

TOWN OF SILVERTHORNE
SEWER SYSTEM CRITERIA

December 2005

TOWN OF SILVERTHORNE SEWER SYSTEM CRITERIA

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
I	GENERAL	
II	BASIC DESIGN PARAMETERS	
	A. Description of System	5
	B. Population	6
	C. Unit Sewage Quantities/Characteristics	6
	D. Friction Factors	6
	E. Peaking Factors	7
III.	DETAILED DESIGN REQUIREMENTS	
	A. Sewer Lines	7
	B. Manholes	10
	C. Miscellaneous Provisions	11
IV	SPECIFICATIONS	
	A. Materials	13
	B. Installation	15
	C. Observation and Testing	16

Standard Details

<u>Detail Number</u>	<u>Detail Description</u>
S-1	Sewer Service Line Connection
S-2	Sanitary Sewer Service In-Line Cleanout
S-3	Typical Sewer Trench Section
S-4	Standard Manhole Riser and Cover
S-5	Shallow Manhole Riser and Cover
S-6	Manhole Base Interior
S-7	Precast Concrete Manhole Base
S-8	Inside Drop Manhole
S-9	Outside Drop Manhole
S-10	Manhole Marker Post

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**Bill Linfield, P.E.,
Public Works Director**

TOWN OF SILVERTHORNE

SEWER SYSTEM CRITERIA

I. GENERAL

The Town of Silverthorne is a member of the Silverthorne/Dillon Joint Authority which operates the Sewage Treatment Plant that services the Towns of Silverthorne and Dillon as well as the Buffalo Mountain Metropolitan District, the Dillon Valley Metropolitan District and the Mesa Cortina Sanitation District. The Joint Authority is responsible for the operation and maintenance, as well as expansion of the facilities jointly used by any of these entities, including the treatment facility, flow measuring vaults and major interceptor trunk sewer lines. The Town of Silverthorne operates and maintains the sewerage collection facilities within its corporate limits that do not fall under the control of the Joint Authority. This document sets forth the criteria for such Town of Silverthorne sewerage collection facilities.

The construction of on-site collection and service lines for individual subdivisions of residential development and for commercial or other development shall be the responsibility of the individual developer. Once constructed, the collection lines and associated facilities shall be deeded to the Town for operation and maintenance. Extension of the existing sewer system to and around the developing property shall be governed by the provisions of the code of the Town of Silverthorne, Chapter 3, Article III, Sewers.

The Developer shall be responsible for collecting sewage from the development and transporting it to a primary collector or interceptor trunk sewer line in accordance with the requirements of the following criteria. Some of the requirements of this document are dependent upon the specific traits of the development, for example peak sewage flows and wastewater characteristics. In most instances, the Developer has the option of meeting the articulated requirements of this document or modifying the land use plan or nature of the users to reduce the individual site requirements.

This document is not intended to be a complete list of every requirement for construction in the Town of Silverthorne, but is designed as a guide to the requirements for materials and methods to be used for the installation of sewer related infrastructure. This document in no way releases the owner, builder, contractor, or their agents from the responsibility to be familiar with the provisions of water regulations or other referenced documents and/or to meet the requirements of those documents. It is hereby declared that the criteria and regulations contained here are necessary to insure and protect the health, safety, prosperity, security, and general welfare of the residents of the Town of Silverthorne,

Colorado. Any area not specifically addressed will be determined by the Town of Silverthorne's Public Works Director or his designee.

II. BASIC DESIGN PARAMETERS

- A. Description of the System: The Town of Silverthorne is a Member of the Silverthorne/Dillon Joint Authority. The Wastewater Treatment Facility, located approximately 2.5 miles north of the center of Town on Blue River Parkway (Colorado Highway 9). At the time of the drafting of this document, the facility is capable of handling a peak flow of 4.0 million gallons per day (MGD), or 10,000 Equivalent Residential Units (EQR). Of that capacity, the Town of Silverthorne has the right to use 4174 EQRs or about 41.7 percent. The design capacity of the facility is currently 4.0 MGD, as of the preparation date of this document.

In addition, the Joint Authority owns and operates three interceptor trunk sewer lines within the Town limits. The Joint Interceptor extends south from the sewage treatment plant along Blue River Parkway to the intersection of the East and West Bank Interceptors (MH O-20). It is constructed of 24 and 27-inch Asbestos Cement Pipe (ACP). The East Bank Interceptor Crosses the river and continues south through the Town and under Interstate 70 to the Town of Dillon and the Dillon Valley District. This line consists mainly of 15 and 18-inch vitrified clay pipe (VCP). The West Bank Interceptor extends south along Blue River Parkway to Interstate 70 and to the Buffalo Mountain Metropolitan District. This interceptor is 18-inch VCP. The Town of Silverthorne's capacity in these various reaches is as listed in Table 1.

TABLE 1

TRUNK SEWER RESERVED CAPACITIES

<u>Interceptor</u>	Lower Limit (MH#)	Upper Limit (MH#)	Total Capacity The Town has the right to use (EQR)
Joint	MH 0-1	MH 0-20	4,644
Joint	MH 0-1	MH 0-10A	600**
East Bank Lower Segment*	MH 0-20	MH 0-35	941
East Bank Middle Segment*	MH 0-35	MH 0-R4	710
East Bank Upper Segment*	MH 0-R4	Dillon/Dillon Valley Metering	0

West Bank Lower Segment	MH 0-20	Vault MH B-18	3,908
West Bank Upper Segment	MH B-18	Buffalo Mountain Metering Vault	300

* Capacities determined from Wright-MacLaughlin Engineers report dated May 11, 1981.

** Capacity which Centron Corporation formerly had the right to use.

B. Population: Population estimates for proposed developments shall be determined using the EQR (Equivalent Residential Unit) Schedule as a basis. One EQR is defined as that amount of water used by equivalent population of 3.5 persons. The EQR Use Classification Schedule is found within Chapter 3 of the Silverthorne Town Code.

C. Unit Sewage Quantities/Characteristics: Estimates of sewage quantities for proposed developments shall be determined using the Use Classification Schedule as a basis. (The Use Classification Schedule is found in the Town Code.)

Sewage quantities shall be estimated at not less than an average daily rate of 288 gallons per day per EQR, or 82.3 gallons per day per capita. In addition to this amount, flow in collectors and trunk sewers shall include an additional 62 gallons of infiltration/inflow per EQR.

The wastewater loading parameters are expected to be that associated with domestic sewage. The Silverthorne/Dillon Joint Authority plant was designed to operate under the conditions presented in Table 3.

TABLE 3
WASTEWATER PARAMETERS

5 day BOD	0.63 lbs/day/EQR
Suspended Solids	0.60 lbs/day/EQR
Phosphorus	8 mg/l
Temperature (high/low)	12.2/4° C

D. Friction factors: Friction factor values (Manning's n) for sewer system analysis and design shall be 0.013 for all types and sizes of material.

- E. Peaking Factors: The peaking factor associated with a particular development shall be based on the population being served by a particular collector sewer line.

III. DETAILED DESIGN PARAMETERS

A. Sewer Lines:

1. Transmission Trunk Sewers

Transmission trunk sewers, primarily the trunk sewers necessary to serve Silverthorne are already in place. Should it become apparent during development review that a sewer line placement is advantageous for service to future developments, the Town may require upsizing of the trunk line for this purpose. Design parameters shall be consistent with those described under "Collector system sewers", below. Population estimates for off site developments for this design will be based on best available information. The Town may require the Developer to provide additional related research / information if and as needed.

2. Collector system sewers:

- a. Shall be designed to be no smaller than eight inches in diameter.
- b. Shall be designed with a depth of flow as listed below.

TABLE 4
DESIGN DEPTHS OF FLOW

<u>Pipe Size</u>	<u>Maximum Allowable Depth of Flow</u>
Less than 18-inch diameter	50%
18-inch diameter and larger	80%

- c. Shall be designed with a slope sufficient to provide a minimum velocity of 2.0 feet per second in a full flowing condition. The design minimum velocity shall also be provided in the engineering report. Table 5 lists recommended grades for various sizes of pipe:

TABLE 5
REQUIRED MINIMUM GRADES FOR SEWERS

<u>Pipe Size</u>	<u>Slope in Percent</u>
4-inch (service)	2.00*
6-inch (service)	1.00*
8-inch	0.40
10-inch	0.28
12-inch	0.22
15-inch	0.17

* The slope may be reduced with approval of the Town

- d. Shall be designed with a maximum velocity less than 15 feet per second. Special design and construction considerations and energy dissipation devices shall be employed should velocities exceed this amount.
- e. Shall be constructed of SDR 35 type pipe. Shall be constructed of C900 pipe where crossings with water main exist. The pipe shall meet the requirements of section IV.A.1.
- f. Shall be installed at a depth capable of serving the development by gravity. Normally depths should not be less than seven feet. The sewer shall also be installed at a depth reasonable for connection from above to allow for service to developments upstream if feasible and necessary. The maximum allowable depth of cover over the pipe shall be 12 feet. Where cover limitations exist, sewer mains may be installed at shallower depths, subject to Town approval. Under these circumstances sewer having depths between 6 to 7 feet deep shall be insulated with 4" blueboard insulating material. In situations where cover is between 4.5 and 6 feet, the line shall be box insulated on 3 sides with 4" blueboard. Insulation shall be boxed around the main on top and both sides and shall be boxed 18" away from the main. The absolute minimum depth for sewer lines is 4.5 feet, subject to Town approval. As necessary, and to be determined by the Town, additional measures to protect the pipe from crushing or deforming due to surface loads may be required.
- g. Shall be installed with a minimum 10 foot separation from any treated water main. Normally sewers shall be designed parallel and 12 feet apart from water lines (center line to center line). If this condition is not met see Section III.C.4. "Waterline Crossings" for additional requirements.

