

**RULES AND REGULATIONS  
FOR  
WATER AND WASTEWATER SERVICE**



**EAGLE RIVER  
WATER & SANITATION  
DISTRICT**

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**APPENDIX E  
EARTHWORK AND CONSTRUCTION**

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## **SECTION I – GENERAL**

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### **1.1 General Requirements**

The installation of pipe material and appurtenances shall be performed in accordance with the acceptable practices set forth by the American Society for Testing Materials (ASTM), the manufacturer's recommendations, these Specifications and approved plans.

### **1.2 Maintenance of Traffic and Closing of Streets**

The Contractor shall carry on the work in a manner that will cause the least interruption in traffic. Adequate barricades, construction signs, safety flasher lights and flag persons as required shall be placed and maintained to protect persons from injury and until it is safe for traffic and pedestrians to use the roadway. All material piles, equipment and pipe that may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor.

All safety and traffic rules and regulations of local authorities shall be observed. All barricading, signage and detours shall be coordinated with the appropriate entity including Eagle County, Colorado Department of Transportation (CDOT), Special Districts, the Town of Avon (TOA), the Town of Minturn (TOM), or the Town of Vail (TOV) and shall be in accordance with said regulations.

### **1.3 Barricades, Guards, and Safety Provisions**

Open excavations, occurring as a part of this work, are to be barricaded and posted with warning lights. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. Protect trees and other features remaining as portion of final landscaping. Safety of workers shall be provided as required by the Occupational Safety and Health Act (OSHA).

Protect benchmarks, existing structures, fences, roads, sidewalks, and other features not designated for demolition. Contractor shall be responsible to repair any damage to those items not designated for demolition or removal in a manner satisfactory to the owner at no additional cost to the owner.

All barricading and detours shall be coordinated with the appropriate entity including any Special Districts, Eagle County, Town of Vail, Town of Avon, Town of Minturn, or Colorado Department of Transportation (CDOT), and shall be in accordance with said regulations

## **1.4 Subgrade and Road Preparation**

Prior to installation of mains in dedicated streets, road construction must have progressed to at least the subgrade stage. Subgrade elevation is defined as the surface in the road paving section immediately below base course. The surface shall be smooth, clear of debris, and free from deep holes, ruts, and large rocks that may hinder main installation. Mains shall be laid where the ground surface is near its final elevation, whether located in a dedicated street or not.

## **1.5 Trenching Operations**

The trench shall be excavated in a manner that will allow the pipe to be installed to the alignment and depth required. The trench shall be excavated only so far in advance of the pipe installation as is necessary to expedite the work.

### **1.5.1 Trench Width**

All existing asphalt or concrete surfacing shall be saw cut vertically in a straight line, and removed from the job site prior to starting the trench excavation. This material shall not be used in any fill or backfill. If required by the local authority, concrete removal shall occur at the nearest control joint.

The trench shall be excavated so that a minimum clearance of six inches (6") shall be maintained on each side of the pipe for proper placement and compaction of the bedding or backfill material. Large rocks, boulders, and stones shall be removed to provide a clearance of at least six inches (6") below and on each side of all pipe, fire hydrants, valves, and fittings. The specified minimum clearances are the minimum clear distances that will be permitted between any part of the pipe and appurtenances being installed and any part, projection, or point of such rock, boulder, or stone.

### **1.5.2 Trench Support**

The trench shall be adequately supported and the safety of workers provided for as required by the most recent standards adopted by the Occupational Safety and Health Administration (OSHA) Standards Board. Sheeting and shoring shall be utilized where required to prevent any excessive widening or sloughing of the trench, which may be detrimental to human safety, to the pipe, and appurtenances being installed, to existing utilities, to existing structures, or to any other existing facility or item.

**1.5.3 Excavated Material**

Excavated material shall not be placed closer than two feet (2') from the top edge of the trench. Heavy equipment should not be used, or placed near the sides of the trench unless the trench is adequately braced.

