

UPPER BLUE SANITATION DISTRICT

DESIGN AND CONSTRUCTION SPECIFICATIONS

AUGUST 2026



Upper Blue Sanitation District
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SECTION 1 - PURPOSE AND INTRODUCTION

These specifications have been adopted by the Board of Directors of the Upper Blue Sanitation District (hereafter referred to as (District)) for the following purposes:

- A. To supplement the Rules and Regulations of the District.
- B. To ensure the consistency of design and construction for all sanitary sewers connecting to the District's existing collection and outfall system.
- C. To standardize the District's plan submittal, review and acceptance procedures.

Developers, contractors and engineers designing and/or constructing a wastewater collection system that will become part of, or connect to the District system shall be familiar with and must comply with these specifications. Construction of any main line collection system shall take place between May 1 and October 31. Any variation from these specifications shall require prior written approval from the District.

END OF SECTION

SECTION 2 – SEWER SERVICE LINES

2.1 DEFINITION

A service line (or building sewer) is a sanitary sewer extending from a building to the main sewer line. The service is owned and maintained by the property owner and must be installed in accordance with these specifications.

Service line connections to manholes are not permitted.

2.2 GENERAL

This section covers pipe sizing and acceptable materials and methods of installation for service lines. All new or replacement service lines and associated fittings installed within the District shall conform to the following standards, and shall be binding regardless of any other body's or agency's regulations covering sewer installations.

2.3 PREDESIGN MEETING

Prior to the start of design, all parties wishing to construct a service line shall contact the District and have a site inspection to determine the best location for the service and point of connection to the main line.

2.4 PIPE SIZING AND MATERIALS

All residential service lines shall be 4 inches minimum in diameter. All commercial service lines shall be 6 inches minimum in diameter. Any building assessed at three SFE's or greater shall have a 6-inch diameter service line. No service line common to more than one structure will be allowed without the written approval of the District. Duplexes and triplexes must have individual service lines for each unit, unless approved by the District.

2.4.1 POLYVINYL CHLORIDE (PVC) SEWER PIPE

All sewer services will be constructed with PVC pipe and fittings.

PVC sewer pipe shall be produced by a continuous extrusion process, employing a prime grade of unplasticized polyvinyl chloride. Material shall comply with the requirements of ASTM specification D3034. The pipe shall be supplied in the longest available and suitable lengths. All pipes shall bear the National Sanitation Foundation seal, the class and size, pressure rating and the name and trademark of the manufacturer. All pipe joints shall be assembled using a non-toxic lubricant.

2.5 CONNECTIONS TO SEWER MAINS

Service line connections to manholes are not permitted without prior District approval.

District personnel shall inspect all connections to the District sanitary sewer system after the line is exposed and prepared for connection. Service line taps to existing sewer mains shall be made

using approved saddle tees (Genco or equal) positioned 30 to 45 degrees above horizontal as shown in the Standard Detail in the Appendix. The saddle shall be fitted with a rubber gasket that achieves a water-tight seal when compressed. Stainless steel clamps shall be used to hold the saddle in place. **No backfill material shall be placed until the sewer connection(s) has been approved by District.**

No pipe shall be installed with less than 2% (1/4" +/-ft.) slope. No service connections to manholes will be allowed unless approved by the District.

Service connections are to be excavated and tapped by a licensed and approved contractor. If the sewer main is damaged in any manner in the process of excavation and tapping, the homeowner/contractor shall ultimately be held responsible for any and all repair costs.

Final sign-off for Certificate of Occupancy shall not be given until any repair costs incurred by the District are paid in full.

2.6 INSTALLATION

All installation of materials shall be in accordance with these standards and the manufacturer's recommendations.

2.6.1 HANDLING

Pipe, fittings, and appurtenances shall be transported, stored, and handled in a manner that prevents damage. Hooks shall not contact joint surfaces. Plastic pipe shall be stored in shaded areas to prevent curvature due to thermal expansion. Under no circumstances shall material be dropped. Pipe handled on skid ways shall not be skidded or rolled against pipe already on the ground.

2.6.2 CLEANING

The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted. All joint contact surfaces shall be kept clean until the joint is completed.

Every precaution shall be taken to prevent foreign material from entering the pipe during installation. No debris, tools, clothing, or materials shall be placed in the pipe. At no time during construction shall water or debris be allowed to enter the system.

Whenever pipe laying is stopped, the open end of the pipe shall be closed with a tight fitting plug in the end of the pipe to keep dirt and debris out of the pipe.

2.6.3 LAYING PIPE

New pipe shall be laid to the lines and grades indicated on the approved drawings. Lateral displacement of the pipe shall be prevented during bedding operations. Pipe shall not be laid in water, nor under unsuitable weather or trench conditions.

Pipe laying shall begin at the lowest elevation with bell ends facing the direction of laying (i.e. upstream). Cutting of pipe shall be done in a workmanlike manner without damage to the pipe. The cut shall be made at right angles to the axis of the pipe and beveled in a manner that leaves a clean smooth edge.

2.6.4 JOINTING OF PIPE

Pipe ends shall be thoroughly cleaned of foreign matter and excess coating material. The pipe gasket space shall be cleaned and the gasket properly installed. The spigot end of the pipe shall be lubricated with a suitable non-toxic lubricant. The pipe joint shall be assembled in accordance with the manufacturer's recommendation and checked for proper installation.

2.6.5 INSULATION

Pipe in driveways, roadways or areas where snow will be removed shall have a minimum cover of 8 feet. Pipe in other areas shall have a minimum cover of 6 feet. All pipe with insufficient cover shall be insulated for a width of 2 feet on either side of the pipe with flat board insulation placed in the trench above the pipe. The insulation shall be extruded polystyrene foam having an average compressive strength of no less than 40 psi and a k factor no greater than 0.20 at 75 degree mean temperature. The minimum acceptable thickness shall be 1 1/2" placed within 2 inches of the top of the pipe. Insulation shall be bedded in gravel and uniformly supported to prevent breakage. All seams shall be securely taped with duct tape or equivalent. Minimum cover over pipe with insulation shall be 4 feet.

2.7 BEDDING

Bedding material shall be 3/4" screened rock (AASHTO M43 No. 67, or equal). Bedding material shall be placed to provide a continuous bearing and support for every point of the pipe between bell holes. The bedding shall be continuous for a depth of 4 inches below the pipe. After the pipe has been laid to grade, additional bedding material shall be placed to a point twelve (12) inches above the top of the pipe.

2.8 GROUND WATER BARRIERS

In high ground water areas the bedding shall be interrupted by clay dikes. The clay dikes shall be spaced every 100 feet or as directed by the District. The clay dikes shall be constructed to the same dimensions, as the bedding except they shall extend 18 inches above the top of the pipe. The dikes shall be keyed into undisturbed ground. Excavated materials shall not be used as bedding material above or below the pipe unless approved by the District.

Where directed by District, a perforated drain shall be installed from the sewer pipe zone to grade to alleviate hydrostatic pressure.

2.9 CLEANOUTS

All service lines shall have a minimum of one cleanout per 100 linear feet of pipeline length. A cleanout consisting of a vertical 90-degree tee the diameter of the service line shall be provided at the property line between the building being served and the main line. The top of the cleanout shall terminate six inches above grade in unimproved areas, and terminate at grade in improved areas. In traveled areas (driveways, sidewalks, etc.) the cleanout must be capped with an iron cap.

All service lines shall also have a cleanout consisting of a vertical wye and 45 degree bend located within 5 feet of the building being served. This cleanout shall be installed as above.

The service line clean-outs are shown in the standard details.

2.10 INSPECTION

The District will make recommendations on the placement and construction of private service lines, and reserves the right to inspect the line during construction. However, the District is not responsible for the construction, workmanship or maintenance of the service line. The District reserves the right to refuse main line connections if the service line does not meet District specifications. The District shall not be responsible or liable for any failures or malfunctions of the service line.

The owner of the service line shall deliver to the District an as-built drawing of the service line prior to receiving a certificate of occupancy.

The as-built drawing shall accurately show the service line and any other adjacent utilities or improvements. The as-built drawing shall show "swing ties" to at least 2 permanent objects for all cleanouts, the connection to the main line and the connection to the building to enable the line to be located in the future.

END OF SECTION

SECTION 3 – SANITARY SEWER DESIGN AND REVIEW REQUIREMENT

3.1 GENERAL

The proposed sewer project shall be reviewed by the District for compliance with these specifications.

3.2 ENGINEER QUALIFICATIONS

A professional engineer registered in Colorado shall design all sewers or structures to be connected to the District system or to be dedicated to the District upon completion. The engineer shall contact the District before commencing design to obtain these specifications and any other pertinent information and to acquaint the District with the proposed project.

3.3 DESIGN INFORMATION

All available information regarding other utilities, property lines and physical improvements (existing and proposed) within the area of proposed construction shall be verified and shown on the plans.

All plans submitted shall be in strict compliance with the standards contained herein and shall meet any and all Special Conditions that may be reasonably required.

3.4 PRE-DESIGN MEETING

A Line Extension Agreement between the applicant and the District is required prior to the extension of any of the District's sewers.

Prior to the preparation of preliminary construction drawings, all applicants shall contact the District to obtain locations of existing sewers affected by the proposed construction. The size and approximate location of the proposed improvements will be discussed at this time to determine compatibility with the District's capacity and capabilities.

Upon request by the District, the applicant shall, at the applicant's sole cost and expense and Upon request by the District, the applicant shall, at the applicant's sole cost and expense and without cost to the District, provide an analysis of the proposed project's impacts on the District's collection system. The analysis shall identify and describe any improvements, modifications, capacity upgrades, or other work necessary, as determined by the District, to accommodate the proposed connection or development. Such required improvements shall be submitted to the District in report form for review and approval. The applicant shall be solely responsible for the design, permitting, construction, inspection, testing, and cost of all required upgrades to the District's collection system, unless otherwise expressly agreed to in writing by the District.

3.5 DRAWINGS

3.5.1 TITLE SHEET

The first sheet of the drawings shall be the title sheet and shall include the following information:

- 1) Location map with north arrow, and numerical and graphic scale.
- 2) Drawing index.
- 3) General notes.
- 4) Title block - the title block shall include the words "title sheet", and the project name, legal name of project area, recording data, (reception number(s)) of all plats or easements used), and a description of the information shown thereon.
- 5) A title sheet will not be required if the number of drawings is three or less. In this case the title block information shall be included on the first drawing page.

3.5.2 PLAN AND PROFILE

- a) Only 24"x36" plans shall be accepted, unless approved by the District prior to submission.
- b) Maximum scale: horizontal 1 inch = 50' (feet). Vertical 1 inch = 10' (feet). Minimum scale: horizontal 1" = 20' (feet). Vertical 1 inch = 4' (feet) Show scale numerically and graphically. Other scales may be used with prior approval of the District.
- c) North arrow.
- d) Show center-line of sewers and service lines main with appropriate ties, angles of deflection, distance between manholes, grade, pipe type, size, and profiles.
- e) Show right-of-way or easement lines, (include date, reception number of recording(s)), street center line, name and number, property lines, curbs, gutters, cross gutters, sidewalks, driveways, paving and other improvements, existing and proposed.
- f) Provide details of recorded easements where required.
- g) Show manhole elevations (rim, surface, invert in, invert out) using North American Vertical Datum of 1988 (NAVD 88).
- h) Use manhole numbers that conform to the District's master plan numbering system.
- i) On each sheet of the plan, show a sufficient number of typical sections to give the relative location of surface and underground improvements with respect to the proposed sewer mains. Indicate size, type and other pertinent data for all improvements.
- j) Indicate the type, size and ownership of all existing utilities in easements, streets or rights-of-way in which the sewers are to be constructed. Tie utilities, sewers, and house connections to street or right-of-way centerline, or to street property line.

- k) Indicate portions of existing utilities that are to be abandoned because of sewer construction.
- l) Plot crowded intersections on an enlarged scale and provide details for structures.

3.5.3 SUPPORTING DATA

Two complete sets of calculations supporting the design criteria used shall be furnished with the preliminary drawings. Each sheet of calculations shall be dated and have the name or initials of the individual making the calculations. The calculations shall include projected flows, design velocity, slope, maximum population to be served, and depth of flow at maximum design flow.

3.7 FINAL DRAWINGS

Two printed paper sets, one mylar set of final drawings, one electronic copy in portable document format (pdf) and AutoCAD format and two sets of specifications for the proposed project shall be provided to the District, accompanied by two sets of supporting data including documentation that easements and rights-of-way have been acquired. The title sheet shall provide a space for approval by the District.

3.8 SOIL/GROUND WATER INVESTIGATION REPORT

A soil/ground water investigation report shall be provided with the preliminary drawings upon the request of the District. If such a report is requested, sufficient subsurface exploratory and sample analysis shall be made to permit the District to make an adequate assessment of any soil/ground water problems which may be encountered. The investigation report shall contain the findings and supporting data for the following:

- a) The in-place relative density, type and extent of material to be encountered.
- b) Moisture content in pounds per cubic foot, percent by weight and percent of optimum.
- c) Potential excavation problems.
- d) Location and extent of excavation.
- e) The suitability of excavated materials for use as backfill.
- f) The compaction characteristics of the soils.
- g) The ground water conditions.
- h) The depth of test holes shall be determined by the soils engineer.

3.9 SURVEYS

A professional land surveyor registered in Colorado, in accordance with recognized good surveying practice, must perform all surveys. All survey notes must be technically correct, accurate, and legible. Notes shall include sketches oriented by a north arrow.

All pdf digital file, and paper copy surveys must display the surveyor of records seal and signature, and the date, and/or dates of survey.

The maximum permissible scale for pdf digital file, and paper copy surveys shall be 1 inch = 50' (feet) and the minimum permissible scale shall be 1 inch = 20' (feet). Surveys that will not fully display at the maximum scale shall be submitted on multiple pages.

Only 24"x36" plans shall be accepted unless approved by the District prior to submission.

3.9.1 HORIZONTAL CONTROL SURVEYS

All property line surveys and location surveys must show authority of points and lines used and/or methods of establishment. Measurements shown on the official survey notes will be accepted provided no error in excess of one part in 5,000 (3rd order) is found. **Control points must be tied down sufficiently to enable the District to find and use them at the time the surveys are submitted and to enable points that may be destroyed prior to construction to be reestablished.** All survey monuments shall be shown in notes and tied into the surveys. When the location is such that survey monuments must be destroyed by the construction, the monuments must be referenced by a licensed land surveyor and replaced by same after completion of project.

3.9.2 VERTICAL CONTROL SURVEYS

Primary benchmark control levels shall be established and conform to an accuracy of 3rd order. The error of closure in loop or section shall be computed by the formula $e = 0.05 k$ where e is the allowable error in feet and k is the distance in miles between benchmark extremes. This error may be increased by a factor of two in mountainous terrain. The datum used must be based upon North American Vertical Datum of 1988 (NAVD 88). A closed level loop shall be used to establish benchmark elevations. Benchmarks for construction purposes shall be established at reasonable intervals (not to exceed 1,000 ft.) along the site of proposed construction. Benchmarks shall be established in locations where they will not be disturbed by construction. Markers in curbs, headwalls, or permanent structures, buried pipes, monuments, etc. are satisfactory. Benchmarks in wooden structures, fences, and poles and on fire hydrants are not satisfactory. All bench marks shall be completely described in the original notes in such a manner that recovery cannot be in doubt. Benchmark descriptions shall be clear, concise, and accurate and submitted to the District along with level notes.

3.10 REVIEW REQUIREMENTS

3.10.1 PRELIMINARY REVIEW

Two sets of plan paper copies and specifications, and one pdf file of each for the proposed project accompanied by two sets of supporting data shall be submitted to the staff of the District for review. Incomplete submittals will be returned for noncompliance prior to review. Upon review and approval by the Manager of the District, notice of said approval shall be transmitted to the

Applicant along with any required modifications. This review shall be completed within ten (10) working days.

Such approval of preliminary plans shall permit the applicant to prepare final construction drawings in accordance with these specifications and incorporate any modifications required by the District.

The purpose of the District review of plans is to ensure compliance with the District's Rules and Regulations, and with these specifications. Approval by the District is not intended and shall not be interpreted as guaranteeing the design of the facility. The District will not be responsible for any damages arising out of the design of the facility.

3.10.2 FINAL REVIEW

- a) Two sets of plan paper copies and one mylar set of final drawings and two sets of specifications, and one pdf file of each for the proposed project accompanied by two sets of supporting data, including documentation that easements and rights-of-way have been obtained and recorded shall be submitted to the staff of the District at least ten days prior to a regular meeting of the Board of Directors of the District. The final drawings and specifications for the proposed project shall be reviewed by the District. When the plans and specifications are found to be in compliance with these specifications approval will be given by the District.
- b) Upon approval of the final plans by the District, two approved copies of the plans and specifications shall be transmitted to the applicant.
- c) If the final drawings and specifications are found not to be in compliance with the District's specifications and previously requested modifications, the District Manager shall disapprove the plans and return them to the applicant.
- d) No sewer, or service line may be connected to the District system without prior approval of the drawings and specifications.
- e) After final approval by District is given, any revisions to the plans must be re-submitted to District for review and approval before construction.
- f) No construction shall commence without an approved Line Extension Agreement.
- g) The construction shall commence within six months of the approval date or the plans must be re-submitted for review.

3.10.3 REVIEW FEES

A fee of \$5.00 per lineal foot must be submitted with the preliminary plans to cover costs incurred by the District in the review process and inspection of the completed line. If approval is granted

by the District for construction of main line sewers during the period from October 31 to April 15, then review and inspection fees shall be increased to \$10.00 per lineal foot.

END OF SECTION

SECTION 4 – SANITARY SEWER DESIGN

4.1 COLLECTOR SEWERS

New sewers shall be designed on the basis of the projected peak flow at ultimate build out. The projected peak flow is calculated by multiplying the estimated average flow in gallons per minute (gpm) by a peaking factor. A peaking factor of 4.0 shall be used for the peak occupancy season and all design flows. The District recognizes one SFE (single family equivalent) as a flow of 300 gallons per day. The minimum acceptable interceptor/collector pipe size shall be 8 inches.