3. Service system lines:

- a. Shall be a minimum of 4-inches in diameter. All lines shall be sized to handle required peak flows from the building.
- b. All building sewers shall be run in practical alignment and at a uniform slope of not less than one-fourth (1/4) of an inch per foot toward the point of disposal. If it is impractical to do so due to the depth of the street sewer or the structural features of the building, sewers four (4) inches and larger may be run at a slope of one eighth (1/8) inch per foot when first approved by the Town.
- c. Shall be constructed of polyvinyl chloride (PVC) SDR-35 pipe (See Section IV.A.1.).
- d. Shall be installed with a minimum of 4 feet 6-inches of cover and a maximum of 12 feet of cover. Insulation may be required in accordance with Section III.A.2.f.
- e. Shall be connected to main collector lines with a stainless steel coupling. For new construction, push on type wye connections will be provided for each lot.
- f. Shall be insulated under all driveways, roadways, parking areas where any portion of the service line is at a depth of cover of 4.5 feet or less from final ground surface (See Section IV.A.5.).
- g. Shall be installed with clean-outs at every change in grade, at a maximum spacing of 100 feet, and for each aggregate change in direction exceeding one hundred and thirty five (135) degrees in accordance with International Plumbing Code. Clean-out piping material shall be the same as the service line piping and shall meet the requirements of Section IV.A.1.
- h. Shall be installed with oil and/or sand interceptors or traps on all lines servicing restaurants, car washes and businesses or commercial garages and other locations as required by the Town. These traps or interceptors shall be sized and installed in accordance with the International Plumbing Code. Oil and/or sand interceptors shall not be sized for less than 1000 gallons.
- i. Shall be installed individually to each building, that is, a separate service line shall be provided to each building and to each unit of a

town house. Multi-family and commercial developments which consist of more than 3 units will require a 6" private sewer main which the individual units services connect to.

- j. Shall be installed in accordance with the International Plumbing Code unless sections a through i are more restrictive, then sections a through shall apply.

B. Manholes:

- 1. Shall be constructed of materials described in Section IV.A.2.
- 2. Shall be spaced as described in Table 6.

TABLE 6
MANHOLE SPACING

<u>Sewer Line Size</u>	<u>Maximum Distance Between Manholes</u>
15-inch diameter and smaller	400 feet
Diameters larger than 15-inches	400 feet

- 3. When located in a paved roadway, the rim shall be depressed 1/4 to 3/4-inch below finished grade. When installed in open ground, the rim shall be installed 6-inches above finished grade. When manholes are installed in a road which will remain gravel for some time, they shall be placed so as to allow for upward adjustment without exceeding the maximum 12-inch grade ring requirement.
- 4. Shall be designed with a minimum drop of 0.10 foot across the manhole.
- 5. Shall be constructed as a drop manhole if the invert of the inlet pipe is greater than 12-inches higher than the outlet pipe invert.
- 6. Shall be identified by the existing manhole that the sewer line connects to. Generally a manhole upstream of an existing manhole shall carry an identifying number identical to the manhole being connected to followed by a decimal point and a number sequentially from one and increasing as they are installed upstream (i.e. SA 5.1, SA 5.2, SA. 5.3....). A new manhole installed between two existing manholes shall carry an identifying number identical to the downstream manhole followed by the next appropriate letter of the alphabet. (i.e. SBA, SBB, SBC...)

7. Shall have the exterior wrapped with bituthene.

C. Miscellaneous Provisions:

1. Cost responsibility: Sewer collection and trunk lines shall be paid for in accordance with ordinances as shown in the following table:

TABLE 7
RESPONSIBILITY FOR SEWER LINE COSTS

	<u>Town</u>	<u>Developer</u>
Original Platted part of Town	X	
Original unplatted part of Town		X
Annexations to original part of Town		X
Upsizing lines to meet collection needs in other areas of Town	X	
Trunk lines and wholesale facilities (metering vaults, treatment facilities)	X	

The Developer and the Town are responsible for the design, construction and inspection of sewers needed to provide for the collection of wastewater for the subject property in concern in accordance with Table 7. If the future needs of the Town require a sewer of a size larger than that needed to provide the needs of the development, the Town will be responsible for the additional cost of material required to have the necessary size collector or interceptor installed. No line 8-inches in diameter or smaller shall be considered as oversized.

2. Lift stations: It is not the intent of the Town of Silverthorne to permit sewage lift stations to service individual subdivisions or commercial/office development. The feasibility study must exhaust all possibilities for gravity service before a lift station will be considered. If it is absolutely necessary to utilize a lift station, at a minimum it will have the following characteristics:
 - a. Entrance and main service level shall be above grade.
 - b. Storage for 24-hours shall be provided.
 - c. Stand-by power will be provided for the design capacity
 - d. As a minimum, the lift station shall meet the requirements and recommendations of the Colorado Department of Public Health and Environment.

3. Easements. Where a sewer line which will become the property of the Town, crosses or is located on private property, an easement for the maintenance, operation, repair or replacement of the item or system must be provided. The easement shall meet the following requirements:
 - a. The easement shall be 25 feet in width; 12-1/2 feet on both sides of the center line of the pipe for the full length of the pipe on the subject property. If water and sewer lines are to be within the easement then it shall be 35 feet in width, with a 10 foot distance to the outside of the pipes. Platted easements shall specifically indicate whether an easement is for water, sewer or both water and sewer. An easement 50 feet wide is required if other utilities, such as phone, cable TV, electric or gas are proposed to be located within the alignment. These utilities shall be located at least 10 feet, horizontally, away from water and sewer mains.
 - b. An appropriate plat, deed or dedication will be required to be conveyed to the Town prior to final acceptance of the line(s) and/or facility.
 - c. The easement shall stipulate that the Town is not responsible for replacement or repair of surface improvements installed within the easement and over the line.
 - d. The easement shall be labeled for its use i.e., WATER for water facilities, SEWER for sewer facilities, DRAINAGE for drainage facilities. Where proposed to be exclusive for only either water and/or sewer, water and sewer easements shall not be labeled as a utility easement. SEE a. ABOVE.
4. Waterline crossings. Whenever any water main lines are crossed, sewer mains and lines shall be constructed from C900 pipe for a horizontal distance of ten feet on either side of and perpendicular to the water line. The length of C900 pipe shall be sufficient to ensure that the water line is not within ten feet of the standard SDR-35 sewer line. Sewer service lines that cross water lines shall have a 20 foot length of C900 pipe centered on the point at which it crosses the water main or service line.
5. Landscaping, revegetation, surface restoration, and erosion control:
 - a. Wherever a sewer main is installed in an open area (area other than a surfaced path or roadway), the surface shall be restored to natural grade. The Town will not be responsible for restoring landscaping or trees that may have been disturbed during the sewer installation process.

- b. Existing trees in the path of water facilities to be installed shall be transplanted to the edge of the easement and maintained throughout the duration of the construction project. No trees shall be planted within water and/or sewer easements. Bushes and shrubs are allowed to be planted within water and/or sewer easements, however the Town will not replace any landscaping that may be damaged or destroyed caused by work done within the easement.
 - c. Areas that are high risk erosion area shall require employment of additional measures such as riprap, planting of low shrubs, and the use of erosion control netting to promote slope stability.
6. Placement of utilities within right-of-way or easements shall be in accordance with the detail found in Town of Silverthorne Street Design Criteria. This layout shall be used and included in the plans and specifications for the project. Utilities other than water and sewer may be in their own easements adjacent to water and sewer lines but may not be within easements designated for other specific uses.

IV. SPECIFICATIONS

- A. Material: All material shall be new and the best available. It shall be according to the latest revision of the standards of the American National Standards Institute (ANSI) and the American Society of Testing and Materials (ATSM). The following are “minimum” requirements.
- 1. Pipe.
 - a. SDR-35 Polyvinyl chloride pipe shall have peaks or joints and be suitable for gravity sewer service and shall meet or exceed the requirements of ASTM specifications. Fittings shall be those made by the pipe manufacturer with bells at each joint or a bell and spigot connection.
 - 2. Manholes shall be constructed of cast-in-place concrete bases or precast bases and precast barrel sections similar to the Details provided at the end of this document.
 - a. Precast concrete sections shall conform to ASTM Specifications.
 - b. Poured in place bases shall be constructed of concrete with a 28-day compressive strength of 3,000 psi and shall be reinforced with

standard deformed reinforcement conforming to the requirements of ASTM Specifications.

- c. The rim and cover shall be constructed of gray iron conforming to the requirements of Class 35 or ductile iron conforming to ASTM specifications. This item shall be "J-Mark" 1161 or "Neenah" R-1706, with "Sewer" stamped on top.
 - d. In suspect areas, waterproof lids shall be provided. These shall either be a self sealing, gasket lid or a bolt down frame and cover similar to "Neenah" R-1916F1.
 - e. Steps shall be made of aluminum similar to "J-Mark" No. 12653B or "Neenah" R-1982-W.
 - f. Manhole cover elevations shall be adjusted with precast concrete grade rings. These rings shall not be less than six inches wide and shall be furnished to allow for a one inch adjustment. No more than twelve inches of adjustment rings will be allowed.
 - g. Gasket seals shall be provided at mating joints of precast concrete sections. Gaskets shall be sized to fit joint dimensions and surface conditions to assure watertight completed installation. Use either compressible closed-cell neoprene rods with compatible bonding agent recommended by material manufacturer; or No. 95 extruded butyl rod and No. 2 Primer each produced by General Sealants, Inc., or equal non-bituminous joint sealing compressible gaskets.
3. Couplings Pipes of dissimilar materials shall be connected with flexible couplings, fitting tightly and providing for proper connection of pipes of different diameters. Couplings shall be constructed of vulcanized rubber meeting the requirements of ASTM Standard D735-61T and shall be strapped to the pipe with steel straps manufactured of type 302 stainless steel. Couplings shall be similar to Calder couplings as manufactured by Joints, Inc.
 4. Grout. A non-shrink grout shall be used to seal pipe connections, grade ring joints, lifting holes and other places necessary to seal manholes watertight.
 5. Insulation shall be rigid, extruded polystyrene foam boards measuring 16-inches or 2 feet wide by 8 feet in length by 4-inches thick with a high density skin. The boards shall be placed 6-inches above the pipe on a compacted back-fill bed. (See Section III.A.2.f for additional requirements.)