All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing traffic. Hydrants, valve lid covers, valve boxes, or other utility controls shall be left unobstructed and accessible until the work is completed.

**1.6 Excavation to Line and Grade**

All excavations shall be made to the lines and grades as established by the approved drawings. The grade and alignment of the pipe being installed shall be controlled by means of laser beam or offset grade stakes, set in the field by a professional surveyor. Pipe trenches shall be excavated to the depth required to provide a uniform and continuous bearing and support for the pipe on solid undisturbed ground at every point between bell holes. Bell holes shall be provided at each pipe joint to permit the joint to be made properly. Any part of the bottom of the trench excavated below the specified grade shall be corrected with approved material and thoroughly compacted. The finished grade of the trench shall be prepared accurately by means of hand tools. The trench bottom should be smooth and free from stones greater than 1.5 inches in diameter, large dirt clods and any frozen material.

**1.7 Caution in Excavation and Protection of Existing Facilities**

The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground utilities and structures, both known and unknown, may be determined. Adequate protection, temporary support and maintenance of all underground and surface structures, utilities and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his expense and under his direction. The Contractor shall be held responsible for the repair of such utilities and structures when broken or otherwise damaged because of negligence or carelessness on his/her part. Any structures, utilities or obstructions disturbed or damaged shall be immediately restored or replaced by the Contractor.

**1.8 Excavation in Poor Soil**

If materials below the excavation subgrade for pipes or structures are found to be soft or unstable or include ashes, cinders, refuse or organic material, or fragments of inorganic

material that cannot, in the opinion of the District Inspector and/or the geotechnical engineer, satisfactorily support the pipe or structure, the contractor shall further excavate to remove the unsuitable material. The excavated volume shall be replaced with structural material compacted to a minimum of 98% standard proctor or as recommended by the geotechnical engineer back to pipe or structure subgrade. The pipe or structure shall then be installed per specifications.

### **1.9 Surplus Excavation Material**

All surplus excavation shall be removed from the job site and disposed of properly. If the surplus excavation is disposed of on private property, prior written permission shall be obtained from the owner of the property and submitted to the District Inspector. All materials must be removed in a timely manner and to the satisfaction of the District Inspector.

### **1.10 Blasting**

In general, blasting will be allowed in order to expedite the work if a permit by the local authority having jurisdiction is granted. All explosives and appurtenances shall be transported, handled, stored, and used in accordance with the laws of the local, state, and federal governments, as applicable.

All blasting shall be controlled so as not to injure any existing structure, utility or facility. Blasting in a trench shall occur only after trench walls are shored or braced in a manner that is satisfactory to the District. The protection of life and property and all liability for blasting shall be placed solely on the person or persons conducting the blasting operation. The hours of blasting shall be in accordance with the permit of the local authority.

### **1.11 Dewatering**

All pipe trenches or structure excavation shall be kept free from water during pipe installation and other related work. The method of dewatering shall provide for a completely dry foundation at the final lines and grades of the excavation.

Dewatering shall be accomplished by the use of well point, sump pumps, rock or gravel drains placed below subgrade foundations or subsurface pipe drains. All water shall be disposed of in a suitable manner without being a menace to public health or causing public inconvenience in accordance with the Contractor's CDPHE permit. Contractor shall obtain any required permits for construction dewatering and the discharge

associated with dewatering. No water shall be drained into other work being completed or under construction.

The dewatering operation shall continue until such time as it is safe to allow the water table to rise in the excavations. Pipe trenches shall contain enough backfill to prevent pipe flotation. When pipe is installed in a casing or tunnel longer than 30-pipe diameters, the pipe inside the casing or tunnels shall be secured so flotation does not occur when the pipe is empty.

Water shall not be allowed to rise until any concrete has set and the forms have been removed. Water shall not be allowed to rise unequally against unsupported structural walls.

