



TOWN OF CRESTED BUTTE

PUBLIC WORKS CRITERIA

FOR DESIGN AND CONSTRUCTION:

EARTHWORK, SEWER, and WATER

March 2009

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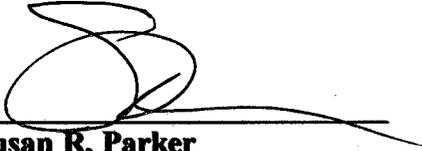
FOREWARD

This is a living document that will be periodically reviewed, updated, and made available to users as part of the Town of Crested Butte, Colorado responsibility for providing technical criteria for design and construction projects in Crested Butte. Contractors should contact the Public Works Department for document interpretation and improvements.

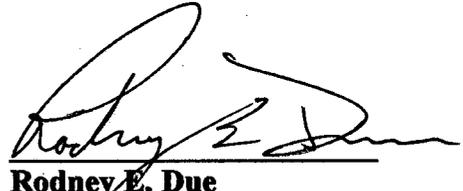
Deviation from these criteria cannot be made without prior written approval of the Public Works Director.

This document is effective upon issuance, and can be found on the Town of Crested Butte Internet site, www.crestedbutte-co.gov

Authorized By:



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Updated as of June 15, 2009

TOWN OF CRESTED BUTTE

PUBLIC WORKS CRITERIA

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TOWN OF CRESTED BUTTE
GENERAL SPECIFICATIONS

SECTION 100

I. SCOPE:

These specifications including material specifications and construction requirements are for all construction within TOWN right-of-way and in other areas under TOWN jurisdiction or ownership.

These specifications are the minimum requirements for materials and construction and may only be modified by written approval of the TOWN OF CRESTED BUTTE.

II. DEFINITIONS AND ABBREVIATIONS:

Wherever the following words, phrases or abbreviations appear in these specifications, they shall have the following meanings:

TOWN: The TOWN OF CRESTED BUTTE, Colorado.

TOWN Code: The official adopted TOWN Code Regulations of CRESTED BUTTE, Colorado.

Engineer: The TOWN Engineer, TOWN OF CRESTED BUTTE, Colorado, or an authorized representative acting on behalf of the TOWN.

Traffic Control Officer: An authorized representative acting on behalf of the TOWN OF CRESTED BUTTE, Colorado.

Inspector: An authorized representative of the TOWN at the site of the work.

Utility: The Water and Sewer Utilities Department of the TOWN OF CRESTED BUTTE, Colorado and all other utilities.

Base Course: The upper course of the granular base of the pavement or the lower course of an asphalt concrete pavement structure.

Culvert: Any structure not classified as a bridge, which provides an opening under or adjacent to the roadway.

Pavement: Any surfacing of streets, alleys, sidewalks, courts, driveways or

similar areas, consisting of mineral aggregate bound into a rigid or semi-rigid mass by a suitable binder such as, but not limited to, portland cement, or asphalt cement.

Pavement Structure: The combination of subbase, base course, and surface course placed on a subgrade to support the traffic load and distribute to the road bed.

Private Street: Any vehicular access serving residential properties where average daily traffic volume exceeds sixty (60) trips a day.

Public Improvements: The term "public improvements" includes public facilities and shall refer to the construction or installation of streets, including curb and gutter, sidewalks, development or extension of the municipal water system, municipal sanitary sewer system, municipal storm sewer system, municipal irrigation system and landscaping.

Right-of-Way: A general term denoting land, property or interest therein, usually in a strip, acquired for or devoted to a street, highway or other public improvement.

Road: A general term denoting an open way for purposes of vehicular and pedestrian travel.

Roadway: The improved portion of the right-of-way intended primarily for vehicular traffic.

Sanitary Sewer: Conduits and related appurtenances employed to collect and carry off water and waste water to a suitable point of final discharge.

Shoulder: That portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Sidewalk: That portion of the street primarily constructed for the use of pedestrians.

Storm Sewer: Any conduit and appurtenance intended for the reception and transfer of storm water.

Street: The improved area of the right-of-way.

Structures: Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, end walls, buildings, sewers, service pipes, under drains, foundation drains, fences, swimming pools and other features which any be encountered in the work and not otherwise classed herein.

Subbase: The lower course of the base of a roadway, immediately above the subgrade.

Subgrade: The supporting structures on which the pavement and its special under courses rest.

Whenever the words, "as directed", "as required", "as permitted" or words of like meaning are used, it shall be understood that the direction, requirements or permission of the Engineer or Town Representative is intended. Similarly, the words "approved", "acceptable", "satisfactory" shall refer to approval by the Engineer or Town Representative.

Whenever references are made to standard specifications, methods of testing materials, codes, practices and requirements, it shall be understood that the latest revision of said references shall govern unless a specific revision is stated. Wherever any of the following abbreviations appear, they shall have the following meaning:

AASHTO - American Association of State Highway Transportation Officials

ASA - American Standards Association

ASTM - American Society for Testing and Materials

AWWA - American Water Works Association

APWA - American Public Works Association

CDOT - Colorado Department of Transportation

CDOT-SSCRB - Colorado Department of Transportation Standard Specifications for Construction of Roads & Bridges

DPW - Department of Public Works, Crested Butte

GCEA - Gunnison County Electric Association

MUTCD - Manual of Uniform Traffic Control Devices

III. RESPONSIBILITY OF THE TOWN:

A. Authority of the Engineer:

The Engineer/Town Representative shall have the authority on behalf of the TOWN to ascertain that all design and construction of facilities is equal to or better than the minimum requirements set forth in these specifications. The Engineer/Town Representative shall have the additional authority to assign an inspector to check any and all work, including all materials to be incorporated in the work, excavation, bedding, backfill, and all construction methods and practice.

B. Authority of the Inspector:

Inspectors are assigned to assist the Contractor in complying with these specifications. They have the authority to reject defective materials, or inferior materials and defective workmanship until such time as the Contractor shall correct the situation in question, subject to final decision by the Engineer.

IV. RESPONSIBILITY OF THE CONTRACTOR:

A. Notice Before Beginning Work:

The Contractor shall notify the TOWN Engineer/Town Representative at least five (5) working days before beginning any construction. If for any reason work should stop on a project during any stage of construction for a period of more than twenty-four (24) hours, it is the responsibility of the Contractor to notify the TOWN Engineer/Town Representative at least twenty-four (24) hours prior to any resumption of work on the project. If the Contractor intends to work extended shifts, double shifts, or hours other than the normal workday of TOWN personnel, he shall notify the TOWN Engineer/Town Representative at least twenty-four (24) hours prior to such extension, except in the event of an emergency. Failure to provide notification may provide sufficient cause for suspension of the project.

B. Traffic Control:

The Contractor shall be required to 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 construction. All signing shall conform to the Manual of Uniform Traffic Control Devices (MUTCD) and shall be subject to the approval of the Traffic Engineer/Town Representative. When specifically authorized by

the Traffic Engineer/Town Representative, portions of the streets shall be allowed to be closed to traffic for construction. However, the Contractor shall make every attempt to keep the time of closure to such streets to a minimum. It shall be the responsibility of the Contractor to notify the Fire Department, Marshal's Office and Ambulance Service twenty-four (24) hours prior to the closure of any street. In addition, for all work within State of Colorado highway rights-of-way the Contractor shall submit a traffic control plan to the CDOT Traffic Engineer for review.

C. Rejected Materials:

All materials installed shall be free of defects of manufacture. Any defective or damaged materials found in the construction or on the construction site shall be marked and removed from the site. In the event the Contractor fails to remove rejected materials from the construction site within a reasonable length of time, the Engineer/Town Representative may arrange for such removal at the expense of the Contractor.

D. Familiarity of Specification:

It shall be the responsibility of the contractor to read and fully comply with all the provisions of these specifications and all laws and regulations that apply to local and state agencies.

E. Maintenance of Site:

The cleanup and restoration of grounds shall be a continuous process from the beginning of construction to final completion of the work. The Contractor shall keep the work site free from the accumulation of debris and waste material caused by the work.

Immediately after the construction activity or major portion thereof is complete the area shall be cleaned and restored to the original grade and condition. All fences shall be replaced to the same elevation and alignment and restored to a condition equal to or better than that at the beginning of construction.

F. Public Relations and Notifications:

The Contractor shall carry on the work in such manner as to cause as little inconvenience as possible to the public, particularly to occupants of property along the project, as is consistent with good workmanship. He shall notify occupants at least twenty-four (24) hours in advance of proposed work that may block entrances or otherwise cause undue difficulty to occupants of property affected and shall restore such entrances to usable condition as soon as possible. The Contractor,

Subcontractors and employees shall at all times be courteous to the public while engaged upon this work.

The Contractor shall notify all business managers and residents affected by the interruption of utilities and other services caused by the work. Such notice shall be given at least forty-eight (48) hours prior to the interruption of service. Notice shall be given for the interruption of domestic water, irrigation water, sewer, trash pickup, mail delivery and changes in access to property. Prior to interruption of domestic water service, a second notice shall be given no less than one (1) hour and no more than four (4) hours prior to discontinuation of service.

Notifications may be verbal or in written form if the business manager or resident cannot be located. The TOWN will furnish door hanger notice cards for interruption of domestic water service only. Water services shall not be discontinued for more than two (2) consecutive hours without special written permission from the Engineer/Town Representative.

Where trees, hedges, shrubs, or other ornamental plantings or structures within the construction limits are not designated to be protected or saved, the Contractor shall notify the owner of the property fronting the plantings or structures in question, not less than ten (10) calendar days prior to their removal. This notification shall include allowing the property owner an option to transplant the plantings or relocate structures fronting his property onto his property instead of having the Contractor remove them. The Contractor shall bid the project based on assuming responsibility for all removals. This notification requirement is intended as a positive public relations action. All notifications described and required in this section are considered as incidental to the Work and will not be measured or paid for separately.

G. Protecting and Relocating Utilities:

It is the responsibility of the Contractor to provide for the protection of all structures and utilities including pipes, fences or similar items.

In the event of a break in an existing water main, gas main, sewer or underground cable, the Contractor shall immediately notify the responsible official of the organization operating the utility interrupted and shall lend all possible assistance in restoring services.

The Contractor shall bear the entire expense of repairing or replacing any utilities or structures disturbed or damaged during construction.

Unless otherwise specified in the Contract Documents, all utility relocations will be the responsibility of the utility companies; the Contractor shall be responsible for coordinating the relocation work with

the Utility Companies and shall bear any reasonable and customary cost associated with the work.

H. Safety and Protection:

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. He shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. All employees on the Work and other persons who may be affected thereby;
2. All work and all materials or equipment to be incorporated therein in storage on or off site;
3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavement, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. The Contractor shall erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for safety and protection.

TOWN OF CRESTED BUTTE

GENERAL EARTHWORK SPECIFICATIONS

SECTION 200

I. SCOPE:

The purpose of this Earthwork Specification is to set forth the criteria to be used for all construction within the rights-of-way and in any other areas of jurisdiction or ownership of the TOWN OF CRESTED BUTTE. Work shall include but not be limited to: Surface Removals, Excavation, Dewatering, Trenching Embankment, Bedding and Backfill for all utilities, structures and roads.