B. Installation:

1. Installation of sewer lines and manholes which will become the property of the Town, or connect to a Town system where service will be required to be provided, shall be performed in a high quality manner. The work shall be conducted with such forces of workers possessing the necessary knowledge, ability, skill and experience to complete the project, or portions of the project in a first class and acceptable condition in a reasonable amount of time.
2. Safety. In accordance with generally accepted construction practices and the requirements of State and Federal safety regulations, the Contractor will be solely and completely responsible for conditions on the job site, including safety of all persons and property during performance of work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Engineer to conduct construction observation of the Contractor's performance is not intended to include review of the adequacy of the Contractor's and/or Sub-contractor's safety measures, in, on, or near the construction site.

The Contractor shall at all times whether or not so specifically directed by the Engineer, take necessary precautions to insure the protection of the public. The Contractor shall furnish, erect, and maintain, at its own expense, all necessary barricades, suitable and sufficient warning lights, construction signs, provide a sufficient number of watchmen and take all necessary precautions for the operation of the work and safety of the public through or around its construction operations.

3. Trenching and Backfill. All trenching and backfill operations shall conform to the requirements set forth in the Town of Silverthorne, Excavation Permit Process and Standards.
4. The Developer shall provide a two (2) year warranty for operation and maintenance on work done on or within the Town's sewer system, unless otherwise specified in writing by the Town. The date of the warranty shall begin following the final acceptance of all work performed. A Certificate of Completion will be issued to the contractor documenting the date of final acceptance. Warranty items are those which will become the property of the Town, or connect to a Town system where service is required to be provided. Satisfactory repair or replacement of any work, material or equipment which becomes defective during this period is required under the warranty; provided that either the Developer or his Contractors and/or Sub-contractors shall be liable under this paragraph for

any failure resulting from the Town's neglect, lack of proper operations of facilities or acts of a third party.

The developer shall request Town acceptance of the installed facility upon completion of the project and of all "punch list" items. The request shall be made in writing to the Town Engineer or Public Works Director. The date of final acceptance shall be the date when a Certificate of Completion is issued by either the Town Engineer or Public Works Director.

If repair or replacement is needed during the warranty period, then the warranty for the particular item(s) repaired or related to the repair shall require an additional 2-year warranty for the repair from the date of acceptance by the Town. The specific area of the repair and extended warranty shall be clearly documented. A new Certificate of Completion will be issued by the Town for each particular warranty item after it has been repaired by the Developer / Contractor and accepted by the Town.

5. Details will be required to be provided as suggested in this document and when in the opinion of the Town such illustration is required to insure complete understanding of construction procedures which are compatible and acceptable to the Town's system and standards of performance. Any requested, and/or supplied detail shall be subject to review and approval by the Town.
 6. Example details S-1 through S-10 provided in this document, are intended for informational purposes to portray the types of installation methods which may be compatible with Town systems and to illustrate the basic standards of construction expected on Town facilities.
 7. Before Final Acceptance, the developer shall provide to Town as-built drawings of the constructed system indicating the location and depth of all system components. One set of 24 x 36 mylars and 2 sets of 24 x 36 paper copies are required. Asbuilts shall be prepared and stamped by a registered Professional Engineer. The as-builts shall be provided in both paper form and digital form, and shall be in a form compatible with the Town's GIS (geographic information system.) Developer responsible for costs associated with integrating asbuilts into the Town's GIS.
- C. Observation and Testing: All facilities being constructed by the Developer, which will become the property of the Town or which will connect to a Town system where service will be required to be provided, will be subject to continuous inspection and testing by the Town.
1. Construction checking.

- a. Developer will provide full time construction inspection by a qualified inspector as determined by the Town Engineer. During construction, the Town will make periodic observations (sometimes commonly referred to as “inspection”). The purpose of these observations and construction checking is to determine the progress of the work and to see if the work is being performed generally in accordance with plans and specifications. The Town will in no way be responsible for how the work is performed, safety in, on or about the job site, methods of performance, or timeliness in the performance of the work.

- b. Inspection of Work.
 - (1) An inspector shall be designated by Silverthorne to exercise authority on its behalf and to see that this all work is performed according to these Sewer System Criteria. In some cases this may be memorialized via an agreement between the Town and the Developer. Work under this Agreement may, without cost or claim against Silverthorne, be suspended by the Town and or the Town’s Inspector for substantial cause. The Inspector will be responsible for inspecting the construction of the sewer system improvements that will eventually be dedicated to the Town. The Town may require that the Inspector be on-site full time if necessary during the construction of the sewer system improvements. The Town may suspend or shut down work on the sewer system improvements if there is a disagreement about the inspection schedule, construction methods and/or materials or any construction related matter regarding the sewer system improvements that is determined by Silverthorne to be substantial. In the event the inspections are conducted by Silverthorne employees, such fees shall be determined by Silverthorne’s standard rate schedule. In the event that the Inspector is not a Town employee but rather an independent contractor, then the Inspectors hourly rate shall be memorialized in the agreement between the Town and the Developer.

 - (2) If sub-standard material, not conforming to the requirements of the approved drawings and specifications, have been delivered to the project, or have been incorporated in the work, or if work shall have been performed of inferior quality, then such material or work shall be considered as unacceptable and shall be removed and replaced as directed by the Town, at the Developer’s

expense, prior to final acceptance of the facilities and before any services will be provided. All materials shall be subject to examination and testing by the Town at any time during manufacture. The right is reserved to reject defective materials during manufacture or before they have been incorporated into the work.

- (3) Some specific items and work, as listed below, and others as may be required by the approved specifications, are required to be tested or checked. The Developer or his Contractor shall give the Town timely notice of readiness for inspection, and if the inspection is by an authority other than the Town, of the date and time fixed for such inspection. Inspections by the Town shall be promptly made. If any work should be covered up without consent of the Town, it must, if required by the Town, be uncovered for examination at the Developer's expense.

A list of specific items requiring complete observation follows:

- (a) Sewer line installation, bedding and back-fill.
- (b) Manhole installation including placement of reinforcing bars, waterproofing and concrete collar installation.
- (c) All service line connections to main lines. Sewer cleanout and water shutoff needs to be visible.
- (d) Main line flushing.
- (e) Final pressure and leakage tests.
- (f) Alignment and grade test/verification.
- (g) Sewer line encasement.
- (h) All connections to existing Town systems.
- (i) Clean-out installation.
- (j) Grease, oil, and sand interceptor installation.

2. Testing.

- a. Throughout the progress of the work, several tests are required to be performed to ensure system integrity, to demonstrate system operation, and to ensure system compatibility prior to placing it into service with the existing Town system. In general, 48-hours notice of ensuing testing is required to be given to the Town.
- b. The following is a description of the tests to be performed along with some specific requirements.
 - (1) Pipeline Flushing. The Contractor shall be responsible for hiring a cleaning company that will high pressure jet clean the lines to insure that sand, rocks, or other foreign material are not left in any of the pipelines. When flushing, care should be taken to prevent damage to property or roadways or erosion of surrounding soils. Flushing water and flushed debris shall not be allowed to enter the existing sewer system.
 - (2) Sewer line alignment and grade verification. Once the sewer pipelines have been flushed, the sewer pipelines shall be inspected by means of closed circuit television (CCTV). Documentation shall consist of a color, VHS-format videotape, log sheets, and a written report detailing the condition of the pipeline and lateral connections/openings. The report shall note the time and date of video inspection, street name, upstream and downstream manhole, direction of view, direction of flow, surface material, pipeline length, pipe section length, pipe size, pipe material, lateral connections, video tape number, counter number, and a detailed logging of defects encountered. Any rejected work shall be repaired, then re-televised.
 - (3) Leakage. All pipelines shall be tested for leakage by means of an air pressure test. The test shall be performed as follows:
 - (a) Preparation for tests: Flush and clean the pipeline prior to testing in order to wet the pipe surfaces and produce more consistent results. Plug and brace all openings in the pipeline and the upper connections. Check all pipe plugs with a soap solution to detect any air leakage. If leaks are found release the air

pressure, eliminate the leaks and start the test procedure over again.