Clay barriers may be required where groundwater is encountered, anticipated or by the direction of the Engineer. Refer to Appendix C and Appendix D for groundwater barrier application in Water and Sewer main construction, respectively.

#### **1.12 Tracer Wire- Refer to Appendix C 3.9**

#### **1.13 Pipe Zone Bedding Material**

The limits of pipe zone bedding shall be from a minimum of six inches (6") below the bottom of the pipe to 12 inches (12") above the top of the pipe. Approved trench backfill may then be installed to the ground line.

*Acceptable types of pipe zone bedding material allowed:*

- (a) 3/4 inch minus: Class 6 Aggregate Base Course, per Section 703.03 (Table 703-3) of the CDOT 2011 Standard Specifications for Road and Bridge Construction-without asphalt material. Soil that meets the requirements of ASTM D 2321 Soil Classifications Class II or Class III bedding material. The material should have a minimum of 30 percent passing the No. 4 screen and less than 50 percent passing the No. 200 screen.
- (b) Screened rock: No. 6 or No. 67 Coarse Aggregate, per Section 703.02 (Table 703-2) of the CDOT 2011 Standard Specifications.
- (c) 3/8 inch screened rock or Squeegee Sand, with 100% of the material passing a 3/8 inch screen and 0-5% passing a No. 200 screen.

Where future excavation is anticipated, the sloughing properties of unconfined screened rock should be taken into consideration and the District may require soil or select

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import. In areas where groundwater may be present, the use of screened rock for bedding is prohibited.

Flow-fill, as specified by CDOT 2011 Standard Specifications, Section 206.02 & 206.03, may be used as bedding with District approval. Compressive strength at 28 days: 50 to 150 psi when molded and cured in accordance with ASTM D 4832.

The maximum particle size of pipe bedding should generally not exceed 1-1/2 (one & a half) inches or 10 percent of the nominal pipe diameter, whichever is less. Bedding for small pipe such as service lines should generally have a maximum particle size not exceeding 3/8 inch.

Additional Requirements:

- (a) All bedding materials shall be free of topsoil, organic materials, asphalt, frozen matter, debris, or other deleterious materials.
- (b) Backfilling shall be conducted in a continuous manner to prevent damage to the pipe and its coating and kept as close to the pipe laying operation as possible.
- (c) Materials not meeting these requirements shall be used only with prior written approval of the District.

In specific areas, such as where access is extremely limited, the use of on-site materials may be allowed, and, when used, must be on-site 1 1/2 inches minus well-graded screened material, free from organic materials, chunks of soil, frozen material, debris, or other suitable materials. Use of on-site bedding material must have prior written District approval.

### **1.14 Insulation Board**

Insulation shall, where required, be in accordance with ASTM C578-Type V Standard Specification for Rigid Cellular Polystyrene Thermal Insulation. Compressive Strength shall be 100 psi minimum per ASTM D1621. Water Absorption, ASTM C272, 0.3% by volume, maximum. DOW STYROFOAM™ HIGHLOAD 100, OWENS CORNING FOAMULAR 1000 or approved equal. 1" of insulation board may be substituted for each 1' of soil cover required to meet the minimum cover requirement, minimum 2" insulation required.

### **1.15 Pipe Zone Backfill and Compaction**

After completion of the trench excavation and proper preparation of the foundation, six inches (6") of bedding material (per Section E 1.12) shall be placed on the trench



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bottom for support under the pipe. Pipe bedding shall be graded to provide for a uniform and continuous support beneath the pipe at all points. Bell holes shall be dug deep enough to provide a minimum of two inches (2") of clearance between the bell and bedding material. All pipes shall be installed in such a manner as to ensure full support of the pipe barrel over its entire length. After the pipe is adjusted for line and grade, and the joint is made, the bedding material shall be deposited and densified under pipe haunches to prevent lateral displacement and hold the pipe in proper position during subsequent pipe jointing, bedding and backfilling operations.