Upon request by the District, the applicant shall, at the applicant's sole cost and expense and without cost to the District, provide an analysis of the proposed project's impacts on the District's collection system. The analysis shall identify and describe any improvements, modifications, capacity upgrades, or other work necessary, as determined by the District, to accommodate the proposed connection or development. Such required improvements shall be submitted to the District in report form for review and approval. The applicant shall be solely responsible for the design, permitting, construction, inspection, testing, and cost of all required upgrades to the District's collection system, unless otherwise expressly agreed to in writing by the District.

4.2 DESIGN VELOCITIES

The acceptable flow velocity range is between 2.0 FPS (feet per second) and 15.0 FPS. Where velocities greater than 15.0 FPS are attained, special provisions shall be utilized to stabilize the pipe and manholes against erosion and displacement. (See standard details.)

Care shall be exercised to avoid velocity conditions that will allow debris (floating or otherwise) to build up in pipes and structures.

4.3 DESIGN SLOPES

The following are minimum slopes that shall be provided; however, slopes greater than these are desirable.

Table I – Minimum Pipe Slopes

Sewer Size	Minimum Slope Feet/100 ft. (inches)	Percent
4"	24.0	2.00
6"	9.0	0.75
8"	6.0	0.50
10"	6.0	0.50
12"	2.6	0.22
15"	1.8	0.15
18"	1.4	0.12
21"	1.2	0.10

24"

1.0

0.08

4.4 SEWER SIZING

4.4.1 SIZE OF INTERCEPTOR/COLLECTOR SEWERS

Sewers 15 inches in diameter and smaller shall be designed to flow not more than half full when carrying peak design flow. Sewers 16 inches and larger shall be designed to flow not more than three-quarters full using peak design flows.

4.4.2 CALCULATION OF PIPE SIZES

Interceptor/collector pipe sizes shall be computed by using the Manning equation.

4.5 SEWER ALIGNMENT AND LOCATION

Sewers shall be laid with straight alignment between manholes. Sewers must be located in public rights-of-way or permanent utility easements. In general, sewers shall be designed deep enough to drain basements and to prevent freezing.

Where sanitary sewers are located within roadways, sewer manholes shall, to the greatest extent practicable, be located within the roadway platform and shall not be located within roadside ditches. In paved roadways, sewer manholes shall, to the greatest extent practicable, be located outside of vehicle wheel paths.

Sewers must have a minimum of six (6) feet of ground cover over the top of pipe where snow cover will not be removed and eight (8) feet of ground cover in all other locations.

In special cases where sufficient ground cover over the pipe cannot be obtained, District will review a **written request** to use insulation and if satisfied that it is the best choice, written authorization to insulate will be given. The request must contain adequate supporting documentation from a qualified engineer to show that insulation will prevent freezing of the pipe.

4.6 SANITARY SEWER EASEMENTS AND RIGHT OF WAY

The District shall require a dedicated utility or sanitary sewer easement having a minimum width of twenty-five (25) feet, centered on the centerline of the sanitary sewer alignment, for sewers with bury depths of fifteen (15) feet or less. For sewers with bury depths greater than fifteen (15) feet, the District may require additional easement width as determined necessary by the District.

Where sanitary sewers are located within public rights-of-way and the sewer centerline is less than twelve and one-half (12.5) feet from the right-of-way line, additional easement area shall be provided outside the public right-of-way as necessary to satisfy the District's minimum easement width requirements.

4.6 SANITARY SEWER BACKLOT ACCESS ROADS

For sanitary sewers located outside of roadways in backlot areas, the District shall require the construction of a dedicated, traversable access road designed to support AASHTO H20 loading and suitable for use by cleaning, inspection, maintenance, and construction equipment accessing the sewer.

Surfacing materials for backlot access roads shall be subject to District review and approval.

END OF SECTION

SECTION 5 – SANITARY SEWER MATERIALS

5.1 GENERAL

All materials used shall be new and the best available and shall conform to the latest standards of the American Water Works Association (AWWA), the American National Standards Institute (ANSI), and the American Society of Testing and Materials (ASTM).

5.2 DUCTILE IRON PIPE

Ductile iron pipe shall be used only with prior approval of the District. Ductile iron pipe may be required in certain circumstances, such as under roads or rivers. Ductile iron pipe is required for all installations exceeding eighteen (18) feet in depth and shall be continuous between manholes. Ductile pipe is required in all water crossings.

5.2.1 DUCTILE IRON SEWER PIPE

Ductile iron sewer pipe shall conform to the latest revision of ANSI standard A21.51. The interior of each length of pipe shall have a cement lining conforming to ANSI standard A21.4. The exterior surfaces of all ductile iron pipe and fittings shall be foundry coated with a bituminous coating. All ductile iron pipe shall be class 50 or greater as necessary to comply with manufacturer's recommended application requirements for soil conditions and depths of bury.

The pipe joints shall be "push on" type made in accordance with ANSI standard A21.11 with gaskets of neoprene or other synthetic rubber intended for buried applications.

Pipe joint restraints shall be Tyler (MJR) system or U.S. Pipe Field Lok Gasket System or an approved equal.

Flanged pipe joints shall conform to ANSI A21.15 with 125 lb. Flanges conforming to ANSI B16.1. Gaskets shall be 1/8" red rubber, full-face type conforming to ASTM D1330 grade I.

5.2.2 DUCTILE IRON PIPE FITTINGS

Ductile iron pipe fittings shall be cast iron conforming to the requirements set forth in ANSI standard A21.10. Fittings 12-inch size and smaller shall be class 250; fittings 12-inch size and larger shall be class 150. Fittings for flanged pipe shall be flanged in accordance with ANSI standard A21.15. All fittings shall be cement lined in accordance with ANSI standard A21.4. Bolts shall be ASTM A307 and nuts shall be ASTM A307 heavy hex or in accordance with ANSI standard A21.11.

5.2.3 CORROSION PROTECTION

Buried ductile iron pipe which may be subject to corrosive soil action shall be protected by a seamless polyethylene tube conforming to AWWA C105. All openings shall be taped water tight using an appropriate PVC or polyethylene tape.

5.3 PVC GRAVITY SEWER PIPE

5.3.1 SCOPE

This specification covers the requirements for Polyvinyl Chloride (PVC) gravity sewer pipe and fittings in sizes 4" through 27", SDR 35, 4"-15" SDR 26.

5.3.2 CONFORMANCE

Pipe and fittings shall meet the requirements of:

- ASTM D 3034 "Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings: SDR 35, and SDR 26 in sizes 4"-15".
- ASTM F 679 "Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and fittings" T-1 Wall, (SDR 35) sizes 18"-27". See the Appendix for complete pipe specification.
- SPR 26 shall be required on all excavations between 16 –18 feet in depth and in cases that require additional strength.

5.4 C-900 PIPE

Where required by the District PVC C-900 pipe shall be used. This pipe shall meet the requirements of AWWA C-900 "PVC pressure pipe". The PVC C-900 pipe shall be Class 150, SDR 18, or better. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring width that meets the requirements of ASTM- D1869 and E-477. The bell section shall be designed to be at least as strong as the pipe wall.

5.5 COUPLINGS

Mechanical Couplings: Whenever it is necessary to join together pipe with different O.D. dimensions or material, mechanical couplings with transition gaskets shall be used and shall be used.

Mechanical coupling, solid sleeve couplings shall be used for pipe repairs for all plastic pipe of the same diameter.

Rubber Couplings: Fernco or similar rubber couplings **shall not** be used for pipe connections.

5.6 MANHOLE DESIGN

5.6.1 MANHOLE DESIGN

Location: Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; at all intersections; and at distances not greater than 400 feet for sewers 18 inches or less, and 500 feet for sewers 18 inches to 30 inches. Cleanouts shall not be used in public sewer systems to replace manholes. When possible, manholes shall be located in streets, either in the

center of the street or the center of a driving lane. Manholes shall not be located in curbs, pans, drainage and/or borrow ditches, or any locations where water can collect and pool.

Drop Type: An outside drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.

Diameter: The minimum inside diameter of manholes shall be 48 inches. For sewer 15" and greater the minimum inside diameter shall be 60 inches.

Flow Channel: The flow channel through manholes shall be made to conform in shape and slope to that of the sewers.

Water tightness: Manholes must pass a vacuum test before acceptance by District. Manholes must be coated and completely wrapped with a bitumastic material approved by the District.

5.6.2 MANHOLE

All manholes shall be constructed of precast concrete barrels and bases unless otherwise approved, in writing, by District. They shall have a four (4) foot minimum inside diameter and conform to ASTM specification C478. The top section shall be a precast concrete eccentric cone with 24-inch opening. The manhole base must be a minimum 48 inch height and the top of the base shall be at least 12 inches above the top of any pipe. All other connections to the manhole base shall be made by coring and using a approved boot or approved equal inserted and held in place by an internal expanding clamp. See standard detail in the Appendix.

Manhole exteriors shall be coated with ConSeal CS-55 waterborne damp-proof coating, or approved equal.

At the District's request, submit manhole concrete compressive strength test results demonstrating compliance with ASTM C478, *Standard Specification for Circular Precast Reinforced Concrete Manhole Sections*, latest edition.

Poured in place manhole bases shall not be permitted.

5.6.3 MANHOLE FRAMES AND COVERS

The frame and cover shall be cast iron, minimum weight 295 pounds and six (6) inches in height. Castings shall be tough, close- grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A 48, Class 30B. Plane or grind bearing surfaces to ensure flat, true surfaces.

Covers shall be true and seat within ring at all points. All covers shall be marked "SEWER". See standard detail in Appendix. All manhole covers shall be frost free.

5.6.4 ADAPTER RINGS

Manhole adapter rings may be used to adjust manhole elevations for street paving. Only one (1) ring can be used per manhole and it must fit properly so as not to rattle or leak. See standard detail in the Appendix.

5.6.5 GROUT/MASTIC

- a) Mastic for joint sealing shall be ConSeal CS 102 or CS 202 Butyl Resin Rubber Sealant or approved equal, conforming with ASTM C990-09.
- b) Cement based grout shall not be used on manhole interiors except for inverts, only Red Line or Blue Line grout will be acceptable for inverts.

5.6.7 BEDDING MATERIAL

All bedding material for pipe and manhole installations shall be ¾" screened rock conforming to AASHTO M43 No. 67, or approved equal.

5.6.8 BITUTHANE WRAP

Install bituthane wrap around all manholes from base to cone. Bituthane wrap seams shall overlap by a minimum of 4 inches.

Bituthane wrap shall have a minimum thickness of 40 mil and a minimum tensile strength of 250 psi.

5.6.8 INSULATION

Where specified, insulation board shall be extruded polystyrene foam having an average compressive strength of no less than 40 psi and a k factor no greater than 0.20 at 75 degree mean temperature. Insulation shall be bedded in gravel and uniformly supported to prevent breakage. All seams shall be securely taped with duct tape or equivalent.

In areas where low main line flow rates are anticipated and as directed by the District, insulation board shall be cut to fit atop the manhole bench. This installation is intended to prevent frazzle ice calving into the manhole invert, blocking flow.

At the discretion of the District, spray-foam insulation may be approved for installation on manhole exteriors.

5.6.9 MANHOLE INSERTS

All manholes installed in the District shall include an HDPE dish insert below the cover to prevent the intrusion of surface water. Manhole inserts shall be Sealing Systems, Inc. HDPE meeting the requirements of ASTM D1248, Class A, Category 5 Type 111. Manhole inserts shall have a lift strap.

END OF SECTION

SECTION 6 – CONSTRUCTION OF COLLECTOR AND INTERCEPTOR SEWERS

6.1 GENERAL

All pipe shall be laid true to line and grade beginning at the downstream end with the spigots pointing in the direction of flow. Preparatory to making pipe joints, all surfaces of the portions to be joined shall be clean and dry. Lubricants shall be used as recommended by the pipe or joint manufacturer's specifications.

Trenches shall be kept water-free and dry during laying, jointing and bedding operations. Under no circumstances shall water be allowed to rise in unbackfilled trenches after the pipe has been placed.

All trenches shall be properly sloped or shored to prevent caving and injury to the pipe layers. The protection of construction workers shall be the sole responsibility of the contractor. District personnel will not enter excavations they determine to be unsafe. Required inspections to be performed by District personnel will not be performed until potentially unsafe conditions are remedied to District personnel satisfaction.

All trenches and excavations shall be backfilled immediately after the pipe has been laid and inspected unless other protection for the pipe is provided. No construction of sewer main line or manholes shall be allowed after October 31 or prior to April 15 unless approved by the District.

Compaction tests shall be required for all phases of sewer construction including earthen trench and manhole foundations, backfill (each lift), and re-surfacing materials.

6.2 CONSTRUCTION OF SEWER PIPELINES

6.2.1 PLANS

A District approved copy of the project plans and specifications shall be kept on the job site at all times during construction. Contractor shall keep a current record of information required for the as-built plans.

6.2.2 CONSTRUCTION STAKING

Prior to construction, the sewer lines shall be staked and the District notified 5 working days before construction starts to enable a field inspection to be conducted.

6.2.3 TRENCH EXCAVATION

General - Excavate trenches to ensure that sides will be stable under all working conditions. Slope trench walls or provide support in conformance with all local and national safety codes. Only as much trench as can safely be maintained by available equipment shall be opened. Trenches shall be backfilled as soon as is practical, but not later than the end of each workday.

Trenches shall be excavated to the alignment and elevations as indicated on the drawings with any deviations approved by the piping system design engineer and District. Appurtenances shall be located and installed in accordance with design requirements. Excavated material shall be stockpiled in a manner that will not endanger the work. Hydrants under pressure, water and gas valves, manhole covers, fire and police call boxes and other utilities and controls shall be left unobstructed and accessible until work is completed. Gutters shall be kept open or other satisfactory provisions shall be made for street drainage. Unless otherwise approved, stockpiles shall not obstruct adjacent streets, walks or driveways.

Minimum Trench Width - Where trench walls are stable, provide a width sufficient, but no greater than necessary, to ensure working room to properly and safely place and compact haunching and other embedment materials. The space between the pipe and trench wall must be wider than the compaction equipment used in the pipe zone. Minimum widths are 18" for 4" and 6" sized pipes and not less than 6"-9" clearance on each side of the pipe for 8" and larger sizes.

Minimum trench widths are intended to provide adequate spacing between pipe and trench wall for proper placing and compaction of haunching material and may vary somewhat depending on construction procedures being used.

These minimum trench widths are based on the use of free flowing granular material.

In addition to safety considerations, minimum trench widths in unsupported, unstable soils will depend on the size and stiffness of the pipe, stiffness of the embedment and in-situ soil and depth of cover. Wide trench conditions are where in-situ lateral soil resistance is negligible, such as in peat, muck or highly expansive soils. Under these conditions, a minimum width of embedment material is required to ensure that adequate embedment stiffness is developed to support the pipe without assistance from the sidewalls. For small diameter PVC pipe (4"-10") the embedment up to the springline of the pipe shall be compacted to a point approximately one pipe diameter from each side of the pipe. For larger diameter PVC pipe (12"-48") the embedment up to the springline shall be compacted to a point at least one pipe diameter or two feet from each side of the pipe, whichever is greater.

In either stable or unstable soil conditions, where wide trench construction is required, a variation of the vertical minimum trench width can be made by laying the pipe in a subditch and back cut or slope the sides of the excavation above the pipe. In such a case, the width of the subditch below the top of the pipe shall be the same as specified above.

6.2.4 MOVABLE SHEETING, TRENCH BOXES OF SHIELDS

Use movable trench supports without disturbing pipe location, joints, or embedment. After embedment is compacted, do not remove trench protection below the top of pipe within the required wide-trench limits. Use movable supports only in wide-trench construction where supports extend below the top of pipe, or on a shelf above pipe installed in a narrow, vertical-wall subditch. Fill and compact voids left by support removal with granular material. Remove bracing

only as backfilling proceeds and without relaxing trench support. When advancing trench boxes or shields, prevent longitudinal pipe movement and joint separation.

6.2.5 DEWATERING

Where conditions are such that running or standing water occurs in the trench bottom, or the soil in the trench bottom displays a "quick" tendency, the water shall be removed by pumps or other suitable means such as well points or pervious under drain bedding, until the pipe has been installed and the backfill has been placed to a sufficient height to prevent pipe flotation. Care shall be taken that any under drain is of proper gradation and thickness to prevent migration of material between the under drain, pipe embedment and native soils in the trench below and at the sides of the pipe.

6.2.6 PREPARATION OF TRENCH BOTTOM

The trench bottom shall be constructed to provide a firm, stable and uniform support for the full length of the pipe. Bell holes shall be provided at each joint to permit proper joint assembly and alignment. Any part of the trench bottom excavated below pipe sub-grade shall be backfilled to pipe sub-grade and shall be compacted as required to provide firm pipe support. When an unstable subgrade condition is encountered which will provide inadequate pipe support, additional trench depth shall be excavated and refilled with suitable foundation material as specified by the engineer or District. In severe conditions special foundations may be required to maintain grade and will be specified by the engineer or the District. A cushion of acceptable bedding material shall always be provided between any hard (rock/bedrock) foundation and the pipe.

Excavation in Poor Soil and Rock - Where the bottom of the trench at sub-grade is found to be unstable or to include ashes, cinders, refuse, vegetable or other organic matter, or large pieces of inorganic material, the District will require the excavation and removal of the unsuitable material. Before the pipe is laid, the sub-grade shall be returned to the proper level with bedding material or approved backfill. In areas where the trench bottom is composed of coarse gravel and boulders, all boulders 3" or larger in diameter shall be removed and replaced with bedding material. In solid rock areas, the trench shall be excavated 6" below sub-grade and brought back to grade with bedding material.

Boulders - No boulders over 6" in diameter shall be allowed in the top 12" of the trench. Further, all backfill shall be carefully placed so that no damage will be done to the pipeline. No backfill material shall have boulders larger than 12" in diameter. Boulders larger than 8" in diameter shall be carefully lowered into trench until the backfill is 4' over the top of the pipe.