- (b) Procedure of test: Add air until the internal pressure of the pipeline is raised to approximately 4.0 psi at which time the flow of air shall be reduced and the pressure maintained between 3.5 and 4.5 psi for a sufficient time to allow the air temperature to come to equilibrium with the temperature of the pipe.
- (c) After the temperature has stabilized, permit the pressure to drop to 3.5 psig in excess of the ground water pressure above the top of the sewer, at which time a stop watch or sweep second hand watch shall be used to determine the time lapse required for the air pressure to drop to 3.0 psig.
- (d) The time elapsed shall not be less than the following:

Pipe Size (inches)	Time (minutes)
6	5
8	5
10	6.5
12	7.5
15	9.5
18	12
21	14
24	15.5

- (e) Brace all plugs sufficiently to prevent blowouts and vent the pipeline completely before attempting to remove plugs.
 - (f) Provide pressurizing equipment with a relief valve set at 5 psi to avoid over pressurizing and damaging an otherwise acceptable line.
- (4) Manhole Visual Examination The Engineer shall visually check each manhole, both exterior and interior, for flaws, cracks, holes, or other inadequacies which might affect the operation or watertight integrity of the manhole. Should any inadequacies be found, the Contractor, at its own

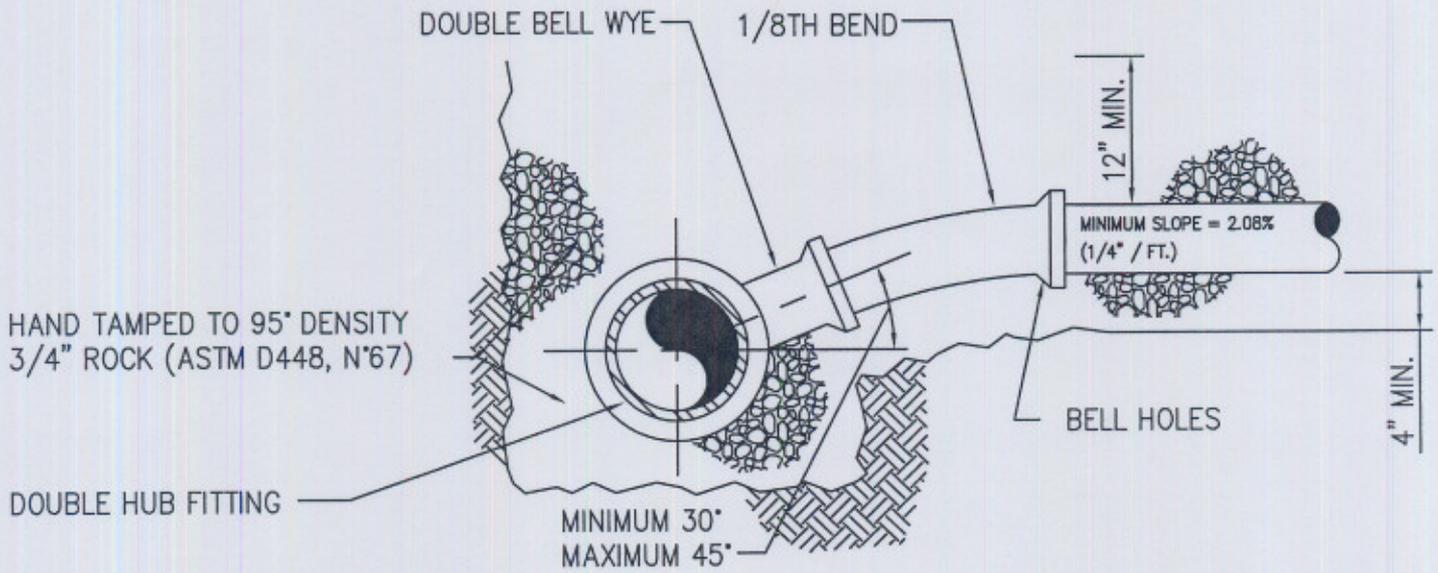
expense, shall make any repairs deemed necessary by the Engineer.

(5) Manhole Leakage Test (vacuum). All manholes shall be tested for leakage and all tests shall be witnessed by the Engineer. The leakage test shall be conducted prior to back-filling around the manhole and shall be carried out in the following manner:

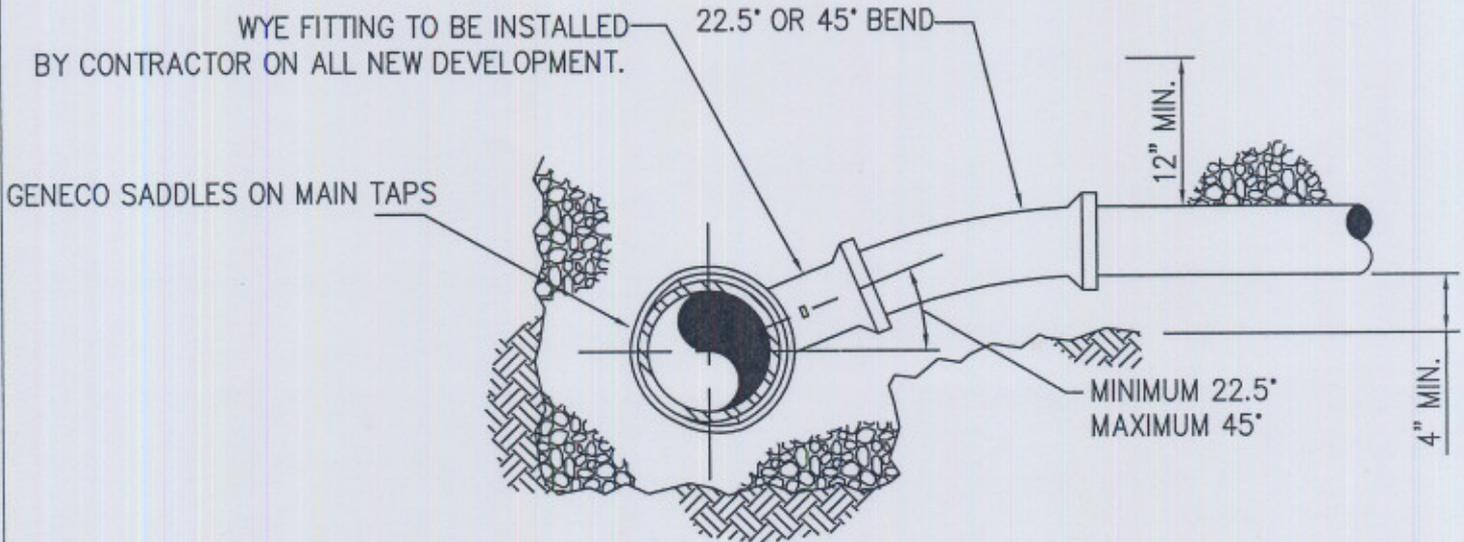
- (a) Manholes shall be vacuum tested after assembly and prior to backfilling.
- (b) Care shall be taken to effect a seal between the vacuum base and the manhole rim. Pipe plugs shall be secured to prevent movement while the vacuum is drawn
- (c) A vacuum of 10 inches of mercury shall be drawn. The time for the vacuum to drop to 9 inches of mercury shall be recorded.
- (d) Acceptance shall be defined as when the time to drop to 9 inches meets or exceeds the following:

<u>Diameter</u>	<u>Time to Drop 1" Hg</u>
4 ft.	120 seconds
5 ft..	120 seconds

- (e) If the manhole fails the test, make necessary repairs. Repairs and repair procedures must be acceptable to Town.
- (f) If preformed plastic gaskets are pulled out during the vacuum test, the manhole shall be disassembled and the gaskets shall be replaced.



1/8TH BEND CONNECTION TO WYE



1/8TH BEND CONNECTION TO TAPPING SADDLE

NOTE:

1. SEWER SERVICE TO BE ASTM 3034, SDR35 PVC PIPE.
2. ALL SERVICE LINES SHALL BE INSPECTED BY AUTHORITY PERSONNEL DURING INSTALLATION AND APPROVED BEFORE BACKFILLED.

NOTE:
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NO SCALE

ISSUED:

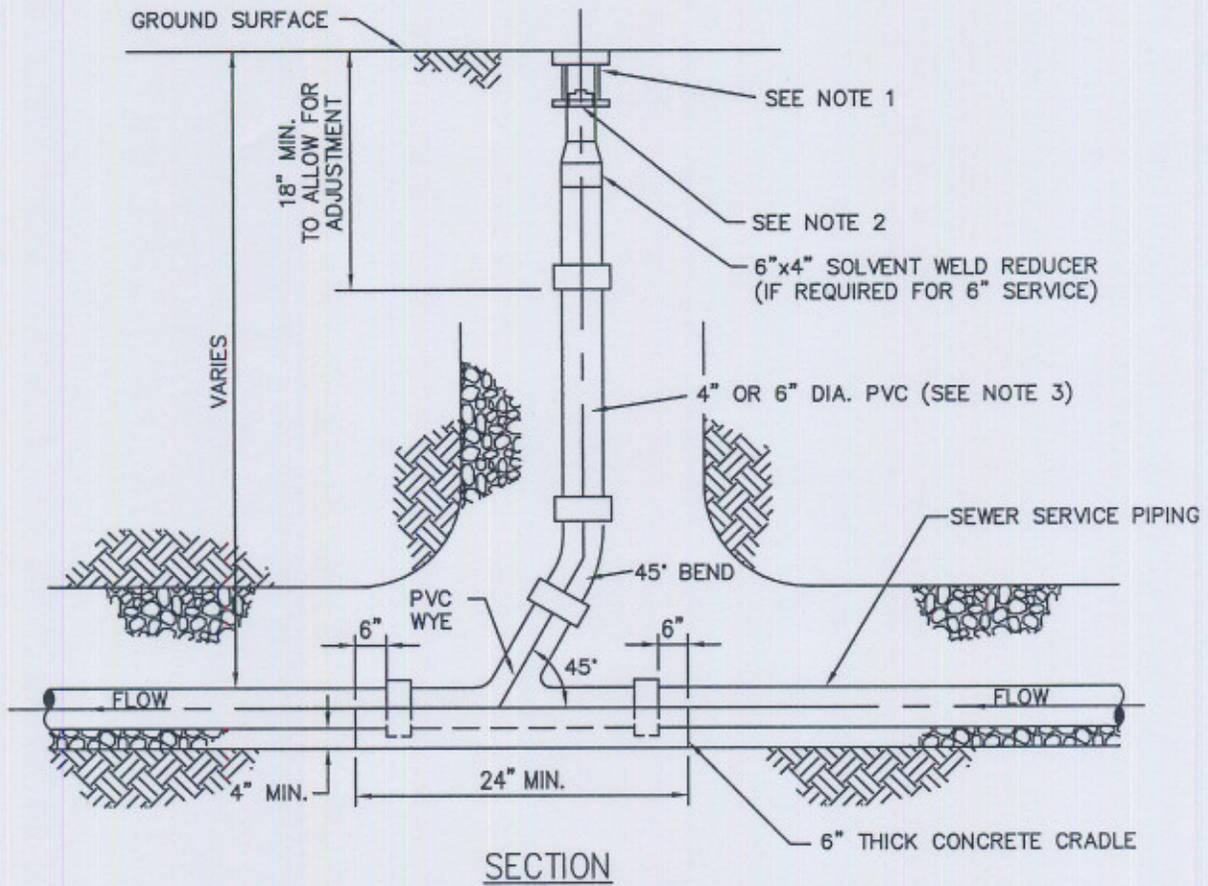


TOWN OF SILVERTHORNE

SEWER SERVICE LINE CONNECTION

DETAIL

S-1



NOTES:

1. TYLER SERIES 6855 SLIP TYPE VALVE BOX TOP SECTION WITH LOCKING LID MARKED "SEWER"
2. 4" PVC SOLVENT WELD BY THREADED ADAPTOR WITH THREADED PLUG.
3. CLEAN OUT FITTINGS AND PIPING TO BE SAME SIZE AS SEWER SERVICE.
4. CLEAN OUT REQUIRED 5' OUTSIDE/ AWAY FROM BUILDING.
5. CLEAN OUT REQUIRED AT EVERY 100' SPACING IN SERVICE LINE BEFORE MAIN.

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NO SCALE

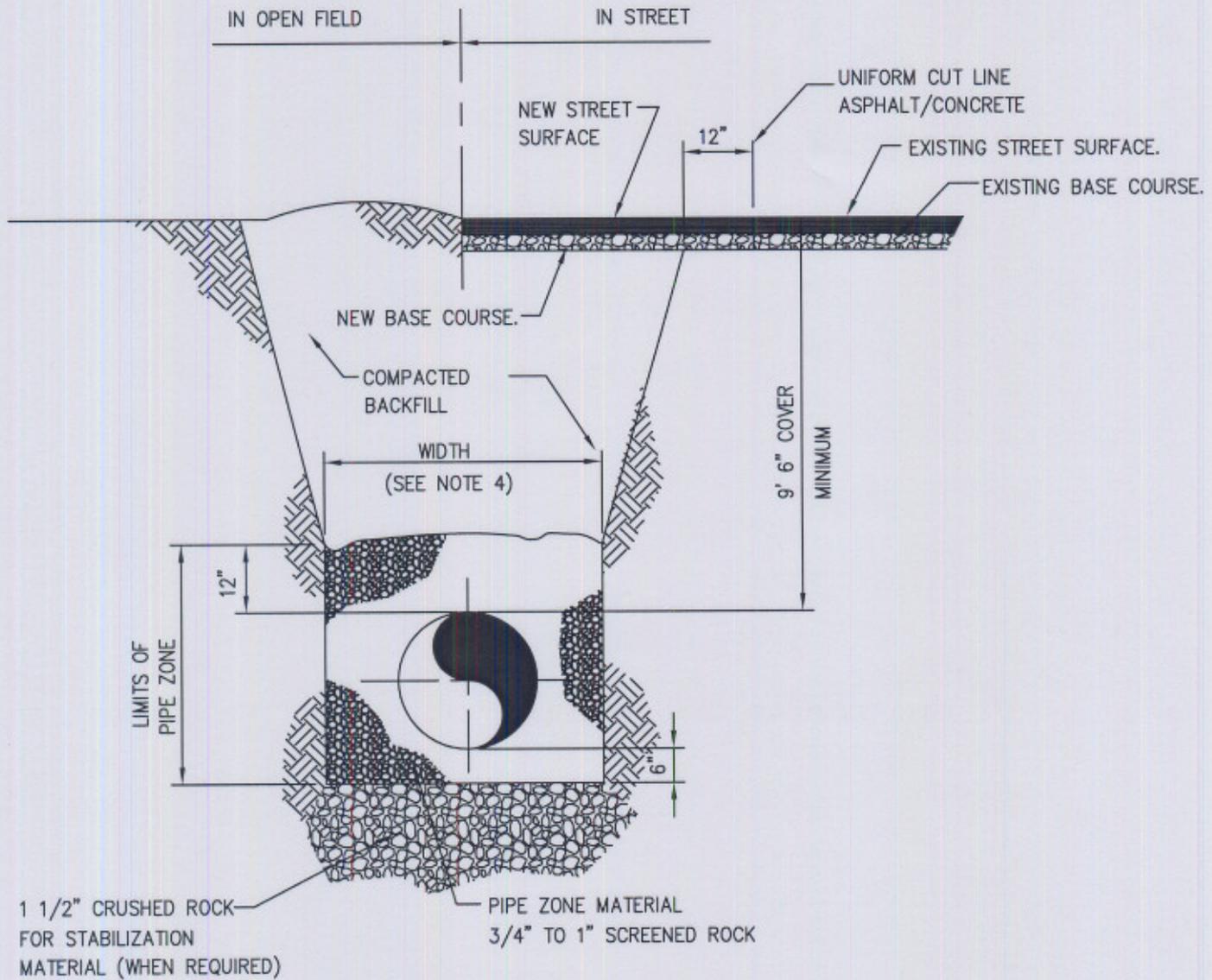
ISSUED:



TOWN OF SILVERTHORNE
 SANITARY SEWER SERVICE IN-LINE CLEANOUT

DETAIL

S-2



- NOTES:
1. ASPHALT PATCH SHALL BE A MINIMUM OF 3" ASPHALT ON 6" ROADBASE OR SHALL MATCH EXISTING PAVEMENT SECTION, WHICHEVER IS GREATER.
 2. TRENCH WALLS TO BE SUPPORTED AS REQUIRED BY O.S.H.A.
 3. MINIMUM COVER TO BE BELOW OFFICIAL STREET GRADE.
 4. MINIMUM TRENCH WIDTH = PIPE O.D. + 12"
MAXIMUM TRENCH WIDTH = PIPE O.D. + 24"

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ISSUED:

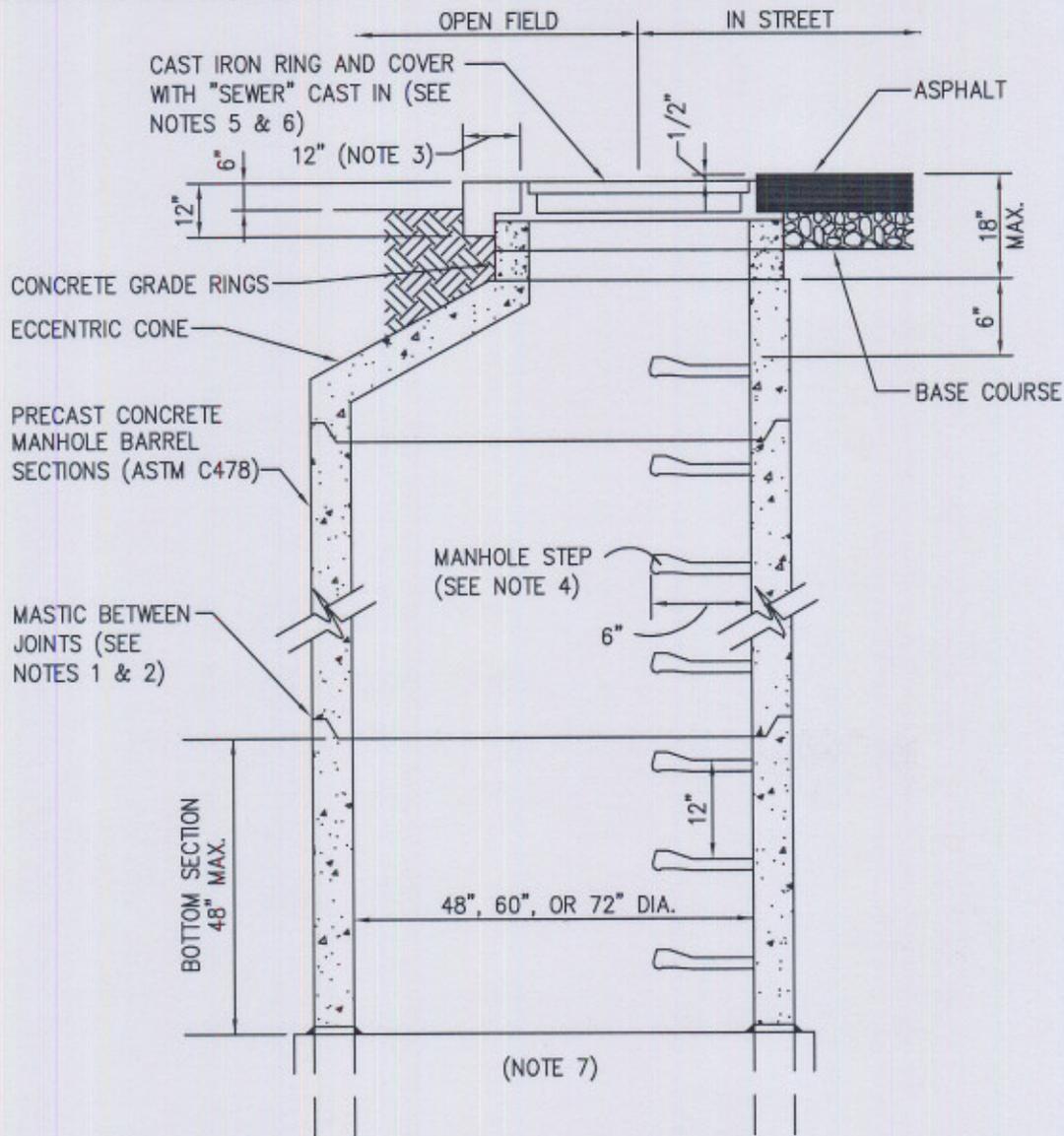


TOWN OF SILVERTHORNE

TYPICAL SEWER TRENCH SECTION

DETAIL

S-3



MANHOLE SECTION WITH
ECCENTRIC CONE

- NOTES:
1. ALL JOINTS TO BE RUBBERNEK OR RAMNEK.
 2. ALL JOINTS SHALL BE DOUBLE SEALED WITH FLEXIBLE PLASTIC JOINT SEALING MATERIAL TO EXTRUDE INTO MANHOLE AND BE TRIMMED OFF IF BELOW WATER TABLE.
 3. ALL MANHOLES PLACED IN THE "OPEN SPACE" AREAS SHALL BE INSTALLED WITH THE RING AND COVER AT AN ELEVATION THAT IS 6" ABOVE FINAL GRADE WITH A COLLAR OF CONCRETE. A MARKER POST SHALL BE INSTALLED NEAR BY. SEE MARKER POST DETAIL.
 4. STEPS INSTALLED OVER DOWNSTREAM INVERT OF MANHOLE AND SHALL BE COPOLYMER COATED PLASTIC 1/2" GRADE 60 STEEL REINFORCED, SIMILAR TO PS2-PF MANUFACTURED BY MA INDUSTRIES.
 5. 60" OR LARGER DIAMETER MANHOLES REQUIRE A 30" OPENING.
 6. ALL RING AND COVERS TO BE CASTINGS, INC. J-1161 FOR 24" OPENINGS OR J-1361 FOR 30" OPENINGS.
 7. SEE EITHER CAST-IN PLACE OR PRECAST MANHOLE BASE DETAIL
 8. AVOID 12" HIGH BARREL SECTIONS IF POSSIBLE.
 9. WRAP ALL BARREL SECTIONS AND CONE WITH BITCHATHANE WRAP - 6" OVERLAP REQUIRED.

NOTE:
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ISSUED:

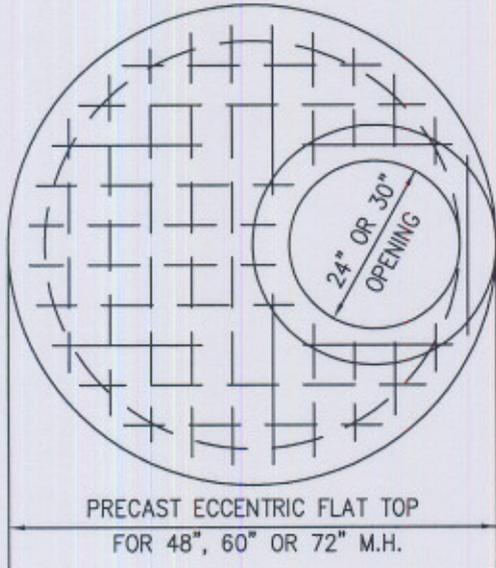


TOWN OF SILVERTHORNE

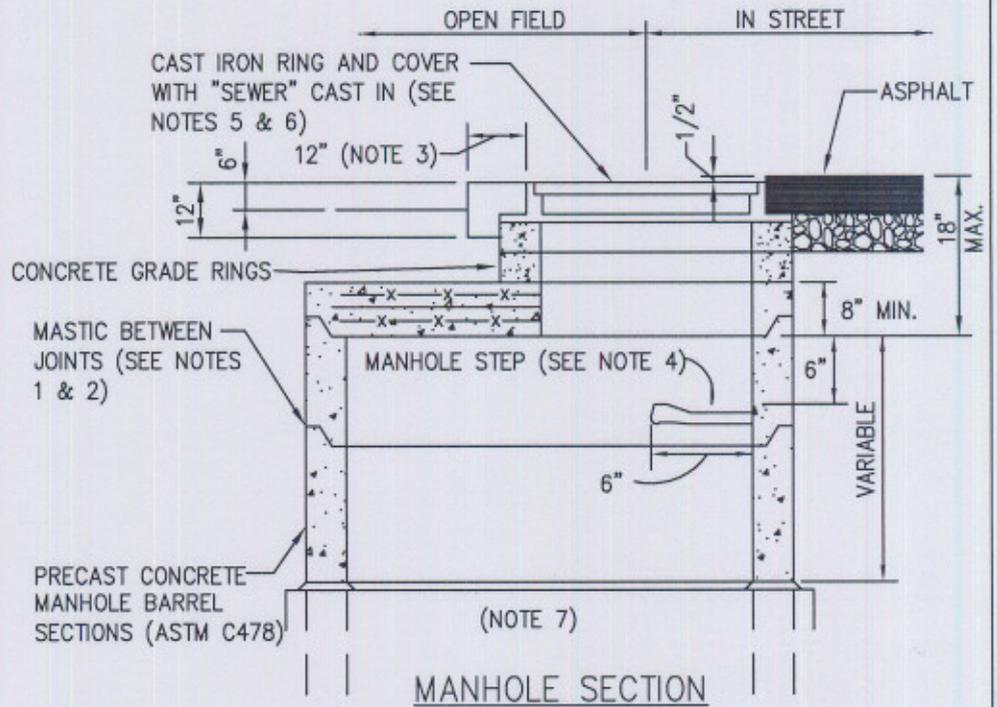
STANDARD MANHOLE
RISER AND COVER

DETAIL

S-4



PLAN



MANHOLE SECTION
WITH FLAT TOP

(TO BE USED WHERE INVERT TO TOP OF COVER IS LESS THAN 8'-6")

NOTES:

1. ALL JOINTS TO BE RUBBERNEK OR RAMNEK IF ABOVE THE WATER TABLE.
2. ALL MANHOLES PLACED IN THE "OPEN SPACE" AREAS SHALL BE INSTALLED WITH THE RING AND COVER AT AN ELEVATION THAT IS 6" ABOVE FINAL GRADE WITH A COLLAR OF CONCRETE. A MARKER POST SHALL BE INSTALLED NEAR BY. SEE MARKER POST DETAIL.
3. STEPS INSTALLED OVER DOWNSTREAM INVERT OF MANHOLE AND SHALL BE COPOLYMER COATED PLASTIC 1/2" GRADE 60 STEEL REINFORCED, SIMILAR TO PS2-PF MANUFACTURED BY MA INDUSTRIES.
4. 60" OR LARGER DIAMETER MANHOLES REQUIRE A 30" OPENING.
5. ALL RING AND COVERS TO BE CASTINGS, INC. J-1161 FOR 24" OPENINGS OR J-1361 FOR 30" OPENINGS.
6. SEE EITHER CAST-IN PLACE OR PRECAST MANHOLE BASE DETAIL
7. AVOID 12" HIGH BARREL SECTIONS WHEREEVER POSSIBLE.

NOTE: THIS DETAIL PROVIDES AN EXAMPLE OF THE MINIMUM STANDARD ALLOWED BY THE TOWN OF SILVERTHORNE WATER DEPARTMENT. ANY PROPOSED DEVIATIONS FROM OR CHANGES TO THESE STANDARDS MUST OTHERWISE BE APPROVED BY THE TOWN OF SILVERTHORNE WATER DEPARTMENT. NO SCALE

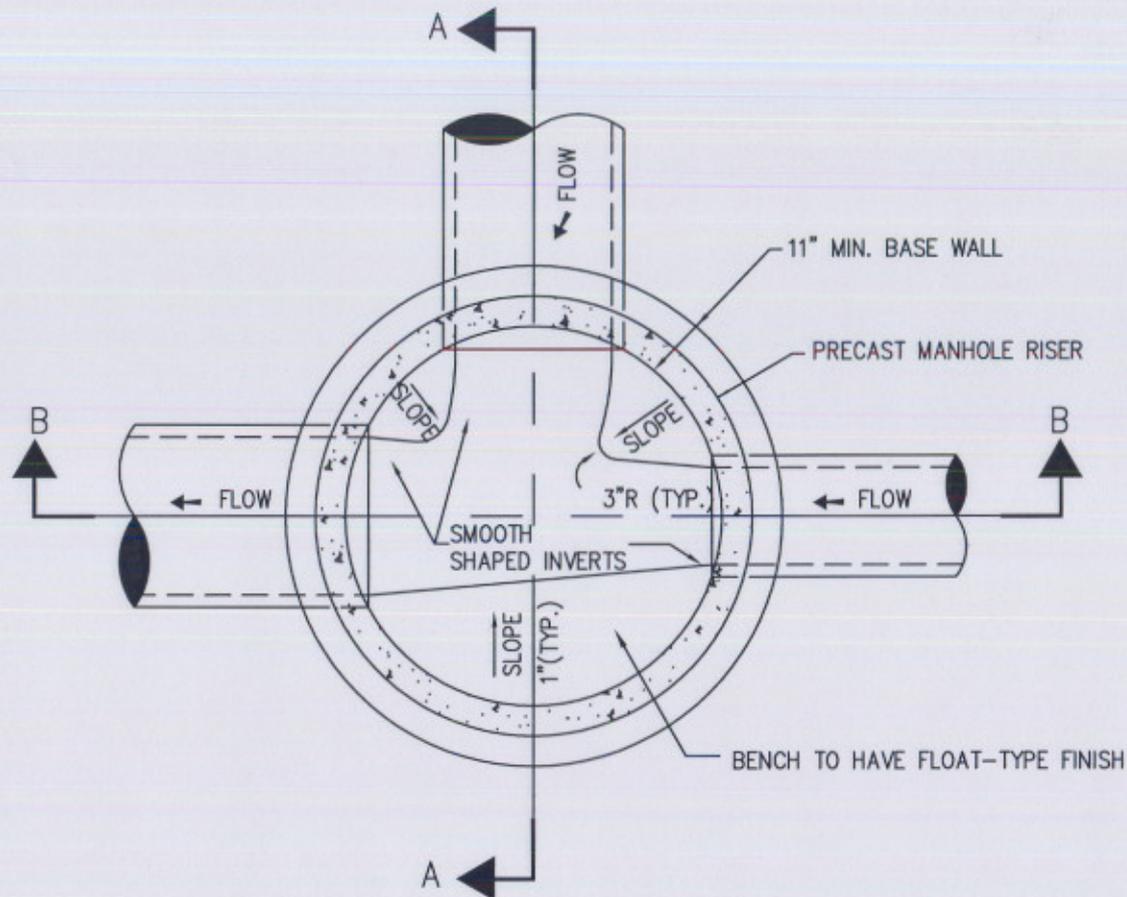
ISSUED:



