Sun Valley General Improvement District
Water Facilities
Technical Specifications

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1.0 Applicable Publications & Reference Standards

A. The publications listed below, including the latest revisions form a part of this specification to the extent referenced.

1. American Water Works Association (AWWA) Publications (AWWA):
2. National Sanitation Foundation (NSF) Publications (NSF):
3. Underwriters' Laboratories, Inc. (UL) Publications (UL):
4. Uni-Bell Plastic Pipe Association (UNI) Publication:
5. Standard Specifications for Public Works Construction (Orange Book, Latest Revision).

2.0 General Requirements

A. This section covers pressure water supply pipe which shall be furnished and installed complete with all jointing materials, fittings and other appurtenances shown on the Drawings or otherwise required for a complete installation.

B. Also reference SVGID Standard Details.

C. All materials shall be sampled and tested in accordance with all applicable requirements of AWWA.

D. Installation shall conform to the applicable requirements of AWWA C600 (C600-C606) except as modified by these specifications, as shown on the Drawings and as approved by **SVGID**.

E. All laying, jointing and testing for defects and leakage shall be performed in the presence of the **SVGID** or their designated representative and shall be subject to **SVGID** approval before acceptance. All **SVGID** inspection costs shall be the responsibility of the Contractor/Developer and will be invoiced in accordance with the **SVGID'**s current Utility Fee Schedule.

F. All additives, wetted materials and/or complete assemblies introduced into or in contact with potable water shall be NSF 60, ANSI/NSF 61 third party certified and NSF 372 third party certified as applicable.

G. Where manufacturers are specifically identified, approved or equals are acceptable.

H. Any deviations from these specifications must receive prior written approval from **SVGID**.

3.0 Pressure Pipe

A. Ductile Iron Pipe

1. Ductile iron pipe shall be Pressure Class 350 (4"-12") or Pressure Class 250 (14"-20") and shall conform to the standard for "Ductile Iron Pipe, Centrifugally Cast, for Water, AWWA C151" unless indicated otherwise on the Drawings.

2. Ductile iron pipe shall be cement mortar lined in accordance with the standard for "Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water, AWWA C104".

3. Ductile iron pipe shall be installed in accordance with the standard for "Installation of Ductile Iron Water Mains and their Appurtenances, AWWA C600", and the manufacturer's recommendations except as otherwise provided herein or shown on the drawings.

4. The maximum allowable joint deflection for push-on type joint and mechanical joint pipe shall be as follows:

Pipe Size	Deflection Angle Degree	Maximum Offset (inches)		Radius of Curve (feet)	
		18 ft. Length	20 ft. Length	18 ft. Length	20 ft. Length
Push-On Type Joint					
4" – 12"	2.5	9	10	415	460
Mechanical Joint Pipe					
4"	4.0	15	17	260	290
6"	3.5	13	15	295	330
8" – 12"	2.5	9	10	415	460
14" – 36"	3.0	11	12	340	380

B. PVC Pipe

1. Polyvinyl chloride pressure pipe, 4 inches through 12 inches, shall be DR 18 and for 14 inches through 24 inches shall be DR 25 unless indicated otherwise on the Drawings. Pipe shall conform to the "Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inches through 60 inches, AWWA C900". Polyvinyl chloride pressure pipe shall have been manufactured within the 18 month period prior to installation.

2. Joints shall be integral bell and spigot with a solid cross section elastomeric ring. Joints shall meet the requirements of AWWA C900. Elastomeric rings shall conform to the "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe, ASTM F477".

3. Polyvinyl chloride pressure pipe showing signs of physical damage or signs of ultraviolet exposure as determined through visual inspection by the **SVGID** will be rejected.

4. Polyvinyl chloride pressure pipe shall be deflected uniformly throughout each pipe length. Deflection shall be accomplished by staking the pipe on both sides of the joint so that deflection at the joint is minimized. The maximum allowable pipe deflection for factory belled pipe shall be as recommend by he pipe manufacturer.

4.0 Fittings

A. Fittings shall be standard gray iron or ductile iron conforming to AWWA C110 or C153. Fittings shall be pressure rated for 350 psi (3"-24").

B. Fittings shall be cement mortar lined in accordance with AWWA C104. Exterior shall be shop-coated with a bituminous coating applied approximately of 1 mil thick. Buried fittings shall be wrapped with polyethylene per AWWA C105.

