

TECHNICAL SPECIFICATIONS AND CONDITIONS FOR THE INSTALLATION OF WATER AND SEWER LINES

PREPARED BY ROUND MOUNTAIN WATER AND SANITATION DISTRICT

**Effective April 20, 2020
Updated March 9, 2023**



59000 Hwy 69 N • PO Box 86
Westcliffe, CO 81252-0086
(719) 783-2604
<https://rmwsd.colorado.gov>

TABLE OF CONTENTS

CONTENTS BY SECTION 6

SECTION 01100: SUMMARY OF WORK..... 7

 PART 1 GENERAL..... 7

 1.1 SECTION INCLUDES 7

 1.2 SCOPE 7

 1.3 DEFINITIONS..... 7

 1.4 AUTHORITY OF THE DISTRICT 8

 1.5 WORK BY THE DISTRICT 8

 1.6 CONTRACTOR RESPONSIBILITY..... 8

 1.7 WORK SEQUENCE..... 9

SECTION 01300: SUBMITTALS..... 10

 PART 1 GENERAL..... 10

 1.1 SECTION INCLUDES 10

 1.2 PRODUCT OPTIONS 10

 1.3 PRODUCT SUBMITTALS 10

 1.4 PRODUCT SUBSTITUTION PROCEDURES 11

SECTION 01500: PRODUCT REQUIREMENTS 12

 PART 1 GENERAL..... 12

 1.1 SECTION INCLUDES 12

 1.2 PRODUCTS..... 12

 1.3 PRODUCT DELIVERY REQUIREMENTS 12

 1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS 12

SECTION 01700: EXECUTION REQUIREMENTS 14

 PART 1 GENERAL..... 14

 1.1 SECTION INCLUDES 14

 1.2 CONTRACTOR RESPONSIBILITIES..... 14

 1.3 CONSTRUCTION FACILITIES 15

 1.4 PROTECTION OF UTILITIES..... 15

 1.5 CLOSEOUT PROCEDURES 16

 1.6 CLEANING & SITE MAINTENANCE 17

 1.7 CONSTRUCTION SCHEDULE, TESTING, AND INSPECTIONS 17

 1.8 RESTORATION..... 18

1.9	CONTROL OF VEHICULAR AND PEDESTRIAN TRAFFIC	18
1.10	CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL MEASURES	19
SECTION 02100: BACKFILL		20
PART 1 GENERAL		20
1.1	SECTION INCLUDES	20
1.2	REFERENCES	20
1.3	SUBMITTALS	20
PART 2 PRODUCTS		21
2.1	FILL MATERIALS	21
PART 3 EXECUTION		22
3.1	EXAMINATION	22
3.2	PREPARATION	22
3.3	BACKFILLING	22
3.4	TOLERANCES	23
3.5	FIELD QUALITY CONTROL	23
3.6	PROTECTION OF FINISHED WORK	24
3.7	SCHEDULE	24
SECTION 02300: TRENCHING		25
PART 1 GENERAL		25
1.1	SECTION INCLUDES	25
1.2	REFERENCES	25
1.3	DEFINITIONS	26
1.4	SUBMITTALS	26
1.5	QUALITY ASSURANCE	26
1.6	QUALIFICATIONS	26
1.8	COORDINATION	26
PART 2 PRODUCTS		26
2.1	FILL MATERIALS	26
PART 3 EXECUTION		27
3.1	LINES AND GRADES	27
3.2	PREPARATION	27
3.3	TRENCHING	28
3.4	SHEETING AND SHORING	29
3.5	BEDDING	30
3.6	BACKFILLING	30

3.7	SURFACE RESTORATION	30
3.8	FIELD QUALITY CONTROL.....	31
3.9	PROTECTION OF FINISHED WORK	31
SECTION 02500: SITE SANITARY SEWER		32
PART 1 GENERAL.....		32
1.1	SUMMARY	32
1.2	REFERENCES	32
1.3	SUBMITTALS	33
1.4	CLOSEOUT SUBMITTALS.....	33
1.5	QUALITY ASSURANCE	33
1.6	DELIVERY, STORAGE, AND HANDLING.....	33
PART 2 PRODUCTS		33
2.1	SEWER PIPING	33
2.2	MANHOLES	34
2.3	BEDDING AND COVER MATERIALS.....	35
PART 3 EXECUTION		36
3.1	EXAMINATION	36
3.2	PREPARATION.....	36
3.3	BEDDING.....	36
3.4	INSTALLATION - PIPE.....	36
3.5	INSTALLATION – MANHOLES	38
3.6	SERVICE CONNECTIONS.....	39
3.7	ABANDONMENT	40
3.8	FIELD QUALITY CONTROL.....	40
SECTION 02700: SITE WATER DISTRIBUTION		43
PART 1 GENERAL.....		43
1.1	SECTION INCLUDES	43
1.2	REFERENCES	43
1.3	SUBMITTALS	44
1.4	CLOSEOUT SUBMITTALS.....	44
1.5	QUALITY ASSURANCE	44
1.6	DELIVERY, STORAGE, AND HANDLING.....	45
PART 2 PRODUCTS		45
2.1	WATER PIPING.....	45
2.2	VALVES.....	46

2.3	HYDRANT	46
2.4	PIPE MARKERS	47
2.5	BEDDING AND COVER MATERIALS.....	48
2.6	ACCESSORIES	48
PART 3 EXECUTION		49
3.1	EXAMINATION	49
3.2	PREPARATION	49
3.3	BORING	49
3.4	BEDDING.....	50
3.5	INSTALLATION - PIPE.....	50
3.6	INSTALLATION - VALVES AND HYDRANTS	53
3.7	INSTALLATION - METERS	54
3.8	SERVICE CONNECTIONS.....	54
3.9	DISINFECTION OF DOMESTIC WATER PIPING SYSTEM.....	55
3.10	FILLING AND FLUSHING DOMESTIC WATER PIPING SYSTEM.....	55
3.11	ABANDONMENT	56
3.12	FIELD QUALITY CONTROL.....	56
APPENDIX.....		58
APPROVED MATERIALS LIST		58
INSTALLATION DIAGRAMS		58

CONTENTS BY SECTION

DIVISION 1 - GENERAL REQUIREMENTS

01100 Summary of Work

01300 Submittals

01500 Product Requirements

01700 Execution Requirements

DIVISION 2 - SITE CONSTRUCTION

02100 Backfill

02300 Trenching

02500 Site Sanitary Sewer

02700 Site Water Distribution

APPENDIX

Approved Materials List

Installation Diagrams

SECTION 01100: SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. (1.2) Scope
- B. (1.3) Definitions.
- C. (1.4) Authority of District.
- D. (1.5) Work by the District.
- E. (1.6) Contractor's Responsibility.
- F. (1.7) Work sequence.

1.2 SCOPE

- A. Specifications and requirements set forth to be used in the design and construction or repair of water and sewer mains, including all associated appurtenances and connections for approval and acceptance by the District.
- B. Excavation and restoration standards are required to preserve the integrity, operational safety, and function of the rights-of-way located within the District.

1.3 DEFINITIONS

- A. District: Shall mean the Round Mountain Water and Sanitation District including personnel with the authority to act on behalf of the District.
- B. Engineer: Shall mean the authorized professional engineer and designated representatives acting on behalf of the District, including but not limited to inspectors in the field.
- C. Local Regulatory Agency/Agencies: Shall mean the governing body or authority having jurisdiction over or responsibility for a particular activity within the scope of a water or sewer line installation project. They may be defined specifically within these Technical Specifications, otherwise, the Contractor shall be responsible to determine same in the local area of the project.
- D. Right-of-Way (ROW or R-O-W): Shall mean the area on, below, or above a public roadway, highway, street, pathway, bicycle lane and public sidewalk in which the District has an interest, including other dedicated rights of ways for utility easements of the District.
- E. Contractor: Shall mean a person, partnership, or corporation approved to work in the District in accordance with the requirements of the rules and regulations of the District.
- F. Excavate: Shall mean to dig into or in any way remove or physically disturb or penetrate any part of a right of way.
- G. Best Management Practices (BMPs): schedules of activities, prohibitions of practices, maintenance procedures, and other management practice to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, waste disposal, or drainage from material storage.

1.4 AUTHORITY OF THE DISTRICT

A. The District shall have authority to ascertain that all construction of water and sewer infrastructure is equal to or better than the minimum construction requirements set forth in these specifications.

B. The District and Engineer have authority to assign an inspector to check any and all work, including materials to be incorporated in the work, excavation, bedding, backfill, and all construction methods and practice.

C. Inspectors are assigned to assist the Contractor to comply with these specifications and have the authority to reject defective or inferior materials and workmanship and to suspend work until the conditions in question are corrected.

1.5 WORK BY THE DISTRICT

A. Work includes:

1. Installation of tapping saddles, corporation stops, and tapping of water mains (note that contractors installing infrastructure for new developments may be given approval to tap mains, install tapping saddles and corporation stops).
2. Flushing and testing of chlorine residual for new water mains.
3. Observe pressure testing of water mains, sewer mains, manholes and appurtenances to be accepted by the District.
4. Operating valves and appurtenances in existing system required for construction, including filling and flushing mains to be accepted by the District.
5. Note that the District retains the right at its discretion to hire a Geotechnical Engineer or Civil Engineer to provide inspection services for new infrastructure being installed in new developments and the cost of the services to be reimbursed by the development owner.
6. Provide Contractor with information to assist with notifying public of water interruption due to construction 24 hours prior to shut off.

1.6 CONTRACTOR RESPONSIBILITY

A. Contractor shall be responsible to read and fully comply with all the provisions of these specifications and General Clauses.

B. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to public and private facilities, people, and property.

C. Contractor shall perform work in a manner subject to current Occupational Safety and Health Administration and State of Colorado safety requirements. It shall be the responsibility of the Contractor to fully comply with these regulations.

D. Contractor shall provide adequate construction signing, flagmen, barricades, etc., to warn vehicular and pedestrian traffic of work in progress and divert traffic as may be required during the course of the construction per approved traffic plan. All signing shall conform to the Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD). Contractor shall notify the respective local and emergency response agencies 48 hours in advance of the closure of any street or access restrictions. This includes but is not limited to: Fire, Police, Town of Westcliffe, Town of Silver Cliff, School District, and other affected organizations such as CDOT or the County.

E. Contractor shall notify the District at least 48 hours prior to a planned water service interruption, request for valve/hydrant operation, testing of mains, or other requested service provided by the District. The Contractor will be required to provide door hangers and coordinate shut-down times with affected property and/or business owners.

F. Contractor shall protect all existing facilities and utilities within the work area and shall be liable for any damage to any such facilities and utilities due to Contractor's activities.

G. Sanitary facilities for the use of project personnel shall be properly secured, located, erected and maintained by the Contractor.

H. Contractor is responsible for Quality Control.

I. Contractor shall provide the District with Material Submittals prior to the start of work.

J. For infrastructure to be accepted by the District, the Contractor shall provide the District with Engineer Stamped Drawings prior to the start of construction that have been reviewed and approved by the District Engineer.

1.7 WORK SEQUENCE

A. Coordinate construction schedule and operations with the District.

END OF SECTION

SECTION 01300: SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. (1.2) Product options
- B. (1.3) Product submittals
- C. (1.4) Product substitution procedures

1.2 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.3 PRODUCT SUBMITTALS

- A. The Contractor must submit the submittal signed, no submittals from vendors.
- B. Product submittals are required for all water and sewer main extensions and any other project the District deems is significant enough to warrant or as required by Specifications.
- C. All submittals shall be approved prior to construction of any water and sewer infrastructure. All submittals shall be submitted at the beginning of the project unless specifically approved for later submittal.
- D. Submittals include but are not limited to:
 - 1. All piping, fittings, appurtenances for water and sewer.
 - 2. Aggregate gradation and proctors to be used for bedding and backfill.
 - 3. Concrete and asphalt materials, if required.
 - 4. All other materials utilized during construction of infrastructure.
 - 5. Road closure plans and schedules.
 - 6. Draft press releases for work activities, if required.

1.4 PRODUCT SUBSTITUTION PROCEDURES

A. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

B. Document each request with complete data substantiating compliance of proposed Substitution with Specifications.

C. A request constitutes a representation that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for Substitution as for specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to the District.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Engineer for review or redesign services associated with re- approval by the District.

D. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Specifications or prior agreements and requirements.

E. Substitution Submittal Procedure:

1. Submit one electronic request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
3. The District will notify Contractor in writing of decision to accept or reject request.

END OF SECTION

SECTION 01500: PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. (1.2) Products.
- B. (1.3) Product delivery requirements.
- C. (1.4) Product storage and handling requirements.

1.2 PRODUCTS

- A. Furnish products listed on the “Approved Materials List for Water and Sewer” suitable for intended use.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the District.
- C. When possible, furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01700: EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. (1.2) Contractor Responsibilities.
- B. (1.3) Construction Facilities.
- C. (1.4) Protection of Utilities.
- D. (1.5) Closeout procedures.
- E. (1.6) Cleaning & site maintenance.
- F. (1.7) Construction schedule, testing, and inspections.
- G. (1.8) Restoration.
- H. (1.9) Control of vehicular and pedestrian traffic.
- I. (1.10) Construction site erosion.

1.2 CONTRACTOR RESPONSIBILITIES

A. Contractor shall obtain an excavation permit with the Town of Westcliffe or Town of Silver Cliff (depending on project location) prior to the beginning of any work operations within the Town's rights of way.

B. Contractor shall assume responsibility for disposing of removed vegetation, tree material, soil, asphalt, concrete, and other surplus materials not specifically identified to be retained by the Towns of Westcliffe or Silver Cliff per Federal, State and Local regulations at Contractor's expense.

C. Contractor shall assume responsibility for performing all work in a workmanlike manner with due care being taken to avoid unnecessary damage to property. Contractor shall be responsible for all damage resulting from carelessness or work performed in an irresponsible or unworkmanlike manner.

D. Contractor shall obtain all utility locates prior to excavating and shall be liable for all damages to existing structures and utilities and shall save the District harmless for any liability or expense for injuries, damages, or repairs.