Compaction tests shall be required for all phases of sewer construction including earthen trench and manhole foundations, backfill (each lift), and re-surfacing materials.

6.2.7 PVC PIPE INSTALLATION AND HANDLING

When a load of pipe arrives at the job site it is the contractor's responsibility to inspect the pipe for defects or damage. While unloading the pipe use reasonable care, DO NOT DROP THE PIPE.

Store it on level ground and do not stack over 8' in height. Damaged or defective pipe will not be accepted by District.

The pipe installation shall be in strict compliance with (ASTM) D2321, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications" or the "Uni-Bell Handbook of PVC Pipe" latest edition.

6.2.8 PIPE LAYING

General - Proper implements, tools and equipment shall be used for placement of the pipe in the trench to prevent damage. In no case shall pipe or accessories be dropped into the trench. Pipe lying generally shall commence at the lowest elevation and terminate at manholes. Pipe bells shall be laid upstream. Whenever pipe lying is interrupted, the open ends of installed pipe shall be closed to prevent entrance of trench water, mud and foreign matter.

Bedding - Bedding is required primarily to bring the trench bottom up to grade. Bedding for main lines shall be $\frac{3}{4}$ " screened rock (AASHTO M43 No. 67, or equal). Bedding materials shall be placed to provide uniform and adequate longitudinal support under the pipe. Blocking shall not be used to bring the pipe to grade. Bell holes at each joint shall be provided to permit the joint to be assembled properly while maintaining uniform pipe support. A compacted depth of 4-6" is sufficient bedding thickness. In trenches that have natural materials of fine grains and in conditions where migration of trench wall material into bedding material can be anticipated, either wide trench construction or well-graded bedding material without voids shall be used.

Haunching - The most important factor affecting pipe performance and deflection is the haunching material and its density. Material shall be placed and consolidated under the pipe haunch to provide adequate side support to the pipe while avoiding both vertical and lateral displacement of the pipe from proper alignment. Haunching is placed up to the pipe springline.

Initial Backfill - That portion of the pipe embedment beginning at the springline of the pipe and extending 12" over the top of the pipe. Since little or no additional side support is gained above the springline, bedding may be used without special compaction efforts.

6.2.9 GROUNDWATER BARRIERS

In high ground water areas clay groundwater barriers keyed into undisturbed ground shall interrupt the bedding. The groundwater barriers shall be spaced every 100' or as directed by the District. The groundwater barriers shall be constructed to the same dimensions, as the bedding except they shall extend 18" above the top of the pipe. Excavated materials shall not be used as bedding material above or below the pipe unless approved by the District. It is the contractor's responsibility to identify the situation and bring it to the attention of the District. The District will approve plans for corrective measures.

6.2.10 MIGRATION

When coarse and open-graded material is placed adjacent to a finer material, fines may migrate into the coarser material under the action of hydraulic gradient from ground water flow. The gradation and relative size of the embedment and adjacent materials must be compatible in order to minimize migration. In general, where significant ground water flow is anticipated, avoid placing coarse, open-graded materials, such as $\frac{3}{4}$ " screened rock (AASHTO M43 No. 67, or equal), above, below or adjacent to finer materials, unless methods are employed to impede migration such as the use of an appropriate stone filter or filter fabric along the boundary of the incompatible materials.

6.2.11 FINAL BACKFILL

The moisture content of backfill materials shall be maintained within suitable limits to permit placement and compaction to required levels. For non-free draining soils, moisture content shall be held close to optimum. In applications where water exists in the trench, free draining backfill materials are generally more suitable because they are more readily densified while saturated. Construction in dredge material shall require imported backfill material approved by the District.

When using mechanical compactors, avoid contact with the pipe. When compacting over the pipe crown, maintain a minimum of 12" of cover when using small mechanical compactors. When using larger compactors, maintain minimum clearances as required by the engineer or District. This decision will be based on the depth of influence of the specific compaction equipment being used. For compaction by heavy wheel loading or hydrohammer methods, a minimum distance of 30" over the crown may be required. Heavy wheel loading and hydrohammer methods of compaction shall not be used for compacting where total cover is less than the influence zone of the compaction device.

All backfill above the bedded pipe shall be carefully placed and compacted. Compaction shall be in 8-inch maximum lifts. No flooding or puddling of trenches will be permitted. All material that is saturated (or more than 5% over optimum moisture) shall be dried out to an acceptable moisture level before use as backfill, or replaced with a suitable backfill material. All compaction shall be 95% of modified proctor density. Compaction testing will be required at a rate of one test every 100 linear feet of pipeline and every two feet of trench depth. All compaction tests shall be performed in accordance with ASTM specification D698-70 method C (or latest revision) and shall be arranged and paid for by the contractor. The contractor shall provide one copy of all soils testing logs to the District. Compaction test results shall be provided to the District on the same day as the tests are conducted.

The District shall be notified of failed areas. All failing areas shall be re-compacted and retested. Material that cannot be compacted to specification shall be removed and discarded. The District may require a different test frequency than specified above if the compaction effort provides consistent satisfactory results or inconsistent results.

Summit County Road and Bridge Department may require use of pit run material for backfill under county roads. It shall be the contractor's responsibility to determine if this shall be required.

Maintenance of Backfill - All backfill shall be maintained in a satisfactory condition, and all places showing signs of settlement shall be filled and maintained during the life of the contract and for a period of two (2) years following the date of final acceptance of all work performed under the contract. When the contractor is notified by the District that any backfill is hazardous due to settlement, he shall correct such hazardous conditions at once.

The contractor, to the satisfaction of the County, Town or the District shall repair any utilities and road surfacing damaged by settlement. In addition, the contractor shall be responsible for costs to the District for all claims for damages and for court actions brought against the District for, and on account of, such damage.

6.2.12 SEWERS ON STEEP SLOPES

It is necessary that sewers on slopes of 20 percent (approximately 11.5°) or greater, and where shallow bury and/or poorly consolidated soil conditions exist, be anchored securely with concrete collars or other appropriate abutments immediately downhill from bells to prevent downhill movement of the pipe. See Anchor Manhole detail in Appendix.

6.2.13 TEE BRANCHES

Tee branches shall be installed at all locations indicated on the approved plans for future service connections.

The District must approve addition or deletion of tee branches during construction. Tee branches shall be positioned 30 degrees above the horizontal and connected to the service line stub using a 22 1/2 degree vertical bend. Tee branches shall be marked using a vertical green metal, or green 4"x4" timber fence post that shall terminate one foot above the ground surface if conditions permit. Marker posts in other areas shall terminate within one foot of the ground surface. All tee branches shall be accurately located on the record drawings by "swing ties" to permanent objects. All tee branches reserved for future use shall be plugged with a removable watertight plug.

6.2.14 CONCRETE ENCASEMENT

Concrete encasement will be required on stream crossings. The encasements shall be made in accordance with the standard detail. All pipes to be encased shall be anchored sufficiently to prevent displacement of the pipe during encasement operations. The use of concrete around sewer pipes shall require written approval by District.

6.2.15 INSULATION

If approved by the District all pipelines with insufficient cover shall be insulated a width of 2 feet horizontally above on either side of the pipe, and 2 feet vertically with flat board insulation placed in the trench around the pipe. The insulation shall be extruded polystyrene foam having an average

compressive strength of no less than 40 psi and a k factor no greater than 0.20 at 75 degree mean temperature. The minimum acceptable thickness shall be 1 1/2" placed within 2 inches of the top of the pipe. Insulation shall be placed in bedding material and uniformly supported to prevent breakage. Seams shall be staggered, and securely taped with duct tape or equivalent. Insulated pipe must have a minimum of four (4) feet of cover over the top of the pipe. Insulation shall be inspected by District before backfilling. See Section 4.5. See Sewer Insulation detail in Appendix.

Spray foam insulation may be used only with prior approval by the District.

6.2.16 HIGHWAY CROSSING/STREET CUTS

Prior to start of construction, the contractor shall obtain the required permits or licenses from the appropriate authority(s). When open cuts are permitted, only one-half the traveled way shall be closed at one time, allowing traffic to proceed on the other half.

Boring, and other trenchless methods of installation shall only be permitted with prior, written approval by the District. Boring and other trenchless methods of installation shall be performed by experienced boring contractors only. Bores shall be constructed to the lines and grades shown on the approved drawings.

Backfill and surface replacement shall be performed to the specifications of the appropriate authority and all requirements of the permit or license shall be met.

6.3 MANHOLE CONSTRUCTION

6.3.1 GENERAL

The distance between manholes shall not be greater than 400 feet for sewers 18 inches in diameter or less. Spacing may be increased to 500 feet for sewers 21 to 30 inches in diameter. Manholes shall be installed at the end of each line, at all grade changes, size changes, intersections or changes in alignment. Manholes shall be used at all collector/interceptor sewer intersections. No manholes shall be placed in borrow ditches or in watercourses. See standard detail in Appendix.

6.3.2 HANDLING

Pre-cast concrete sections shall be handled carefully and shall not be bumped or dropped. Chains, cables and hooks shall not come in contact with joint surfaces. Pre-cast concrete sections will be inspected before installation. All cracked or otherwise defective or substandard units will be marked rejected and removed from the construction site.

6.3.3 INSTALLATION

Pre-cast manhole bases shall be placed on level compacted sub- grade consisting of 4 inches of bedding material (95% modified proctor density) to the grade and alignment shown on the construction drawings. Pipes shall be connected by use of water stops as shown on detail BSD-05

and described in section 5.5.1. Holes for field connections shall be carefully cored or drilled. In no case shall holes be made in manholes with pneumatic hammers or similar devices.

6.3.4 INVERTS

Inverts shall be carefully poured and troweled into the shape of the pipes through the manhole. The inverts shall be constructed of 3,000 psi concrete using type II cement. Side branches shall be connected on as large a radius curve as practical. All inverts shall be troweled to a smooth clean surface.

6.3.5 GRADE ADJUSTMENT

Pre-cast grade rings shall be installed between the top of the cone and the manhole casting on all manholes. The rings shall be sealed with two strips of joint mastic between each layer. A minimum of 6" grade and a maximum 12" grade ring adjustment is required. No more than three (3) grade rings shall be used.

6.3.6 FINAL GRADE OF MANHOLE COVERS

Non-traveled Areas - Manhole cover shall be 4 to 8 inches above finished grade.

Non-paved Traveled Areas - Manhole cover shall be 4 to 6 inches below finished grade.

Paved Areas - Manhole covers shall be 1/4" to 3/4" below grade.

6.3.7 DROP MANHOLES

An outside drop manhole shall be constructed at all manholes where the incoming pipe invert is twenty-four (24) inches or more above the exit pipe invert. Drop manholes shall be constructed in accordance with the details. No inside drop manholes will be allowed.

6.3.8 MODIFYING EXISTING MANHOLES

All new holes required in existing manholes to facilitate installation of additional pipes or replacement of existing pipes shall be cored in the manhole walls. The pipe shall be sealed with a Kor N Seal rubber boot or approved equal. All connections must be inspected and approved by the District.

The core shall continue through the invert bench to form a new flow channel.

6.3.9 COATING MANHOLES

Apply two (2) coats of Tnemec 450 or approved equal bitumastic paint to all exterior manhole walls. Do not backfill until coating has cured a minimum of 24 hours. All damage to the paint shall be repaired. Cement based grout or coating shall not be used in any manhole for sealing purposes. All coatings are to be applied according to the manufacturer's instructions. A bitumastic wrap shall also be applied to the entire manhole. (See 6.3.10)

6.3.10 EXTERNAL MANHOLE SEALING

The adjusting rings and manholes shall be sealed with an external sealing sleeve as manufactured by Infi-Shield or Grace Construction Products or an approved equivalent. The rubberized asphalt sheet membrane waterproofing system shall have a minimum thickness of 60 mils and the low temperature flexibility shall be unaffected to -45 degrees Fahrenheit per ASTM D1970. The material shall be installed in strict compliance with the manufacturer's recommendations.

6.3.11 JOINTS

Flexible plastic joint sealing compound in accordance with these specifications shall be applied to all manhole joints. The application of the priming compound and the sealing compound shall be accomplished in strict conformance with the manufacturer's instructions. The joint materials shall conform to the approximate manufactured shape at the time of installation. Any materials not conforming shall be rejected and not used. The joint materials shall not be stretched or in any other way distorted. The sealing compound shall be heated before installation when the ambient temperature is below 40 degrees Fahrenheit.

6.3.12 TESTING

All manholes shall be vacuum tested. The test shall be in strict compliance with ASTM C1244-93 "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure Test". See Appendix for complete test requirements.

6.3.13 BEDDING MATERIAL

All bedding material for pipe and manhole installations shall be ¾" screened rock (AASHTO M43 No. 67, or equal).

END OF SECTION

SECTION 7 – SURFACE RESTORATION

7.1 GENERAL

Where pavement, curb and gutter, sidewalks, or other improved surfaces have been removed during the course of the work, such items shall be restored to a condition equal or better to that prior to removal. The sub-grade for all restored surfaces shall be thoroughly compacted by mechanical or hand tampers, or vibratory rollers, or by other means of compaction acceptable to the District, and the municipality in which the sewer installation is occurring..

7.2 STREET IMPROVEMENTS

Paving, signs, curb and gutter, sidewalks or other street improvements destroyed, removed, or damaged during construction shall be replaced with the same type and dimensions of units removed and shall be equal to, and consistent with, the undisturbed portions of the improvements existing prior to the trench excavation.

All concrete used in the restoration work shall be equal to the requirements of the street or highway department having jurisdiction. The thickness of all paving shall be the same as the adjacent undisturbed paving but shall be not less than 4 inches. The top 8 inches of backfill material within street pavement driveways, or street curbing areas shall be equal to class 6-road base as specified in the Colorado Department of Transportation Standard Specifications.

7.3 FINISH GRADING AND CLEANUP

The contractor shall grade the trench line to a smooth grade to affect a neat and workmanlike appearance of the trench line. Boulders that cannot be placed in the trench backfill shall become the property of the contractor and removed from the project limits.

Excess excavated material shall become the property of the contractor and be removed from the project limits.

The contractor shall remove all tools, equipment of the work, barricades and temporary structures from the site. All excess dirt and rubbish shall be removed, and the construction site left clean.

7.4 CONTRACTORS RESPONSIBILITY

7.4.1 GENERAL

The contractor, prior to closing any road or property access shall notify Summit County Communications and similar notification shall be given upon reopening.

7.4.2 PROTECTION/MAINTENANCE OF PUBLIC AND PRIVATE PROPERTIES

The contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The contractor shall erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for safety and protection. The

contractor shall notify owners of other utilities when prosecution of work may affect them. The contractor shall remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the contractor or anyone directly or indirectly employed by him or anyone for whose acts he is liable.

The contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient red lights, danger signals and detour and other signs, provide a sufficient number of flaggers, and take all necessary precautions for the protection of work safety of the public. Effective barricades shall protect roadways closed to traffic, and obstructions shall be eliminated at night.

All traffic control shall be in conformance with State Highway Specifications and municipal requirements. Overnight street closures will not be permitted. It will be the responsibility of the contractor to provide access to properties affected by temporary street closures and to notify all affected property owners, emergency services of the time and duration of street closures at least 72 hours prior to closure.

When the need for any barricade or sign no longer exists, it shall be removed. Upon completion of all work, all remaining construction signs and barricades shall be removed.

In accordance with generally accepted construction practices, the contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The District's review of the construction is not intended to include review of the adequacy of the contractor's safety measures in, on, or near the construction site.

The contractor shall take, use, provide, and maintain all necessary precautions, safeguards, and protection to prevent accidents or injury to persons or property on, about, or adjacent to the site of the work. The contractor shall post danger signs warning against any hazards created by the work. He shall designate a responsible member of his organization on the job site, whose duty shall be the prevention of accidents, and the name of the person so designated shall be reported to the District in writing. In an emergency affecting the safety of life or of the work or adjoining property, the contractor, without special instruction or authorization from the District, is hereby permitted to act, at his discretion, to prevent such threatened loss or injury, and he must take such action if so instructed or authorized by the District.

All natural drainages and road ditches shall be restored to their original condition. This shall be done immediately behind the backfill operations in order to prevent surface drainage from damaging the surrounding properties or the construction work.

7.4.3 PROTECTION OF SEWER DURING CONSTRUCTION

During construction special precautions shall be taken to prevent earth, rocks, and other deleterious substances from entering the pipeline. The end of the pipeline shall be securely plugged each time construction is suspended. Introduction of foreign materials such as mud, sand, debris, ground

water, construction materials, and any other material considered foreign to a domestic wastewater system shall not be allowed in any District owned facility. In the event of introduction of such foreign substance, the District reserves the right to collect from the person or persons responsible, all costs associated with handling the foreign substance. Such costs shall include, but are not limited to, costs associated with removing and cleaning and/or repair of facilities, treatment costs, and incidental costs such as engineering and legal fees.

7.4.4 SAFETY

The safety of all workers and the public shall be the responsibility of the contractor or applicant. The contractor or applicant shall take all prudent precautions to protect the public from harm at all times. The contractor shall conduct all work in accordance with all applicable safety standards, including OSHA and local regulations. District personnel shall be responsible for their own safety only. Excavations, which are deemed unsafe by District personnel, shall have the unsafe conditions corrected before District personnel will enter the excavations for inspections, connections or other work.

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Work, including maintaining an appropriate safety plan. Contractor shall further comply with, and give all notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss, including but not limited to all such rules and regulations, policies, and directives of the District. As all Work on or related to District Facilities is subject to oversight of the District, the District shall have the authority, but not the obligation, to stop Work if District representatives observe a practice they reasonably believe is in violation of any applicable safety standard. The District shall confer with the engineer of record to determine whether the practice is a safety violation prior to Work continuing.

7.4.5 PERMITS

Permits and licenses of a temporary nature necessary for the prosecution of the work shall be secured and paid for by the contractor. The contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn or specified.