TOWN OF SILVERTHORNE
SHALLOW MANHOLE
RISER AND COVER

DETAIL

S-5



NOTES:

1. CONCRETE BASE AND/OR INTERIOR CONCRETE FILL SHALL BE MINIMUM 2500 PSI CONCRETE
2. SEE CAST-IN-PLACE OR PRECAST CONCRETE MANHOLE BASE FOR SECTIONS A-A AND B-B.

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NO SCALE

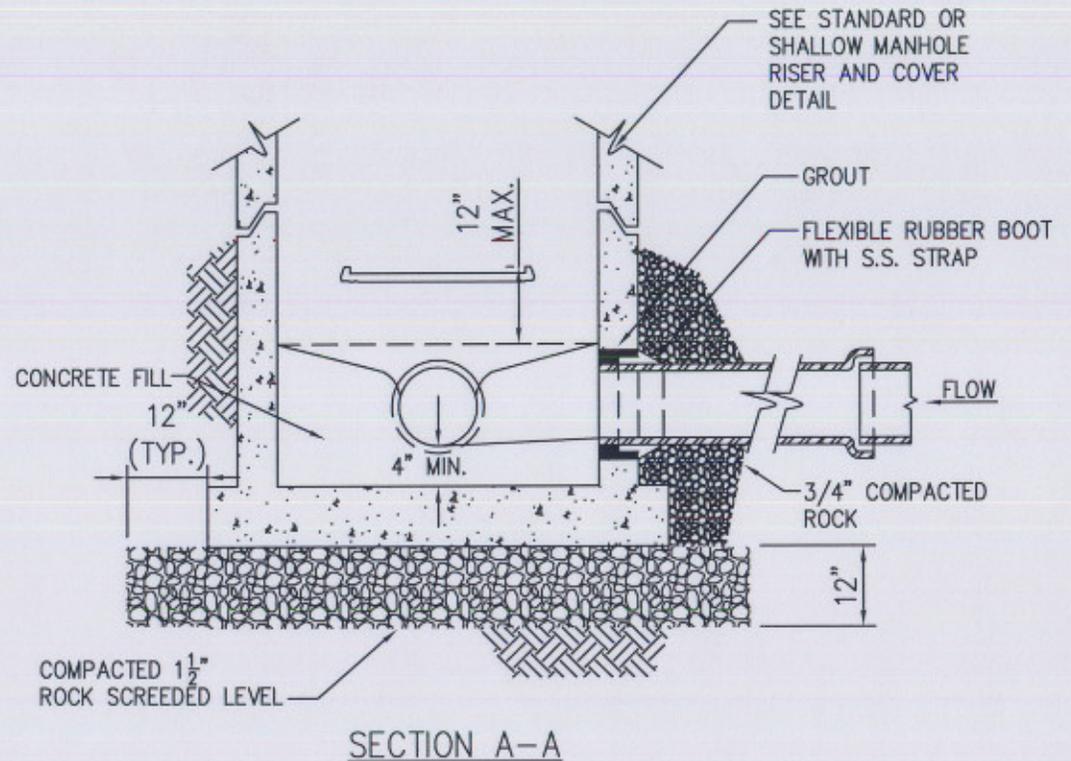
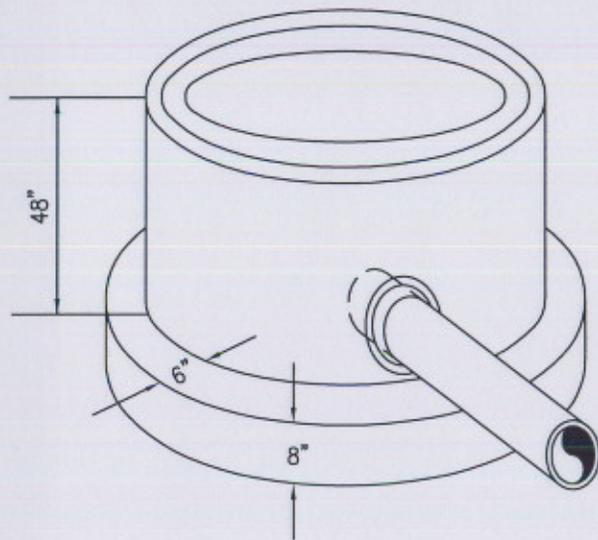
ISSUED:



TOWN OF SILVERTHORNE
 MANHOLE BASE INTERIOR

DETAIL

S-6



NOTE:

1. PRECAST CONCRETE SHALL MEET OR EXCEED STRENGTH OF 4000 PSI.
2. APPLY LATEX BONDING AGENT TO PRECAST BASE SECTION BEFORE PLACING CONCRETE FILL BASE AND INVERTS.

NOTE:
THIS DETAIL PROVIDES AN EXAMPLE OF THE MINIMUM STANDARD ALLOWED BY THE ARAPAHOE COUNTY WATER & WASTEWATER AUTHORITY. THE DESIGN ENGINEER SHALL AMEND THE DETAIL AS NEEDED TO ADJUST TO SPECIFIC PROJECT CONDITIONS.

NO SCALE

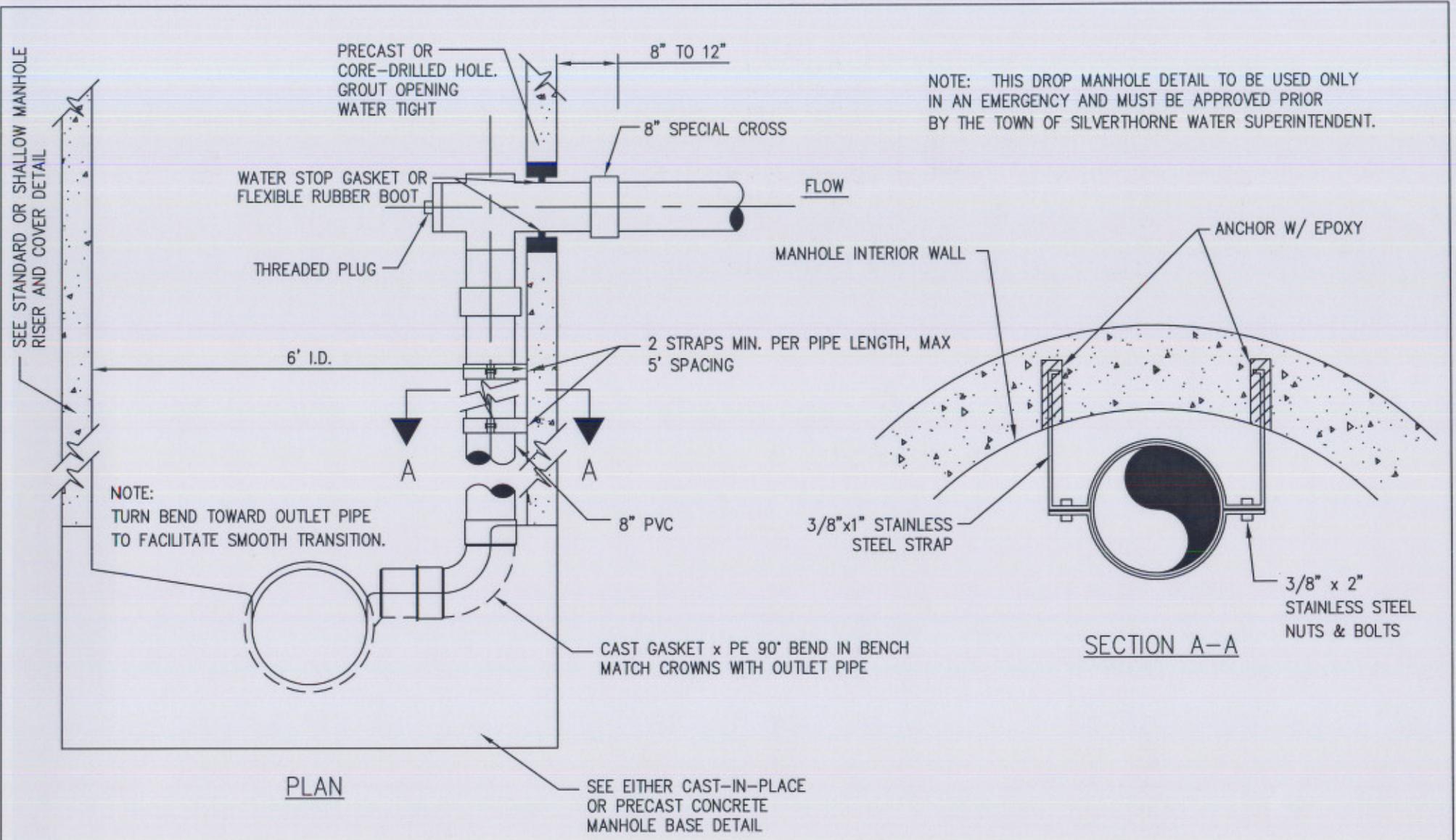
ISSUED:



TOWN OF SILVERTHORNE
PRECAST CONCRETE MANHOLE BASE

DETAIL

S-7



NOTE: THIS DETAIL PROVIDES AN EXAMPLE OF THE MINIMUM STANDARD ALLOWED BY THE TOWN OF SILVERTHORNE WATER DEPARTMENT. ANY PROPOSED DEVIATIONS FROM OR CHANGES TO THESE STANDARDS MUST OTHERWISE BE APPROVED BY THE TOWN OF SILVERTHORNE WATER DEPARTMENT.

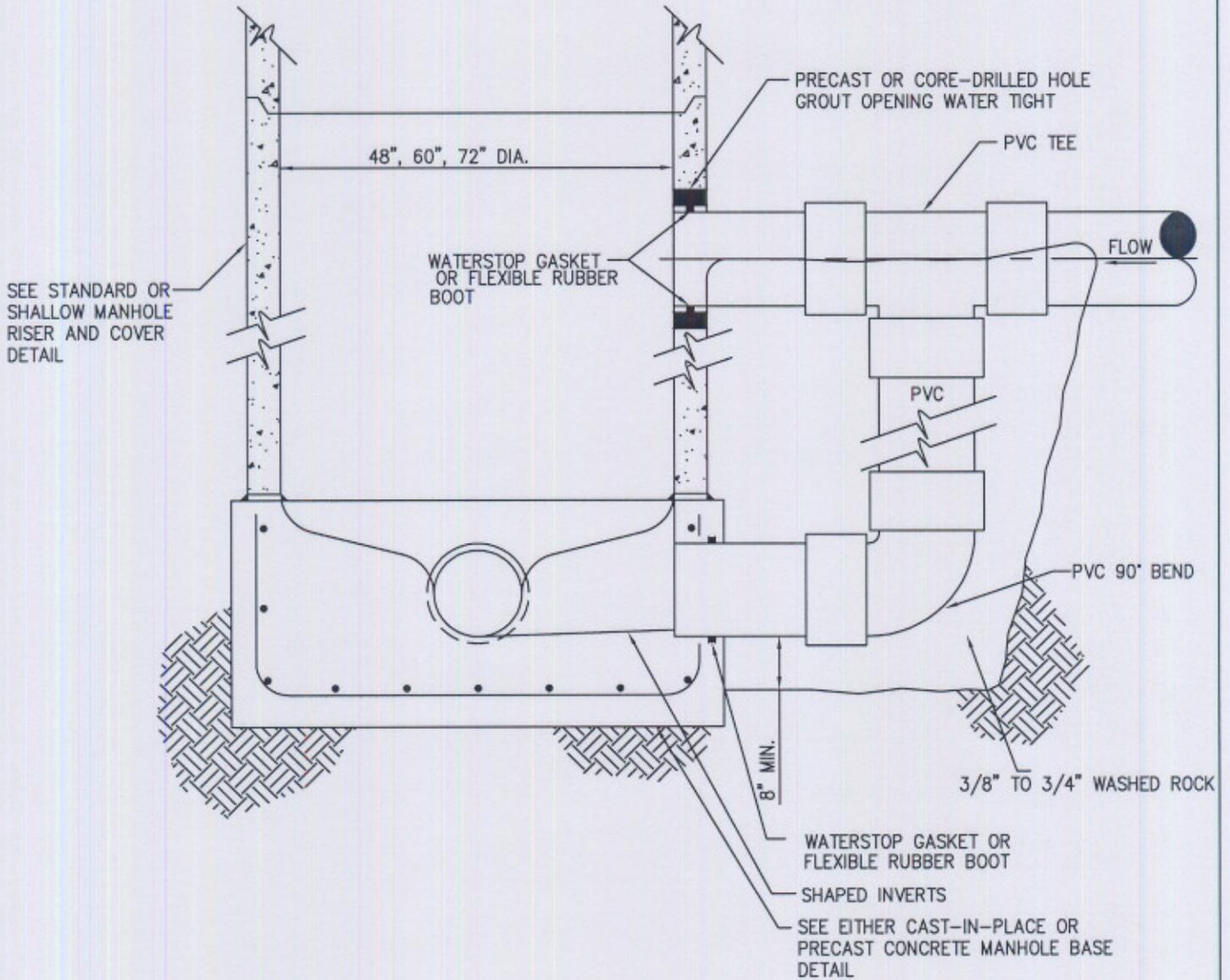
NO SCALE

ISSUED:



TOWN OF SILVERTHORNE
INSIDE DROP MANHOLE

DETAIL
S-8



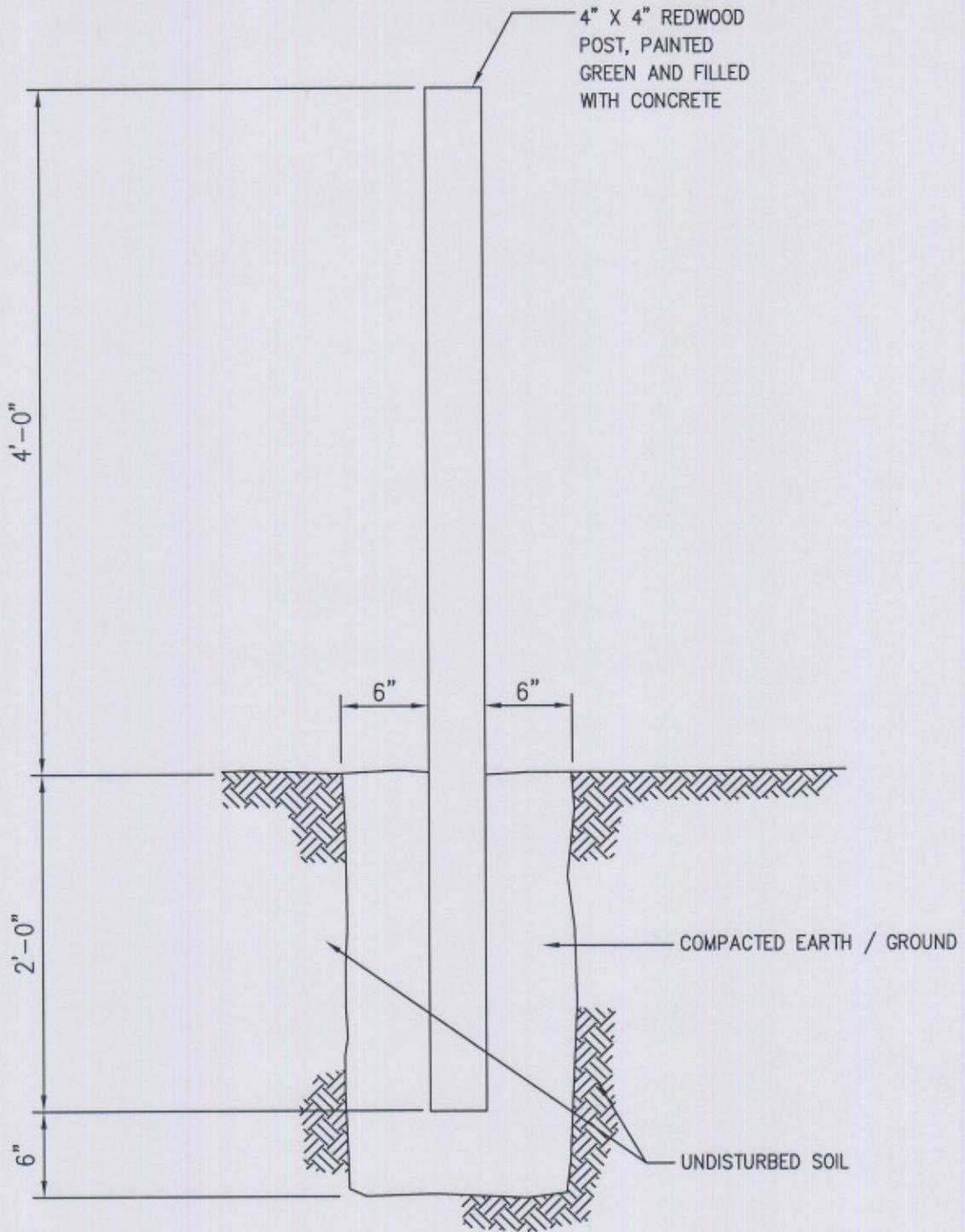
NOTE:
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ISSUED:



TOWN OF SILVERTHORNE
 OUTSIDE DROP MANHOLE

DETAIL
 S-9



NOTE:

1. PROVIDE ONLY IF MANHOLE NOT IN TRAVELED WAY.

NOTE:
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NO SCALE

ISSUED:



TOWN OF SILVERTHORNE

MANHOLE MARKER POST

DETAIL

S-10