

BONA VISTA WATER IMPROVEMENT DISTRICT



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CONSTRUCTION STANDARDS &
TECHNICAL SPECIFICATIONS

Prepared by:



J-U-B ENGINEERS, INC.

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BONA VISTA WATER IMPROVEMENT DISTRICT

SUBMITTED & RECOMMENDED


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REVISION LOG

Technical Specifications

Date	Description of Change	Approved by
10-06	Title Changes	GLS
06-12	Corrosive Soils Mitigation Requirements	GLS
04-13	Hot soil changes and Thrust block	GLS
03-14	Resurfacing	GLS
02-18	State Rules Review	GLS
12-23	Sewer Separation; Private	GLS

Standard Drawings

Date	Description of Change	Approved by
10-06	2" Meter Detail Changes	GLS
04-13	PRV Station, 1" Meter, and blow off changes	GLS
05-15	Protectus Water Meter Detail Changes, Compound Water Meter Detail Changes	GLS
01-16	Locator Wire; Vault size correction	GLS
05-16	1 1/2" and 2" Poly Service	GLS
05-18	Snake Pit, Blow-off Valve, and State Rules Review	GLS
04-19	Revised Fire Hydrant pipe material from ductile iron to PVC	GLS
12-23	Revised lid details, Air Vac piping	GLS

SECTION 1

GENERAL DEVELOPMENT AND CONSTRUCTION REQUIREMENTS

1.1 SCOPE:

This section defines the general requirement for improvements to be built by a subdivider or contractor working for the District.

The required improvements shall include all water line improvements in front of all lots along all dedicated streets to a connection with existing improvements of the same kind or to the boundary or the subdivision nearest existing improvements. Design must provide for future extension to adjacent developments. All water lines, and any other buried conduit shall be installed to the boundary lines of the subdivision.

1.2 CONSTRUCTION DRAWINGS:

Complete and detailed construction plans and drawings of improvements shall be submitted to the District for the review by the District prior to receiving final plat approval and prior to commencing construction. No construction shall be started until the plans have been checked and approved by the District.

1.3 STANDARDS FOR CONSTRUCTION DRAWINGS:

The following instructions are for the purpose of standardizing the preparation of drawings to obtain uniformity in appearance, clarity, size, and style.

These plans and designs shall meet the standards defined in the specifications and drawings hereafter outlined. No construction shall commence until plans have been accepted by the District. The minimum information required on drawings for improvements is as follows:

All drawings and/or prints shall be clear and legible and conform to good engineering and drafting room practice printed on quality paper that is scalable along with a pdf copy. Size of drawings shall be 11" x 17".

A. In general, the following shall be included on drawings:

1. North arrow (plan).
2. Scale and elevations referenced to an approved datum.
3. Stationing and elevations for profiles.
4. Title block, located in lower right corner of sheet to include:
 - a. Name of City.
 - b. Project title (subdivision, etc.)
 - c. Specific type and location of work.
 - d. Space for approval signature of City Engineer and date.
 - e. Name of engineer or firm preparing drawings with license number, P.E. stamp and signature, name and address of owners of record, and developer.

- B. Culinary water drawings shall show:
 - 1. Scale: 1" = 20' or 1" = 50' horizontal (may be shown on street drawings).
 - 2. Size and location of water mains, valves and hydrants and minimum cover.
 - 3. Type of pipe.
- C. Each set of plans shall be accompanied by a separate sheet of details for special structures which are to be constructed and are not covered by the District Standards. All structures shall be designed in accordance with the minimum District Standards.
- D. Separate drawings of elements of the District Standards shall not be required to be redrawn and submitted with the construction drawings unless specific deviations from the standards are requested for approval, however, the construction drawings shall refer to the specific items of the Standards that are to be incorporated into the work.

1.4 PRECONSTRUCTION CONFERENCE:

The preconstruction conference shall not be held until the Respective City Engineer has approved and signed the construction plans. A preconstruction conference shall be held before any excavation or other work is begun in the subdivision or Project. The meeting will include: (a) City Engineer; (b) District representative, (c) Developer of Project Manager; (d) Subdivision or Project Engineer; (e) all Contractors and Subcontractors involved with installing the subdivision or project improvements; (f) or any other city or utility representatives as deemed by the City. Items pertaining to the construction and inspection of the subdivision or Project improvements will be discussed.

1.5 INSPECTION:

All construction work involving the installation of improvements in the subdivision or project shall be subject to inspection by the District. It shall be the responsibility of the person responsible for construction to insure that inspections take place where and when required. Certain types of construction shall have continuous inspection, while others may have only periodic inspections.

1.6 REQUESTS FOR INSPECTION:

Requests for inspections shall be made to the District Offices by the person responsible for the construction. Requests for inspection on work requiring continuous inspection shall be made three (3) working days prior to the commencing of the work. Notice shall also be given one (1) day in advance of the starting of work requiring periodic inspection, unless specific approval is given otherwise by the District.

1.7 CONSTRUCTION COMPLETION INSPECTION:

An inspection shall be made by the District after all construction work is completed. Any faulty or defective work shall be corrected by the persons responsible for the work within a period of thirty (30) days of the date of the District's Inspection Report defining the faulty or defective work.

1.8 CONSTRUCTION TESTING:

All in-place density testing shall be performed and paid for by the Subdivider, Developer, Contractor or Project Manager. The cost of obtaining necessary soil “proctors”, asphalt extractions, gradations, “Marshall” asphalt densities, and concrete test cylinders shall be provided by and paid for directly by the Subdivider, Developer, Contractor or Project Manager.

1.9 APPROVAL BY DISTRICT ENGINEER:

All references within these specifications to the “District Engineer” shall be construed to refer to “The District Engineer or his duly authorized representative”.

1.10 DRAWINGS:

All reference within these specifications to “The Drawings” shall mean the District approved construction drawings or the District Standards and Technical Specifications as is applicable.

1.11 AMENDMENT PROCESS:

Whenever, in the opinion of the District, the District Engineer, or the General Manager, a literal enforcement of these regulations may work an undue hardship or a literal enforcement of the provisions may be unnecessary to meet the goals and standards of the District, the District may modify those standards in the following manner:

Modifications may be granted when there are practical difficulties involving carrying out the provisions of the Public Works Standards and Technical Specifications and a panel consisting of the District Engineer, and the General Manager (or another District Employee as designated by the General Manager), determine that granting of a modification for an individual case will meet the goals and requirements of the District without unduly jeopardizing the public and the individual’s interest. The District shall first receive an application for a modification to the standards from any interested party. Upon receipt of the application the panel of three discussed above shall find that a special individual reason makes the strict letter of the standard impractical, and shall find the modification is in conformance with the intent and purpose of the standards and shall find that such modification does not in any way lessen the integrity of the standards. When such findings of fact are made, the panel may grant such modification as it deems appropriate. The details of any action granted as modification by this panel shall be recorded and entered in the files of the District, with the specific reason for the granting of said modification.

1.12 DISTRICT SYSTEM ANALYSIS:

When required by either the District, a City or the Fire Marshall having jurisdiction, an analysis of the water system will be required. Said analysis shall be either conducted by the District at pre-paid expense of the Developer, or shall be conducted by a Licensed Professional Engineer and verified by the District Engineer (at the expense of the developer). Any oversize of district lines beyond the development as required by said analysis shall be the responsibility of the Developer.

1.13 GUARANTEE OF IMPROVEMENTS:

The Contractor warrants and guarantees that the materials and workmanship of the improvements provided for hereunder, and every part thereof, remain in good condition for a period of one (1) year after the date of completion and conditional acceptance by the Owner, which date of approval

1.14 EROSION CONTROL:

The contractor shall be responsible for controlling erosion and pollution from the construction site. Best Management Practices for such efforts along with all appropriate permits shall be the responsibility of the contractors. Efforts shall be made to: avoid tracking mud off site, control dust, avoid concrete washout into water ways, avoid silt migration from trenches and flushing and other measures as deemed necessary by the state, city, owner, developer, or the contractor.

1.15 RIGHTS-OF-WAY AND EASEMENTS:

The Owner will obtain all required licenses for construction on City, County, State Roads, but securing of digging permits and posting of required bonds will be the responsibility, and at the expense of the Contractor.

1.16 FIRE CONNECTIONS:

Fire connections for fire lines to building or fire hydrants must be pre-approved by the District. Appropriate fees must be paid and plans submitted for such connections prior to construction.

1.17 CONTRACTOR LICENSING:

Any contractor working on any part of the system shall be licensed and in good standing with the State Department of Occupational Licensing.

1.18 CORROSION PROTECTION

Measures to mitigate the corrosive effects of the soils shall include but not be limited to: the installation of PVC or HDPE pipe instead of ductile iron as allowed by these specifications; or the use of poly wrap of ductile iron pipe.

All bolts and nuts within the district shall be stainless steel or blue coated (see 4.2.03) and installed at the expense of the developer. All metal appurtenances shall be epoxy coated. Mitigation measures shall be approved by the District Engineer.

1.19 OWNERSHIP

All pipes in public right of ways are in the ownership of the District. Any pipes, valves, hydrants and other appurtenances outside the public Right of way are in the ownership of the respective property owner, beginning at the isolation valve on the District main. Said private lines shall be maintained and upgraded by the respective Owner. This includes periodic testing and documentation of fire hydrants and fire lines as required by the Fire Marshal.

All water meters are in the ownership of the District including maintenance and any upgrades.

1.20 SEWER SEPARATION

Water lines shall maintain a minimum separation of 10 feet horizontally and 18" vertically from the sewer (with the water above the sewer) in accordance with State Rules R309-550-7. This includes water and sewer gravity mains, sewer laterals and pressurized sewer mains and laterals. Any variation from these separation requirements must receive an exception letter from the State Division of Drinking Water to this rule prior to construction.

Non-conforming crossings may be mitigated by providing a water-tight casing for each crossing for a minimum distance of 10 feet horizontally from the crossing. This distance is measured perpendicularly from the water main.

The request for exception must be submitted by the District Engineer, with engineered plans showing both the plan view and profile view identifying the locations and elevation of all crossings. Plans shall be prepared and stamped by the Developer's Licensed Engineer.

SECTION 2

EXCAVATION AND BACKFILL FOR PIPELINES

2.1 GENERAL

The work covered by this specification consists of furnishing all labor, tools, materials, equipment, and in performing all operations in connection with the excavation, trenching, and backfilling for underground pipelines and appurtenances.

2.2 CONTROL OF GROUNDWATER

Trenches shall be kept free from water during excavation, fine grading, pipe laying and jointing, and pipe embedment operations in an adequate and acceptable manner. Where the trench bottom is mucky or otherwise unstable because of the presence of groundwater; and in all cases where the static groundwater elevation is above the bottom of any trench or bell hole excavation, such groundwater shall be lowered to the extent necessary to progress. The discharge from trench de-watering shall be conducted to natural drainage channels, gutters, or drains. Surface water shall be prevented from entering trenches.

2.3 EXCAVATION FOR PIPELINES

Excavation for pipelines shall follow lines parallel to and equidistant from the location of the pipe centerline. Trenches shall be excavated to the depths and widths required to accommodate the construction of the pipelines, as follows:

- A. Except in ledge rock, cobble rock, stones, or water-saturated earth, mechanical excavation of trenches shall not extend below an elevation four inches above the bottom of the pipe after placement in its final position. All additional excavation necessary for preparation of the trench bottom shall be made manually. Excavation shall not be carried below the grade shown on the drawings. Any unauthorized excavation made below grade for any reason shall be backfilled in accordance with these specifications.
- B. Excavation for trenches in ledge rock, cobblerock, stones, mud, or other material unsatisfactory for pipe foundation shall extend to a depth of at least four inches below the bottom of the pipe. A bedding of special material shall be placed and thoroughly compacted with pneumatic tampers in four-inch lifts to provide a smooth, stable foundation. Special foundation material shall consist of suitable earth materials free from roots, sod, or organic matter. Trench bottoms shall be hand-shaped as specified in paragraph (A) above.

Where unstable earth or muck is encountered in the excavation at the grade of the pipe, a minimum of twelve inches below grade will be removed and backfilled with crushed rock or gravel to provide a stable subgrade.

- C. The maximum width of trench, measured at the top of the pipe shall be as narrow as possible but not wider than fifteen inches on each side of water pipe.
- D. Excavation for pipelines under existing curb and gutter, concrete slabs or sidewalks, shall be open cut. In no case shall tunneling be allowed. At the option of the Respective City Engineer, jacking under permanent facilities may be allowed based on his direction. Backfill of open cut areas shall be restored as specified in Section 2.7.

2.4 GRAVEL FOUNDATION FOR PIPE (1 1/2" minus gravel)

Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, where water must be drained to maintain a dry trench bottom for pipe installation, and at other locations as previously defined, the subgrade shall be excavated to the specified depth and replaced with crushed rock or gravel.

Gravel for pipe bedding shall be clean, crushed rock or gravel conforming to the following gradation:

Screen	% Passing
1-1/2"	100
No. 4	5

The gravel material shall be deposited over the entire trench width in six-inch maximum layers; each layer shall be compacted by tamping, rolling, vibrating, spading, slicing, rodding, or by a combination of two or more of these methods. In addition, the material shall be graded to produce a uniform and continuous support for the installed pipe.

2.5 BLASTING

Blasting will not be allowed except by special permission of the Respective City Engineer. When the use of blasting is necessary, the Contractor shall use utmost care not to endanger life or property. The Contractor shall comply with all laws, ordinances, and applicable safety code requirements and regulations relative to the handling, storage, and use of explosives and protection of life and property, and he shall be fully responsible for all damage attributable to his blasting operations. Signals warning persons of danger shall be given before any blast. Suitable weighted plank coverings of timber mats shall be provided to confine all materials lifted by blasting within the limits of the excavation or trench.

Excessive blasting or overshooting will not be permitted, and any material outside the authorized cross section which may be shattered or loosened by blasting shall be removed at the Contractor's expense. The District Engineer shall have authority to order any method of blasting discontinued which leads to overshooting or is dangerous to the public or destructive to property or to natural features.

2.6 SHEETING BRACING, AND SHORING OR EXCAVATIONS

Excavation shall be sheeted, braced, and shored as required to support the walls of the excavations to eliminate sliding and settling and as may be otherwise required to protect the workmen and existing utilities, structures, and improvements. All such sheeting, bracing, and shoring and side slopes shall comply with the requirements of the Utah State Industrial Commission and OSHA.

All damage resulting from lack of adequate sheeting, bracing and shoring shall be the responsibility of the Contractor, and the Contractor shall accomplish all necessary repairs or reconstruction resulting from such damage.

2.7 BACKFILLING

Backfill shall be carefully placed around and over pipes and shall not be permitted to fall directly on a pipe from such a height or in such a manner as to cause damage. In these specifications the process of preparing the trench bottom to receive the pipe and the backfilling on each side of the pipe to a level over the top of the pipe is defined as bedding. Bedding requirements are as defined on the Respective City Standard Drawings and in the Specifications for each pipe type. Backfill around the pipe to the level indicated in the Standard Drawings shall not contain rocks more than 1 ½ inch diameter (¾ inches for plastic pipe) and shall be free from sod, vegetation, and other organic or deleterious materials.

Trench backfilling above the level of the pipe bedding outside of the street right-of-way shall normally be accomplished with native excavated materials and shall be free from rocks larger than eight inches in diameter.

2.8 COMPACTION OF BACKFILL

Compacted backfill shall be placed by means of pneumatic tire rollers, hoe packs or other mechanical tampers of a size and type approved by the District Engineer.

The backfill in all utility trenches shall be compacted according to the requirements of the materials being placed. Under pavements or other surface improvements the in-place density shall be a minimum of 95% of laboratory standard maximum dry density, as determined by AASHTO T-180. In shoulders and other areas the in-place density shall be a minimum of 90% of laboratory standard maximum dry density, as determined by the same laboratory method. A District approved testing laboratory shall provide in-place density tests at various depths throughout the trench backfill. In-place density tests shall be taken every 200 feet of trench section (mainline and service laterals), at manholes and other structures unless otherwise directed by the Engineer. A copy of all in-place density tests shall be delivered to the District and the Project Engineer for review and approval. Any portion of the trench backfill which does not meet the minimum compaction requirements of this section, shall be removed, recompacted and retested at the cost of the contractor until passing tests are obtained.

The material shall be placed at a moisture content such that after compaction the required relative densities will be produced; also, the material shall be placed in lifts which, prior to compaction, shall not exceed two feet (10" maximum lifts in the pipe bedding section) or as recommended by the project soils engineer. Prior to compaction, each layer shall be evenly spread and moistened, if required, as approved by the project soils engineer.

Approval of equipment, thickness of layers, moisture content, and compactive effort shall not be deemed to relieve the Contractor of the responsibility for attaining the specified minimum relative densities. The Contractor, in planning his work, shall allow sufficient time to make tests for relative densities for the approval of the District Engineer.