C. Flanges

1. Flanges shall conform to ANSI B16.1 and shall have bolt circles compatible with ANSI 125/150 lb.

2. Studs and bolts shall be of such length that no less than ¼-inch nor more than 1/2-inch will be projected through the nut when drawn tight. All bolt heads and nuts shall be hexagonal except where special shapes are required.

3. Gaskets shall conform to ASTM D1330, Grade I, red rubber, ring type, 1/8-inch thick.

D. Bolts

1. Shall be made of corrosion-resisting steel conforming to the requirements of ASTM A193, Grade B7. Bolts shall conform to ASTM A194, Grade 2H Heavy Series. The fit shall be free fit (Class 2), except that medium fit (Class 3) shall be provided in holes tapped for studs.

2. Unless specifically indicated otherwise, all buried nuts, bolts and T Heads shall be supplied with a factory applied fluoropolymer coating. The coating shall be low friction, wear and corrosion resistant. Any coated bolts, nuts or T Heads damaged during installation shall be removed from the job site and replaced. Coating system shall be Tripac 2000, or Equal.

E. Mechanical Joints

1. Mechanical joints shall conform to AWWA C110 or C153.

2. Mechanical joints when indicated on the Drawings shall be restrained using a mechanical joint ductile iron retainer gland, shall have a pressure rating of 350 psi, and shall be EBAA Series 1100, or pproved or Equal.

3. PVC Pressure Pipe: Mechanical joint where indicated on the Drawings shall be restrained using a mechanical joint PVC pressure pipe retainer gland rated at a minimum working pressure equal to the pressure class of the pipe being utilized, and shall be EBAA Series 2000.

F. Restrained Pipe Joints

1. Ductile Iron Pipe: Restraint shall be provided by the use of a Field Lok 350 gasket as manufactured by US Pipe.

2. PVC Pressure Pipe: Pipe joints, where indicated on the Drawings, shall be restrained at the bells using a restraint ring incorporating a gripping surface used to grip the pipe

rated at a minimum working pressure equal to the pressure class of the pipe being utilized, and shall be EBAA Series 1900 or 2800.

G. Mega Flange

1. Mega Flanges shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles compatible with ANSI 125/150 lb. standard. Flange adapters shall be capable of a minimum of three degrees of deflection during assembly or permit lengths of pipe to be field cut to within 0.6 of maximum distance between flanges to allow for simplified alignment of flanged appurtenances. The mega flanges shall have a pressure rating of 350 psi when used on ductile iron pipe and a pressure rating equal to the pipe when used on PVC pipe. Mega Flanges shall be EBAA Series 2100 Mega Flange.

H. Transition Couplings.

Transition couplings shall be straight or reducing as required. Center and end rings shall be ductile iron per ASTM A536, gaskets shall be SBR per ASTM C2000 MBA 710, NSF approved. Bolts and nuts shall be trackhead bolts, heavy hex nuts, UNC 5/8" rolled thread, high strength, low alloy corrosion resistant steel per AWWA C111. All parts and pieces shall receive an 8 to 12 mil fusion bonded epoxy coating. T-Bolts and Nuts shall be coated with a polytetrafluoroethylene dry film protective coating and lubricant. Buried couplings shall be double wrapped with polyethylene per AWWA C105. The coupling shall be a 501 or RC501 as manufactured by Romac Industries.

I. Flange Coupling Adapter (3-12 inches)

Flange coupling adapters flange body shall be ductile iron per ASTM A536, Grade 65-45-12, Class 125/150, end rings shall be ductile iron per ASTM A536, gaskets shall be compounded for water and service and meet the requirements of AWWA C219, ASTM D2000. Bolts and nuts shall be trackhead bolts, heavy hex nuts, UNC 5/8" rolled thread, high strength, and low alloy corrosion resistant steel per AWWA C111. All parts and pieces shall receive an 8 to 12 mil fusion bonded epoxy coating. T-Bolts and Nuts shall be coated with a polytetrafluoroethylene dry film protective coating and lubricant. Anchor pins, when specified on the Drawings shall be 316 SS. Buried couplings shall be double wrapped with polyethylene per AWWA C105. The flange coupling adapter shall be rated for 260 psi and shall be a FCA501 as manufactured by Romac Industries.