E. Contractor shall perform all work not covered in the Specifications to applicable industry standards.

F. Contractor shall conform to all applicable State and local Codes and Ordinances.

G. Contractor shall provide all construction surveying and/or staking as deemed necessary to complete the project as intended per the Specifications and approved plans.

1.3 CONSTRUCTION FACILITIES

A. Provide and place all traffic control signs, barricades, and devices during the total construction time of the work, including time for concrete curing. Temporary fencing or other adequate measures to control pedestrian access to construction area shall be maintained.

B. Contractor's construction activities are restricted to the area within the Towns of Westcliffe or Silver Cliff rights of way and Town owned property boundaries as near as practical and within any specified construction easements. All reasonable efforts shall be made to maintain access for property owners and residents and their business patrons to and from private property within the site.

C. Protect all private and public property located within the construction site. All property disturbed by Contractor during construction will, at Contractor's expense, be repaired or replaced and left in as good a condition as originally found.

D. All temporary utilities such as electricity, sanitation services, heating, or other services required for construction and other facilities such as safety equipment, fire extinguishers, warning signs, lights, or special equipment shall be supplied as needed by the Contractor at his expense.

E. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment. Protect site from puddling or uncontrolled running water. Provide sumps, water barriers as required to protect site from soil erosion and other potential damage to work, such as storm water accumulating on site from upstream.

1.4 PROTECTION OF UTILITIES

A. The Contractor shall protect all public utilities encountered. These may include telephone lines, culverts, buried cables, power lines, water lines, sewer lines, irrigation laterals, gas lines and other overhead and underground utilities.

B. Before any excavation or work is begun in the vicinity of the above-named utilities, each utility company or department concerned must be notified in advance of such work.

C. The Contractor shall be held liable for all damages to any and all public utilities encountered on this project, due to the Contractor's operations. Such damages shall include all physical damages to utilities and all damages due to the interruption of service of such utilities, when such damages and interruptions are caused by the Contractor's operations.

D. Where alterations or moving of utilities is not required to permit construction of the work, the Contractor shall take such measures as the utility entity may direct to properly protect these utilities throughout his construction activities and shall cooperate at all times with the proper authorities and/or Owner in maintaining service of the above-named utilities affected by the work.

E. The cost of damages due to the Contractor's operations, the cost of moving water or sewer service lines and the cost of protecting the utilities, where alteration or moving is not required to permit construction of the work, shall be paid for by the Contractor.

F. Should any pipelines, water lines, gas mains, electrical conduits, sewer pipes, overhead wiring, telephone lines, buried cables, power lines, or any other such utilities not specifically mentioned and provided for elsewhere as a part of this document, have to be moved, repaired, reconditioned or revised due to construction, or moved temporarily to permit construction of work, the party or parties owning and operating such utilities shall perform the actual work of moving, repairing, reconditioning or revising such utilities, unless other agreements are reached with the utility companies involved.

G. Local utility companies and contact information:

1. Utility Notification Center of Colorado (UNCC)
12600 W. Colfax Ave. Ste: B310 Lakewood, Colorado 80215
Phone: 811
Admin: 303-232-1991
Fax: 303-234-1712

2. Local Utility Companies Are:

- a. Black Hills Energy (Electricity)
- b. Century Link (Phone)
- c. Round Mountain Water and Sanitation District (Water and Sewer)

1.5 CLOSEOUT PROCEDURES

A. Contact District for final inspection.

B. Provide submittals required by the District.

C. Provide as-built plans required by the District:

1. As-built plans shall be submitted for all water and sewer main extensions and any other project the District deems is significant enough to warrant.
2. Two copies of as-built plans for completed construction shall be submitted on 24-inch X 36-inch sheets (minimum scale of drawing, 1 inch = 50 feet) along with a digital copy to the District.

D. Drawings of Record Criteria:

1. "As-Built/Drawing of Record" means a drawing, or series of drawings, that depict improvements as they were actually constructed, and that are drawn to the same scale, with the same detail, accuracy, format and form as the drawings that were submitted for original approval. Information on the project facilities shall indicate sufficient horizontal and vertical dimensional data so that the constructed improvements may be located and delineated.
2. "As-Built/Drawing of Records" are required of any set of plans approved by the District.

3. To effectively comply with this requirement, it will be necessary for the Engineer to provide a periodic review and inspection of the installation of those facilities within the project. The Engineer may supplement his review and inspection of the project by utilizing information taken from a valid survey.
4. The design engineer shall submit to the District the required number (no less than 3) of certified "As-built" or "As-Built/Drawing of Record" on media required by the District signed and stamped within 60 days of the final walk- through inspection.
5. If any errors or omissions are discovered by the District within the "As- Built/Drawing of Record", the design engineer shall make corrections and resubmit the plans within 30 days of notice by the District.
6. The "As-Built/Drawing of Record" shall contain a certification from an Engineer registered in the State of Colorado that indicates that the project has been substantially completed in accordance with the approved plans and specifications, or that the deviations noted on the "As-Built/Drawing of Record" will not prevent the project from complying with the design function of the project.
7. "As-Built/Drawing of Record" shall be submitted in the same page format as the original approved plans. If revision requires the addition of a new sheet, it shall be added to the back of the existing set and the entire set renumbered accordingly. All pages must be included in the same order as the original and marked "As-Built/Drawing of Record" regardless of whether any revision applies to any particular page or not. If no changes occurred, simply write "As- Built/Drawing of Record" on the drawing.

1.6 CLEANING & SITE MAINTENANCE

- A. Public streets within the work site must be washed and swept daily or otherwise, according to the discretion of the District. Anytime during the course of the Work, Contractor shall, at the discretion of the District, wash, sprinkle, or wet down streets or alleys, including areas affected by work detours and construction traffic.
- B. Execute final clean-up of site prior to final project inspection.
- C. Clean debris from right of ways and drainage systems.
- D. Clean worksite; sweep paved areas, rake landscaped surfaces clean; provide access at all driveways and cross streets.
- E. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.7 CONSTRUCTION SCHEDULE, TESTING, AND INSPECTIONS

- A. At least 24 hours prior to the start of any work, Contractor shall furnish a submittal of construction schedule to facilitate scheduling required inspections according to the specifications and to minimize the Contractor's wait time.

B. Reports will be submitted by an approved inspector to District indicating observations and results of tests and indicating compliance or non-compliance with requirements. Testing will be done at Contractor's expense and does not relieve Contractor from performing Work to requirements.

C. Retesting required because of non-conformance to specified requirements shall be performed on instructions by the District and will be done at Contractor's expense.

D. If necessary, Contractor shall be responsible for supplying the District, at the Contractor's expense, with suitable soils tests from a licensed independent soil testing laboratory, with gradation and proctor density data for any material used in the work for backfill.

1.8 RESTORATION

A. All excavations and improvements shall be completely restored within a period of twenty-one days subsequent to acceptance of backfill and compaction.

B. If restoration is not complete by the end of the required time, the District will schedule to complete the restoration at Contractor's expense, after a nine-day advance notice to Contractor.

C. Restoration during times of inclement weather may be delayed at the direction of the District. Temporary measures may be implemented, including but not limited to a cold asphalt patch to be replaced when weather permits.

1.9 CONTROL OF VEHICULAR AND PEDESTRIAN TRAFFIC

A. Contractor shall obtain permission from Colorado CDOT and/or the towns of Westcliffe and Silver Cliff to close the roadways to traffic during construction activities, if it is necessary.

B. Contractor shall accommodate adjacent property owners and businesses by providing access and parking within the street right-of-way as near to properties as possible, except during paving operations when residents will be expected to walk.

C. Contractor shall be fully responsible for providing qualified personnel to provide and place all traffic control signs and devices during the total construction time of the project.

D. Contractor shall provide traffic control that shall conform to the intent and instructions provided by the District, CDOT and the Manual of Uniform Traffic Control Devices (MUTCD).

E. Contractor is responsible for notifying the Police Department, the Fire District, and all emergency and ambulance service providers of any street closures or blockages, due to construction, prior to beginning any such activity. Contractor shall also maintain the means at all times to provide emergency access routes to all properties located along the construction site when needed.

1.10 CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL MEASURES

A. Contractors and subcontractors must implement Best Management Practices (BMPs) to reduce pollutants in any storm water runoff from construction activities. Contractors are further required to control construction site waste such as discarded materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality. These activities must comply with all applicable State and local laws and regulations.

END OF SECTION

SECTION 02100: BACKFILL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. (1.2) References
- B. (1.3) Submittals
- C. (2.1) Fill Materials
- D. (3.1) Examination
- E. (3.2) Preparation
- F. (3.3) Backfilling
- G. (3.4) Tolerances
- H. (3.5) Field Quality Control
- I. (3.6) Protection of Finished Work
- J. (3.7) Schedule

1.2 REFERENCES

- A. Colorado Department of Transportation:
 - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.

- B. American Society for Testing and Materials:
 - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³)).

1.3 SUBMITTALS

- A. Materials Source: Submit name of imported materials suppliers.

- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Road Base: Type Class 6.

Coarse Aggregate Class 6 (Road Base): Aggregates for Class 6 base shall be crushed stone, or crushed gravel, natural gravel, material which conforms to the quality requirements of AASHTO M 147 except that the requirements for the ratio of minus 75 μm (No. 200) sieve fraction to the minus No. 40 sieve fraction, stated in 2.2.2 of AASHTO M 147, shall not apply. The requirements for the Los Angeles wear test (AASHTO T 96) shall apply to Class 6 Aggregate. Aggregate for class 6 base shall meet the grading requirements of Table 703-3 for the class specified for the project, unless otherwise specified. The liquid limit shall be as shown in Table 703-3 and the plasticity index shall not exceed six when the aggregate is tested in accordance with AASHTO T89 and T 90 respectively. See Table 1 for sieve size requirements. The Material sized between the #4 sieve and the 3/4" sieve must be a minimum of 60% angular material, i.e., crushed stone or gravel with angular surfaces. 60% of the material shall pass the Fractured Faces Test for which 2 or more faces shall be fractured surfaces.

B. 3/4" Screened Crushed Rock

C. Trench Backfill under existing and proposed streets: Type Class 6 or Class 1. Class 1 may be native materials crushed or screened to 2-inch minus.

D. Ordinary Backfill: As specified on Drawings, only as directed by the District inspector.

E. Stabilizing Material: Minimum of 1 1/2 inch, uniformly graded, clean rock, or as directed by Engineer.

F. Rip Rap: 12" minus well-graded rock.

G. Flow-Fill: Structural Backfill that meets the requirements of 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 206.02; within the following limits:

1. Components per cubic yard

Fine Aggregates (Type A2 as specified in Section 02060)	1,845 lbs.
Coarse Aggregates (Type A1 as specified in Section 02060)	1,700 lbs.
Cement	50 lbs.
Water	325 lbs.

2. Slump – 6 inch minimum, 8 inch maximum

3. Strength – 10 psi minimum in 1 day, 60 psi maximum in 18 days.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify subgrade is suitable for placement of backfill.
- B. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill approved by the Engineer and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Place aggregate in maximum 8-inch layers and compact to 95 percent, maximum dry density, ASTM 1557, Modified Proctor, except for the top 4 feet of trench, which shall be compacted to 95 percent, maximum dry density, ASTM D1557, Modified Proctor. Lift size may be increased when it is demonstrated that compaction requirements can be met using other methods. The District inspector will make final determination on the thickness of each lift in the field. 17
- D. Use smaller mechanical tamping equipment in areas inaccessible to compaction equipment.
- E. Place fill material in continuous layers and compact in accordance with schedule at end of this section.
- F. Employ placement method that does not disturb or damage other work.
- G. Maintain optimum moisture content of backfill materials to attain required compaction density.
- H. Make gradual grade changes. Blend slope into level areas.
- I. Remove surplus backfill materials from site.
- J. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Compaction Testing: In accordance with ASTM D1557.

B. When tests indicate, Work does not meet specified requirements, remove Work, replace, compact, and retest.

C. Compaction Testing for Bedding and Backfill:

1. The District may hire an independent, licensed engineer experienced soils analysis and evaluation to perform required tests in accordance with ASTM D1557 and charge the owner/contractor for the expense or require the owner/contractor to hire the licensed engineer and approve the direct distribution of test reports to the District for review. Copies of test results showing exact location of sample collection and test sites must be furnished to Engineer. Engineer shall be informed prior to testing, and he may designate areas of testing.

2. Testing is to be done at various elevations in trench, which may require excavation by Contractor after backfill is installed.

3. Frequency of Compaction Tests will be specified by District inspector in the field but shall be no less than every 200 feet at every 1 foot of depth of the backfill or anytime the means and methods of compaction change. A lesser frequency may be approved by District if successful and consistent results are being achieved in the field.

4. Testing shall use the Modified Proctor method. Alternatives such as Standard Proctor or Relative Density based on necessity due to material type may be used with the permission of the District so long as the necessary conversion data, testing, and information has been completed and submitted prior commencement of the work.

5. The density test results shall be reported by the Geotechnical Engineer to the District and to the Contractor at the time of testing.

6. The Contractor shall report to the District when the work has progressed to a point where it is ready to be tested. The Contractor shall provide the District with adequate advance notice (generally 24 hours) to allow scheduling of testing. The District shall decide whether to take tests at any given depth or section and shall schedule testing so as to minimize interference with the Contractor's operations. The Contractor shall adjust his operations to allow access to the backfill for testing. Notwithstanding, the Contractor's opinion of readiness for testing, if a lift of backfill is being placed, the previous lift shall be considered ready to test, and may be tested at the District's discretion.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.6 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.
- B. All areas showing signs of settlement shall be filled and maintained by Contractor during all construction phases and warranty period.
- C. When Contractor is notified by the District that any backfill is hazardous, the condition shall be corrected at once.
- D. Compacted fills must be adequately protected during cold weather construction activities. Any frozen fill should be thawed or removed, recompact and tested as directed by the project engineer or the District.

3.7 SCHEDULE

- A. Fill Under Footings, Inlets, Manholes, Vaults, and other Concrete Structures:
 - 1. Fill Flow Fill, 18 inch thick to required elevations for the width of the footing.
- B. Fill to correct Over-excavation and Unstable Subgrades:
 - 1. Flow Fill, flush to required elevation.