2.9 IMPORTED BACKFILL MATERIAL

Existing native excavated materials shall not be used as structural or any utility trench within the public right-of-way backfill. The Contractor shall furnish and install imported granular material. Sieves are given with the following import material type as follows.

- A. **Sand Material:** Shall be free from sod vegetaion, and other organic or deleterious materials. (Alternative gradations will be considered)

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 4	90-100
No. 200	10-15

Use as directed by the engineer and as shown on the Drawings

- B. **3/4" Course Aggregate:** 3/4 inch minus angular, crushed, free of shale, clay, friable material and debris; graded in accordance with ANSI/ASTM C136; within the following limits: (Alternative gradations will be considered)

<u>Sieve Size</u>	<u>Percent Passing</u>
3/4 inch	100
1/2 inch	75 to 95
3/8 inch	65 to 85
No. 4	40 to 65
No. 10	25 to 50
No. 50	10 to 25
No. 200	2 to 8

Use as directed by the engineer and as shown on the Drawings

- C. **2" Minus Gravel:** This granular material shall pass a 2 inch square sieve and shall not contain more than 15% of material passing a 200 mesh sieve, and shall be free from sod, vegetation, and other organic or deleterious materials.

Use as directed by the engineer and as shown on the Drawings

- D. **Pit Run 6" minus :** Durable material free of shale, clay, organic matter, friable material and debris meeting the following limits: (Alternative gradations will be considered)

<u>Sieve Size</u>	<u>Percent Passing</u>
6 inches	100
4 inches	75 to 90
3 inches	60 to 75
2 inches	40 to 65
1 inch	30 to 50
No. 4	10 to 35
No. 200	2 to 8

Use as directed by the engineer and as shown on the Drawings.

- E. **Native Material:** Native material, free of organic material, friable materials and debris. Maximum allowable size is four (4) inches.

Use as directed by the engineer and as shown on the drawings

SECTION 3
PORTLAND CEMENT CONCRETE

3.1 SCOPE

This section of the specifications defines materials to be used in all portland cement concrete work and requirements for mixing, placing, finishing, and curing. This specification only applies to concrete owned and maintained by BVW. Any public or private must be per respective City Specification or owner.

3.2 MATERIALS

Materials used in Portland cement concrete and reinforcing of portland cement concrete shall meet the following requirements.

- A. Cement: portland cement shall be Type II or as approved by the District Engineer and shall comply with the Standard Specification for Portland Cement, ASTM C-150.
- B. Aggregates: Concrete aggregates shall conform to Tentative Specifications for Concrete Aggregates, ASTM C-33.
- C. Water: Water used in mixing concrete shall be clean and free from oil, acid, salt, injurious amounts of alkali, organic matter or other deleterious substances.
- D. Entraining Agent: An air-entraining agent shall be used in all concrete exposed to the weather. The agent shall conform to ASTM Designation C-175 and C-260.
- E. Admixtures: No admixture (except calcium chloride) will be permitted to be used in portland cement concrete unless such use is specifically authorized by the District Engineer. Calcium chloride shall conform to ASTM Standard Specification D-98.
- F. Reinforced Steel: All bar material used for reinforcement of concrete shall be grade 60 steel conforming to the requirements of ASTM Designation A-615 and shall be deformed in accordance with ASTM Designation A-305.
- G. Welded Wire Fabric: Welded wire fabric for concrete reinforcement shall conform to the requirements of ASTM A-185.

3.3 CONCRETE MIX

For the purpose of practical identification, concrete has been divided into three classes: Class A, S, and C. Basic requirements and use for each class are as defined below:

B 6

Class	Minimum Cement (sack S/c.y.)	Minimum 28-day Compressive Strength (p.s.i.)		Primary		Use
A	6-1/2		4,000	Reinforced Concrete		Structural
4"					1	
6"	1	1		2	2	
8"		2	2	3	4	
10"	2	3	3	4	5	
				3,500 Sidewalks, curb, gutters, cross gutters, pavements and unreinforced footings and foundations		

C 5 2,500 Thrust Blocks, anchors, mass concrete

All concrete shall also comply with the following requirements.

A. Aggregates:

B. Water:

The maximum size of the aggregate shall be not larger than one-fifth of the narrowest dimension between form S within which the concrete is to be cast, nor larger than three-fourths of the minimum clear spacing between reinforcing bars or between reinforcing bars and fomls. For unreinforced concrete slabs, the maximum size of aggregates shall not be larger than one-fourth the slab thickness.

Sufficient water shall be added to the mix to produce concrete with the minimum practicable slump. The slump of mechanically vibrated concrete shall not exceed four inches. No concrete shall be placed with a slump in excess of five inches. The maximum permissible water-cement ratio (including free moisture on aggregates) shall be 5 and 5-3/4 gallons per bag of cement respectively for Class A and B air entrained concrete.

C. Air-Entraining: Air content for air-entrained concrete shall comply with the following:

Course Aggregate Size Air Content
(In.) %

IV2to2Yz5+/-I 3/4 or I 6+/- 3/8 or Y2 7 + I-1

The air-entraining agent shall be added as liquid to the mixing water by means of mechanical equipment of accurate measurement and control.

D. Calcium Chloride: Calcium chloride may be added as an accelerator with prior approval of the District Engineer during cold weather, with maximum amount being two pounds per sack of cement.

3.4 FORMS

Forms shall be substantially built and adequately braced so as to withstand the liquid weight of concrete. All linings, studding, walling and bracing shall be such as to prevent bulging, spreading, or loss of true alignment while pouring and displacement of concrete while setting.

Metal forms shall be used for curb and gutter work unless otherwise specified by the Respective City Engineer. All edge forms for sidewalk pavements, curbs, and gutters shall be of sufficient rigidity and adequately braced to accurately maintain line and grade. Prior to concrete placement, all Forms shall be lightly coated with oil to prevent concrete adhesion to form materials.

All cast-in-place structures shall be double fanned.

Forms for curved sections shall be so constructed and placed that the finish surface of walls and edge of sidewalks, curbs and gutters will not deviate appreciably from the arc of the curve.

Exposed vertical and horizontal edges of the concrete in structures shall be chamfered by the placing of moldings in the forms at those locations shown on the Drawings.

3.5 JOINTS

Joints shall be provided for sidewalk and curb and gutter as follows:

- A. Sidewalks: As per respective City's specification.
- B. Curb and Gutter: As per respective City's specification.

3.6 REINFORCEMENT AND EMBEDDED ITEMS

Reinforcing steel shall be clean and free from rust, scale, paint, grease, or other foreign matter which might impair the bond. It shall be accurately bent and shall be tied to prevent displacement when concrete is poured. Reinforcing steel shall be held in place by only metal or concrete ties, braces and supports. No steel shall extend from or be visible on any finished surface and shall have a minimum of 1 inch concrete cover.

The Contractor shall use concrete chairs for holding the steel away from the subgrade, and spreader or other type bars for securing the steel in place. The spreader bars shall be not less than 3/8 inch in diameter.

3.7 PREPARATIONS

Before hatching and placing concrete, all equipment for mixing and transporting the concrete shall be cleaned, all debris and ice shall be removed from the places to be occupied by concrete, forms shall be thoroughly wetted (except in freezing weather) or oiled, and masonry filler units that will be in contact with concrete shall be well drenched (except in freezing weather), and the reinforcements shall be well drenched (except in freezing weather), and the reinforcements shall be thoroughly

cleaned of ice or other coatings. Water shall be removed from spaces to receive concrete.

When placing concrete on earth surfaces, the surfaces shall be free from frost, ice, mud, and water. When the sub grade surface is dry soil or pervious material, it shall be sprayed with water immediately before placing of concrete or shall be covered with waterproof sheathing paper or a plastic membrane. No concrete shall be placed until the surfaces have been inspected and approved by the District Engineer or District Inspector.

3.8 CONCRETE MIXING

All concrete shall be ready-mixed and delivered in accordance with ASTM C-94. The concrete shall be mixed until there is a uniform distribution of the materials. Sufficient water shall be used in mixing concrete to produce a mixture which will flatten and quake when deposited in place, but not enough to cause it to flow. Sufficient water shall be used in concrete in which reinforcement is to be embedded, to produce a mixture which will flow sluggishly when worked and which, at the same time, can be conveyed from the mixer to the forms without separation of the coarse aggregate from the mortar. In no case shall the quantity of water used be sufficient to cause the collection of a surplus in the forms or exceed the maximum allowable slump as specified in 3.3 (b).

3.9 DEPOSITING

Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. The concrete placing shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the corners of forms and reinforcing bars. No concrete that has partially hardened or been contaminated by foreign material shall be deposited in the work, nor shall retempered concrete be used. No concrete shall be dropped more than 3 feet. Concrete delivered to the job site having a temperature which exceeds 90°F shall not be placed. Concrete cooling methods during hot weather will be approved by a District Engineer.

All concrete in structures shall be vibrator compacted during the operation of placing and shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of the forms.

3.10 PLACING CONCRETE IN COLD WEATHER

No concrete shall be poured where the air temperature is lower than 40°F, at a location where the concrete cannot be covered or protected from the surrounding air. When concrete is poured below a temperature of 35°F the ingredients of the concrete shall be heated so that the temperature of the mixture shall not be less than 50° or more than 100°F. Before mixing, the heated aggregates shall not exceed 125°F and the temperature of the heated water shall not exceed 175°F. Cement shall not be added while the temperature of the mixed aggregates and water is greater than 100°F. When there is likelihood of freezing during the curing period, the concrete shall be protected by means of an insulated covering and/or heating to prevent freezing of the concrete for a period of not less than 7 days after placing. Concrete shall not be placed on frozen soil.

Equipment for protecting concrete from freezing shall be available at the job site prior to placing concrete. Particular care shall be exercised to protect edges and exposed corners from freezing. In the event heating is employed, care shall be taken to insure that no part of the concrete becomes dried out or is heated to temperatures above 90°F. The housing, covering, or other protection used shall remain in place and intact at least 24 hours after the artificial heating is discontinued. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

3.11 FINISHING

All concrete finish work shall be carefully performed and shall produce a top quality visual appearance as is common to the industry. After the concrete for slabs has been brought to the established grade and screened it shall be worked with a magnesium float and then given a light broom finish. In no case shall dry cement or a mixture of dry cement and sand be sprinkled on the surface to absorb moisture or hasten hardening. Surface edges of all slabs shall be rounded to a radius of $\sqrt{2}$ inch.

After concrete has been poured in curb and gutter forms it shall be puddled and spaded so as to insure a thorough mixture, eliminate air pockets, and create uniform and smooth sides. Before the concrete has thoroughly set, and while the concrete is still green, the forms shall be removed and the front and top sides shall be finished with a flat or steel trowel to make a uniform finished surface. Wherever corners are to be rounded, special steel trowels shall be used while the concrete is workable and the corners constructed to the dimensions specified.

The top and face of the curb and also the top of the apron on combined curb and gutter must be finished true to line and grade and without any irregularities of surface noticeable to the eye. The gutter shall not hold water to a depth of more than one fourth (1/4) of an inch, nor shall any portion of the surface or face of the curb or gutter depart more than one-fourth (1/4) of an inch from a straight edge ten (10) feet in length, placed on the curb parallel to the center line of the street nor shall any part of the exposed surface present a wavy appearance.

3.12 CURING AND PROTECTION

As soon as the concrete has hardened sufficiently to prevent damage, the finished surface shall be protected for curing one of the following ways:

- A. Ponding of water on the surface or continuous sprinkling.
- B. Application of absorptive mats such as 3-inch of cured hay, clean straw or fabric kept continuously wet.
- C. Application of two inches of moist earth or sand uniformly distributed on the surface and kept saturated by spraying with water.

- D. Application of light colored waterproof plastic materials, conforming to “Specifications for Waterproof Sheet Materials for Curing Concrete” ASTM C-171, placed and maintained in contact with the surface of the concrete.
- E. Application of a curing compound, conforming to “Specifications for Liquid Membrane-Forming Compounds for Curing Concrete” ASTM C-309. The compound shall be light in color and shall be applied in accordance with the manufacturer’s recommendations immediately after any water sheen, which may develop after finishing has disappeared from the concrete surface.

The freshly finished surface shall be protected from hot sun and drying winds until it can be sprinkled or covered as above specified. The concrete surface must not be damaged or pitted by rain. The contractor shall provide and use, when necessary, sufficient tarpaulins to completely cover all sections that have been placed within the preceding twelve (12) hours.

The Contractor shall erect and maintain suitable barriers to protect the finished surface. Any section damaged from traffic or other causes occurring prior to its official acceptance, shall be repaired or replaced by the Contractor at his own expense in a manner satisfactory to the District Engineer.

Defective concrete conditions or surfaces shall be removed, replaced or repaired as directed to meet the approval of the District Engineer.

3.13 CONCRETE TESTING

In the event that the concrete placed or delivered to the job site appears to have questionable quality, the District Engineer may order the taking of concrete test cylinders to check required compressive strengths. In place concrete may be cored for testing. Cost of all required laboratory testing shall be the responsibility of the Subdivider/Developer, Contractor or ready-mix supplier. All concrete delivered to the job site shall be accompanied by a ticket specifying bag mix, air content, etc., said tickets shall be given to the District Inspector who may field check slump and air entrainment compliance.

SECTION 4
CULINARY WATER SYSTEM

4.1 GENERAL:

4.1.1 WORK INCLUDED

- A. Inspection
- B. Preparation
- C. Water Pipe Installation
- D. Valve and Fitting Installation
- E. Thrust Block Installation
- F. Corrosion Protection
- G. Field Quality Control
- H. Metered Services
- I. Pressure Reducing Stations – on an As-need Basis, as pressures approach or exceed 150 psi.
- J. Fire Hydrants
- K. Fire Lines
- L. Air Relief and Blow-offs
- M. Chamber Drainage
- N. General
 - 1. The work to be done consists of furnishing all necessary labor, materials and equipment to provide complete installation and testing of water system facilities. Modifications to existing facilities shall conform to District specifications.
 - 2. The construction of water mains shall include: excavation, backfill and compaction, construction of concrete structures, anchors, thrust blocks, supports, encasements; furnishing, installing, testing and disinfecting water pipelines, fittings, valves, blow offs, air valves, services, fire hydrants, and all appurtenances; removal and restoration of existing improvements and all work in accordance with the project plans and specifications.

3. No valve or other control on the existing system shall be operated for any purpose by the contractor. The District will operate all valves, hydrants, etc., either with District personnel or under their provision and proper advance notice given.

O. Unacceptable Work

1. Unacceptable work as determined by the District whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner at the contractor's expense.

4.1.2 RELATED WORK

- A. General Development and Construction Requirements – Section 1
- B. Excavation and Backfill for Pipelines – Section 4
- C. Disinfection of Water Distribution Systems – Section 5

4.1.3 QUALITY ASSURANCE

- A. Comply with federal, state, and local codes and regulations. Underground piping pressure testing shall be witnessed by the District Engineer or a designated District representative.
- B. Pipe, valve and appurtenance materials and workmanship shall be in accordance with AWWA Standards or other standards as specified herein.
- C. All pipe, joints, fittings, valves, and fire hydrants shall conform to ANSI/NSF Standard 61

4.1.4 REFERENCES

- A. American Water Works Association (AWWA)
 1. C105, "Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for Water and Other Liquids".
 2. C111, "Rubber-Gasket Joints for Ductile-Iron and Gray-Iron pressure Pipe and Fittings".
 3. C151, "Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids".

4. C504, “Rubber-Seated Butterfly Valves”.
5. C509, “Resilient-Seated Gate Valves for Water and Sewer Systems”.
6. C600, “Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances”.
7. C600-10, “Installation of Ductile Iron Water Mains and Their Appurtenances”.

B. American Society for Testing and Materials (ASTM):

1. A-126: For valve bodies.
2. D2774: Recommended Practice for Underground Installation of Thermoplastic Pressure Piping and PVC Pipe and AWWA Manual of Practice M23, 2003
3. D2774: Recommended Practice for Underground Installation of Thermoplastic Pressure Piping and AWWA Manual of Practice M55, 2006

4.1.5 SUBMITTALS

- A. Submit manufacturer’s specifications for all products to the District for approval.

4.1.6 DELIVERY, STORAGE AND HANDLING

- A. Load and unload pipe, fittings, valves, and accessories by lifting with hoists or skidding so as to avoid shock or damage. Do not skid or roll pipe on skid ways against pipe already on the ground.
- B. Each length of pipe shall be unloaded opposite or near the place where it is to be laid in the trench.
- C. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means approved by the District.

4.2 PRODUCTS

4.2.1 PIPE

POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

1. Pipe Diameter 4”-12”:
Standard ANSI/AWWA – C900 PVC Pipe,
DR-18, Class 150
- Pipe Diameter 14” or greater:
Standard ANSI/AWWA – C905 PVC Pipe,
DR-14, Class 165
- National Sanitation Foundation: NSF Standard 61

American Society for Testing and Materials: ASTM D2774

2. Locator Wire: AWG THHN 14 ga. Solid Copper plastic coated wire

DUCTILE IRON PIPE

A. Buried Applications

1. AWWA C151.
2. AWWA C600-10.
3. Larger shall be pressure Class 250 p.s.i.
4. Cement lined and bituminous coated in accordance with AWWA C104.
5. Rubber gasketed slip-on pipe joints in accordance with AWWA C111.
6. Class 250 psi mechanical joint fittings in accordance with AWWA C110.
7. Standard: NSF 61 – Drinking Water System Components – Health Effects.

