

TOWN OF SILVERTHORNE

WATER SYSTEM CRITERIA

December 2005

TOWN OF SILVERTHORNE WATER SYSTEM CRITERIA

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Public Works Director**

TOWN OF SILVERTHORNE WATER SYSTEM CRITERIA

I. GENERAL

The Town of Silverthorne has developed a Water System Master Plan which identifies the water system components such as source wells, treatment facilities, pump stations, storage tanks, pressure zones and transmission and distribution lines. The construction of transmission, distribution and service lines for individual subdivisions of residential development and for commercial development shall be the responsibility of the individual Developer. Once constructed, the distribution lines and associated appurtenances such as fire hydrants shall be dedicated to the Town for operation and maintenance. Extensions of the existing water system to and around the developing property shall be governed by the provisions of the Code of the Town of Silverthorne, Chapter 3, Article IV, Water.

The Developer shall be responsible for distributing water through the development in accordance with the requirements of the Silverthorne Town Code and following Water System Criteria. Design criteria and construction specifications and requirements may be promulgated, changed or amended from time to time at the sole discretion of the Public Works Director and shall be effective upon approval and authorization of the Public Works Director. The Public Works Director shall have the authority to waive, supercede or alter such standards and/or requirements on a case-by-case basis if he or she determines that there is sufficient and/or practical reason to do so. Such action by the Director may result in standards which are either more or less stringent than those appearing in this document.

Fire protection service is provided by the local Fire District, which is a separate entity from the Town of Silverthorne municipal government. The Town works cooperatively with the Fire District often utilizing the district as a referral agency in order to provide input and comment with respect to development proposals. The Town has adopted the International Fire Code – (the specific edition is updated from time to time – check with the Building Official to find out the current edition being used by the Town.) Some of the items which are pertinent to water system design and construction are paraphrased in the sections which follow, but the International Fire Code and its Amendments shall be consulted and followed for more specific criteria and requirements, as necessary. In addition the Town may apply more stringent requirements on a case by case basis, based on the Fire Districts needs and concerns.

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 to be used, and for the installation of water system related improvements. 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 System: The Town of Silverthorne's water system is comprised of four basic pressure zones with operating pressures ranging from 35 psi to a maximum normally allowable pressure of 140 psi. The zones are designated as shown in Table 1.

TABLE 1
WATER SYSTEM PRESSURE ZONES

| Zone | Lower Limit Elevation (feet) | Upper Limit Elevation (feet) | Zone Tank Overflow Elevation (feet) |
|---------|------------------------------------|------------------------------------|----------------------------------------------|
| Low | 8480 | 8680 | 8780± |
| Base | 8680 | 8880 | 8975± |
| 2W & 2E | 8880 | 9080 | 9180± |
| 3W & 3E | 9080 | 9280 | 9380± |

Water distribution facilities shall be designed within the proper zone in which the development is located within to ensure that it can be served via gravity and does not require pressurization or pumping.

The Town's supply system is comprised of wells with combination booster pumps, chlorination, and fluoridation stations. The Water System Master Plan (separate document) further illustrates Silverthorne's system showing existing and proposed facilities with sizes and schematic locations.

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

C. Unit Water Uses: Estimates of water usage and system development fee (i.e. “tap fee”) assessments for proposed developments shall be determined using the Town of Silverthorne use Classification Schedule found within Chapter 3 of the Silverthorne Town Code.

Water use shall be estimated at not less than an average maximum daily rate of 350 gallons per day per EQR, or 100 gallons per day per capita. Irrigation demands other than other ordinary onsite landscaping shall be determined on a case by case basis specific to the scope of the proposed project.

D. Water Rights: Each new development, which is not currently within the corporate limits of the Town of Silverthorne, will be required to provide the needed rights to serve the project in accordance with the Town’s Annexation Policies described in the Town Code.

E. Friction Factors: Friction factor values (C) for water system analysis and design shall be as shown in Table 2.

TABLE 2

FRICITION FACTORS

| Pipe Size | “C” Value |
|--------------------|-----------|
| 6-inch and 8-inch | 100 |
| 10-inch and larger | 110 |

F. Fire Flow Requirements:

1. *Typical Fire Flow requirements are described below. These requirements and methods were reviewed and approved by the Fire District during the drafting of these Water System Criteria. If in the meantime, the Fire District changes their standards and requirements, then those standards and requirements shall supersede the fire flow standards and requirements found in this document. Additional Questions related to fire flow requirements and sprinkler systems shall be directed to the Fire District.

For the base pressure zone, the basic system of supply, storage, treatment, transmission, and pumping capacity was designed to supply 3,500 gallons per minute for 3 hours. All fire flow requirements shall be limited to this

system capacity, furnished at 20 psi residual pressure, in combination with average peak daily flow rates. The flow rate for any structure, or set of structures requiring rates over this maximum, must first be reduced through the use of sprinklers, control of building construction materials, control of space between buildings and control of the building fire loads. The standard for determining structure fire flows shall be "Needed Fire Flow," a Texas Instruments (TI-59) Program which is based on the Insurance Services office Guide for Determination of Required Fire Flow, 1974; The Fire Suppression Rating Schedule, 1980; and the Commercial Fire Rating Schedule, 1975. A brief description of the program follows:

The calculation of Needed Fire Flow requires three steps. After determination of the Construction Class (C), it is necessary to determine the total Affective Area (A). This is step one and has many variables according to Construction Class (C). When the Affective Area (A) is determined, the formula, $18 C (A)^{0.5}$, will provide Basic Fire Flow (BFF) of the building.

Step two limits this flow according to the following limits.

| | |
|-----------------------------------|-------------------------|
| Construction Class ¹⁻² | -- 8,000 G.P.M. Maximum |
| Construction Class ³⁻⁶ | -- 6,000 G.P.M. Maximum |
| One Story, All (C) | -- 6,000 G.P.M. Maximum |

This provides the Adjusted Fire Flow (AFF), to which additional factors are applied.

Step three adjusts the Basic or Adjusted Fire Flow by additional factors to establish the Needed Fire Flow (NFF). The formula of $(O) (S) (X) (BFF \text{ or } AFF) + \textcircled{R} = \text{N.F.F.}$, will complete the process. The items must be applied in proper order or the calculation will be incorrect. The Occupancy Factor (O) is based on the combustibility of the occupancy contents. The factor ranges from 0.75 to 1.25 and may increase or decrease the required flow. The Sprinkler Factor (S) is a credit for a full rated sprinkler system. The system must be complete to receive the 50% credit allowed. Exposure Factor (X) is the sum of separation factors. This factor is an add-on factor, however, it may not exceed 75%. Wood shingle roofs \textcircled{R} create an additional exposure hazard and increase the fire flow requirement by 500 G.P.M. Additional questions related to fire flow requirements and sprinkler systems shall be directed to the Fire District.

The ability to take the fire flows out of the mains is mostly a function of hydrant spacing and hydrant type.

- a. Hydrant type: All hydrants shall have one 5-1/4 inch pumper nozzle and two 2-1/2 inch nozzles. The required hydrant is further described in Section IV.A.5. of this document.
- b. Hydrant spacing: The following criteria must be met when considering hydrant spacing.
 - (1) The needed fire flow must be provided by a minimum of 2 hydrants in all cases and may be supplied by up to three (3) hydrants for flows of 2,500 gpm or less and up to four (4) hydrants for required flow rates of 2,500 to 3,500 gpm.
 - (2) There must be enough hydrants spaced around a building such that the distance from each hydrant to the structure, measured as the hose would be laid (i.e. from the hydrant through the pumper and to the fire), will add up to the total needed fire flow according to the following:

TABLE 3

HYDRANT RATING CRITERIA

| Distance from Structure (feet) | Fire Flow Credit (gpm) |
|--------------------------------|------------------------|
| 0-300 | 1,000 |
| 301-500 | 670 |

Note: No hydrant will be credited unless it has easy access to a pumper engine. No hydrant requiring a hand lay will be credited.

- (3) In subdivisions allowing only single-family detached or duplex configured building it is acceptable to locate a fire hydrant on the street at a spacing of not more than 600 feet.
- (4) When in the opinion of the Fire Chief, additional hydrants are needed to better protect the area or to provide better coverage of a hazard, he may require that a hydrant be located within a 150 foot straight line distance of all portions of each building.

- (5) The detailed location requirements of Section III. B of this document are adequately followed.

G. Pressure: The system shall be capable of supplying the required demands at the following specified pressures:

1. Minimum pressure of 30 psi at peak hour demand.
2. Required fire flows at 20 psi residual pressure during peak day demands.
3. Normal operating pressure between 35 and 140 psi.

III. DETAILED DESIGN REQUIREMENTS

A. Water Lines:

1. Distribution and transmission system pipelines:
 - a. Shall not be smaller in size than as shown on the Water System Master Plan drawings. Analysis of the proposed subdivision system shall be made to ensure Master Plan sizes are adequate. In most cases, the minimum distribution system pipe line shall be 8-inch. However, in single family residential subdivisions, allowing only structures of single family detached and duplex configuration, 6-inch distribution lines may be installed providing that:
 - (1) Required fire flows can be met.
 - (2) No single 6-inch line is longer than 1,000 feet, unless otherwise approved by the Town of Silverthorne Utilities Director or Water Superintendent.
 - (3) 8-inch (minimum) lines are provided passing throughout the subdivision where system extensions are to be made or are planned to be made on the perimeters.
 - b. Shall be looped wherever feasible to provide for a system which adds to the strength of the surrounding system, provides adequate flexibility and precludes any dead end mains.
 - c. Shall be AWWA, Class 52, push on joint, ductile iron pipe (DIP). See Section IV.A.1.a.

- d. Shall be installed with conductivity connections as described in Section IV.A.4.
- e. Shall be installed with a minimum cover of 9.5 feet to top of pipe under paved or gravel surfaces where automobile traffic is intended, and 8.5 feet in all other locations. The cover shall be maintained when water lines pass under culverts or drainage swales or road side ditches. The maximum allowable depth of cover shall be 12 feet. Where cover limitations exist, water mains may be installed at shallower depths, subject to Town approval. Under these circumstances waterlines having depths between 6 to 9.5 feet deep shall be insulated with 4" blueboard insulating material. In extreme cases where cover is severely water mains less than 6 feet in depth may be considered by the Town. If the Town approves this shallow depth, then the line shall be box insulated on three sides with 4" blueboard. Insulation shall be boxed around the main on top and both sides. Insulation shall be boxed 18" away from the main. 5 foot bury is the absolute minimum that will be considered for water line depths and is subject to Town approval.
- f. Shall be installed with a minimum 10 foot separation from any sewer main. This distance is to be from center of both pipes. Normally water lines shall be designed parallel and 12 feet apart from sewers (center line to center line).
- g. Shall have isolation valves installed in the system:
 - (1) at least every 1,000 feet where services are connected,
 - (2) at least every 2,000 feet where the line is in open area between subdivisions or supply or storage facilities, and
 - (3) where needed to provide system flexibility and reliability.
 - (4) valves shall be resilient seat NRS gate valves and shall open-left (Mueller, US, Waterous or Clow brand resilient wedge valves only). Isolation valves shall be located at all tees and spaced not more than 1000' apart on straight runs. (Check with Water Superintendent for verification of specific model numbers.)
 - (6) valve boxes shall be Tyler square bottom type. (Check with Water Superintendent for verification of specific model numbers.)

(7) pipe joints and epoxy valves. All pipe joints must be copper strapped or cad-welded for conductivity. Where cad-welding is the method chosen, heavy guage single strand wire must be used (minimum 6G wire). Repaint all welded areas.