7.4.6 AS-BUILTS

It shall be the responsibility of the contractor and applicant to obtain as-built drawings which provide accurate measurements to and depths of all pipe and appurtenant facilities, service line connections and crossings of other utilities. No backfilling shall be performed before the required measurements are taken. In the event that any of the aforementioned items are backfilled without being properly referenced, it shall be the responsibility of the contractor to re-expose said items for measurement. The District will not accept the project until acceptable as-built information is furnished.

As-built drawings shall conform to the requirements of sections 3.5.1 and 3.5.2 of these specifications.

Two printed paper sets, one mylar set of as-built drawings, one electronic copy in portable document format (pdf) and AutoCAD format shall be provided to the District.

7.4.7 SERVICE INTERRUPTIONS

Interruptions of service may be necessary at certain times during the construction. The number and length of interruptions shall be kept to a minimum. Interruptions shall be limited to the period between 7:00 A.M. and 7:00 P.M. Monday through Friday, excluding holidays. The contractor shall notify all persons affected by the service interruptions not less than 24 hours in advance either by posting prominent and easily read signs or by distribution of handbill notices or both.

7.4.8 INDEMNIFICATION

The contractor will indemnify and hold harmless the District and its agents and employees from and against all claims, damages, losses, and expenses including attorney fees arising out of or resulting from the performance of the work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting there from; and as caused in whole or in part by any negligent or willful act or omission of the contractor, anyone directly or indirectly employed by him or anyone for whose act any of them may be liable.

END OF SECTION

SECTION 8 – SPECIAL CONSIDERATIONS

8.1 WATER AND SEWER LINE CROSSINGS

8.1.1 WATER SUPPLY CROSS-CONNECTIONS

There shall be no physical connection between a public or private potable water supply system and a sewer, or appurtenance thereto which would permit the passage of any sewage or polluted water into the potable supply.

8.1.2 RELATION TO WATER WORKS STRUCTURES

While no general statement can be made to cover all conditions, it is generally recognized that sewers must be kept remote from public water supply wells or other water supply sources.

8.1.3 RELATION TO WATER MAINS

Where sewer lines cross water and sewer mains or come within 10 horizontal feet of each other, the sewer pipe shall be a minimum of 18 inches clear distance vertically below the water main. If this clear distance is not feasible, the pipe section must be designed and constructed so as to protect the water main. Minimum protection shall consist of the installation of an impervious and structurally sound sewer.

8.1.4 DUCTILE IRON PIPE AND C-900 PIPE

One length of C-900 or class 50 ductile iron pipe at least 18 feet long centered over the water main shall be used where a sewer line crosses above, or within 18" below a water line. Joints between the sewer pipe and the special pipe shall be encased in a concrete collar at least 6 inches thick and extending at least 6 inches either side of the joint.

8.1.5 CONCRETE

Concrete encasement of sewer pipe is not permitted at water line crossings.

8.1.6 MECHANICAL JOINTS

When C-900 or ductile iron pipe is used for the waterline crossing, the transition joint from sewer pipe to the special pipe shall be connected with a mechanical joint coupling, or equal, as manufactured by Mueller or Dresser couplings in lieu of concrete encasement.

Pipe joints at the crossings shall be equivalent to water main standards of construction and shall be pressure tested to assure water tightness. The tests shall be conducted in accordance with Section 9 of these specifications.

8.1.7 BACKFILL

In all cases suitable backfill or other structural protection shall be provided to preclude settlement or failure of the special pipe. Bedding material shall be placed between water and sewer lines at all crossings.

8.2 STREAM CROSSINGS

8.2.1 GENERAL

All work in "wet" or wetland areas adjacent to streams shall conform to the applicable provisions of Section 11.

8.2.2 PIPE

All stream crossings shall be constructed of ductile iron pipe to 10 feet either side of the stream banks. The top of the pipe shall be laid a minimum of 2 feet below the stream flow line. Every effort shall be made to keep pipe joints out of the streambed area. All pipe joints, which must occur in the streambed area and within 10 feet of the edge of the stream shall have restrained joints or mechanical joint couplings (Section 8.1.6). The pipe shall be adequately anchored to prevent displacement. This shall be accomplished by using a trench section that incorporates concrete anchors to prevent displacement of the pipe by the stream flow. All pipe which may be buoyant when empty shall be anchored by using concrete encasement as shown in the Appendix.

8.3 BACK LOT LINE CONSTRUCTION

The construction of sewer main line shall be constructed in roadways or easily accessible rights of ways. Back lot line construction is discouraged and will require District approval. If such approval is given, then permanent access will be provided with the addition of sufficient road base to support the Districts maintenance equipment.

END OF SECTION

SECTION 9 – GREASE TRAPS AND INTERCEPTORS

9.1 GENERAL

Because of the impact of grease on the District's lines and treatment plant, grease traps and interceptors are required on establishments preparing or serving food. The traps and interceptors must be installed at the time of construction of new facilities.

All grease traps and interceptors shall be new and the trap or interceptor and its installation shall be in conformance with the latest edition of the uniform plumbing code except as modified herein.

Grease traps are defined as: A device designed to retain grease from one to a maximum of four fixtures.

Grease interceptors are defined as: A device of at least 750-gallon capacity that shall be remotely located and designed to retain grease from one or more fixtures.

9.2 GREASE TRAPS AND INTERCEPTORS REQUIRED

An approved type grease trap or interceptor complying with the provisions of this section shall be installed in the waste line leading from sinks, drains and other fixtures or equipment in the following establishments: restaurants; cafes; lunch counters; cafeterias; bars and clubs; hotels; hospitals; factory or school kitchens; or other establishments where grease may be introduced into the drainage or sewage system. A grease interceptor shall be installed to serve all of the above listed types of establishments constructed after May 1, 1990. A grease trap or interceptor is not required for individual dwelling units or for any private living quarters.

9.3 SPECIFICATIONS AND PROCEDURES

- a) Plans shall be submitted to and approval obtained from the District prior to the installation of any grease trap or interceptor in any establishment set forth in subsection 9.2.
- b) No grease trap shall be installed which has an approved rate of flow more than fifty-five (55) gallons per minute, except when specially approved by the District.
- c) No grease trap or interceptor shall be installed which has an approved rate of flow less than twenty (20) gallons per minute.
- d) Each plumbing fixture or piece of equipment connected to a grease trap or interceptor shall be provided with an approved type flow control or restricting device installed in a readily accessible and visible location in the tail piece or drain outlet of each such fixture. Flow control devices shall be so designed that the total flow through such device or devices shall at no time be greater than the rated capacity of the trap or interceptor. No flow control device having adjustable or removable parts shall be approved.

- e) For the purpose of this section, the term "fixture" shall mean and include each plumbing fixture, appliance, apparatus or other equipment required to be connected to or discharged into a grease trap or interceptor by any provision of this section.
- f) Each grease trap or interceptor required by this section shall have an approved rate of flow which is not less than that given in Table II for the total number and size of fixtures connected thereto or discharging therein. The total capacity in gallons from fixtures discharging into any trap or interceptor shall not exceed two and one-half (2 1/2) times the flow rate of the subject trap or interceptor as per Table II.
- g) No more than four (4) separate fixtures shall be connected to or discharged into any one (1) grease trap.
- h) Each grease trap or interceptor shall be vented as required by the uniform plumbing code and each fixture discharging into a grease trap or interceptor shall be individually trapped and vented in an approved manner, except that an approved type grease trap may be used as a fixture trap for a single fixture when the horizontal distance between the fixture outlet and the grease trap does not exceed four (4) feet and the vertical tail pipe or drain does not exceed two (2) feet.
- i) Each grease trap or interceptor shall be installed and connected so that it shall be at all times easily accessible for inspection, cleaning and removal of the intercepted grease.
- j) Grease traps and interceptors shall be maintained in efficient operating conditions by periodic removal of the accumulated grease. No such collected grease shall be introduced into any drainage piping, public or private sewer and it shall be disposed of in an environmentally safe manner.
- k) Each grease trap or interceptor shall be constructed of durable material satisfactory to the District and shall have a full size gas tight cover that can be easily and readily removed.
- l) No water-jacketed grease trap or interceptor shall be approved or installed.
- m) Each grease trap or interceptor shall have an approved water seal of not less than two (2) inches in depth or the diameter of its outlet, whichever is greater.
- n) No grease trap or interceptor required by this section shall be installed until the District has approved it.
- o) The District may require such tests as may be necessary to determine the grease collecting efficiency of the various types and kinds of grease traps and interceptors to establish the rate of flow or other rating thereof. Such test requirements may be revised or modified from time to time as may be deemed necessary by the District. A list of

approved and acceptable traps and interceptors shall be kept on file in the office of the District.

- p) No grease trap or interceptor shall be installed which does not comply in all respects with District regulations and is accepted by the District. Whenever it shall come to the attention of the District that any grease trap or interceptor does not so comply, the District shall immediately suspend or revoke such approval.

TABLE II GREASE TRAPS AND INTERCEPTORS

MAXIMUM TOTAL NUMBER OF FIXTURES CONNECTED	CAPACITY OF FIXTURES CONNECTED (GALLONS)	REQUIRED RATE OF FLOW GALLONS PER MINUTES (GPM)	GREASE RETENTION CAPACITY IN POUNDS
1	50	20	40
2	65	25	50
3	90	35	70
4	125	50	100

9.4 USE OF GREASE TRAPS AND INTERCEPTORS

Grease traps and interceptors shall be cleaned, as a minimum according to the following schedule:

GREASE RETENTION CAPACITY (POUNDS)	CLEANING FREQUENCY
40	EVERY 2 MONTHS
50	EVERY 2 ½ MONTHS
70	EVERY 3 MONTHS
100	EVERY 4 MONTHS
>100	EVERY 6 MONTHS

MORE FREQUENT CLEANING IS ENCOURAGED

Those establishments with deep fat fryers shall have a contract with a fat collection service and provide a copy of the contract to the District. Unless specifically required or permitted by the District, no food waste disposal unit shall be connected to or discharged into any grease trap. Food waste disposal units may be connected to grease interceptors.

9.5 INSPECTION

The District shall have the right to enter the premises of all establishments having grease traps or interceptors for the purpose of inspecting the installation, operation and/or maintenance of the grease trap or interceptor.

Grease traps or interceptors that are not installed in an acceptable manner so that grease is efficiently and continuously removed from the wastewater, will not be approved by the District.

Owners of grease traps or interceptors that are not operated and maintained as required to efficiently remove the grease, may be assessed a surcharge by the District and required to properly maintain the grease trap or interceptor as a condition of continued service.

END OF SECTION

SECTION 10 SEWER TESTING AND ACCEPTANCE

10.1 GENERAL

10.1.1 PIPE AND MANHOLE CLEANING

All new manholes and pipe shall be thoroughly cleaned prior to performing acceptance tests. Cleaning shall be performed to the satisfaction of the District at the expense of the applicant.

10.1.2 TESTING

After completing a reasonable section of sewer line, the applicant shall furnish all equipment and personnel necessary to conduct a "line acceptance test" using the method specified below. The applicant shall give the District 48 hours advance notice of any required tests. All sewer laterals, (sewer service lines), that are to be installed at the same time as the main line shall be included in any testing. All testing shall be at the expense of the applicant. All equipment for testing shall be supplied by the applicant. All pressure gauges used for testing shall bear a current certification and/or have certification available for District personnel at the time of testing.

10.2 LOW PRESSURE AIR TEST

10.2.1 EQUIPMENT

The low-pressure air test shall be performed on all PVC or ductile iron pipelines. The test shall be observed and accepted by District personnel. The test equipment shall meet the following minimum requirements.

- a) Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
- b) Pneumatic plugs shall resist internal test pressure without requiring external bracing or blocking.
- c) All air used shall pass through a single control panel.
- d) Three individual hoses shall be used for the following connections.
 - 1. From control panel to pneumatic plugs for inflation.
 - 2. From control panel to sealed line for introducing the low-pressure air.
 - 3. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

10.2.2 TEST PROCEDURE

The pipe installation shall be tested with low-pressure air according to the following procedure:

- a) The pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe. The plugs shall then be placed in the line at the manholes, which terminate the reach to be tested and inflated to 25 psig.
- b) Low pressure air shall be introduced into this sealed section of line until the internal air pressure exceeds by 5 psig the external pressure of any ground water that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize. After the stabilization period, the air pressure shall be adjusted to 3 1/2 psig greater than the average backpressure of any ground water that may be over the pipe. Air pressure in reaches crossing waterlines shall be 10 psig for the air test. The air hose from the control panel shall then be disconnected and the test commenced.
- c) The portion of the line being tested shall be considered acceptable, if the time required for the pressure to decrease from 3 1/2 to 2 1/2 psig (greater than the average back pressure of any ground water that may be over the pipe) shall be greater than the time given by the following formula:
$$T = 0.0850 DK/Q$$

T = time in seconds
 K = 0.000419 DL, but not less than 1.0
 Q = specified rate of loss, 0.003 Cu. Ft./Min./Sq. Ft. of internal surface
 D = pipe diameter, inches
 L = length of pipe being tested, feet the minimum allowable time given by the above formula with the specified rate of loss at 0.003 Cu. Ft./Min./Sq. Ft. of internal surface is given in Table III.
- d) No sealant may be used in any new sewer construction without the prior approval of the District.
- e) Proper precautions must be taken during testing to ensure against injury to personnel by not allowing personnel in or above manholes while the line is pressurized.
- f) If the leakage in any reach exceeds the allowable maximum, the line shall be repaired and re-tested at no expense to the District.

10.3 MANHOLE VACUUM TESTING - FINISHED PRODUCT

All manholes following construction and before acceptance by District must satisfactorily pass the following vacuum test. The test will be conducted in strict compliance with all requirements of ASTM C1244-93 or latest revision. **NOTE: The District will only allow testing of a finished product.**

Manholes failing to pass the test must be repaired and retested until a satisfactory test has been achieved.

10.4 DEFLECTION TESTING

After backfilling is complete, and prior to acceptance of the work the District may require, each reach of PVC sewer to be checked for excessive deflection by pulling a mandrel through the pipe. The mandrel shall be designed and sized for each size of pipe. The mandrel diameter shall be 95% of the nominal inside pipe diameter and shall be at least 1.5 pipe diameters in length. The mandrel shall be constructed with an odd number of runners placed parallel to the pipe centerline and equally spaced around the perimeter of the mandrel. Mandrels for 8-inch pipe shall be constructed with at least 9 runners, and more runners shall be utilized for larger pipe sizes. Pulling of the mandrel shall be by hand. No mechanical equipment can be used in the pulling of the mandrels. Test mandrel shall be furnished by the applicant. All test equipment, calibration data and procedures shall be subject to the approval of the District.

Ring or diametric deflection of the installed pipe shall not exceed 5% of the design internal diameter of the pipe. Pipe sections that restrict free passage of the mandrel shall be removed and replaced or excavated, re-bedded, backfilled and retested. All such repairs, replacement, remedial work and retesting performed by the applicant shall be at the contractor's expense.

The deflection test may be conducted concurrently with the T.V. inspection of the pipe interior, subject to approval by the District.

10.5 T.V. INSPECTION

The interior of all installed pipe, as deemed necessary by the District, shall be inspected by T.V. camera prior to final acceptance of the pipeline. The T.V. inspection shall be arranged by the District. This T.V. Inspection can occur anytime prior to the expiration of the two (2) year warranty.

The applicant shall bear all costs incurred in correcting deficiencies found during the T.V. inspection, including cost of additional T.V. inspection required to verify correction of noted deficiencies. (Deficiencies include but are not limited to dips, deflections, rolled gaskets, leaks, etc.).

T.V. equipment expressly designed for pipeline inspection purposes and operated by experienced and qualified personnel shall be pulled through the entire pipeline. The T.V. operator shall maintain a log of all inspections and note location, type and extent of any deficiencies. The T.V. operator shall also photograph all deficiencies and photograph not less than one "typical" location per each 200 feet of pipeline inspected.

All new, or reconstructed sewer mains, laterals, and manholes shall be inspected in conformance with NASCCO, PACP, LACP and MACP (level 1) requirements. All NASCCO computer output forms shall be submitted to the District.

10.6 PRESSURE AND LEAKAGE TESTS OF FORCE MAINS

All force mains shall be subjected to a pressure test and a leakage test. The pressure test shall be to a pressure equal to 1.5 times the maximum developable pump pressure (pump operating on a dead end line) or to the rated pressure of the pipe whichever is less.

The applicant shall provide all necessary piping connections between the pipeline to be tested and the source of water supply, together with test pumping equipment, water meter, pressure gauge, plugs, and other equipment, materials, and facilities required for the tests.

Test pressure shall be applied by means of a force pump of such design and capacity that the required pressure can be applied and maintained without interruption for the duration of each test. The pressure shall be maintained constant (within a maximum variation of plus or minus 5 percent) during the entire time the line leakage measurements are being made, so that the allowable leakage rate may be accurately determined from the leakage rate formula.

Leakage measurements shall not be started until a constant test pressure has been established; compression of air trapped in unvented pipes or fittings will give false leakage readings under changing pressure conditions. After the test pressure to be used has been established and stabilized, the line leakage shall be measured by means of a water meter installed on the intake side of the force pump.

Line leakage is defined as the total amount of water introduced into the line as measured by the meter during the leakage test. No pipeline, or tested section thereof, will be accepted if and while it has a leakage rate in excess of the rate determined by the following formula:

L = .00025ND_p, IN WHICH:

L = MAXIMUM PERMISSIBLE LEAKAGE RATE, IN GALLONS PER HOUR, THROUGHOUT THE ENTIRE LENGTH OF LINE BEING TESTED.

N = NUMBER OF JOINTS IN THE LINE UNDER TEST.

D = NOMINAL INTERNAL DIAMETER (IN INCHES) OF THE PIPE IN THE LINE.

P = THE SQUARE ROOT OF THE LEAKAGE TEST PRESSURE, IN PSIG.

The water meter and pressure gauge shall be accurately calibrated, have a calibration certification and be suitable for the specified tests.

