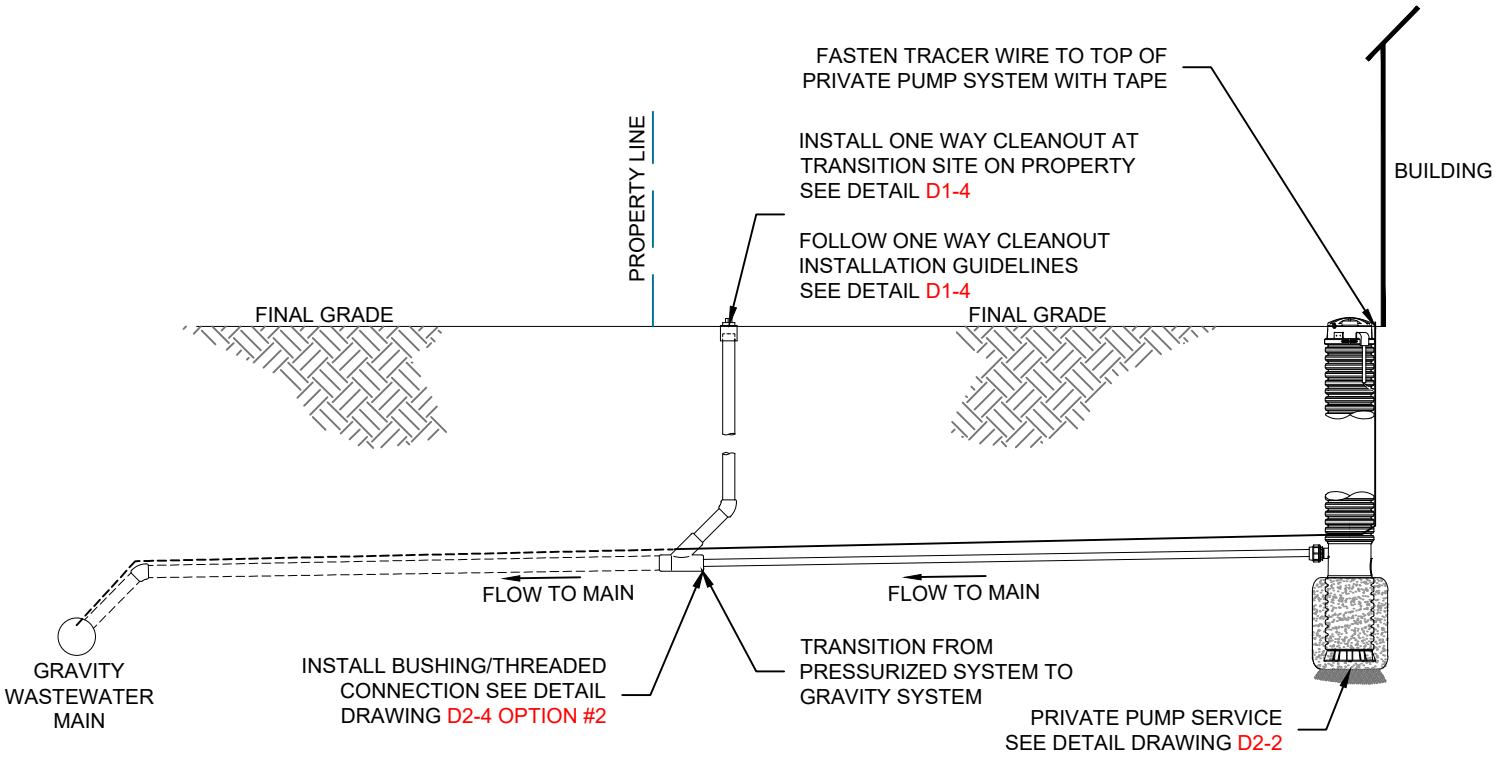


OPTION #2

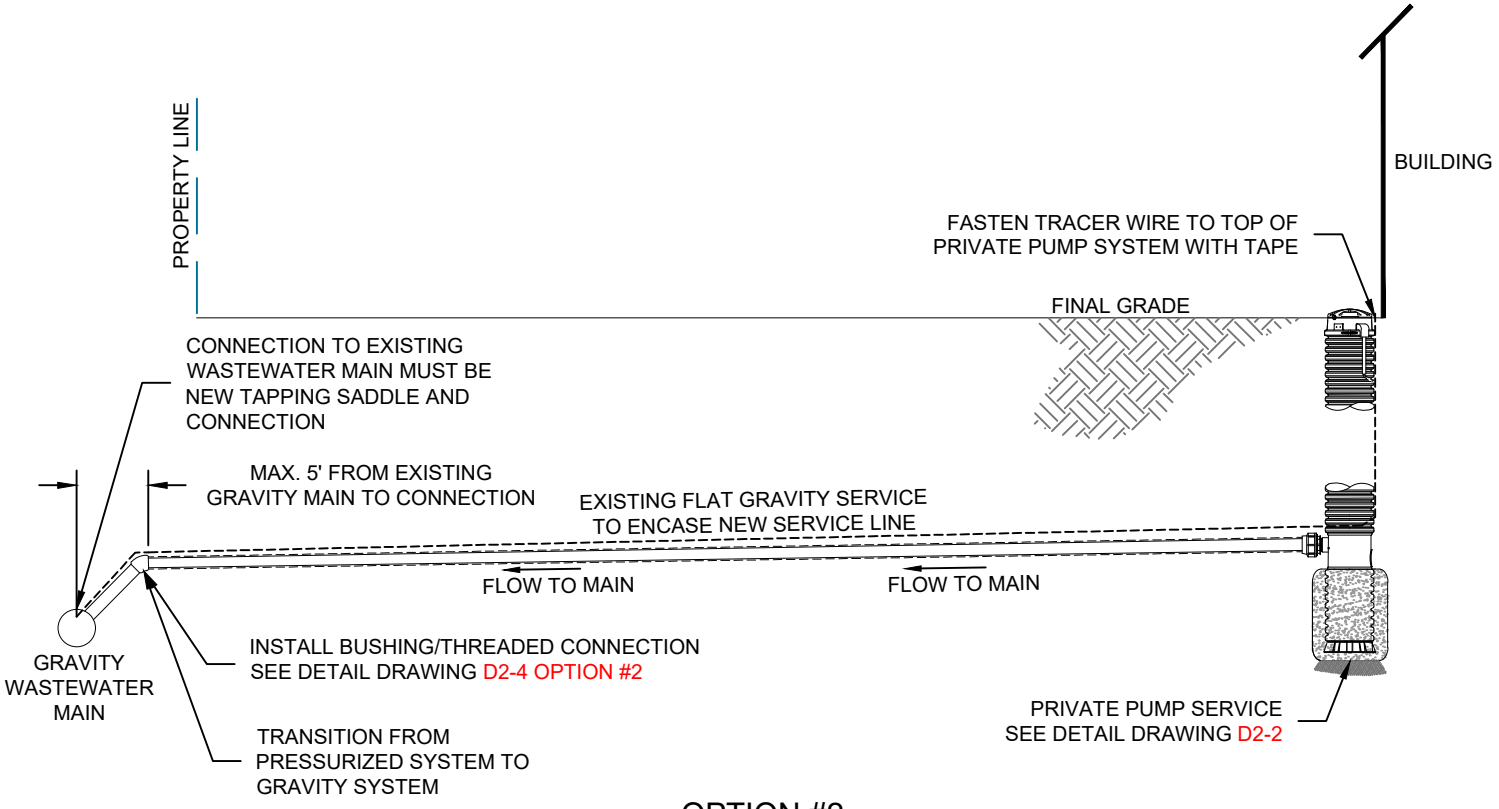
NOTES:

1. CORP STOP AND CURB STOP ARE NOT REQUIRED WHEN CONNECTING TO A GRAVITY WASTEWATER MAIN.

Colorado Springs Utilities It's how we're all connected	PRESSURIZED WASTEWATER SERVICE LINE CONNECTION TO A GRAVITY WASTEWATER MAIN	D2-4 DATED 5/2015



OPTION #1



OPTION #2

NOTES:

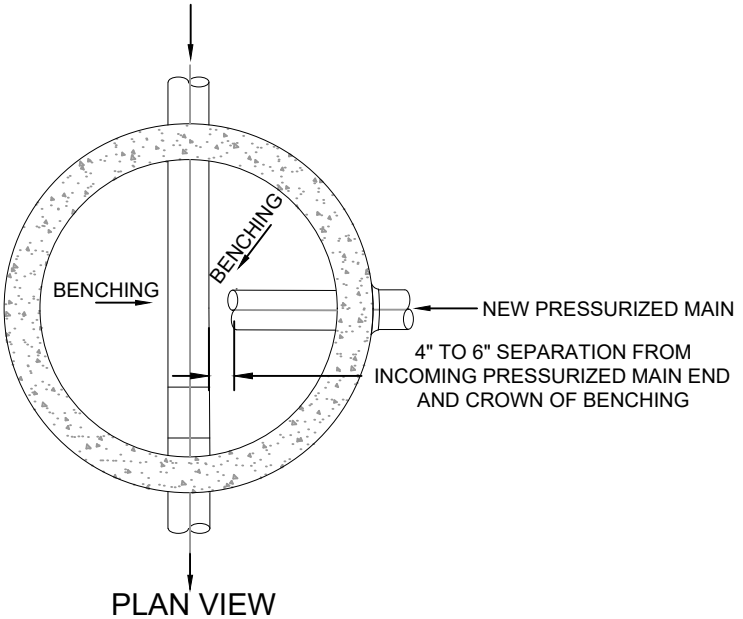
1. SINGLE CLEAN-OUT TO FOLLOW ONE WAY CLEAN-OUT STANDARDS WHEN A MID-SERVICE CONNECTION IS BEING MADE.
2. TRACER WIRE TO BE CONTINUOUSLY CONNECTED FROM THE MAIN LINE TO THE CLEAN-OUT LOCATED AT THE BUILDING.

