

RESOLUTION 13-05

A RESOLUTION AMENDING THE DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION IN HYRUM CITY.

WHEREAS, the Hyrum City Council approved the revised Design Standards and Construction Specifications for Public Works Construction in Hyrum City in January 2003; and

WHEREAS, the Design Standards and Construction Specifications for Public Work Construction provides general requirements and design guidelines for installation of utilities and other public improvements in Hyrum City; and

WHEREAS, upon recommendation of Hyrum City's Engineer and Public Works Department, the City Council has determined there is a need to amend and update Hyrum City's Design Standards and Construction Specifications for Public Works Construction.

NOW, THEREFORE, BE IT RESOLVED by the City Council of Hyrum, Cache County, Utah, to approve the revisions, attached hereto as Exhibit "A", to Hyrum City's Design Standards and Construction Specifications for Public Works Construction in Hyrum

THIS RESOLUTION shall become effective upon adoption.

ADOPTED AND PASSED by the Hyrum City Council this 2<sup>nd</sup> day of May, 2013.

HYRUM CITY CORP.

BY: \_\_\_\_\_  
W. Dean Howard  
Mayor

ATTEST:

\_\_\_\_\_  
Stephanie Fricke  
City Recorder

SECTION 5

HYRUM CITY  
GENERAL REQUIREMENTS  
AND  
SPECIFICATIONS  
FOR  
SANITARY SEWER INSTALLATIONS

## **5. GENERAL REQUIREMENTS AND SPECIFICATIONS FOR SANITARY SEWER INSTALLATIONS**

### **5.1 GENERAL REQUIREMENTS**

#### **5.1.1 GENERAL:**

The following Hyrum City "Design Standards and Construction Specifications for Sanitary Sewer Installations" were developed to establish practical, uniform design and construction of sanitary sewers in Hyrum City. These criteria are not intended to cover extraordinary situations, and in such instances, deviations from the criteria may be allowed where justified, upon approval of the City.

Sanitary sewer construction shall include the performance of all operations necessary to lay sewer pipe mains, wye branches, individual sewer laterals, manholes, test mains for leaks and all incidental work necessary to complete the work in a satisfactory manner.

### **5.2 DESIGN CRITERIA:**

#### **5.2.1 DESIGN REGULATIONS:**

- A. All sanitary sewer systems shall be designed to exclude all storm water and water from underdrain systems, roofs, streets, and other paved areas.
- B. Downspout connections, foundation and basement drains, sumps and storm drain connections shall be prohibited from discharging into the sanitary sewer system.
- C. Each dwelling unit shall be served by an individual lateral. "Stacked" dwelling units may be served otherwise.
- D. Sewer lines including laterals shall be designed for at least 10 feet horizontal separation, measured edge to edge from any water line.
- E. Sewer lines crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside wall of the water main and the outside wall of the sewer line.
- F. All utilities paralleling the sanitary sewer shall be designed to have at least 5 feet horizontal separation, measured edge to edge of the utility. This includes storm sewers, secondary water lines, conduits of all types, telephone cable, underground power and other cables.
- G. No laterals to manholes without approval of the Engineer.

#### **5.2.2 LATERALS:**

Laterals connected to the public sewers shall meet the following requirements:

- A. Laterals will be of PVC, ductile iron or other material approved by the City.
- B. Lateral shall have locating wire run the entire length of the lateral from the main line to the cleanout box listed in 5.2.2.F below with a minimum of 12" of extra wire coiled in the box.
- B. Laterals shall have a nominal inside diameter of not less than 4 inches nor greater than 6 inches.
- C. Each dwelling unit shall be served by an individual lateral. "Stacked" dwelling units may be served otherwise.
- D. Laterals shall be laid at a minimum slope of 1/4-inch per foot (2%).
- E. Laterals should not be located under driveways.
- F. Cleanouts shall be installed at 50-foot intervals for 4" laterals, 75-foot intervals for 6" laterals, and at all changes in direction. In all cases, a cleanout shall be installed just outside of structure, or as close as practicable. This cleanout shall be housed in a typical irrigation valve box with a minimum size of 17"L x 12"W x 13"D.
- G. In all cases where a lateral is under pressure, the section of lateral from the street right-of-way or easement line to the main sewer line shall be gravity. Maintenance for the line from the home to the main line shall be the responsibility of the property owner.
- H. Laterals shall conform to these Hyrum City "Standards and Specifications."

### 5.2.3 DESIGN PERIOD:

The sewer system shall be designed to serve the estimated ultimate tributary area and shall be based on the best information available, including area master plans, current zoning regulations and approved planning and zoning reports when available.

### 5.2.4 DESIGN CAPACITY:

Design average flow shall be estimated at not less than 100 gallons per capita per day, including infiltration at 200 gallons per diameter inch per mile per day. To accommodate peak flows, sewers shall be designed, flowing full, to carry not less than the following contributions:

- A. (1) 4-inch and 6-inch laterals: 400 gallons per capita per day.

- (2) 8-inch thru 15-inch sewers: 400 gallons per capita per day.
- (3) Larger than 15-inch sewers: 250 gallons per capita per day.
- B. Flow from commercial, municipal and industrial connections.
- C. Additional ground water infiltration, if applicable.

5.2.5 ALTERNATE METHODS OF DESIGN:

If use is made of methods of sewer design other than those described above, a complete description of methods used shall be presented to the City Engineer for approval.

5.2.6 SEWER SIZE:

All public sewers shall be 8 inches in diameter or larger.

5.2.7 SEWER DEPTH:

Sewers shall be placed deep enough to serve all basements, assuming a 2% grade on house laterals. They shall be well below frost line at all points and also the top of the sewer line shall be 2 feet lower than the bottom of any water lines placed in the same street. Minimum cover shall be 36 inches from the top of the pipe. Sewers at depths greater than 14 feet shall be given special design considerations.

5.2.8 SEWER SLOPES:

All sewers shall be designed and constructed for mean flow velocities, when flowing full, of not less than 2.0 feet per second, based on Kutter's formula using an "n" value of 0.013. The following are the minimum slopes which shall be provided; however, slopes greater than these are desirable, especially in the upper reaches of sewer systems.

<u>Sewer Size</u>	<u>Minimum Slope in Feet Per 100</u>
8"	0.40
10"	0.28
12"	0.22
14"	0.17
15"	0.15
16"	0.14
18"	0.12
21"	0.10
24"	0.08

Sewers on slopes 20 percent or steeper shall be anchored immediately downstream from bells with concrete anchors or approved equal as follows:

- A. Not over 36 feet center-to-center on grades 20 percent and up to 35 percent.
- B. Not over 24 feet center-to-center on slopes 35 percent to 50 percent.
- C. Not over 16 feet center-to-center on slopes steeper than 50 percent.

5.2.9 SEWER ALIGNMENT:

- A. Sewers shall be designed on straight alignment between manholes.
- B. Sewer lines shall not be designed to run parallel to and within 5 feet either side of the curb and gutter. Special cases and variances to the standard may be approved upon recommendation by the City Engineer.

5.2.10 PIPE TRANSITIONS:

At manholes, where sewer diameters change, the flow energy gradient shall be continuous. The 0.8 depth point of the two sewers shall be placed at the same elevation, with proper allowance for any manhole head loss or as required to provide proper flow. The minimum drop through manholes shall be 0.2 feet if an alignment change of more than 45 degrees is designed.

5.2.11 MANHOLES:

- A. Location: Manholes shall be installed at the end of each line, at all changes in pipe size or changes in alignment or grade; at all intersections; and at the midway point in standard blocks. In no case shall the spacing between manholes exceed 400 feet.

Manholes shall be provided at street intersections.

Watertight, seal-down covers shall be provided in areas subject to flooding.

Manholes shall not be positioned in waterways, such as gutters.

Manholes shall not be placed within 10 feet of storm drains, catch basins or in low points where catch basins are located.

- B. Inverts: Flow channels through manholes shall be shaped to conform to cross-sections and slopes of connecting sewers. Floors and channels shall be shaped such that television camera access will not be impeded.

- C. Drop Connections: Drop connections shall be used whenever the elevation difference between the invert of the inflow pipe and the outflow pipe exceed 18 inches. All drop connections shall conform to the Standard Detail Drawing for "Drop Manholes." Only outside

drop connections will be permitted.

D. **Diameters:** Manhole inside diameter shall be at least 60 inches for flow-through conditions and at least 48 inches for dead end conditions.

Manholes deeper than 16 feet shall be specially designed and approved by the City Engineer.

E. **Shallow Manholes:** Shallow manholes shall be required for depths less than 6 feet. See Standard Detail Drawing.

#### 5.2.12 CLEANOUTS:

Cleanouts shall not be used as an alternative to manholes on sewer lines 8 inches in diameter and greater.

Cleanouts for laterals shall conform to Section 5.3.2-F and the Standard Detail Drawings.