II. MATERIALS:

A. Fill Material:

1. On-site: All on-site material suitable for STRUCTURAL BACKFILL shall be soil or soil-rock mixture which is free from frozen material, organic matter and other deleterious substances. It shall contain no rocks over eight (8) inches in greatest dimension. It shall have less than 20% by weight passing the No. 200 sieve and a liquid limit not greater than 35.
2. Imported: Pit Run: Shall be well graded eight (8) inch minus material. It shall have less than 20% by weight passing the No. 200 sieve and a liquid limit not greater than 35.
3. Other Materials: Other materials may be selected by the Contractor subject to the approval of the Engineer/Town Representative.
4. Granular Bedding Material: Granular bedding material shall be a well graded, gravelly material meeting the requirements of ASTM Designation D448, as follows:

<u>Sieve Size</u>	<u>Total Passing (Max % By Weight)</u>
1/2 "	100 %
3/8 "	80 %
No. 4	10 %
No. 200	5 %

5. Subbase - Course Aggregate: CDOT Class 2 Aggregate Base Course.
6. Base Course Aggregate: CDOT Class 6 Aggregate Base Course.
7. Select Backfill Material may be either CDOT Class 6 Aggregate Base Course or Granular Bedding Material.
8. Sand Specifications: Refer to GCEA requirements for conduit installation.
9. Flow-Fill:

<u>Ingredients</u>	<u>Lbs./C.Y.</u>
Cement (0.45 sack)	42
Water (39 gallons)	325 (or as needed)
Coarse Aggregate (Size no. 57)	1700
Sand (ASTM C-33)	1845

III. INSTALLATION:

A. Street Construction:

Streets shall be constructed by the subdivider to conform to the standards Described in State Department of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction, 2005, or latest revision. When there are conflicts between the standards set forth herein and State Department of Highways, Division of Highways, State of Colorado, Standard Specifications for Road and Bridge Construction, 1991, the Standards set forth herein shall prevail.

B. Street Layout:

1. Street layout shall be designed to conform to the standards described in Residential Streets, second edition, published by the American Society of Civil Engineers, National Association of Home Builders and the Urban Land Institute in 1990, or latest edition. Copies are available in the Planning Department. When there are Conflicts between the standards set forth herein and Residential Streets, the standards set forth herein shall prevail.
2. Street layout shall conform to the Master Street Plan in the Crested Butte Land Use Plan.

C. Sidewalks:

1. The Town utilizes Standard Specifications for Roadway and Concrete Construction which are based upon CDOT Standard Specifications for Road and Bridge Construction, 2005 or latest revision.
2. SP-5 Section 601.02 - Classification (Concrete)

Mix design for concrete shall conform to Concrete Class D as specified in Table 601-1

The Town reserves the right to modify the concrete mix design after review of the final mix design submitted by the Contractor if an acceptable alternate mix can meet the following general concrete mix design criteria:

Compressive Strength: 4000 psi minimum at 28 days

- a. Minimum number of cylinders passing above requirement shall be 90%
- b. Minimum strength of cylinder acceptable, 3800 psi

Cement Content: 6 bags per cubic yard, minimum

Maximum permissible water-cement ratio - for 4000 psi strength, air entrained, absolute ratio by weight 0.45

Slump: 4 inch maximum

Air content: 6% +/- 1% for all concrete

D. Noxious Weed Management:

Contractors shall conform to the standards described by the Town of Crested Butte Noxious Weed Management Plan, as required by the Colorado Noxious Weed Act of 2008.

E. Clearing:

Excavation and grading for street improvements and paving projects shall include removal of trash, rubbish and low lying vegetation in the construction area. All vegetation and objects designated to remain shall be protected from injury or defacement.

F. Grubbing:

All vegetation such as trees, stumps, hedges, shrubs, brush, heavy sod, heavy growth of grass, decayed vegetable matter, rubbish and other

unsuitable material within the area of excavation or upon which embankment is to be placed shall be stripped or otherwise removed to a minimum depth of 3 inches. All such materials shall be wasted or spread outside the construction area or disposed of as directed by the Engineer/Town Representative. In no case shall such objectionable material be allowed in or under embankment. Except in areas to be excavated, stump holes and other holes from which obstructions are removed, shall be backfilled with suitable material and compacted in accordance with these specifications.

G. Stripping:

Stripping shall consist of removing unsuitable overburden material before removal of other material for use in the roadway. All areas to be graded and all embankments or fill areas under paved slabs shall be stripped.

H. Excavation:

After all clearing, grubbing and stripping has been done, excavation of every description and of whatever materials encountered within the grading limits of the project shall be performed. All suitable excavated materials shall be transported to and placed in embankments or fills within the limits of the work.

The excavation and embankments for the roadway and ditches shall be finished to reasonably smooth and uniform surfaces. Variation from the subgrade plane shall not be more than 1 inch of soil. Excavation operations shall be conducted so that material outside of the limits of slopes will not be disturbed, but all cuts shall be made to subgrade a minimum of 1 foot outside the proposed edge of paving slab or curb. Prior to beginning grading operations in any area, all necessary clearing and grubbing in that area shall have been performed. The Contractor shall not excavate beyond the dimensions and elevations established and material shall not be removed prior to the staking. If excavation to the finished graded section encounters a subgrade or slopes of spongy material, vegetable matter or trash pockets, the Engineer/Town Representative may require the Contractor to remove the unsuitable materials and backfill to the finished graded section with suitable material. The Engineer/Town Representative may designate as unsuitable those soils or materials that are in his judgment detrimental to the finished roadway. All unsuitable material shall be disposed of outside the construction area.

I. Roadway Excavation and Grading:

This work shall consist of excavation, disposal, shaping or compaction of all material encountered within the limits of the roadway in close conformity with the lines, grades and typical cross sections shown on the plans or as directed by the Engineer/Town Representative.

J. Shouldering and Miscellaneous Work:

The Contractor shall deposit sufficient suitable earth between curb and sidewalks, or property lines, so that when smoothed and consolidated in final deposition, it will provide a uniform smooth slope from top of curb to the adjacent sidewalk or property line. All broken concrete, trash and debris shall be removed before any fill is placed back of curb. In case excavation is necessary to accomplish the above purpose, the Contractor shall make such necessary excavation, and shall leave the parking area so filled or excavated free from all trash and debris.

The Contractor shall set all manholes, water boxes or other service boxes, to the proper finished grade of the pavement or of the fill back of the curb. This work will be considered as part of the grading.

K. Embankments:

Embankment construction shall consist of constructing roadway embankments, including preparation of the areas upon which they are to be placed; the construction of dikes; the placing and compacting of approved material within project areas where unsuitable material has been removed; and the placing and compacting of embankment material in holes, pits and other depressions within the project area. Only approved materials shall be used in the construction of embankments and backfills.

Free running water shall be drained from the material before the material is placed. Rocks, broken concrete or other solid materials more than 6 inches in greatest dimension shall not be placed in embankment areas less than 1 foot deep as measured from the subgrade. Materials up to about 150 pounds in weight may be placed at the base of fills over 3 feet deep measured from the subgrade. All fill material shall be free from roots, organic material, trash and frozen material.

When an embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is built one-half width at a time, the slopes that are steeper than 4:1 when measured longitudinally or at right

angles to the roadway shall be continuously benched over those areas where it is required as the work is brought up in layers. Benching shall be well keyed and where practical a minimum of 8 feet wide. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut out shall be recompacted along with the new embankment material at the Contractor's expense.

Embankment material shall be placed in horizontal layers not to exceed 8 inches in loose depth and compacted prior to placing each following layer. When pipe is to be installed in areas requiring fills or embankments, the embankment or fill shall be completed a minimum of one (1) foot above the top of the pipe to be installed, prior to trenching and installation of the pipe.

The Contractor shall add moisture to or dry by aeration each layer as may be necessary to meet the requirements for compaction. Materials shall not be placed in embankments or fills when the moisture content exceeds 3% above or is 5% below optimum moisture content for that material. Under roadways and extending one foot beyond proposed curb line measured perpendicular from the centerline embankments shall be compacted for the entire depth of the fill to a density of not less than 90% maximum density except the top three feet which shall be compacted to at least 95% maximum density as defined by ASTM D698 / AASHTO T-99.

L. Trench Excavation:

1. Surface Removals and Topsoil Preservation:

The Contractor shall remove surface materials and obstructions only to the widths necessary for excavation of the trench. All fences, landscaping and structures not designated for removal shall be protected or, if moved, restored to their original condition after construction is complete. Removal of concrete curbs, gutters, sidewalks and driveways shall be along existing joints or neatly cut lines.

Where excavation is required under paved areas, the pavement shall be cut in such a manner as to affect a smooth, straight cut edge and as a vertical face six (6) inches minimum beyond the trench wall. All vegetation, concrete, asphalt and other refuse removed from the construction limits shall be separated from suitable topsoil and backfill material, and hauled to a disposal site secured by the Contractor.

Clean topsoil suitable for final grading shall be stripped, stockpiled

separately in approved locations and restored to the surface after the trench is backfilled evenly. Where excavation is in a lawn covered area the sod shall be cut and removed and replaced after trench filling so as to promote regrowth. Where sod is disturbed the contractor shall re-sod with like grass at his own expense.

2. Stockpiling Excavated Material:

Excavated material shall be piled in locations that will not endanger the work, create traffic hazards or obstruct sidewalks and driveways. Fire hydrants, valve boxes, manholes and other utility access points shall be left unobstructed until the work is complete. Gutters and other water courses shall not be obstructed unless other provisions are made for runoff and street drainage.

All surplus material and excavated material unsuitable for backfilling shall be removed from the site and disposed of in areas secured by the Contractor.

3. Trenching:

Trenches shall be excavated to the width necessary to permit the pipe to be laid and jointed properly and backfill materials placed and compacted as required. Where conduit is to be installed outside of existing pavement and pipes have an inside diameter of 33 inches or less, the trench shall be excavated at pipe level a minimum of 16 inches wider than the outside diameter of the pipe so that a clear space of not less than 8 inches is provided on each side of the pipe.

For pipes having an inside diameter of 36 inches or greater, the trench shall be excavated at pipe level a minimum of 24 inches wider than the outside diameter of the pipe so that a clear space of not less than 12 inches is provided on each side of the pipe. Wherever it is necessary to exceed these limits, approval of the Engineer shall be obtained and provision shall be made for the additional load imposed on the pipe. When sheeting is used, the widths indicated above shall be measured to the inside dimension between the sheeting.

a. Bracing and Sheeting of Trenches:

All trenches shall be properly braced, sheeted or otherwise supported to provide safe working conditions and protection of the Work, workers and adjacent property. Bracing and

sheeting shall conform to the recommendations in the Occupational Safety and Health Standards for Construction (OSHA). A sand box or trench shield may be used in lieu of sheeting and bracing as permitted by OSHA. Unless otherwise approved, all trench support materials shall be removed in a manner that will prevent caving of the sides and movement or other damage to the pipe.

b. Trenches with Sloping Sides:

Where working conditions and right-of-way width permit (as determined by the Engineer/Town Representative), trenches, may be excavated with sloping sides in accordance with OSHA requirements. Sloping sides will not be allowed when it requires excavation beyond the limits shown on the Construction Drawings.

In traveled streets, alleys or narrow easements, only vertical trenches with proper bracing will be allowed.

Where trenches with sloping sides are permitted, the slopes shall not extend below a point 12 inches above the top pipe. The trench shall be excavated with the vertical sides below this point with widths not exceeding those specified on the Standard Drawings.

4. Unauthorized Pavement Removal:

Unless authorized by the Engineer/Town Representative, all removed pavement and excavations made beyond the lines and grades shown on the Construction Drawings or described in the Specifications shall be replaced at the Contractor's expense.