- h. Shall be insulated from freezing where construction phasing or other circumstances indicate a risk – (see III.A.1.e.)
- i. Water mains and their appurtenances must be properly bedded. The material requirement for bedding is 3/4" or 1" screened rock. There must be a minimum bedding of 6" below the pipe and 12" above and to the sides of the pipe.

Service system lines:

- a. Shall be 1-inch HDPE for individually metered residential services. Service line material shall be Cresline HD CE Blue™ unless otherwise approved by the Town water Superintendent. Larger sizes for non-metered fire flow may be considered on a case by case basis.
- b. Shall be equipped with pressure regulating valves where the static pressure can exceed 80 psi.
- c. Shall be High Density Poly Etheylene (HDPE) Cresline HD CE Blue™. Pressure rating shall be 200 psi or greater. Proposed material substitutions from different manufactures must at a minimum meet these criteria and must be approved by the Town Water Superintendent.
- d. Shall be installed with a minimum of 8.5 feet of cover and a maximum of 12 feet of cover. If any part, including the goose neck, has less than the required 8.5 feet of cover, freezing prevention provisions will be necessary - (see Section III.A.1.e.).
- e. Shall be installed with a curb stop and box between 1 and 3 feet within the property line beyond the right-of-way or easement.
- f. Shall be installed with a minimum 10 foot separation from, or with a one foot vertical separation above, sewer service lines.

- g. Shall be insulated under all driveways, roadways, or parking areas or where any part of the service line is less than 8.5 feet from the below ground surface.
- h. Service lines shall be stubbed just beyond the property line of the lot for which the water service line serves. This is the construction and cost responsibility of the Developer's.
- i. Service taps shall be separated by at least 18" and shall be no closer than 24" to the end of a pipe section. Wet taps and saddles are required for service lines. Abandoned service lines shall be terminated at the corporation stop and must be plugged with a threaded plug.
- j. The Owner/Contractor shall be responsible to perform the live tap on the pressurized main. Owner/Contractor responsible for any damage caused to the water main or related infrastructure.
- k. All multi-family and/or commercial buildings that exceed (3) three separate units shall be required to install a single meter box to facilitate in measuring water consumption for the entire building. Separate, individual meters may be installed beyond the master meter but will be the responsibility of the homeowners association or property management company to apportion the bill between individual units within the building. The service line to the meter box shall not be less than 4" DIP.
- l. Where absolutely necessary due to the length of a service line run, service line couplings shall be brass or cast bronze body with compression type outlets – (Mueller only, unless otherwise approved by the Town's Water Superintendent.) No couplings are permitted within 25' of any building structure or foundation. The service line must be pressurized and the couplings inspected prior to backfill. No buried, soldered joints will be allowed.
- m. Water meter kit will be provided by the Town. The charge for the water meter kit will be paid by the Developer at the time of building permit issuance. The meter kit will have remote readout. The water meter assembly will be the same size as the service line except where the service line also provides fire service. The water meter shall be installed with a yoke in such a manner that there is no mechanical strain on the meter and the piping will not restrict meter removal. The meter will only be installed in the horizontal position. Electrical continuity will be maintained across the entire water meter assembly with copper continuity straps.

B. Fire Hydrants:

1. Shall be as described in Section IV.A.5.
2. Shall not be closer than 30 feet measured distance to the closest structure.
3. Shall be accessible from roads and shall be located so that there is direct, unobstructed access to them.
4. Shall be installed on a lateral line of 6-inch ductile iron pipe no longer than 150 feet in length. The lateral shall have an isolation valve in it located 2 to 4 feet from the fire hydrant and shall have conductivity connections in accordance with Section IV.A.4.
5. Shall be installed with a breakaway traffic flange located at the elevation equal to the adjacent finished grade.
6. Shall be installed in a location or manner such that a clear operating platform free of obstructions or obstacles exists within a seven (7) foot radius of the operating nut.
7. Shall be installed in a location or manner such that the path a fireman would be required to take from the logical pumper location to the fire hydrant is not impaired by any obstruction or obstacle including landscape berms or drainage swales having a vertical deviation of more than 18-inches from the traffic flange elevation.
8. 6" diameter concrete crash bollards may be required in locations as determined by the Water Superintendent. The requirement for bollards will be determined on a case by case basis. Bollards provide protection from potential damage done to fire hydrants caused by vehicular collisions. Bollards shall be located no closer than 3 feet from the center of the hydrant operating nut. Top of bollard shall not extent higher than the bottom of the pumper nozzle. Bollards shall be constructed from iron pipe which is filled with concrete and which includes a toweled dome on top. Bollards are to be buried to a depth of 3 feet within a 12 inch diameter hole. The excavated area shall be filled to grade with concrete.

C. Miscellaneous Provisions:

1. Shall be paid for in accordance with the following table:

RESPONSIBILITY FOR PIPELINE COSTS

| | Town | Developer |
|--------------------------------------------------------------------------------------------|------|-----------|
| Original Platted part of Town | X | |
| Original unplatted part of Town | | X |
| Annexations to original part of Town | | X |
| Up sizing lines to meet transmission needs in other areas of Town | | X |
| Transmission lines and wholesale facilities (tanks, wells, pump station, PRV vaults, etc.) | X | |

The Developer is responsible for the design and construction of and inspection costs related to water lines needed to provide the amounts of water for domestic use and fire flows for the property in concern in accordance with Table 5. 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 Water 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 water 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 water system improvements. The Town may suspend or shut down work on the water system improvements if there is a disagreement about the inspection schedule, construction methods and/or materials or any construction related matter regarding the water 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.

If the Water System Master Plan, or future needs of the Town, require a pipeline 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 pipeline installed. In instances where this occurs, the Town and Developer shall enter into a reimbursement agreement. No line 12-inches in diameter or less shall be considered as oversized.

2. Water Meters.

- a. Water meters are required on all services provided to customers within the Town. Meters must be paid for by the developer at the time of building permit application and will be provided by the Town. Remote read transponders shall be installed inside each building where there is a meter by the Silverthorne Water Department.
- b. The meter shall be installed inside each building and adequately protected from damage. It shall be installed to the approval of the Town and so that the meter has a minimum of 12-inches of clearance above and below, right and left and a minimum working space clearance of 3 feet on the side from which maintenance will occur. It shall be protected from freezing. Meters shall not be installed on the fire sprinkler system of any building. The Town stocks 3/4 & 1 inch meters. Other sizes will require ordering. Please allow a minimum of 4 weeks lead time.

3. Backflow Prevention Device. All service lines are required to have backflow prevention devices installed upstream of the water meter. Single family residential type buildings shall have a double check valve assembly similar or equal to a Watts Regulator No. 7. Multi-family, transient residential, and commercial buildings will require a higher degree of backflow protection depending on the level of potential hazard.

4. Thrust restraint.

- a. Three types of thrust restraints may be employed; thrust blocking, restrained joints, or the use of Mega-Lugs. Lines that are 12-inches and smaller in diameter shall use thrust blocks sized for the fitting to be restrained at test pressure while taking into consideration the soil bearing pressures. The thrust block shall be poured against firm, undisturbed soil. If sufficient undisturbed bearing area cannot be obtained for thrust blocks, oversized blocks, restrained joints in adequate lengths, or a combination of the two may be

acceptable, subject to Town approval. Thrust blocks shall be poured with a bond breaker in such a manner to leave the bolts accessible for repairs. Lastly, the use of Mega-Lugs or other comparable mechanical joint restraints as another alternative, subject to Town approval.

- b. For pipelines larger than 12-inches in diameter, a combination of thrust blocks and thrust restraints, or a total thrust restraint system shall be engineered and sized to handle the test pressures.
5. Fire Sprinkler Systems. The fire sprinkler system shall be equipped with flow detection equipment and shall have antitampering devices attached to valves. The location of sprinkler system equipment shall be approved by the Fire Chief.
6. Distribution system appurtenances.
 - a. Air Release Valves (ARVs) shall be required at the high points of pipelines where hydrants and/or service lines are not present. They shall be APCO Model No. 143C combination air/vacuum valve or approved equal.
 - b. Blow-offs will be installed at the end of all dead end lines in a similar manner to that shown in Detail W-9.
 - c. Main line pressure reducing valves (PRVs) may be required to meet the pressure zone requirements in the Town of Silverthorne. Where required, they shall be reviewed and approved by the Town and installed in a manner similar to the detail found at the end of this document. The detail is an example of a typical PRV and is provided for informational purposes. The PRV for each given site shall be designed for the pressures and site constraints of that particular site.
7. Easements. Where a water line or fire hydrant 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. The easement for a fire hydrant lateral line shall be as in item a. above and shall also extend 7-feet beyond the rear of the hydrant.
 - c. An easement dedicated to the Town shall be required for all hydrants. 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 hydrant(s).
 - d. 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.
 - e. 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.
8. Valve and fire hydrant operating wrenches. For each project, a valve and fire hydrant operating wrench shall be provided to the Town, as listed below, prior to final acceptance of the system:
- a. For each 15 valves or fraction thereof, one new buried gate valve operating wrench, and
 - b. For each 10 fire hydrants or fraction thereof, two new Waterous "Pacer" fire hydrant operating wrenches or one new wrench with a STORZ five-inch/operating nut combination similar to that supplied by American Snap Tite FSW-1.
9. Sewer crossings. Whenever any sewer main lines are crossed such that they are above or less than 18 inches below the water lines, the sewer line shall be C-900 type pipe for a horizontal distance of ten feet on either side or and perpendicular to the water line. The length of the C-900 pipe shall be sufficient to insure that the water line is not within ten feet of a standard sewer line. Sewer service lines that cross water mains shall have a 20 foot length of C-900 pipe centered on the point at which it crosses the water main or service line.

10. Landscaping, revegetation, surface restoration, and erosion control:
 - a. Wherever a water line 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 water line 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 shall require employment of additional measures such as riprap, planting of low shrubs, and the use of erosion control netting to promote slope stability.
11. 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 Water Works Association (AWWA). The following are "minimum" requirements.
 1. Pipe.
 - a. For distribution and transmission pipelines 6 inches and larger, the pipe shall be AWWA Class 52 ductile iron (DIP). All sizes shall be "push-on" joint type with rubber gaskets.
 - b. For 1 inch service lines, the material shall be High Density Poly Ethylene (HDPE). If a pipe line larger than 1 inch is required, the material shall be Class 52 ductile iron pipe, 4 inches in diameter.

2. Fittings.
 - a. Distribution system fittings shall be ductile iron, Class 52 cement lined, with mechanical joints. Conductivity straps are required.
 - b. Service line fittings shall conform to the material used and be acceptable for operating pressures of up to 150 psi. All fittings shall be compression type.
3. Valves.
 - a. All system section valves, service line valves in ductile-iron pipelines, and fire hydrant lateral valves, shall be gate valves, AWWA approved. Each valve shall conform to standards for buried service for a working pressure of 150 psi and be iron body, bronze-mounted, resilient seat, parallel seated, and open left (counter clockwise), have a non-rising stem, a 2 inch operating nut, and mechanical joint connections.
 - b. Service line valves. Corporation stops shall be Mueller or an approved equal for the required size and be of the compression fitting type. Curb stops shall be the same brand. All valves shall be compression type fittings.
4. Pipeline Conductivity. Conductivity of the pipeline shall be provided as follows:
 - a. For mechanical joints, copper straps, or other provisions for conductivity must be provided as approved specifically by the Town.
 - b. For push-on joints, the electrical conductivity across the joint shall be made with:
 - (1) Electro-Bond utilizing ½" x 6" copper strips with pre-welded pipe connections and bolted across joints.
 - (2) "Cadweld" CAM-109 welder, and cartridge CA15 may be used as an alternate with the approval of the Town. The connection wire shall be a No. 4 solid bare copper bare copper wire.
 - (3) After the connection has been completed, the connections, wire or strap and bolts, and pipe adjacent to the connections shall be thoroughly coated with enamel paint.