#### 5.2.13 PROTECTION OF WATER SUPPLIES:

It is generally recognized that sewers and appurtenances must be kept remote from public water supply wells and other water supply sources and structures. The following specific requirements shall be observed at all times:

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

B. Sewers shall be laid at least 10-foot horizontally from any existing or proposed water main. Separation distances shall be measured pipe edge to pipe edge.

C. Where the 10-foot separation stated above is not achieved, the water line shall be located above the sewer either in a separate trench, or on a bench of undisturbed earth with at least 18 inches of vertical depth between bottom of the water main and top of the sewer pipe except as specified in paragraph "D" below.

D. Where sewer and water mains must cross and the vertical separation mentioned above is not possible, both mains should be constructed of mechanical-joint ductile iron pipe, or equivalent for a distance of at least 10 feet on either side of the point of crossing.

E. The above requirements shall apply to building sewers and water service lines to buildings except that copper tubing service laterals (not plastic) may pass under sewer mains or laterals. This copper tubing must pass at least 18 inches under the sewer.

#### 5.2.14 EASEMENTS:

- A. Easements shall be required on all public sewer not located in dedicated roadways.
- B. All easements shall be 20 feet wide minimum.
- C. Easements shall extend 10 feet beyond the last manhole on a line.
- D. When a sewer is located in an easement, not abutting a street right-of-way, access easements shall be provided.
- E. Signed easements shall be submitted to the City along with Final Design Plans.

5.2.15 WASTEWATER PUMPING STATIONS:

Use of wastewater pumping stations shall be avoided whenever possible. The City requires design calculations for each installation and reserves the right to require the use of specific types and makes of equipment i.e. pumps, valves, lifting systems, variable frequency drives, emergency power generation, etc. As a minimum, wastewater pumping stations shall be configured with wetwell and drywell, drywell submersible pumps, and above ground architectural structures. Wastewater pumping stations shall conform to state regulations and be approved by the City and Utah Department of Environmental Quality Division of Water Quality.

5.2.16 BORINGS:

- A. Borings shall be designed and constructed in accordance with the applicable City, County, State, Federal and Railroad Standards, permits, and/or as designated on Approved Plans.
- B. Steel casings for bored construction shall be steel pipe conforming to ASTM A-53 Grade B. Steel pipe shall have a minimum wall thickness of 0.375" minimum yield stress of 42,000 psi. Minimum wall thickness shall be in accordance with the following:

Diameter of Casing Under Railroads	Nominal Wall Thickness (Inches)		
	<u>(Inches)</u>	<u>&amp; Highways</u>	<u>All Other Uses</u>
	12" - 18"	0.375	0.375
	Over 18" - 22"	0.375	0.375
Over 22" - 28"	0.438	0.375	
Over 28" - 34"	0.500	0.375	
Over 34" - 42"	0.562	0.500	
Over 42" - 48"	0.625	0.562	

- C. Casings under interstates shall extend from right-of-way to right-of-way. When installed with more than 15 feet of cover, the casing shall be designed to carry the extra load.



- D. Casing material, size, length and invert elevations shall be shown on Final Design plans.
- E. Sewer pipe material shall be shown on Final Design plans.
- F. Use redwood skids or approved prefabricated plastic casing skids throughout the length of the pipe tied at every pipe diameter length to brace pipe installed in casing to prevent shifting or flotation during backfilling of annular ring between the casing and carrier pipe.
- G. The annular space between the casing and sewer pipe may require filling with sand, "pea" gravel, or Portland Cement grout.
- H. The ends of the casing shall be sealed and watertight as specified on Final Design plans.
- I. Install pipe barrels to rest upon support blocks with the pipe bells clearing the casing invert by at least 1/2".
- J. The bored portion of the sewer should be completed before construction of the adjacent portions to allow for discrepancies in alignment and grade which may occur during the boring operation.

#### 5.2.17 PREVENTION OF GROUNDWATER MIGRATION:

The Engineer shall consider methods to prevent the continuous migration of groundwater along the trench line.

#### 5.3 MATERIAL REQUIREMENTS:

##### 5.3.1 GENERAL:

Unless specifically designated otherwise in each case, all materials and equipment furnished for permanent installation in the work shall conform to applicable standard specifications and shall be new, unused and undamaged when installed or otherwise incorporated in the work. No material or equipment shall be used by the Contractor for any purpose other than that intended or specified. All materials not conforming to these specifications shall be specifically approved in writing by the City Engineer prior to delivery to the jobsite.

Any material or equipment found by the Inspector not conforming to City Standards and Specifications is subject to rejection.

##### 5.3.2 SEWER PIPE:

###### 5.3.2.1 CONCRETE SEWER PIPE:

A. Materials: All concrete pipe shall be made using Type V cement. Admixtures and pozzolans may be used only with approval of City Engineer.

B. Non-Reinforced Concrete Pipe:

1. Shall be Class 3 non-reinforced concrete sewer pipe conforming to ASTM C-14.
2. Joints shall be of the bell-and-spigot, compression type rubber gasket design conforming to ASTM C-443.

C. Reinforced Concrete Pipe:

1. Shall be used for sanitary sewers 18 inches in diameter and larger.
2. Shall be Class III, minimum, reinforced concrete sewer pipe conforming to ASTM C-76. Reinforcement shall be circular.
3. Joints shall be of the bell-and-spigot, compression type rubber gasket design conforming to ASTM C-443.

5.3.3 DUCTILE IRON SEWER PIPE:

5.3.3.1 Ductile Iron Pipe: Shall be a minimum wall thickness of Class 51 and conform to ASTM A-746. Cement-mortar or bituminous lining shall be specified on the Approved Plans.

5.3.3.2 Fittings: Shall be ductile iron and conform to ANSI A21.10. Fittings shall be consistent with the specified pipe.

5.3.3.3 Joints: Shall conform to ANSI A21.11 and shall be mechanical type.

5.3.4 POLYVINYL CHLORIDE (PVC) PIPE:

A. Materials: All PVC sewer pipe shall be made from PVC plastic conforming to ASTM D-1784 Class 12454-B or 12454-C.

B. PVC Sewer Pipe: PVC sewer pipe will be permitted for installation up to 27 inch diameter and shall conform to the requirements of ASTM D-3034, Class SDR 35 for pipe sizes 4" thru 15" and ASTM F-679 for pipe sizes 18" thru 27".

C. Joints: Joints shall be bell-and-spigot compression type with flexible elastomeric seals conforming to the requirements of ASTM D-3212.

D. Fittings: All fittings shall conform to ASTM D-2241. The strength class shall be not less than the strength class of any adjoining pipe.

E. Low-Head Pressure PVC Sewer Pipe: Shall conform to AWWA C-900. Minimum wall thickness shall be DR-18 or Pressure Class 150. Joints shall be bell-and-spigot type with integral bell gasketed joints.

F. Installation: The pipe shall be installed in accordance with the requirements of ASTM D-2321 and as specified herein and as shown on the "Pipe Installation Detail" contained herein.

### 5.3.5 MANHOLES:

#### 5.3.5.1 GENERAL:

Manholes shall be watertight, precast, reinforced manholes, complete with adapter rings, frame, cover, pipe connections, ladder, concrete sections, cast-in-place base and prefabricated base. Monolithic concrete manholes may be allowed subject to approval by the City.

#### 5.3.5.2 PRECAST REINFORCED CONCRETE MANHOLES:

Manholes shall conform to ASTM C-478 and the Standard Detail Drawing for "Precast Manholes".

Precast base sections shall include a base riser section with integral floor and shall be supplied with a flexible pipe connector conforming to ASTM C-923. Precast reinforced concrete cone sections shall be of the ECCENTRIC type.

Manholes deeper than 16 feet shall have precast reinforced concrete cone sections of the ECCENTRIC type.

All joints and lift holes shall be sealed with non-shrinking grout or a continuous bead of bituminastic material. In wet areas both sides of the joint shall be grouted.

#### 5.3.5.3 CAST-IN-PLACE CONCRETE MANHOLES:

Cast-in-place bases shall have a 28-day minimum compressive strength of 2500 psi and contain not less than 5-1/2 bags of Type II or V cement per cubic yard and shall conform with the Standard Specification for Portland Cement ASTM C-150.

Cast-in-place bases over live main lines shall have a 24-hour cure period before stacking sections on the poured base.

Wall, cone sections and risers shall be precast reinforced concrete conforming to ASTM C-478

and the Standard Detail Drawing for "Cast-in-Place Manholes". Precast reinforced concrete cone sections shall be of the ECCENTRIC type.

All joints and lift holes shall be sealed with non-shrinking grout or a continuous bead of bituminastic material. In wet areas both sides of the joint shall be grouted.

Manholes deeper than 16 feet shall have precast reinforced concrete cone sections of the ECCENTRIC type.