5. Excavation Below Grade:

Where the excavation is carried beyond or below the lines and grades shown on the plans or staked, the Contractor shall, at his own expense, refill and compact all such excavated space with suitable granular material.

6. Over-excavating for Rock:

When bedrock or boulders are encountered in the trench bottom or loose, stony soil where there is the possibility of pipe being subjected to "point" contacts, the trench shall be over-excavated a

minimum of 6 inches. The over-excavated material shall be replaced with Engineer/Town Representative approved material and compacted.

If blasting is required for rock excavation, all work with explosives shall conform to Federal and State Laws, and OSHA rules and regulations. Any damage caused by blasting shall be repaired by the Contractor at his expense.

7. Unstable Trench Bottom:

Where the excavation is found to consist of organic matter or any other material that the Engineer/Town Representative determines to be unsuitable for supporting the pipe, the trench shall be excavated to an additional depth as directed by the Engineer/Town Representative and replaced with an approved granular stabilization material. The Engineer/Town Representative shall determine suitability of materials to be used.

8. Removal of Water:

- a. A construction dewatering permit, as required by the State of Colorado, shall be obtained by the contractor.
- b. Trenches shall be kept free of water during pipe laying operations by draining, pumping or other approved methods. The water level shall be maintained below the trench bottom throughout the placement of bedding, pipe laying, joining and backfilling operations. The dewatering shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench. Water shall be disposed of in a suitable manner without damage to adjacent property or without being a menace to public health and convenience. Under no circumstances shall trench water be discharged into sanitary sewers. The method of disposal of trench water shall be approved by the Engineer/Town Representative.

9. Bedding and Shaping Trench Bottom:

All trenches shall be excavated to at least 4 inches below the pipe grade and backfilled to grade with approved granular bedding material. The bedding material shall be hand shaped and graded until the trench bottom is uniform and free from rocks, bumps, and depressions. A coupling or bell hole shall be dug at each pipe joint

with sufficient length, width and depth to permit assembly of the joint and provide a minimum clearance of 2 inches between the coupling and the trench bottom. Class B bedding shall be the minimum acceptable bedding for all pipe. Refer to Class B Embedment Drawing.

If in the opinion of the Engineer/Town Representative the pipe is subjected to unusual loading Class A - Concrete Arch bedding may be required. The Contractor shall provide an analysis the load conditions and the bedding required if directed by the Engineer/Town Representative. Refer to Class A Embedment Drawing.

10. Backfilling Pipe and Structures:

Unless otherwise specified or approved by the Engineer/Town Representative, all backfill material shall be placed with moisture-density control in accordance with the typical trench detail shown on the Town's Standard Drawings. All backfill material shall be adjusted to within +2% / -4% of the optimum moisture content prior to its placement in the trench. Jetting or water soaking trenches to achieve compaction of the backfill will not be permitted except when: (1) soil sample tests show that the backfill and excavated trench materials consist of gravel or other granular material having less than 15 percent by weight passing on No. 200 sieve; and (2) the Engineer/Town Representative has given written approval prior to water soaking.

During initial backfilling, the Contractor shall take all necessary precautions to prevent movement or distortion of the pipe or structure being backfilled. Pipe bedding material shall be placed and compacted in even lifts on both sides of the conduit to 6 inches above the top of the pipe. Above the bedding material, earth backfill material shall be placed full width in uniform layers not more than twelve inches thick. Each layer shall be compacted to the required density with approved mechanical or hand tamping equipment.

Concrete structures shall not be backfilled until the concrete and mortar therein has attained a minimum compressive strength of 2000 psi and can sufficiently support the loads imposed by the backfill. Select backfill shall be placed simultaneously on all sides of the structure in layers approximately 12 inches thick. Each layer shall be compacted to not less than 95 percent of the maximum dry density determined in accordance with ASTM D698 / AASHTO T-99.

11. Compacting Backfill Material:

Backfill material in trenches shall be compacted to at least 90 percent of maximum density except for the top 3 feet of the trench under existing or proposed roads or structures which shall be compacted to at least 95 percent of maximum density. Maximum density shall be defined by ASTM D698 / AASHTO T-99. All approved backfill material shall be moisture-conditioned to within +2% / -4% of the optimum moisture content prior to its placement.

12. Backfilling with Flow-Fill

At the Contractors option Flow-Fill meeting the requirements set forth in the Materials portion of this specification may be used in lieu of compacted backfill in pipeline trenches and around structures only. Compaction testing of trench backfill will not be required if material meeting the above requirement is used. See Standard Drawings for this section.

M. Storm Water Permit and Plan:

For construction disturbing an area of one acre or more, a storm water permit and plan must be obtained as required by the State of Colorado.

IV. TESTING:

A. Embankments:

In-Place Density: One test for every 6000 sq. ft. per lift.

B. Trenches:

For every 400 lineal feet of trench and each branch or section of trench less than 400 feet in length, at least one compaction test shall be performed for each two foot vertical lift of backfill material placed. The first test shall be taken approximately two (2) feet above the top of pipe and the last test shall be at the pavement subgrade or six (6) inches below the ground surface in unpaved areas. Compaction tests shall be taken at random locations along the trench and wherever poor compaction is suspected. If any portion of the backfill placed fails to meet the minimum density specified, the area shall be defined by additional

tests as necessary and the material in the designated area shall be removed and replaced to the required density at the Contractor's expense.

C. Acceptance:

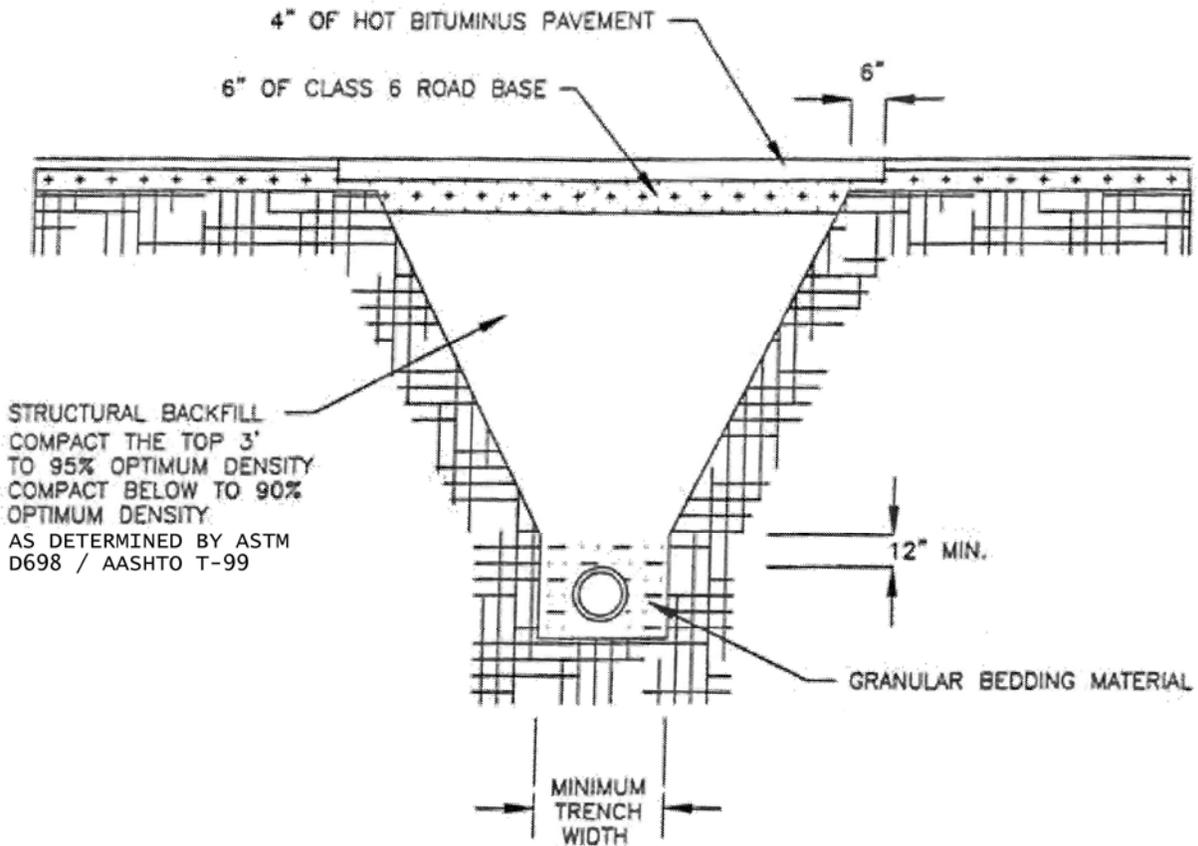
All compaction testing shall be performed by an independent soil testing laboratory acceptable to the Town. It shall be the Contractor's responsibility to make necessary excavations in order to accommodate compaction tests or retests at all locations designated.

A summary report of all compaction test results shall be submitted to the office of the Engineer/Town Representative. The test results are required as a basis of acceptance of facilities by the Town.

D. Cost of Testing:

The contractor shall bear all costs of testing unless otherwise specified or agreed to in writing by the Town.

STANDARD TRENCH DRAWING



TRENCH WIDTH NOTES:

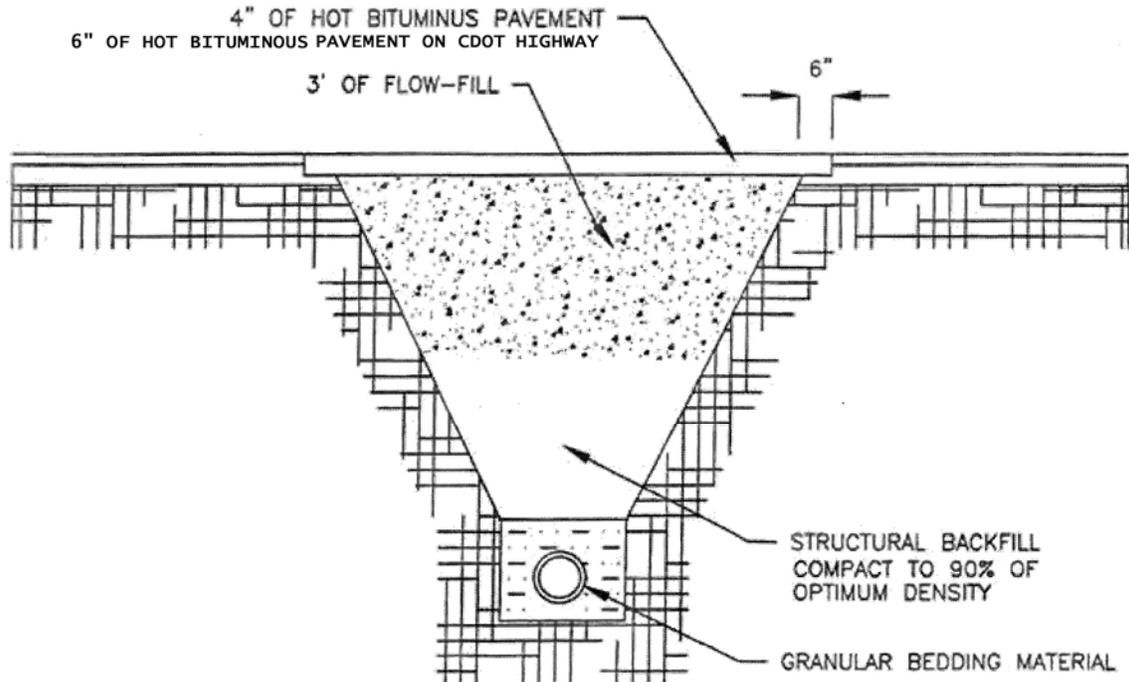
1. INSIDE DIAMETER PIPE < 33" ALLOW 8" MIN. EACH SIDE OF PIPE
2. INSIDE DIAMETER PIPE > 36" ALLOW 12" MIN. EACH SIDE OF PIPE
3. TRENCH WIDTHS SHALL NOT BE WIDENED BEYOND THESE LIMITS BELOW 12" OVER THE TOP OF THE PIPE.