- (4) All pipe joints must be copper strapped or cad-welded to maintain conductivity. Where cad welding is the method chosen heavy gauge single strand wire (minimum 6 gauge) shall be used.

5. Fire Hydrants. All fire hydrants shall be Waterous "Pacer" WB-67 DDP with 34-inch traffic flange meeting the following requirements:

| | |
|---------------------|---------------------------------------------------------------------------------------------------------|
| Nozzzle | 5-1/4 inch |
| Inlet | 6 inch for mechanical joint |
| Depth of Bury | 9'6" or 8'6" (as required to meet the water line cover) |
| Operating Nut | 1 inch pentagon |
| Open | Left (CCW) |
| Outlets | Two 2-1/2 inch, one 5-1/4 inch pumper nozzle (threads to match existing) |
| Threads | National Standard |
| Caps | Cap with Pentagon Nut |
| Color | Red (all above ground parts) |
| Thrust Restraint | Bottom thrust block and 2-3/4" tie rods from main tee to hydrant bottom. Mega-Lugs are also acceptable. |
| Elevation of nozzle | 42" ± 3" operating nut above finished ground surface at traffic flange. |

6. Valve boxes.

- a. Main line valve boxes shall be cast iron, have 5-1/2 inch shafts and be 1/4 inch minimum thickness. They shall be an extension type with screw-on or slide-type adjustment, have a flared based to fit over the matching sized valve, and have a cover labeled "WATER."
- b. Curb stop boxes shall be cast-iron 2-3/4 inch diameter with extensions similar to Mueller H-10346. A cast iron, lid marked "Water" shall be attached to the curb box by means of a hexagonal brass nut. An acceptable optional curb box is a McDonald model No. 5601.
- c. Valve boxes in paved areas shall be 1/4" to 3/4" lower than the adjacent pavement grade. In areas where a valve box is located only partially within pavement, pavement shall be increased so as to completely surround the valve box. Valve boxes located in unpaved areas shall not be more than 2" below finished grade.

7. Thrust restraint.

- a. Thrust blocks shall be made of concrete with a mix no leaner than 1 part cement to 2-1/2 parts sand to 5 parts aggregate to 1/2 parts water, and have a 28 day strength of not less than 2000 psi. The bond breaker shall be a polyethylene sheeting.
 - b. Tie rods shall be steel with a minimum tensile strength of 60,000 psi. All joint harnesses, clamps, rods, bolts, washers, nuts and other metal parts shall receive two coats of enamel paint which meets the material and application standards called for elsewhere. All restraint rods shall be encased in polyethylene sheathing taped closed at each end.
 - c. Mega-Lugs or other comparable mechanical joint restraints, subject to Town approval.
8. Polyethylene sheeting/sheathing shall be a minimum thickness of 8 mils. For pipe or tie rod protection, it may be either tubular or flat sheets with provisions for making anti-corrosion connections and joints. Tears shall be likewise made watertight.
 9. Coal tar enamel paint shall be the proper product for the material it is being applied to and shall be installed in accordance with and in the thickness recommended by the manufacturer.
 10. Insulation shall be rigid extruded polystyrene boards measuring 16 inches or 2 feet by 8 feet by 4 inches thick with a high density skin. The boards shall be placed 18 inches above the pipe on either 1" or 3/4" screened rock bedding material.

B. Installation:

1. Installation of water lines, valves, fittings, and other appurtenances 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 workmen possessing the necessary knowledge, ability, skill and experience of workmen 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. Lines to be capped at the end of the days production.
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 of 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 Subcontractor'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 his 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 protection of the work and safety of the public through or around his construction operations. A traffic control plan (TCP) which is in conformance with the latest edition of the Manual in Uniform Traffic Control Devices (MUTCD) will be required for work that is to be done within public streets and right-of-ways. The TCP shall be submitted to the Town for review and approval prior to commencement of work.

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 water 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 W-1 through W-12 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, and/or the Fire District (for fire protection items and systems).

1. Construction checking.
 - a. 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 Water 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 water 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 water system improvements. The Town may suspend or shut down work on the water system improvements if there is a disagreement about the inspection schedule, construction methods and/or materials or any construction related matter regarding the water 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.

b. Inspection of Work.

- (1) Inspectors may be appointed to inspect materials used to observe the work done. Inspections may extend to all or any part of the work and to the preparation or manufacture of the materials to be used. The inspectors will not be authorized to alter the provisions of specifications, or to delay the fulfillment of the construction by failure to inspect materials and work with reasonable promptness. An Inspector cannot issue instructions contrary to the approved drawings and specifications or act as Foreman for any Contractor or Sub-contractor. The Inspector will have authority to reject defective material and to suspend any work that is being done improperly subject to the final decision of the Town.
- (2) If sub-standard material, not conforming to the requirements of the approved drawings and specifications, has been delivered to the project, or has 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 Developers expense, prior to 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) Pipeline installation, bedding and backfill.
- (b) Fire hydrant installation from main line tee to grading of ground at traffic flange.
- (c) All thrust blocks.
- (d) All valve boxes, main line, hydrant laterals, and service curb stop boxes form placement over valve to surface grading.
- (e) All service line connections to main lines.
- (f) Testing of residual chlorine content, and/or bacteriological count.
- (g) main line flushing subsequent to chlorine test.
- (h) Final pressure and leakage tests.
- (i) Conductivity.
- (j) Sewer line encasement.
- (k) All connections to existing Town systems.
- (l) Adjustments of fire hydrant traffic flanges, where required. (This includes any disassembly of fire

hydrants on site once material has been provided by equipment supplier).

- (m) Water meter installation whether interior to a building.
- (n) Blow-off installation.
- (o) Encasement pipe installation, "feeding in" main line.
- (p) PRV system installations.
- (q) Fire hydrant operation.

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 flush the pipelines as the work progresses by a means in accordance with good practice to insure that sand, rocks, or other foreign material are not left in any of the pipelines. If possible, the flushing shall be made through an open pipe end; otherwise, use of a fire hydrant may be acceptable, but only on special approval of the Town of Silverthorne Water Superintendent. When flushing, care should be taken to prevent damage to property or roadways or erosion of surrounding soils.
 - (2) Pressure Test. After each section of pipeline has been laid and partially backfilled, except for the joints, or except when the Town directs the trench to be backfilled for reasons of public safety, or if the Contractor elects to backfill prior to testing, as permitted, the pipe shall be slowly filled with water and tested. All pipe shall be tested at a pressure of at least 1.5 x the working pressure at the point of testing. Test pressures shall be not less than 1.5

times the working pressure at the highest point along the test section, but shall not exceed 180psi. Each street shall be tested separately, but outside feeder mains may be tested in convenient lengths. The duration of each pressure test shall be at least 2 hours.

Each section of pipeline being tested shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Town. The Contractor shall furnish all necessary labor and equipment to perform the test.

Before applying the specified test pressure, all air must be expelled from the pipe.

All exposed pipes, fittings, valves, hydrants and joints will be carefully examined during the open-trench test. Any cracked or damaged pipe or appurtenances found during the test shall be removed and replaced by the Contractor with sound material. The test shall be repeated until the results are satisfactory to the Town.

- (3) Leakage Test. A leakage test shall be conducted after the pressure test has been completed, unless the pressure test indicated that there are no leaks. The Contractor shall furnish the pump, pipe, connections, meters, and all other necessary apparatus, and shall furnish the necessary assistance to conduct the test. The duration of each leakage test shall be two hours and, during the test, the main shall be subjected to a hydrostatic pressure of 1.5 times the working pressure at the highest point along the test section, but shall not exceed 180psi. pounds per square inch.

No pipeline installation will be acceptable until the leakage is less than the amount computed by the following formula:

$$L=SD(P)^{0.5}/133,200$$

L = Allowable leakage in gallons (for two hour test)

S = Total length of pipe (feet)

D = Nominal diameter of pipe (inches)

P = Average test pressure during the test (psi)

Should any test of pipe disclose leakage greater than that specified above, the Contractor shall, at his own expense,

locate and repair the points of leakage until the leakage is within the specified allowance.

The pipe may be subjected to hydrostatic pressure and inspected and tested for leakage at any convenient time after the trench has been partially backfilled, except at the joints, or backfilled as permitted by the Town. Where any section is provided with concrete thrust blocks, the pressure test shall not be made until at least two days have elapsed after the concrete was installed.

- (4) Disinfecting. All newly installed water pipelines shall be disinfected after all construction work has been completed. Chlorine shall be added to the water in an acceptable method, in the amount to form a 50 ppm free chlorine residual. The introduction of chlorine into the pipeline shall be done under the supervision of the Town. The chlorinated solution shall be left in the pipelines for not less than 24 hours, and after that length of time, the chlorine residual of the solution, at any place in the system, shall not be less than 25 ppm. The line shall remain static during the disinfecting process.

At the end of 24 hours, a bacteriological test is to be performed to insure adequate disinfection. Upon approval of the disinfection, the new system shall be flushed until the chlorine residual is 0.3 ppm. When flushing the high concentration chlorine, it shall be discharged no closer than 300 feet from the Blue River, and it shall not be allowed to flow into any natural or man made channels where it could be carried quickly to the River.

After the final line flush, the line must remain static and isolated for a minimum of 24 hours prior to a sample being drawn to check for bacteria. The Contractor will be responsible for collecting and arranging for the lab analysis of the samples and shall provide all lab results to the Town. Samples are required to be analyzed by a State accredited lab.

- (5) Fire Hydrant Operation and Flow. The Silverthorne Water Superintendent shall conduct an operational and flow test on each newly installed fire hydrant. No hydrant will be accepted if it cannot be cycled through two complete open and shut operations without malfunction and if it shows any