#### 5.3.6 MANHOLE CASTINGS:

All castings shall be cast iron rings and covers conforming to ASTM A-48 Class 30. Castings shall be cleaned and painted with an asphalt coating prior to delivery to the site. All castings shall have a combined minimum weight of 400 pounds with the cover approximately 150 pounds and the ring approximately 250 pounds. The foundry name and casting number shall appear on the casting. All castings shall be made in the U.S.A. or be approved by the City Engineer.

Covers shall be in accordance with the following:

- A. Covers shall be 24 inches in diameter.
- B. Covers shall be vented with a pick-hole for opening. Vent holes shall not be larger than 5/8" diameter.
- C. All covers shall be marked "SEWER".
- D. Watertight seal down covers shall be of the gasket and bolt down type, with countersunk, hexagonal bolts.

#### 5.3.6.1 MANHOLE STEPS:

Manholes that are more than 4 feet deep shall be provided with steps, either driven or cast-in-place. Manhole steps shall be plastic encapsulated steel or fiber glass reinforced and be spaced no more than 16-inches on center.

#### 5.4 CONSTRUCTION REQUIREMENTS:

##### 5.4.1 GENERAL:

##### 5.4.1.1 MATERIALS HANDLING:

All sewer pipe, manhole sections, castings and appurtenances shall be transported, handled and stored in a manner which will insure proper installation in an undamaged condition. The Contractor shall replace all material found to be defective or which has been damaged. This

includes the replacement of material found to be defective prior to expiration of the guarantee period.

5.4.1.2        INSPECTION:

All work and materials, from the beginning of the construction until the completion and acceptance of the proposed project shall be subject to inspection by Hyrum City or its authorized representative, at their convenience. The Inspector shall have access to the work at all times. Any work found by the Inspector not conforming to Approved Plans and/or these City "Standards and Specifications" is subject to rejection.

The Contractor shall notify the City 48 hours prior to the start of construction.

5.4.2        TRENCH EXCAVATION:

5.4.2.1       GENERAL:

The work included under "Trench Excavation" shall include: every operation necessary for excavation of all materials of whatever nature within the designated limits of the trenches; maintaining the excavation by shoring, bracing or other accepted methods and its removal; providing for the uninterrupted flow of surface water or sewage during construction; and protecting all pipes, conduits, culverts, bridges and all other public and private property which may be endangered by the work.

5.4.2.2       TRENCHING:

- A.    Alignment: Trench excavation for pipe installation shall be performed to the alignment and grade as indicated on the plans or as required by the City Engineer.
- B.    Tunneling: Tunneling or boring will be required to preserve existing pavements.
- C.    Pavement Removal (if permitted by written approval of the City): All pavement removal shall be in accordance with the applicable City, County or State Standards and permits.
- D.    Trench Width: Trenches shall be excavated to a width which will provide adequate working space for proper pipe installation, jointing and embedment. Minimum sidewall clearance shall be 6 inches and the maximum sidewall clearance shall be 12 inches, measured from the outside wall of the installed pipe at a depth of 12 inches above the pipe.
- E.    Limitation of Excavation: Except by expressed written permission of the City, the maximum length of open trench shall be 300 feet, or the distance necessary to accommodate the amount of pipe installed in a single day (including open excavation, pipe laying and appurtenances, construction and backfill which has not been temporarily resurfaced).

F. Trenching by Machine or by Hand: The use of mechanical equipment will be permitted except in places where machines may cause damage to existing structures above or below ground, in which case, hand methods shall be employed.

G. Structure Protection: The Contractor shall provide temporary support, adequate protection and maintenance of all underground and surface structures, pipes, drains, sewers and other obstructions affected by the construction work. Any structure that has been disturbed shall be restored or replaced.

#### 5.4.2.3 DEWATERING:

All excavation shall be dewatered before any construction is undertaken therein. Concrete shall be placed only upon dry, firm foundation material and pipe shall be laid only in dry trenches.

#### 5.4.2.4 BLASTING:

The Contractor's responsibility with respect to the use of explosives during blasting includes compliance with all laws, rules and regulations of the Federal, State, the City and the insurer, governing the keeping, storage, use, manufacture, sales, handling, transportation or other distribution of explosives. All operations involving the handling, storage and use of explosives shall be conducted with every precaution by trained, reliable workers under satisfactory supervision. Blasts shall not be fired until all persons in the vicinity have had ample notice and have reached positions out of danger there from. The Contractor shall advise the Engineer, all utility companies, the Hyrum City, City Police, the Cache County Public Works Department, the Cache County Sheriff's Department and any public body that should be advised in advance as to when and where charges are to be set off.

#### 5.4.2.5 SAFETY:

A. Excavations shall be performed, protected and supported as required for safety and in the manner set in the Chapter, "Excavations, Trenching and Shoring" of the Utah Occupational Safety and Health Standard for Construction. Additional precautions shall be implemented if deemed necessary by the City and shall be at the expense of the Contractor.

B. The Contractor shall furnish and maintain all necessary safety equipment, such as barrier signs, warning lights and guards to provide adequate protection for persons and property during all phases of construction.

C. The Contractor shall give reasonable notice to the owners of public or private property and utilities when such property and utilities are within the construction area.

D. The Contractor shall at all times observe and comply with all Federal, State and local laws, ordinances and regulations which will in any manner affect the work.

5.4.3 PIPE EMBEDMENT:

5.4.3.1 GENERAL:

The pipe shall be carefully bedded as specified on Approved Plans and/or shall meet the requirements of these City "Standards and Specifications".

5.4.3.2 RIGID PIPE:

A. Suitable Subgrade: The trench bottom shall be constructed to provide a firm and stable support for the entire length of the pipe. The pipe subgrade shall be shaped to fit the bottom of the pipe for a width of ½ the diameter of the pipe. Each joint shall be properly bedded to insure uniform and continuous bearing along the pipe. Initial backfill shall be placed a minimum of 12 inches above the top of the pipe. Selected backfill material consisting of earth or sand, free of stones larger than 2-1/2 inches, hard clods, frozen material or other debris shall be placed in the trench simultaneously on each side of the pipe in 6 inch lifts for the full width of the trench in such a manner as not to damage or disturb the pipe. The density of subgrade material shall be ninety-five percent (95%) of maximum density as determined by ASTM D-1557 (Modified Proctor).

B. Unsuitable Subgrade: Whenever unsuitable subgrade material is encountered that requires over-excavation (excavation more than 6 inches below the bottom of the pipe) trenches shall be over-excavated at least 1/4 the diameter of the pipe (6 inches minimum) in depth and stabilized with 1/2" to 1-1/2" clean angular rock. Bedding material shall then be placed in compliance with Section 5.4.3.3.

5.4.3.3 RIGID PIPE BEDDING MATERIAL:

Bedding material of 6 inches minimum shall be required. This material shall be 1/4" to 1" clean, angular rock. This same material shall be used for haunching. Haunching shall be placed to the spring line of the pipe. Selected backfill material consisting of earth or sand, free of stones larger than 1 (one) inch, hard clods, frozen material or other debris shall be placed in the trench simultaneously on each side of the pipe for the full width of the trench in such a manner as not to damage or disturb the pipe. The density of bedding material shall be ninety-five percent (95%) of maximum density as determined by ASTM D-1557 (Modified Proctor).

5.4.3.4 FLEXIBLE PIPE BEDDING MATERIAL:

Bedding, one fourth the diameter of the pipe (6" minimum) shall be required. This material shall be 1/4" to 1" clean, angular rock. This same material shall be used for haunching. Haunching shall be placed to the spring line of the pipe. Selected backfill material consisting of earth or sand, free of stones larger than 3/4 inch, hard clods, frozen material or other debris shall be placed in the trench simultaneously on each side of the pipe for the full width of the trench in

such a manner as to not damage or disturb the pipe. The density of backfilled material shall be 95% of maximum density in roadway areas and 90% of maximum density in off-road areas as determined by ASTM D-1557 (Modified Proctor).

5.4.3.5 REQUIRED MATERIAL ONE (1) FOOT ABOVE THE PIPE:

Material placed for a minimum depth of one foot above the top of the pipe shall meet the same requirements for bedding rigid or flexible pipe including quality of material and compaction.

5.4.4 PIPE INSTALLATION:

5.4.4.1 GENERAL:

This section covers the installation of all sanitary sewer pipe, fittings, manholes and appurtenances. No connection to existing structures shall be made without approval of the City.

5.4.4.2 PIPE LAYING:

All work shall be in accordance with the following related standards and these specifications.

- A. Concrete Sewer Pipe: As per manufacturer's recommendations for pipe installation.
- B. Ductile Iron Pipe: AWWA C-600 "Installation of Gray and Ductile Cast-Iron Water Mains and Appurtenances".
- C. PVC Sewer Pipe: ASTM D-2321 "Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe". ASTM D-2855 "Standard Recommended Practice for Making Solvent-Cement Joints with PVC Pipe and Fittings".
- D. General Requirements:

1. Piping shall be laid to the alignment and grades indicated on approved construction drawings within the following limits provided that such variation does not result in a level or reverse grade:

Alignment	1 inch per 100 feet
Grade	+/- 1/2 inch

2. Install pipe of size, material, strength, class and joint type with embedment as shown on the Approved Construction Plans and conforming to these Hyrum City "Standards and Specifications".