PAVEMENT PATCHING NOTES:

1. EXISTING PAVEMENT TO BE CUT STRAIGHT 6" FROM THE EDGE OF THE TRENCH
2. IF THE ADJACENT PAVEMENT IS DISTURBED IT SHALL BE RECUT TO A NEAT LINE AND REPLACED.
3. MINIMUM PATCH THICKNESS IS 4" OR MATCHING EXISTING WHICHEVER IS GREATER.
4. MINIMUM PATCH THICKNESS ON CDOT HIGHWAY IS 6"
5. PATCHING SHALL BE COMPLETED WITHIN 48 HOURS OF COMPLETION OF BACKFILL
6. IF HOT BITUMINOUS PAVEMENT IS NOT AVAILABLE COLD PATCH SHALL BE USED. COLD PATCH SHALL BE REPLACED WITH HOT BITUMINOUS PAVEMENT AS SOON AS IT IS AVAILABLE.

Drawing No. 1

FLOW-FILL BACKFILL DRAWING



SEE STANDARD TRENCH DRAWING FOR TRENCH WIDTH AND PAVEMENT PATCHING REQUIREMENTS.

EXCEPT:

IF HOT BITUMINOUS PAVEMENT IS NOT AVAILABLE THE TRENCH MAY BE FILLED LEVEL TO THE ADJACENT PAVEMENT WITH FLOW-FILL. THE TOP 4" SHALL BE REPLACED WITH HOT BITUMINOUS PAVEMENT AS SOON AS IT IS AVAILABLE.

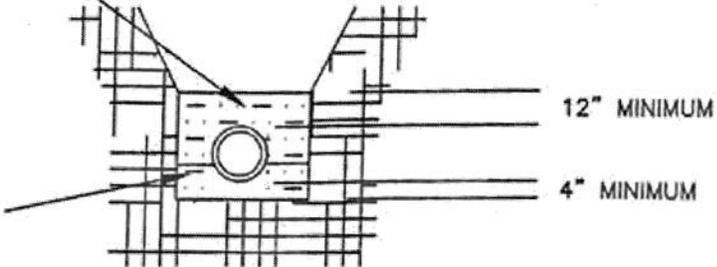
COMPACTION TESTING NOT REQUIRED ON FLOW-FILL.

Drawing No. 2

PIPE EMBEDMENT DRAWING

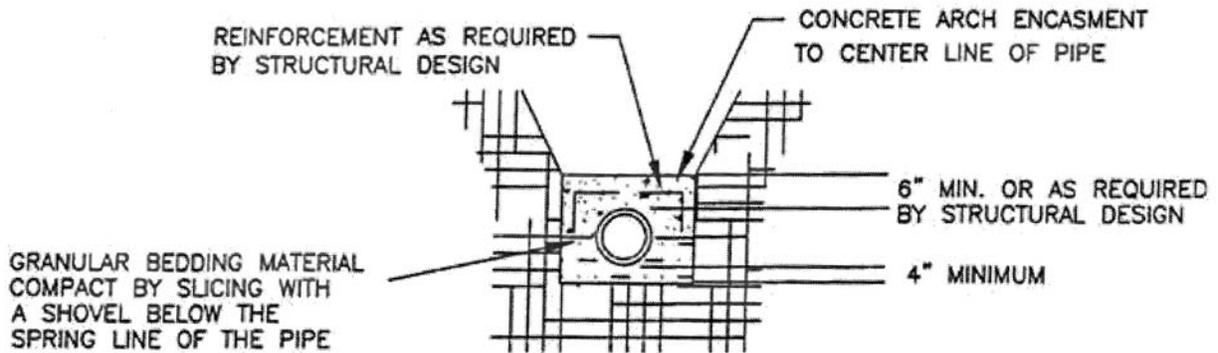
GRANULAR BEDDING MATERIAL
COMPACT BY SLICING OR
VIBRATORY COMPACTOR ABOVE
THE SPRING LINE OF THE PIPE

GRANULAR BEDDING MATERIAL
COMPACT BY SLICING WITH
A SHOVEL BELOW THE
SPRING LINE OF THE PIPE



CLASS B EMBEDMENT DRAWING

GRANULAR BEDDING MATERIAL SHALL BE PLACED IN 6" MAX. LIFTS



CLASS A EMBEDMENT DRAWING
CONCRETE ARCH ENCASMENT

Drawing No. 3

TOWN OF CRESTED BUTTE
WATER MAIN AND SERVICE SPECIFICATIONS

SECTION 300

I. SCOPE:

The purpose of the Water Main and service specifications is to set forth the criteria to be used in the construction of water mains and services for approval and acceptance by the Town of Crested Butte.

II. GENERAL INFORMATION:

- A. All excavation and backfilling shall be performed according Section 200, General Earthwork specifications.
1. Verify trench is not going to become a channel for water to collect and flow down.
 2. Properly backfill material.
 3. Use proper compacting method.
 4. Must have identifying tape before backfilling.
 5. Get approval from DPW before excavating in the roadway.
 6. Contractor responsible for proper signs or personnel to divert traffic.
 7. Wedging or blocking of the bell or pipe is not permitted for achieving slope before backfilling.
- B. All water mains shall be a minimum of 8 inches in diameter.

III. MATERIALS:

- A. **Pipe:** Pipe larger than two inches shall conform to #1 below. Pipe two inches or smaller shall conform to #2 below.
1. Water mains shall be constructed with ductile iron pipe. Ductile iron pipe for water mains shall conform to the AWWA C-151, thickness class 52. Ductile iron pipe shall be cement-lined per AWWA C-104.
 2. Service lines shall be constructed with high-density polyethylene (HDPE) pipe or copper pipe and conform to AWWA C-901, or other if approved by the Town. Refer to Section L, Service Lines for further detail.

B. Joints:

Ductile iron pipe joints shall be mechanical, push-on or restrained push-on joints conforming to AWWA C-111.

C. Gaskets:

Gaskets shall be of neoprene or other synthetic rubber material.

D. Restrained push-on joints:

American "Lok-Fast" or "Lok-Ring", CLOW "Super-Lock", US Pipe "Lok-Tyton" or "Lok-Tyte", Griffin "Snap-Lock", Pacific States "Thrust-Lock".

E. Restrained Glands:

EBBA Iron model No. 1100 series

F. Fittings:

Fittings shall be ductile-iron conforming to AWWA C153 pressure Class 350 and mechanical joints conforming to AWWA C-111 with appropriate gaskets for the connected pipe.

G. Bonding Straps:

Bonding straps shall be de-oxidized copper conforming to ASTM-B 152-58 D.H.P., a minimum of 1 1/4 inch wide by 1/8 inch thick and of sufficient length to attach to each pipe.

Bonding may be accomplished using Cad Weld method for ductile pipe with a minimum wire requirement of #4 BSD Copper.

H. Valves & Valve Boxes:

1. Gate Valves: Gate Valves shall be in accordance with AWWA Standard C509, equal to the class of pipe being used, with mechanical joint ends. All valves shall be equipped with a non rising stem and standard 2 inch square wrench nut. Stems will provide "O" ring dirt seal and pressure seal packing.
2. Butterfly Valves: Butterfly valves shall be Town approved and shall conform to AWWA Standard C504.
3. All valves shall open counter-clockwise (Open Left).

4. Valve Boxes: Valve boxes will be provided for each valve, such boxes to be buffalo-type 2 or 3 piece with extension as required. Shafts will be not less than 6 inches in diameter and will be capped with a standard flush-type lid weighing not less than 10 pounds and marked "Water".

I. Fire Hydrants:

Fire Hydrants shall be in accordance with AWWA Specification C-502 and shall be Guardian model K81A as manufactured by ITT Kennedy Valve. Hydrant installation may require an adjustable grade device to be determined by the Town, Gradelok or equivalent.

J. Encasements & Thrust Blocks:

Concrete for encasements or thrust blocks minimum compressive strength of 2500 psi in twenty-eight (28) days.

K. Appurtenances:

1. Pipe: Refer to Section A, Pipe.
2. Joints: Larger than two inch shall conform to Section B, Joints. Joints two inch and smaller shall be compression.
3. Fittings: Larger than two inch shall conform to Section F, Fittings. Fittings two inch and smaller shall be compression.

L. Service Lines:

1. Service lines shall be a minimum of 1 inch in diameter.
2. All service lines shall be installed with insulated pipe foam from the water main to the water meter.
3. All HDPE pipe shall have coated, solid locating wire attached and accessible at the ground surface.

M. Corporation Stops:

All 1 inch to 2 inch corporation stops shall be ball-style and rated at 300 psi, materials to be approved by the Town.

N. Curb Valves/Stops:

Curb valves/stops shall be 1 inch to 2 inch ball-style curb valve/stops:
Materials to be approved by the Town.

O. Curb Boxes:

Materials to be approved by the Town.

P. Service Saddles:

Materials to be approved by the Town.

IV. INSTALLATION:

A. Depth:

Pipe shall be installed a minimum of 7 foot from top of pipe to existing or proposed grade, whichever is lower.

B. General:

All pipe and fittings shall be carefully lowered into the trench by means of a hoist, ropes or other suitable tools or equipment in such a manner as to prevent damage to the water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench. All pipe and fittings shall be carefully examined for cracks or other defects immediately before installation in final position. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. During laying operations, no debris, tools, clothing or other material shall be placed in the pipe. As each length of pipe is placed in the trench, the spigot end shall be centered in the bell and the pipe forced on and brought to correct line and grade. Precautions shall be taken to prevent dirt from entering the joint space.

At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means approved by the Town. If water is in the trench, the plug shall remain in place until the trench is pumped completely dry.

Where pipe is laid on a grade of 10% or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe upgrade. The cutting of pipe for inserting valves, fittings or closure pieces

shall be done in a neat and workmanlike manner without damage to the pipe and so as to leave a smooth end at right angles to the axis of the pipe. No pipe shall be laid when in the opinion of the Town or their representative trench conditions are unsuitable.

C. Bonding Strap:

A bonding strap shall be installed across each joint in the water line to provide metal to metal continuity. Bonding straps shall be attached at each end by means of magnesium weld or other approved method.

D. Valves:

Valves shall be set and joined to pipe/fittings in the manner specified for cleaning, laying and joining pipe and fittings. Valves shall have the interior cleaned of all foreign matter before installation. Valves shall be inspected in the open and closed positions to insure that all parts are in working condition.

E. Valve Boxes:

Valve boxes shall be provided for all valves. Valves 12 inches and larger shall be provided with a bonnet. Valve boxes will be centered and plumb over the wrench nut of the valve with the box cover flush with the level of the finished grade or such level as may be directed by the Town. Upon completion of backfill around the valve box, a 4 x 4 inch timber shall be placed vertically next to each valve box, the exposed portion of which shall be at least 4 feet above finished grade.

F. Fire Hydrants:

Fire Hydrants shall be installed to finished grade elevation. An appropriately sized Class 150 valve shall be required with each hydrant and both shall be installed at the location designated by the Town.