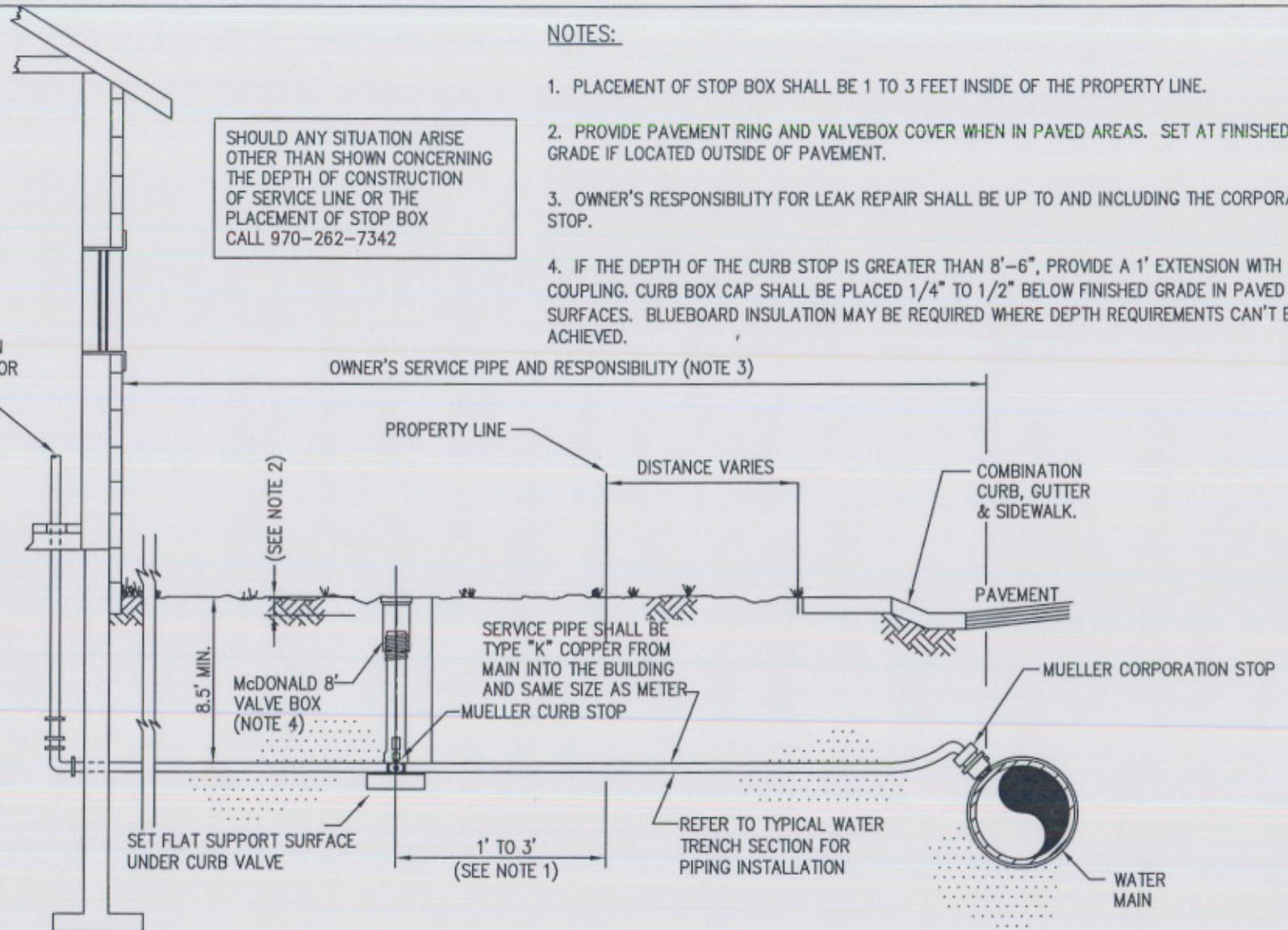
leakage during the test process. The water system will not be accepted if the testing reveals the fact that the required fire flows for the project cannot be achieved through the installed hydrants.

NOTES:

1. PLACEMENT OF STOP BOX SHALL BE 1 TO 3 FEET INSIDE OF THE PROPERTY LINE.
2. PROVIDE PAVEMENT RING AND VALVEBOX COVER WHEN IN PAVED AREAS. SET AT FINISHED GRADE IF LOCATED OUTSIDE OF PAVEMENT.
3. OWNER'S RESPONSIBILITY FOR LEAK REPAIR SHALL BE UP TO AND INCLUDING THE CORPORATION STOP.
4. IF THE DEPTH OF THE CURB STOP IS GREATER THAN 8'-6", PROVIDE A 1' EXTENSION WITH COUPLING. CURB BOX CAP SHALL BE PLACED 1/4" TO 1/2" BELOW FINISHED GRADE IN PAVED SURFACES. BLUEBOARD INSULATION MAY BE REQUIRED WHERE DEPTH REQUIREMENTS CAN'T BE ACHIEVED.

SHOULD ANY SITUATION ARISE OTHER THAN SHOWN CONCERNING THE DEPTH OF CONSTRUCTION OF SERVICE LINE OR THE PLACEMENT OF STOP BOX CALL 970-262-7342

SEE METER LOCATION SCHEMATIC DETAIL FOR CONTINUATION (SEE DETAIL 2)



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

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| ISSUED: |
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TOWN OF SILVERTHORNE

WATER SERVICE LINE AND STOP BOX CONNECTION & INSTALLATION

DETAIL

W-1

DETAIL W-2

WATER METER INSTALLATION PROCEDURE TOWN OF SILVERTHORNE

BALL VALVE
(After meter ... not provided)



Copper ground
wire

WATTS # 7 BACKFLOW
(Provided)



METER SETTER W/ COMPRESSION
FITTINGS, AND METER
GENERATOR W/ GASKETS
(Provided)



Meter must be installed horizontally w/
serial #'s facing up.

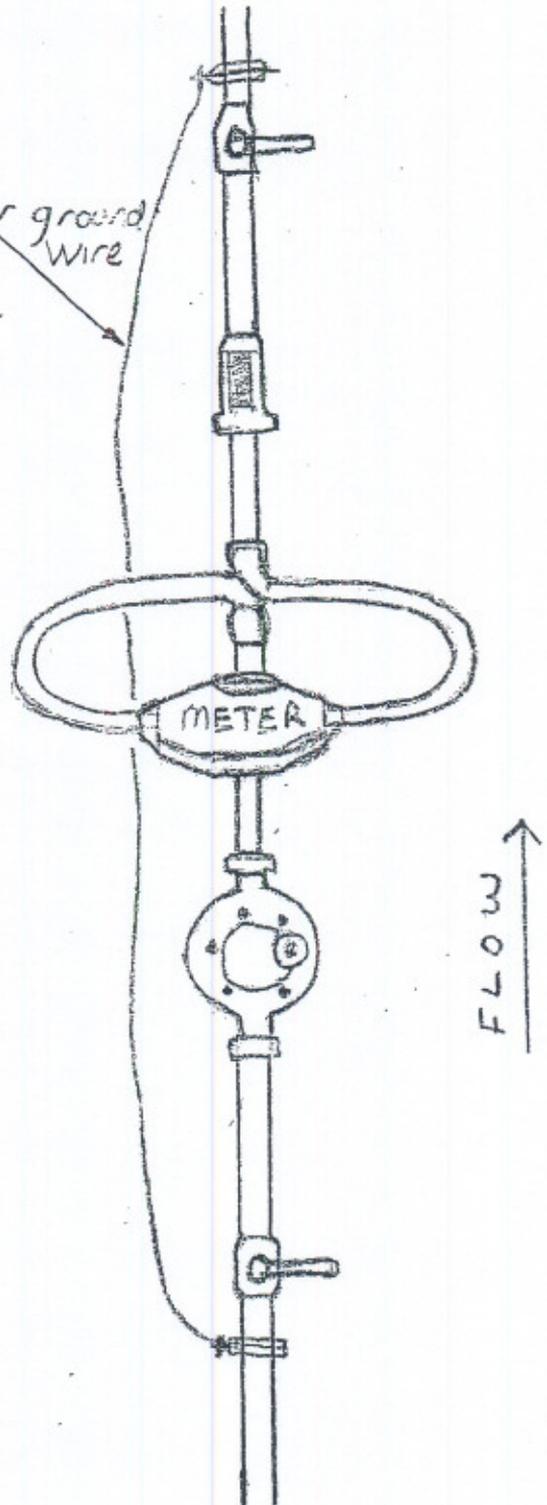
PRV - PRESSURE REDUCING
VALVE (Not provided)



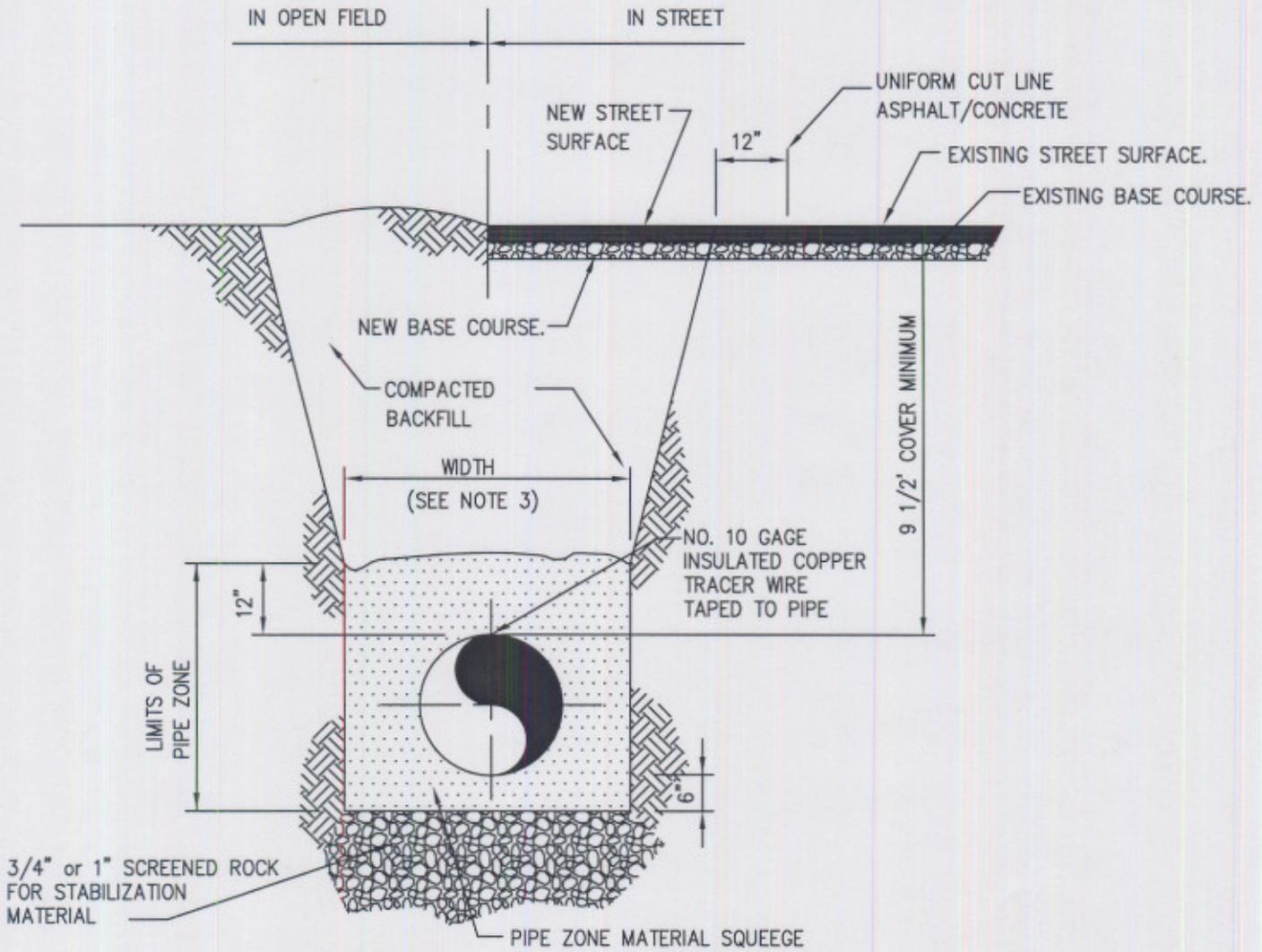
BALL VALVE
(Before meter ... not provided)



GROUND STRAP W/ CLAMPS
(Not provided)



AUTO METER TRANSPONDER WILL BE INSTALLED BY WATER
DEPARTMENT STAFF AT FINAL INSPECTION



- 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 TRENCH WIDTH = PIPE O.D. + 12"
MAXIMUM TRENCH WIDTH = PIPE O.D. + 24"

NOTE:
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ANY PROPOSED DEVIATIONS FROM OF CHANGES TO THESE STANDARDS MUST OTHERWISE BE APPROVED BY THE TOWN OF SILVERTHORNE WATER DEPARTMENT.