3. Pipe shall be laid in a straight line at a uniform grade between manholes.
4. Pipe laying shall begin at the lowest elevation and proceed upstream with the bell end of bell-and-spigot pipe positioned upstream.
5. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted.
6. Pipe shall not be laid in water or under unsuitable weather or trench conditions.
7. All field cuts shall be made at right angles to the axis of the pipe.  
All pipe shall be filed to remove roughness.
8. All connections between two piping materials or between two field cuts of the same material shall be made with adapters designed and intended for that specific purpose and shall be approved by the City.
9. All joint preparation and jointing operations shall comply with the recommendation of the pipe manufacturer.
10. Whenever pipe laying is stopped, the open end of the pipe shall be plugged and or glued with a watertight plug and the trench shall be properly backfilled to protect the pipe from floating. Said plug shall be constructed to prevent plug migration into the pipe using mechanical stops. Inflatable plugs or other devices that rely solely on interior pipe friction are not allowed.
11. If adjustment of position of a pipe length is required after being laid, it shall be removed and re-jointed.
12. Any pipe that has floated shall be removed from the trench and the pipe shall be re-laid as directed by the City.
13. In addition to the above general requirements, all pipe installation shall comply with the specific requirements of the pipe manufacturer.

5.4.5 TRENCH BACKFILL:

5.4.5.1 GENERAL:

The work included under "Trench Backfill" shall include every operation above the pipe embedment zone. The density of backfilled material shall be 95% of maximum density in roadway areas and 90% of maximum density in off road areas as determined by ASTM D-1557 (Modified Proctor).

5.4.5.2 BACKFILLING:

All backfilling shall be in accordance with the applicable City, County or State Standards, permits and as designed on the Approved Plans. On-site materials may be used for backfilling if approved by the City. All construction within State rights-of-way must have the approval of UDOT including backfill material and placement.

5.4.5.3 PAVEMENT REPLACEMENT:

All pavement replacement shall be in accordance with the applicable City, County or State Standards, permits and/or as designated on Approved Plans.

5.4.6 MANHOLES:

5.4.6.1 GENERAL:

Manholes shall be constructed at the locations indicated and in accordance with details as shown on the Approved Plans and/or Standard Detail Drawings.

5.4.6.2 SUBGRADE:

Manholes are to be constructed on a stable foundation capable of supporting the loads imposed.

5.4.6.3 MANHOLE BASE:

A. Cast-in-Place Bases:

1. The base shall be a continuous pour of concrete.
2. Cast-in-place bases shall be at least 6 inches in thickness below the invert and shall extend at least 6 inches radially outside of the outside dimensions of the precast manhole wall section. The base shall extend at least 6 inches above the bottom of the wall section on the outside of the wall section.
3. The initial precast wall section shall be supported on concrete blocks and adjusted to proper alignment and grade prior to pouring of the base.
4. The precast wall section shall not bear directly on any of the pipes.

B. Precast Base Sections: Precast base sections shall be placed so as to be fully and uniformly supported in proper alignment.

#### 5.4.6.4 INVERTS:

All inverts, precast bases, cast-in-place bases or connections to existing manholes shall meet the following requirements:

- A. Invert channels shall be smooth with a uniform grade from inflow to outflow pipe inverts.
- B. Minimum drop through manholes shall be 0.2 feet at all alignment changes of 45 degrees or greater.
- C. Changes in flow direction shall be smooth, uniform and made with the longest radius possible.
- D. The cross-sectional shape of the invert channels shall match the lower halves of the inflow and outflow pipes.
- E. All openings around pipes shall be grouted to form a permanent watertight seal such as with grout.
- F. The pipe shall protrude into the manhole a maximum of 4 inches.

#### 5.4.6.5 WALL SECTIONS:

Precast sections shall be placed and aligned to provide vertical sides.

#### 5.4.6.6 JOINTS:

All joints between sections, grade rings and castings shall be sealed with a continuous bead of watertight bituminastic material or non-shrinking grout. All manholes shall have joints and lift holes grouted on the outside of the manhole in addition to standard sealing procedures.

#### 5.4.6.7 BACKFILLING:

Backfill according to Section 5.4.5.2.

#### 5.4.6.8 PLACING CASTINGS:

- A. In Roadways: Top of castings shall be set parallel to finished road surface. Castings shall be fully and uniformly supported. Wedges or shims used to elevate castings shall be brick or metal with concrete placed for uniform support. Collars around manholes shall be either a concrete collar, 9 inches wide minimum, or an asphalt hot-mix to match existing paving.
- B. Off Roadways: All manholes shall be set to the grade shown on Approved Plans or as directed by the City Engineer or Inspector.

5.4.6.9        STUBS:

All stubs shall be plugged with watertight plugs at the end of pipes outside        of the manhole and marked with 2x6 or 4x4 post.

5.4.6.10       OVER EXISTING SEWERS:

Manholes to be built on an existing sewer shall be constructed in such a manner as will not disrupt service of the existing sewer. The manhole base, walls and invert shall be completed before the top half of the sewer pipe is cut or broken away. Rough edges of the pipe thus exposed shall be grouted in such a manner as to produce a smooth and acceptable finish. Any portion of the existing sewer damaged shall be repaired or replaced by the Contractor.

5.4.6.11       PROTECTION DURING CONSTRUCTION:

A plywood bottom or plugs shall be placed in manholes during construction to prevent debris from entering sewer lines.

5.4.6.12       DROP MANHOLES:

Drop manhole connections, as indicated on Approved Plans or as required whenever the elevation differences between the flow lines of the inflow pipe and the outflow pipe exceed 18 inches, shall conform to the Standard Detail Drawing for "Drop Manholes" or Approved Plans. All drop manholes shall be constructed with an outside drop unless specifically authorized by the City.

5.4.7           LATERALS:

5.4.7.1        GENERAL:

This section covers the connection of laterals to main sewer lines. Any alterations to this specification shall be approved by the City prior to connection.

5.4.7.2        CONNECTION REQUIREMENTS:

A.        Type of Connection:

1.        In all cases, a manhole shall be used to connect sewer lines 8 inches and larger to existing sewer mains.

2.        The connection of sewer laterals to sewer mains shall be made by installing a "wye" branch or a "saddle" fitting or INSTA TEE made specifically for lateral-sewer main connections. "Saddle" fittings shall be banded securely onto the pipe with stainless steel bands. The hole cut into the sewer line wall shall be sized to avoid any flow restrictions between the fitting and pipe and shall be cored neatly. "Wye" and "tee" saddles shall be PVC. Any other material must be

approved by the City.

B. Installation: All lateral connections shall be in accordance with these City "Standards and Specifications":

1. All connections shall be left uncovered until inspected by the City Inspector.
2. Service connections shall be bedded, backfilled and compacted as per pipe specifications or as directed by the City Inspector.
3. All sewer lines shall remain in service while connections are made.
4. Any damage to existing sewer manholes or lines during connections shall be corrected by the Contractor as directed by the City.
5. The invert of all sewer laterals at the point of connection shall be at or above the spring line of the sewer main.

5.4.7.3 LATERAL REQUIREMENTS:

A. Installation:

1. Material and construction requirements of laterals shall be in accordance with these City "Standards and Specifications" and the Standard Detail Drawing for "Typical Service Connection".
2. The City shall be notified 24 hours prior to installation of the sewer lateral.
3. 4 inch laterals shall be laid at a minimum slope of 2%. Variations are to be reviewed by the City Inspector.

5.4.8 ACCEPTANCE TESTS:

5.4.8.1 GENERAL:

The Contractor shall perform all pipe and line flushing and testing of installed pipelines and televising the installation. The Contractor shall notify the City 48 hours in advance of any proposed testing operation. After the Contractor has cleaned the lines he shall give the City 48 hours advance notice that the system is ready for air testing.

Visual inspection, air leakage, deflection and television inspection shall be performed on all installed sewer lines prior to acceptance. Additional tests may be required by the City. Defects designated by the City Engineer or Inspector shall be repaired prior to acceptance of the sewer lines.

5.4.8.2 CLEANING:

A. Public Sewer Lines: Each section of sewer line between manholes shall be straight and uniformly graded with no damaged pipe, misaligned or displaced joints or other defects. All sections of pipe shall be cleaned with a pressure jet to remove all dirt, debris and obstructions.

B. Laterals: All connections, lines and appurtenances shall be examined by the City prior to backfilling. All sections of pipe shall be free of dirt, debris and obstructions.