END OF SECTION

SECTION 02300: TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. (1.2) References
- B. (1.3) Definitions
- C. (1.4) Submittals
- D. (1.5) Quality Assurance
- E. (1.6) Qualifications
- F. (1.7) Field Measurements
- G. (1.8) Coordination
- H. (2.1) Fill Materials
- I. (3.1) Lines and Grades
- J. (3.2) Preparation
- K. (3.3) Trenching
- L. (3.4) Sheeting and Shoring
- M. (3.5) Bedding
- N. (3.6) Backfilling
- O. (3.7) Surface Restoration
- P. (3.8) Field Quality Control
- Q. (3.9) Protection of Finished Work

Related Sections:

1. Section 02500– Site Sanitary Sewer.
2. Section 02700 - Site Water Distribution: Site water lines including domestic water lines.

1.2 REFERENCES

- A. Colorado Department of Transportation:
 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
- B. American Society for Testing and Materials:
 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³)).
 3. Road and Alleyway Maintenance Specifications of the Towns of Westcliffe and Silver Cliff.

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Obtain an Excavation Permit prior to any excavation from the Town of Westcliffe or the Town of Silver Cliff, depending on location of the project.

B. Excavation Protection Plan: as required by applicable codes, laws, and standards.

C. Materials Source: Submit name of imported fill materials suppliers.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with District and industry standards.

B. Maintain one copy of each required document on site.

1.6 QUALIFICATIONS

A. Contractor must be licensed, insured and approved by the District.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to work.

1.8 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

B. Verify locations, types, and sizes of existing facilities that will be integrated with project work.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Road Base: Type Class 6 as specified in Section 2100 or 3/4 Screened Crushed Rock.

B. Trench Backfill under existing and proposed streets: Type Class 6 or Class 1. Class 1 may be native materials crushed or screened to 2-inch minus. Material must be approved prior to use by the District. A wheel roll test with a loaded single axle dump truck may be used to test trench compaction if approved by the District if not testable by nuclear gage.

C. Stabilizing Material: Minimum of 1 ½ inch, uniformly graded, clean rock, or as directed by Engineer.

D. Blended Aggregate: Type A3 as specified in Section 02060. This backfill shall be allowed under new streets in approved subdivisions. A geotechnical engineer shall design all backfill. The developer's engineer shall provide oversight of installation and compaction including compaction testing. Native soil shall be allowed for the top 2 foot of trench backfill when trench is under an open drainage/irrigation channel for the purpose of sealing the channel and minimizing leakage.

E. Flow-Fill: Structural Backfill that meets the requirements of 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 206.02; within the following limits:

1. Components per cubic yard

Fine Aggregates (Type A2 as specified in Section 02060) 1,845 lbs.

Coarse Aggregates (Type A1 as specified in Section 02060) 1,700 lbs.

Cement 50 lbs.

Water 325 lbs.

2. Slump – 6 inch minimum, 8 inch maximum

3. Strength – 10 psi minimum in 1 day, 60 psi maximum in 18 days.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.

1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use staking for alignment and elevation of water mains to establish lines and grades.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.

C. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities indicated to remain.

- E. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.
- F. Prior to excavation in paved areas, the pavement shall be cut in such a manner as to affect a smooth, straight edge and a vertical face 12 inches minimum beyond the trench wall.

3.3 TRENCHING

- A. Excavate subsoil by open cut to the depth required, unless written permission is given by District to do otherwise, for utilities at the required locations.
- B. Remove lumped subsoil, boulders, and rock.
- C. When rock or hard clay is encountered, the trench shall be over-excavated 6 inches.
- D. Excavation performed within 24 inches of existing utility service shall be done in accordance with utility's requirements.
- E. Do not advance open trench more than 200 feet ahead of installed pipe, unless the District determines a shorter length is necessary for the safety of the public.
- F. Cut trenches to the width necessary to permit the pipe to be laid, jointed properly, inspected, and backfilled properly. No trench shall have a width of no less than the diameter of the pipe plus 12 inches. The maximum clear trench width, measured 1 foot above the top of the pipe barrel shall not be greater than that shown in the following table unless otherwise specified:

<u>Pipe Diameter (inches)</u>	<u>Maximum Trench Width (inches)</u>
6	36
8	36
10	36
12	36
16	36
20	44

- G. When maximum trench widths are exceeded and Engineer determines that the design load limits of the pipe are exceeded, the Contractor will be required to either cradle the pipe in concrete or to use a pipe of a stronger class.
- H. Remove water or materials that interfere with Work. Contractor shall provide and maintain at all times ample means and devices to promptly and properly dispose of all water entering trench excavation. Water shall be disposed of in a suitable manner without damage to adjacent property or without a menace to public health and convenience. Unless authorized, in writing, trench water shall not be allowed to enter any water or sewer lines. Protect pipeline against damage from water in the event of a storm or pump failure.
- I. Excavate trenches to depth indicated on Drawings. The trench shall be excavated to a depth below the established grade equal to 1/8 the outside diameter of the pipe, but not less than 4

inches. Provide uniform and continuous bearing and support for bedding material and pipe. A continuous trough shall be excavated to receive the bottom quadrant of the pipe barrel and bell ends. Excavate adequate space for required restraints, valves, and fittings prior to placing pipe in trench.

J. Do not interfere with the bearing soil of foundations of existing structures.

K. When Project conditions permit, slope side walls of excavation starting 1 foot above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

L. When subsurface materials at bottom of trench are loose, soft, or otherwise unsuitable, excavate to greater depth as directed by the District until suitable material is encountered. It shall be replaced, as directed by Engineer, with approved backfill material and methods to provide a suitable foundation for the pipe, which may include 1 ½ inch clean rock.

M. Trim excavation. Remove loose matter.

N. Correct areas over-excavated with compacted backfill as specified for authorized excavation as directed by the District.

O. Remove excess subsoil, not intended for reuse, from site. Topsoil shall be removed and piled separately for use in finish grading the site. Excavated material that is suitable for backfilling shall be piled in an orderly manner, a sufficient distance from the trench to avoid over-loading and to prevent slides or cave-ins.

P. Boring, Tunneling, and Jacking:

1. Not permitted under existing sidewalk, curb and gutter, or other structures, where depth of trench and soil conditions permit.
2. Written permission by the District is required.
3. Tunneling will not be permitted for distances greater than 10 feet.
4. When jacking is required, only persons experienced in such work, using suitable equipment, shall perform the operation.
5. Flow-fill shall be used as backfill under any structure that has had material excavated from beneath them, been jacked, or for any tunnel.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Design sheeting and shoring to be removed at completion of excavation work.

C. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

D. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BEDDING

A. Bedding installation and material shall be in accordance with Section 2100.

3.6 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen, non-organic, or otherwise suitable fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place fill material in continuous layers and compact in accordance with the specifications of this document. Flow-fill may be used from 4 inches above the pipe barrel to the top of the trench.

D. Compact backfill material to 95 percent, maximum dry density, ASTM D1557, Modified Proctor, except for the top 4 feet of the trench, which shall be compacted to 95 percent, maximum dry density, ASTM D1557 Modified Proctor. Wheel roll test may be approved by the District or the Engineer if nuclear gage is not usable for Class 1 material.

E. Lifts will not exceed 8 inches in depth unless a sheep's foot compactor or a hydraulic plate compactor (head shaker) mounted on excavation equipment of adequate size is used. Lift size may be increased by using this compaction equipment when it is demonstrated that compaction requirements can be met. District will make final determination on the thickness of each lift in the field. Only equipment designed for the purposes of compaction shall be used.

F. Employ placement method that does not disturb or damage utilities in trench, and other existing structures or facilities.

G. Maintain optimum moisture content, plus or minus 3 percent, of fill materials to attain required compaction density.

H. Do not leave more than 25 feet of trench open at end of working day.

I. Protect open trench to prevent danger to the public.

3.7 SURFACE RESTORATION

A. Pavement (either asphalt or concrete), curb and gutter, sidewalks, drainage culverts, headwalls, etc., or other improved surfaces that have been removed during the course of work shall be restored to a condition as equal to or better than that prior to removal and to the same elevation and alignment.

B. The subgrade for all restored surfaces shall be thoroughly compacted by mechanical or hand tampers weighing at least 20 pounds, by vibratory rollers, or by other means of compaction approved by the District.

C. Surface restoration shall be per current applicable Town of Westcliffe or the Town of Silver Cliff Specifications and Standards and subject to review by the District.

D. Where excavation occurs in paved areas, the pavement shall be repaired as required in the Specifications and Standards of the Towns of Westcliffe or Silver Cliff.

3.8 FIELD QUALITY CONTROL

A. Compaction Testing: In accordance with ASTM D698.

B. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

C. Compaction Testing for Bedding and Backfill:

1. The District may hire an independent, licensed engineer experienced in soil analysis and evaluation to perform required compaction tests and require the owner/contractor to reimburse the District for the expense or may require the owner/contractor to hire an independent testing firm. Copies of all Proctor curves and test results showing exact location of sample collection and test sites must be furnished to the District as directed. Engineer shall be informed prior to testing, and he may designate areas of testing.
2. Testing is to be done at various elevations in trench, which may require excavation by Contractor after backfill is installed.
3. Frequency of Compaction Tests will be specified by inspector in field but shall be no less than every 200 feet at every 1 foot of depth of the trench or anytime the means and methods of compaction change.
4. Testing shall use the Modified Proctor method. Alternatives such as Standard Proctor or Relative Density based on necessity due to material type may be used with the permission of the Engineer so long as the necessary conversion data, testing, and information has been completed and submitted prior commencement of the work.

3.9 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

B. All areas showing signs of settlement shall be filled and maintained by Contractor during all construction phases and for a period of 1 years following the date of final acceptance.

C. When Contractor is notified by the District that any backfill is hazardous, the condition shall be corrected at once.

END OF SECTION

SECTION 02500: SITE SANITARY SEWER

PART 1 GENERAL

1.1 SUMMARY

- A. (1.2) References
- B. (1.3) Submittals
- C. (1.4) Closeout Submittals
- D. (1.5) Quality Assurance
- E. (1.6) Delivery, Storage, And Handling
- F. (2.1) Sewer Piping
- G. (2.2) Manholes
- H. (2.3) Bedding and Cover Materials
- I. (3.1) Examination
- J. (3.2) Preparation
- K. (3.3) Bedding
- L. (3.4) Pipe
- M. (3.5) Installation – Manholes
- N. (3.6) Service Connections
- O. (3.7) Abandonment
- P. (3.8) Field Quality Control

Related Sections:

- 1. Section 02100 - Backfilling
- 2. Section 02300 - Trenching: Execution requirements for trenching required by this section.

1.2 REFERENCES

A. Colorado Department of Transportation:

- 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.

B. American Society for Testing and Materials:

- 1. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
- 2. ASTM D1557 - Modified Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³)).
- 3. ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.3 SUBMITTALS

- A. Product Data: Submit data on pipe materials, pipe fittings, manholes, and accessories.
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents “AS BUILTS”: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with District standards.
- B. Maintain one copy of each document on site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01500 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Pipes, fittings, valves, and accessories shall be loaded and unloaded or otherwise handled in such a manner as to minimize the possibility of damage prior to installation. All materials shall be stored at the construction site in such a way as to prevent damage and to assure they are kept as clean as possible prior to installation.

PART 2 PRODUCTS

2.1 SEWER PIPING

- A. PVC Pipe:
 - 1. Fittings: SDR 35, Schedule 40
 - 2. Couplings: Shielded Sewer sleeve
 - 3. Joints: Pipe joint assemblies shall be bell and spigot with an O- ring rubber gasket, or solvent weld for clean-outs.
 - 4. Taps on new mains shall be flanged, rigid gasketed PVC fastened with serrated stainless-steel straps.

5. Size:

- a. The minimum size of any new sewer main within the collection system shall be eight (8) inches in diameter.
- b. Larger sizes shall be required as needed to provide proper flow capacity or velocity.

6. Thickness: SDR35 meeting ASTM D3034.

7. Use/Location: Allowed for use in entire system.

8. Service lines:

- a. Schedule 40 PVC
- b. 4" minimum diameter
- c. 1/4" per linear foot drop

B. Pipe Markers

1. All sewer pipeline and service lines shall be installed with burial rated underground warning tape labeled "sewer line buried below" at least 2 ft above the top of the sewer pipeline spanning the entire pipeline.
2. All piping shall be installed with a continuous, Direct Burial #12 AWG Solid (.0808" diameter) tracer wire, 45 mil high molecular weight-high density green polyethylene jacket complying with ASTM-D-1248, 30-volt rating for location purposes by means of an electronic line tracer. Tracer wire installed in directional drill installations shall be steel core hard drawn 1,150 pounds average tensile break load. tap wire shall be Copperhead Industries, LLC, or approved equal by District.
3. The wire shall be placed above all sewer pipeline and service lines.
4. For open cut installation the wire shall be taped to the pipeline at 25-foot intervals. The wire shall be terminated above ground at manhole lids and where service lines enter a structure. All splices in tracer wire shall be made with waterproof split bolt connectors.
5. Upon completion of the tracer wire installation, the Contractor shall demonstrate to the District that the wire is continuous and unbroken through the entire run of the pipe by providing full signal conductivity when energizing for the entire run. If the wire is broken, the Contractor shall repair or replace it.

2.2 MANHOLES

A. General: Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; at all pipe intersections; and at intervals of not more than 400 feet apart. All dead-end manholes where future sewer main extension is anticipated shall have line laid through the manhole a maximum of one (1) pipe length with the size designated by the District and shall be plugged with an approved plug provided by the Contractor.

B. Barrel Size: The internal diameter of the manhole barrel shall not be less than forty- eight (48) inches for sewers of sizes eighteen (18) inch or less; sixty (60) inches for sizes twenty-one (21) to forty-eight (48) inch; seventy- two (72) inches for sizes larger than forty-eight (48) inch.

C. Precast Manholes: Precast manhole barrels and cones shall be manufactured in conformity with ASTM C478 and shall be so marked by the manufacturer.

D. Cast-In-Place Manholes: Concrete used in cast-in-place manholes and manhole bases shall have a twenty-eight (28) day strength of 4000 psi and shall contain not less than six (6) sacks of Portland Cement per cubic yard.