NO SCALE

ISSUED:



TOWN OF SILVERTHORNE

TYPICAL WATER TRENCH SECTION

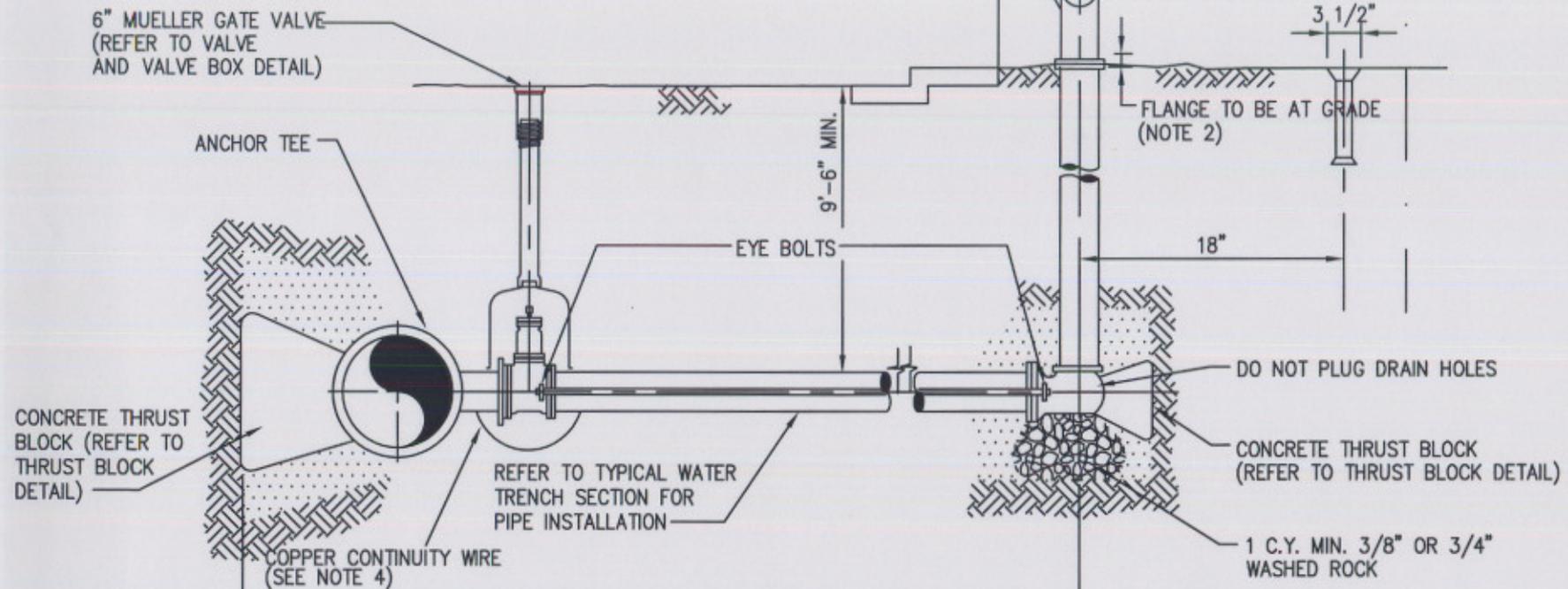
DETAIL

W-3

HYDRANT SHALL BE PLUMB IN ALL DIRECTIONS WITH PUMPER NOZZLE FACING STREET. SHALL BE PAINTED SAFETY RED. (SEE NOTE 1)

2' MINIMUM DISTANCE BEHIND SIDEWALK REQUIRED WHERE RIGHT-OF-WAY ALLOWS

3' MIN. TO VALVE BOX



- NOTES:
1. USE WATEROUS PACER WB-67
 2. ADJUST HYDRANT FLANGE ELEVATION TO BE AT GRADE WITH ADJACENT ELEVATION.
 3. 8 MIL POLYETHYLENE WRAP REQUIRED ON ALL FITTINGS
 4. SOLID COPPER CONTINUITY STRAP REQUIRED ON ALL EPOXY COATED FITTINGS
 5. CRASH BOLLARDS REQUIRED ON HYDRANTS WITHIN COMMERCIAL PROJECTS AND IN OTHER LOCATIONS AS DETERMINED IF NECESSARY BY THE TOWN.
- ALL PIPE MUST BE RESTRAINED WITH RODS OR MEGALUGS, AS DETERMINED BY SILVERTHORNE WATER DEPARTMENT

NOTE:
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NO SCALE

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| ISSUED: |
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TOWN OF SILVERTHORNE

TYPICAL FIRE HYDRANT ASSEMBLY

DETAIL

W-4

1/4" TO 3/4" BELOW GRADE WITHIN PAVED AREAS.
LEVEL WITH GRADE IN NON PAVED AREAS.

WORD "WATER" ON COVER

FINISHED SURFACE

TYLER SERIES 3-PIECE,
SCREW TYPE D.I. VALVE BOX
W/ 5 1/4" BARREL CENTERED
VERTICALLY OVER VALVE

IF GREATER THAN 9'-6",
PROVIDE OPERATING NUT
EXTENSION W/ CENTERING
RING. TOP OF EXTENSION
SHALL BE PLACED BETWEEN
6" AND 18" FROM THE TOP
OF BOX

COPPER CONTINUITY WIRE

GATE VALVE

WIDE OVAL BASE
(DENVER BOTTOM)

NOTES:

1. GATE VALVES SHALL OPEN CCW AND BE RESILIENT SEAT
2. FITTINGS SHALL BE WRAPPED WITH 8 MIL MINIMUM THICKNESS POLYETHYLENE SHEETING. ALL VALVES AND FITTINGS SHALL BE EPOXY COATED.
3. VALVE BOX TOP SHALL BE SET 1/4" TO 3/4" BELOW FINAL ASPHALT PAVEMENT GRADE. SHALL BE INSTALLED AT GRADE IN NON-PAVED AREAS.
4. PROVIDE MARKER POST WHERE NECESSARY, AS DETERMINED BY SILVERTHORNE WATER DEPARTMENT.
5. SEE TYPICAL WATER TRENCH SECTION DETAIL.
6. VALVE BOX AND ROD SHALL BE INSTALLED VERTICALLY AND SHALL NOT BE TILTED IN ANY DIRECTION.
(WHERE REQUIRED FOR VALVES DEEPER THAN 10')

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:

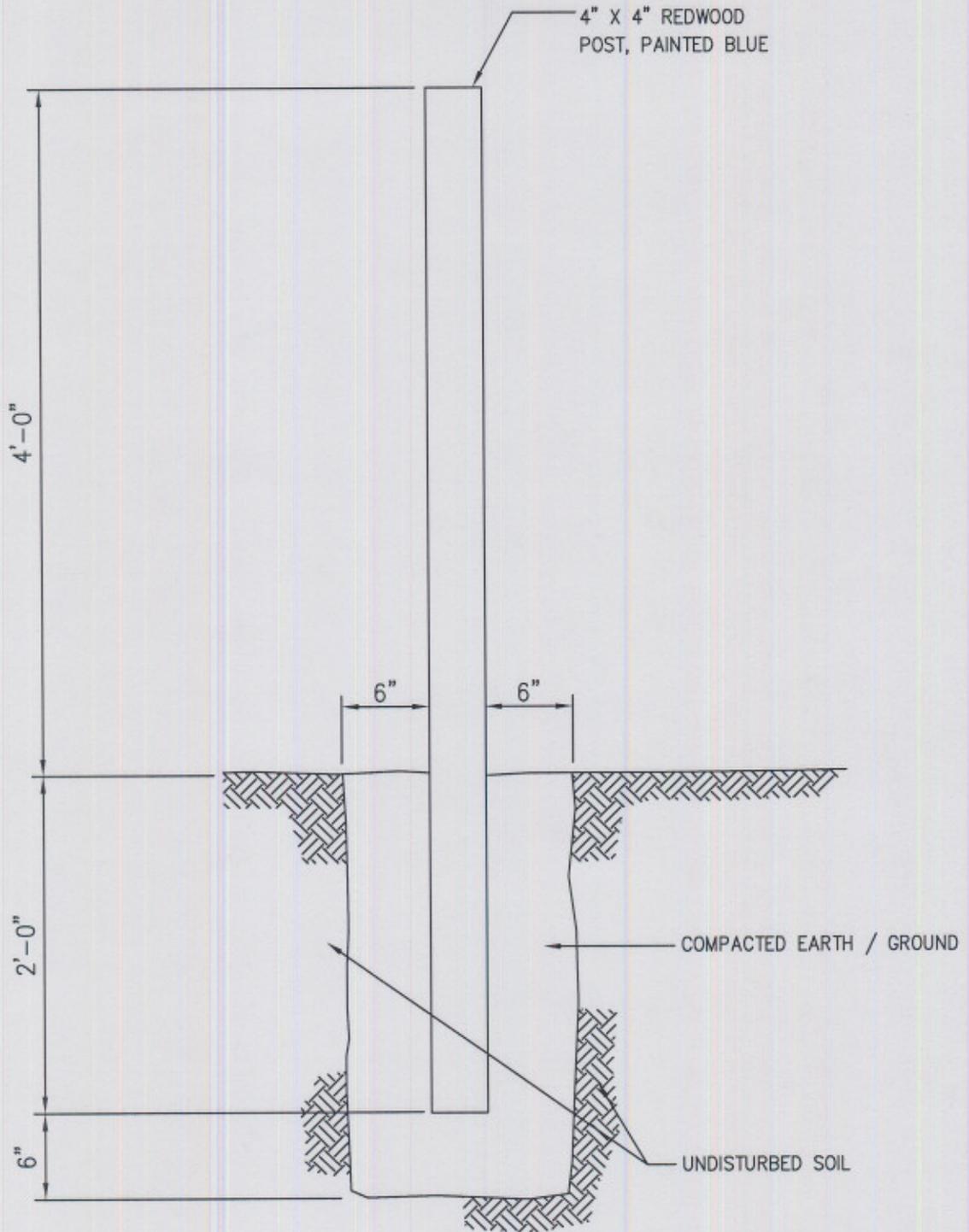


TOWN OF SILVERTHORNE

VALVE AND VALVE BOX DETAIL

DETAIL

W-5



NOTE:

1. PROVIDE ONLY IF VALVE NOT IN TRAVELED WAY.

NOTE:
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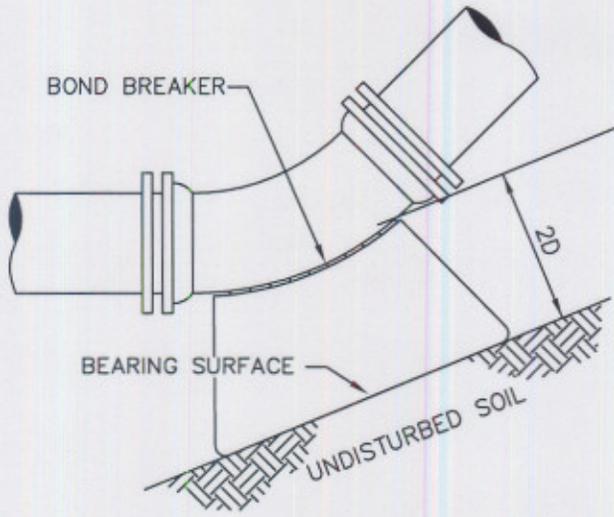
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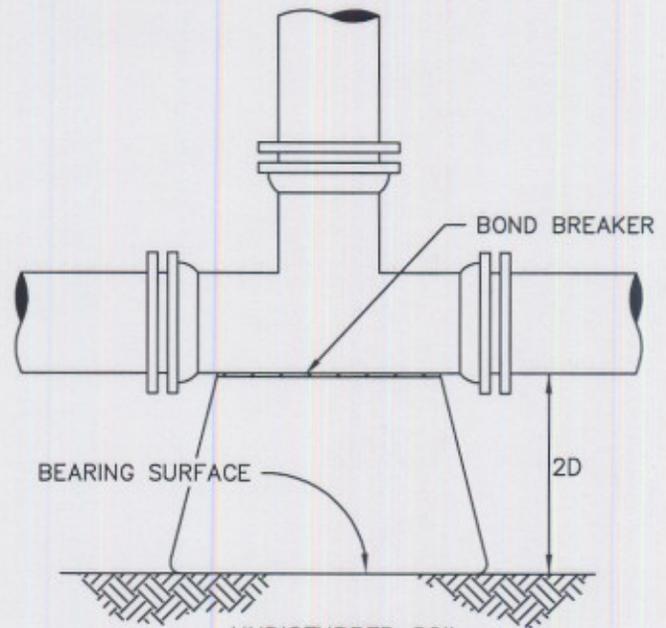