Hydrant drainage in pervious soil shall be provided at the base of the hydrant by placing coarse gravel or crushed stone from the bottom of the trench to at least 6 inches above the water opening (weep holes) in the hydrant and to a distance of 1 foot around the elbow.

Hydrant drainage in clay or other impervious soil shall be provided by a drainage pit 2 feet in diameter and 3 feet deep excavated below the hydrant and filled compactly with coarse gravel or crushed stone under and around the elbow of the hydrant and to a level of 6 inches above the water opening (weep holes).

G. Thrust Restraints:

All plugs, tees, valves, bends and hydrants or a change in direction of 10 degrees or more shall be provided with Thrust Restraints.

H. Thrust Blocks:

Concrete Thrust Blocks shall be placed between the solid ground of the trench wall and the fitting. The backing shall be so placed that the pipe and fitting joints will be accessible for repair. Plastic "cloth" shall be placed between the fitting and concrete. Unless a design is provided by a Registered Professional Engineer thrust blocks shall be as shown in the Standard Drawings for this section.

I. Restrained Joint Pipe:

Unless a design is provided by a Registered Professional Engineer pipe shall be restrained in each direction from a plug, tee, bend, hydrant or change of 10 degrees or more as shown in the Standard Drawings for this section.

J. Encasements:

Prior to placing the concrete for cradles or encasements, temporary supports consisting of concrete blocks or bricks shall be used to support the pipe in place. Not more than 2 supports shall be used for each pipe length, one adjacent to the shoulder of the bell and the other near the spigot end. No encasements shall be poured until the Town has inspected and approved the pipe to be encased and its supports.

K. Water Taps and Services:

Water taps and services shall be a minimum of 7 feet from top of pipe to existing or proposed finish grade whichever is lower.

A bonding strap shall be installed on all DIP pipe.

Installation of service lines and taps on the water main will be installed to the property line at the time of main construction.

For all service taps follow manufactures' recommendations for minimum size water main for direct tapping.

Each 2 inch and smaller service line that is machine tapped shall be

connected to the water main through a brass ball style corporation stop. The main shall be tapped at 22° degrees from the horizontal center line of the pipe, and the stop must be turned so that the T-handle will be on the side.

All water service lines shall be installed with a frost loop. See the Standard Drawings of this section.

Any water service line installation that crosses an irrigation ditch requires the installation of culvert pipe in the irrigation ditch. Installation and materials shall be approved by the Town.

L. Relationships between Water Lines and Sanitary Sewers:

Lines shall mean all water or sewer lines including mains, laterals and service lines.

When water and sewer lines are within 10 feet horizontally of each other and the sewer line is above or less than 18 inches below the water line, the portion of the sewer line within that area shall:

- 1) Be constructed of approved waterline pipe and joints (Ductile Iron Cement mortar lined pipe conforming to AWWA C-151; OR
- 2) Be constructed of SDR 35 PVC sewer pipe with all joints and pipe within 10 feet of the water line encased in concrete that is a minimum of 6 inches thick centered on the crossing pipe.

In all cases, suitable backfill or other structural protection shall be provided to preclude the settling or failure of both pipes.

Crossings of sewer and water lines shall not be at an angle less than 45 degrees unless approved by the Town.

See the Standard Drawings for this section.

V. INSPECTION AND TESTING:

A. Testing Pressure Pipelines:

Water mains shall be tested for pressure and leakage in accordance with these Specifications and AWWA Standard C-600.

The Contractor shall furnish all labor, equipment, tools, water and other

incidental items required to conduct the tests. Test results will not be considered valid without the presence of the Town representative throughout the test.

No pressure testing shall be performed until all thrust blocks have been placed and cured for at least 7 days, and the pipeline backfilled adequately to prevent any movement or lifting of the pipe. Pavement or other permanent surfaces shall not be placed until all pressure and leakage tests are satisfactorily completed.

B. Test Pressure:

The test pressure for all pipes shall be 50% more than the maximum operating pressure as determined by the Town at the lowest elevation of the test section, but shall be a minimum of 150 psi at any elevation in the test section.

C. Filling:

The pipeline shall be filled with potable water at least 24 hours before being subjected to the hydrostatic pressure test. Each section of pipeline shall be filled slowly and all air expelled by means of taps at points of highest elevation.

D. Leakage:

The specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Town. The leakage test shall be performed for a minimum of 2 hours. No pipe installation will be accepted if the leakage for the section of line being tested is more than the rate calculated using a standard formula.

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

where:

L = testing allowance, gallons per hour

N = number of joints in the tested line

D = nominal pipe diameter, inches

P = average test pressure, psi

Table 2620-1 Hydrostatic Testing Allowance per 1000 ft. of Pipeline (gph)

Avg. Test Pressure (psi)	Nominal Pipe Diameter (in.)												
	3	4	6	8	10	12	14	16	18	20	24	30	36
450	0.48	0.64	0.96	1.27	1.59	1.91	2.23	2.55	2.87	3.19	3.82	4.78	5.73
400	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41
350	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90	4.68
275	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05
200	0.32	0.42	0.64	0.85	1.06	1.27	1.49	1.70	1.91	2.12	2.55	3.19	3.82
175	0.30	0.40	0.60	0.79	0.99	1.19	1.39	1.59	1.79	1.99	2.38	2.98	3.58
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31
125	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02
100	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70

Leakage is defined as the quantity of water to be supplied to the section of pipeline being tested, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

E. Disinfection of Waterlines:

After completion of pressure testing and prior to being placed into service, all new water mains and repaired portions or extensions of existing mains shall be chlorinated by the Contractor in accordance with AWWA Standard C-601.

F. Preliminary Flushing:

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have entered the pipe. If a hydrant was not installed at the end of the main, then a 2-1/2 inch tap shall be installed in order to flush the line.

G. Form of Applied Chlorine:

Chlorine shall be applied by one of the methods described in AWWA C-601, subject to approval by the Town. If AWWA C-601 section 5 is utilized - Tablet Method - then flushing will take place after chlorination.

H. Point of Application:

The prepared point of application of the chlorinating agent is at the beginning of the pipeline extension or any isolated section of it, and through a corporation stop inserted in the pipe. The water injector for

delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipeline extension. Alternate points of application may be used when approved or directed by the Town.

I. Preventing Reverse Flow:

Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used if desired.

J. Retention Period:

Treated water shall be retained in the pipe at least twenty-four (24) hours. After their period, the chlorine residual at pipe extremities and at other representative points shall be at least twenty-five (25) mg/L.

K. Chlorinating Valves and Hydrants:

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent and under normal operating pressure.

All Chlorinated water shall be neutralized to a residual of no greater than 1.0 ppm before discharge as approved or directed by the Town.

L. Final Flushing and Testing:

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows upon test a chlorine residual of less than one (1) mg/L.

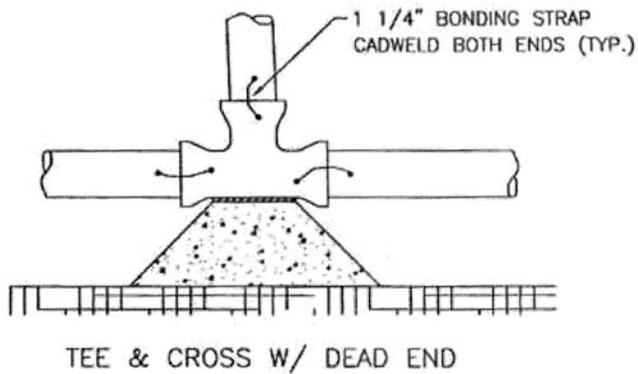
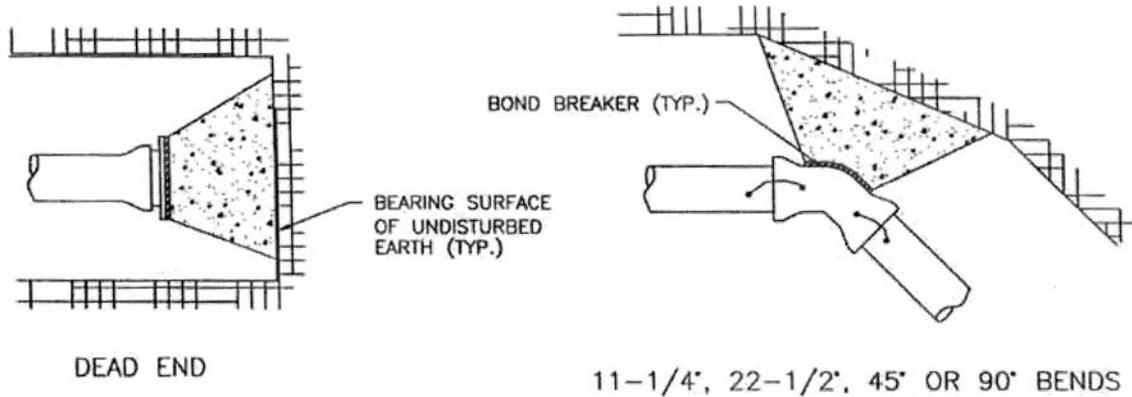
M. Bacteriologic Tests:

After final flushing, and before the water main is placed in service, bacteriologic tests shall be performed in accordance with AWWA C-601.

N. Trench Backfill Compaction Testing:

Testing shall be performed according to Section 200 General Earthwork Specifications, IV. Testing.