The bedding material shall be placed in 6 inch maximum lifts & should be tamped under the haunches of the pipe to spring line. The bedding should be compacted to a minimum of 90 percent at +/- 2 percent of optimum moisture content, referencing Standard Proctor (ASTM D698/ AASHTO T99). The compaction of pipe bedding is not required when using squeegee sand or screened rock. The only requirement is sufficient tamping to achieve uniform support under the pipe. Special care shall be used in placing this portion of backfill so as to avoid disturbing the pipe.

The limits of pipe zone bedding shall be from a minimum of six inches (6") below the bottom of the pipe to 12 inches (12") above the top of the pipe. Approved trench backfill may then be installed to the ground line.

### **1.16 Trench Backfill Material**

Starting 1' above the top of pipe and out of the pipe bedding zone, the trench shall be backfilled with native materials excavated from the work site unless deemed unsuitable by the District. Wet, soft or frozen material, asphalt and concrete chunks, cinders, ashes, refuse, vegetation or organic material, boulders, large rocks or other deleterious substances are unsuitable materials and shall not be used for backfill. If the excavated material is not suitable for backfill, as determined by the District, suitable material shall be hauled in and utilized, and the rejected material hauled away and disposed of properly. Suitable backfill material includes:

Class 1 or Class 2 Structure Backfill per Section 703.08 of the CDOT 2011 Standard Specifications.

Pit run - Class 3 Aggregate Base Course, per Section 703.03 (Table 703-3) of the CDOT 2011 Standard Specifications with the following modifications: material to be reasonably well graded 6-inch minus pit run material. Fill/reject sand shall not be allowed as imported pit run.

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Screened rock: No. 467 Coarse Aggregate, per Section 703.02 (Table 703-2) of the CDOT 2011 Standard Specifications.

Where future excavation is anticipated, the sloughing properties of unconfined screened rock should be taken into consideration and the District may require soil or select import. In areas where groundwater may be present, the use of screened rock for backfill is prohibited.

Flow-fill, as specified by CDOT 2011 Standard Specifications, Section 206.02 & 206.3, may be used as backfill with District approval. Compressive strength at 28 days: 50 to 150 psi when molded and cured in accordance with ASTM D 4832.

No rocks over 6" in diameter are allowable 12" above the pipe bedding zone and in the top 12" of trench and no backfill material with rocks larger than 12" in diameter is allowable.

### **1.17 Trench Backfill Compaction**

Above the pipe bedding zone, the trench backfill material shall be placed in loose 12-inch lifts. Backfill shall be consolidated and/or compacted by vibrating, tamping or a combination thereof, to the satisfaction of the appropriate controlling authority or geotechnical engineer's recommendations.

The District shall require that in all instances where the trench is within limits of pavement, shoulders of roads, sidewalks, structures or major improvements, the compaction of predominately cohesive soils shall not be less than 95 percent (95%) of maximum dry density for cohesive soils as determined by ASTM D 1557/AASHTO T180 within 2% of optimum moisture content for meeting ASTM D 1557 requirements for compaction. For clay soils the moisture content shall be 0 to +2% of optimum moisture. For non-cohesive soils compact to not less than 70 percent (70%) relative density per ASTM D4253/ D4254, or the more restrictive local specification.

Where trenches are outside pavement and located in areas where trench settlement can be tolerated, the compaction of the cohesive soil shall not be less than 90 percent (90%) as determined by ASTM D 1557/AASHTO T180, within 2 percent (2%) optimum moisture content.

Backfilling shall be conducted in a continuous manner to prevent damage to the pipe and its coating and kept as close to the pipe laying operation as possible.

The District will require copies of all compaction reports to be submitted to District Inspectors to ensure compaction compliance.

## **1.18 Cleanup**

Upon completion of the work, all rubbish, unused materials, concrete forms and other like materials shall be removed from the job site. All excess excavation material shall be disposed of as specified herein and the areas shall be left in a state of order and cleanliness. Cleanup shall be performed within ten (10) days of the completion of construction or in accordance with an acceptable arrangement made between all parties involved. Cleanup shall be to the satisfaction of the District Inspector or local authority.