Colorado Springs Utilities
It's how we're all connected

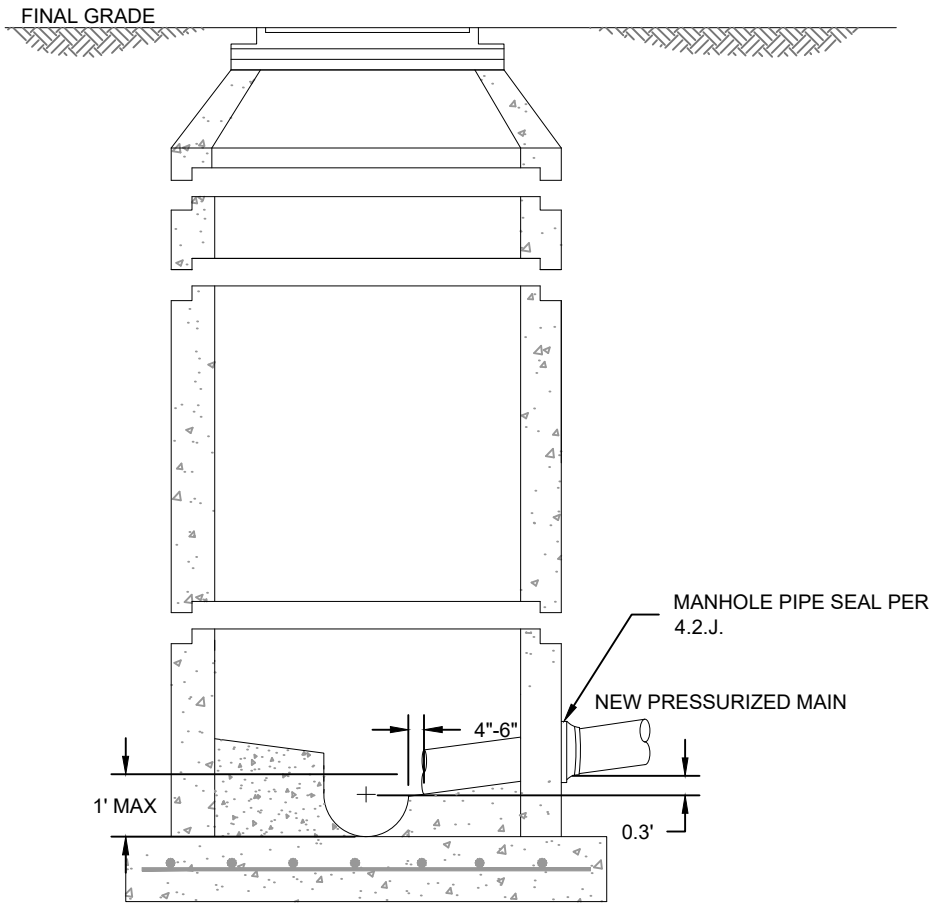
RETROFIT PRESSURIZED WASTEWATER SERVICE LINE WITH TRACER WIRE AND CLEAN-OUTS

D2-5

DATED 07/2025



PLAN VIEW



PROFILE VIEW

NOTES:

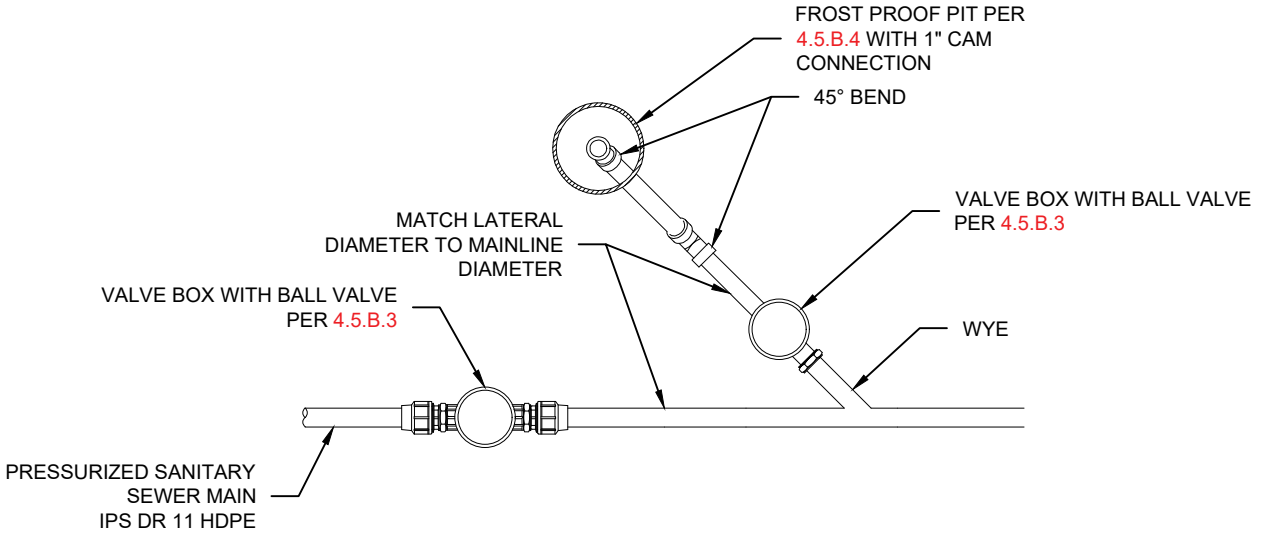
1. SEE DETAIL DRAWING C3-1 FOR MANHOLE REQUIREMENTS.
2. DROP CONNECTIONS ARE NOT ALLOWED
3. INVERT FLOWS MUST MATCH
4. MANHOLE SHALL BE EPOXY COATED