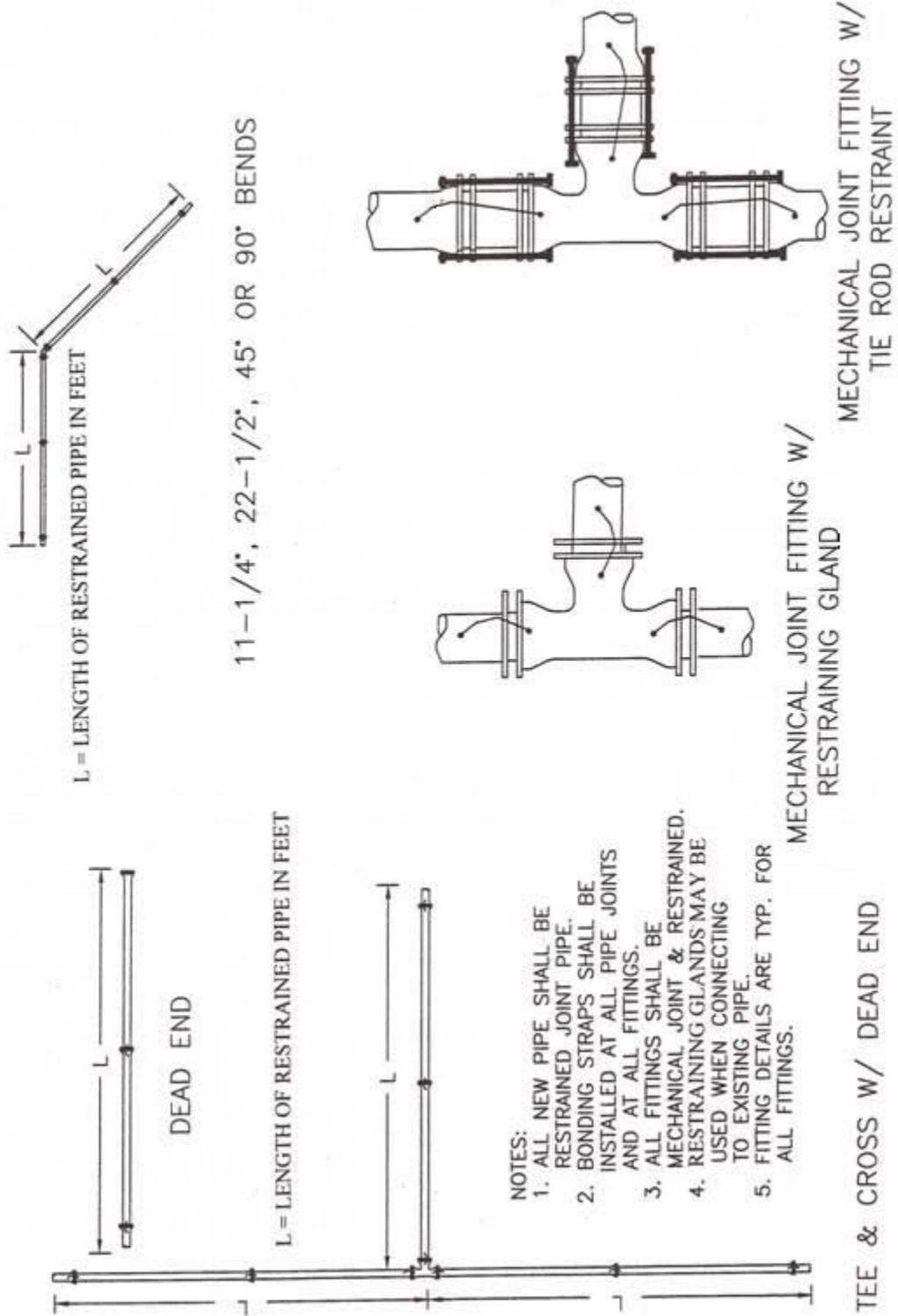
THRUST BLOCK DRAWING



- NOTES:
1. ALL FITTINGS REQUIRING THRUST BLOCKS SHALL BE WRAPPED IN POLYETHYLENE BOND BREAKER MATERIAL.
 2. CONCRETE SHALL NOT BEAR ON BOLTS OF MECHANICAL JOINT FITTINGS.
 3. PIPE AND FITTINGS MAY BE EITHER MECHANICAL JOINT OR PUSH ON JOINT.

Drawing No. 6

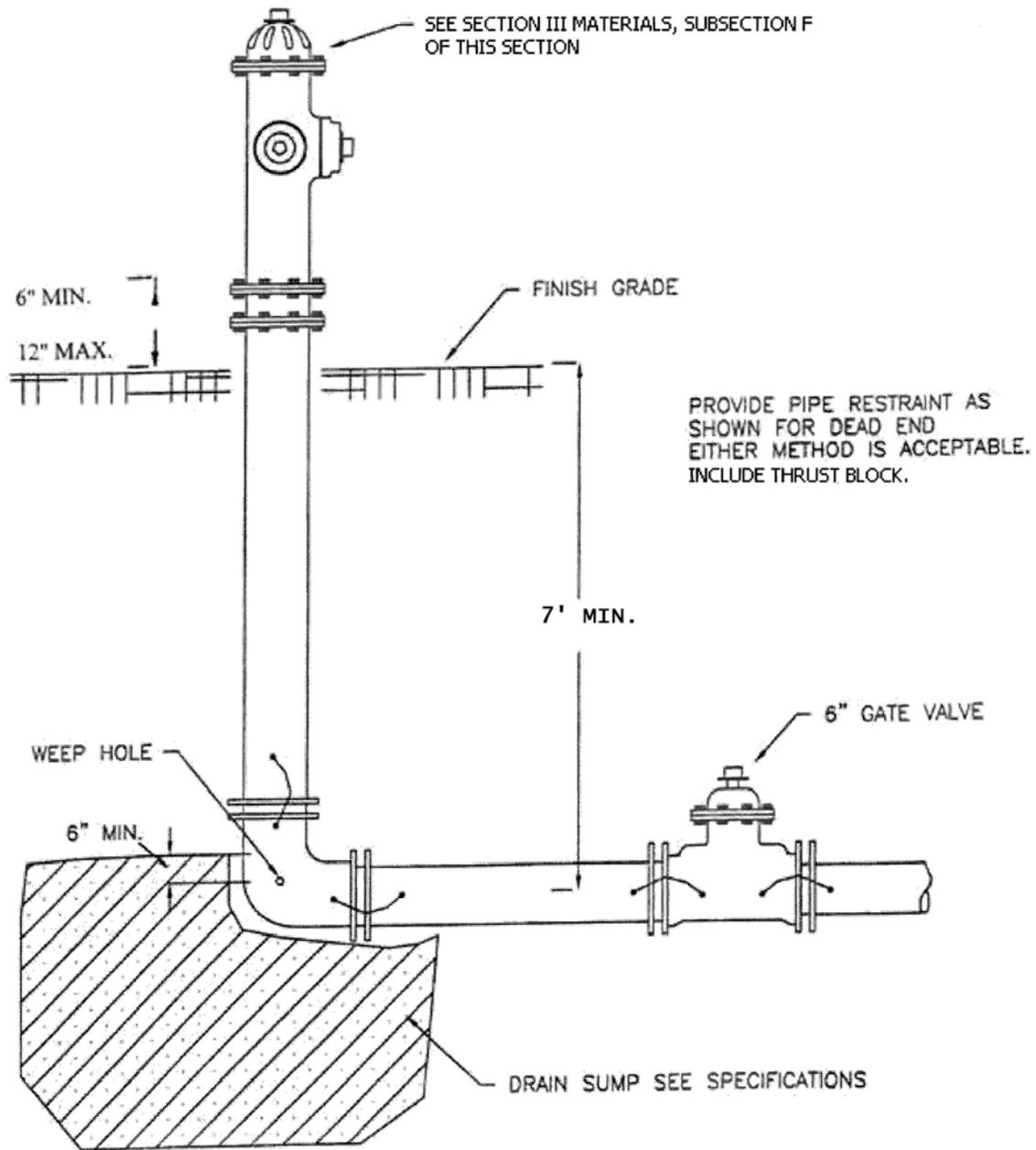
RESTRAINED PIPE DRAWING



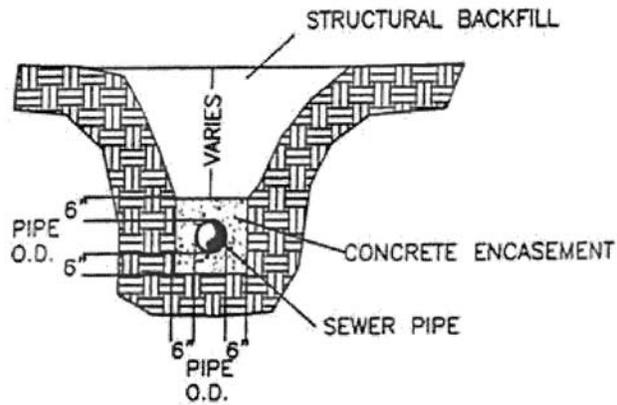
Drawing No. 7

300-12

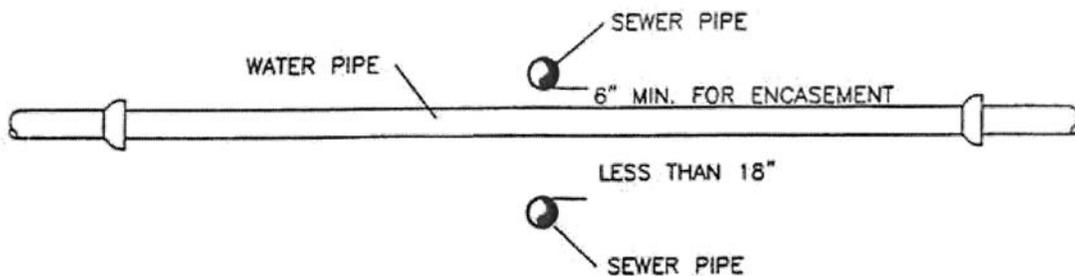
STANDARD FIRE HYDRANT DRAWING



SANITARY SEWER – WATER PIPE CROSSING



CONCRETE ENCASEMENT



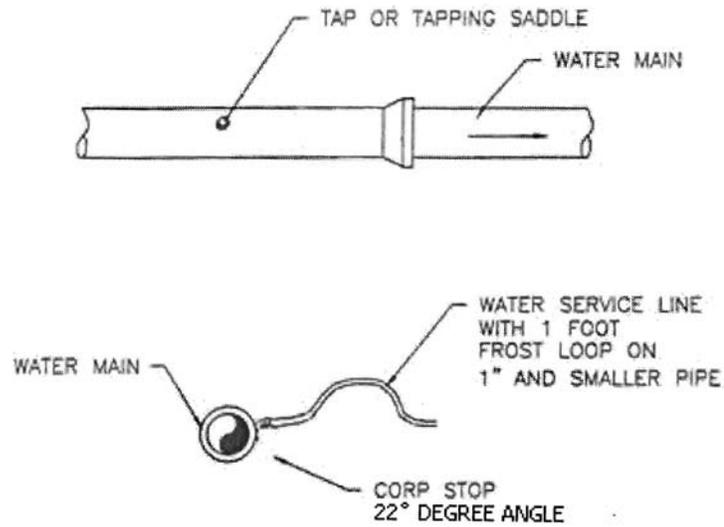
PIPE CROSSING

NOTE:
 IF THE SEWER PIPE IS ABOVE THE WATER PIPE
 OR IF THE SEWER PIPE IS LESS THAN 18" BELOW THE WATER PIPE
 THE SEWER PIPE MUST BE CONCRETE ENCASED TO PROTECT THE WATER PIPE.
 SEE SPECIFICATION SECTION 500 OR 600 FOR PROTECTION REQUIRED.
 PROTECTION MUST EXTEND A MINIMUM OF 10' EACH WAY FROM THE CROSSING.

Drawing No. 9

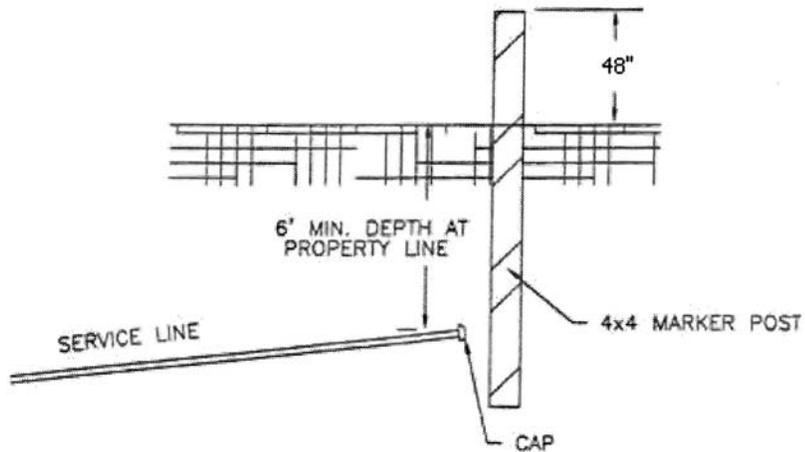
300-14

SERVICE CONNECTIONS



Drawing No. 10

WATER SERVICE MARKER



Drawing No. 11

TOWN OF CRESTED BUTTE
SANITARY SEWER SPECIFICATIONS
SECTION 400

I. SCOPE:

The purpose of the Sanitary Sewer Specifications is to set forth the criteria to be used in the construction of sewer mains, services, manholes, and lift stations for approval and acceptance by the Town of Crested Butte.