B. Above Ground Applications

1. Same as below ground except joints and fittings to be flanged in accordance with AWWA C115.
2. Gaskets to be full faced, 1/16th inch thick rubber.

WATER PIPE INSTALLATION

- A. The water pipe shall be laid and maintained to lines and grades established by the drawings and specifications with fittings and valves at the required locations unless otherwise approved by the District. Unless otherwise shown, all water lines shall have 4.0' minimum cover to final finish grade. All main lines are to be located 10' off the street centerline as shown on the District approved drawings unless otherwise specified. All valves and fire hydrants are to be installed as noted on the approved plans.
- B. When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the District Engineer to provide clearance as required by federal, state, or local regulations or as deemed necessary by the District to prevent future damage or contamination of either structure.
- C. In areas of contamination, precautions shall be made to protect against permeation of organic compounds. Non-permeable materials shall be used throughout the system.

- D. When crossing open waters such as canals, rivers, etc. greater in width than 15 feet the following shall take place:
1. A minimum of 2 feet or greater shall be provided over the pipe.
 2. Pipe with joints shall be of special construction, having restrained joints for joints within the surface water course and flexible restrained joints at both edges of the water course.
 3. Isolating valves shall be provided on both sides of the water crossing at locations not subject to high ground water or flooding, so that the section can be isolated for testing or repair.
 4. A means shall be provided, such as a sampling tap, not subject to flooding, to allow for representative water quality testing on the upstream and downstream side of the crossing.
 5. A means shall be provided to pressure test the underground water crossing pipe.
- E. Water supply conduits and major service lines crossing known fault areas should be either designed to accommodate significant differential movement of the ground, or be valved immediately above and below the points of the fault crossing to allow control of water flow, in case of pipe rupture during an earthquake event.
- F. Lay all water lines on a continuous grade to avoid high points except as shown on the plans.
- G. Prevent foreign material from entering the pipe while it is being placed in the trench. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.
- H. As each length of pipe is placed in the trench, the joint shall be assembled in accordance with manufacturer's recommendations
- I. A continuous and uniform bedding shall be provided in the trench for all buried pipe. Stones larger than $\frac{3}{4}$ " for PVC and 2" for Ductile Iron shall be removed for a depth of at least 6 inches below the bottom of the pipe to 12 inches minimum above the pipe.
- J. The pipe shall be brought to correct line and grade, and shall be secured in place with approved backfill material in accordance with the Bona Vista Water Improvement District Public Works Standards.

- K. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or plumb stems or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that recommended by pipe manufacturer and shall be approved by the District Engineer.
- L. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the District. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation should the trench fill with water.
- M. Cutting pipe for the insertion of valves, fittings, or closure pieces shall be done in a neat, workmanlike manner without creating damage to the pipe or lining.
- N. Cut ends and rough edges shall be ground smooth. For push-on joint connections, the cut end shall be beveled.
- O. Whenever possible, all tie-ins will be made dry. The District shall turn off the water upon 48 hours minimum advance notice by the contractor. It shall be the contractor's responsibility to advise all affected water users of the interrupted service a minimum of 24 hours prior to any service interruption. In large areas where there is heavy use, where shutting down the line is not feasible in the opinion of the District Engineer, the contractor shall be required to tie onto the main by using a wet tap.
- P. All dead ends shall be plugged complete with a 2" or a 4" Eclipse #2 post hydrant or a fire hydrant. Either the device shall achieve a flushing velocity of at least 3.0 fps in the main line being flushed.
- Q. All water mains to be laid with locating wire. THHN 14 ga. Plastic coated copper. A locator wire access box (such as Snakepit brand) is needed at every hydrant
- R. The use of Asbestos and Lead pipes shall not be allowed. Pipes and Fittings shall be "lead free" in accordance with Section 1417 of the Federal Safe Drinking Water Act. They shall be certified as meeting ANSI/NSF 372 or Annex G of ANSI/NSF 61.
- S. Only materials that have been used previously for conveying drinking water may be reused. Used materials shall meet the above standards, be thoroughly cleaned, and be restored to their original condition.

4.2.2 ACCESSORIES

- A. Nuts and Bolts shall all be corrosion resistant. See Section 4.2.3.A.
- B. Gaskets to be 1/16th inch full face rubber.

- C. 8 mil. Polyethylene wrap in accordance with AWWA C105.

4.2.3 CORROSION PROTECTION

- A. Bolts and nuts: All bolts and nuts within the system shall be corrosion resistant.
Alternatives include:

Hex Bolts: A307A Bolt with Tripac 2000 Blue coating system or District approved equal; or Stainless Steel Type T316 bolts with 316 heavy nut.

T-Bolts: A242 Steel bolts with Tripac 2000 Blue coating system or District approved equal; or Stainless Steel T316 bolts with 316 heavy nut.
- B. Encase all buried ductile iron valves, fittings, connections and specialties in minimum 8 mi. polyethylene sheets in accordance with AWWA C-105. Duct tape shall be used to secure polyethylene sheets to the pipe.
- C. Encase buried ductile iron pipe in minimum 8 mil. Polyethylene sheets in accordance with AWWA C-105 in selected areas and soil types which required corrosion protection as approved and directed by the District Engineer.
- D. Metal fitting on PVC pipe to be wrapped in min 5 mil Visqueen.

4.2.4 VALVES

- A. Isolation valves:
 - 1. Isolation valves shall be placed no more than 500 feet intervals in commercial districts and 800 feet in other districts.
 - 2. Where future development is not expected valve spacing shall not exceed 1 mile.
- B. Gate valves (10" and smaller):
 - 1. Cast Iron Body, Bronze Mounted: Furnish resilient-seated gate valves 2 inches through 10 inches that conform to the requirements of AWWA C509, non-rising stem design with "O" ring seals, and shall be SS.
 - 2. Operating Direction: Open counterclockwise.
 - 3. Buried Valves: Flanged, mechanical joint, or as indicated.
- C. Tapping valves and sleeves:

1. Tapping valves shall have large diameter seat rings to permit entry of tapping machine cutters. Inlet shall be flanged. Outlet shall suit branch piping and shall include the required flange for tapping machine adapter connection. In other details, tapping valves shall conform to the requirements outlined for gate valves in Paragraph 4.2.4 A.
 2. Tapping Saddle shall be stainless steel fully gasketed.
- D. Butterfly valves (12" and Larger):
1. Shall comply with the requirements of AWWA C504, Class 150B.
 2. Valve bodies shall be cast in conforming to ASTM A126, Class B. Ends shall be flanged unless otherwise specified.
 3. Valve discs shall be streamlined and shall have a continuous 360 sealing surface of stainless steel, ASTM A276, type 304.
 4. Valve shafts shall be stainless steel ASTM A276, type 304, of stub construction with at least 1-1/2 shaft diameter engagement into the disc and shall be fastened to the disc with upset pins.
 5. Valve seats shall be of Buna N material bonded to the valve body.
 6. Valve bearings shall be self-lubricating and non-corrosive and shall have a significant difference in hardness from the valve shaft.
 7. Valve actuators shall be designed as an integral part of the valve and shall meet all the requirements of AWWA C504. All actuators shall be hermetically sealed and permanently lubricated with not exposed moving parts. All manual actuators will meet the requirements of AWWA C504 for nut input.

4.2.5 VALVE BOXES

- A. Shall be suitable for HS-20 traffic loading.
- B. Shall be furnished and installed over each line valve and over each auxiliary hydrant valve. All buried valves shall be installed complete with a Tyler 564A slip valve box or approved equivalent. Valves over 5' in depth shall have a valve nut extension stem installed.
- C. Valve Boxes to be raised within 30 days after the roadway is asphalted.

- D. All valve boxes shall be collared as shown on the drawings in both Asphalted and non asphalted areas.

4.2.6 FITTINGS

All brass fittings shall have NL stamped on them (No Lead).

- A. Mechanical joint:

- 1. Mechanical joint fittings shall be ductile iron 350 working pressure, and 125 pound compacted C153-A21, and shall conform to AWWA C-111. Mechanical joint fittings shall be coated with a petroleum asphaltic coating 1 mil thick.

- B. Flanged fittings:

- 1. Flanged fittings shall conform to AWWA C-110 Cast Iron Fittings. Flanges shall be faced and drilled and shall be Class 250 working pressure, and 125 pound compacted. Flanged fittings shall be coated with a petroleum asphaltic coating 1 mil thick.

4.2.7 VALVE AND FITTING INSTALLATION

- A. Valves shall be as located on property line in new subdivisions.
- B. Valve-operating stems shall be oriented in a manner to allow proper operation.
- C. A valve box shall be provided for every valve that has no gearing or operating mechanism or in which the gearing or operating mechanism is fully protected with a gear case. The valve box shall not transmit shock or stress to the valve and shall be centered over the operating nut of the valve, with the box cover flush with the surface of the finished area or such other level as may be directed by the owner. In paved areas, a concrete collar around the valve box is required.
- D. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

4.2.8 METERED SERVICES

- A. District Ownership of metered lines ends at the meter box on residential connections. District Ownership of commercial lines ends at the property line. All lines beyond this point must be installed in accordance with the current Plumbing Code.
- B. ¾" and 1" Service Laterals (see Standard Details):
 - 1. Materials

1. All supplies, labor, machinery, etc. will be supplied by the contractor. The District will supply and set the meter for all sizes.
 2. All connections must be made with compression copper fittings made of brass.
 3. Tapping Saddles required on PVC pipe. See drawings for details.
 4. Brass corporation stops Mueller B-25028 or equivalent. Tap directly into the main. All direct taps shall be CC thread. Saddles are allowed on ductile iron mains.
 5. Type K soft drawn copper pipe installed as one solid piece from main to meter.
2. Installation:
- a. All meters shall be located between the curb and the sidewalk unless approved otherwise by the District Engineer. Also, the water lateral shall be located at the center of the lot frontage and the sewer lateral located 10' downstream from the meter.
 - b. Corporation stops shall be tapped at 45 degree angles unless approved otherwise by the District Engineer. The installer should firmly compact dirt around and under the corporation stop and copper loop.
 - c. Type K soft drawn copper shall be connected to the top of the water main at a 45 angle by using a brass nut and a compression fitting on the end of the copper. All tubing shall be cut straight.
 - d. A small loop (goose neck) of excess copper must be put in the copper tubing to accommodate for settlement that may occur (see Standard Details).
 - e. All laterals must be of one continuous copper tube between the corp stop and the meter box. No joints or copper to copper connectors will be allowed.
 - f. All laterals shall have a minimum of 48" cover from top of copper tubing to finished grade.
 - g. From the top of the lid (cast iron) to shut off valve on the yoke, there must be a distance of not less than 18" or more than 24". No meter will be set if this or any other specification is not met.
 - h. All pig-tails will be type K drawn copper pipe and will be stubbed into the property a minimum of 5'.

- i. All meter boxes shall be centered squarely over the yoke to provide access to the connection nuts on the bottom of the yoke. Meter box interior shall be kept clear of dirt so that connecting nuts are visible.
- j. All meter boxes will be installed so the lid of the meter box will be 1" above T.B.C. after any settlement has occurred.
- k. See Standard Details for typical installation detail.
- l. Precautions should be used to prevent any foreign materials from entering the pipe. All pig-tails will be mashed on the end which is stubbed into the property. Contractor will make every effort to ensure that no kinks or restrictions occur in the copper service.
- m. Copper laterals may, at the discretion of the District Engineer, be required to be bedded in sand. If sand bedding is required, a minimum of 6" below and 6" above the pipe shall be placed.

B. 1-1/2" and 2" Service Laterals (see Standard Details):

1. Material

- a. All supplies, labor, machinery, etc. will be provided by the contractor.
- b. Type K soft drawn copper pipe or Poly-CTS (copper tube size) pipe with locator wire installed as one solid piece from main to meter.
- c. Copper or brass screw type fittings (ball valves, strainers, nipples, tees, bends, etc.). Mueller Corp.
- d. 5 foot diameter precast concrete manhole with 30" cast iron ring and lid suitable for HS-20 traffic loading (D & L Supply 1181 or District approved equal). An alternate 30" diameter poly meter vault section can be used with the prior approval of the District Engineer. Lid to have 2" hole.
- e. Meter box to have 12" gravel floor.

2. Installation:

- a. All meter vaults shall have a gravel base (floor) not less than 12" thick.
- b. The meter shall be a minimum of 24" and a maximum of 36" from the top of the box (see Standard Details). In cases where the main water line is deeper, the

service lateral will be raised to conform to this specification.

- c. A bypass shall be installed on the metered line with a locking type valve.
- d. All joints shall be or equivalent to Mueller compression fittings.
- e. No sprinkler systems shall be tied into the line inside of the meter vault.
- f. When subject to traffic, the box must be designed for Hs-20 traffic loading and be equipped with an appropriate cover approved by the District Engineer.
- g. 1 ½" and 2" taps to the main line shall be made with a saddle. A compression type corporation stop is acceptable.
- h. See Detail Drawings for typical meter installation detail.

C. 3" and Larger Service Laterals:

1. Materials

- a. Ductile iron pipe.
- b. Ductile iron, flanged gate valves and fittings.
- c. Concrete meter vault with cast iron lid, concrete floor and 18" diameter drain sump with personnel access manhole and steps.
- d. Floor supports as needed.
- e. 30" cast iron ring and lid with 2 2" recessed holes. D&L A-1180-S47

2. Installation

- a. The meter vault shall have a concrete floor.
- b. In case of extreme depth (over 36") a ladder shall be poured into or securely fastened to the vault wall. The access lid shall be moved so that it is centered over the ladder.
- c. The bypass shall be a 2" bypass for 3" & 4" meters, and a 4" bypass for 6" and 8" meters.

- d. No sprinkling system shall be tied inside the meter vault. Such tie-ins must be made on the property owners side of the meter station (outside the vault).
- e. When subject to traffic the box must be designed for HS-20 traffic loading and be equipped with an appropriate lid approved by the District Engineer.
- f. The meter vault shall be poured so that 12" minimum clearance exists between all sides of the vault and the piping.
- g. See Detail Drawings for typical installation detail.

4.2.9 SERVICE CONNECTIONS

All meter installation shall conform to the State-adopted plumbing code and local jurisdictional standards.

All service connections made to new and existing water mains shall be $\frac{3}{4}$ " I.D. in size and shall be made by the use of a standard drilling and tapping machine designed for use on water mains, such as a Mueller B-100 machine on cast iron and the Mueller E-5 machine with proper adapters on steel and A/C. The Mueller E-5 equipped with shell cutter and proper bit on PVC and a cookie retainer. Any machine shall be approved by the Bona Vista Water District before it is used to drill and tap into any water main owned or being built for the Water District. The thread shall be standard iron pipe thread. The tap shall be made so the corporation stop, when screwed into the main, will be flush with the inside wall of the water main and does not extend into the waterway. If service connection is made to pipe other than cast iron a service saddle approved by the District will be required. The District requires a Romac 101N saddle on lines 6" and under and a Romac 202N on lines larger than 6". On steel pipe said saddle shall be installed and shall be wrapped with hot applied tapecoat or wax wrap. Such saddle to be the Romac 202N. Class 200 PVC controlled O.D. Saddle.

The service line material as used between the main and meter valve shall be American-made type "k" copper tubing. It shall be connected to the corporation stop by a compression fitting and shall be properly cleaned and tightened so the compression nut will tighten to the corporation stop fully and will do so without any leakage of water. The corporation stop shall be made so the corporation stop, when screwed in, will extend out of the main at an angle 45 degrees from vertical. The type "k" copper tubing shall extend out from the corporation stop into a neatly formed loop extending approximately 9 inches above the corporation stop and then neatly formed in an approximate $\frac{1}{2}$ circle down to a horizontal line perpendicular from the main and extended to the designated spot for the meter box at a minimum depth of 4 feet below any ground surface under which it is extended. Pipe shall be a one piece, continuous line, absent of couplings.

All meter settings shall be made by use of a setting yoke, equal to Ford Y-502 or Mueller-H5020. The copper service line shall extend from the main to a yoke within the meter box.

The street side of the copper setter shall have a meter angle valve with lock wing/lock off device to set the inlet side of the meter. An expansion hand wheel will be required to tighten and adjust. The house or customer side for the setting should be fitted with a double independently acting and approved by the Utah Drinking Water Regulations check valve device which shall be designed to prevent back flow to the public supply. The approved equipment is either For HHC 94323G or Mueller H-14245. Said back flow preventer shall be in place of meter angle ell on customer side designed to connect to the meter.