All joints in piping shall be water-tight and free from visible leaks during the prescribed tests. If the leakage test is made after the pipeline has been backfilled and the joints covered, and such test shows a leakage rate in excess of the permissible maximum, the contractor shall make all necessary

surveys in connection with the location and repair of leaking joints to the extent required to reduce the total leakage to an acceptable amount. All such repair costs shall be borne by the applicant.

Each leak that is discovered within two (2) years after the line is placed in operation shall be located and repaired by the applicant.

10.7 ACCEPTANCE

After all required tests and inspections have been performed with satisfactory results, the Manager of the District will issue a "letter of acceptance" for the facilities. The applicant shall warranty the accepted work against defects for a period of two (2) calendar years. The applicant or contractor shall be responsible for all repairs necessary in this time period.

10.8 GUARANTEE

The applicant or contractor shall guarantee all materials and equipment furnished and work performed for a period of two (2) years from the date the District issues a "letter of acceptance". The applicant or contractor shall warrant and guarantee for a period of two (2) years from the date of District issuance of a "letter of acceptance" that the system is free from all defects due to faulty materials or workmanship and the applicant or contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The District will give notice of observed defects with reasonable promptness. In the event that the applicant or contractor shall fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the District may do so and charge the applicant or contractor the costs thereby incurred.

10.9 CONTRACTOR QUALITY ASSURANCE

The applicant must have a qualified construction supervisor, who shall certify that the lines were installed per drawings and specifications and certify the results of the acceptance tests.

10.10 DISTRICT QUALITY ASSURANCE

In addition to any construction supervision required by the applicant, the District may designate a construction observer who shall observe the installation of all sewer facilities that are to be connected to the District sanitary sewer utility. The representative of the District shall ascertain that the District standards are met and that the system is constructed in conformance with the final plans and specifications as approved by the staff of the District. During construction where ground conditions or other factors reveal that minor modifications to the final plans and specifications are in the best interests of the District and in the interest of diligent prosecution of the work, the District may, at its discretion, approve minor changes in the work. Such changes shall be in writing and copies provided to:

- 1) Applicant
- 2) Applicants Engineer

3) Manager of the District

Failure to construct sewer facilities in accordance with the approved plans and specifications will result in non-acceptance of the facilities by the District. Facilities, which have not been accepted by the District, shall not be connected to the District's system until all deficiencies are corrected. The District shall not be responsible for any costs or legalities associated with the failure during the warranty period.

10.11 DISTRICT RESPONSIBILITY

The District or its representative shall keep a daily construction report. At no time shall the District or its representative be responsible for the quality or execution of the work or the safety of the worksite. All such responsibilities shall be borne by the applicant. The sole purpose of the District's inspection of construction is to determine if the construction complies with the District's rules and regulations and the specifications at the time of inspection. Approval by the District is not intended and shall not be interpreted as guaranteeing the construction of the project and the District shall not be responsible for any damages arising out of the construction of the project.

10.12 CONTRACTOR RESPONSIBILITY

The qualified construction inspector representing the applicant shall have responsibility for reporting all construction deficiencies to the District Manager and the construction superintendent. At no time shall the District or its representative is responsible for the quality or execution of the work or the safety of the worksite. All such responsibilities shall be borne by the applicant.

END OF SECTION

SECTION 11 OFF-ROAD CONSTRUCTION

11.1 GENERAL

All off road construction shall be undertaken with extreme care to minimize environmental impacts. All necessary measures to minimize erosion and damage to existing vegetation shall be employed by the applicant. The applicant shall restore all areas affected by construction to preconstruction conditions or better.

11.2 GUIDELINES FOR MINIMIZING EROSION/ENVIRONMENTAL IMPACTS

11.1.1 EQUIPMENT

Equipment must be used that is appropriate to the task and the terrain. Because of many variables in the landscape, pieces of equipment suitable in one area might not be acceptable in another area. Under different conditions, there are advantages and disadvantages to both rubber tire and track equipment. Flexibility shall be exercised in the field.

11.1.2 CONSTRUCTION IN WET AREAS

Because of the short construction season, it is virtually impossible to avoid activity during the summer rainy season. However, rainfall usually lasts for short periods and quickly dissipates or infiltrates. When the surface is wet, construction activity shall be limited to "low impact tasks". Permanently wet areas shall be circumvented when possible. Saturated soils are particularly prone to movement when additional water is added.

Water bars, and possibly contour trenching, shall be constructed as needed in order to disperse discharge and to prevent excessive concentrations and erosion.

Construction activity shall not encroach upon streams or other water bodies. A buffer strip will reduce the risk of pollution. Methods consistent with established municipal standards shall be employed to prevent the discharge of phosphorus from the construction site into local ground or surface waters. The contractor must conform to all appropriate municipal erosion control and runoff regulations.

11.1.3 ACCESS ROADS

A high potential for erosion is associated with access roads.

Specific suggestions for reducing this potential are presented in "Guides for Controlling Sediment from Secondary Logging Roads", Intermountain Forest and Range Experiment Station, Northern region, Missoula, Montana, United States Department of Agriculture.

Roadway ruts tend to concentrate potentially hazardous heads of water. Ruts shall be avoided, but if they occur, immediate repair is suggested. Discharge points shall be controlled to prevent high velocities and flows that may cause erosion and silting in streams.

11.1.4 CONSTRUCTION ON SLOPES

There is a dramatic increase in erosion potential on slopes in excess of 15% (Soil Conservation Service, Kremmling, Colorado). Activity in such areas shall be avoided, or at least minimized. If it becomes necessary to develop any cut or fill slopes, the grade shall preferably not exceed 2 to 1. Wherever steep slopes or banks present serious problems, as slumping or mass movement, riprapping, cribbing or other stabilization procedures shall be employed.

11.1.5 EROSION CONTROL

Whenever soils are disrupted, erosion potential increases, and immediate stabilization shall be considered.

One of the most effective stabilization procedures is revegetation, (discussed in the following section). Due to the varying conditions of surfaces and types of soil, there is a minimum amount of vegetative cover necessary to prevent erosion in each case. If this covering is lost it must be replaced as soon as possible. Considering the costs of revegetation and the interim risk of failure, the maintenance of the existing cover is preferred.

Extremely dry weather can also be unfavorable. Aside from associated fire hazard, the fines in the soil can quickly come to the surface when disturbed, and become subject to wind erosion. Additionally, ground vegetation under dry conditions has a very low tolerance to surface activity.

Special emphasis shall be made to direct and control excessive water flow within the disturbed area, especially directly over the trench area. On slopes greater than 6%, erosion control bars shall be constructed at least every 50 feet along the trench. These bars shall extend the width of the disturbed area. All erosion control work shall be done prior to the seeding and mulching operation.

11.1.6 POLLUTION CONTROL

The applicant shall maintain adequate measures to completely prevent the pollution of adjacent property, storm drains, or natural or man-made watercourses by sewage, sediment caused by erosion, phosphorus, debris, oil, grease or other sources of pollution caused by the construction of facilities. All measures shall be "the best possible" and shall conform to all applicable standards. In sensitive areas the District may require submittal of an "Erosion Control Plan" with the plans for construction. The contractor shall be responsible to comply with the municipal regulations regarding erosion control and phosphorus discharge.

11.2 LANDSCAPE REMOVAL

The Contractor shall be responsible for obtaining all permits/permission from all governing agencies, property owners and developers concerning the clearing of trees and underbrush. The disposal of the debris shall be handled in accordance with all applicable municipal regulations.

11.3 LANDSCAPE REPLACEMENT

Revegetation shall be in accordance with applicable municipal regulations.

11.4 DAMAGED SURFACES AND PROPERTY

If any pavement, street, shrubbery, sod, rock, fence, poles or other property and surface structures have been damaged, removed or disturbed by the contractor, whether deliberately or through failure to carry out the requirements of the controlling agency or the specific directions of the District, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced or repaired, to the satisfaction of the owner, at the expense of the Contractor. All restoration shall be performed in a timely manner and to the satisfaction of the District.

END OF SECTION

SECTION 12 LIFT PUMPS AND SIPHONS

Due to the wide variation of conditions and needs, detailed specifications for main line siphons and lift pumps shall be approved on a case-by-case basis. A pre-design meeting is required for all lift stations and siphons.

12.1 APPROVALS

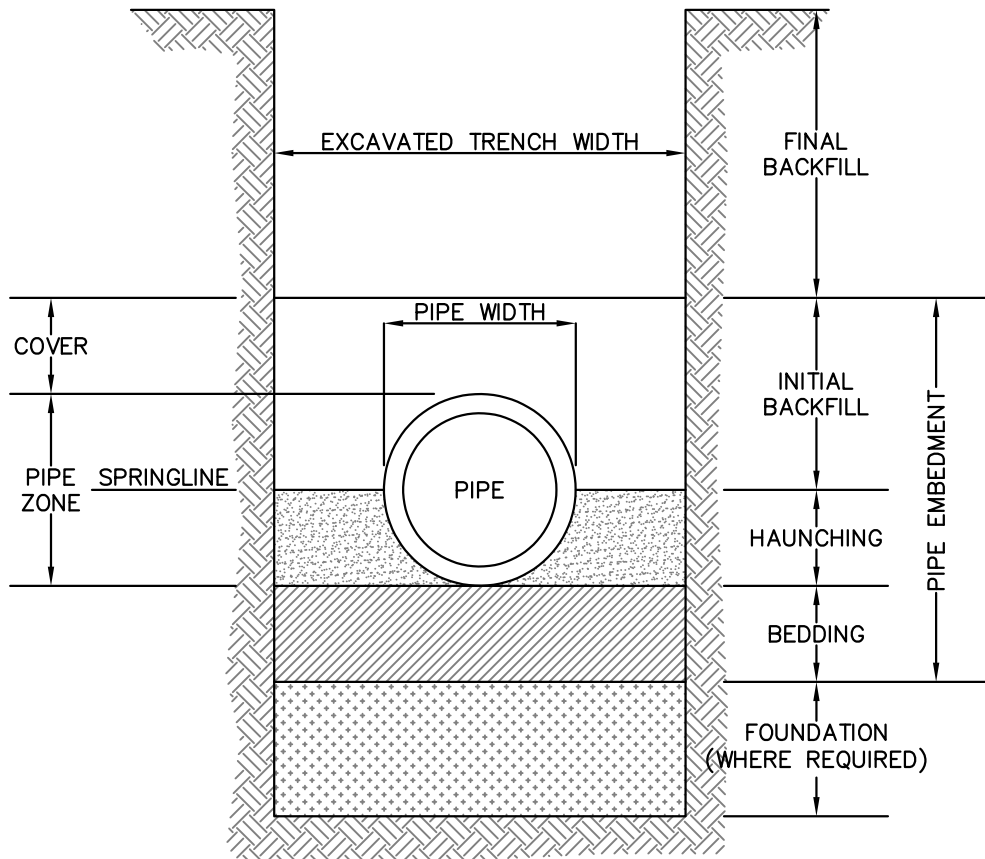
The use of main line and lift pump(s) in a proposed collection system shall be approved by the District prior to the submittal of the system design.

12.2 SERVICE LIFT STATIONS

Service lift stations shall be the sole responsibility of the owner of the facility and installed in accordance with the District's Specifications. All force services shall be constructed of Schedule 80 PVC pipe, minimum 1 1/2" in diameter. The flow of a service lift station shall be not be more than the maximum possible flow generated by the service. The District accepts no responsibility for and will make no repairs to such service lift stations or pipelines.

END OF SECTION

APPENDIX



N.T.S.

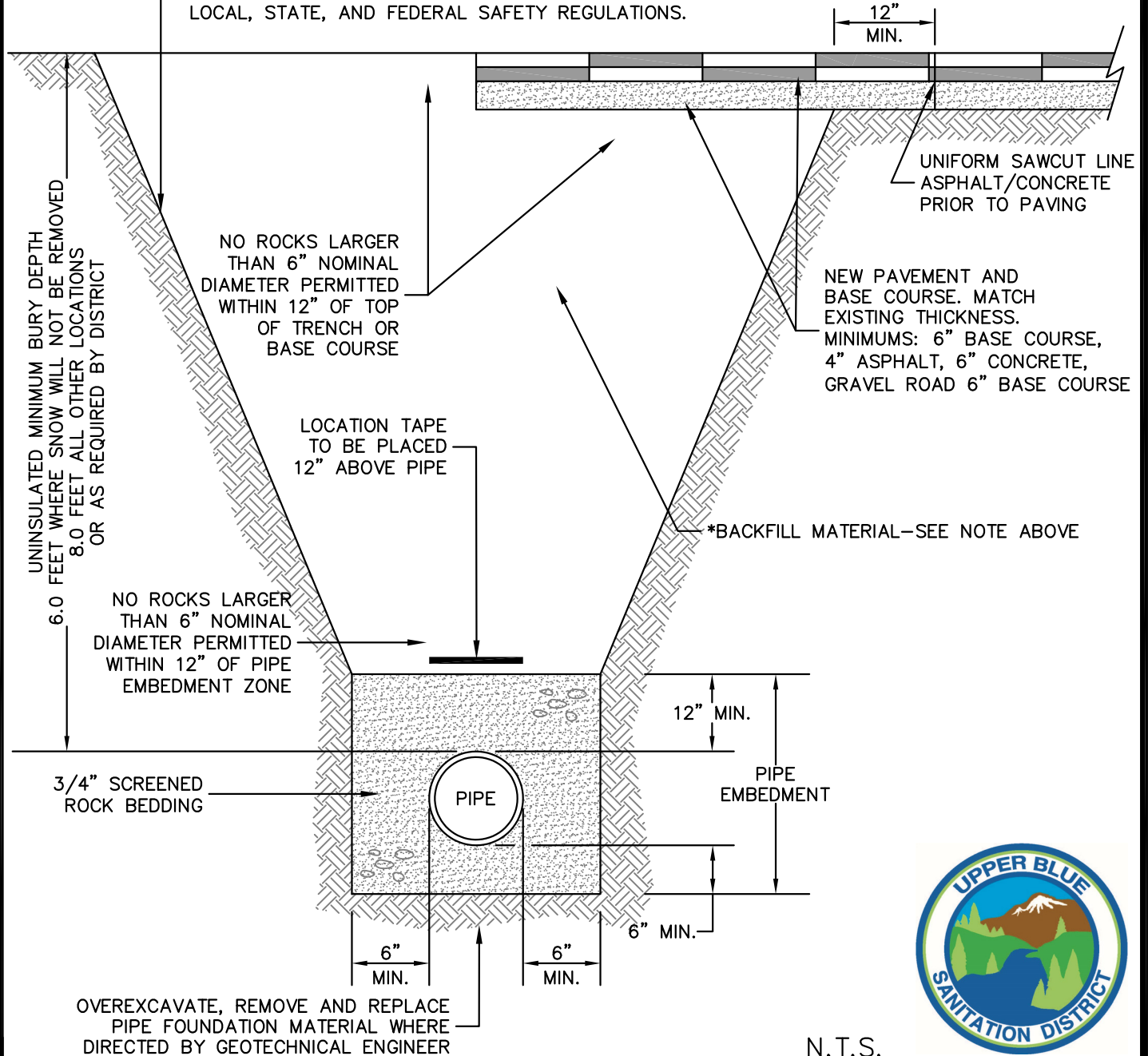
UPPER BLUE SANITATION DISTRICT

REVISED

TYPICAL TRENCH SECTION

*NOTE: BACKFILL MATERIAL—MAXIMUM 8" LIFTS,
 95% (MPD) IF UNDER ROADWAY OR STRUCTURE
 90% (MPD) IF NOT WITHIN 10' OF ROADWAY OR STRUCTURE
 DISPERSE LARGE ROCKS IN THIS ZONE PROVIDED ROCKS
 DO NOT INTERFERE WITH BACKFILL COMPACTION REQUIREMENTS
 ROCKS LARGER THAN 18" NOMINAL DIAMETER TO BE REMOVED
 FROM BACKFILL AND DISPOSED OF OFFSITE.

LAY BACK TRENCH WALLS IN ACCORDANCE WITH
 GEOTECHNICAL ENGINEER'S RECOMMENDATIONS
 1:1 MIN. WITHOUT GEOTECHNICAL RECOMMENDATION
 TRENCH SHALL BE BRACED OR SHEETED AS
 NECESSARY FOR THE SAFETY OF THE WORKMEN
 AND PROTECTION OF OTHER UTILITIES OR
 STRUCTURES IN ACCORDANCE WITH APPLICABLE
 LOCAL, STATE, AND FEDERAL SAFETY REGULATIONS.