J. Flange Coupling Adapters (14 inches and greater).

Flange coupling adapters flange body shall be carbon steel with minimum yield of 30,000 psi. End rings shall be contoured rolled mill section carbon steel per ASTM A536, gaskets shall be SBR per ASTM C2000 MBA 710. Bolts and nuts shall be trackhead bolts, heavy hex nuts, UNC 5/8" rolled thread, high strength, and low alloy corrosion resistant steel per AWWA C111. All parts and pieces shall receive an 8 to 12 mil fusion bonded epoxy coating. T-Bolts and Nuts shall be coated with a polytetrafluoroethylene dry film protective coating and lubricant. Anchor pins, when specified on the Drawings shall be 316 SS. Buried couplings shall be double wrapped with polyethylene per AWWA C105. The flange

coupling adapter shall match the maximum pressure rating of the flange and shall be a FCA400 as manufactured by Romac Industries.

5.0 Valves

A. Butterfly Valves

1. Butterfly valves shall be either flanged (ANSI Class 150), wafer lugs, FL or mechanical joint or combination thereof as indicated on the Drawings and shall conform to AWWA C504. Bodies shall be cast or ductile iron. Valves shall be designed for a working pressure of 150 psi (or 250 psi if indicated on the Drawings).

2. All valves shall be furnished with self-lubricated bearings of PTFE coated stainless steel for smooth, low torque operation. Shaft seals shall be provided to prevent leakage and to protect bearings from internal or external corrosion.

3. Seats shall be of the reinforced resilient type and shall be field replaceable. Seats shall also act as a body liner to prevent flow from contacting the body casting. Seats shall provide a positive seal without use of flange gaskets.\

4. Seats shall be of rubber. Shafts shall be one piece and shall be of 316 stainless steel. Shaft diameter shall meet the 75B standard from AWWA specification C504 for butterfly valves. Shafts shall be finish ground to minimize bearing and shaft seal wear. Shafts of 16" (400mm) and larger shall have a non-adjustable thrust collar.

5. Discs shall be cast or ductile iron ASTM A126, Class B with a 316 stainless steel edge. The disc to shaft connection shall be made with 304 stainless steel connection.

6. Non-buried valves shall be provided with manual lever or manual handwheels. All non-buried actuators shall provide external indication of disc position. Buried service valves shall have a buried service actuator with 2-inch square operating nut sized to operate with a maximum input of 150 foot pounds.

7. Latch lock levers shall provide automatic, positive latching in the open, closed, and a minimum of eight intermediate positions. These valves shall allow locking in any position with a standard padlock.

8. Butterfly valves and actuators shall be supplied by the same manufacturer as shall be as manufactured by Mueller or Valmatic.

B. Gate Valves

1. Resilient wedge gate valves and component parts thereof shall conform to the following standards, except as otherwise specified in these Specifications:

AWWA C515, Resilient-Wedge Gate Valves for Water Supply Service

ASTM B 62, Composition Bronze or Ounce Metal Castings
AWWA C550, Protective Interior Coatings for Valves and Hydrants

2. Gate valves shall be of the iron-bodied, non-rising stem type with O-ring stem seals and shall be rated at 350 psi.

3. All interior parts of the gate valve, except the valve body and stem, shall be made of bronze conforming to the requirements of ASTM B 62. Valve stems shall be of bronze containing not more than 5% of zinc, not more than 2% of aluminum, and shall have a minimum tensile strength of 60,000 psi, a yield strength of 40,000 psi, and an elongation of at least 10% in two inches, as determined by a test coupon poured from the same ladle from which the valve stems to be furnished are poured.

4. Gate valves shall be suitable for installation in the vertical or horizontal position.

5. Gate valves shall have the bonnet connected to the body by means of bolts and nuts or studs which are cadmium-plated steel or stainless steel 304 or 316. Type II Service Class I zinc-plated bolts are also acceptable.

6. Non-buried valves shall be provided with manual hand wheels. All non-buried actuators shall provide external indication of disc position. Buried service valves shall have a buried service actuator with 2-inch square operating nut sized to operate with a maximum input of 150 foot pounds.