The yoke shall be installed to set with bottom below finish ground level (approx. 18") and sit so supply rises vertically 18" above bottom allowing water meter to be set in the center of the meter box.

Meter box which shall be 36" x 18" concrete or corrugated poly shall be furnished and installed set to proper grade with a cast iron ring and cover with lock down lugs and standard pentagon bolt on lock down worm and shall be 4" in height with cover to be 1" above T.B.C. Cast iron ring and cover to be comparable in design and quality with DL2240-15 tapped 2" for use with electronic read out meter with minimum opening of 11 inches on lid. Contractor or owner is responsible to set proper grade and cost of any adjustment shall be responsibility of the contractor and done prior to meter being set.

All service lines shall be capped until connected for service.

4.2.10 FIRE HYDRANTS (See Standard Details)

A. Materials

1. Fire hydrants shall be placed in coordination with the local fire official.
2. All fire hydrants shall be red in color and shall be one of the following 6" compression type hydrants, with stainless steel bolts:
 - a. Mueller Centurion
 - b. Clow Medallion
 - c. Waterous
3. Auxiliary valve complete with valve box.
4. Gravel for sump.
5. Concrete for blocking and setting hydrant (Mega-lug connections utilized to replace concrete blocking is acceptable with the prior authorization of the District).
6. All hydrants shall conform to AWWA Specifications C-502.

7. Hydrant shall be equipped with two 2 ½” hose nozzles and one 4 ½” nozzle, and nozzles shall have the national standard threading.
8. Each hydrant shall be supplied with O-ring seals and a national standard pentagon operating nut designed for clockwise rotation closing.
9. Auxiliary valve shall conform to the Districts Specification for gate valves. The water line from the main to the hydrant shall be 6” minimum.
10. Blocking shall conform to the Districts Specifications for thrust blocking.

B. Fire Hydrant Installation

1. Hydrants shall be located as shown on the drawings and shall be set so that no portion of the hydrant shall be within 12 inches of any sidewalk, curb or other obstruction.
2. All hydrants shall be set so they stand plumb and match the established grade at the ground level flange. Nozzles shall face the street as directed by the District’s Engineer or Inspector.
3. The trench for the hydrant shall be slightly over excavated to provide a 1 cubic yard gravel sump as shown on the drawings.
4. Concrete thrust blocking shall be set behind the hydrant for support.
5. The drain holes shall not be covered by the concrete blocking.
6. All hydrants shall be level both at the side and at the back.
7. All hydrants shall be turned on after installation and inspected by the District and Fire Marshall for proper operation.
8. See Detail Drawings for Fire Hydrant Connection Detail.
9. Fire hydrants shall not be located within 10 feet of sanitary sewer. Where possible hydrants shall not be located within 10 feet of storm drains.

4.2.11 FIRE SPRINKLER/SUPPRESSION LINES

- A. All fire lines must be equipped with a gate valve. The valve shall conform to District specifications for gate valves.

- B. The fire lines are private from the valve throughout. It is recommended that either soils be tested for corrosivity or that corrosion resistant pipes and appurtenances be installed similar to the public system requirements.
- C. All fire lines shall be AWWA approved pipe, size, and material as specified by the local Fire Marshal, as shown on the District approved site plans. Fire lines shall meet the District's specifications for main lines.
- D. Notify the District Inspector 48 hours prior to installation.
- E. Unless written authorization is given by the Fire Marshal, no services shall be connected to the fire sprinkler/suppression lines.
- F. All fire lines need to be tested for High Chlorine and Bacteriological presence (through the same tests as water mains) by the District Inspector.

4.2.12 AIR RELIEF AND BLOW-OFFS

- A. At high points in water mains where air can accumulate, provisions shall be made to remove air by means of hydrants or air relief valves.
- B. The open end of the air relief vent pipe from automatic valves shall be provided with a #14 mesh, non-corrodible screen and a downward elbow, and where possible, be extended to at least one foot above grade. Alternatively, the open end of the pipe may be extended to as little as one foot above the top of the pipe if the valve's chamber is not subject to flooding, or if it meets the requirements of (7) Chamber Drainage.
- C. Blow-offs or air relief valves shall not be connected directly to a sewer.
- D. Adequate number of hydrants or blow-offs shall be provided to allow periodic flushing and cleaning of water lines.
- E. The air relief valve shall be installed in a manner to prevent it from freezing. A shut-off valve shall be provided to permit servicing of an air relief valve.

4.2.13 CHAMBER DRAINAGE

- A. Chambers, pits, or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system, shall not be connected directly to a storm drain or sanitary sewer.
- B. Chambers shall be provided with a drain to daylight, if possible. Where this is not possible, underground gravel-filled absorption pits may be used if the site is not subject

to flooding and conditions will assure adequate drainage. Sump pumps may also be considered if a drain to daylight or absorption pit is not feasible.

4.3 EXECUTION

4.3.1 INSPECTION

- A. All pipe fittings, valves and other appurtenances shall be examined by Contractor carefully for damage and other defects immediately before installation.
- B. Defective materials shall be marked and held for inspection by the District Engineer, who may prescribe corrective repairs or reject the materials.
- C. Prior to installation, valves shall be inspected for direction of opening, freedom of operation, tightness of pressure-containing bolting, cleanliness of valve ports and seating surfaces, handling damage, and cracks. Defective valves shall be corrected or held for inspection by the District Engineer.
- D. No pipe shall be laid in water or when, in the opinion of the District's Engineer or Inspector the trench conditions are unsuitable.

4.3.2 PREPARATION

- A. Furnish temporary support, adequate protection, and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the progress of the work.
- B. Bed pipe with 12" sand.
- C. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign material before the pipe is laid. Bevel and file plain end of pipe to prevent gasket damage during joint assembly.
- D. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, and valves shall be lowered carefully into the trench by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water-main materials and protective coatings and linings. Under no circumstances shall water system materials be dropped or dumped into the trench.

4.3.3 SEPARATION OF WATER MAINS AND SEWERS

A. Horizontal Separation

A water main should be laid at least ten feet horizontally from any existing or proposed sewer line. Should local conditions prevent a lateral separation of ten feet, the contractor or developers engineer shall consult with the District Engineer for possible conditions and requirements and will need prior approval from the Division of Drinking Water. Water and sewer lines shall not be laid in the same trench. The bottom of the waterline shall be at least 18" above the top of the drain or sewer line. At the same time, the waterline must be sufficiently buried to prevent freezing. Pressure sewer needs to be 18" from bottom off water line and must be sleeved, with no exceptions.

4.3.4 THRUST BLOCK INSTALLATION

- A. Thrust blocks shall be provided at eccentric reducers, valves, tees, plugs, caps, fire hydrants and at bends. Thrust blocks are also required when any mega-lug retainer gland is used.
- B. Thrust block shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that shown on the drawings. The block shall, unless otherwise shown or directed, be so located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair. Concrete shall not be located within 1 ½" of the joints and bolts.
- C. Concrete for thrust blocks shall have a compressive strength of not less than 2500 psi in 28 days.
- D. Care shall be taken to not pour concrete around bolts.
- E. Refer to Standard Details for thrust block details.

4.3.5 BACKFILL

All pipe and fittings shall be backfilled to a point 12 inches above the pipe by hand. The fill material shall be placed in by hand tools in 6 inch layers and compacted by mechanical or hand tools. The fill material must be free of rocks or hard materials over 1 ½ inches in diameter for an area of 12 inches, (the maximum rock size is ¾ inches for plastic pipe) both over and under and on each side of the pipe. The material from a point 12 inches above the pipe may be placed in 12 inch layers and compacted until the fill reaches a point in 12 inches below the established grade after which it may be pushed in by machine and compacted by rolling over it with pneumatic tires on the machine used for backfilling.

4.3.6 RESURFACING

Any finished surface such as concrete, asphalt, turf or gravel must be restored to its original condition by the contractor at his own expense after the pipe is installed and backfill completed. The contractor must construct resurfacing to the approval of U.D.O.T., Weber County, or any city within the District. It shall be contractor's responsibility to know amount of resurfacing and agency requirements.

4.3.7 FIELD QUALITY CONTROL

A. Temporary connections for pressure testing shall be made by the Contractor at his expense and removed by him after the satisfactory completion of the testing work.

B. Pressure Test:

1. After completion of the installation of the system, (including water mains and all service laterals) or any reasonable length thereof, prior to surface restoration and after thorough flushing of the portion to be tested, pressure tests shall be made. The system to be tested shall be subjected to a hydrostatic pressure of 150 pounds per square inch, following AWWA C600-10 procedures, unless otherwise noted on the drawings, for a period of not less than 2 hours duration.
2. The portion to be tested shall be filled with water slowly and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the District Engineer. The Contractor shall make the temporary connection for pressure testing.
3. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation stops at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged by the Contractor with a brass plug.
4. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the District Engineer or his representative, at no cost to the Owner.

C. Leakage Test:

1. A leakage test shall be conducted concurrently with the pressure test, following AWWA C600-10 procedures.
2. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
3. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:
In inch-pound units,

$$L = \frac{SD\sqrt{P}}{148,000}$$

Where:

- L = allowable leakage, in gallons per hour
- S = length of pipe tested, in feet
- D = nominal diameter of the pipe, in inches
- P = average test pressure during the leakage test, in pounds per square inch (gauge)

Example

- S = 1000 ft.
- D = 8 inches
- P = 75 psi.

$$\text{Allowable leakage in gal/hr} = \frac{1000 \times 8 \times \sqrt{75}}{148,000} = 0.47 \text{ gallon/hr}$$

4. Acceptance of installation shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified above, the contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.
5. All visible leaks, other than a minor amount of sweating, shall require immediate stoppage of the test and tightening of the joints so that, when pressure is again put on the system, there will be no leakage.

D. Disinfection of Water Distribution Systems:

1. Refer to Section 5.

4.3.8 CROSS CONNECTION CONTROL AND BACKFLOW PREVENTION

- A. It shall be unlawful at any place supplied with water from the Bona Vista Water Improvement District System to do any of the following:
 - 1. To install after written notification from the General Manager, Backflow personnel, or Inspector or use any physical connection or arrangement of piping or fixtures which may allow any fluid or substance not suitable for human consumption to come in contact with potable water in the District System. Including pressurized irrigation.
 - 2. To install any connection, arrangement, or fixtures without using a backflow prevention device or assembly designed to prevent a violation of subsection A. Any such device or assembly must be approved for installation by the General Manager, Backflow personnel, or Inspector with respect to each application.
 - 3. To install any backflow prevention device or assembly described in subsection B which is not installed as required in the Utah Plumbing Code.
- B. Officers and employees of the District shall have the right to enter any place which is supplied with water from the Bona Vista Water Improvement District System and conduct a hazard survey or any other examination or test reasonably necessary to the enforcement of this section.
- C. Any user of water from the Bona Vista Water Improvement District System, and not the District, shall pay all costs of installation and testing of backflow prevention devices or assemblies.
- D. Backflow prevention devices or assemblies required by this section shall be tested not less than once each year by a technician certified by the Safe Drinking Water Committee of the State of Utah. Test results shall be furnished to the District General Manager.
- E. Water service may be discontinued to any user who is found to be in violation of this ordinance and who fails to take corrective action within ten (10) days after violation notification, except that water service may be discontinued immediately if an immediate threat to the water supply exists.
- F. Any person who violates the provisions of the section shall be civilly liable to the District, and to third persons other than the District, for all damages proximately caused by said violation.

SECTION 5

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

5.1 GENERAL

5.1.1 WORK INCLUDED

- A. Flushing of water distribution system and supply lines
- B. Chlorine disinfection (50ppm)
- C. Chlorine residual tests (taken by the District)
- D. Two approved bacteriological tests (taken by the District) (If more than 3 tests have to be performed, the cost of additional tests will be billed to the contractor.)
- E. Pressure Test

The process of the work to be completed as listed above is to be done in the following sequence: After pipe is installed with all valves, bends, plugs, thrust blocks (and laterals for new developments), the pipe is filled with clean water to mix with the chlorine placed in the pipe during construction. The water remains in the pipe for 24 hours for disinfection contact. The line is then flushed to a safe location and sits for a 16-hour period. After this second period, the first Bacteriological sample is taken by District Personnel. The water in the line continues to sit for a second 16-hour period, at which time a second Bacteriological sample is taken. If both samples show negative bacteria present, then disinfection is complete and the pressure test is initiated as described below. Following the passing of these tests, the line is then ready for service. Details for tests and methods are included herein, including contingencies for non-passing Bacteriological and Pressure tests.

5.1.2 QUALITY ASSURANCE

All disinfection and testing procedures shall be in accordance with applicable Federal, State, and local standards, and in accordance with applicable provisions of AWWA C651-14.

5.1.3 DISINFECTION OF WATERLINES

All new lines shall be properly disinfected by the contractor and the cost shall be borne by the contractor and included in the price of installation per foot of pipe.

5.1.4 METHOD

The line shall be disinfected by the contractor and the cost included in the price per foot of laying pipe. All lines and appurtenances shall be disinfected in accordance with AWWA

Standard C651. Following the initial filling of water line, a solution of Calcium Hypochlorite shall be introduced into the line to mix with the water. The line is checked at various points to make certain the solution is present throughout the entire line. For the strength of solution needed refer to 5.2.1.C or for “Super chlorination” refer to 5.2.1.D.

The line is then shut down and allowed to stand for a 24-hour period. Afterwards, tests for residual are taken. If a residual referred to in 5.2.1 C(D) is still present, the line is flushed in accordance with all existing requirements for disposal of chlorinated water. After flushing the pipe, it is filled with water and bacteria tests are taken, which must pass all State requirements.

5.1.5 COMPLETION OF DISINFECTION

After the line has been satisfactorily disinfected the water will be thoroughly flushed from the line and tested to make certain the heavily chlorinated water is expelled from the line. This work shall be performed by the contractor at his expense except the valves to supply water into the new line shall be operated by the District’s Employees. District requires 2 approved bacteria samples on new water line at 16 hours and 32 hours.

5.1.6 COMPLETION

After satisfactory tests and disinfection of the line the District will accept the line if the tests prove satisfactory and will then begin to serve water through it.

5.2 PREPARATION

5.2.1 SAME REFERENCE TO STANDARDS ARE TO APPLICABLE CITY, COUNTY OR STATE

TABLE 1
Ounces of Calcium Hypochlorite Granules to be Placed
at Beginning of Main and Each 100-ft Interval

Pipe Diameter (in.)	Calcium Hypochlorite Granules (oz.)
4	0.5
6	1.25
8	2.5
10	3.5
12	5.0
14	7.0
16	9.0
18	11.0

- A.** Placing of calcium hypochlorite tablets: During construction, 5 gram calcium hypochlorite tablets shall be placed in each section of pipe and also one such tablet shall be placed in each hydrant, hydrant branch main, and other appurtenances. The number of 5 gram tablets required for each pipe section shall be $0.0012d^2L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. The tablets shall be attached by an adhesive such as Permatex No. 1, or equal. There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. Attach all the tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.
- B.** When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 ft/s. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 41 F, the water shall remain in the pipe for at least 48 hours. Valves shall be positioned so that the strong chlorine solution in the treated main will not flow into water mains in active service.

TABLE 2
Tablets to be Placed in Pipe Sections

Pipe Diameter (Inches)	Length of Pipe Section, ft.				
	13 or less	18	20	30	40
	(Number of 5 gram Calcium Hypochlorite Tablets*)				
4"	1	1	1	1	1
6"	1	1	1	2	2
8"	1	2	2	3	4
10"	2	3	3	4	5
12"	3	4	4	6	7
16"	4	6	7	10	13
20"	5	8	10	14	18

*Based on 3.25 g. available chlorine per tablet (65% available chlorine per 5 gram tablet); any portion of tablet rounded to next higher number. Dose of 25 mg/l required.

- C.** A detectable free chlorine residual (≥ 0.2 mg/L) shall be found at each sampling point after the 24- or 48-hr period. If directed by the District, the completed piping system, of specified sections, shall be disinfected using the slug method of Chlorination.
- D.** In review of the AWWA documentation, the District has adopted a flushing velocity standard of 3 feet per second in the main line. The discharge flow rates to achieve this

are given in the following table. The contractor is to verify the correct amount of hydrants or outlets to achieve the appropriate volume.

Main Line Size	Flushing Flow Rate to Achieve 3 fps
6"	264 GPM
8"	470 GPM
10"	734 GPM
12"	1057 GPM
14"	1439 GPM
16"	1880 GPM

5.2.2 ALTERNATIVE METHODS

A. Alternative disinfection methods:

1. Continuous-Feed Method PG AWWA C651-14, Section 4.4
2. Slug Method PG AWWA C651-14, Section 4.5

5.2.3 FINAL FLUSHING

A. Clearing the main of heavily chlorinated water:

1. After the applicable retention period, the chlorinated disinfection water shall be drained from the line.
2. Flushing shall continue until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system.