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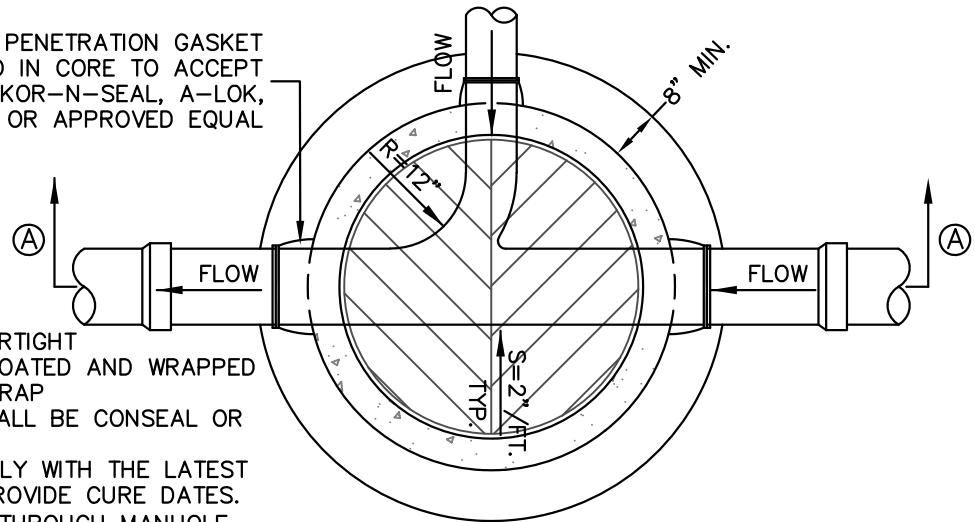
UPPER BLUE SANITATION DISTRICT

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TRENCH CROSS-SECTION DETAIL

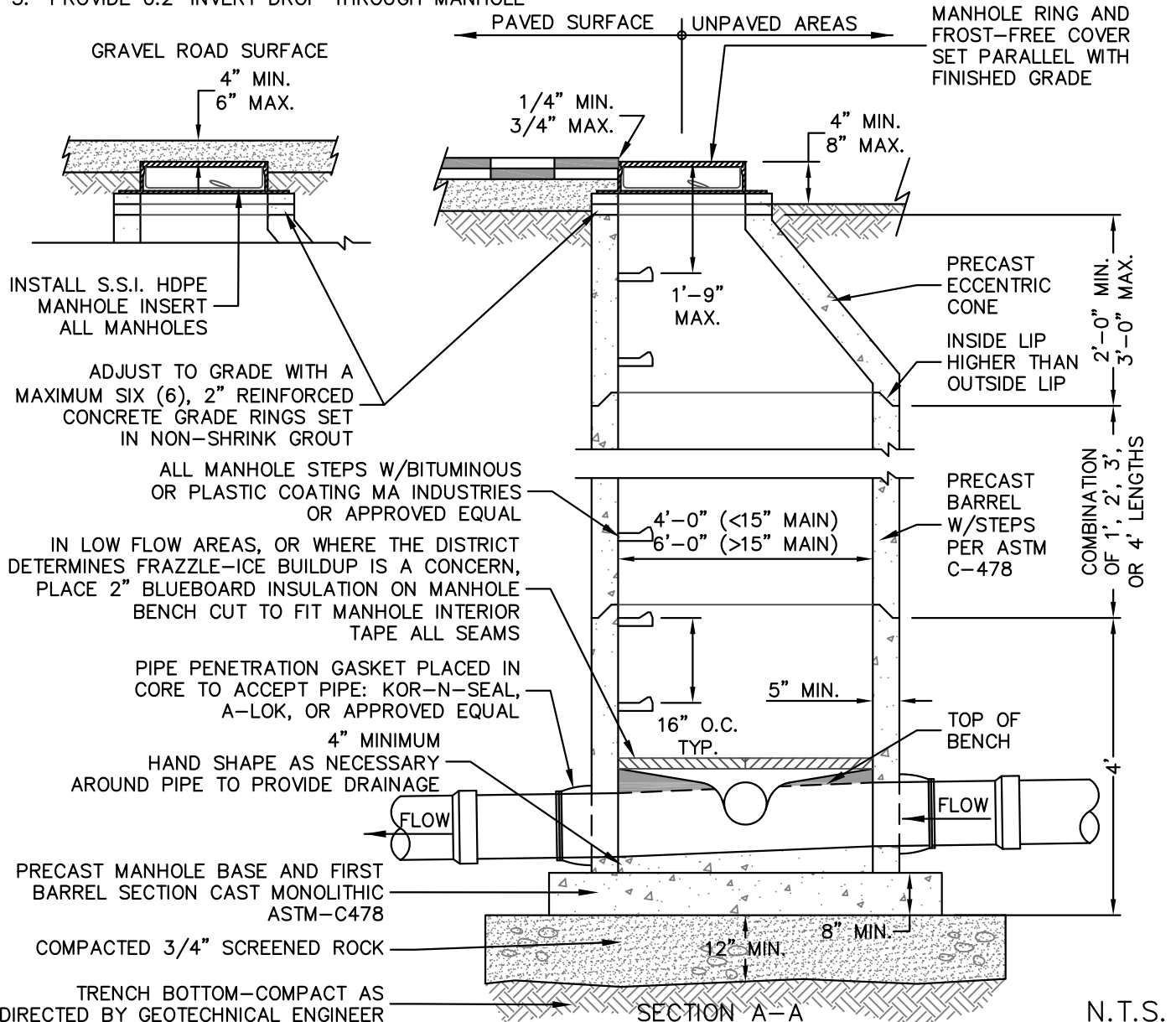


PIPE PENETRATION GASKET
PLACED IN CORE TO ACCEPT
PIPE: KOR-N-SEAL, A-LOK,
OR APPROVED EQUAL



NOTES:

1. ALL JOINTS SHALL BE WATERTIGHT
2. ALL MANHOLES SHALL BE COATED AND WRAPPED IN APPROVED BITUMASTIC WRAP
3. MASTIC FOR JOINT SEAL SHALL BE CONSEAL OR APPROVED EQUAL
4. ALL CONCRETE SHALL COMPLY WITH THE LATEST ACI-318 SPECIFICATIONS. PROVIDE CURE DATES.
5. PROVIDE 0.2' INVERT DROP THROUGH MANHOLE



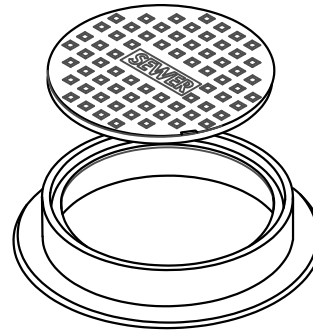
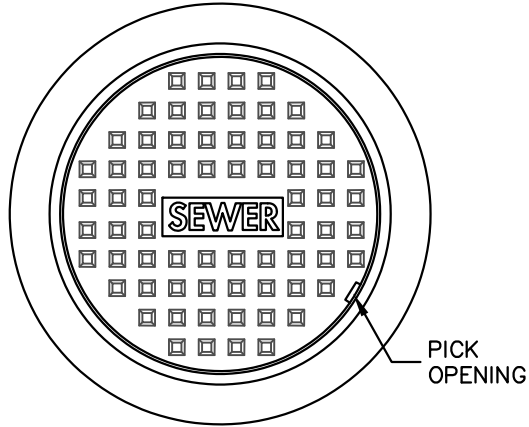
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UPPER BLUE SANITATION DISTRICT

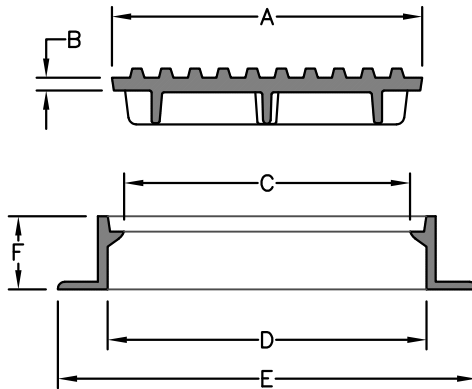
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STANDARD MANHOLE

MANHOLE RING AND COVER LIGHT, MEDIUM AND HEAVY DUTY

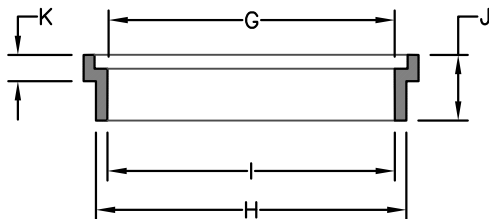
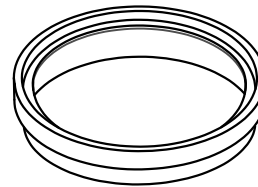
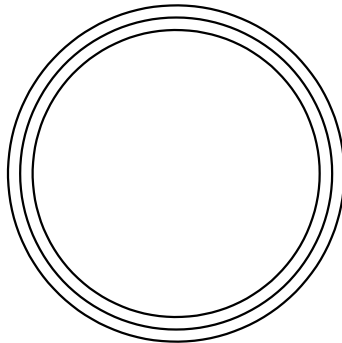


LETTERING SHALL BE CAST
AS PART OF COVER



DIMENSIONS IN INCHES						COMBINED WT. LBS.
A	B	C	D	E	F	
24	1 $\frac{1}{16}$	22 $\frac{1}{4}$	24 $\frac{5}{8}$	32	6	295

*MANHOLE ADAPTER RING (RISER)



DIMENSIONS IN INCHES						WT. LBS.
G	H	I	J	K		
24 $\frac{1}{4}$	23 $\frac{1}{4}$	22 $\frac{1}{4}$	1 $\frac{1}{2}$	1		50
24 $\frac{1}{4}$	23 $\frac{1}{4}$	22 $\frac{1}{4}$	2	1		64
24 $\frac{1}{4}$	23 $\frac{1}{4}$	22 $\frac{1}{4}$	2 $\frac{1}{2}$	1		73
24 $\frac{1}{4}$	23 $\frac{1}{4}$	22 $\frac{1}{4}$	3	1		82
24 $\frac{1}{4}$	23 $\frac{1}{4}$	22 $\frac{1}{4}$	4	1		85
24 $\frac{1}{4}$	23 $\frac{1}{4}$	22 $\frac{1}{4}$	5	1		89
24 $\frac{1}{4}$	23 $\frac{1}{4}$	22 $\frac{1}{4}$	6	1		95

*NOTES:

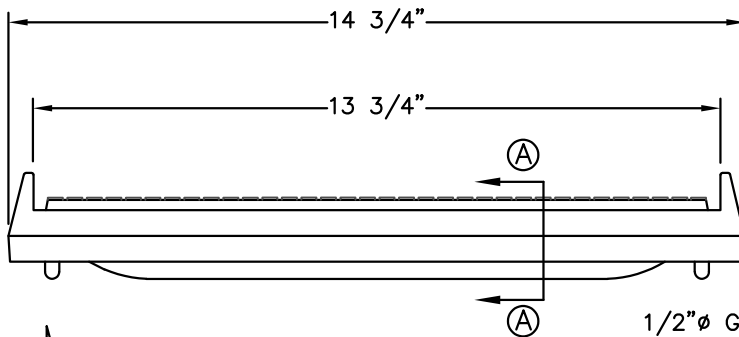
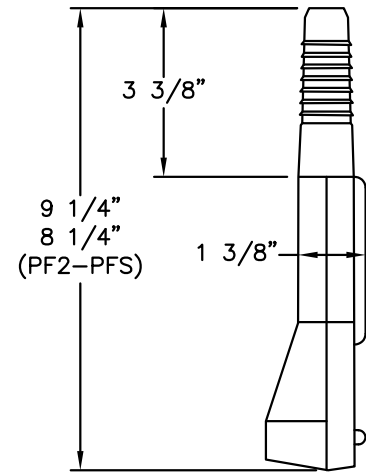
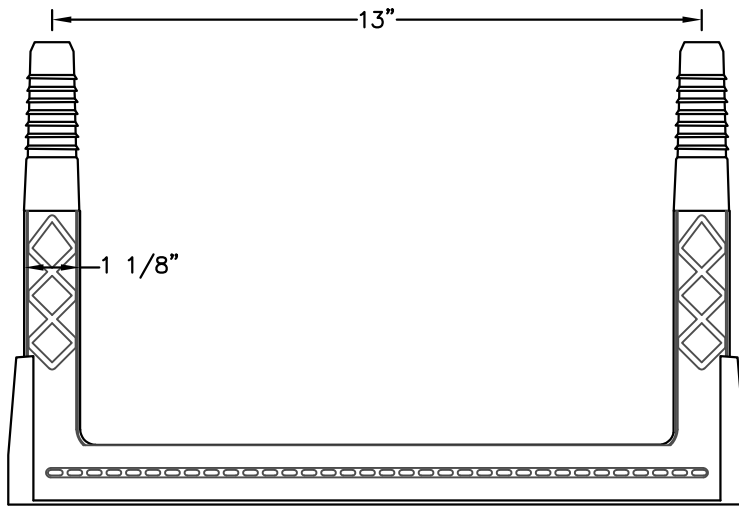
1. MANHOLE ADAPTER RINGS PERMITTED
IN PAVED ROADS ONLY
2. ONLY ONE (1) ADAPTER RING
PERMITTED PER MANHOLE

N.T.S.

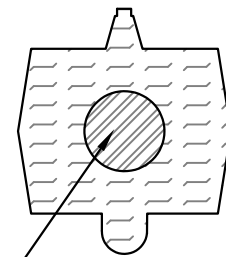
UPPER BLUE SANITATION DISTRICT

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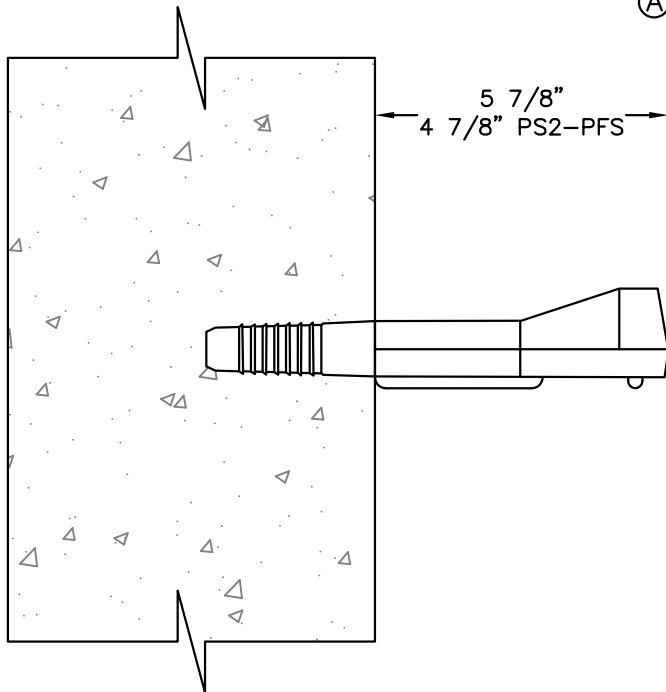
MANHOLE RING AND COVER



1/2"Ø GRADE 60
REINFORCING STEEL



SECTION A-A



NOTES:

1. MEETS: ASTM C-478, ASTM D-4101, ASTM A-615, AASHTO M-199
2. AS MANUFACTURED BY M.A. INDUSTRIES, PART NO. PF2-PF OR PF2-PFS
3. CAPACITY: 2,500 LBS. WITH STEP EXTENDED 6 3/8" FROM WALL
4. MATERIAL: COPOLYMER POLYPROPYLENE PLASTIC WITH 1/2"Ø GRADE 60 STEEL REINFORCEMENT
5. FIRST STEP SHALL BE 1'-9" MAXIMUM BELOW MANHOLE COVER
6. STEPS SHALL BE INSTALLED AT 16" ON CENTER