TOWN OF SILVERTHORNE
 VALVE MARKER POST

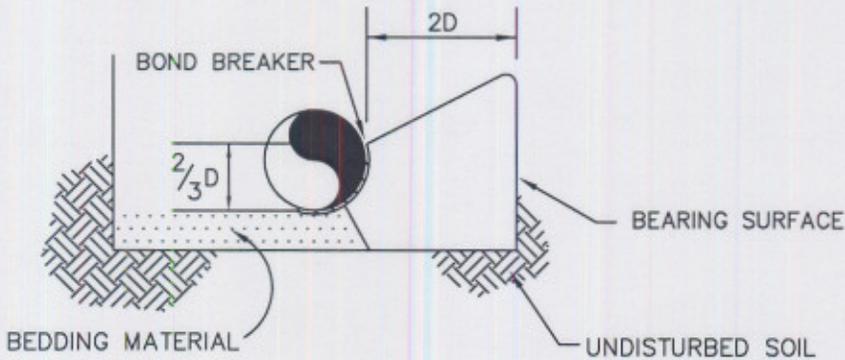
DETAIL
 W-6



BEND



TEE



TYPICAL CROSS SECTION

MINIMUM BEARING SURFACE AREA
(IN SQUARE FEET)

| PIPE SIZE | BENDS | | | | TEE OR DEAD END |
|-----------|-------|------|------|------|-----------------|
| | 11¼° | 22½° | 45° | 90° | |
| 4" | 0.5 | 1.0 | 1.5 | 2.5 | 2.0 |
| 6" | 1.0 | 1.5 | 3.0 | 5.5 | 4.0 |
| 8" | 1.5 | 2.5 | 5.0 | 9.0 | 6.5 |
| 12" | 3.0 | 5.5 | 10.5 | 19.5 | 14.0 |
| 16" | 5.0 | 9.5 | 18.5 | 34.0 | 24.0 |

NOTES:

1. D = PIPE DIAMETER
2. DO NOT COVER FITTING BOLTS WITH CONCRETE.
3. ALL FITTINGS ARE TO BE WRAPPED IN POLYETHYLENE SHEETING.
4. PROVIDE MINIMUM 2500 PSI CONCRETE.
5. SIZES SHOWN FOR 1,500 PSF SOIL BEARING PRESSURE AND AN INTERNAL TEST PRESSURE OF 150 PSI.

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.

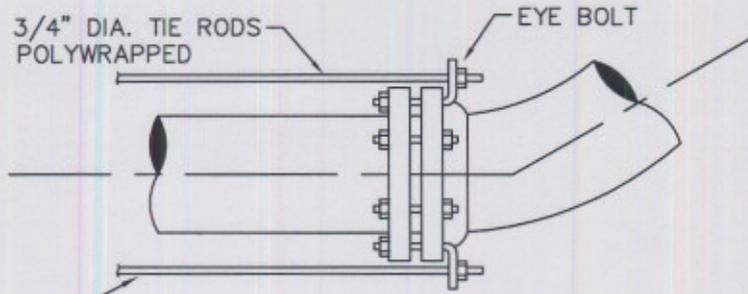
NO SCALE

ISSUED:



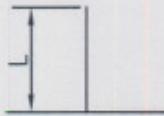
TOWN OF SILVERTHORNE
THRUST BLOCK

DETAIL
W-7



RODDING REQUIREMENTS TO BE VERIFIED/DETERMINED IN THE FIELD.

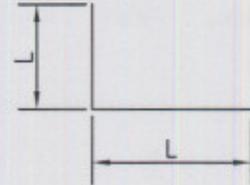
TYPICAL RESTRAINED JOINT



TEE



BENDS



90° BEND

ROD DIAMETER, GRADE AND LENGTH OF TIED PIPE

| PIPE SIZE | 4" | | | 6" | | | 8" | | | 12" | | | 16" AND LARGER | | |
|--------------------|-----------------------------|-----|------|------|-----|------|------|-----|------|------|-----|------|-------------------------------------------------|---|---|
| | D | L | G | D | L | G | D | L | G | D | L | G | D | L | G |
| TEE (BRANCH ONLY) | 3/4" | 30' | M.S. | 3/4" | 45' | M.S. | 3/4" | 60' | M.S. | 3/4" | 86' | M.S. | SPECIAL DESIGN BY PROJECT PROFESSIONAL ENGINEER | | |
| PLUG OR 90° BEND | 3/4" | 30' | M.S. | 3/4" | 45' | M.S. | 3/4" | 60' | M.S. | 3/4" | 86' | M.S. | | | |
| 45° BEND | 3/4" | 9' | M.S. | 3/4" | 13' | M.S. | 3/4" | 18' | M.S. | 3/4" | 25' | M.S. | | | |
| 22-1/2° BEND | 3/4" | 1' | M.S. | 3/4" | 4' | M.S. | 3/4" | 5' | M.S. | 3/4" | 7' | M.S. | | | |
| 11-1/4° BEND | | | | | | | 3/4" | 1' | M.S. | 3/4" | 2' | M.S. | | | |
| ALL VERTICAL BENDS | TOTALLY RESTRAINED, L = 40' | | | | | | | | | | | | | | |

NOTES:

1. LENGTH OF RESTRAINED PIPE MEASURED EACH WAY FROM BENDS OR FITTING.
2. LENGTH REFERS TO THE AMOUNT OF PIPE WHICH MUST BE TIED TOGETHER, AND IS NOT NECESSARILY THE LENGTH OF THE RODS.
3. CLAMPS AND RODS SHALL BE EXTENDED TO NEXT PIPE.
4. D = DIAMETER, L = LENGTH, G = STEEL GRADE
5. MINIMUM 9.5' OF GROUND COVER IS REQUIRED.
6. BASED ON 150 P.S.I., INTERNAL PRESSURE.
7. M.S. MEANS MILD STEEL ROD, A.S.T.M. STANDARD DESIGNATION A-36.
8. NUTS SHALL BE A.S.T.M., STANDARD DESIGNATION A-307, GRADE A OR B, HEXAGON HEAVY SERIES.
9. LENGTH OF TIED PIPE CHART IS ALSO FOR THE LENGTH OF PIPE RESTRAINT FOR RESTRAINING GLANDS AND BELL RESTRAINTS.
10. MJ RESTRAINING GLANDS SHALL BE SIMILAR AND EQUIVALENT TO EBBA IRON SERIES 1100 OR UNI-FLANGE 1400 SERIES FOR DIP AND EBBA IRON SERIES 2000 PV OR UNI-FLANGE SERIES 1500 FOR PVC. BELL JOINT RESTRAINTS SHALL BE SIMILAR AND EQUIVALENT TO EBBA IRON SERIES 1700 OR UNI-FLANGE SERIES 1390 FOR DIP AND EBBA IRON SERIES 1600 OR UNI-FLANGE SERIES 1390 FOR PVC.

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:

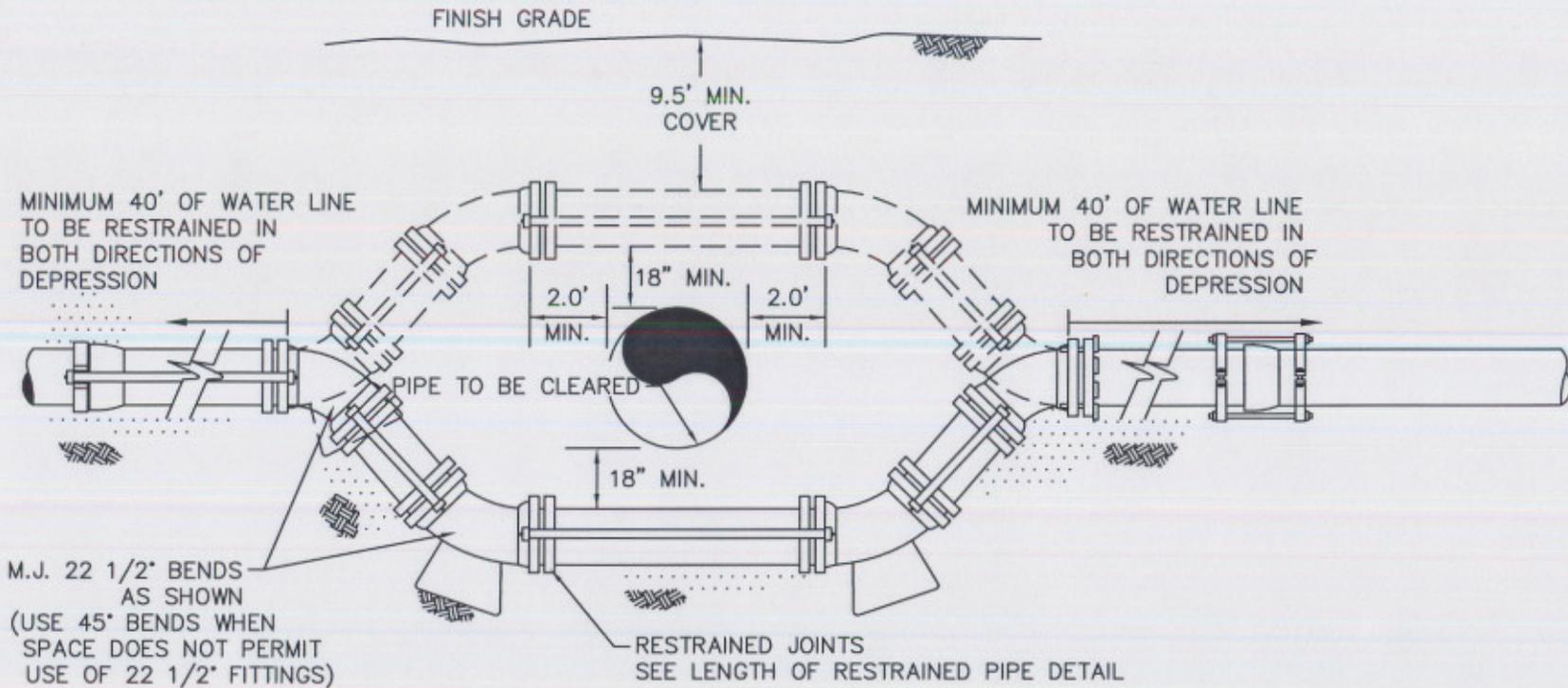


TOWN OF SILVERTHORNE

LENGTH OF RESTRAINED PIPE

DETAIL

W-8



TYPICAL DETAIL FOR WATER LINE DEPRESSION

(FOR 12" AND SMALLER PIPE)

NOTES:

1. PIPE USED BETWEEN RESTRAINTS IN DEPRESSED OR RAISED AREAS SHALL BE D.I.P.
2. MAY SUBSTITUTE MEGA-LUGS AND BELL RESTRAINTS FOR RODDING.
3. PROVIDE CONCRETE THRUST BLOCKS UNDER BENDS AS SHOWN.
4. REQUIREMENTS FOR RODS AND/OR MEGA LUGS TO BE DETERMINED BY THE SILVERTHORNE WATER DEPARTMENT.

NOTE:
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ANY PROPOSED DEVIATIONS FROM OR CHANGES TO THESE STANDARDS MUST OTHERWISE BE APPROVED BY THE TOWN OF SILVERTHORNE WATER DEPARTMENT.