B. Disposing of heavily chlorinated water:

1. The environment to which the chlorinated water is to be discharged shall be inspected. Do not discharge to any fish habitat, agricultural lands or other location where damage may occur.
2. If there is any question that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water.
3. Contractor to comply with Federal Clean Water Act. If necessary secure permission from Utah "DEQ" or County Health Department for disposal of heavily chlorinated water.

5.2.4 BACTERIOLOGICAL SAMPLING AND TESTING

- A. Samples for bacteriologic analysis shall be collected in sterile bottle treated with sodium thiosulfate. A minimum of two (2) consecutive samples must be taken; 16 hours apart. A sampling tap shall be provided by the Contractor. The District shall be responsible for sampling and bacteriologic analysis by a certified testing laboratory. Contractor to give minimum 48 hours notice to the District prior to required sampling.

- B. Waterline:
 - 1. After final flushing and before the water main is placed in service, a sample shall be collected from the water line and tested for the absence of coliform organisms in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater". Said samples shall be taken at least every 1200 feet of new main plus one sample from the end of the new line, and at least one from each branch. The testing shall be by either the multiple tube fermentation technique or the membrane filter technique.
 - 2. All samples shall be taken from a sampling tap or fire hydrant at a representative point on the system.
 - 3. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained.
 - 4. If check samples show the presence of coliform organisms, then the main shall be re-chlorinated by the continuous-feed or slug method of chlorination until satisfactory results are obtained.
 - 5. High velocities in the existing system, resulting from flushing the new main, may disturb sediment that has accumulated in the existing mains. When check samples are taken, water entering the new main shall also be sampled.
 - 6. When the samples are satisfactory, the water line may be placed in service upon receiving notification from the District Engineer or his designer to do so.

5.2.5 DISINFECTION PROCEDURES WHEN CUTTING INTO OR REPAIRING EXISTING MAINS

- A. The following procedures apply primarily when mains are wholly or partially dewatered. After the appropriate procedures have been completed, the main may be returned to service prior to completion of bacteriological testing in order to minimize the time customers are out of water. Leaks or breaks that are repaired with clamping devices while the mains remain full of pressurized water present little danger of contamination and require no disinfection.

B.

1. Trench treatment: When an old main is opened, either by accident or by design, liberal quantities of hypochlorite shall be applied to open trench areas.
2. Swabbing hypochlorite solution: The interiors of all pipe and fittings (particularly couplings and sleeves) used in making the repair shall be swabbed or sprayed with a 1-percent hypochlorite solution before they are installed.
3. Flushing: Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations permit, flushing toward the work location from both directions is recommended. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water is eliminated.

SECTION 6

RESTORATION OF SURFACE IMPROVEMENTS

6.1 GENERAL

The Contractor shall be responsible for the protection and the restoration or replacement of any improvements existing on public or private property at the start of work or placed there during the progress of the work. All restoration of improvements shall comply with the requirements of Section 1 – “General Development and Construction Requirements”.

Existing improvements shall include but are not limited to permanent surfacing, curbs, gutters, sidewalks, planted areas, ditches, driveways, culverts, fences, and walls. All improvements shall be reconstructed to equal or better conditions in all respects than the existing improvements removed.

6.2 GRAVEL SERVICE

Where trenches are excavated through gravel surfaced areas such as roads and shoulders, parking areas, unpaved driveways, etc., the gravel surface shall be restored and maintained as follows:

- A. The gravel shall be placed deep enough to provide a minimum of 12 inches of material.
- B. The gravel shall be placed in the trench at the time it is backfilled. The surface shall be maintained by blading, sprinkling, rolling, adding gravel, etc., to maintain a safe, uniform surface satisfactory to the District Engineer. Excess material shall be removed from the premises immediately.
- C. Material for use on gravel surfaces shall be obtained from sound, tough, durable gravel or rock meeting the following requirements for grading:

<u>Sieve Size</u>	1 Inch Gradation <u>Ideal Gradation</u> (Percent Passing)	<u>Ideal Gradation</u> (Tolerance)
1 inch	100	0
½ inch	85	+/-6
No. 4 sieve	55	+/-6
No. 16 sieve	31	+/-4
No. 200 sieve	9	+/-2

6.3 BITUMINOUS SURFACE

Where trenches are excavated through bituminous surfaced roads, driveways, parking areas, etc., the surface shall be restored and maintained as follows:

- A. A temporary gravel surface shall be placed and maintained as required in Paragraph 6.2 above after the required backfill and compaction of the trench has been accomplished.
- B. The gravel shall be placed to such depth as to provide 12 inches thickness below the bottom of the asphalt pavement and shall be brought flush with the paved surface.
- C. The area over trenches to be resurfaces shall be graded and rolled to provide a subgrade which is firm and unyielded. Density of the subgrade materials shall be 95% of AASHTO T-180. Mud or other soft or spongy material shall be removed and the void filled with gravel and rolled and tamped thoroughly in layers not exceeding six inches in thickness. The edges of trenches which are broken down during the making of subgrade shall be removed and trimmed neatly before resurfacing.
- D. Before any permanent resurfacing is placed, the Contractor shall trim the existing paving to clean, straight lines as nearly parallel to the centerline of the trench as practicable. Said straight lines shall be thirty feet minimum length and no deviations from such lines shall be made except as specifically permitted by the District Engineer.
- E. Existing bituminous paving shall be cut back a minimum of six inches beyond the limits of any excavation or cave-in along the trench so that the edges of the new paving will rest on at least six inches of undisturbed soil.
- F. As soon as is practical, weather permitting, the bituminous surface shall be restored by standard paving practices to the thickness shown on the Drawings and/or defined in the Proposal (Minimum 3”), or matching the existing pavement cut during excavation.
- G. Pavement restoration shall include priming of pavement of edges and sub-base with Type MC-70 bituminous material and placing and rolling plant hot mix bituminous material to the level of the adjacent pavement surfaces.

6.4 CONCRETE SURFACES

All concrete curbs, gutters, sidewalks, and driveways shall be removed and replaced to the next joint or scoring line beyond the actually damaged or broken sections; or in the event that joints or scoring lines do not exist or are three or more feet from the removed or damaged section, the damaged portions shall be removed and reconstructed to a neat “saw cut” vertical plane face. All new concrete shall match, as nearly as possible, the appearance of adjacent concrete improvements. Where necessary, lamp black or other pigments shall be added to the new concrete to obtain the desired results.

All concrete work shall conform to the requirements of Section 3 of these specifications.

BONA VISTA WATER IMPROVEMENT DISTRICT

STANDARD DRAWINGS

SUBMITTED & RECOMMENDED

Gregory L. Seemiller
 GREGORY L. SEEMILLER, P.E.
 CONSULTING DISTRICT ENGINEER

No. 181128
 12/28/23
 DATE

REGISTERED PROFESSIONAL ENGINEER
 STATE OF UTAH

INDEX OF DRAWINGS

- BV-00 TITLE PAGE AND INDEX OF DRAWINGS
- BV-01 WATER SERVICE CONNECTIONS
- BV-02 FIRE HYDRANT, BLOW OFF, AND AIR RELEASE VALVES
- BV-03 3", 4", AND 6" COMPOUND WATER METER STATION
- BV-04 PROTECTUS 6" & 8" WATER METER STATION
- BV-05 PERMANENT AND TEMPORARY BLOW-OFF HYDRANT

APPROVAL

Blake Carlin
 BLAKE CARLIN
 BONA VISTA WATER IMPROVEMENT DISTRICT, GENERAL MANAGER

12/12/23
 DATE

Matt Fox
 MATT FOX
 BONA VISTA WATER IMPROVEMENT DISTRICT, ASSISTANT GENERAL MANAGER

12/12/23
 DATE

SEPTEMBER 2006
 UPDATED: November 2023



J-U-B ENGINEERS, INC.

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OTHER J-U-B COMPANIES



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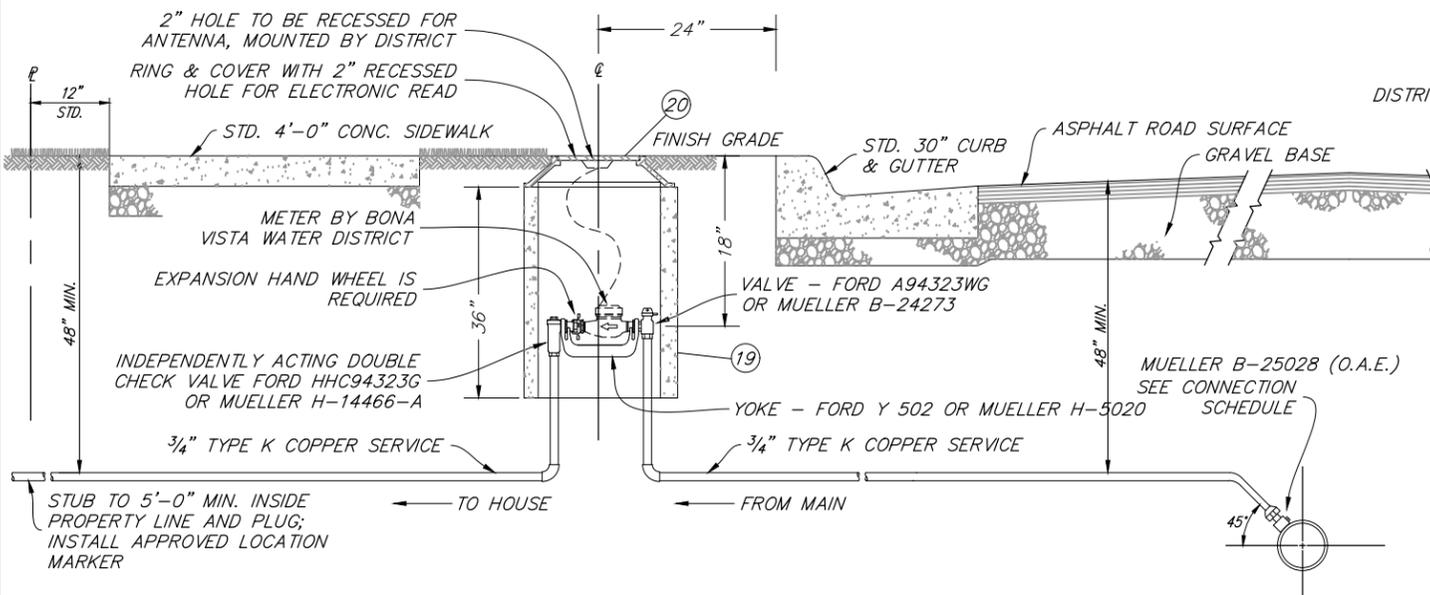
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LAST UPDATED: 11/9/2023

SHEET NUMBER:

BV-00



NO.	3/4" SERVICE	1" SERVICE
19	18"x36" METER BOX-CONCRETE OR CORRUGATED PVC (DOUBLE WALL)	24"x36" METER BOX-CONCRETE OR CORRUGATED PVC (DOUBLE WALL)
20	CAST IRON COVER W/ LOCKING NUT (D & L SUPPLY MODEL L-2240-15)	24" MANHOLE RING & COVER W/ CAMLOCK (D & L SUPPLY MODEL B-5024-03)

TYPICAL CULINARY WATER SERVICE CONNECTION

OWNERS RESPONSIBILITY:

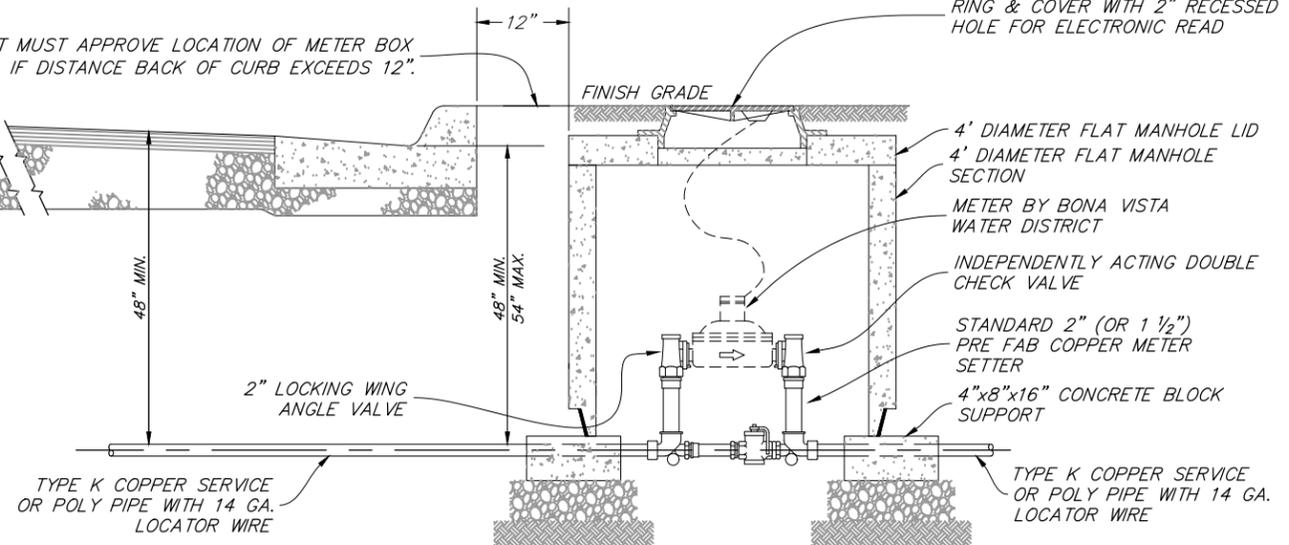
- THE OWNER OR CONTRACTOR SHALL PAY CONNECTION FEE AND SECURE PERMITS.
- THE OWNER OR CONTRACTOR SHALL PAY FOR ALL COSTS OF INSTALLATION INCLUDING ALL MATERIALS, (SADDLE, NECESSARY PIPE, YOKE/SETTER, CHECK VALVE, METER ANGLE VALVE & EXPANSION FITTING, METER BOX, CAST RING & COVER, - METER PROVIDED BY BONA VISTA WATER DISTRICT) ALL EXCAVATION AND FILL, ASPHALT REPLACEMENT, WATER MAIN CONNECTION, AND LABOR.
- NOTIFY THE DISTRICT 24 HOURS IN ADVANCE FOR LINE LOCATIONS AND/OR TAP ON MAIN. ALL WORK MUST BE INSPECTED AND APPROVED BY BONA VISTA WATER DISTRICT.
- PROPER GRADE IS THE OWNERS/CONTRACTORS RESPONSIBILITY. THE DISTRICT WILL NOT SET METER UNLESS THE YOKE AND METER BOX ARE AT THE PROPER GRADE.
- WORK MAY BE DONE BY OWNER OR LICENSED PLUMBER OR CONTRACTOR. ALL WORK IS THE RESPONSIBILITY OF THE OWNER.
- OWNER OR CONTRACTOR SHALL CALL BLUE STAKES OR DIRECT TO UTILITY COMPANIES FOR LOCATION OF UNDERGROUND GAS, TELEPHONES, ELECTRIC, CABLE T.V., IRRIGATION, PETROLEUM, AND SEWER LINES BEFORE DIGGING.

DISTRICTS RESPONSIBILITY:

- BONA VISTA WATER DISTRICT WILL FURNISH AND INSTALL METER AT NO COST.
- THE DISTRICT WILL LOCATE WATER MAIN PRIOR TO EXCAVATION - 24 HOUR NOTICE.
- THE OWNER WILL MAKE THE TAP ON THE WATER MAIN INCLUDING FURNISHING THE CORPORATION STOP.
- THE DISTRICT WILL FURNISH AND SET WATER METER IN CUSTOMERS YOKE.
- THE DISTRICT WILL INSPECT AND APPROVE ALL WORK - 24 HOUR NOTICE.