E. Manhole Steps: Shall be provided.

F. Frames And Covers: Manhole frames, rings and covers shall be HS-20 traffic rated, twenty-four (24) inch I.D., meet the standards of ASTM A48 class 35 as manufactured by the Neenah Foundry Company, Neenah Wisconsin or approved equal. The cover shall fit the ring in accordance with the manufacturer's dimensions. Covers with more than one lifting hole will not be accepted. The lifting notch shall be on the covers edge and not in the center and shall not allow surface water to enter the manhole. Frames and grates shall meet an AASHTO HS20 traffic load rating.

G. Manhole Sealant: All joints between manhole sections and pipe openings shall be sealed with an approved watertight sealant ("Rub-R-Nek", or equal). Manholes in areas with high water tables shall be coated on the exterior with an approved watertight sealant. Grade rings and cover rings shall be sealed to the top of the cone with "Rub-R-Nek".

H. Concrete Collars: All manholes in gravel roads shall have concrete collars installed per the Standard Detail. This includes manholes in areas such as alleyways.

2.3 BEDDING AND COVER MATERIALS

A. 3/4" Screened Crushed Rock

B. Road Base: Type Class 6.

C. Flow-Fill: Structural Backfill that meets the requirements of 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 206.02; within the following limits:

1. Components per cubic yard

Fine Aggregates (Type A2 as specified in Section 02060) - 1,845 lbs.

Coarse Aggregates (Type A1 as specified in Section 02060) 1,700 lbs.

Cement - 50lbs.

Water - 325 lbs.

2. Slump – 6 inch minimum, 8 inch maximum

3. Strength – 10 psi minimum in 1 day, 60 psi maximum in 18 days.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify connections and municipal utility water main size, location, and invert as indicated on Drawings.

3.2 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02300 for Work of this Section.
- B. Minimum support for the pipe shall be directed by the design engineer to meet conditions in the field. No pipe shall be installed when the design engineer has determined that the trench conditions are unsuitable.
- C. Prior to placing concrete for cradles or encasements, temporary supports consisting of concrete blocks shall be used to support the pipe in place. Not more than two supports shall be used for each pipe length, one on either end. Inspection by the District is required prior to placement of concrete.
- D. Place bedding material at trench bottom, level fill materials under pipe in one continuous layer not less than 4 inches compacted depth. Place bedding material 6 inches above the top of the pipe; compact to 95 percent, maximum dry density, ASTM D1557, Standard Proctor.
- E. Place fill material in accordance with the Specifications of the Towns of Westcliffe and Silver Cliff.

3.4 INSTALLATION - PIPE

- A. Carefully lower pipe and fittings into trench in such a manner as to prevent damage to the water main materials and protective coatings and linings.

B. Prevent foreign material from entering pipe or joint space while it is installed. During installation, no debris, tools, clothing, or other materials shall be placed in the pipe. At times when installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or as directed by the Engineer. If water is in trench, the plug shall remain in place until the trench is pumped completely dry.

C. Horizontal Clearance Between Sewer and Water Mains: Maintain minimum of ten (10) feet horizontal between sewer and water mains. At no time shall a bell or spigot PVC water pipe joint be located within five (5) feet of the centerline of a sanitary sewer pipe trench.

D. Vertical Clearance Below or Above Water Lines: Where sewer lines cross water mains or come within ten (10) horizontal feet of each other, the sewer pipe shall have a minimum of eighteen (18) inches vertical clearance *below* the water main. Should a situation exist where a sewer main must be constructed crossing *above* a water main, the minimum vertical clearance shall also be eighteen (18) inches. If this vertical clearance is not feasible, the sewer pipe section must be designed and constructed so as to protect the water main (See point 1), and the minimum vertical clearance shall be six (6) inches.

1. Water Main Protection: The sewer pipe shall be sealed within another, larger continuous (joint free) pipe, for at least ten (10) feet horizontally on either side of the water main. The sewer pipe shall be sealed within the encasement pipe with non-shrink concrete grout extending at least 6" into the larger pipe.

E. Service Line Protection: Sewer service lines shall maintain minimum 4 ft separation from water service lines. Where a newly installed sewer service line must come within four (4) horizontal feet or cross an existing water service line, it shall be encased within SCH 40 PVC pipe, sealed at the ends with non-shrink grout or burial rated sealant. This applies to force mains as well.

F. Sewer mains shall be placed under traveled portion of roadway if possible. Provide staking for alignment and elevation a minimum of 50 feet apart and for location of manholes.

G. Install pipe with a preferred 7-feet of cover, and a minimum of 3.5-feet of cover from top of the pipe to the final finished grade of street.

H. If for any reason, required cover cannot be maintained over existing installed sewer mains and services; the mains and service lines so affected shall be relocated at the expense of the developer/owner.

I. Push-On Joint Pipe:

1. Remove all oil, grit, excess coating, and foreign material from inside of bell and outside of spigot.
2. Flex the circular rubber gasket inward and insert in the recess of the bell. Apply a thin film of gasket lubricant to the inside surface of the gasket and the spigot end of the pipe.
3. Install the spigot end of pipe in bell without letting it contact the ground. Push the joint together. Pipe that is not furnished with a depth mark shall be marked prior to assembly to assure that spigot is installed to the proper depth.
4. Field cut spigot ends shall be filed and ground smooth and angled to resemble the original manufactured end.

J. Install pipe to allow for expansion and contraction without stressing pipe or joints per pipe specifications.

K. Backfill trench in accordance with the Specifications of the Towns of Westcliffe and Silver Cliff.

3.5 INSTALLATION – MANHOLES

A. Construction: Manholes shall be installed or constructed on undisturbed soil at the base. If soil is disturbed at the base, eighteen inches (18”) of flow fill shall be placed at the base. Manholes shall be installed or constructed at the locations and to the elevations indicated on the drawings. Manholes shall be backfilled using a class 6 road base. The District's written approval shall be required prior to installation of any non-standard size, shape, or type manholes.

B. Adjust Manhole Ring & Cover to Grade: The cone section shall not extend closer than eight (8) inches and not more than ten (10) inches from the top of the manhole cover. Precast concrete adjustment rings or HDPE adjusting rings meeting ASTM D- 4976 shall be used on top of the cone to support and adjust the manhole ring & cover to the required final grade.

C. Seal Pipe Ends to Manhole: Where the sewer main enters the manhole, appropriate measures shall be taken to prevent any infiltration of groundwater into the system.

D. Manhole Bases: Inverts shall be cast with uniform curves and smooth surfaces. The floor of the manhole outside of the channel shall be finished smooth surface and shall slope to the channel. The minimum thickness of the base shall not be less than eight (8) inches under the invert of the manhole channel.

E. Continuous Pipe Through Manhole (Inverts): The PVC sewer line may be laid continuously through manhole locations wherever grade and alignment permit. After the invert has been cast, the upper half of the pipe shall be cut out, for at least 36” and the bottom cleaned. Precast inverts may be used when approved by the District. Inverts through the manhole shall be smooth and manhole bottoms shall slope to the sewer invert by a minimum of 2” from manhole wall. If the PVC pipe is not continuous through a manhole the invert shall provide a minimum of 0.1 ft. drop in a straight run, 0.2 ft. drop in a manhole angled at 45 degrees or less and a 0.3 ft. drop in manholes angled greater than 45 degrees.

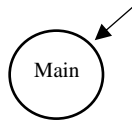
F. Connections to Existing Manholes: Sewer pipe connection to existing manholes where there is no existing pipe stubbed out shall be made in such a manner that the finished work will conform as nearly as practicable to the requirements specified for new manholes. The new sewer shall be designed and located so flowline will be as close to possible to the top of the existing pipe. The Contractor shall break out as small an opening in the existing manhole as practical to insert the new sewer pipe. The existing concrete foundation bench shall be chipped to fit the new pipe. Non-shrink cement grout shall be used as necessary to smoothly finish the new invert and to seal the new line, so the junction is watertight. Flowlines shall be constructed in a professional manner, finished smooth, and shaped to provide directional control of the flow.

G. Outside Drop Manholes: Whenever the elevation difference between the incoming sewer invert and the invert of the manhole cannot be accommodated to the District's satisfaction by a transition in the invert, an outside drop shall be constructed.

3.6 SERVICE CONNECTIONS

A. Sewer Service Laterals: All sewer service laterals shall be installed by contractor. Tapping of live sewer mains shall be performed by the District. District may, at their discretion, allow a contractor to install sewer taps on new sewer main extensions before they are placed in service. All connections shall be inspected by the District during construction and while being tested.

B. New Line Tap: New sanitary sewer mains shall utilize taps, so tap is at a location of 45 degrees to the centerline of the pipe. Sewer taps shall utilize Sewer Saddles approved by the district. (See approved materials list and paragraph H in this section)



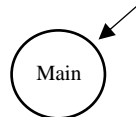
C. Service Size & Slope: Service laterals for individual residences, and for multi-family residences of up to 4 units, shall be 4" PVC, ASTM D 3034 Schedule 40, installed on a grade of not less than 1/4" in per foot. Service laterals for multi-family residences of more than 4 units, and for commercial or industrial usage, will be individually sized by the design engineer based on flow predictions and the International Plumbing Code. All service sizes larger than 4 inches shall be connected to the main by the installation of a manhole.

D. Service Location / Stub-Outs: Service lines are to be installed at standardized locations throughout the subdivision, preferably near the center of the lot away from the power, phone, & TV utilities which tend to congregate at lot corners. Service lines shall be installed to a point inside the property line, and 2' beyond the dedicated easement, and shall be capped or plugged with a fitting suitable to withstand pressure testing. The end of the installed service line shall be marked with a 2" x 4" timber post or 4" PVC sewer pipe, painted green, extending from the bottom of the service line to a point approximately 18" above grade.

E. Separation of Water and Sewer Service Lines: (See 3.4 F)

F. Service Locations to be Staked: The Contractor shall place a grade stake locating each sewer service before it is installed. Both the Tap and the end of the service shall be so staked. The actual installed location of service taps, and the ends of the service laterals shall be measured and recorded by the Project Engineer on the As- Built Drawings.

G. Existing Line Tap: New taps to an existing sewer line are to be made at an angle of 45 degrees to the centerline of the pipe unless approved otherwise by the District in advance. Sewer taps shall utilize Sewer Saddles approved by the district. (See approved materials list)



H. Disconnection of Existing Sewer Taps: Disconnection of sewer service lines shall be responsibility of the property owner. Disconnection shall take place within 2 feet of the main. The side closest to the main shall be plugged with concrete and capped. An inspection shall be performed by the District prior to backfill.

3.7 ABANDONMENT

A. Existing sewer mains indicated by the Engineer shall be abandoned and pipe ends shall be plugged with 1-foot of concrete as directed.

B. Existing manholes to be abandoned shall be removed as a whole, including invert, and shall be backfilled.

3.8 FIELD QUALITY CONTROL

A. Contractor will perform Field inspecting under the direct supervision of the District inspector unless otherwise indicated.

B. In addition to any deficiencies covered by ASTM D3034, PVC that has any of the following visual defects will not be accepted:

1. Straightness: Any joint of pipe which has a camber (perpendicular offset from a straight line) of more than one half inch (1/2") in the length of the joint. Pipe with camber of less than 1/2" shall be installed with the curves laid horizontally alternating left and right.
2. Pipe which is sufficiently out-of-round to prohibit proper jointing.
3. Improperly formed bell and spigot ends.
4. Fractured, cracked, chipped, or otherwise damaged pipe.
5. Pipe that has been damaged during shipment or handling.
6. The interior and exterior surfaces of all PVC pipe shall be uniform in color, shall not have been "sunburned" during long term outside storage, and shall be smooth and free of scratches or blisters.

C. The District will not approve any pipeline installation if there is any infiltration along any length of the pipeline or at manholes. Approved testing method is pressure testing and visual observations prior to placing in service.

D. Low Pressure Test: All sections of sewer pipeline, including service laterals, shall be tested for integrity by low pressure air testing in accordance with the recommendations of the Uni-Bell 5th Edition (or latest version) Handbook of PVC Pipe Design and Construction guideline. Any section that fails to hold pressure within .5 psi for the test interval, in accordance with the test protocol, shall be repaired at the Contractor's expense.

1. Backfill: The pipeline shall be backfilled sufficiently to restrain the pipe laterally & vertically.

2. Test Pressure: The sewer pipeline will be plugged at each pair of manholes and pressurized with compressed air to 3.6 psi +/- .1 psi above groundwater pressure, if any.

3. Maximum Pressure Drop: Loss of air pressure during the test interval, defined below, shall not exceed .5 psi. The test interval shall be the sum of the test time for the main line plus test time for the service laterals, in accordance with the accompanying table:

Minimum Test Interval (Minutes)								
Sewer Main Air Test for a 0.5 PSI Maximum Pressure Drop								
	Pipeline Length							
Pipe Diameter:	100'	150'	200'	250'	300'	350'	400'	450'
4"	1:53	1:50	1:50	1:50	1:50	1:50	1:50	1:50
6"	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8"	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10"	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12"	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15"	7:05	7:05	8:54	11:00	13:21	15:35	17:48	20:02

E. Vertical Pipe Deflection: Prior to Final Acceptance of the project, the District inspector will require the testing of any new section of the sewer pipeline for vertical ring deflection. This is typically accomplished by pulling a mandrel through the pipeline. Maximum ring deflection of the pipeline under load shall be limited to 5% of the vertical internal pipe diameter. All pipe deflection exceeding 5% shall be repaired or replaced by the Contractor at no expense to the District.

F. Video Inspection: Prior to final acceptance and the pipeline being placed into service, the contractor shall either submit a copy of video inspection to the District at the contractor's expense, or the District will provide video inspection at the District's expense. The video inspection shall show footage of all taps and manholes. This video inspection shall become the property of the District and shall be used to determine condition of installation. Deficiencies discovered during the video inspection shall be the contractor's responsibility to correct.

G. Compaction testing for bedding and backfill in accordance with the "Trenching" section of this document.

H. When tests indicate Work does not meet specified requirements, repair Work and retest.

I. Before backfilling any sewer service line or new main line within the Towns right-of-way, the District must be contacted for an inspection. This applies to both new installation and repairs. Failure to call for an inspection will result in re-excavating and re-backfilling the line at the Contractor's or property owner's expense, in order that the work can be properly inspected.