5.4.8.3 AIR TESTS:

A. Requirements: Following cleaning an "Air Test" shall be performed on the full length of each public sewer line installed with the following requirements:

1. The Contractor shall give the City 48 hours notice of any test to be performed on the system.

2. All air tests shall be observed by the Inspector, unless the air test is performed by a "Testing Firm" which the City and City Engineer approves prior to the testing.

3. Each section tested shall be noted on an "Air Test" form to be submitted to the City. Acceptances, failures, reasons for failure and retests shall be shown on the form.

4. All sewer pipe shall be tested after the completed backfill.

5. All air tests are to include laterals when installed in conjunction with the sewer main.

6. All stubs are to be air tested.

7. All repairs indicated by any unsuccessful tests shall be made and the tests repeated until the successful performance of all tests is achieved.

B. Method of Testing: The method of "Air Testing" gravity sewer lines shall be as follows:

1. Clean test section by water jet.

2. Plug all pipe outlets with suitable test plugs bracing each plug securely if needed.

3. Raise the internal pressure in the test section to 4.0 psig.

4. After the pressure is reached, allow the pressure to stabilize. This usually takes 2 to 5 minutes, depending on the pipe size.

5. Disconnect the air supply and allow the test pressure to decrease to no less than 3.5 psig.

Starting pressure may be greater than 3.5 psig.

6. Determine the time that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig.

7. If the time period is less than the Minimum Test Time Required (see attached ASTM minimum test time chart) locate and repair problem and retest.

#### 5.4.8.4 DEFLECTION TEST:

All flexible and semi-rigid pipe shall be tested for deflection, joint displacement, or other obstruction by passing a rigid mandrel through the pipe by hand, not less than 30 days after completion of the trench backfill, but prior to any resurfacing. The mandrel test shall comply with the specific procedures required in Section 306-1.4.6 of the SSPWC, except for the additional provision that the mandrel shall be a full circle, solid cylinder, or a rigid, non-adjustable, odd-numbered leg (9 leg minimum) steel cylinder, approved by the Engineer as to design and manufacture.

**TABLE 1**  
**SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP**  
**FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015**

Pipe Dia. (in.)	Min. Time (min:sec)	Length for Min. Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15	
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46	



TABLE II  
 SPECIFICATION TIME REQUIRED FOR A 0.5 PSIG PRESSURE DROP  
 FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015

Pipe Dia. (in.)	Min. Time (min:sec)	Length for Min. Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	46:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

**5.4.8.5 VACUUM TESTING MANHOLES BY THE NEGATIVE AIR PRESSURE TEST:**

The procedure for vacuum testing manholes by the negative air pressure test shall be as follows:

All lift holes shall be plugged.

All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury.

The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in Table 1 below.

If the manhole fails the initial test, necessary repairs shall be made by an approved method. The

manhole shall then be retested until a satisfactory test is obtained.

TABLE 1  
MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS

Depth (ft)	Diameter, inch								
	30	33	36	42	48	54	60	66	72
Time, s									
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

5.4.8.6 TELEVISION INSPECTION:

The Developer or Contractor, prior to final acceptance by the City, shall have the new facilities televised and provide the City with a VHS video cassette for the City to review. The City will notify the Developer or Contractor of the condition thereof. The Contractor shall thereupon immediately make any repairs or corrections required by the City. The video cassette shall become a part of the City's records.

5.4.9 CLEANUP:

All surplus materials, tools and any temporary structures shall be removed from the construction site by the Contractor. All rubbish, dirt or excess earth from the excavation shall be removed by the Contractor at the earliest possible date and the construction site left clean and acceptable to the construction Inspector.

ASTM MINIMUM TEST TIME

Time in Minutes Required for Pressure Drop of 1 psi

Length	4"	6"	8"	10"	12"	15"	18"
50	0.15	0.35	0.60				
75	0.35	0.53	0.90				
100	0.30	0.70	1.20	1.5	1.8	2.1	2.4
125	0.38	0.88	1.50				
150	0.45	1.05	1.80				
175	0.53	1.23	2.10				
200	0.60	1.40	2.40		3.0	3.6	4.2
250	0.75	1.75	3.00				
300	0.90	2.10	3.60	4.5	5.4	6.3	7.2
350	1.05	2.45	4.20				
400	1.20	2.80	4.80	6.0	7.2	8.4	9.6

Minimum Test Time for Various Pipe Sizes

	Nominal Pipe Size	T (time)	Nominal Pipe Size
T (time)			
(Inches)		(Min/100 ft.)	
(Inches)		(Min/100 ft.)	

3	0.2	21
3.0		
4	0.3	24
3.6		
6	0.7	27
4.2		
8	1.2	30
4.8		
10	1.5	33
5.4		
12	1.8	36
6.0		
15	2.1	39
6.6		
18	2.4	42
7.3		

Note: ASTM Low-Pressure Air Testing Method for Concrete (C-924-84) and Vitrified Clay Pipe (C-828-8)

SECTION 6

HYRUM CITY  
GENERAL REQUIREMENTS  
AND  
SPECIFICATIONS  
FOR  
POTABLE WATER MAINS,  
SERVICE LINES  
AND  
SECONDARY PRESSURE  
IRRIGATION  
INSTALLATIONS

## **6. GENERAL REQUIREMENTS AND SPECIFICATIONS FOR POTABLE WATER MAINS, SERVICE LINES AND SECONDARY PRESSURE IRRIGATION INSTALLATIONS**

### **6.1 DESIGN CRITERIA:**

#### **6.1.1 DESIGN REGULATIONS:**

- A. All water system improvements or extensions shall comply with the design and operation rules prepared by the State of Utah, Division of Drinking Water, Department of Environmental Quality and the City Standards. If there is a conflict between Standards; the most stringent shall rule.
- B. A pipe network analysis shall be required for developments consisting of 50 equivalent residential lots or more that will indicate the water consumption anticipated and the pressures at each intersection of main lines.
- C. Construction of the project shall not begin until complete plans and any modifications to these specifications have been approved, in writing, by the City.
- D. No new drinking water facility shall be put into operation until approval to do so has been given in writing by the City.
- E. Plans shall be stamped, signed and dated by a professional engineer, registered in the State of Utah, who has experience in designing public drinking water projects and who will be responsible for the design.

#### **6.1.2 SERVICE LINES:**

Service lines connected to the public water system shall meet the following criteria:

- A. Service lines shall be installed by a General Utility Contractor licensed and bonded in Utah.
- B. Service lines will be Type K Copper or other material approved by the City.
- C. Service lines shall have a nominal inside diameter of not less than (3/4") three quarter inch nor greater than 1 inch, unless approved by the City.
- D. Each dwelling unit shall be served by an individual service line. Multi-family dwelling units may be served otherwise where approved by the City to be master metered.
- E. Service lines shall not be located under driveways.

F. Maintenance of the line from the home to the meter shall be the responsibility of the property owner.

#### 6.1.3 DESIGN PERIOD:

The water system shall be designed to serve the ultimate service area and shall be based on the best information available, including area master plans, current zoning regulations and approved planned and zoning reports when available.

#### 6.1.4 DESIGN CAPACITY:

A. General Requirements: The distribution system shall be designed to insure that a minimum of 20 psi exists at all points within the system during peak day demands in conjunction with fire flow demands.

B. Indoor Use-Assumed Peak Instantaneous Demand: The peak instantaneous demand to be assumed for indoor use shall be  $Q = 10.8 N^{0.64}$ , where N equals the total number of equivalent residential connections (ERC) and Q equals the total flow in gallons per minute (gpm) delivered to these connections.

C. Outdoor Use, Peak Instantaneous Demand: The peak instantaneous and peak day demands for outside use shall be determined by multiplying the irrigated acreage by 7.92 (gpm) and 3.46 (gpm) for each acre irrigated.

D. Fire Flow: The Design Engineer shall consult with the local fire suppression authority regarding needed fire flows in the area. Generally, fire flows shall be as required by Table A-111-A-1 of the 1997 Uniform Fire Code. According to this table, minimum fire flow for a one or two family dwelling, not exceeding 3,600 square feet, is 1000 gpm. Required fire flows for other types of buildings are higher.

#### 6.1.5 WATER MAIN SIZE:

All public water mains shall be 8 inches in diameter or larger provided that the instantaneous peak flows meet the requirement of paragraph 6.1.4. Dead end lines with fire hydrants shall be 8 inches in diameter to provide the required fire flows. Larger mains may be required to meet fire flow demand or to provide adequate service to adjacent areas.

#### 6.1.6 WATER MAIN DEPTHS:

Water lines shall be installed to a minimum depth of five feet to the top of the pipe.

#### 6.1.7 FIRE HYDRANTS:

Fire hydrants shall be installed in accordance with the regulations of the Fire Department and these standards. Hydrants shall be placed in the system not over five hundred feet apart. The maximum distance from any point on street or road frontage shall not exceed 250 feet. Hydrants are to be placed at each end of the block and one in the middle of the block.