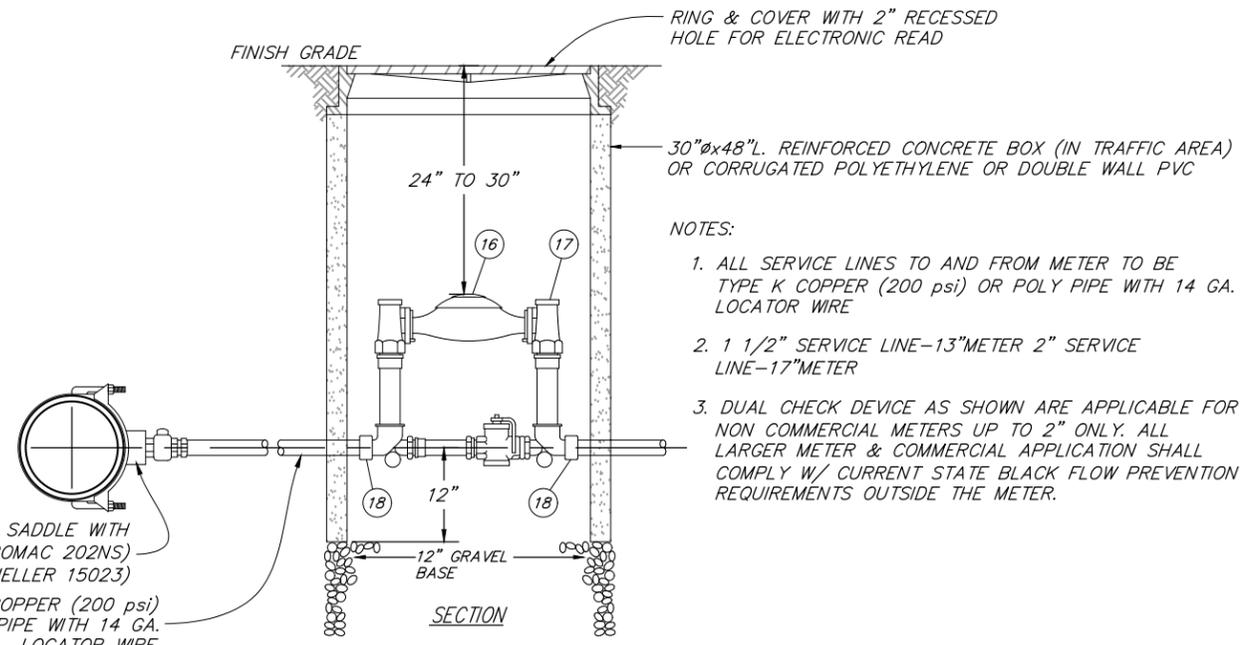
MATERIAL	SIZE	CONNECTION ⓐ
STEEL AND/OR ASBESTOS CEMENT	#6"	ROMAC 101 N
STEEL AND/OR ASBESTOS CEMENT	>6"	ROMAC 202 N DOUBLE STRAP
CAST IRON AND/OR DUCTILE IRON	#6"	CORPORATION STOP-MUELLER B-2502B
CAST IRON AND/OR DUCTILE IRON	>6"	CORPORATION STOP-MUELLER B-2502B
PVC C-900	#6"	ROMAC 101 N (FOR PVC) W/ I.P. CORPORATION STOP MUELLER B-2502B
PVC C-900	>6"	ROMAC 202 N DBL. STRAP (FOR PVC) W/ I.P. CORP. STOP
PVC CLASS 200	<8"	CONTROLLED O.D. SADDLE

ⓐ SADDLE CAN BE COMPARABLE TO ABOVE BUT SAME CORROSION PROOF BODY AND WIDE STRAPS ARE REQUIRED.
 ⓑ ALL NEW SUB CONNECTION TAPS SHALL BE DONE BY DEVELOPER. DISTRICT PROJECT TAPS SHALL BE COORDINATED BY THE DISTRICT.



2" (OR 1 1/2") WATER METER STATION

NO.	DESCRIPTION (1 1/2" & 2" METER STA.)	JOINT TYPE	1 1/2" LINE	2" LINE
16	WATER METER	FL	1 1/2"	2"
17	"MUELLER" B-2423-2 METER YOKE (18" HEIGHT)	-	1 1/2"	2"
18	"MUELLER" 110 COMPRESSION CONN. COUPLING	-	1 1/2"	2"

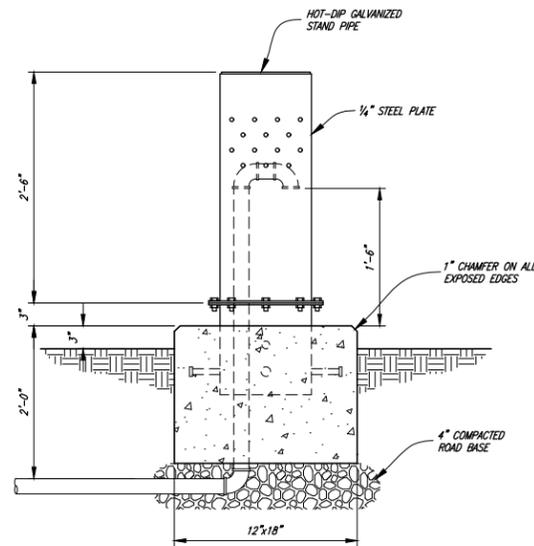


1 1/2" & 2" WATER METER STATION

- NOTES:**
- ALL SERVICE LINES TO AND FROM METER TO BE TYPE K COPPER (200 psi) OR POLY PIPE WITH 14 GA. LOCATOR WIRE
 - 1 1/2" SERVICE LINE-13" METER 2" SERVICE LINE-17" METER
 - DUAL CHECK DEVICE AS SHOWN ARE APPLICABLE FOR NON COMMERCIAL METERS UP TO 2" ONLY. ALL LARGER METER & COMMERCIAL APPLICATION SHALL COMPLY W/ CURRENT STATE BACK FLOW PREVENTION REQUIREMENTS OUTSIDE THE METER.

REVISION	DATE	DESCRIPTION
1	DDF/CLS/06/29/16	1 1/2" and 2" POLY SERVICE
2	DTJ/CLS/03/21/18	METER DEPTH, METER BOX SPEC

WATER SERVICE CONNECTIONS
 BONA VISTA WATER IMPROVEMENT DISTRICT
 STANDARD DETAIL



AIR VENT DETAIL

THRUST PER P.S.I. OF WATER PRESSURE AT VARIOUS FITTINGS

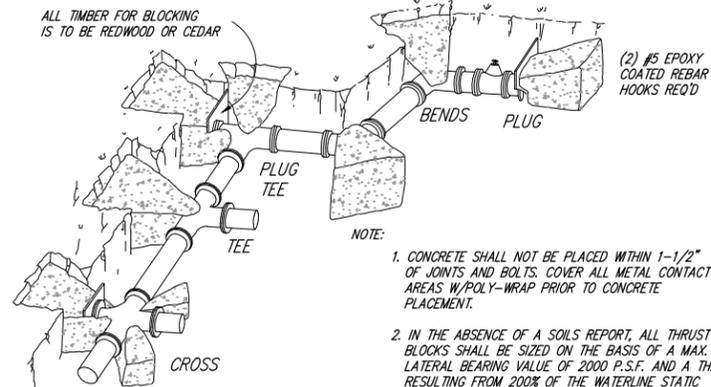
PIPE SIZE	DEAD END OR TEE	90° ELBOW	45° ELBOW	22 1/2° ELBOW
4	19	27	15	7
6	39	55	30	15
8	67	94	51	26
10	109	154	84	43
12	155	218	119	61
14	210	296	161	82
16	272	383	209	106
18	351	494	269	137
20	434	611	333	169
24	623	878	478	244

EXAMPLE:

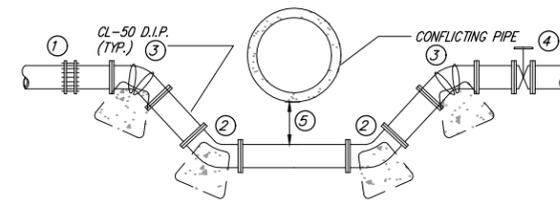
8-INCH 90° ELBOW, PRESSURE 200 LB./SQ. IN.
FROM TABLE: THRUST = 94 x 200 = 18,800 LB.
ASSUME BEARING STRENGTH OF SOIL = 2000 LB./SQ. FT.
 $\frac{18,800}{2,000} = 9.4$ SQ. FT. AREA OF BEARING REQUIRED FOR THRUST BLOCK

NOTES:

1. IN USING THE ABOVE TABLES, USE THE MAXIMUM INTERNAL PRESSURE ANTICIPATED (I.E. HYDROSTATIC TEST PRESSURE, POSSIBLE SURGE PRESSURE DUE TO PUMP SHUT OFF, ETC.).
2. SEE SOILS REPORT FOR BEARING STRENGTH OF SOIL. IN THE ABSENCE OF A SOILS REPORT, AN AVERAGE SOIL (SPADABLE MEDIUM CLAY) CAN BE ASSUMED TO HAVE A BEARING STRENGTH OF 2000 P.S.F.

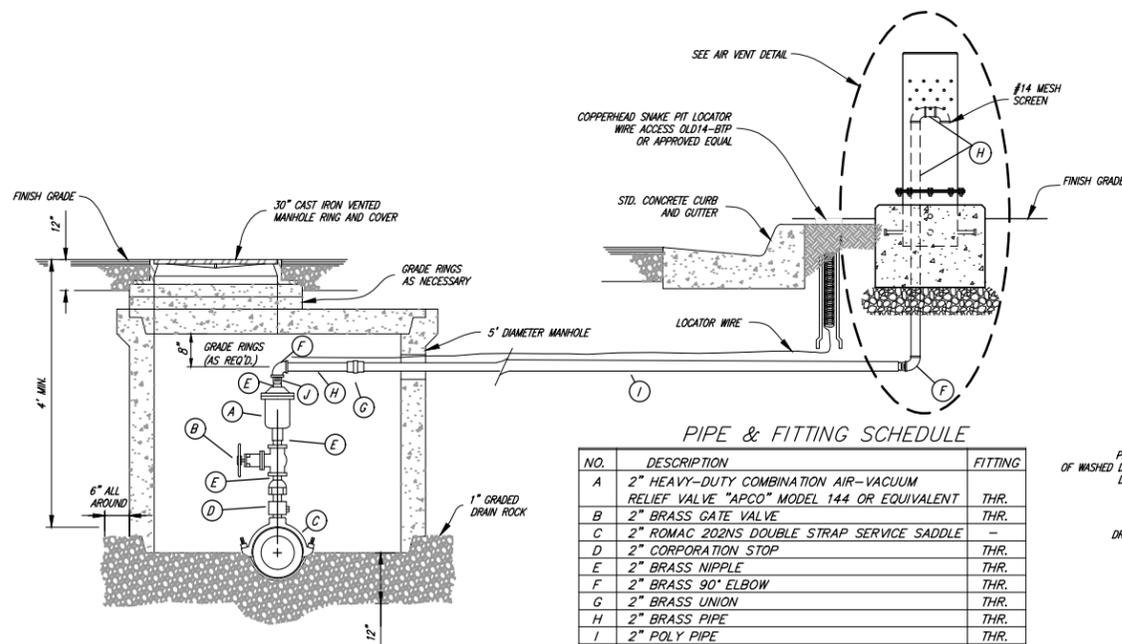


THRUST BLOCKING



- 1 TRANSITION COUPLING; ROCKWELL MODEL 441 OR ROMAC MODEL 501.
- 2 MJ 45° BEND W/RETAINER GLANDS.
- 3 CONSTRUCT THRUST BLOCKS AT EACH 45° BEND W/(3) #6 REBARS SECURING BLOCK TO FITTING (EPOXY COATING).
- 4 FURNISH & INSTALL MJ GATE VALVE & BOX IF REQUIRED BY THE DISTRICT ENGINEER
- 5 MINIMUM OF 12" SEPERATION BETWEEN THE WATERLINE AND CONFLICTING PIPE TO BE CROSSED. IF CONFLICTING PIPE IS A SEWER PIPE THEN THE WATERLINE MUST CROSS OVER THE SEWER PIPE WITH A MINIMUM CLEARANCE OF 18" BETWEEN PIPES.

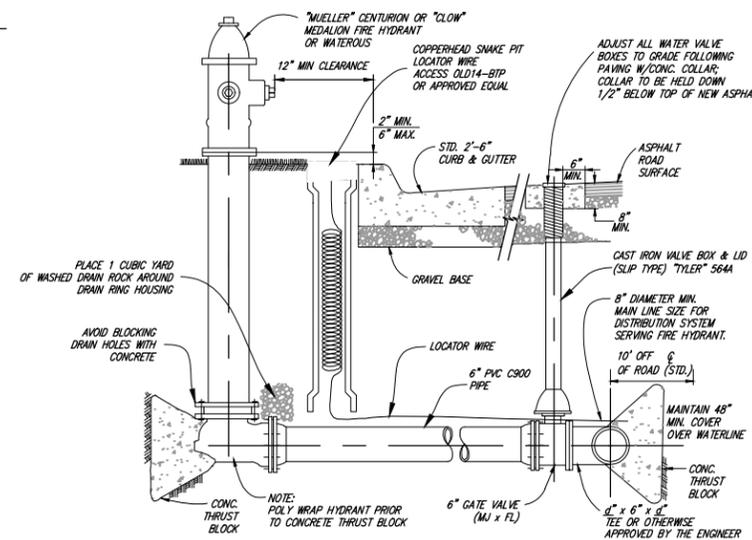
TYPICAL WATERLINE LOOP



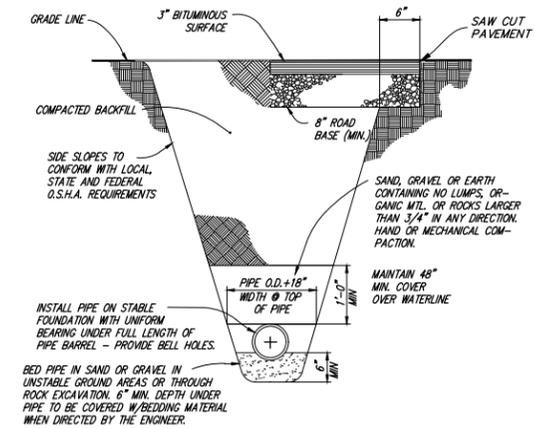
COMBINATION AIR RELEASE VALVE STATION

PIPE & FITTING SCHEDULE

NO.	DESCRIPTION	FITTING
A	2" HEAVY-DUTY COMBINATION AIR-VACUUM RELIEF VALVE "APCO" MODEL 144 OR EQUIVALENT	THR.
B	2" BRASS GATE VALVE	THR.
C	2" ROMAC 202NS DOUBLE STRAP SERVICE SADDLE	THR.
D	2" CORPORATION STOP	THR.
E	2" BRASS NIPPLE	THR.
F	2" BRASS 90° ELBOW	THR.
G	2" BRASS UNION	THR.
H	2" BRASS PIPE	THR.
I	2" POLY PIPE	THR.
J	2" BRASS MALE ADAPTOR	THR.



TYPICAL URBAN FIRE HYDRANT CONNECTION



TYPICAL TRENCH SECTION

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NO.	DESCRIPTION	BY	DATE
1	ADDED SNAKE PIT TO HYD. & COMBO	JDM	05/07/18
2	BEARING MIN. FROM 4" TO 6"	JDM	05/14/18
3	REVISED FIRE HYD PIPE MATERIAL	JDM	04/25/19

**WATER SERVICE CONNECTIONS
BONA VISTA WATER IMPROVEMENT DISTRICT**

STANDARD DETAIL

FILE: STANDARD DETAILS
JUB PROJ #: 85-11-123
DRAWN BY: JDM
DESIGN BY: GLS
CHECKED BY: GLS

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

LAST UPDATED: 12/28/2023

SHEET NUMBER:

BV-02

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NO.	REVISION	DESCRIPTION	BY	DATE

3" & 4" WATER METER STATION
 BONA VISTA WATER IMPROVEMENT DISTRICT
 APPENDUM 2 3" & 4" METER DETAIL

FILE: STANDARD DETAILS
 JUB PROJ. #: 55-11-123
 DRAWN BY: JDM
 DESIGN BY: GLS
 CHECKED BY: GLS
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY
 LAST UPDATED: 12/28/2023

SHEET NUMBER:

BV-03

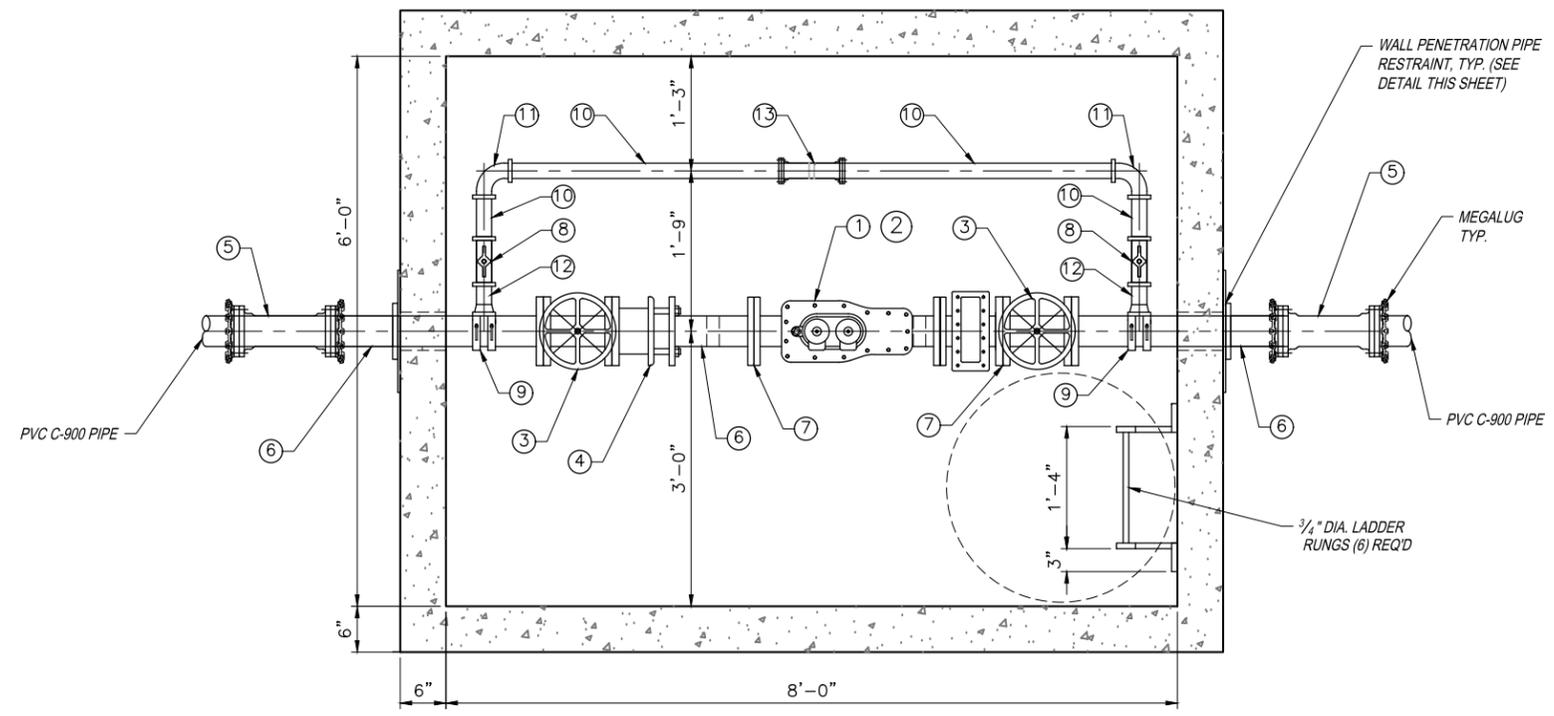
PIPE & FITTING SCHEDULE

NO.	DESCRIPTION (3" & 4" METER STA.)	JOINT TYPE	3" COMPOUND LINE	4" COMPOUND LINE
1*	NEPTUNE TRIDENT W-350DR METER W/ STRAINER	FL	3"	-
2*	NEPTUNE TRIDENT W-1000DR METER W/ STRAINER	FL	-	4"
3	GATE VALVE	FL	4"	4"
4	ROMAC FCA501 FLANGED COUPLING ADAPTER	FLxPE	4"	4"
5	ROMAC 501 D.I. SLEEVE	MJ	4"	4"
6	D.I. NIPPLE	FLxPE	4"	4"x**
7	D.I. REDUCER	FL	4"x3"	-
8	BALL VALVE	-	2"	2"
9	BRASS SADDLE ROMAC 202 BS	-	2"	2"
10	GALVANIZED NIPPLE	-	2"	2"
11	GALVANIZED 90° BEND	-	2"	2"
12	BRASS NIPPLE	-	2"	2"
13	GALVANIZED DRESSER COUPLING	-	2"	2"
14	VAULT SIZE (WxLxH)	-	6'x8'x6.5'	6'x8'x6.5'
15	PIPE STANDS	-	3 EA.	3 EA.

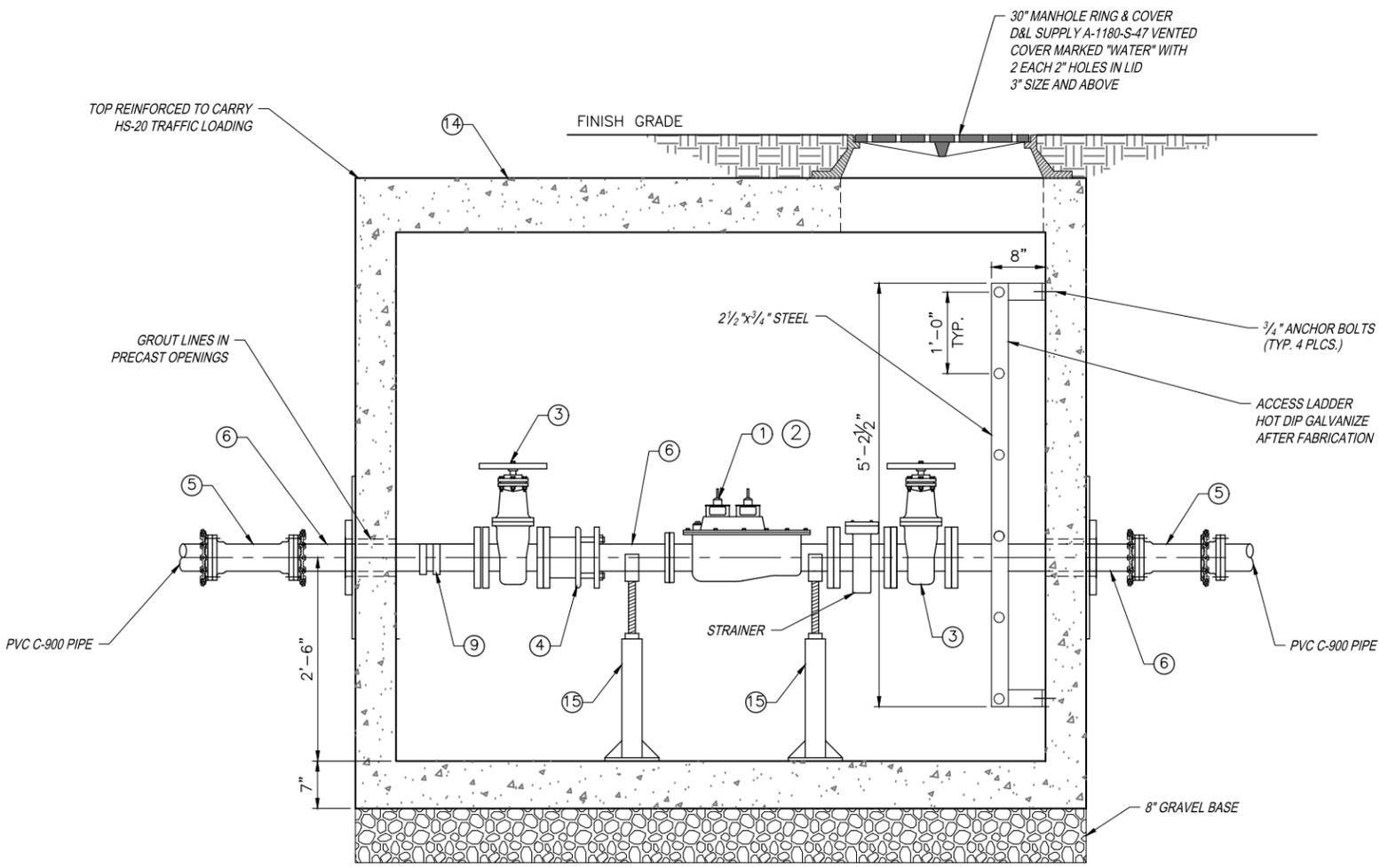
* METER TO BE SUPPLIED BY DISTRICT AS PART OF THE CONNECTION FEE.
 ** FIELD FIT.

NOTES:

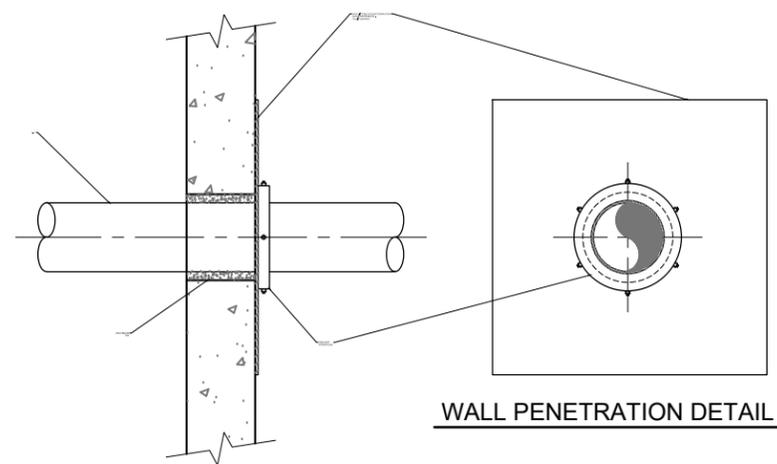
- PROPERTY OWNER OR CONTRACTOR SHALL PAY FOR ALL COSTS OF INSTALLATION INCLUDING ALL MATERIALS, ALL EXCAVATION AND FILL, ASPHALT REPLACEMENT AND WATER MAIN CONNECTION.
- INSPECTION OF ALL WATER LINE INSTALLATIONS WILL BE DONE BY A BONA VISTA INSPECTOR, WITH A 48 HOUR MINIMUM NOTICE REQUIRED PRIOR TO START OF WORK.
- CONTRACTOR IS RESPONSIBLE FOR ALL CITY, COUNTY OR STATE ROAD CUT PERMITS AND REGULATIONS.
- ALL FITTINGS SHALL BE AWWA C-110 WITH 125 LB. FLANGES. ALL PIPING SHALL BE DUCTILE IRON PIPE - CLASS 350 P.S.I. MIN.
- ALL CONNECTIONS MUST BE COMPATIBLE WITH CURRENT BACK FLOW PRIVATION.
- JOINT RESTRAINERS (MEGALUG) AND THRUST BLOCKS REQUIRED ON EXTERIOR FITTINGS AS SHOWN.



PLAN



SECTION



WALL PENETRATION DETAIL

3" & 4" WATER METER STATION
 SCALE: N.T.S.

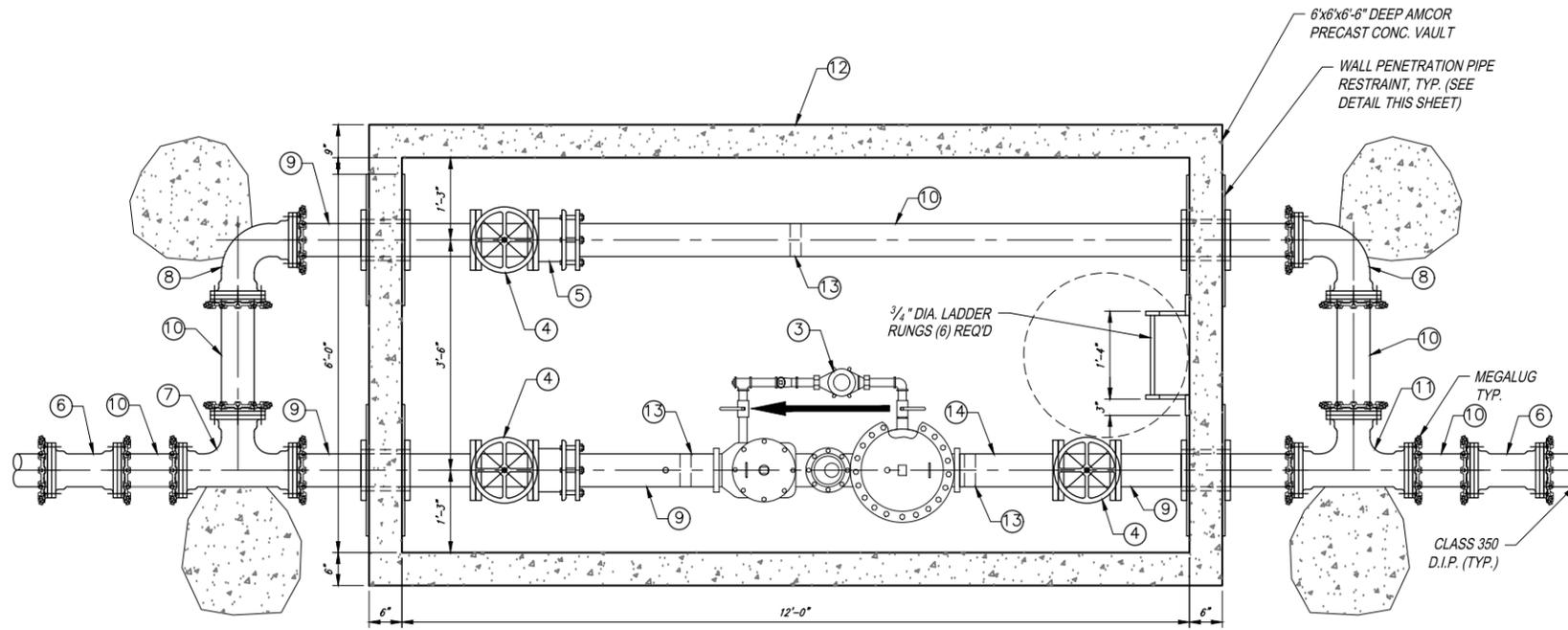
PIPE & FITTING SCHEDULE

NO.	DESCRIPTION (6" & 8" METER STA.)	JOINT TYPE	6" PROTECTUS LINE	8" PROTECTUS LINE
3*	PROTECTUS METER	FL	6"	8"
4	GATE VALVE	FL	6"	8"
5	ROMAC FCA501 FLANGED COUPLING ADAPTER	FLxPE	6"	8"
6	ROMAC 501 D.I. SLEEVE	MJ	6"	8"
7	D.I. TEE	MJ	6"	8"
8	D.I. 90° ELBOW	MJ	6"	8"
9	D.I. NIPPLE	FLxPE	6"x**	8"x**
10	D.I. PIPE	PE	6"x**	8"x**
12	VAULT SIZE (WxLxH)	-	6'x12'x6.5'	6'x12'x6.5'
13	PIPE STANDS	-	3 EA.	3 EA.
14	D.I. SPOOL	FLxFL	6" x 18"	8" x 18"

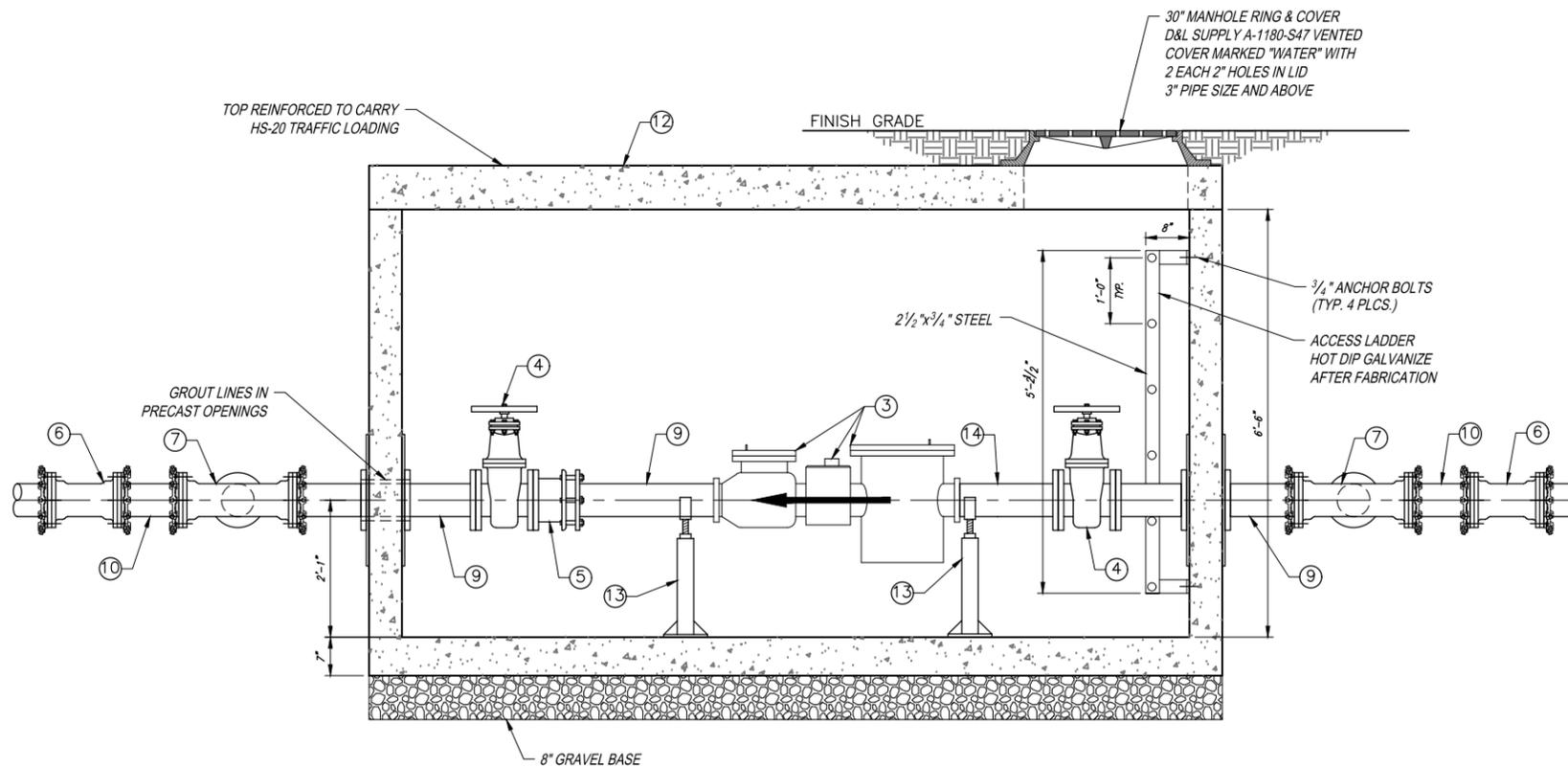
* METER TO BE SUPPLIED BY DISTRICT AS PART OF THE CONNECTION FEE.
 ** FIELD FIT.