7. Resilient-wedge gate valves shall be as manufactured by Mueller.

6.0 Combination Air Release Valve

a. The combination air release valve shall be single body double orifice and comply with AWWA C-512. The body inlet shall be baffled to protect the float from direct forces of rushing air and water to prevent premature valve shut off. The seat must be fastened to the valve cover without distortion for drop tight shut off. The floats shall be hermetically sealed. The plug or float shall be center guided through hex bushings for positive shut off. Valve exterior shall be painted with an NSP approved primer. Each valve shall be equipped with a drain plug.

b. Minimum working pressure rating shall meet or exceed the pressure class rating of the pipe that the valve is being installed on.

c. The materials of construction shall be as follows:

Body and Cover	Cast Iron per ASTM A126 GR B
Float	Heavy Stainless Steel per ASTM A240
Needle & Seat	Buna-N
Plug	Bronze per ASTM B124
Leverage Frame	Delrin/Cast Iron per ASTM D2133/ASTM A126 GR B

d. The combination air release valve shall be DeZurik-APCO, Crispin Model UL.

7.0 Service Clamps

A. Service clamps shall be full circle type, AWWA approved for PVC or ductile iron pipe, of the size specified on the Drawings minimum rated working pressure of 250 psi. Saddles shall be fusion bonded epoxy lined and coated and straps and bolts shall be 304 stainless steel. Service Saddles shall be Mueller.

8.0 Corporation Stops

A. Corporation stops shall be ball valve, bronze conforming to ASTM B 61 (AP) or ASTM B 62, and suitable for a working pressure of 250 psi. Stop shall be lead free and NSF certified. Inlet end shall be IP threaded, outlet end shall be suitable for connection to PE plastic pipe, Mueller Ori Seal.

9.0 Tapping Sleeves

A. Tapping sleeves: Shall be constructed of stainless steel rated to a pressure of 150 psi. Sleeves shall be Mueller.

10.0 Underground Warning Tape & Tracer Wire

A. Underground warning tape shall be detectable metallic and minimum 3 inches wide. The tape shall be colored Blue and labelled as "Buried Underground Potable Water" or similar. Tracer wire shall be 12 gauge insulated solid copper insulated wire.

11.0 Chlorine Tablets & Adhesive

A. Adhesive shall be Permatex No. 1, NSF 60 approved, or other alternative approved by the **SVGID**.

12.0 Pipe Laying

A. Also reference SVGID Trench Detail SV-5.

B. The pipe shall be laid to the lines shown on the Drawings and specified herein and the sections shall be closely jointed to form a smooth flow line. Immediately before placing each section of pipe in final position, the bedding shall be checked for firmness and uniformity of surface. Vertical deviations shall be field fit by **CONTRACTOR** and at no time shall vertical curve radii exceed manufacturer's recommendations. **CONTRACTOR** shall supply and install vertical elbows as required to maintain minimum depth requirements.

C. The radius of curvature of the trench that can be used without exceeding the allowable deflection shall be as specified by the pipe manufacturer. The deflection at any flexible joint shall not exceed that prescribed by the manufacturer of the pipe. The manufacturer's printed installation guide outlining the radii of curvature that can be negotiated with pipe sections of various lengths shall be followed.

D. Proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be provided and used by the **CONTRACTOR** for safe and efficient execution of the work. All pipe, fittings, valves, and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

E. The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged, or unsound pipe shall be repaired or replaced. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept thoroughly clean during and after laying. All openings on the pipe line shall be closed with watertight expandable type sewer plugs or test plugs at the end of each day's operation or whenever the pipe openings are left unattended. The use of burlap, wood, or other similar temporary plugs will not be permitted.

13.0 Jointing

A. The bell end of the pipe shall contain a rubber gasket.

B. The gasket and the gasket seat (if applicable) inside the bell shall be wiped clean before the gasket is inserted. At this time a thin film of lubricant shall be applied to the gasket and to the outside of the clean pipe end. Lubricant other than that furnished with the pipe shall not be used. The end of the pipe shall be then be inserted carefully into the bell to complete the joint. The use of the backhoe bucket or similar to force the pipe together will not be allowed.