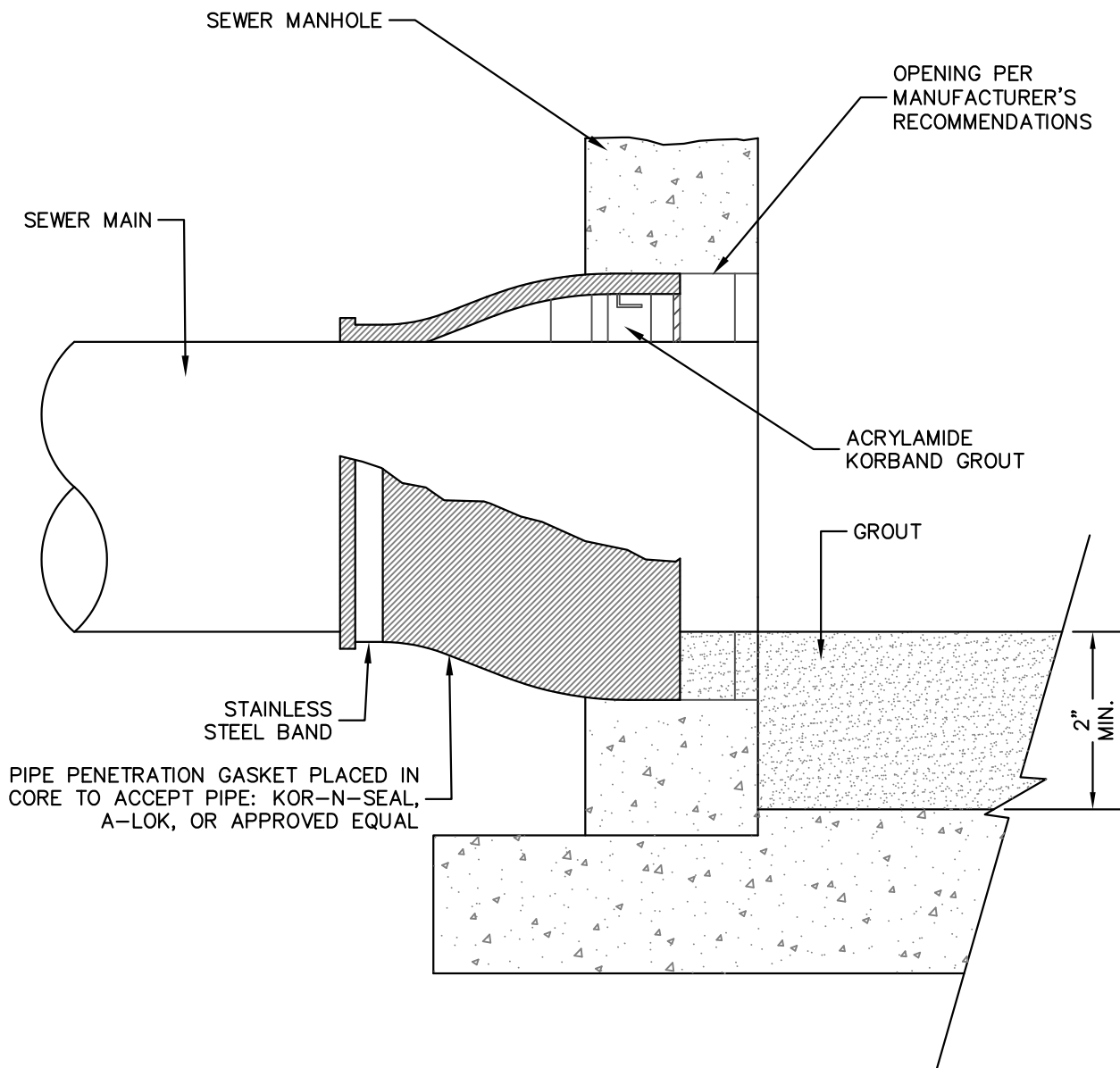


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MANHOLE STEP

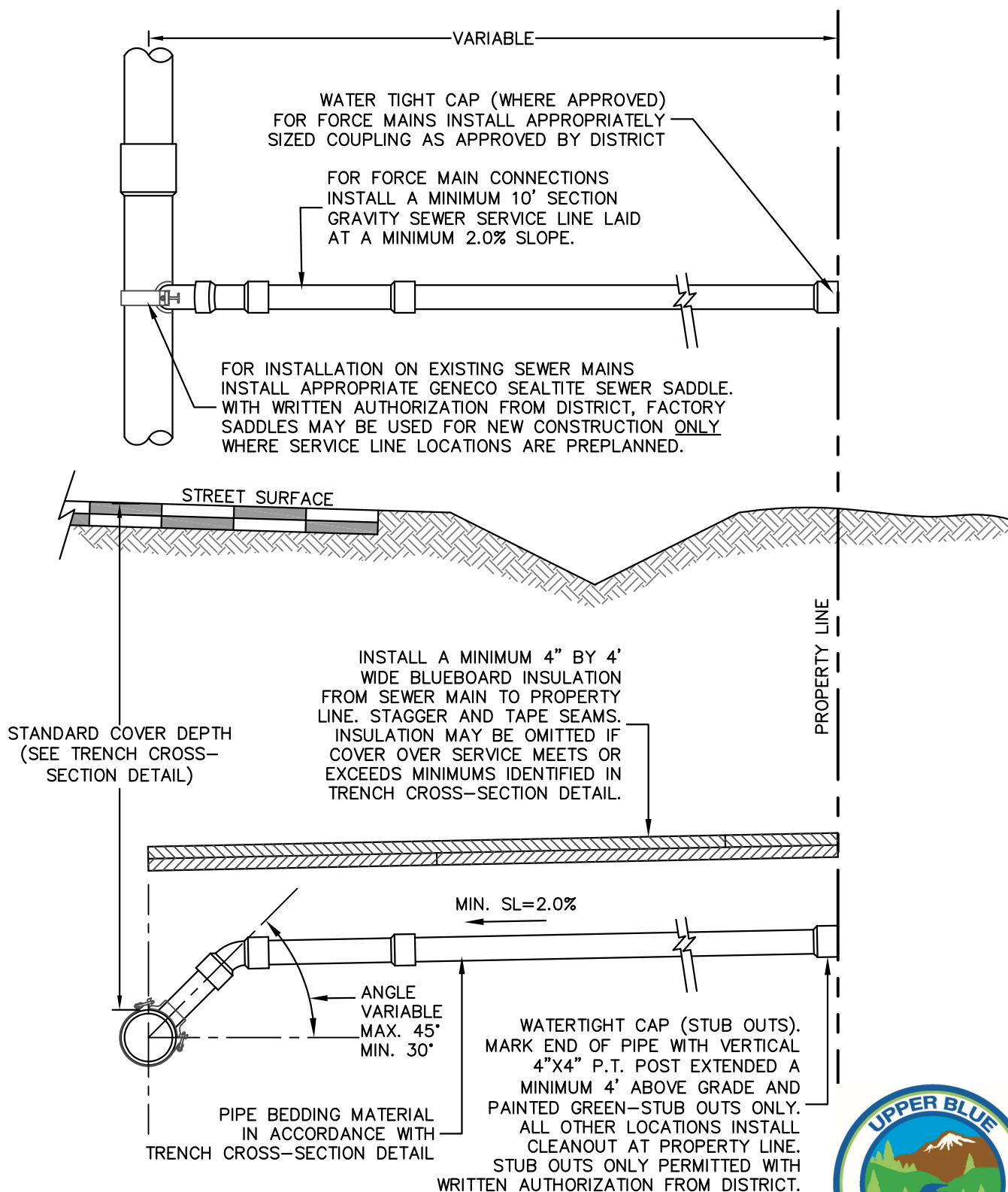


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UPPER BLUE SANITATION DISTRICT

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CORE AND SEAL BOOT



NOTE: FOR LOCATIONS NOT CONFORMING TO THIS DETAIL, CONSULT WITH THE DISTRICT FOR REQUIREMENTS

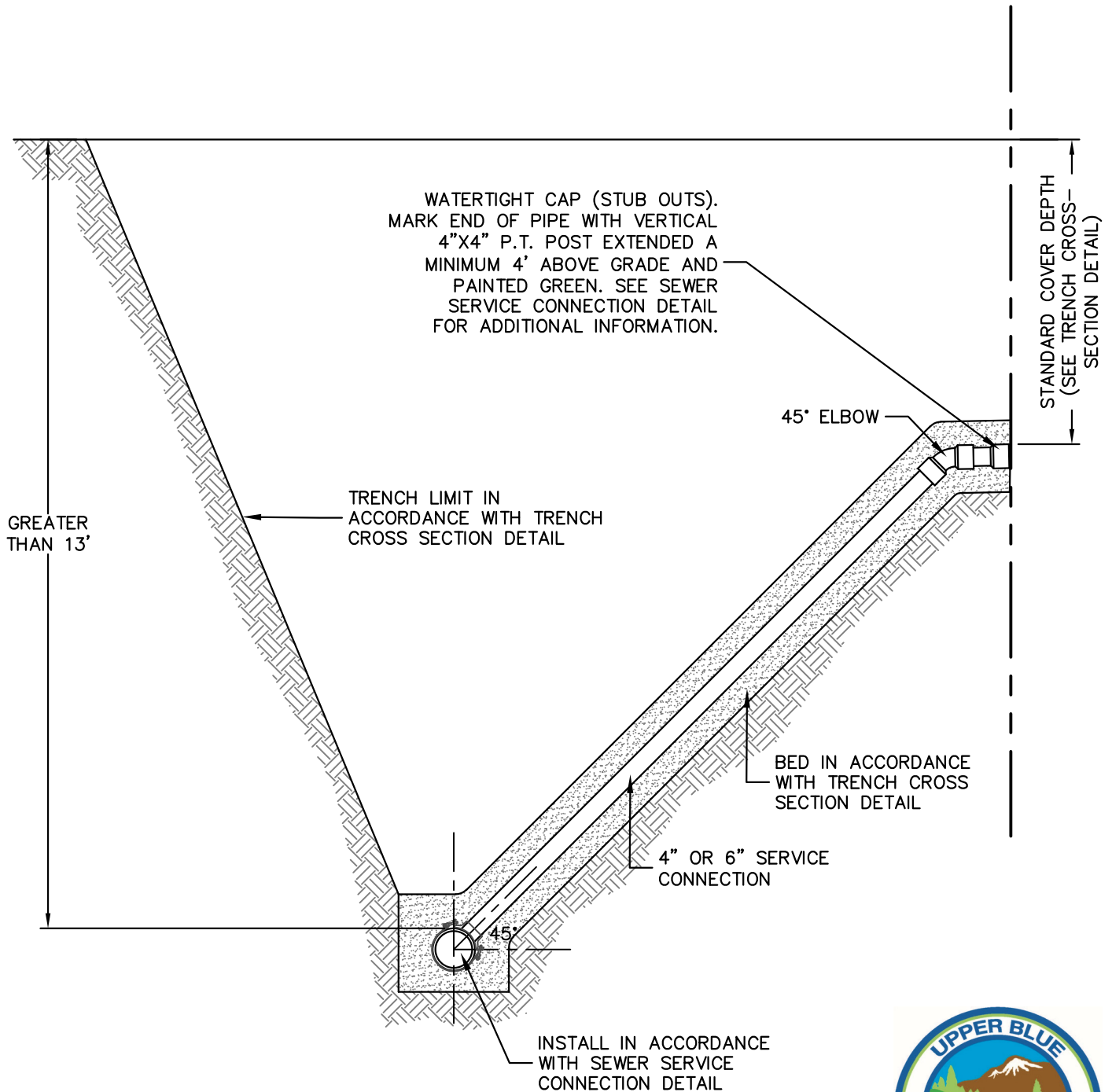
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SEWER SERVICE CONNECTION

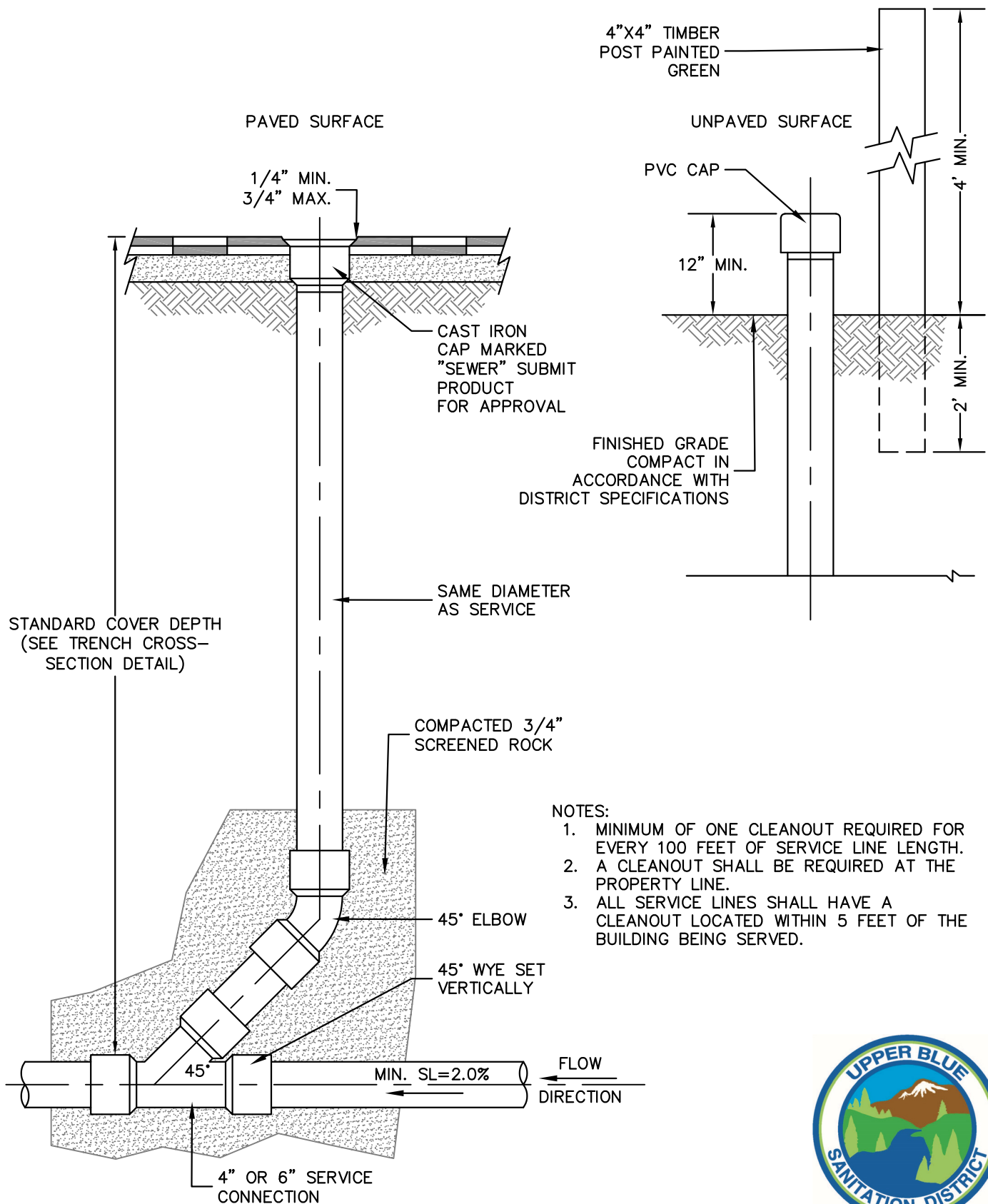


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UPPER BLUE SANITATION DISTRICT

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DEEP SEWER SERVICE CONNECTION



UPPER BLUE SANITATION DISTRICT

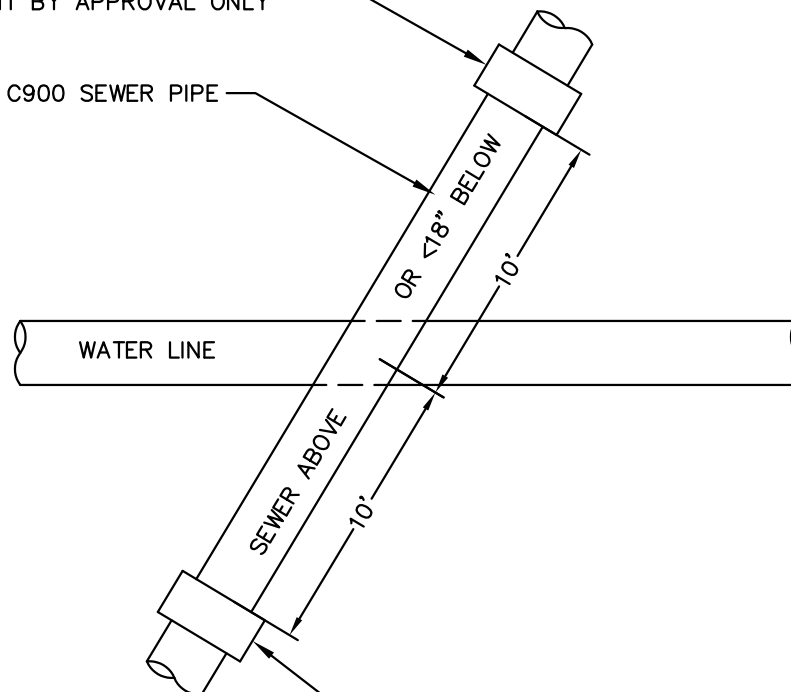
REVISED

SEWER SERVICE CLEANOUT



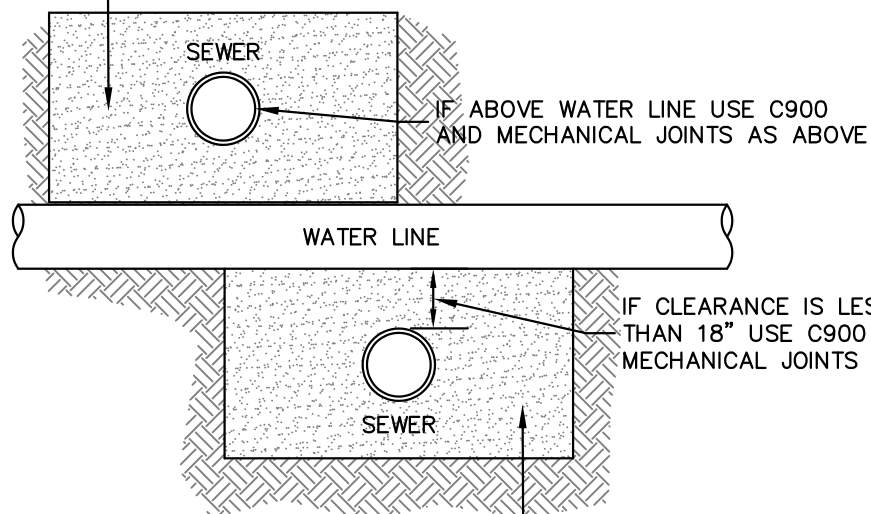
MECHANICAL JOINT COUPLING CONFORMING
WITH DISTRICT SPECIFICATIONS
DISTRICT MAY PERMIT CONCRETE
ENCASEMENT BY APPROVAL ONLY

C900 SEWER PIPE



PIPE EMBEDMENT ZONE
PER DETAIL

MECHANICAL JOINT COUPLING CONFORMING
WITH DISTRICT SPECIFICATIONS
DISTRICT MAY PERMIT CONCRETE
ENCASEMENT BY APPROVAL ONLY



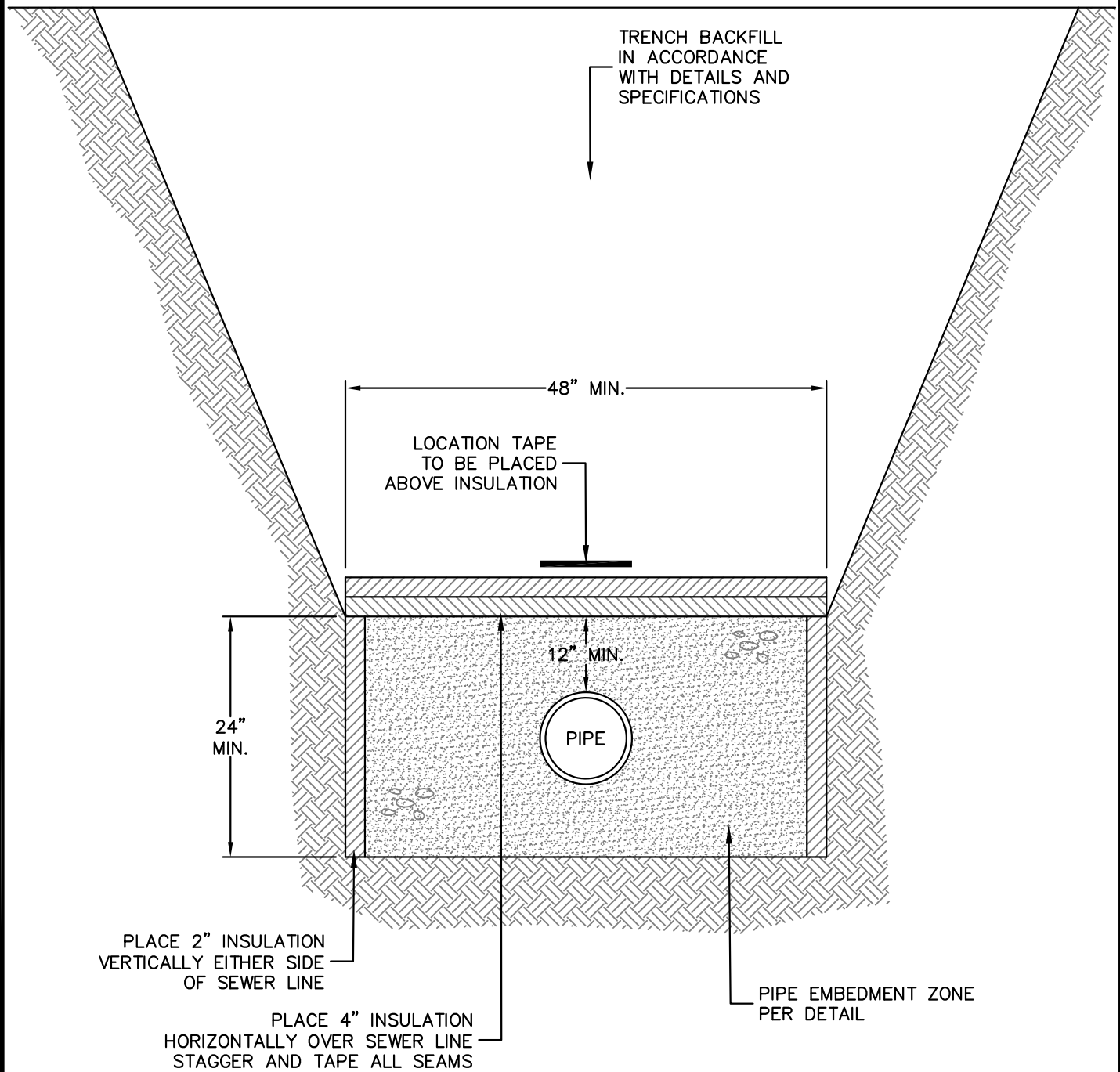
PIPE EMBEDMENT ZONE
PER DETAIL

N.T.S.