J. District personnel will make sewer taps and inspections between the hours of 8:00AM and 3:00PM, Monday through Friday. No taps or inspections will be done after 3:00PM.

K. Pipe shall be installed at the depths, grades, and locations shown on the approved drawings. A pipeline laser shall be used to establish line and grade for the excavator and the pipe layers. Trained, qualified personnel using appropriate surveying equipment and methods shall set the laser to line and grade. The District may order cessation of work if the Contractor fails to provide trained and qualified personnel to set the laser.

L. The pipeline may be placed in operation after all required cleaning, testing, and inspection have been completed and written permission has been granted by the District. During the warranty period, any defects in the system resulting from defective materials, poor workmanship, or any other cause attributable to the Contractor shall be corrected at his expense and to the satisfaction of the District. Should the Contractor fail to respond within 48 hours after written notification of any deficiency, the District may complete the work and bill the Contractor. In emergency situations, the District shall take whatever steps necessary to correct the problem.

END OF SECTION

SECTION 02700: SITE WATER DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. (1.2) References
- B. (1.3) Submittals
- C. (1.4) Closeout Submittals
- D. (1.5) Quality Assurance
- E. (1.6) Delivery, Storage, And Handling
- F. (2.1) Water Piping
- G. (2.2) Valves
- H. (2.3) Hydrant
- I. (2.4) Pipe Markers
- J. (2.5) Bedding and Cover Materials
- K. (2.6) Accessories
- L. (3.1) Examination
- M. (3.2) Preparation
- N. (3.3) Boring
- O. (3.4) Bedding
- P. (3.5) Installation - Pipe
- Q. (3.6) Installation - Valves and Hydrants
- R. (3.7) Installation - Meters
- S. (3.8) Service Connections
- T. (3.9) Disinfection of Domestic Water Piping System
- U. (3.10) Filling and Flushing Domestic Water Piping System
- V. (3.11) Abandonment
- W. (3.12) Field Quality Control

Related Section:

- 1. Section 02300 - Trenching: Execution requirements for trenching required by this section.

1.2 REFERENCES

- A. Colorado Department of Transportation:
 - 1. 2011 CDOT Standard Specifications for Road and Bridge Construction.
- B. American Society for Testing and Materials:
 - 1. ASTM A536 – Standard Specification for Ductile Iron Castings.
 - 2. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
 - 3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³)).
 - 4. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

C. American Water Works Association:

1. AWWA C104 - American National Standard for Cement- Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C111 - American National Standard for Rubber- Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C153 – Ductile-Iron Compact Fittings, 3-inch Through 16-inch, for Water and Other Liquids.
4. AWWA C207 – Steel Pipe Flanges for Waterworks Service – Sizes 4-inch Through 144-inch.
5. AWWA C502 - Dry-Barrel Fire Hydrants.
6. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
7. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
8. AWWA C605 – Underground installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
9. AWWA C651 – Disinfecting Water Mains.
10. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.

D. Underwriters Laboratories Inc.:

1. UL 246 - Hydrants for Fire - Protection Service.

1.3 SUBMITTALS

- A. Product Data: Submit data on pipe materials, pipe fittings, valves, and accessories.
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents “AS BUILTS”: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with District standards.
- B. Maintain one copy of each document on site.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01500 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Pipes, fittings, valves, and accessories shall be loaded and unloaded or otherwise handled in such a manner as to minimize the possibility of damage prior to installation. All materials shall be stored at the construction site in such a way as to prevent damage and to assure they are kept as clean as possible prior to installation.

PART 2 PRODUCTS

2.1 WATER PIPING

A. The District reserves the right to require ductile iron piping for sections of new water main within the developed portion of the District that will connect to ductile iron on both ends.

B. Water main extensions shall be designed to make continuous loops, connecting to the District water system in at least two points wherever possible to provide alternate sources of supply.

C. Ductile Iron Pipe: AWWA C151 and C104, Pressure Class 350, exceptions by Engineer may include Class 50 Tyton Joint or Class 52.

1. Fittings: Ductile iron, compact, AWWA C153, manufactured/cast in U.S.A.
2. Joints: AWWA C110, C111, and C153, push on single rubber gasket, mechanical joint restraints ("Mega-lug", retainer gland) for all connections to valves and fittings.
3. Jackets: AWWA C105 polyethylene jacket, half lapped, 8 mil (0.008 inch), polyethylene tape.
4. Coatings & Linings: AWWA C205, cement-mortar lining, bituminous seal coating.
5. Size:

a. The minimum size of any new water main within the distribution system shall be eight (8) inches in diameter.

b. In location where the design engineer determines that a water main must be larger than eight (8) inches in diameter, the water main shall be of such size as specified by the District or recommended by the design engineer.

c. Larger sizes shall be required as needed to provide proper distribution flow, pressure, and fire protection.

6. Use/Location: Allowed for use in entire system.

D. High Density Polyethylene

1. Pipe shall be DR9 pressure class 200 psi, C.T.S.
2. Fittings: Compression per Approved Materials List with stainless steel stiffener.
3. Size: Up to 2-inch. Pipe shall be sized to maintain same I.D. as CTS and may require upsizing with reducers.
4. All HDPE piping shall be installed with tracer wire per District specifications.

- E. PVC Pipe: AWWA C900 and C905,
1. Fittings: AWWA C111, cast iron, wrapped, manufactured/cast in U.S.A.
 2. Joints: ASTM D3139 compression gasket ring, AWWA C153 and C900, mechanical joint restraints (“Mega-lug”) for all connections to valves and fittings.
 3. Jackets: Fittings and valves only, AWWA C105 polyethylene jacket, half lapped, 8 mil (0.008 inch), polyethylene tape.
 4. Size:
 - a. The minimum size of any new water main within the distribution system shall be eight (8) inches in diameter.
 - b. In location where the design engineer determines that a water main must be larger than eight (8) inches in diameter, the water main shall be of such size as specified by the District or recommended by the design engineer.
 - c. Larger sizes shall be required as needed to provide proper distribution flow, pressure, and fire protection.
 5. Thickness: DR-18.
 6. Use/Location: Allowed for use in entire system.

2.2 VALVES

A. GATE VALVES

1. Valves: Manufactured/cast in U.S.A.
2. 4-12 inches: AWWA C509, iron body, resilient seat, open left, non-rising stem with 2-inch square nut, single wedge, MJ.
3. Accessories: Manufactured/cast in U.S.A.

B. BUTTERFLY VALVES

1. Valves: Manufactured/cast in U.S.A.
2. 16 inches or larger: AWWA C504, iron body, bronze disc, resilient replaceable seat, open left, non-rising stem with 2-inch square nut, MJ.
3. Accessories: Manufactured/cast in U.S.A.

C. CONCRETE COLLARS

1. All valves shall have concrete collars in gravel roads.
2. All manholes shall have concrete collars in gravel roads or alleyways.

2.3 HYDRANT

A. Manufacturers per Approved Materials List.

B. Hydrants shall be domestic hydrants for casting, parts, and manufacturing.

C. Hydrant: AWWA C502, UL 246, dry barrel type, traffic “break away” type, safety stem coupling, frangible bolts or safety flange allowing full rotation of nozzle section, main valve opening 5 ¼ inch minimum, 6-inch mechanical joint inlet, 1 ½ inch pentagon operating nut, open left.

D. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

E. Hose Connection: 2 hose nozzles, 1 pumper nozzle, national standard threads, 1 ½ inch pentagon nut on caps.

F. Finish: Factory applied powder coated Red in color to match existing hydrants in system.

2.4 PIPE MARKERS

A. Underground

1. All water pipeline and service lines shall be installed with burial rated underground warning tape labeled “water line buried below” at least 2 ft above the top of the water pipeline spanning the entire pipeline.

2. All piping shall be installed with a continuous, Direct Burial #12 AWG Solid (.0808” diameter) tracer wire, 45 mil high molecular weight-high density blue polyethylene jacket complying with ASTM-D-1248, 30-volt rating for location purposes by means of an electronic line tracer. Tracer wire installed in directional drill installations shall be steel core hard drawn 1,150 pounds average tensile break load. Tracer wire shall be Copperhead Industries, LLC, or approved equal by District.

3. The wire shall be placed above the water pipeline and HDPE service lines.

4. For open cut installation the wire shall be taped to the pipeline at 25-foot intervals. The wire shall be terminated at the top of valve and curb stop boxes. All splices in tracer wire shall be made with waterproof split bolt connectors.

5. All tracer wire terminals at valve locations shall be inserted into valve box one foot below grade. Valve box shall have ¼ hole and 18-inch of tracer shall be in box. All tracer wire terminals at hydrant locations shall be Copperhead Snakepit Magnetized Tracer Connection Cobra T3 (blue for potable water) manufactured by Copperhead Industries LLC or approved equal by the Engineer; HDPE or SS bracket to mount to hydrant flange and 2 feet of ¾- inch stainless steel conduit.

6. Upon completion of the tracer wire installation, the Contractor shall demonstrate to the District that the wire is continuous and unbroken through the entire run of the pipe by providing full signal conductivity when energizing for the entire run. If the wire is broken, the Contractor shall repair or replace it.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: 3/4" Screened Crushed Rock.

B. Road Base: Type Class 6. Flow-Fill: Structural Backfill that meets the requirements of 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 206.02; within the following limits:

1. Components per cubic yard

Fine Aggregates (Type A2 as specified in Section 02060)	1,845 lbs.
Coarse Aggregates (Type A1 as specified in Section 02060)	1,700 lbs.
Cement	50 lbs.
Water	325 lbs.
2. Slump – 6 inch minimum, 8 inch maximum
3. Strength – 10 psi minimum in 1 day, 60 psi maximum in 18 days.

2.6 ACCESSORIES

A. Concrete for Thrust Restraints, Cradles, Valve Blocking, and Encasements:

1. Refer to District Standard Detail for restraint sizing.
2. Concrete: compressive strength of 4000 psi in 28 days.

B. Bell Joint Restraint: ductile iron, ASTM A536, split ring for sizes greater than 12 inch.

1. PVC pipe: restraint mechanism shall consist of a plurality of individually activated gripping surfaces to maximize restraint capability, EBAA Iron series 1600 or 2800 respectively.
2. DI pipe: restraint mechanism shall consist of a wedge action restraint ring on the spigot joint to a ductile iron follower gland behind the bell, EBAA Iron series 1700.

C. Bolts: Cor-ten steel by U.S. Steel Company or approved equal.

D. Tapping Saddles: Smith Blair Series 317 or better, epoxy coated ductile iron body with double stainless-steel straps and NFS Buna-N Gasket. Saddles for PVC pipe must have straps a minimum of 1" in width.

E. Valve boxes: 5 1/4 inch diameter screw type, per Approved Materials List, "WATER" shall be cast in valve box covers, bonnet required for valves 12 inches or larger.

F. Corporations: Ball type, CC threaded, compression, per Approved Materials List.

G. Curb Stops: Compression, per Approved Materials List.

H. Valve Blocking: solid concrete blocks, 4-inch x 8-inch x 16-inch minimum.

I. Meter Pits: The location of meter pits will be determined by the District based on a case-by-case basis.

1. Meter pits shall be installed between the back edge of the curb and the front edge of the sidewalk in the parkway utility easement. Where no curb, gutter and sidewalk exist, the District shall determine the location of the meter pits.

2. Meter pits shall normally be 20' x 36" heavy plastic meter pits as manufactured by Midstates or approved equal.

3. Meter pits in traffic areas, parking areas or driveways shall have a H20 traffic rated lid and concrete collar or be integrated into the driveway concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify connections and municipal utility water main size, location, and invert as indicated on Drawings.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.3 BORING

A. A qualified contractor shall perform boring with proper boring equipment.

B. Water pipe shall be installed through a steel sleeve under irrigation canals, railroads, creeks, waterways, and other structures designated by the Engineer.

C. Steel sleeve shall be of Standard Weight, Schedule 30 steel, with a diameter adequate to receive the pipe bells and insulators.

D. Corrosion resistant coated casing insulators with steel bands and glass reinforced plastic runners shall be installed and centered within the sleeve according to the manufacturer's instructions at the maximum allowed spacing.

E. Rubber end seals with stainless steel bands, clamps, and screws shall be installed on both ends of the sleeve.

3.4 BEDDING

- A. Excavate pipe trench in accordance with Section 02300 for Work of this Section.
- B. Minimum support for the pipe shall be directed by the design engineer to meet conditions in the field. No pipe shall be installed when the District has determined that the trench conditions are unsuitable.
- C. Prior to placing concrete for cradles or encasements, temporary supports consisting of concrete blocks shall be used to support the pipe in place. Not more than two supports shall be used for each pipe length, one on either end. Inspection by District is required prior to placement of concrete.
- D. Place bedding material at trench bottom, level fill materials under pipe in one continuous layer not less than 4 inches. Place bedding material 6 inches above the top of the pipe; compact to 92 percent, maximum dry density, ASTM D698, Standard Proctor.
- E. Place fill material in accordance with the Specifications of the Towns of Westcliffe and Silver Cliff.

3.5 INSTALLATION - PIPE

- A. Carefully lower pipe and fittings into trench in such a manner as to prevent damage to the water main materials and protective coatings and linings.
- B. Prevent foreign material from entering pipe or joint space while it is installed. During installation, no debris, tools, clothing, or other materials shall be placed in the pipe. At times when installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or as directed by the Engineer. If water is in trench, the plug shall remain in place until the trench is pumped completely dry.
- C. Horizontal Clearance Between Water and Sewer Mains: Maintain minimum of ten (10) feet horizontal clearance between water and sewer mains. At no time shall a bell or spigot PVC water pipe joint be located within 5 feet of the centerline of a sanitary sewer pipe trench.
- D. Vertical Clearance Above or Below Sewer Lines: Where water pipelines cross sewer pipelines or come within ten (10) horizontal feet of each other, the water pipe shall have a minimum of eighteen (18) inches vertical clearance above the sewer main. Should a situation exist where a water main must be constructed crossing below a sewer main, the vertical clearance shall also be eighteen (18) inches. If this vertical clearance is not feasible, the water pipeline must be designed and constructed so as to protect the water main (See point 1), and the minimum vertical clearance shall be six (6) inches.
 - 1. Water Main Protection: The contractor shall construct the new water main so as to center a full 20' section of pipe on the existing sewer line so as to provide maximum distance between the joints of the water pipe and the sewer main. This will likely require the contractor to cut and re-bevel the end of the previously laid pipe in order to center. Centering shall be +/- 1 ft from centerline of sewer pipe. The water main shall be blocked on both sides of the sewer pipe with concrete blocks resting on undisturbed native soil.