#### 6.1.8 VALVES:

Valves shall be placed in the system so that sections of the pipe no longer than six hundred feet may be isolated and shut off from the rest of the system so repair may be made with a minimal amount of water connections put out of service. When connecting to existing or new lines at tees, a minimum of three valves shall be installed. Where crosses are used, a minimum of four valves shall be used.

#### 6.2 MATERIAL REQUIREMENTS:

##### 6.2.1 GENERAL:

Unless specifically designated otherwise in each case, all materials and equipments furnished for permanent installation in the work shall conform to applicable standard specifications and shall be new, unused and undamaged when installed or otherwise incorporated in the work. No material or equipment shall be used by the Contractor for any purpose other than that intended or specified. All materials not conforming to these specifications shall be specifically approved in writing by the City prior to delivery to the jobsite. Any material or equipment found not conforming with City Standards and Specifications is subject to rejection.

##### 6.2.2 PIPE FOR WATER MAINS:

###### 6.2.2.1 GENERAL:

1. These specifications cover the pipe and fittings normally used for water distribution systems.
2. Special considerations will be covered in the Approved Plans and Special Conditions.

###### 6.2.2.2 PIPE:

A. Ductile Iron Fittings and Rubber Gasket Joints: All joints under this specification shall be short body cast iron fittings conforming to ANSI/AWWA C110 or Ductile Iron Compact MJ fittings conforming to ANSI/AWWA C153 Class 350.

B. Ductile Iron Pipe: Ductile Iron Pipe shall be of Pressure Class 350 thru 12" diameter meeting the requirements of AWWA C151. Pipe and fittings shall be manufactured in the United States of America.



C. Polyvinyl Chloride Plastic Water Pipe: All PVC pressure pipe for culinary water service shall conform to AWWA C900 (4"-12") or AWWA C905 (14" and larger) Pressure Class 235 (DR18). All PVC pressure pipe for secondary water shall conform to AWWA C900 (4"-12") or AWWA C905 (14" and larger) Pressure Class 235 (DR18) and shall be purple in color to make it suitable for use with reclaimed water.

All rigid PVC pipe used for potable water service shall bear the seal of approval of the National Sanitation Foundation Testing Laboratory, Inc., which has qualified the pipe for potable water service.

Pipe shall be produced in standard and random lengths. At least 85% of the total footage of any class and size shall be furnished in standard lengths. The remaining 15% may be in random lengths.

1. Standard lying lengths shall be 20 feet plus or minus one inch for all sizes.
2. Random lengths shall not be less than 10 feet long.

Each standard and random length of pipe shall be marked on the outside surface with the trade name with the appropriate designation code (e.g. PVC 1120), DR, nominal size, pressure classification and date of manufacture.

Samples of pipe, physical and chemical data sheets, may be required to be submitted to the Engineer for approval and approval may be required before the pipe is purchased.

The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform in color as commercially practical.

The rigid PVC pipe used in the municipal water distribution system shall be composed of PVC compounds meeting the requirements of ASTM D1784.

### 6.2.3 VALVES FOR WATER MAINS:

A. Description: The valves shall be suitable for an ordinary waterworks service intended to be installed in a normal position on buried pipe lines for water distribution systems. All valves shall be Mueller, or equal, with non-rising stem valves.

The minimum requirements for all gate valves shall, in design, material and workmanship, conform to the standards of AWWA C509 for Resilient-Sealed Gate Valves. All materials used in the manufacture of waterworks gate valves shall conform to the AWWA Standards designed for each material listed. All gate valve operating stems shall be equipped with a two (2) inch operating nut. All gate valves shall open counterclockwise.

The minimum requirements for all butterfly valves shall, in design, material and workmanship conform to the standards of the AWWA C504. Any water valve 12 inches or larger shall be

butterfly-type. Also, any water line with working pressure greater than 150 psi shall have only butterfly-type valves installed.

Where static line pressure exceeds 125 psi, only 250 psi working-pressure valves shall be used.

**B. Materials:**

1. **Manufacture and Marking:** The valves shall have the name or mark of the manufacturer, year valve casting was made, size and working pressure plainly cast in raised letters on the valve body.

2. **Type and Mounting:** The valve bodies shall be ductile iron, mounted with approved non-corrosive metals, All wearing surfaces shall be bronze or other approved non-corrosive material. Contact surfaces shall be machined and finished in the best workmanlike manner, and all wearing surfaces shall be easily renewable.

3. **Valve Seats:** Resilient seats shall be applied to the gate and shall seat against a corrosion-resistant surface. The surface may be either metallic or non-metallic, applied in a manner to withstand the action of line fluids and the operation of the sealing gate under long-term service. A metallic surface shall have a corrosion resistance equivalent to or better than bronze. A non-metallic surface shall be in compliance with ANSI/AWWA C550. Resilient seats shall be bonded or mechanically attached to the gate. The method used for bonding or vulcanizing shall be proved by ASTM D429; either method A or method B. For method A, the minimum strength shall not be less than 250 psi (1,725 kPa). For method B, the peel strength shall not be less than 75 lb/in. (9.3 kg/m).

All exposed mechanical attaching devices and hardware used to retain the resilient seat shall be made of a corrosion-resistant material.

4. **End Connections:** The dimensions push-on end connections shall conform to the dimensions of the AWWA Standard C111/A21.11. The dimensions for the mechanical joint connections shall conform to the ANSI/AWWA C111/A21.11.

The end flanges of flanged valves shall conform in dimensions and drilling to the standard ANSI B16.1 for ductile iron flanges and flanged fittings, Class 125, unless specifically provided otherwise. The bolt holes shall straddle the vertical center line.

5. **Gate Valve Stem Seals:** Unless otherwise designated in the Approved Plans, all gate valves up to and including 12-inch in size shall be furnished with O-ring Stem Seals. Number, size and design shall conform to the AWWA Standards for gate valve O-Ring Stem Seals. For all valves over 12", the stem seals shall be conventional type stuffing-box with graphite packing per AWWA Standard No. C600-18.1.

6. **Tapping Valves:** Tapping valves shall be furnished with flanged inlet end connections having a machined projection on the flanges to mate with a machined recess on the outlet flanges

of the tapping sleeves and crosses. The outlet ends shall conform in dimensions to the AWWA Standards for hub or mechanical joint connections, except that the outside of the hub shall have a large flange for attaching a drilling machine. The seat opening of the valves shall be larger than normal size to permit full diameter cuts.

7. Hydrostatic Test Pressure of Valves at Factory: Each gate valve shall be tested at the factory for performance and operation prior to painting in conformance with Section 6 of AWWA Standard C509.

8. Installation of Gate Valves: All gate valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. The valves shall also be carefully inspected for injury to the outer protective coatings.

Valves 12-inch and under shall be installed in a vertical position and be provided with a standard valve chamber or ductile iron gate box so arranged that no shock will be transmitted to the valve. The box shall be centered over the operating nut, and the cast iron box cover shall be set one-half (1/2) inch below the roadbed or finished paved surface. All valve boxes must be brought to this elevation prior to the placement of asphalt, unless otherwise approved by City Engineer. After installation, all valves shall be subjected to the field test for piping as outlined in Section 6.8 of these specifications. Should any defects in design, materials or workmanship appear during these tests, the Contractor shall correct such defects with the least possible delay and to the satisfaction of the Engineer. Should the Contractor fail to do this within a reasonable period of time in the judgement of the Engineer, he may cause such defects to be corrected and take appropriate action to receive payment for the work.

9. Butterfly Valves: Butterfly valves shall be cast iron or ductile iron body, rubber seated, tight closing type butterfly valves conforming to AWWA Specification C504. Other types may be used if specified or approved by the Engineer.

Valves shall be fitted with Class 125 or Class 250 flanges conforming to ASME/ANSI B16-1 or ANSI/AWWA C110/A21.10.

The valve body shall be high strength cast iron ASTM A126 Class B with 18-8 Type 304 stainless steel body seat. Valve vane shall be high strength cast iron ASTM A48 Class 40, having rubber seat mechanically secure with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel nylon locked screws.

Rubber seat shall be a full circle 360° seat not penetrated by the valve shaft. Valve shaft shall be one piece, extending full size through the entire valve and operator with no neckdown, keyways or holes to weaken it. Valve shaft shall have 304 stainless steel journals rotating in reinforced teflon bearing. Packing shall be “triple-seal” rubber designed for permanent duty in underground service.

Certification of performance, leakage and hydrostatic tests as described in Section 5 of AWWA Specification C504 shall be furnished. Valves shall be the product of a manufacturer having a minimum of five years experience in the manufacture of waterworks and distribution valves. Butterfly valves shall be as manufactured by Henry Pratt, Dresser or approved equal.

10. Ball Valves: Ball valves shall conform to ANSI/AWWA C507 Standard for Ball Valves 6-inch through 48-inch.

11. Check Valves: Check valves shall be of the Lever-Weight Type, conventional flanged style as manufactured by Mueller Company, or approved equal, conforming to ANSI/AWWA C508 Standard for check valves 2-inch through 48-inch.