## **1.19 Surface Restoration**

### **1.19.1 General Requirements**

The Contractor shall obtain the necessary road cut permits for the project from the governing agency and adhere to all requirements therein. The width of pavement removed shall meet the standards of the governing agency. At a minimum, the Contractor shall saw cut the pavement along straight lines. The cut face of the remaining pavement shall be approximately vertical.

The Contractor shall bring all existing District appurtenances to grade in accordance with District Specifications. The Contractor shall restore all pavement, sidewalks, curbing, gutters or other surface structures removed or disturbed as part of the work to a condition equal to existing or meeting the standards of the governing agency, or property owner, and shall furnish all incidental labor and materials. Surface cuts shall be, at a minimum, restored to a condition equal to those prior to construction. No permanent pavement shall be restored until the backfill is properly compacted (per Appendix E, Section 1.15). Place aggregate base course in accordance with permit requirements, geotechnical engineer's requirements or as shown on the plans. At a minimum, compact aggregate base course to 95% AASHTO T180/ASTM D 1557. Replace pavement in accordance with permit requirements, geotechnical engineer's requirements or as shown on the plans. Consolidate concrete with vibrators.

### **1.19.2 Damaged Surfaces and Property**

If any pavement, street, landscaping, sod, rock, fences, poles or other property and surface structures have been damaged, removed or disturbed by the Contractor, either deliberately or through failure to carry out the requirements of the governing agency or the specific directions of the District, or through failure to employ usual and reasonable safeguards, such property shall be replaced or

repaired to original condition and to the satisfaction of the Applicant, at the expense of the Contractor. All restoration shall be performed in a timely manner not to exceed three (3) working days and to the satisfaction of the District Inspector or by a date mutually agreed upon by the District and Applicant and Contractor and Applicant.

**1.20 Directional Boring/Trenchless Installation**

Water and sewer main installation by directional boring or trenchless methods may be required in certain instances. This type of installation could lead to reduced accessibility for future District maintenances and repair efforts. Trenchless installation will be reviewed and approved by the District on a case-by-case basis. In order to receive approval for this installation method, the applicant will be required to submit the following information:

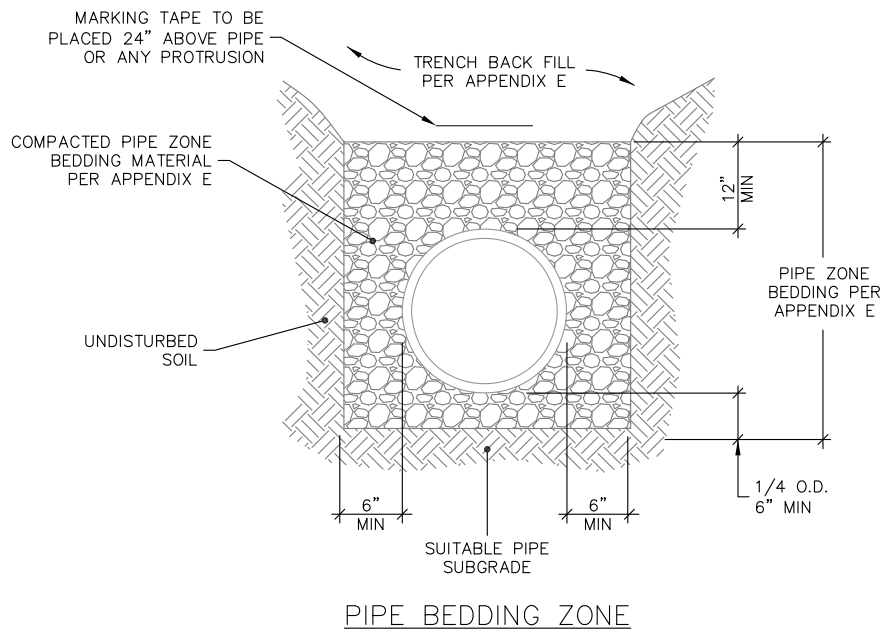
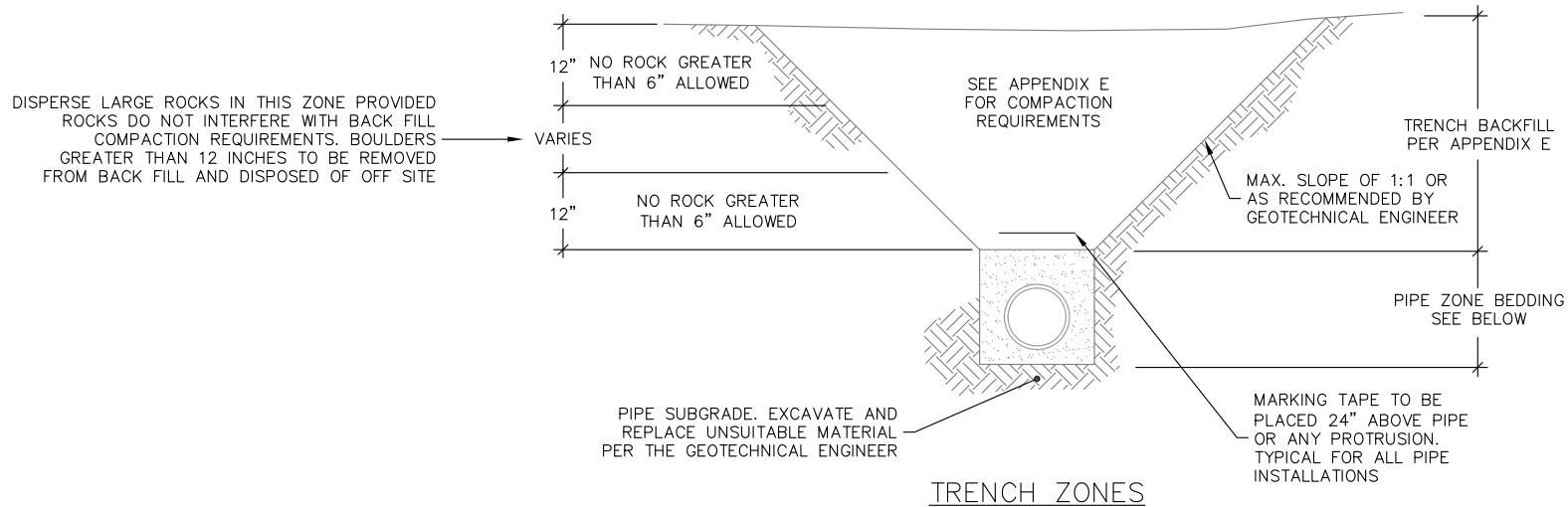
- Written justification for utilizing trenchless technology
- Directional boring plans and technical specifications including pipe materials
- Qualifications of the directional boring contractor
- Other supplemental information that may be reasonably requested by the District.

The applicant should note that all requirements for testing and acceptance of water and sewer mains will remain in full force and effect regardless of the installation methodology. The District may require continuous oversight by District inspectors during boring and pipe installation operations.


## SECTION II – DETAILS

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### E-01: Main Trench Section



FOR PAVED AREAS, STOP BACKFILL AT REQUIRED DEPTH TO ALLOW FOR CONSTRUCTION OF PAVEMENT SECTION

 <p><b>EAGLE RIVER</b> WATER &amp; SANITATION DISTRICT</p>	TYPICAL MAIN TRENCH SECTION	
	DRAWN BY: JEC	DATE: 03/01/2017
846 FOREST ROAD VAIL, CO 81657 (970) 476-7480	SCALE: NONE	REV: N/A
WWW.ERWSD.ORG	E-01	