Bedding and backfill materials within 3-feet either side of the intersection of water and sewer pipe shall be lightly compacted (less than 95% Standard Proctor density) until the water main is backfilled to approximately 6-inches above the top of the pipe, at which point normal compaction shall begin.

E. Water service lines shall maintain minimum 4 ft separation from sewer mains or service lines. Where a newly installed water service line must come within four (4) horizontal feet or cross an existing sewer main or service line, it shall be encased within SCH 40 PVC pipe, sealed at the ends with non-shrink grout or burial rated sealant.

F. Water mains shall be installed so that a continuous loop is provided for an alternate source of supply where deemed practical by the District.

G. Water mains shall be placed under traveled portion of roadway if possible. Provide staking for alignment and elevation of water mains a minimum of 50 feet apart and for location of hydrants.

H. Install pipe with 5-feet of cover from top of the pipe to the final finished grade of street.

I. If for any reason, required cover cannot be maintained over existing installed water mains or water service lines; the mains and service lines so affected shall be relocated at the expense of the developer/owner.

J. Mechanical Joint Fittings:

1. Install ductile iron piping and fittings per AWWA C600 and PVC piping and fittings per AWWA 605.
2. All fittings and valves shall be wrapped/encased with polyethylene jacket per AWWA C105.
3. There shall be a minimum of 18 inches of pipe between all valves and fittings.
4. Remove all oil, grit, excess coating, and foreign material from inside the fitting. Slip the follower gland on the spigot end of the pipe with the lip extension of the gland toward the socket, or bell end. Place the rubber gasket on the spigot end with the thick edges toward the gland. Push the entire section of pipe forward to seat the spigot in the socket end of the fitting. Press the gasket into place within the socket. Move the follower gland along the pipe into position for bolting. Insert all the bolts and “finger” tighten nuts. Tighten nuts spaced 180 degrees apart alternately in order to produce an equal pressure on all parts of the gland. Tighten all nuts with a torque limiting wrench according to the following torques:

Bolt Size	Torque (ft-lb)
5/8"	40-60
3/4"	60-90
1"	70-100
1 1/2"	90-120

K. Push-On Joint Pipe:

1. Remove all oil, grit, excess coating, and foreign material from inside of bell and outside of spigot.
2. Flex the circular rubber gasket inward and insert in the recess of the bell. Apply a thin film of gasket lubricant to the inside surface of the gasket and the spigot end of the pipe.
3. Install the spigot end of pipe in bell without letting it contact the ground. Push the joint together. Pipe that is not furnished with a depth mark shall be marked prior to assembly to assure that spigot is installed to the proper depth.
4. Field cut spigot ends shall be filed and ground smooth and angled to resemble the original manufactured end.

L. Water mains shall be designed to be restrained mechanically without the use of thrust blocks when at all possible:

1. Design of number and placement of mechanical joint restraints shall be by a licensed professional engineer.
2. Install "Mega-Lug" fittings or retainer glands on all fittings and valves. Form and place concrete for thrust restraints at elbow or change of direction of pipe main in addition to mechanical restraints.
3. At a minimum, install a bell joint restraint when a bell end is within 14 feet of a fitting or valve. Also, the last section of pipe at a dead end shall have a bell joint restraint, in addition to adequate blocking, if the section is less than 14 feet. Pipe sizes larger than 8 inches in diameter will have different requirements.
4. A closed valve that will be pressure tested against shall be considered as a dead end.
5. Locking gaskets (if available) may be substituted for bell joint restraints where applicable with the District's approval.

M. Route pipe in straight line at a constant depth. When pipe is laid on a grade of 10 percent or greater, the laying shall start at the lower elevation and shall proceed uphill with the bell ends of the pipe uphill.

N. Install pipe to allow for expansion and contraction without stressing pipe or joints per pipe specifications.

O. Concrete Thrust Restraints (when applicable):

1. Form and place concrete for pipe thrust restraints at change of pipe direction when required by the design engineer or not otherwise restrained.
2. Place concrete to permit full access to pipe and pipe accessories against undisturbed trench wall.
3. Use plastic "bond breaker" between concrete restraint and pipe or fitting.
4. Allow concrete restraint to cure for 12 hours before continuing backfill operations.

P. Install trace wire continuously to the top of PVC pipe taped at least 25 ft. intervals to keep it on top of pipe during backfill operations. Bring trace wire to surface at every hydrant and valve location and at locations indicated by Engineer.

Q. Backfill trench in accordance with Specifications of the Towns of Westcliffe and Silver Cliff.

3.6 INSTALLATION - VALVES AND HYDRANTS

A. Install valves at locations indicated on Drawings.

B. In gravel roads, Valve boxes shall have a square concrete collar installed flush with road surface. Collar shall be 8-inch x 16-inch x 16-inch and shall one diamond shaped #5 rebar with 3-inch clearance.

C. Set valves on blocking placed on subsoil.

D. Valves up to and including 8 inches: install solid concrete blocks, 4-inch x 8-inch x 16-inch minimum.

E. Valves 10 & 12 inch: blocks under 10-inch and 12-inch butterfly valves shall be pre-cast concrete 3-foot wide X 3-foot wide and 6-inches thick. The blocks shall be constructed with concrete of a compressive strength of 3500 psi at 28 days and reinforcement of #4, grade 40 deformed bar at 12-inch o.c. each way. Smaller blocks will be stacked tightly onto the pre-cast block up to the bottom of the valve operator nut of all butterfly valves. Flow-fill in addition to blocking shall be installed a minimum of 8 inches under valve up to the spring line of the pipe.

1. Valves greater than 12 inches: blocks under valves shall be pre-cast concrete 4-foot wide X 4-foot wide and 6-inches thick. The blocks shall be constructed with concrete of a compressive strength of 3500 psi at 28 days and reinforcement of #4, grade 40 deformed bar at 12-inch o.c. each way. Flow-fill in addition to blocking shall be installed a minimum of 8 inches under valve up to the spring line of the pipe.

2. The Engineer may specify for valves of all sizes cast-in-place concrete blocking.

F. Center and plumb valve box over valve. Set box cover flush with finished grade. Boxes in paved areas shall have a 2'x2' square concrete collar with #5 rebar, 2" clearance, and concrete jointing for each quadrant.

G. Install hydrants at locations indicated on Plans and as required by the Fire Department and the District. Hydrants shall be a maximum of 500 feet apart, generally at each intersection, and located in conformance with the Uniform Fire Code.

H. When a drainage ditch deeper than 2 feet exists between a hydrant and the roadway, a culvert of appropriate size of at least 10 feet in length shall be installed centered on the hydrant.

I. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

J. Set hydrants to grade, with nozzles at least 16 inches above ground. Breakaway flanges shall be at an approved height per manufacturer's recommendations.

K. Connect hydrant to water main with a 6-inch branch line (using the least number of joints possible) controlled by an independent 6-inch gate valve. Locate control valve per Detail.

L. Provide drain gravel 12 inches square by 12 inches deep (in clay or other impervious soil, pit shall be 36 inches square by 36 inches deep) filled with 1 ½ inch washed gravel with a waterproof barrier on top between pit and backfill. Encase elbow of hydrant in gravel to 12 inches above drain opening.

3.7 INSTALLATION - METERS

A. Install Work in accordance with District standards and Technical Specifications or as shown on Drawings.

B. Meter pits shall be installed between the back edge of the curb and the front edge of the sidewalk in the parkway utility easement. Where no curb, gutter and sidewalk exist, The District shall determine the location of the meter pits.

3.8 SERVICE CONNECTIONS

A. District personnel will perform the installation of taps on the water main. The District may, at their discretion, allow a sufficiently trained contractor to install taps on new water main extensions before they are put into service. All required shoring and safety measures shall be in place prior to District personnel entering the trench to make the taps. The Contractor shall perform excavation, backfill, compaction, and maintenance of trenches for the water main taps and service lines.

B. Where it is required to reconnect the existing tap to the new water main, the Contractor shall extend the existing service line to the new main. Where the Contractor encounters existing galvanized steel or lead pipe water service lines, the Contractor shall completely replace such lines with high density polyethylene line, ¾" minimum. This work shall include miscellaneous fittings for connection to the existing curb stop or water meter or coupling connection at the edge of the street R-O-W, as approved by the District.

C. No service line splices are to be installed under a newly constructed, reconstructed, or overlaid street.

D. For separation of water and sewer service lines, see (3.5 E)

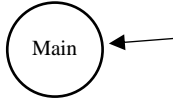
E. For stub-outs: The curb box of the installed service line shall be marked with a 2" x 4" timber post or metal t-post, painted blue, extending from the curb box at least 18" above grade.

F. Service lines shall be placed with 5-ft of cover based on finished grade and shall be installed with tracer wire per District specifications. Depths less than 5- ft shall be insulated and receive prior written approval by the District.

G. Tapping saddles are not required on ductile iron water mains.

H. Taps will not be made by District until the water main has been tested and accepted.

I. Taps will be placed on the water main at a 70-90 degree angle from the top of the main, no closer than 18 inches to another tap, fitting, valve, or a spigot/bell end of pipe.



J. Saddle nuts shall be tightened evenly with the following torque:

Bolt Size	Torque (ft-lb)
5/16"	10-12
1/2"	25-30
5/8"	50-60

3.9 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system per AWWA C651 and CDPHE standards before placing new water main in service. All new development shall pay the expense for any and all tests associated with a new line.

B. Dry granular calcium hypochlorite containing 65% available chlorine by weight shall be used to disinfect water lines. Granules shall be placed in each section of laid pipe before the next section of pipe is installed. The number of granules needed will be calculated before installation and care will be taken to deposit granules past any bell connection to prevent damage. Each hydrant, hydrant branch, and other appurtenances shall also be disinfected.

C. Chlorine residual shall not be less than 50 ppm in the water after 24 hours standing in the pipe. The line shall be re-chlorinated and re-tested until the residual requirement is met.

D. All valves or other appurtenances shall not be operated while the line is filled with the chlorination agent.

3.10 FILLING AND FLUSHING DOMESTIC WATER PIPING SYSTEM

A. If a fire hydrant is unavailable, it may be necessary to install temporary blow-offs to facilitate blowing off and disinfecting the new water mains before the mains can be tied into the District water system. The Contractor shall furnish all materials, labor, and equipment to install and remove the temporary blow-offs. For each blow-off, the Contractor shall install the required assembly as approved by the design engineer (as the blow-off is temporary).

B. Taps shall be made to expel air in locations at high points where no hydrant or blow-off is installed. The design engineer shall specify the size and number of taps. Such taps shall be plugged when testing is complete. Permanent high points in the water main shall have air and vacuum valves and vaults installed.

C. All dead-end portions of the main that are to be tied into existing mains after completion shall be fitted with temporary blocking of sufficient strength to withstand required test pressures.

D. Filling and flushing of mains shall be performed by District personnel.

E. All backfill operations shall be complete and all permanent concrete thrust blocks in place for a minimum of 24 hours prior to any filling or flushing operations.

F. Following chlorination, all treated water shall be flushed from the pipeline until, upon test by District personnel, the water is proved comparable in quality to the water served to the public from the existing system.

3.11 ABANDONMENT

A. Existing water mains indicated by the Design engineer shall be abandoned as directed.

B. Existing water valves shall be removed, if necessary, to install the new main or can be left in place. Valves left in place shall have their valve boxes removed and the resulting void filled with flow fill.

C. Existing fire hydrants to be abandoned shall be removed as a whole assembly by disconnecting it at the lateral without damage to the assembly or surrounding structures and landscape. The hydrant shall be salvaged by delivering it to the District yard if directed, otherwise shall be disposed of at Contractor's expense.

D. Services shall be abandoned by removing the corporation stop and installing a threaded plug. Work shall be inspected by the District.

3.12 FIELD QUALITY CONTROL

A. The Contractor will provide trained personnel to perform line testing unless otherwise indicated.

B. Bacteriological tests shall be paid for by the owner/developer prior to placing lines in service. The District shall observe tests and review results prior to placing lines in service.

C. Pressure testing shall be scheduled upon receipt of a negative coliform bacteria test result.

D. Pressure test system:

1. After completion of pipeline installation, including backfill, but prior to final connection to existing system, the Contractor will provide trained personnel to conduct, in presence of the District inspector, concurrent hydrostatic pressure and leakage tests in accordance with AWWA C600 & AWWA C605.

2. The Contractor shall accept full responsibility for testing against any existing valves, fire hydrants, or other appurtenances.

3. The Contractor will provide equipment required to perform leakage and hydrostatic pressure tests.
4. Test Pressure: Not less than 150 psi or 1.5 times in excess of maximum static pressure, whichever is greater.
5. Conduct hydrostatic test for at least two-hour duration.
6. Pressure shall not vary by more than 5 psi during the hydrostatic pressure test.
7. Before applying test pressure, completely expel air from section of piping under test. Provide corporation cocks so air can be expelled as pipeline is filled with water. After air has been expelled, close corporation cocks and apply test pressure. At conclusion of tests, remove corporation cocks installed and plug pipe openings.
8. The District personnel will slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
9. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.
10. No pipeline installation will be approved when leakage is greater than that determined by the following formula:

$$L = ND\sqrt{P} \cdot 7,400$$

L = allowable, in gallons per hour

N = number of joints in section to be tested

D = nominal diameter of pipe, in inches

P = average test pressure during leakage test, in pounds per square inch (gauge)

11. When leakage exceeds specified acceptable rate, locate source and make repairs. Repeat test until specified leakage requirements are met.