NO SCALE

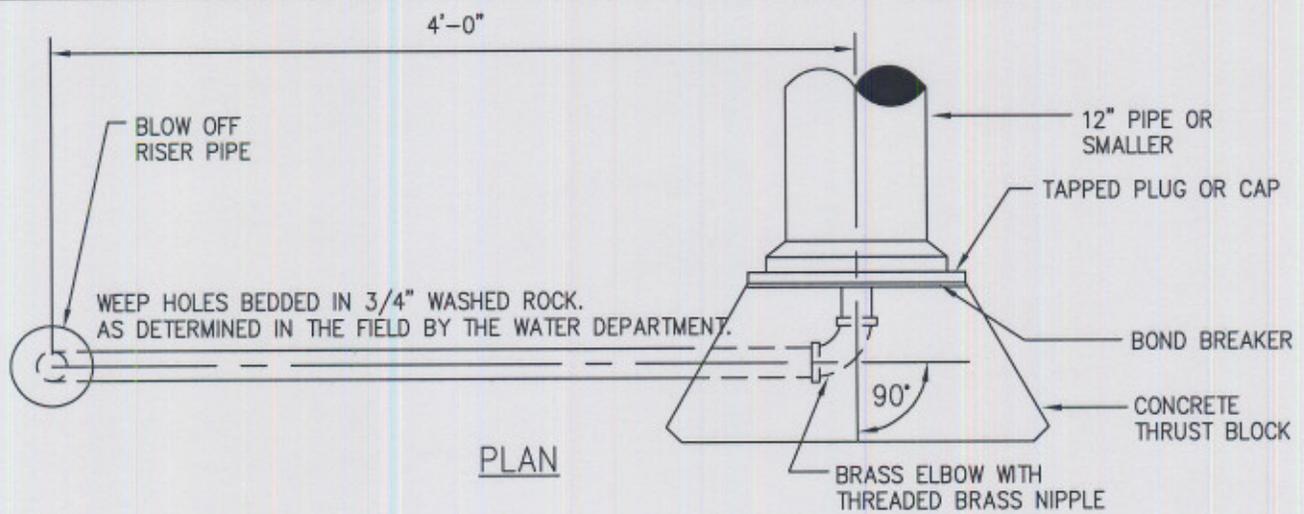
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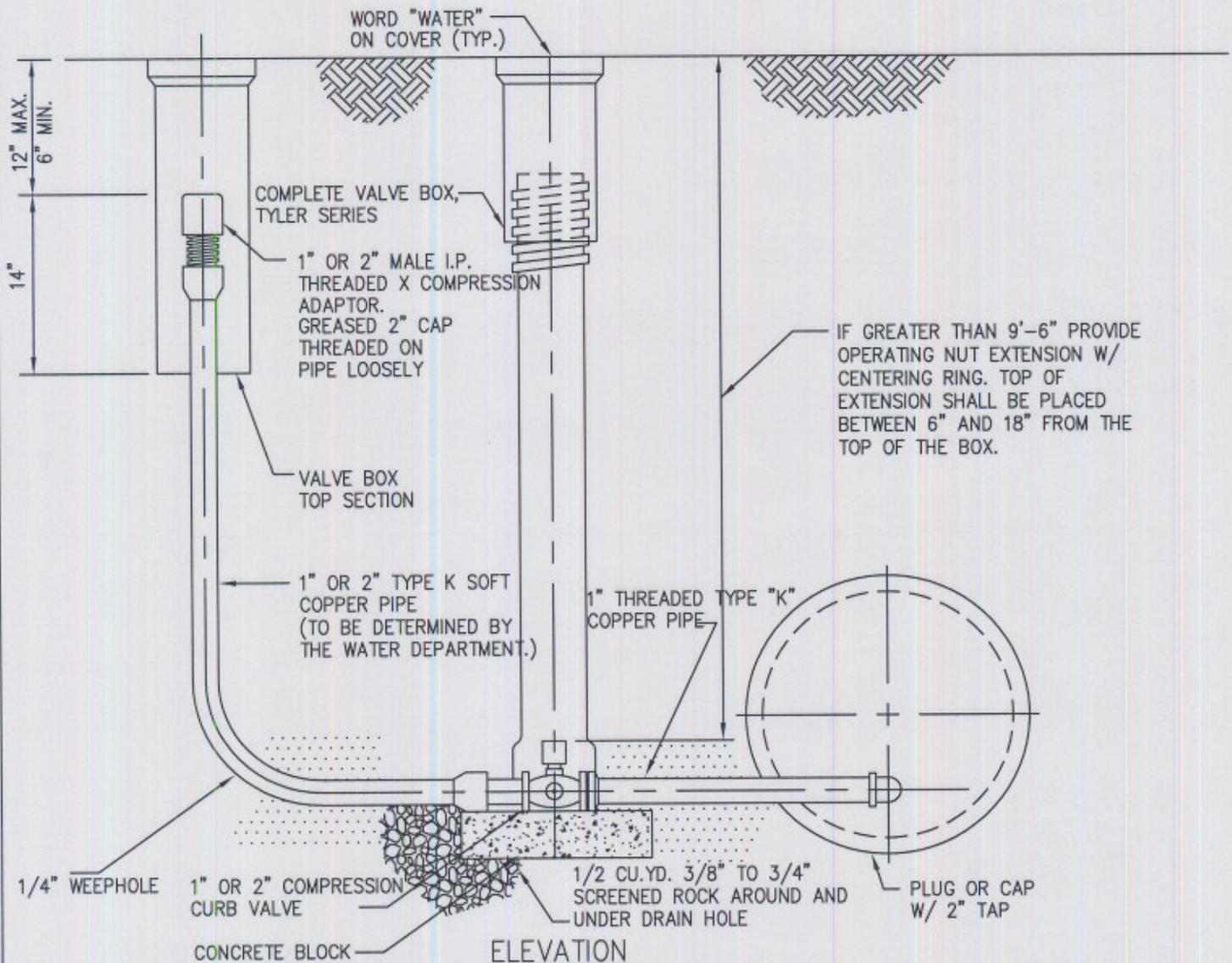
TOWN OF SILVERTHORNE
RESTRAINED JOINTS AT VERTICAL BENDS

DETAIL

W-9



PLAN



ELEVATION

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:

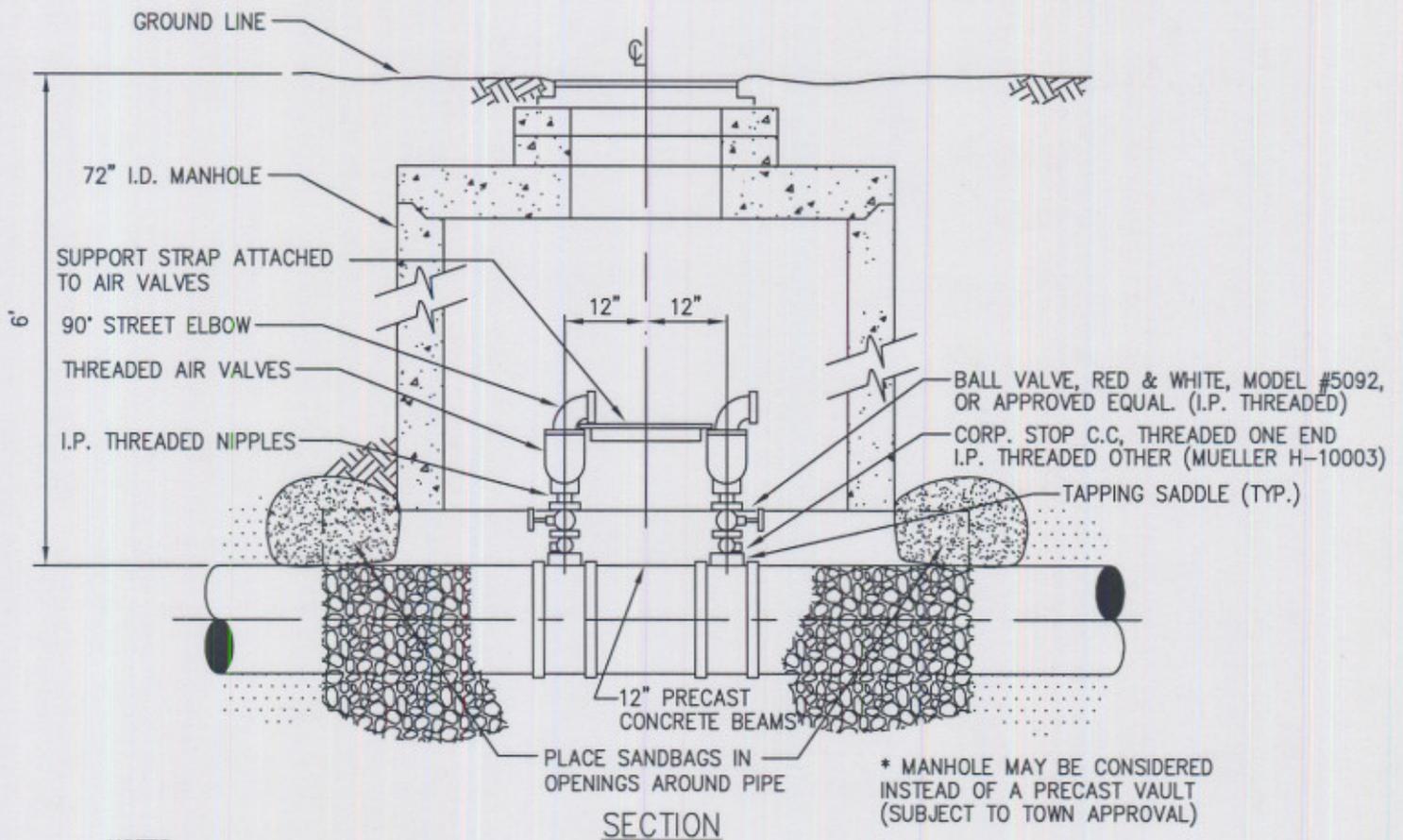
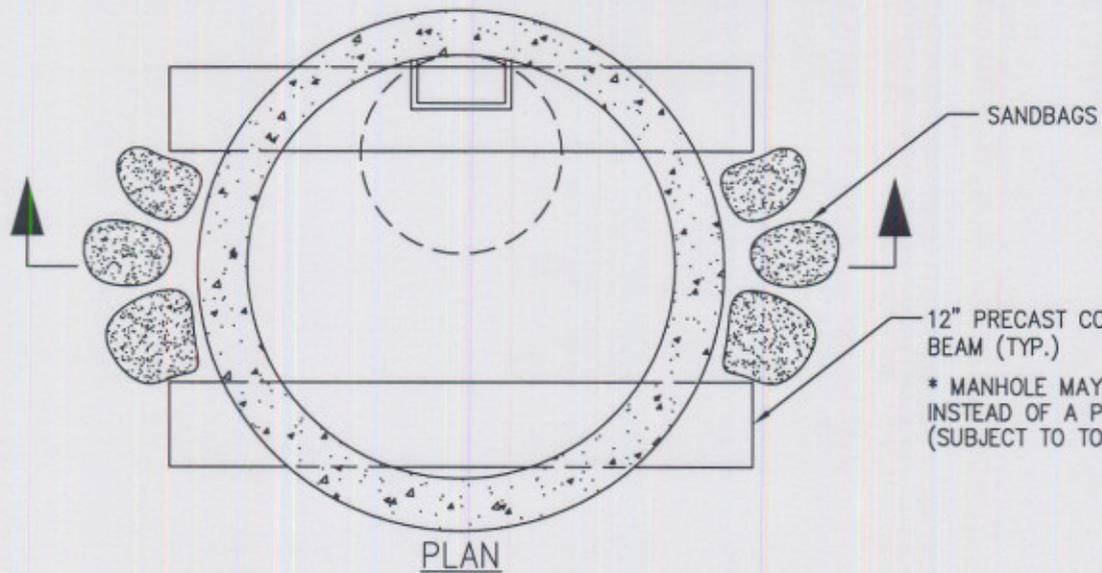


TOWN OF SILVERTHORNE

BLOW-OFF INSTALLATION
FOR 12" AND SMALLER PIPE

DETAIL

W-10



NOTES:

1. 3/8" TO 3/4" ROCK SHALL BE PLACED IN BOTTOM OF MANHOLE TO CROWN OF PIPE ONLY.
2. ALL PIPE AND FITTINGS SHALL BE BRASS.
3. 6" THRU 10" LINES SHALL HAVE, 2 EA., 1" COMBINATION AIR VALVES.
4. 12" LINES AND LARGER SHALL HAVE, 2 EA., 2" COMBINATION AIR VALVES.
5. SUPPORT STRAP SHALL BE 1/4" S.S. STRAPPING DRILLED TO MATCH AIR VALVE HOLES.
6. SEE SHALLOW MANHOLE RISER AND COVER DETAIL.