C. The assembly of the joint shall be made in accordance with the printed recommendations of the manufacturer. This shall be accomplished with an assembly tool if so recommended by the manufacturer, so that the resulting position of the sleeve shall be such that it is centered over pipe ends. Insert the pipe so that the stop line is flush with the bell end. ***Any section of pipe where the stop line is not visible after insertion shall be corrected.*** Field cut pipe shall be marked with a stop line prior to insertion. After assembling the coupling, the rubber gasket location shall be checked with a suitable gauge. Gaskets for the full circumference of the pipe shall be located at a distance from the bell end as recommended by the manufacturer of the couplings. If the distance does not fall within required limits, the joint shall be disassembled and reassembled in an acceptable manner.

D. When pipe laying is not in progress, the open end of the pipe shall be closed by approved means to prevent trench water from entering pipe. Adequate backfill shall be deposited on pipe to prevent floating of pipe. Any pipe which has floated shall be removed from the trench, cleaned, and relaid in an acceptable manner. No pipe shall be laid when, in the opinion of the **SVGID**, the trench conditions or weather are unsuitable for such work.

E. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water and shall be acceptable to the pipe manufacturer. It shall be submitted for approval in the submittal process and delivered to the job site in enclosed containers and shall be kept clean.

14.0 Installation of Fittings

A. Fittings shall be installed utilizing standard installation procedures. Fittings shall be lowered into trench by means of rope, cable, chain, or other acceptable means without damage to the fittings. Cable, rope, or other devices used for lowering fitting into trench, shall be attached around exterior of fitting for handling. Under no circumstances shall the cable, rope, or other device be attached through the fitting's interior for handling. Fitting shall be carefully connected to pipe or other facility, and joint shall be checked to insure a sound and proper joint.

15.0 Thrust Blocking

A. Also reference SVGID Detail SV-7.

B. Thrust blocks shall be installed such that they bear against the pipe fitting (not the pipe) on one side and against undisturbed earth on the other side.

C. Thrust block concrete shall not obstruct removal of flange bolts from fittings. Concrete shall be prevented from adhering to the fittings. Either a liquid bond breaker shall be applied to the fitting, or an impervious membrane (plastic, building paper, etc.) shall be used.

D. Concrete thrust blocking shall be provided at all tees, elbows, wyes, caps, valves, hydrants, reducers, and other points of unbalanced thrust. Thrust blocking shall be poured so the thrust surface bears against undisturbed soil.

E. Thrust block shall also be utilized where restrained joints are specified when indicated on the Drawings.

16.0 Installation of Valve Boxes

A. Also reference SVGID Detail SV-2.

B. All buried valves (and corporation stops when indicated on the Drawings) shall be installed with valve boxes including the riser and concrete collar.

C. Backfill shall be the same as specified for the adjacent pipe. Place backfill around the valve boxes and thoroughly compact to a density equal to that specified for the adjacent trench and in such a manner that will not damage or displace the valve box from proper alignment or grade. Misaligned valve boxes shall be excavated, plumbed, and backfilled at the Contractor's expense.

17.0 PVC Pressure Testing

A. General

1. The entire pressure pipeline shall be subjected to a pressure/leakage test in accordance with AWWA C605 and the following procedure:

2. Sections of the line shall be tested by first filling the line with water and allowing the section to stand under slight pressure for 24 hours. The installation of saddles and taps in the main strictly for the purpose of pressure testing is not allowed unless approved by **SVGID.**

3. The pressure shall then be raised and held at the test pressure (at the lowest point) by the addition of water for a minimum of two hours at the following test pressures;

PVC DR 14	250 psi
PVC DR 18	235 psi
PVC DR 21	200 psi
PVC DR 25	165 psi

4. The line shall then be allowed to stand for one hour without the addition of water and the pressure recorded at the end of that hour.

5. The initial test pressure shall then be restored by addition of water and the quantity of water added to reach test pressure accurately measured and recorded. The quantity added shall not exceed that allowed by the following formula;

   Q (gallon/hour) =Length (ft) x Diameter (inches) x SQRT(Pressure (psi))/148,000

   Should the leakage exceed the specified amount or should leaks be otherwise noted, the **CONTRACTOR** shall locate points of leakage, rework the line and again test the line.

6. Except where otherwise required by permits, it is intended that the pressure/leakage test be conducted with the trench backfilled.

7. All tools, pumps, fill points, gauges, meters, temporary valves and bulkheads, bracing, and other equipment needed for testing shall be provided by the **CONTRACTOR** at his expense and shall be subject to approval by **SVGID**. The test pressure shall be measured at the low point of each test section.