The plug, which shall be guided at both ends with a through integral shaft, will be opened by the flow velocity and closed by a lever and weight which can be adjusted to any position on the lever and which returns the plug to the seat before reversal of flow occurs.

All check valves shall have a maintenance pit of a size as approved by the City Engineer to provide access.

12. Air Relief/Vacuum Relief Valves: Air Relief Valves shall be CLA valves or equal of the type and model shown on the Approved Plans or as specified in the Contract Documents.

13. Valve Boxes and Covers: All valves not in a vault as per the attached Standard Drawing shall be provided with a cast iron valve box of the extension sleeve type, and the correct adjustable height to bring the top of the valve box flush with the finished surface. The valve box shall not be less than 5 inches in diameter, and shall have a minimum thickness of 3/16 inch, and shall be provided with suitable base and cover for culinary water valves. The word "Water" shall be cast on the cover. For secondary water, a triangular lid bearing the word "irrigation" shall be used. Valve boxes shall be equal to Mueller H-10357 with No. 6 or No. 8 round base as needed. There shall also be furnished to the City Water Department, 1 "T" handle operating wrench for each 5 new valves installed on the project.

### 6.3 WATER SERVICE CONNECTIONS AND FIRE LINES:

#### 6.3.1 GENERAL:

Service connections will be made by the Contractor, in accordance with these Specifications and Standard Drawings. This includes furnishing and installing service connection at the main, service line, yoke and box. The City will furnish and install the meter. All connections to the Hyrum water system including fire lines shall be metered unless otherwise approved by the City. In the case of connections serving only a fire system, the cost of the meter vault and appurtenances shall be borne by the developer while the meter shall be provided at no additional cost by Hyrum City. All service connections including fire lines shall be constructed in accordance with the provisions of this section up to the first shut-off valve within the building.

Service connections will be activated only after inspection, testing, chlorination and flushing of all new water line facilities, and also only after acceptance of the main line, unless otherwise approved by Hyrum City.

Each culinary service connection must be pressure tested in accordance with Section 6.8 except that the test pressure shall not exceed 200 pounds per square inch. Each fire line shall be pressure tested in accordance with Section 6.8 except that the test pressure shall not exceed 200 pounds per square inch.

Water service connections shall be installed in accordance with the attached applicable Standard Drawings.

### 6.3.2 MATERIALS:

A. Corporation Stops: Corporation Stops will be brass with ball type or Mueller Oriseal type (1-1/2" and 2" sizes only) inlets and Mueller, or Ford, 110 Compression connection outlet in accordance with AWWA Standard C800.

B. Service Clamps: All service taps shall be equipped with double or single-strap stainless steel Teflon-coated service clamps.

C. Pipe Materials: All service lines will be type K, soft copper tubing, conforming to AWWA Standard C800 and ASTM B88, or HDPE, conforming to AWWA C901. Laterals shall be installed without any connections or appurtenances between the corporation stop and the meter yoke.

D. Meter Yoke: Meter yokes will be Mueller or Ford V-80 series "copper setter" of molded copper tubing with reinforcing bars and angle type dual check valve, meter fittings will be standard threads, copper tubing fittings to be copper flair in accordance with AWWA Standard C700.

E. Meter Box: Meter boxes will be 18-inch diameter for 3/4-inch meter installation, 24-inch diameter for 1-inch meter installation and 48-inch concrete diameter for 1-1/2-inch meter installation. The box will be white ABS Pipe, 36-inches in length with knock-out for touch reading. Meter box shall be located as per the approved drawings and is subject to approval by the City.

Standard length of the box will be 48 inches unless otherwise approved. Prior approval by the City is required in these cases.

F. Meter Box Lid: Meter box lids will be of cast iron or cast aluminum. The lid shall be secured with standard nut. All meter lids must have a 2-inch hole for remote reading and be approved by the City.

G. Curb Stop and Curb Box: Mueller Oriseal curb valve and cast iron extension-type curb box with arch pattern base with cast iron foot piece as manufactured by Mueller. Prior approval by City required for substitution.

H. Meters: Meters shall be supplied by the City but paid for by the Developer.

### 6.3.3 CONSTRUCTION:

Taps shall be made and service pipe installed at a right angle to the water main. The tap shall be made on the middle of the main at an angle between 45 degrees and 60 degrees from the vertical plane, on the side of the main to which service is to be extended.

The water main shall be tapped by machine drilling a hole in it the size to fit the corporation for the service line. The drilling machine and method of tapping shall be approved by the City. A representative of the City shall inspect the main and tap prior to backfilling. In the event the tap is covered before it is inspected, it shall be uncovered by the Contractor to allow for inspection. If the tap or water main is damaged during the process of locating, it shall be repaired immediately by the Contractor in a manner acceptable to the City.

The service line shall be constructed as near as possible in the center of the lot and on the shortest and straightest route possible. No service line may be constructed through, or in front of any adjoining property.

All service lines installed across and under existing roads that are paved shall be installed by boring or pulling the pipe. No open cuts will be permitted.

If the line is not to be connected initially to a meter yoke, the end of the service line shall then be sealed shut to keep rocks and dirt out of the line. Every precaution shall be taken to prevent foreign material, including trench water from entering the pipe.

Where existing services are to be transferred from old to new mains, the Contractor shall plan and coordinate his work with that of the City so that service will be resumed with the least possible inconvenience to consumers.

Whenever the Contractor is required by the Approved Plans and Special Conditions to remove an existing water main, the Special Conditions will state whether or not the salvage of pipe, valves, hydrants and fittings will be required and the method of payment therefore.

All meter installations will be located (9) nine feet from the property line in front of the building and shall not occur in a sidewalk or driveway. If it is impossible to construct the meter box at this location, approval to relocate must first be secured from the City.

All meter installations will be installed so that the meter box lid is at grade with a tolerance of

+1/2".

All irrigation sprinkling systems will be connected no closer than 2 feet from the meter box on the customer side of the meter.

The Contractor shall not in any case remove old pipe until all service connections have been transferred to the new main. Adequate provisions shall be made by the Contractor during construction for the care and protection of mains or services in use.

Where salvage of pipe, valves, hydrants and fittings is required under the contract, salvage methods shall be used which will save all materials intact and undamaged. Salvaged material shall be stored at the City's yard, unless otherwise provided.

If salvage is not specified, the materials thereof shall become the property of the Contractor and shall be promptly removed from the site for disposal as he sees fit.

To supply customers with water during the construction of a water main project where any section of the pipe has passed a satisfactory hydrostatic and bacteriological test, the City reserves the right to install a corporation stop into the section of a new main and install service connections at such locations as the City may elect, at no expense to the Contractor. The attaching of any such service connections by the City shall not be construed by the Contractor as an acceptance by the City for any part of the work required under the Contract.

#### 6.4 FIRE HYDRANTS:

##### 6.4.1 GENERAL:

These Specifications are to be used in conjunction with the AWWA Standard C502 or the latest revision thereof for fire hydrants for ordinary water works service.

##### 6.4.2 MATERIALS:

A. Material for Hydrants and Appurtenances: All materials used in the production of fire hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502.

B. Hydrant Size and Type: Hydrants shall be 5-inch minimum size with 2-1/2 inch hose nozzles and 1 - 4-1/2 inch pumper nozzle. Hydrants shall be supplied with O-Ring seals and a 6-inch ASA 125 pound flanged inlet. Each hydrant shall be supplied complete with a flanged mechanical joint auxiliary gate valve with box. They shall be Mueller Super Centurion A-423 or Clow. A hydrant key shall be provided to the Public Works Department for each five hydrants installed.

C. Auxiliary Valve: Per Section 6.2.3 of these Specifications.

D. End Connections: The dimensions of hub or bell end connections shall conform to the dimensions of the AWWA Standard No. 100. The dimensions of the mechanical joint connection shall conform to the USASI Specification No. A21.11.

The flanged lateral connection shall be faced and drilled to conform to the American Standard for 125-lb. W. P. flanged fittings when static pressures do not exceed 125 pounds. 250 pounds working pressure, flanged fittings shall be used when working pressure is greater than 125 pounds. Flanges shall be machine finished to a true surface. Bolt holes shall straddle the vertical center line.

E. Sidewalk Flange Construction: Hydrants shall be provided with a sidewalk flange. Breaking devices shall be at the sidewalk flange which will allow the hydrant barrel to separate at this point with a minimum breakage of hydrant parts in case of damage. There shall also be provided at this point a safety stem coupling on the operating stem that will shear at the time of impact. Unless otherwise specified, all hydrants shall be equipped with O-Ring stem seals.

F. Factory Hydrostatic Test: All hydrants installed shall have certification of being subjected to an internal hydrostatic test of 300 pounds per square inch with the hydrant valve in a closed position and again with the hydrant valve in an open position upon request by the City Engineer.