E. Compaction testing for bedding and backfill in accordance with Section 02100.

F. When tests indicate Work does not meet specified requirements, repair Work and retest.

G. The pipeline may be placed in operation after all required cleaning, testing, and inspection have been completed and written permission has been granted by the District. During the warranty period, any defects in the system resulting from defective materials, poor workmanship, or any other cause attributable to the Contractor shall be corrected at his expense and to the satisfaction of the District. Should the Contractor fail to respond within 48 hours after written notification of any deficiency, the District may complete the work and bill the Contractor. In emergency situations, the District shall take whatever steps necessary to correct the problem.

END OF SECTION

APPENDIX

APPROVED MATERIALS LIST

Part Name	Part # / Description
Water Infrastructure (See Water Section 02700 2.1, 2.2, 2.3, 2.4, 2.6)	
Locator Wire	Copperhead 9612TWCCS500, ASTM-D1248 (Blue)
Water Main Valve	2" Square Nut, Open left, Non-rising, Iron body, Resilient Seat, C509/515
Valve Box	Tyler Union 6850
Couplings	Mega-Lug Mechanical Joint Restraint
Water Mains	AWWA C900 PVC
Fire Hydrant	AVK, 5'6", Dry-Barrel, AWWA C502, "Break away" type, Open left
Water Service Lines (See Water Section 02700 2.1 D, 2.6)	
Locator Wire	Copperhead 9612TWCCS500, ASTM-D1248 (Blue)
Water Service Saddle	Mueller or Smith Blair, Ductile Iron, Double SS Strap, Epoxy Coated
3/4" CTS Poly Tubing	3/4"X100' CTS PE TUBING 200PSI / PE3408 NSF SDR-9 D2737
3/4" Pipe Stiffener / Insert	AY McDonald 6133T 3/4" SS INSERT FOR CTS PE
3/4" Corporation Valve	Ford FB1000-3NL 3/4 BALLCORP CCXCTS PJ (CTS) NO LEAD
3/4" Curb Valve	Ford B44-233NL 3/4 BALL CURB PJ CTS (NO LEAD)
5 ft AP Curb Box with Inner Rod	5'0" 5601 AP CURB BOX W/ROD
3/4" Angle Meter Valve	Ford BA23-332WNL 5/8X3/4 ANG BMV CFXM (NO LEAD)
3/4" Angle Meter Check Valve	Ford HHCA34-323NL 3/4 ANG DUAL CHK VALVE NO LEAD
20" x 36" Meter Pit	20X36 MIDSTATES METER PIT MS2036B / MID STATES PLASTICS
20" Aluminum Dome for Meter Pit	20" M70 ALUMINUM DOME MTR BOX
Sewer Infrastructure (See Sewer Section 02500 2.1)	
Locator Wire	Copperhead 9612TWCCS500, ASTM-D1248 (Green)
Sewer Mains	SDR35 PVC, 8" minimum
Sewer Fittings	SDR35 PVC, SCH40
Sewer Repair Coupling	Shielded Sewer Sleeve, Fernco StrongBack RC Coupling
Manholes	See Sewer 2.2
Sewer Service Lines (See Sewer Section 02500 2.1 A, B)	
Locator Wire	Copperhead 9612TWCCS500, ASTM-D1248 (Green)
8" x 4" SDR35 Sewer Saddle	8" X 4" SDR35 PVC SDL TEE GXG
4" SCH40 x SDR35 ADPT	4" SDR35 X DWV ADPT HXH
4" SCH40 Service Line	ASTM D 3034 SCH40, 4" minimum

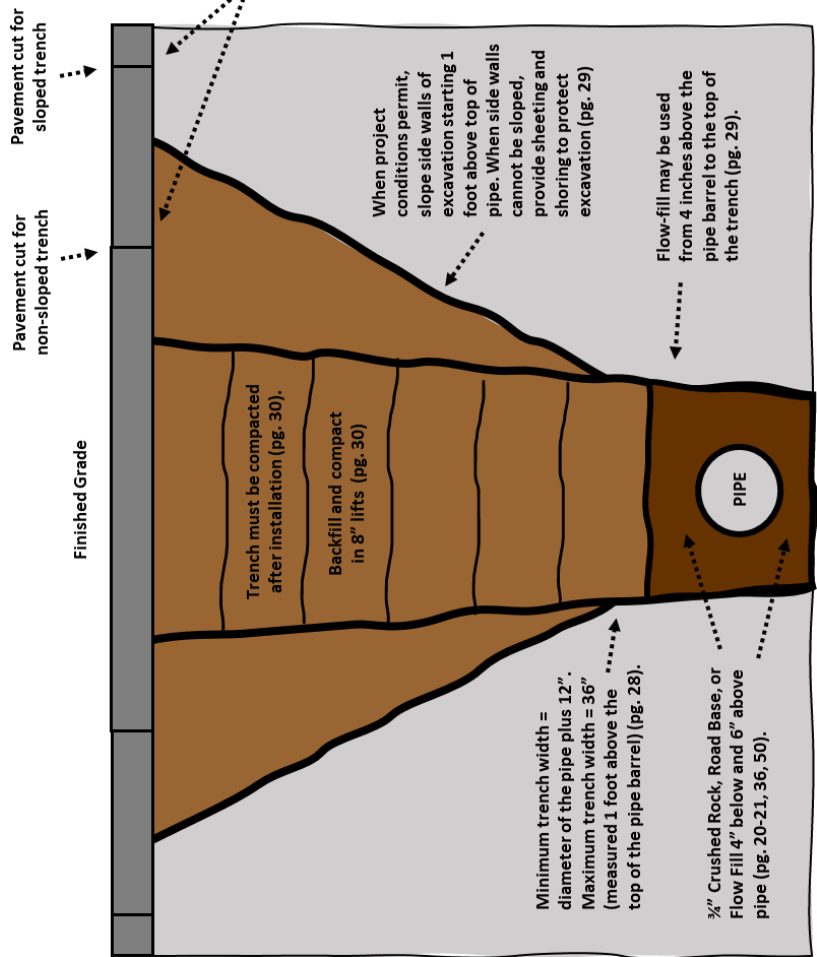
Contact RMWSD for information related to unlisted materials.

INSTALLATION DIAGRAMS

See following pages 59-65.

TYPICAL TRENCH DIAGRAM

See section 2100 & 2300



Surface restoration shall be per current applicable Town of Westcliffe or the Town of Silver Cliff Specifications and Standards and subject to review by the District.

Where excavation occurs in paved areas, the pavement shall be repaired as required in the Specifications and Standards of the Towns of Westcliffe or Silver Cliff (pg. 31).

Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil. (pg. 29)

Disclaimer:

This diagram is provided as a resource for contractors and DOES NOT supersede the District's Regulations and Specifications in any way.

Notes:

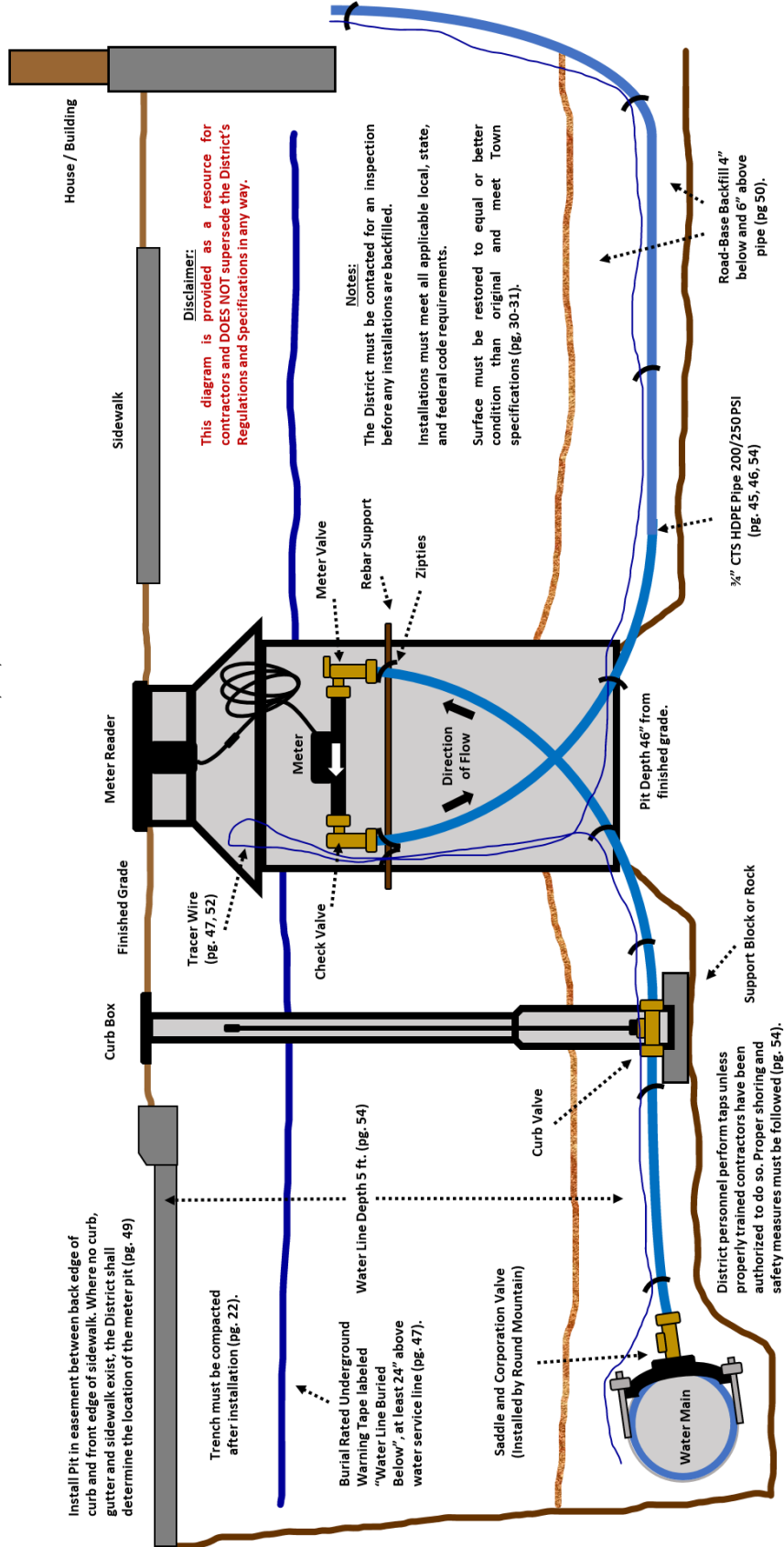
The District must be contacted for an inspection before any installations are backfilled.

Installations must meet all applicable local, state, and federal code requirements.

Surface must be restored to equal or better condition than original and meet Town specifications (pg. 30-31).

WATER TAP DIAGRAM

See section 2700, 3.7, 3.8



Install pit in easement between back edge of curb and front edge of sidewalk. Where no curb, gutter and sidewalk exist, the District shall determine the location of the meter pit (pg. 49)

Trench must be compacted after installation (pg. 22).

Burial Rated Underground Warning Tape labeled "Water Line Buried Below", at least 24" above water service line (pg. 47).

Water Line Depth 5 ft. (pg. 54)

Saddle and Corporation Valve (Installed by Round Mountain)

Curb Valve

District personnel perform taps unless properly trained contractors have been authorized to do so. Proper shoring and safety measures must be followed (pg. 54).

Disclaimer:
This diagram is provided as a resource for contractors and DOES NOT supersede the District's Regulations and Specifications in any way.

Notes:
The District must be contacted for an inspection before any installations are backfilled.
Installations must meet all applicable local, state, and federal code requirements.

Surface must be restored to equal or better condition than original and meet Town specifications (pg. 30-31).

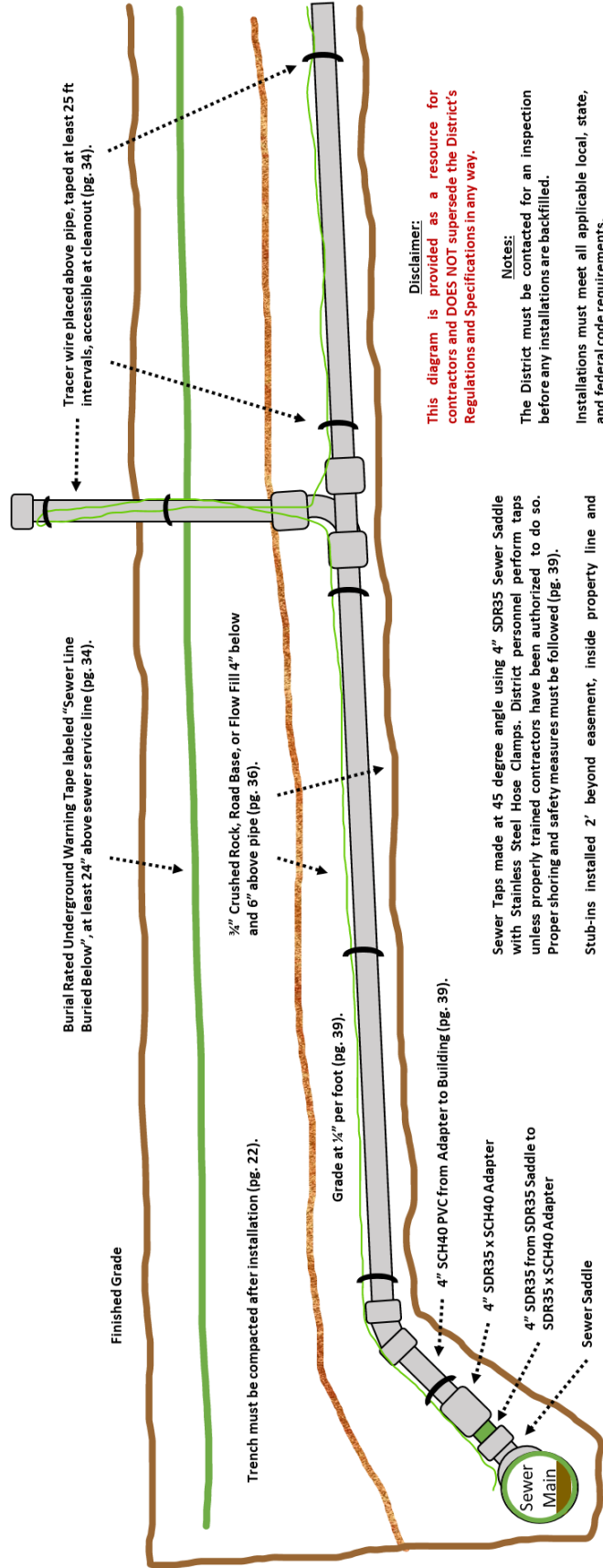
Pit Depth 46" from finished grade.