B. Measurement of Leakage

1. 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 (0.35 Bar) of the specified test pressure after the air in the pipeline has been expelled and the pipe filled with water. The quantity of water supplied to maintain pressure shall be quantified by means of a positive displacement measurement from a reservoir of known volume. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

C. Allowable Leakage

1. No pipe installation will be accepted if the leakage for the section of the line that is tested is greater than allowed by the Standard Specifications.

2. If the test leakage in any section is greater than permitted, the **CONTRACTOR** shall, at his own expense, locate and repair the defective materials until the leakage is within the permitted allowance. All visible leaks shall be repaired regardless of the amount or rate of leakage.

3. Disinfection of water mains shall be accomplished in accordance with all the requirements set forth in AWWA C651 unless otherwise specified herein.

18.0 Ductile Iron Pressure Testing

A. General

1. The entire pressure pipeline shall be subjected to a pressure/leakage test in accordance with AWWA C600 and the following procedure:

2. Sections shall be tested by first filling the line with water and allowing the section to stand under slight pressure for 24 hours. The installation of saddles and taps in the main strictly for the purpose of pressure testing is not allowed unless approved **SVGID**.

3. The pressure shall then be raised and held at the test pressure (at the lowest point) by the addition of water for a minimum of two hours at the following test pressures;

   Pressure Class 350 150 psi

4. The line shall then be allowed to stand for one hour without the addition of water and the pressure recorded at the end of that hour.

5. The initial test pressure shall then be restored by addition of water and the quantity of water added to reach test pressure accurately measured and recorded. The quantity added shall not exceed that allowed by the following formula;

   Q (gallon/hour) =Length (ft) x Diameter (inches) x SQRT(Pressure (psi))/148,000
   Should the leakage exceed the specified amount or should leaks be otherwise noted, the **CONTRACTOR** shall locate points of leakage, rework the line and again test the line.

6. Except where otherwise required by permits it is intended that the pressure/leakage test be conducted with the trench backfilled.

7. All tools, pumps, fill points, gauges, meters, temporary valves and bulkheads, bracing, and other equipment needed for testing shall be provided by the **CONTRACTOR** at his expense and shall be subject to approval by SVGID. The test pressure shall be measured at the low point of each test section.

B. Measurement of Leakage

1. 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 (0.35 Bar) of the specified test pressure after the air in the pipeline has been expelled and the pipe filled with water. The quantity of water supplied to maintain pressure shall be quantified by means of a positive displacement measurement from a reservoir of known volume. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

C. Allowable Leakage

1. No pipe installation will be accepted if the leakage for the section of the line that is tested is greater than allowed by the Standard Specifications.

2. If the test leakage in any section is greater than permitted, the **CONTRACTOR** shall, at his own expense, locate and repair the defective materials until the leakage is within the permitted allowance. All visible leaks shall be repaired regardless of the amount or rate of leakage.

3. Disinfection of water mains shall be accomplished in accordance with all the requirements set forth in AWWA C651 unless otherwise specified herein.

19.0 Disinfection and Cleanliness

A. Disinfection of water mains shall be accomplished in accordance with all the requirements set forth in AWWA C651 and as specified herein.

B. Precautions shall be taken to protect pipe interiors, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize entrance of foreign material. When pipe laying is not in progress, for example, at the close of the day's work, all openings in the pipeline shall be closed by water tight plugs. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

C. If dirt that, in the opinion of **SVGID**, will not be removed by flushing enters the pipe, the interior of the pipe shall be cleaned and swabbed as necessary with a 5 percent hypochlorite disinfecting solution.

D. No contaminated material capable of supporting prolific growth of micro-organisms shall be used for sealing joints. Packing material shall be handled in such a manner as to avoid contamination.

20.0 Disinfection-New Pipe

A. Unless otherwise stated herein the tablet method of disinfection shall be used. However, since this method requires scrupulous cleanliness to be effective, it will not be allowed if trench water or foreign material has entered the main. If the pipe, in **SVGID's** opinion, is not in a clean condition, another method prescribed in AWWA C651 shall be used for disinfection even if the tablets have already been installed.

B. Tablets shall be placed in each section of pipe and also in hydrants, hydrant branches, and other appurtenances. They shall be attached by an adhesive, except for the tablets placed in hydrants and in the joints between the pipe sections. All the tablets within the main must be at the top of the main. If the tablets are fastened before the pipe section is placed in the trench, their position shall be marked on the section to assure that there will be no rotation.