II. GENERAL INFORMATION:

- A. All excavation and backfilling shall be performed according Section 200, General Earthwork Specifications.
1. Verify trench is not going to become a channel for water to collect and flow down.
 2. Properly backfill material.
 3. Use proper compacting method.
 4. Must have identifying tape before backfilling.
 5. Get approval from DPW before excavating in the roadway.
 6. Contractor responsible for proper signs or personnel to divert traffic.
 7. Wedging or blocking of the bell or pipe is not permitted for achieving slope before backfilling.
- B. All materials shall conform to appropriate ASTM designation. The Town may reject any materials showing defects.
- C. Flexible conduit shall be marked with the following:
1. Name or Trademark of Manufacturer
 2. ASTM Specification
 3. Nominal Diameter

III. SEWER MAINS, SERVICES AND MANHOLES:

A. General Specifications:

1. All new construction of sewer mains and manholes must be designed by a Professional Engineer licensed in the state of Colorado.
2. The Professional Engineer must provide calculations relevant to the design flows at initial build, final build out. These shall include, but are not limited to, peaking factors, per capita daily flow, commercial capacity allowances and inflow and infiltration allowances.
3. The Professional Engineer shall provide data that shows the new construction design life.
4. Manholes shall be located so that they are not in drainage areas.
5. All sewer mains must be located in town right of way.
6. The design must include a manhole at any sewer main change in direction or grade or at a maximum of 400 feet from the adjacent manholes.
7. A manhole is required at the commencement of a sewer main.
8. A stub out in a manhole may be required if deemed necessary for future expansion.
9. Plans and specifications shall require the toning of any area to be excavated for underground utility lines. In areas where non-metallic pipe lines may be present, ultrasonic detection methods or field-locating grade nodes (manholes, cleanouts) may be used as appropriate. Research "as-built" construction drawings, and perform field investigations, to ensure that all known underground utility lines are identified on the construction drawings prior to actual field excavations. Perform soil borings sampling and testing when required. Include a note and/or specification to indicate the cost of repairing any damaged underground utility line shall be borne by the Contractor regardless of whether or not the utility lines are depicted on the construction drawings.
10. The Contractor to be responsible for diverting sewage as necessary for performance of work. The Town will not perform sewage

diversion operations for the Contractor. The Contractor shall supply all labor and equipment necessary to compliantly perform his operations, which may include the use of bypass pumps, tank trucks, temporary piping/hoses, etc. The Contractor will also be responsible for any costs associated with sewage spills resulting from construction operations, which may include, but are not limited to, clean-up and fines.

11. Construction dewatering into the Town's sewer collection system is not permitted. Discharge of hydro-test water, dechlorinated water from pipe line disinfection or flush water from storm drain cleaning is not permitted into the Town's wastewater collection system. A construction dewatering permit as require by the State of Colorado shall be obtained by the contractor.
12. Construction drawings should include pertinent project-specific sewer notes or construction notes to clarify or bring attention to certain construction requirements that directly or indirectly affect the Town's sewer collection/transmission systems and those who work on these systems. Some of the following sewer notes may apply to typical sewer construction work. The designer may choose to modify these notes and/or provide other project-specific notes as deemed applicable to the scope of work.
 - a. The Contractor shall be responsible for performing and maintaining any incidental sewage bypass pumping or diversion work that will be required to accomplish the construction work.
 - b. For any new concrete surface that will be exposed to sewage flow, the Contractor shall maintain sewage bypass/diversion operations for the duration of the specified curing time for the concrete.
 - c. The Contractor shall be responsible for providing and maintaining temporary power as necessary to maintain normal lift station operations.
 - d. The Contractor shall be responsible for damage to any Town utility system resulting from construction operations; any damage shall be reported immediately to the Director of Public Works. Any sewer repair performed by the Contractor shall be inspected by the Town prior to backfilling.
 - e. The Contractor will be responsible for regulatory fines or penalties that may be imposed by environmental regulatory agencies (EPA and/or CDPHE) in the event of sewage overflow or spill resulting from construction operations.

- f. The Contractor shall reimburse the Town for any emergency response effort that may be required by Government forces to mitigate the adverse effects of any sewage overflow or spill resulting from the Contractor's operations.
 - g. Any sewer manhole to be abandoned shall have its cone section removed and disposed of, pipe penetrations plugged with Class "C" concrete and the remaining riser structure backfilled and compacted to finish grade.
 - h. Cleanouts on any abandoned service lateral shall be plugged and terminated a minimum of 12 inches below finish grade.
 - i. Prior to abandonment, pipe shall be filled with flowable fill as noted.
 - j. The Contractor shall contact the Director of Public Works to make arrangements for the Town to take custody of salvageable sewer manhole frames and covers. Manhole frames and covers not accepted by the Town shall be disposed of by the Contractor.
 - k. Potentially lethal levels of hydrogen sulfide (H₂S) gas may develop in the gravity sewer collection system.
 - l. The Contractor shall ensure that loose material, tools and equipment from construction operations are appropriately removed from the sewer collection system. Any damage to downstream lift station equipment resulting from negligence will be assessed to the Contractor.
 - m. Adjust all manhole frames and covers to the new finish grade.
 - n. Provide 3 days advance notice to the Director of Public Works for inspection of any new wye saddle construction for new service connections to existing sewer mains.
 - o. During periods of non-work and for the duration of contract work, the Contractor is responsible for providing proper barricades and signage to keep the public safe.
 - p. Upon completion of the sewer construction, make advance arrangements (3 working days minimum) with the Director of Public Works for final acceptance inspection of the new sewer construction.
 - q. Construction dewatering into the Town's sewer collection system is prohibited.
13. As much as possible, sewage flow shall not be interrupted. Contractor-provided bypass measures should be incorporated into the design of the project. The designer should also coordinate construction with the Director of Public Works. Contractors shall provide and maintain interim emergency generators or portable

pumping provisions to maintain normal sewage flow as needed to perform the work.

14. All requests for information on the Town's wastewater system shall be made via the Director of Public Works. The Town makes no representation that released documents and files (e.g. record drawings, maps, reports, studies, etc.), hard copy or otherwise, or the information they contain, are accurate, current or complete.
15. Three copies of shop drawings shall be provided to the Town for review and approval as applicable and/or for record purposes.
16. Upon completion of the sewer construction work, ensure the Town is furnished with three sets of complete sewer "as-built" drawings.
17. Utilities and work required by Town staff shall be paid for by the Contractor. For all construction projects where Town utilities are made available for the Contractor's use the Town contractually requires that the Contractor pay for Town utility service used (potable water, sewer, etc.). The Contractor shall also be responsible for, and pay for, associated costs of connecting, disconnecting, conveying utilities to the work site, meters, backflow preventers, etc. as necessary.

B. Sewer Lines:

1. Structures (including but not limited to buildings, backflow preventers, transformer pads, mechanical equipment and anchor walls) shall not be built over new or existing sewer lines. As a general rule-of-thumb, consider a 1:1 depth-to-width sewer line excavation clearance. For structures that can transmit live loads to the foundation (e.g. – flag poles, utility poles), a structural or soils engineer should establish the appropriate horizontal setback distance, but in no instance shall any structure be located closer than 3-feet from any sewer line.
2. Minimum pipe cover shall be 6 feet.
3. All sewer lines must be identified with buried warning and identification tape.
4. Saddle wye's must be gasketed with all stainless steel clamps.
5. A horizontal clearance of at least 10-feet shall be provided between water lines and sewer lines. At crossings maintain 18" vertical

separation between the bottom of the water line and the top of the sewer. See Section 300, IV.L. for further requirements. Any instance where this is not possible will require approval by the Director of Public Works.

6. Trees shall not be planted closer than 20 feet, and shrubs/hedges not closer than 5 feet from a new or existing sewer line. Also, in the event that excavation for future repairs to the underground utility lines become necessary, the Town will not fund for removal, relocation, disposal or replacement of any affected planting.
7. Because PVC is not ultraviolet resistant, the Contractor is required to properly protect PVC pipe staged at the job site.
8. Require SDR 35 PVC or other as approved by the Town.
9. The type of fittings to be specified will be determined by the type of pipe used. Sanitary fittings shall be specified in all cases. Push-on type plastic or PVC fittings without sanitary sweeps will not be permitted. When specifying fittings for C-900 PVC pipe, the designer should check to ensure that the inside diameter of the fitting corresponds to the inside diameter of the C-900 PVC pipe specified since the inside pipe diameter is variable in achieving the desired shell thickness (stiffness). "Lips" at improperly specified fittings can snag solids resulting in hydraulic flow constrictions. If no-hub cast iron pipe installation is permitted, approved cast iron or stainless steel fittings shall be used. If PVC sewer pipe is used, double-gasketed push-on joints generally offer better shear and pull resistance over "mission" (rubber) couplings, and they also offer better joint stiffness (less joint deflection).
10. Sewer pressure mains shall be ductile iron with 316 stainless steel nuts and bolts unless otherwise approved by the Director of Public Works. In some situations, the use of high-density polyethylene (HDPE) pipe may be permitted provided thermal expansion factors are considered in the design. All ductile iron pipes without cathodic protection systems shall be installed with polyethylene encasement. If non-metallic pipe is approved for use, a tracer wire is required. Specifications shall require that all pressure mains be leak tested prior to final acceptance.
11. Appropriate air release provisions shall be installed at all high points in the pressure main where air can accumulate. Air release valves specified shall be designed specifically for sewage applications and all interior mechanical components shall be

fabricated of stainless steel. Valves with plastic components are not acceptable.

12. If isolation valves are installed in a pressure main, install pressure cleanouts immediately downstream of the isolation valve. Viton-gasketed stainless steel pressure blank covers, or approved equal, shall be installed such that the cleanout flange face is parallel to the finish grade, 12-inches below grade and within a manhole structure.
14. Pipe shall be laid upgrade from structure to structure, with bell end upgrade unless otherwise directed or permitted by the engineer.

C. Manholes:

1. Manholes shall have a protective inside coating. (Calcium Aluminate is recommended).
2. Manholes and valve structures shall be located in roadway areas or in serviceable vehicle corridors. This is to ensure that maintenance vehicles are not forced to drive over grassed lawns or landscaped areas. Adequate clearance between the edge of a building (wall and roof line) and other structures should be provided to enable repair of the lines by use of heavy equipment.
3. Manholes shall be constructed so as to form a circle in the horizontal plane.
4. Manholes shall be either pre-cast or cast-in-place reinforced concrete. Details of manholes shall clearly indicate a properly formed channelized base and shall indicate proper water-tight grouting of all pipe penetrations and precast sections.
5. Manholes shall be provided without rungs.
6. All influent pipe connections to manholes shall be made at the properly channelized invert of the manhole, whether it is a direct connection or a drop connection. "Waterfall" type connections are substandard and will not be permitted.
7. All pipe penetrations shall be made perpendicular to the circumference of the manhole – angled deflections at existing flow channels will not be permitted.