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:



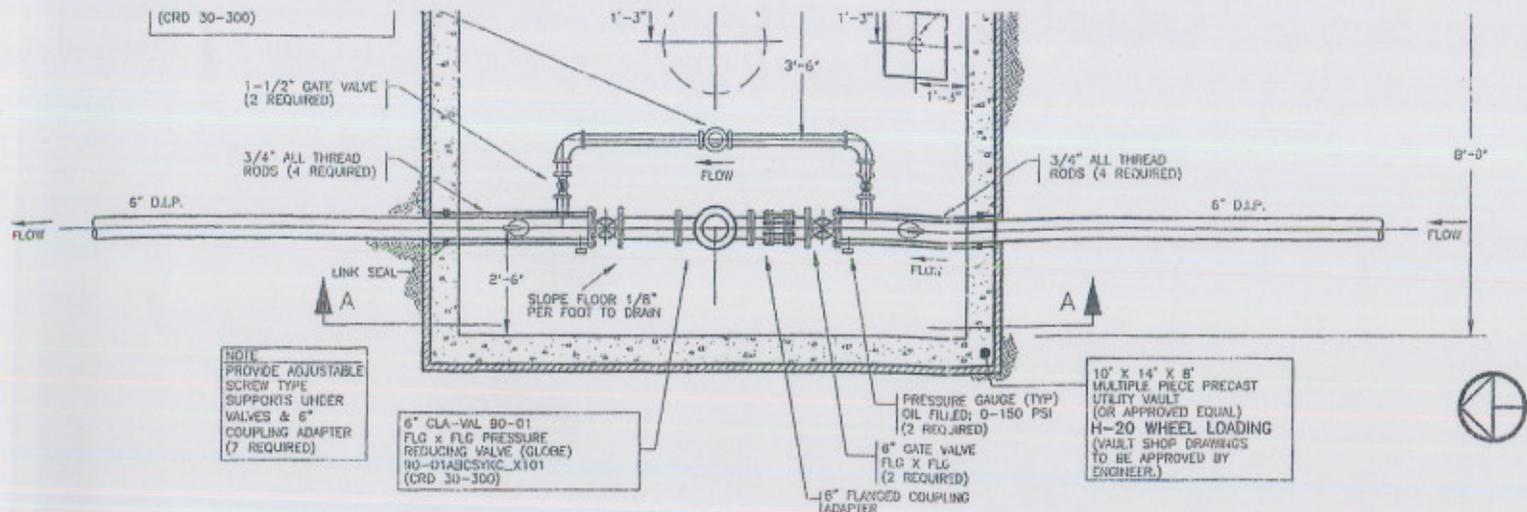
TOWN OF SILVERTHORNE

AIR RELIEF VALVE ASSEMBLY

DETAIL

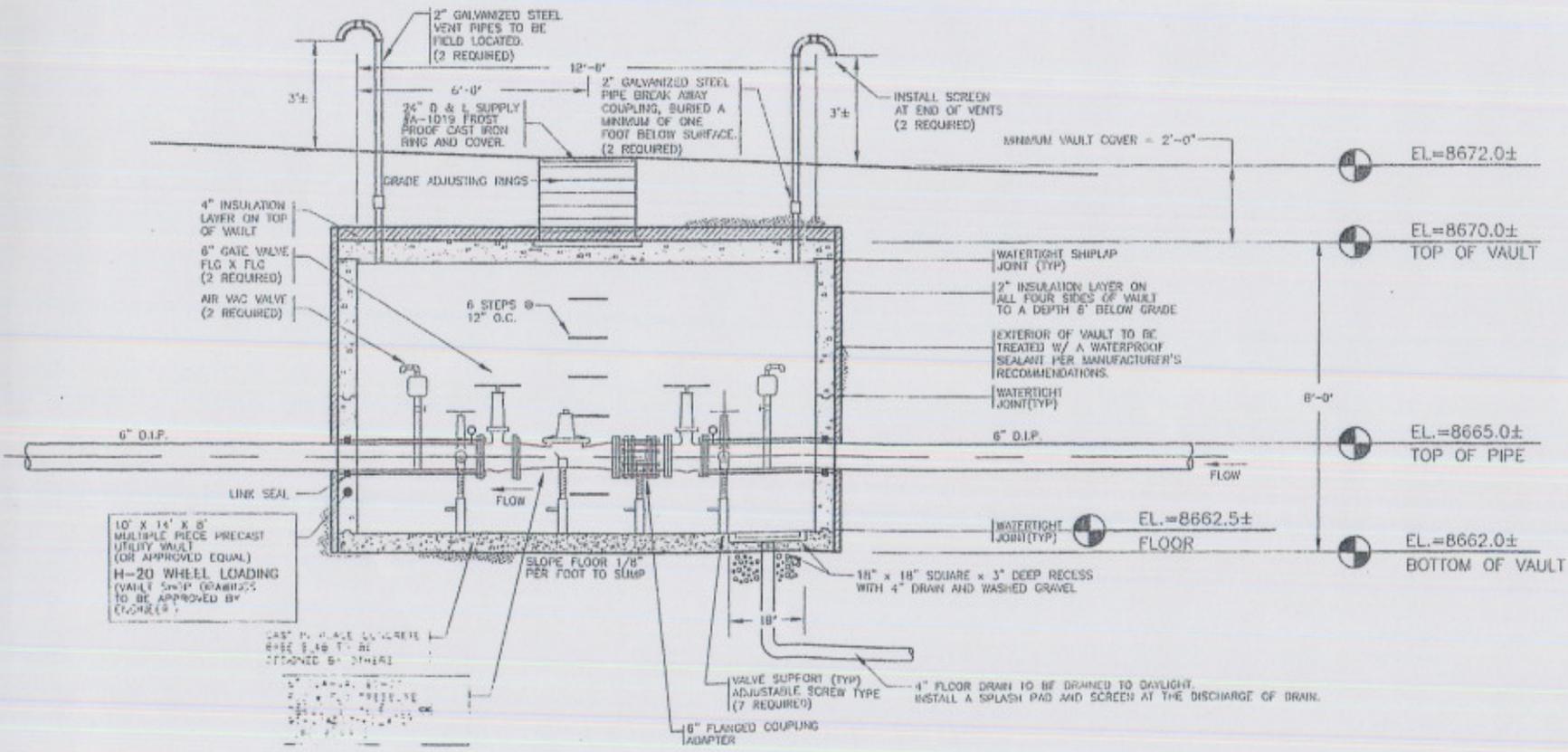
W-11

PRV



PRECAST VAULT AND CONTROL VALVE PLAN

SCALE 1/2" = 1'-0" : FITTINGS AND PIPES NOT ALL SHOWN TO SCALE



PRECAST VAULT AND CONTROL VALVE SECTION A-A

FITTINGS AND PIPES NOT ALL SHOWN TO SCALE

DETAIL W-12

Watts complete line of... Back-siphonage, backflow preventive devices

The Complete Concept in Cross Connection Control

No. 8—HOSE BIBB VACUUM BREAKERS
For 3/4" H. T. sill cocks and threaded faucets where a portable hose could be attached. Tested and approved under A.S.S.E. Standard 1011 and I.A.P.M.O. Uniform Plumbing Code.



No. 8A - Non-removable type and No. NF8 - For frost-proof hydrants are listed by IAPMO®.

No. NLF9—BACKFLOW PREVENTER
Double check valve type with atmospheric vent. Especially made for use on laboratory faucets with gooseneck spout. Size 3/8" N.P.T.



IAPMO® Listed
Certified under ANSI/A.S.S.E. Standard 1035 - "Laboratory Faucet Vacuum Breakers."

No. 9D—BACKFLOW PREVENTER

Continuous pressure type with intermediate atmospheric vent. Suitable for continuous pressure. Sizes 1/2" and 3/4" N.P.T. Meets A.S.S.E. Std. 1012.



Resident Not Testable
No. 7 — BACKFLOW PREVENTER
Dual check backflow preventer for water supply service or individual outlets. Sizes 1/2" - 1".



3/8" No. 7 for deep sink or similar in-line continuous pressure applications.

**TABLE A
STANDARDS AND TESTING LABORATORIES
FOR BACKFLOW PREVENTER PERFORMANCE
TEST AND CONSTRUCTION**

| PRODUCT | CURRENT STANDARDS | | | WATTS SERIES |
|---------------------------------------------------------|-------------------|-------|--------------------------------|--------------|
| | ASSE | AWWA | FCCCHR of USC | |
| Atmospheric type vacuum breakers | 1001 | | | 288A |
| Hose connection vacuum breakers | 1011 | | | 8 |
| Backflow preventer with intermediate atmospheric vent | 1012 | | | 9D |
| Reduced pressure principle backflow preventer | 1013 | C-506 | Manual for Cross Conn. Control | 909, 009 |
| Double check valve type backpressure backflow preventer | 1015 | C-506 | Manual for Cross Conn. Control | 709, 007 |
| Vacuum breakers, pressure type | 1020 | | | 800 |
| Dual check valve backflow preventer | 1024 | | | 7 |
| Laboratory faucet vacuum breaker | 1035 | | | NLF9 |

REFERENCES:

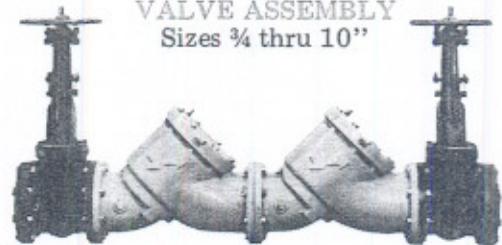
- ASSE — American Society of Sanitary Engineering
- AWWA — American Water Works Association
- USC - FCCC — University of Southern California, Foundation for Cross Connection Control Research
- NSF — National Sanitation Foundation

Commercial

No. 800 — PRESSURE TYPE VACUUM BREAKER
Anti-siphon pressure type vacuum breakers for continuous pressure piping systems. Sizes 1/2" thru 2".
3/4" - 2" are IAPMO® Listed.



No. 709 DOUBLE CHECK VALVE ASSEMBLY
Sizes 3/4" thru 10"



No. 909 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER
Sizes 3/4" thru 10"



Listed by IAPMO®

For additional information, send for C-BPD catalog on Backflow Prevention Devices.



(also Feb 10)

HOQRS: Rte. 114 & Chestnut St., No. Andover, MA 01845
MAIL: Box 628, Lawrence, MA 01842 Telex: 94-7460
Tel. (*617) 688-1811 Fax: (*617) 794-1848/794-1674
*Area code (617) will be (508) in July 1988.
International Subdivision:
Watts Reg

DETAIL W-13