C. Chlorine tablets shall be attached to the pipe wall, there shall be no adhesive on the tablet except on the broad side next to the surface to which the tablet is attached.

D. When installation has been completed, the main shall be filled with water at a velocity of less than 1 foot per second. This water shall remain in the pipe for at least 24 hours. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. **CONTRACTOR** shall not operate any valve in the system without permission of the utility.

E. The number of hypochlorite tablets to be attached to the inside of each section of pipe shall be as shown in the following table taken from AWWA C651:

Number of 5-G Calcium Hypochlorite Tablets
Required for Dose of 25 Mg/l*

Length of	**Diameter of Pipe - Inches**						
Section - Feet	**4**	**6**	**8**	**10**	**12**	**14**	**16**
13 or less	1	1	1	2	3	4	4
18	1	1	2	3	4	5	6
20	1	1	2	3	4	5	7
30	1	2	3	4	6	8	10
40	1	2	4	5	7	10	13

*Based on 3.25 g available chlorine per tablet.

F. Final Flushing. After the applicable retention period, the heavily chlorinated water shall be flushed with potable water from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/l. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline. **CONTRACTOR** shall conduct chlorine resident test in the presence of **SVGID**. **CONTRACTOR** shall obtain any discharge permits required for the surface discharge of the flushing water from the Nevada Division of Environmental Protection and shall dechlorinate the water as required.

G. Bacteriological Sampling. Testing shall comply with AWWA C651, NAC 445A.67145 and NAC 445A.67265. After final flushing, and before the water main is connected to the existing system and placed in service, the **CONTRACTOR** shall prepare all sample points to the satisfaction of **SVGID** and **SVGID** shall collect representative samples from the sample points.

The samples shall be collected and tested for bacteriologic quality. Two samples from each sample point shall be collected at least 24 hours apart.

The installation of saddles and taps in the main strictly for the purpose of sampling or the connection of the Section prior to their full acceptance is not allowed unless approved by the **SVGID**. Tests shall be performed by a laboratory certified by the State of Nevada.

If any of the initial bacteriological samples fail, a second round of sampling shall be performed (2 samples minimum 24 hours apart from each sample point) by **SVGID** in the Section that failed. It is advised that before the second round of sampling be performed that the **CONTRACTOR** thoroughly re-flush the Section (minimum 2.5 feet per second until at least 2 to 3 pipe volumes are purged). If any of the samples fail for a second time, the entire Section shall be re-disinfected utilizing the continuous feed or slug method as defined in AWWA C651 and then re-sampled (2 sets of samples from each sample point taken at least 24 hours apart).

When the bacteriological samples are all negative (passing), have been approved by the **SVGID** and accepted by the Washoe County Health District, the new main may be connected to the existing system and placed into service following the final connection procedures.

21.0 Disinfection-Cutting into or Repairing Existing Mains and Final Connections

A. Shall comply with AWWA C651.

B. Trench Treatment. Wet excavations shall be treated with liberal amounts of hypochlorite tablets.

C. Swabbing with Hypochlorite Solution. The interior of pipe, valves, fittings and appurtenances shall be swabbed, spayed and/or dipped with a NSF 60 approved 1 percent hypochlorite solution. Valves shall be disinfected both in the open and closed positions.

D. Cleanliness. Every effort shall be made to prevent any water, soil or other contamination from entering into the pipe, fittings or appurtenances at any time.

E. Flushing. The pipe shall be thoroughly flushed immediately after completion of the work and shall be continued until discolored water is eliminated. If valve and hydrant locations permit, flush toward the work location from both directions.

F. If, in the sole opinion **SVGID**, **CONTRACTOR** has not strictly adhered to the above requirements, **SVGID** will require that **CONTRACTOR**, at his cost, properly obtain representative samples for bacteriological testing at several locations surrounding the work area following flushing and then delivering them to a State of Nevada Certified laboratory. The **CONTRACTOR** will also be required to perform duplicate sampling after 24 hours of collecting the first set of samples from the same previous sample points. Positive results will require additional flushing and sampling, and possible boil water order, the cost of which will all be borne by the **CONTRACTOR**.