8. Manhole frames shall be firmly (structurally) affixed to the top of the manhole cone and grouted around the ring of the frame. Standard-sized frames and covers shall be specified as depicted in approved standard details.
9. Where a large junction structure is required, include a sufficient number of manholes on the structure to allow full direct access to all points in the structure.
10. Manholes shall not be situated in sump depressions or drainage swales where rainfall or snow melt runoff can accumulate. The designer should carefully check finish grades to ensure that this situation does not occur. The intent is to minimize direct inflow for all new manhole installations.
11. Changes in direction of flow through the manhole shall be made with a smooth, curved channel having as large a radius as possible. The change in size of channels shall be made gradually and evenly and shall be formed directly in the concrete. The floor of the manhole outside of the channel shall be finished to a smooth surface and shall slope to the channel. The minimum thickness of the base shall not be less than 8 inches under the invert of the manhole channel.
12. The sewer should be laid continuously through manhole locations wherever grade and alignment permit and the manhole built later. In such cases, the foundation shall be laid and carried up approximately to the center of the pipe. After the manhole is built, the upper half of the pipe shall be cut out and the bottom finished.
13. For manholes where the pipe does not continue, the pipe shall not extend more than one inch inside the manhole wall.
14. 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 essential requirements specified for new manholes. The contractor shall break out as small an opening in the existing manhole as necessary to insert the new sewer pipe. The existing concrete foundation bench shall be shaped to the cross-section of the new pipe in order to form a smooth continuous invert. Cement grout shall be used as necessary to smoothly finish the new invert and to seal the new line so the junction is watertight.
15. No service laterals shall be tied in to any manhole.

16. Drop manholes are to be avoided to the extent practicable.
17. When a drop manhole is deemed necessary and the elevation difference between the incoming sewer invert and the invert of the manhole is equal to or greater than 24 inches an outside drop shall be required.

D. Service Lines and Connections:

1. A Contractor must get approval before tapping a sewer main. This includes approval of the date and time of the tap. Contractor should plan on giving a 2 week window to the town. No sewer main shall be tapped without a representative from the Town present.
2. Before tapping the contractor must have identified the material of the main and have the proper saddle.
3. Service taps into sewer mains shall use a factory tee, gasketed saddle wye or gasketed fitting in conjunction with a repair sleeve coupling. Holes for saddle connections shall be made by mechanical hole cutters and shall be the full diameter of the service line. Holes shall be de-burred and carefully beveled to provide a smooth hole shaped to conform to the fitting. Service connections shall be made in the top $\frac{1}{4}$ of the main.
4. The Contractor shall provide the Town with measurements of the distance between the new service tap and the upstream and downstream manholes.
5. For all building sewers, including housing units, a sanitary cleanout shall be installed within 5 feet from the building line. Additional building sewer cleanouts shall be installed at intervals not to exceed one hundred (100) feet in straight runs and at each horizontal change in direction in a sewer service lateral.

IV. INSPECTION AND TESTING:

- A. All pressure and leakage testing shall be performed by the contractor under direct control of the Engineer or an approved representative.

- B. No testing shall occur without a representative from the town present.
- C. All new sewer lines will be air tested.
- D. All new manholes will be hydraulically or vacuum tested.
- E. All new sewer lines will be deflection tested. Maximum deflection for pipe joints shall be limited to 80% of the deflection recommended by the manufacturer.
- F. The final testing and approval will only occur after backfilling and compaction. The contractor may request that a preliminary test be performed prior to backfilling.
- G. In the event that service taps are pre-tapped, all testing and inspection will be performed after the last pre-tap has been made.
- H. On contracts that involve the construction of new sewer mains (manhole-to-manhole), the replacement of sewer main pipe with new sewer pipe (manhole-to-manhole), or for projects where subsequent heavy grade compaction is performed after the laying of sewer collection mains, the Contractor shall provide a video inspection of the interior of the constructed sewer main. The video shall include a progressive video recording of the main section using standard pipeline video equipment. The equipment used to video-document the interior of the main shall either be equipped with an inclinometer indicator that portrays the slope of the main on the video recording, or the video shall be recorded with partial flow in the main (or with a fully wetted invert) such that an assessment can be made of the trueness of grade (workmanship). The video shall also clearly depict all pipe joint sections and service taps along the entire length of pipe in a continuous recording sequence.
- I. The contractor must provide a 5 day window for inspection and testing to occur.
- J. A visual inspection by the town is required before any sewer line or manhole is covered.
- K. The town may require secondary testing if further construction is performed on the line or adjacent lines that is judged to have weakened the integrity of the tested line.

- L. Trench backfill compaction testing shall be performed according to Section 200 General Earthwork Specifications, IV. Testing.

V. LIFT STATIONS:

A. General (Design, Specifications):

1. All new lift stations must meet Colorado state regulations.
2. The lift station must be designed by a Profession Engineer licensed by the State of Colorado.
3. Design calculations, signed by a Professional Engineer, must be submitted to the Town for review and shall contain the following computations: Capacity at peak flow, system head, cycle time, buoyancy calculations, and storage volume.
4. The lift station shall be sized based upon the anticipated upstream flow that will be realized in a 5 year period of development. The amount of development in a basin is judgmental and will be determined by the City.
5. The lift station design must include a concrete pad around the wet well hatch with a minimum diameter of 10 ft.
6. Design must include a convenience receptacle on its own circuit.
7. The lift station must have back up power. If a generator is used to meet this specification, see section E--Generators.
8. The lift station must operate on 3-phase power, 460V, 4 wire.
9. Check valves and isolation valves must be located in a valve box outside the wet well.
10. The lift station must be accessible to maintenance vehicles.
11. The area within 20ft. diameter of lift station must maintain the same grade as the wet well hatch. The area within 20 ft. diameter of lift station as well as along access way to lift station must have a 20 ft. vertical clearance.
12. The lift station must include must include external connections and a transfer switch to accommodate a portable generator.

13. All equipment must be guaranteed by the manufacturer for a period of 1 year from the date of final inspection.
14. No services may be connected to the influent line to the lift station until final approval.
15. The lift station shall be designed with 100% pumping redundancy.
16. Wet well must have a protective internal coating to be approved by the Town. 100% Calcium Aluminate is recommended.

B. Documentation and Training:

1. Three copies of the O & M manuals must be provided to the town. O & M manual must include generator information if applicable.
2. A copy of the station's electrical wiring diagram which depicts all breakers, relays, controls, switches, etc. shall be included in the final O & M manual. A laminated copy of this diagram must be posted at the lift station.
3. Detailed preventative maintenance schedules and procedures shall also be included in this manual.

C. Mechanical Equipment:

1. Mechanical equipment located in a wet well must be explosion proof.
2. An hour meter must be provided for each pump.
3. Any horizontal well coverings must open fully, (180 degrees), and be equipped with a device to prevent accidental closure.
4. The air release/ vacuum relief required on force main must be equipped with fittings to allow for back flushing.
5. The lift station shall have an emergency bypass hose connection assembly to the pressure main exiting the lift station to allow a station lift bypass with a portable pump. This hose connection assembly shall be equipped with a plug valve in the closed position and a 4-inch or 6 inch quick coupling type cam-lock connectors (female) with protective cam-lock plugs (male).

6. Only stainless steel may be used for hardware within the wet well.
7. The force main shall have a minimum inner diameter of 4".
8. Isolation valves must be plug type.
9. Pumps type and manufacturer to be approved by the Town. Barnes submersible grinder pumps recommended.
10. Sewer force main must be marked with tape to identify the pipe as a sewer force main in order to prevent accidental water service taps.
11. Any special tools required for such work as operation, calibration, adjustment or service maintenance must be provided to the Town and listed in the O& M manual.
12. Pumps must be removable without entering the wet well.

D. Electrical Equipment:

1. Control system brand, type and configuration shall be approved by the Town.
2. Control circuitry must be configured so that failure of any single component does not disable both pumps.
3. Control boxes must be designed to operate in -40 to 100 deg F ambient temperature.
4. Wet well must be equipped with a level indicator of the transducer or ultrasonic type and must have a float switch back up.
5. Control boxes must meet NEMA standards.
6. The lift station shall have a red alarm light to indicate a high level situation. This light must be visible from the nearest road.
7. The lift station must be capable of indicating pump motor seal failure and overheat conditions with a yellow or red light visible from the nearest road.
8. The lift station must have an audible alarm to indicate a high level situation. The alarm must be audible from 100 ft.

9. The lift station must be equipped with alarm dial-out capability with a 24 hour back up. This alarm may use cellular or land lines. The contractor must supply 1-year of phone service. The dialer must call out when the high level alarm signals and in the event of a power failure.
10. No electrical splices or junction boxes are allowed within a wet well.

E. Generators:

1. The generator shall self-test at least once per week by running under load for a minimum of 30 min.
2. The generator shall be housed in a weather proof enclosure. Quiet site soundproofing shall be provided to reduce noise to 70dB at a distance of 7 meters Housing must include a critical grade exhaust muffler. The generator must be mounted so that all doors can open 90 deg. Equipment shall be permanently fastened to the pad in accordance with the manufacturer's instructions.
3. The entire standby generator set shall be warranted for a period of five years from the date of commissioning.
The generator must be able to start when the ambient temperature is as low as -40 degrees F.
4. Generator shall be supplied with all auxiliary systems necessary for operation (i.e. batteries, battery charger, block heater, etc.).
5. Generator set shall operate at 1800 rpm and at a voltage of 460 Volts AC, three phase, four wire, 60 Hz.
6. The standby power system shall include an automatic transfer switch.
7. Generator must have fuel storage capacity for 24 hours.

APPENDIX A

**APPLICATION AND EXCAVATION,
CUTTING PERMIT**

APPLICATION AND EXCAVATION, CUTTING PERMIT

Town of Crested Butte

P.O. Box 39
Crested Butte, Colorado 81224

—A National Historic District—

LEGAL DESCRIPTION:

Lot Numbers _____
Block _____

APPLICATION NO.	DATE

MAJOR INSTALLATION

MINOR INSTALLATION

1	APPLICANT	MAILING ADDRESS	PHONE		
2	JOB STREET ADDRESS	MAILING ADDRESS	PHONE		
3	PROPERTY OWNER	MAILING ADDRESS	PHONE		
4	CONTRACTOR	MAILING ADDRESS	PHONE		
5	ENGINEER/ARCHITECT	MAILING ADDRESS	PHONE		
6	OTHER PARTIES INVOLVED (INSURANCE CO.)	MAILING ADDRESS	PHONE		
7	OTHER PARTIES INVOLVED (BOND CO.)	MAILING ADDRESS	PHONE		
8	NEW CONSTRUCTION <input type="checkbox"/>	ALTERATION <input type="checkbox"/>			
		REPAIR <input type="checkbox"/>			
9	VALUATION OF PROJECT (ESTIMATED COST)	BOND REQ'D.		AMT.	
10	START DATE	EST. COMPLETION DATE			

FEE	AMOUNT	DATE
PERMIT		
\$25.00 MINOR		
\$50.00 MAJOR		

11	DESCRIPTION OF WORK OR REPAIR/PROVIDE SKETCH FOR MINOR INSTALLATION. ATTACH CONSTRUCTION PLANS AND SPECIFICATIONS FOR MAJOR INSTALLATION.

The Excavation Permit shall become null and void if construction is not commenced within 120 days of the date of issuance. The Excavation Permit shall expire one year after the date of issuance and all construction must be completed prior to the expiration of the permit.

I hereby certify that I have read and examined this application and set of instructions and that all information in this application is true and correct. All provisions of the Town of Crested Butte Excavation and Cutting Specifications and Requirements will be complied with whether specified herein or not. The granting of a permit does not presume to give authority to violate or cancel provisions of any other state or local law regulating construction or the performance of construction.

Further, I understand that the violation of any of the provisions previously set forth shall be deemed a misdemeanor and upon conviction of any such violation I shall be punishable by a fine of not more than \$300, or, by imprisonment for not more than 90 days, or, by such fine and imprisonment for each and every day that violation is committed, continued or permitted.

Signature of contractor/authorized agent date

Signature of owner date