Colorado Springs Utilities
It's how we're all connected

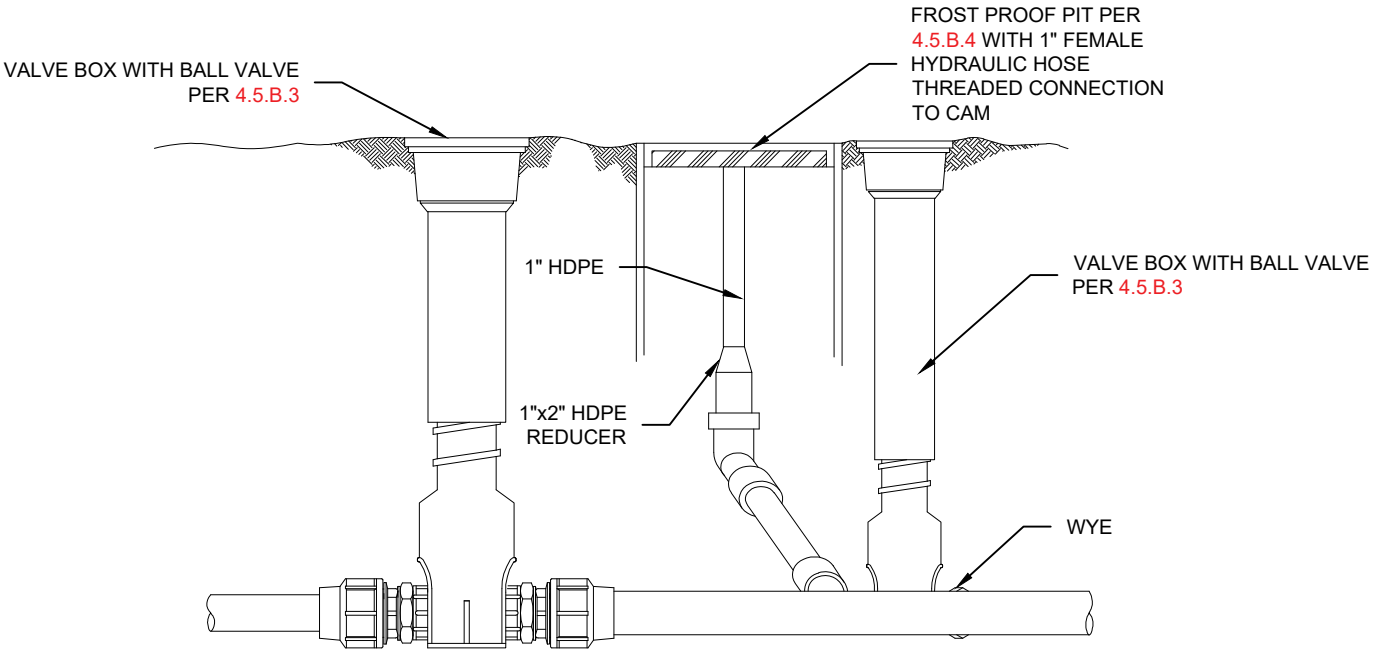
PRESSURIZED MAIN CONNECTION TO EXISTING MANHOLE

D2-6

DATED 07/2025



PLAN VIEW

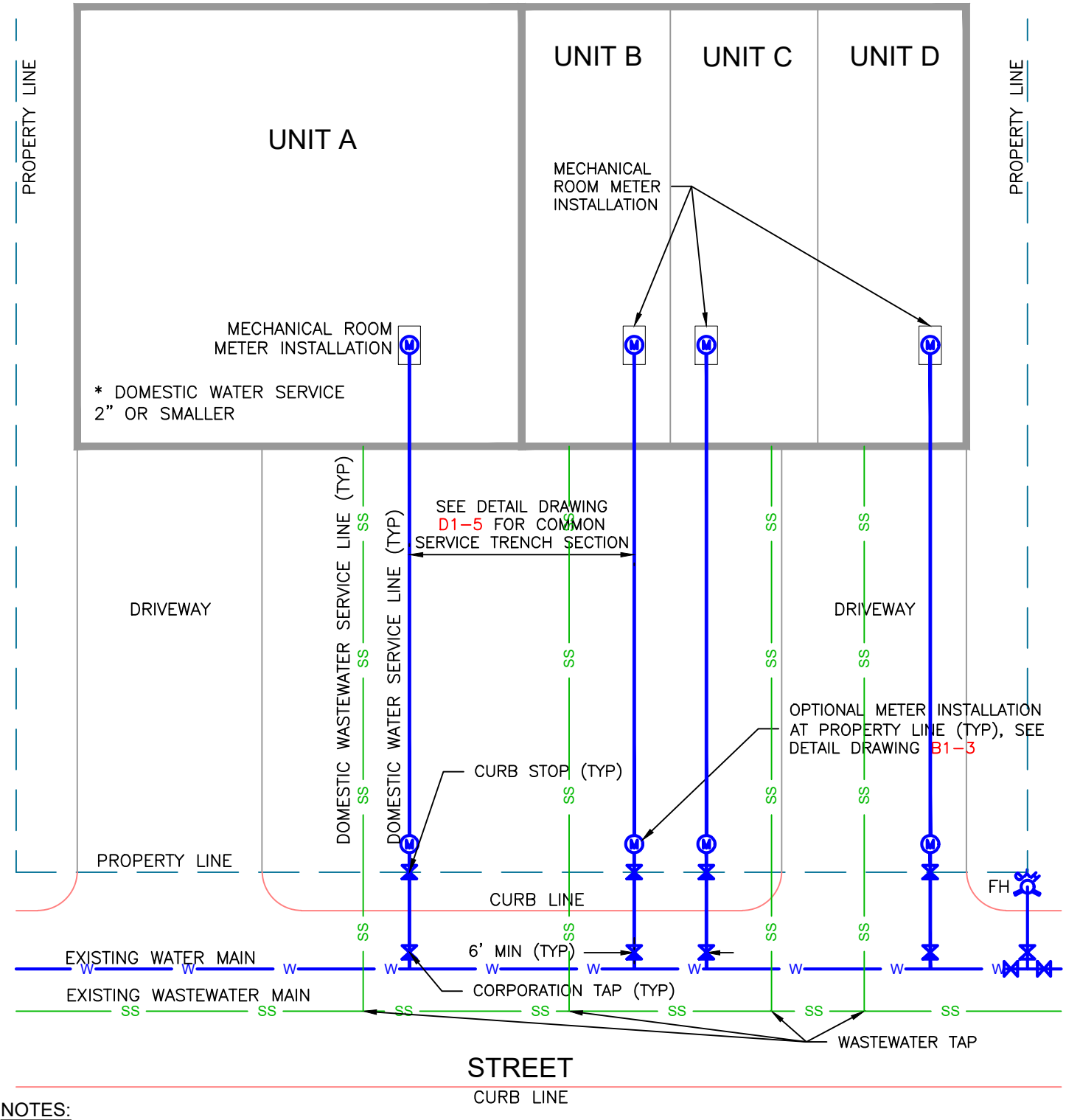


PROFILE VIEW

NOTES:

1. PIPE AND FITTINGS SHALL BE 2" IPS DR 11 HDPE
2. INLET AND OUTLET PIPE DIAMETERS MAY BE REDUCED TO MATCH PRESSURIZED WASTEWATER MAIN.

Colorado Springs Utilities It's how we're all connected	FLUSHING CONNECTION TO EXISTING PRESSURIZED MAIN, 2"	D2-7 DATED 07/2025



NOTES:

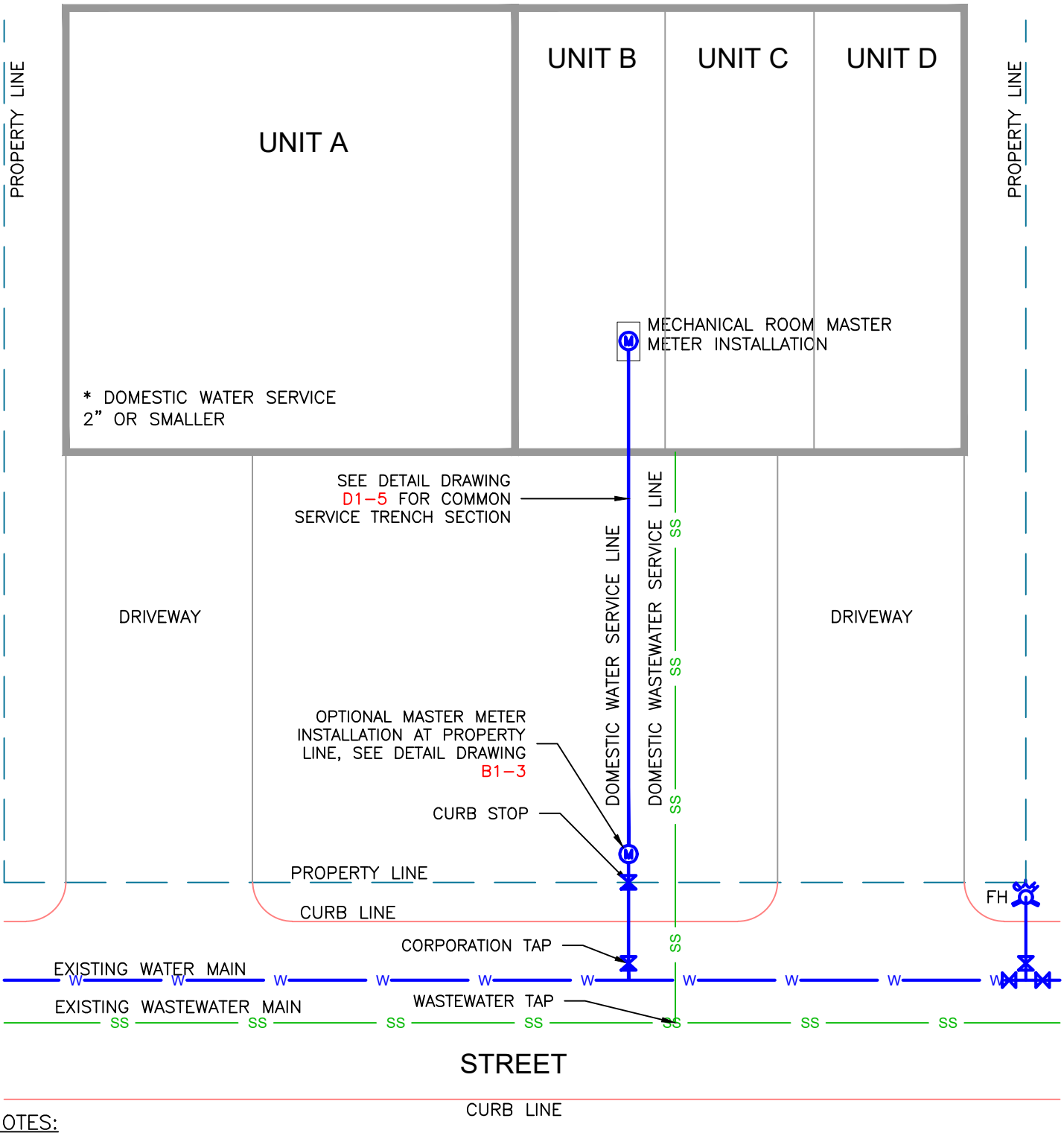
1. THIS DETAIL DRAWING APPLIES TO A SINGLE PLATTED LOT WITH MULTIPLE DWELLING UNITS, WHERE EACH UNIT IS CONNECTED AND METERED SEPARATELY. IF THE PROPERTY IS SUBDIVIDED, INDIVIDUAL SERVICE LINES SHOULD BE INCLUDED ON THE INDIVIDUALLY PLATTED LOT. IN THE ALTERNATIVE A PRIVATE EASEMENT SHOULD BE PROVIDED TO ACCOMMODATE WATER SERVICE LINES THAT MAY CROSS ANOTHER PLATTED LOT.

Colorado Springs Utilities
It's how we're all connected

MULTI-FAMILY RESIDENTIAL PREMISES
UTILITY SERVICE OPTION #1

D3-1

DATED 1/2017



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.L OF THE WATER LESS FOR BACKFLOW PREVENTION REQUIREMENTS.
3. UNITS CAN BE SUBMETERED BY THE CUSTOMER AFTER THE MASTER METER.

Colorado Springs Utilities
It's how we're all connected

MULTI-FAMILY RESIDENTIAL PREMISES
UTILITY SERVICE OPTION #2

D3–2

DATED 1/2017


Colorado Springs Utilities
It's how we're all connected