3/4" CTS HDPE Pipe 200/250 PSI (pg. 45, 46, 54)

Road-Base Backfill 4" below and 6" above pipe (pg 50).

SEWER TAP DIAGRAM

See section 2500, 3.6



Disclaimer:
 This diagram is provided as a resource for contractors and DOES NOT supersede the District's Regulations and Specifications in any way.

Notes:
 The District must be contacted for an inspection before any installations are backfilled.

Installations must meet all applicable local, state, and federal code requirements.

Surface must be restored to equal or better condition than original and meet Town specifications (pg. 30-31).

Sewer Taps made at 45 degree angle using 4" SDR35 Sewer Saddle with Stainless Steel Hose Clamps. District personnel perform taps unless properly trained contractors have been authorized to do so. Proper shoring and safety measures must be followed (pg. 39).

Stub-ins installed 2' beyond easement, inside property line and plugged or capped with fitting able to withstand pressure testing (pg. 39). Stub-ins marked with 4" x 4" post or 4" SCH40 PVC pipe, painted green, extending at least 18" above final grade (pg. 39).

VALVE AND VALVE BOX DIAGRAM

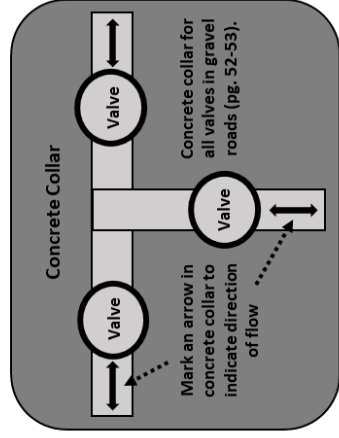
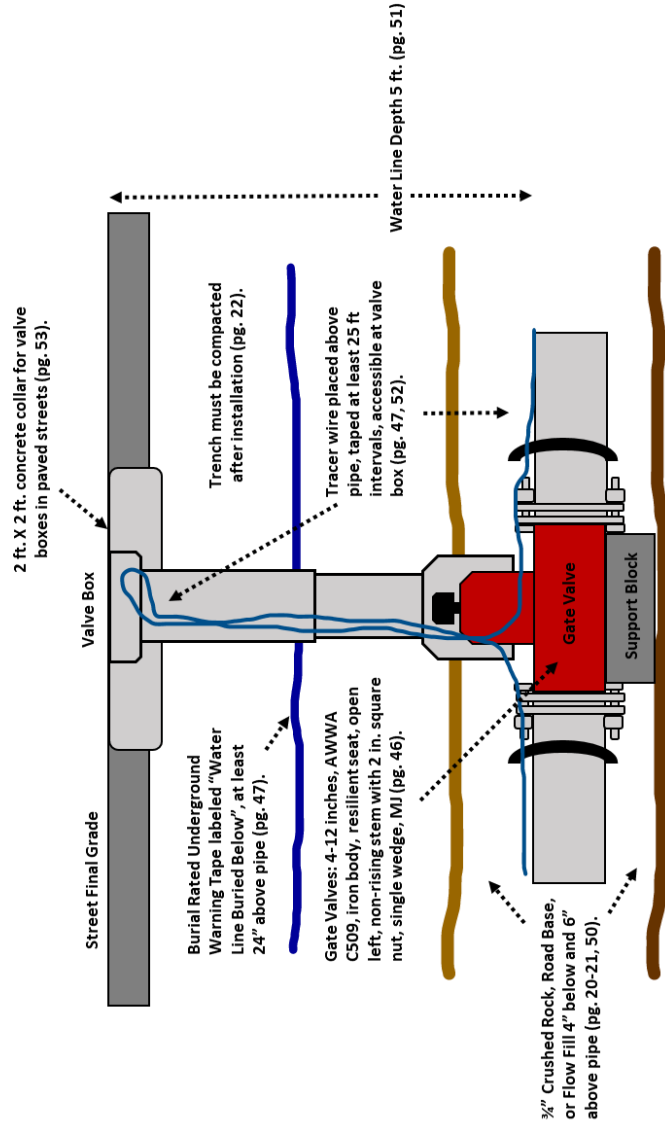
See section 2700, 2.2, 3.5, 3.6

Disclaimer:
 This diagram is provided as a resource for contractors and DOES NOT supersede the District's Regulations and Specifications in any way.

Notes:
 The District must be contacted for an inspection before any installations are backfilled.

Installations must meet all applicable local, state, and federal code requirements.

Surface must be restored to equal or better condition than original and meet Town specifications (pg. 30-31).



FIRE HYDRANT DIAGRAM

See section 2700, 2.3, 3.5, 3.6

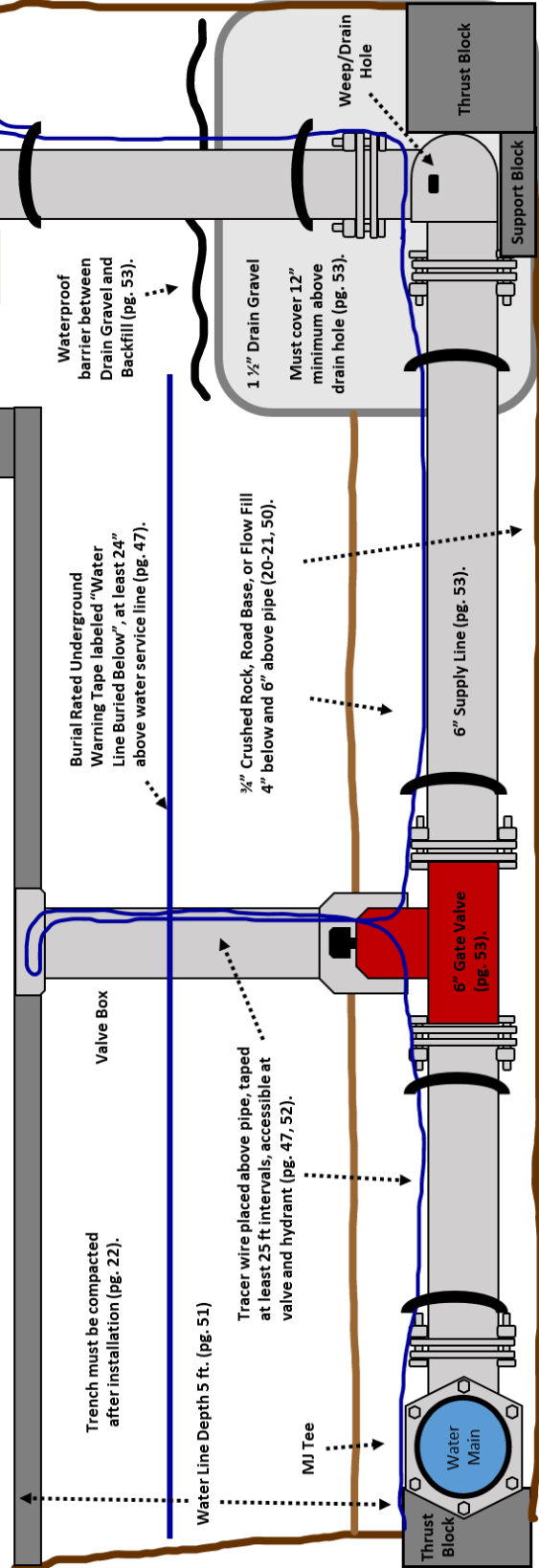
Disclaimer:
This diagram is provided as a resource for contractors and DOES NOT supersede the District's Regulations and Specifications in any way.

Notes:
The District must be contacted for an inspection before any installations are backfilled.

Installations must meet all applicable local, state, and federal code requirements.

Surface must be restored to equal or better condition than original and meet Town specifications (pg. 30-31).

Fire Hydrant
2 Hose Nozzles, 1 Pumper (pg. 47).
Hydrants spaced maximum 500 ft apart (pg. 53).
Set hydrant plumb, pumper facing roadway, nozzles min 16" above grade (pg. 53).



THRUST BLOCK DIAGRAM

See section 2700, 3.5, 3.10

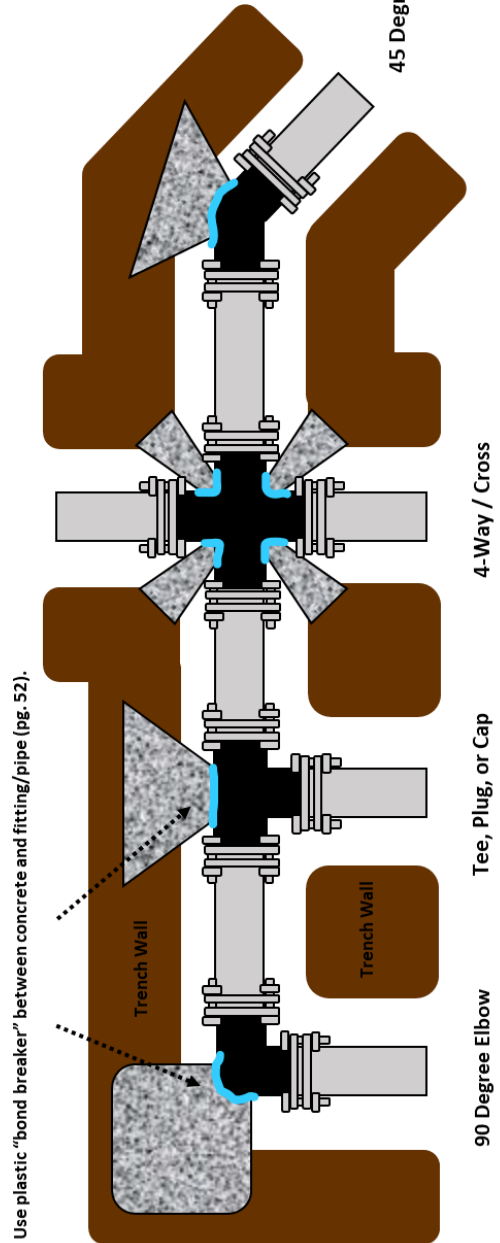
- Water mains shall be designed to be restrained mechanically without the use of thrust blocks when at all possible (pg. 52).
- Form and place concrete for pipe thrust restraints at change of pipe direction when required by the design engineer or not otherwise restrained (pg. 52).
- Place concrete to permit full access to pipe and pipe accessories against undisturbed trench wall (pg. 52).
- Allow concrete restraint to cure for 12 hours before continuing backfill operations (pg. 52)
- All backfill operations shall be complete and all permanent concrete thrust blocks in place for a minimum of 24 hours prior to any filling or flushing operations (pg. 55).

Disclaimer:
 This diagram is provided as a resource for contractors and DOES NOT supersede the District's Regulations and Specifications in any way.

Notes:
 The District must be contacted for an inspection before any installations are backfilled.

Installations must meet all applicable local, state, and federal code requirements.

Surface must be restored to equal or better condition than original and meet Town specifications (pg. 30-31).



Use plastic "bond breaker" between concrete and fitting/pipe (pg. 52).

90 Degree Elbow

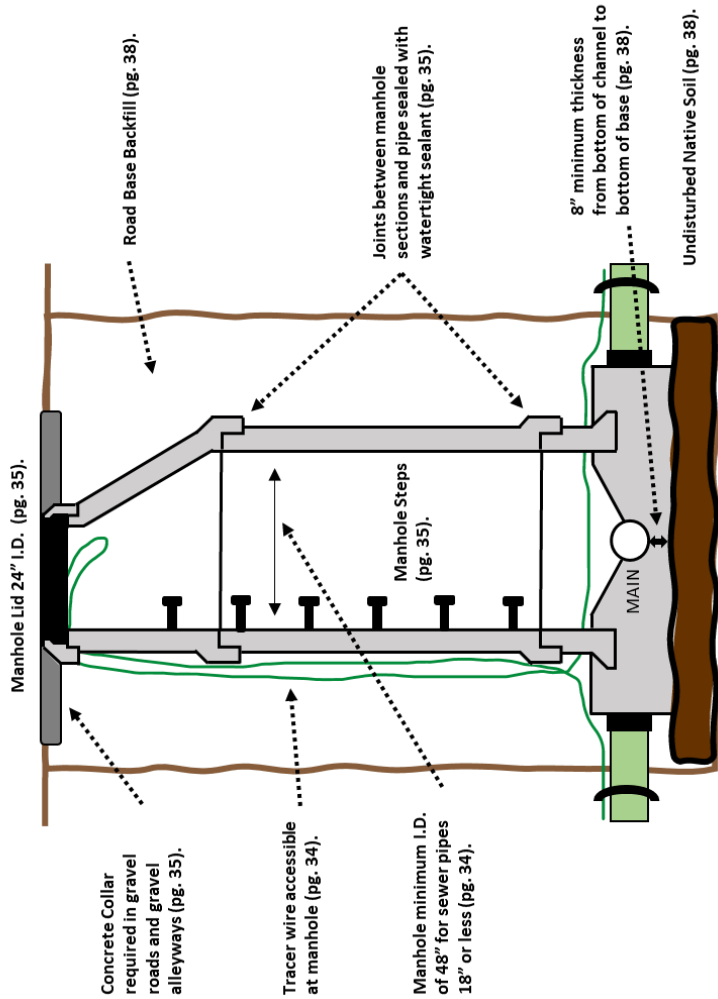
Tee, Plug, or Cap

4-Way / Cross

45 Degree Elbow

SEWER MANHOLE DIAGRAM

See section 2500, 2.2, 3.5



Manholes shall be installed at the end of each line; changes in grade, size, or alignment; pipe intersections; maximum 400 feet apart. (pg. 34).

Disclaimer:

This diagram is provided as a resource for contractors and DOES NOT supersede the District's Regulations and Specifications in any way.

Notes:

The District must be contacted for an inspection before any installations are backfilled.

Installations must meet all applicable local, state, and federal code requirements.

Surface must be restored to equal or better condition than original and meet Town specifications (pg. 25).