UPPER BLUE SANITATION DISTRICT

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WATER—SEWER CROSSING



NOTES:

1. INSTALL RIGID INSULATION IN ACCORDANCE WITH DISTRICT SPECIFICATIONS.
2. INSULATION SHALL BE PLACED IN BEDDING MATERIAL AND UNIFORMLY SUPPORTED TO PREVENT BREAKAGE.
3. INSULATION SHALL ONLY BE PERMITTED WITH PERMISSION FROM DISTRICT.
4. INSULATED PIPE MUST HAVE A MINIMUM 4 FEET OF COVER OVER PIPE WHERE SNOW WILL NOT BE REMOVED AND 6 FEET OF COVER OVER PIPE AT ALL OTHER LOCATIONS.

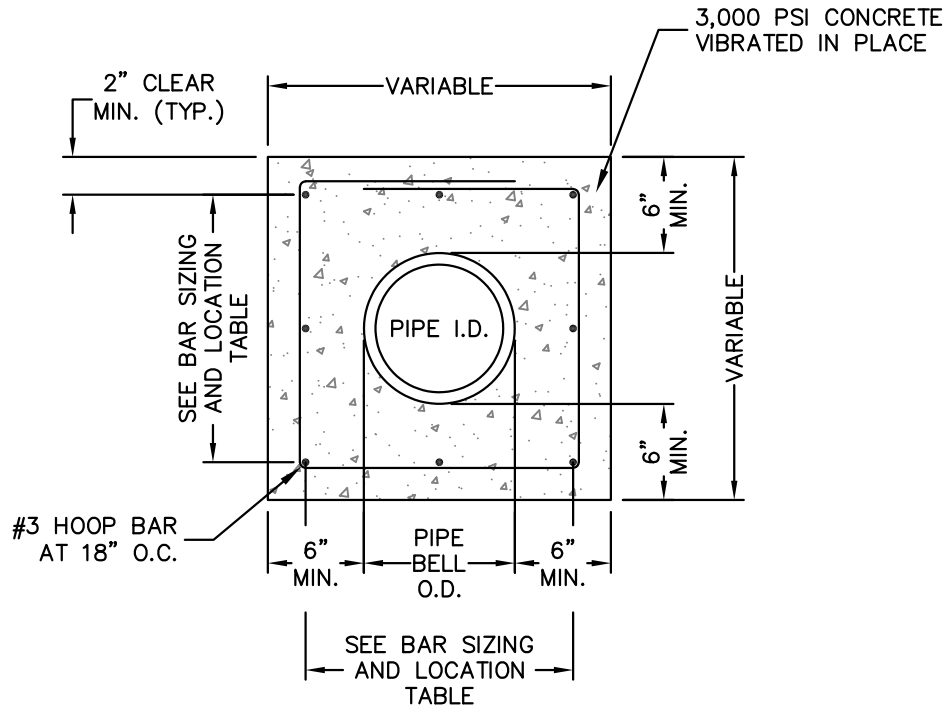
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UPPER BLUE SANITATION DISTRICT

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SEWER INSULATION



PIPE I.D.	NO. OF LONGITUDINAL BARS AND LOCATION
6 IN.	4 – NO. 4 BARS 1 EACH CORNER
8 IN.	4 – NO. 4 BARS 1 EACH CORNER
10 IN.	8 – NO. 8 BARS 3 EACH SIDE
12 IN.	8 – NO. 8 BARS 3 EACH SIDE
15 IN.	8 – NO. 8 BARS 3 EACH SIDE
18 IN.	8 – NO. 8 BARS 3 EACH SIDE
21 IN.	12 – NO. 4 BARS 4 EACH SIDE
24 IN.	12 – NO. 4 BARS 4 EACH SIDE
27 IN.	12 – NO. 4 BARS 4 EACH SIDE
30 IN.	12 – NO. 4 BARS 4 EACH SIDE
33 IN.	12 – NO. 4 BARS 4 EACH SIDE
36 IN.	16 – NO. 4 BARS 5 EACH SIDE

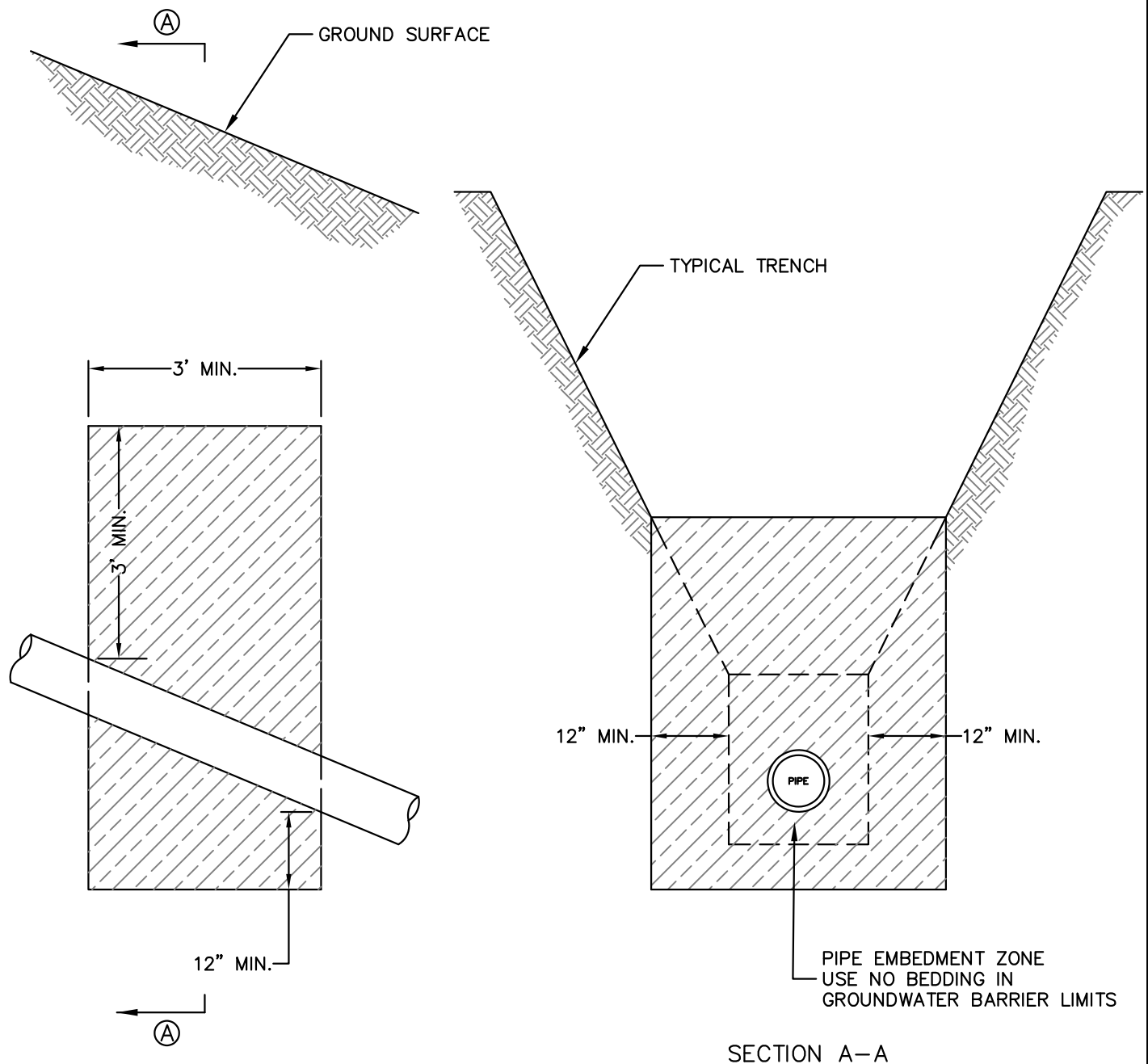


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CONCRETE ENCASEMENT



NOTES:

1. PROVIDE GROUNDWATER BARRIERS ON ALL PIPE WHERE SLOPE EXCEED 30%, WHERE GROUNDWATER IS PRESENT, AND/OR AS DIRECTED BY DISTRICT.
2. SPACING BETWEEN GROUNDWATER BARRIERS SHALL BE AS SHOWN ON PLANS AND PROFILES, OR AS DIRECTED BY DISTRICT BASED UPON OBSERVED FIELD CONDITIONS.
3. CLAY MATERIAL SHALL BE COMPACTED TO 95% STANDARD PROCTOR. PLASTICITY INDEX OF 10 MIN. 70% PASSING NO. 200 SIEVE.
4. DO NOT USE BEDDING MATERIAL IN GROUNDWATER BARRIER LIMITS.
5. WHERE DIRECTED BY THE DISTRICT, INSTALL PERFORATED DRAIN LINE FROM TRENCH ELEVATION TO A STABILIZED DRAINAGEWAY TO ALLEVIATE HYDROSTATIC PRESSURE.

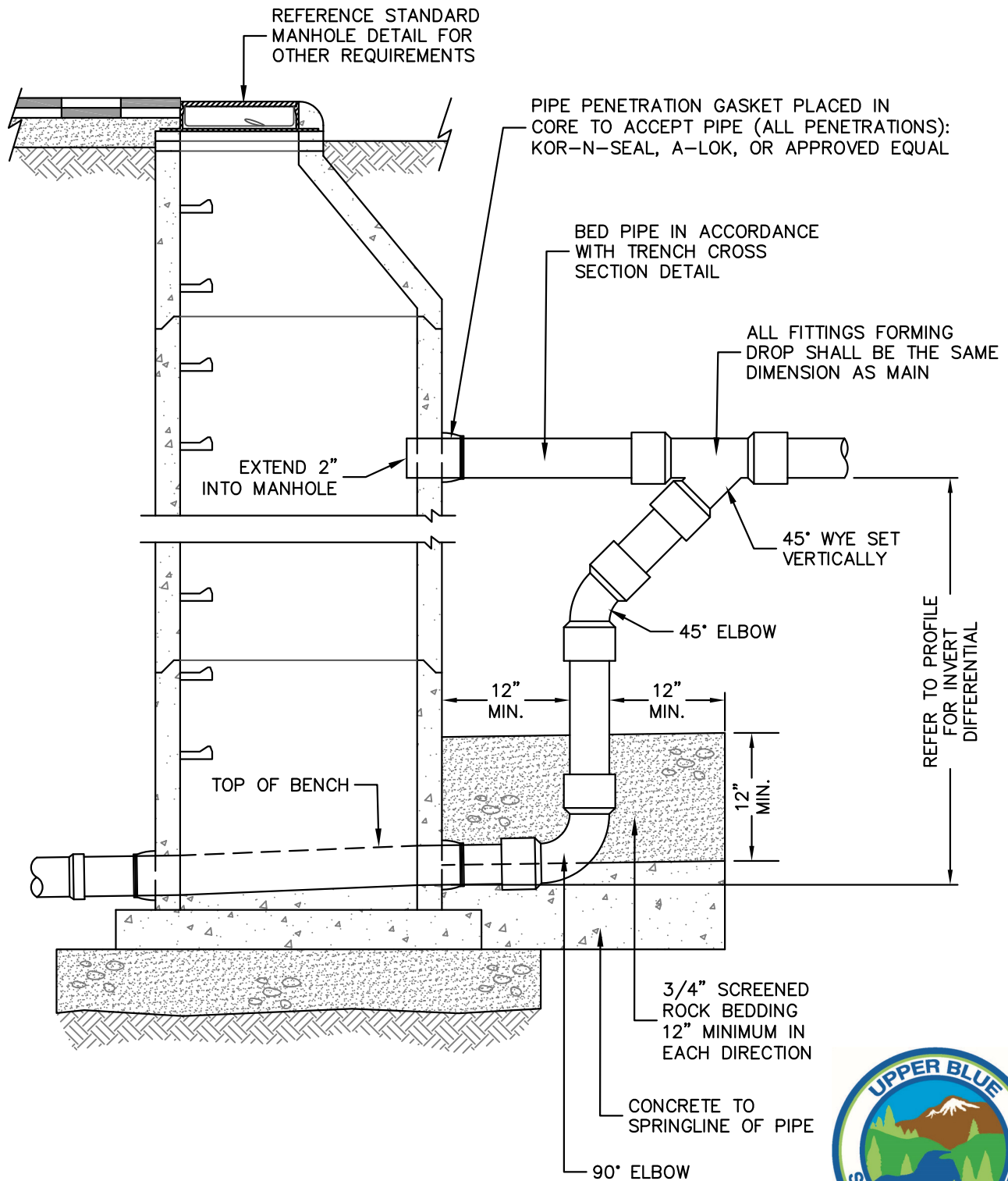
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GROUNDWATER BARRIER

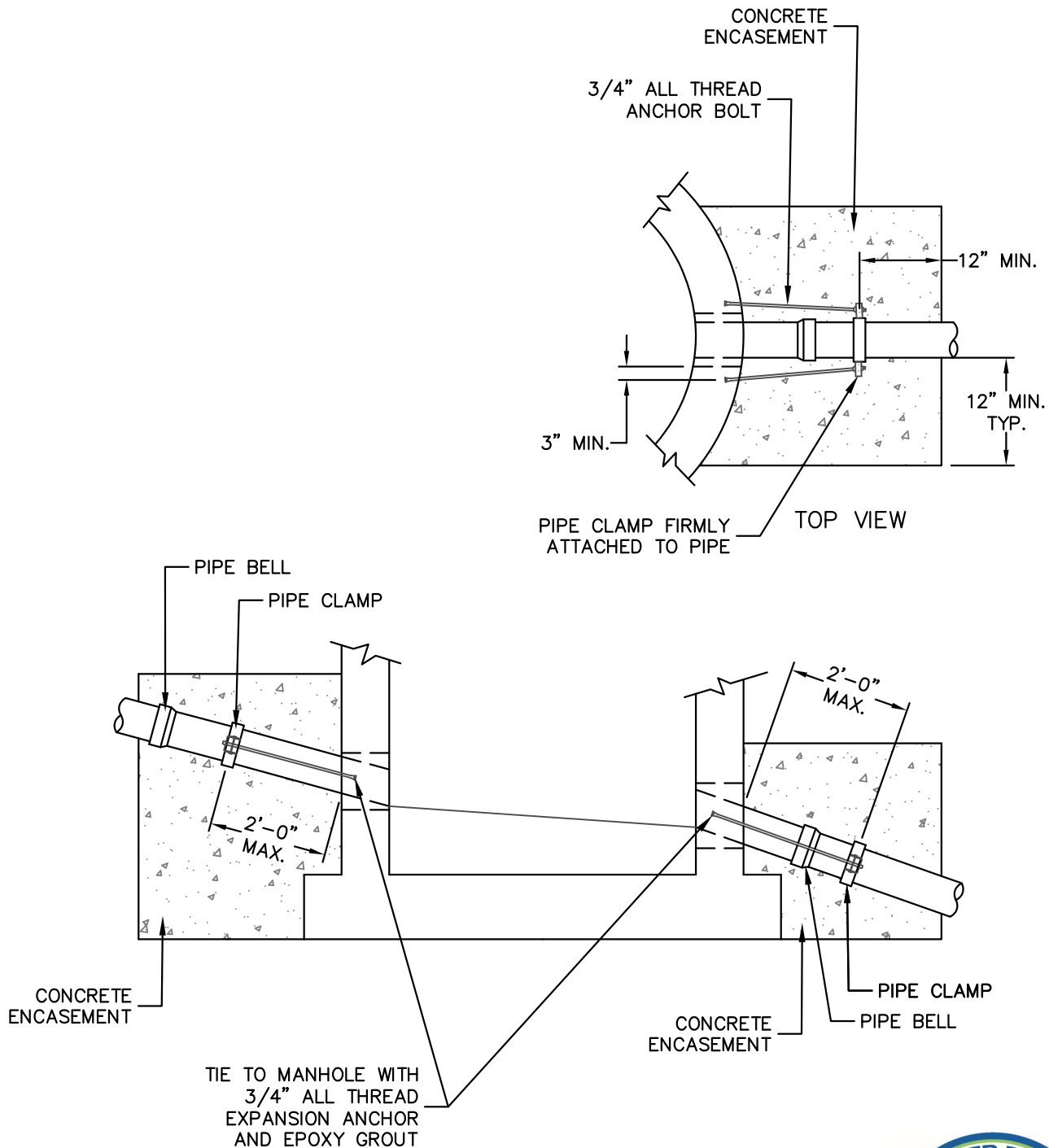


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DROP MANHOLE



NOTE: ANCHOR MANHOLES ARE REQUIRED WHERE PIPE SLOPES EXCEED 20%



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ANCHOR MANHOLE