NOTES:

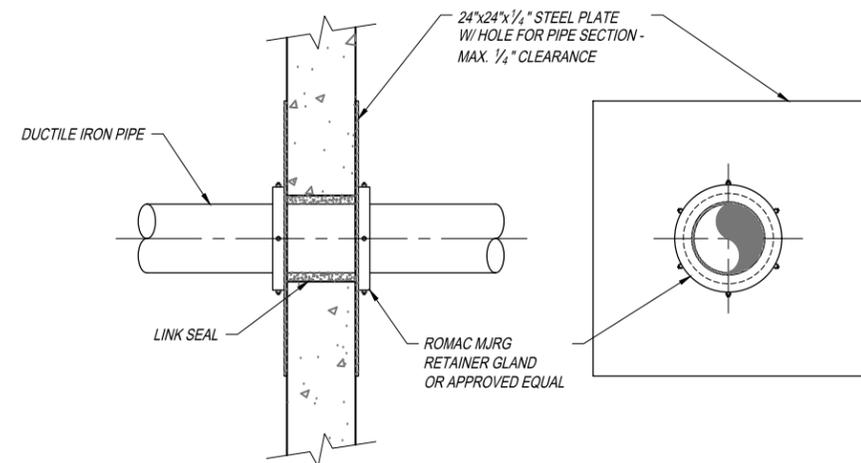
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PLAN



SECTION



WALL PENETRATION DETAIL

- NOTES:
- ALL SPECIFIED BRANDS OF MATERIALS SHOWN ON THESE DRAWINGS ARE DISTRICT STANDARDS. OTHER EQUIVALENT BRANDS MAY BE USED WITH THE PRIOR APPROVAL OF THE ENGINEER AND THE WATER DISTRICT INSPECTOR.
 - DUE TO HIGH GROUNDWATER, SUMP DRAINS IN THE VAULT ARE NOT FEASIBLE. VAULT TO BE SEALED AND DISTRICT STAFF ARE EQUIPPED WITH PUMPS FOR ACCESS.

6" & 8" PROTECTUS WATER METER STATION
 SCALE: N.T.S.

NO.	REVISION	DESCRIPTION	DATE
1	FIXED ANNOTATIVE SCALE	DTJ/CLS/5/17/18	
2	ADDED GROUNDWATER NOTE	DTJ/CLS/6/6/18	

6" & 8" PROTECTUS WATER METER STATION
 BONA VISTA WATER IMPROVEMENT DISTRICT
 STANDARD DETAIL

FILE: STANDARD DETAILS
 JUB PROJ. #: 85-11-123
 DRAWN BY: JDM
 DESIGN BY: GLS
 CHECKED BY: GLS
 AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY
 LAST UPDATED: 12/28/2023

SHEET NUMBER:
BV-04

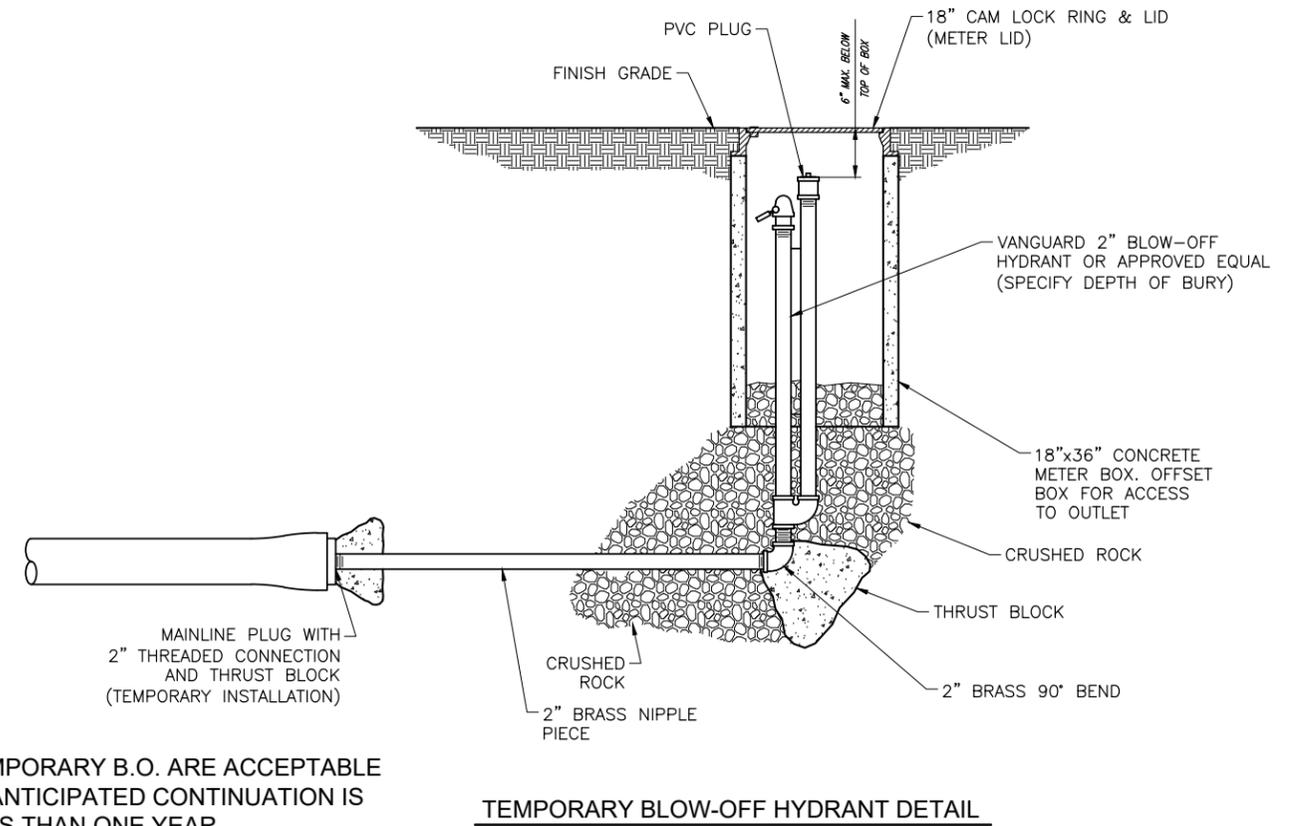
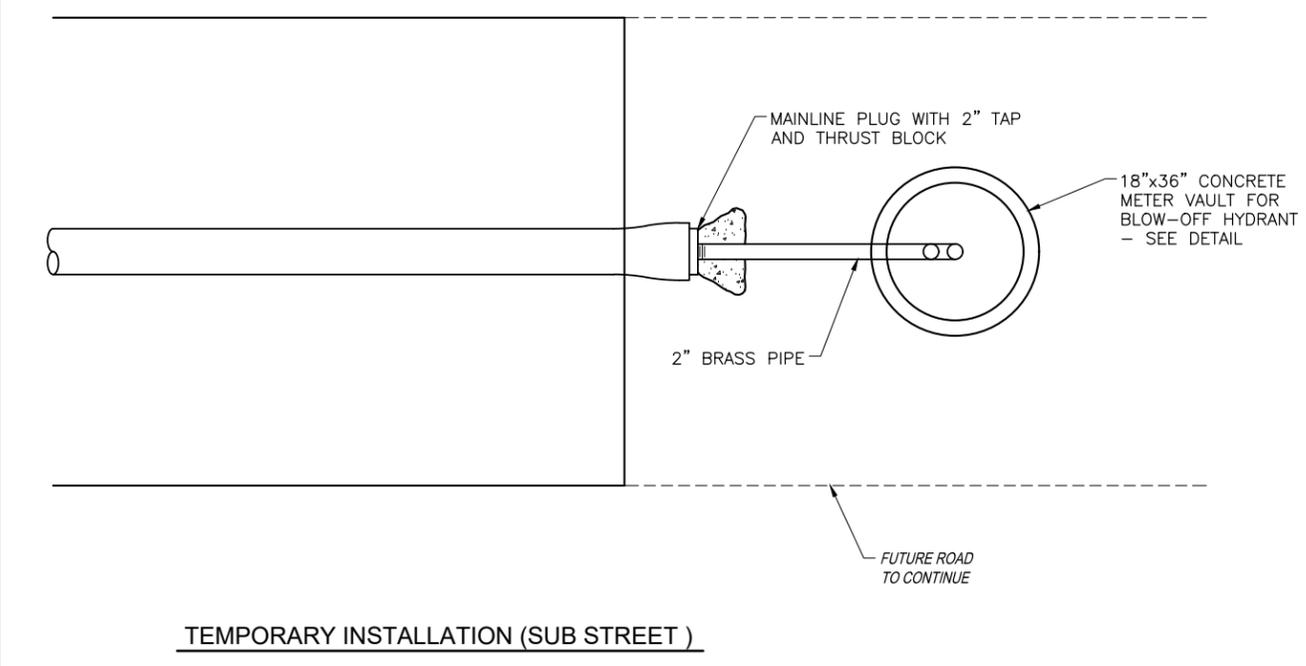
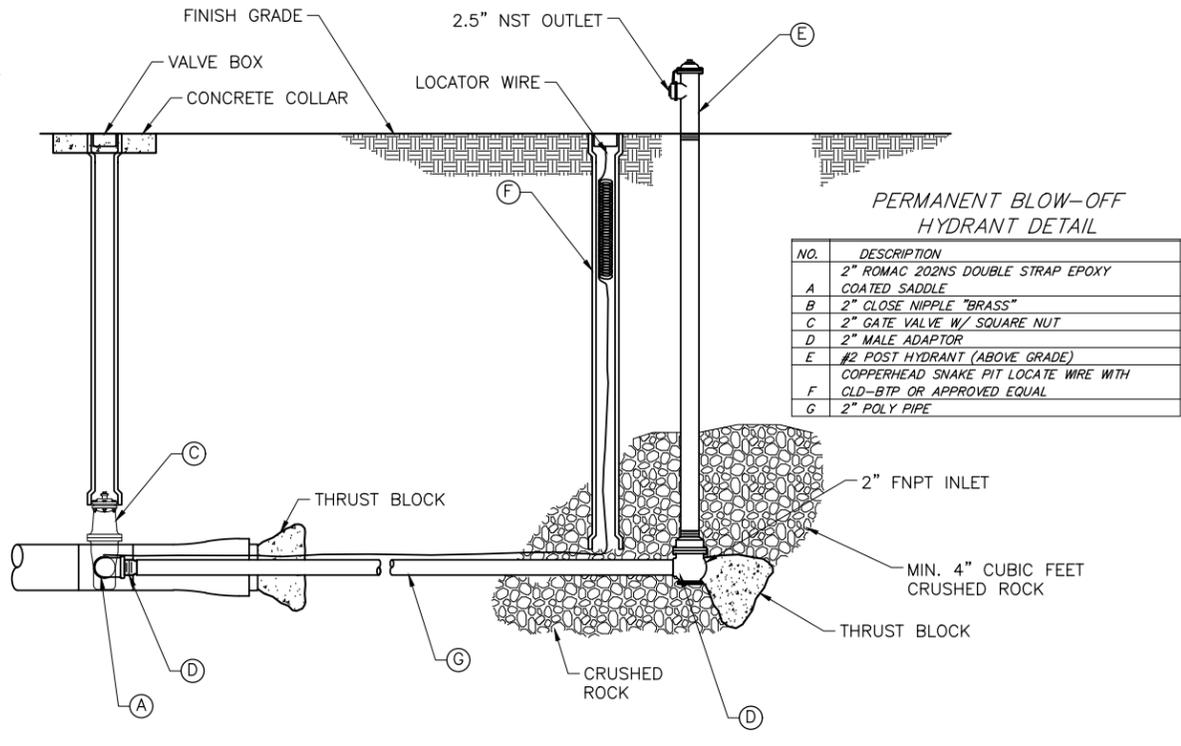
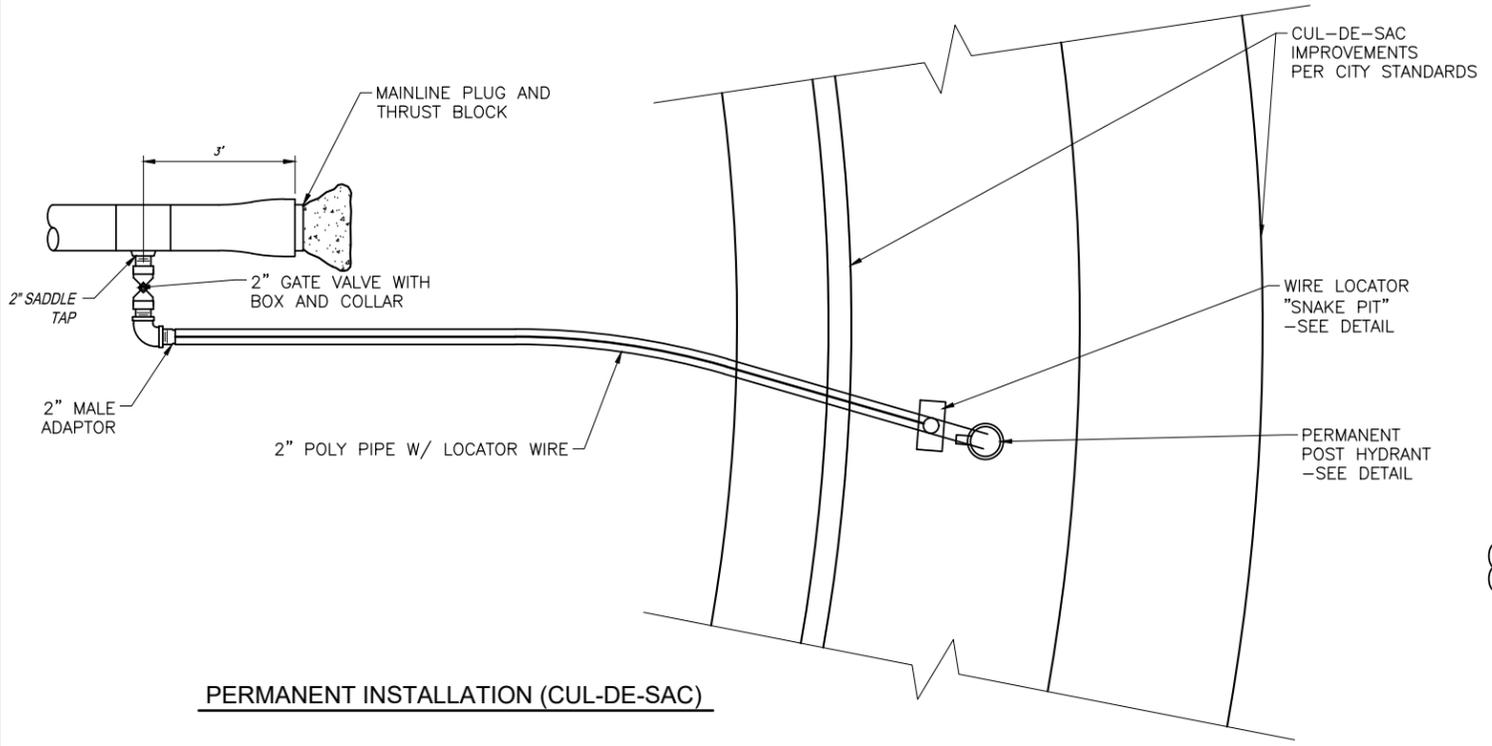
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NO.	DESCRIPTION	DATE	BY
1	BEPL BOX W/ SNAKE PIT, POST HYD.	02/27/18	
2	PIT & HYD. PLAN, NOTES FOR TEMP.	4/25/18	

PERMANENT AND TEMPORARY BLOW-OFF HYDRANT
 BONA VISTA WATER IMPROVEMENT DISTRICT

STANDARD DETAIL

FILE:	STANDARD DETAILS
JUB PROJ. #:	85-11-123
DRAWN BY:	JDM
DESIGN BY:	GLS
CHECKED BY:	GLS
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY	
LAST UPDATED:	12/28/2023
SHEET NUMBER:	BV-05



* TEMPORARY B.O. ARE ACCEPTABLE IF, ANTICIPATED CONTINUATION IS LESS THAN ONE YEAR

PERMANENT AND TEMPORARY BLOW-OFF HYDRANT
 SCALE: N.T.S.

Plot Date: 12/28/2023 2:43 PM Plotted By: Sam Wakeham
 Date Created: 12/28/2023 10:00 AM Client: SUIT BONA VISTA APPRO. ECTS STANDARDS 2023 UPDATE STANDARD DETAILS DWG