#### 6.4.3 CONSTRUCTION DETAILS:

A. Setting Hydrants: Hydrants shall be installed in accordance with the detail shown on the enclosed drawing in the location specified in the Approved Plans or as designated by the City.

All hydrants shall be inspected in the field upon arrival to ensure proper working order. After installation, they shall be subjected to a hydrostatic test not to exceed the factory test pressure. New hydrants are to be marked by a red-painted snow stake approved by the City. Hydrants shall not be operated for the purpose of obtaining water for normal construction purposes. Any hydrant so operated shall be replaced by the Contractor.

B. Hydrant Connections: Hydrant laterals shall consist of a section of mechanical joint ductile iron 6-inch pipe restrained from the main to the hydrant and shall include an auxiliary gate valve set vertically and placed in the line as indicated in the Standard Drawings for hydrant settings.

C. Relocating Existing Hydrants: When shown on the Approved Plans or when directed by the City, existing hydrants shall be moved. When the existing tee is moved to a new hydrant location, a new tee shall be inserted and the open part of the abandoned tee shall be securely sealed and blocked. When the existing hydrants are blocked to the main line, the same method shall be used to anchor the hydrants at their new locations. The work shall conform in all respects to hydrant settings as described elsewhere in these Specifications.



D. Hydrant Extensions: The minimum requirements for all flanged hydrant barrel extensions, operating stems and flanged adaptors for hydrant lateral connections shall, in design, material and workmanship, conform to the AWWA Standards for such castings. The drilling of the flanges on the extensions shall match the drilling of the flanges on the hydrant. The drilling of the adaptor flanges shall match those of the hydrant foot flange and the auxiliary gate valve flange.

E. Testing of Fire Hydrants: Fire hydrants shall be subjected to a hydrostatic test at a minimum of 150% of the working pressure of the supply main but not to exceed 200 pounds per square inch for a period of two hours, after being connected to the main water line and after concrete anchor blocks at all thrust points are in place. Testing shall be made with the whole interior of the hydrant under pressure with the auxiliary valve and the foot valve open and the hose nozzles and pumper connections closed. Under the test procedure, there shall be no leakage through the main valve or stuffing box, nor through the castings or the joints of the assembled hydrant. Under the test conditions, the leakage through the drain valve shall not exceed four fluid ounces per minute. Other leakage or other imperfections found in either test shall be corrected before the hydrant is accepted. At the option of the Contractor, he may test each fire hydrant separately or he may choose to test fire hydrants along with the water line hydrostatic pressure test.

## 6.5 WATER MAIN AND SERVICE LINE CONSTRUCTION:

### 6.5.1 GENERAL:

All water mains and service line construction within the Hyrum City water system or intended to be connected to the Hyrum City water system shall be accomplished in accordance with the requirements of these Specifications. In all cases construction must conform to Utah's Drinking Water Regulations. All water lines, connections, and appurtenances on the customer's side of the meter or beyond a point five feet beyond the edge of the nearest all-weather roadway, whichever creates the greater distance, of private line shall be privately maintained. No public water mains shall be accepted by the City until there is sufficient usage through the line to prevent wintertime freezing. No landscape irrigation line shall be connected to the City system without a backflow preventer similar to attached drawings.

### 6.5.2 APPROVED PLANS:

Water main construction shall be done in accordance with the Contract Documents for the work, prepared under the direction of a Professional Engineer licensed in Utah and approved by the City Engineer and Hyrum City.

### 6.5.3 LICENSES AND PERMITS REQUIRED:

A. All water mains and service line construction shall be done by a General Utility

Contractor licensed and bonded in Utah.

B. When construction is required within the public right-of-way, a permit shall be secured by the Contractor from Hyrum City at least 48 hours before initiating construction. When construction necessitates, shutting down a segment of public water main for a connection, the connection shall be made between the hours of 2:00 a.m. and 7:00 a.m. local time unless otherwise approved by the City.

C. A cash bond shall be posted to guarantee the work for a period of two years.

D. An indemnity bond shall also be posted to guarantee that work will conform to the City's Standard Specifications and to guarantee that Hyrum City will not be liable for any accidents, property damage or physical damage to any individual related to acts of the Contractor.

E. The City shall be notified 48 hours minimum before the planned construction is to commence and also before starting up Whenever construction is interrupted for any reason.

F. A plumbing permit is required from the City prior to connecting landscape irrigation lines to the City water system.

#### 6.5.4 INSPECTION:

All work shall be inspected by a City authorized Inspector who shall have the authority to halt construction when, in his opinion, construction is being performed contrary to the Contract Documents. Whenever any portion of these Specifications is violated, the City Administrator, by written notice, may order that portion of construction which is in violation of the Contract Documents to cease until such violation is corrected. A copy of the order shall be filed with the Contractor's license application for future review. If deficiencies are not corrected, performance shall be required of the Contractor's Surety.

#### 6.6 TRENCH EXCAVATION AND BACKFILL FOR WATER MAINS:

##### 6.6.1 GENERAL:

The Specifications in this section, and those of sections 6.2.2 through 6.2.6, shall apply to the construction of water distribution mains and appurtenances in sizes up to and including twenty-four inches (24") in diameter for both temporary and permanent installation under ordinary conditions.

Water mains will be constructed on locations as shown on the Approved Plans.

Where grading is required, rough grading or excavation and embankment shall be completed before excavation of the water main trench.

Guarantee: Unless otherwise provided by the Special Conditions, the Contractor shall guarantee that the design, materials, workmanship and performance of the pipe, valves, hydrants, valve chambers, boxes, fittings and accessories furnished by him will be as specified, and that they and the installation of them will be satisfactory to the Owner for the purpose intended for a period of two years after final acceptance of the installation.

#### 6.6.2 UNGRADED STREETS:

On streets, when grading is not provided in the contract schedule, the depth of trench excavation shall be as shown on the Approved Plan and Profile and as staked by the Engineer.

Where the Approved Plans show the pipe is to be laid above the existing ground surface, an embankment fill shall be made and compacted to conform with the section shown on the Approved Plans and the water main trench shall be excavated therein. That portion of the embankment below the bottom of the pipe shall be compacted with rollers or mechanical compactors under controlled moisture conditions.

#### 6.6.3 CLEARING AND GRUBBING IN UNGRADED STREETS:

The area to be excavated or filled shall be cleared and grubbed by the Contractor. This work shall consist of the removal and disposal of all logs, stumps, roots, brush and other refuse. All such material shall be removed and disposed of as directed by the City.

#### 6.6.4 REMOVAL AND REPLACEMENT OF PAVEMENT FROM DRIVEWAYS AND SIDEWALKS:

Removal and replacement of existing street improvements shall be performed as specified in the City's standards and shall be considered as incidental to the construction and the costs shall be included in the installation of the water line.

The removal of material from pavement, driveway and sidewalk and the disposal thereof shall be considered as incidental to the construction.

#### 6.6.5 GRADE AND ALIGNMENT:

Grade and alignment on ungraded streets will be given from hubs set parallel to the line of the pipe, and on graded streets the grade and alignment shall be taken from established points on the existing curbs or sidewalks, when directed by the Engineer. Trenches for the pipe shall be opened in accordance with the lines and grades given or to the standard minimum cover of five (5) feet, depending on elevation and future surface treatment, whichever is greater. The Contractor shall transfer lines and grades to the pipe from hubs set by the Engineer or from existing concrete curbs or sidewalks as an incidental part of his work.

Sequence of operations, traffic requirements, or restrictions on the amount of open trench, if any,

will be provided in the Special Conditions.

#### 6.6.6 TRENCH EXCAVATION:

The Contractor shall perform all excavation of every description and of whatsoever substances encountered to the depth indicated on the Standard Drawings or specified herein. All excavations shall be made by open cut unless otherwise provided in the Contract Documents. The banks of the trenches shall be kept in accordance with Utah Occupational Health and Safety Division (UOSHA) requirements. To protect adjacent structures the trench shall be properly sheeted and braced.

Work shall comply with the "Utah Occupational Safety and Health Rules and Regulations" for the Utah State Industrial Commission.

All grading and other excavations nearby shall be controlled to prevent surface water from flowing into the excavations. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance away from the edges of trenches to avoid overloading and to prevent slides or cave-ins. Unsuitable material, or that in excess to the needs for embankments or backfill, shall be removed and disposed of by the Contractor.

The Contractor shall exercise sound engineering and construction practices in excavating the trench and maintaining it so that no damage will occur to any foundation, structure, pole line, pipe line, or other facilities because of slough, slopes, or from any other cause. If, as a result of the excavation, there is disturbance of the ground such as to endanger other property, the Contractor shall immediately take remedial action at his own expense. No act, representation or instruction of the Engineer or his representatives shall in any way relieve the Contractor from liability for damages or costs that result from trench excavation.

Care shall be taken not to excavate below the depth indicated, and excavation below that depth shall be backfilled with selected backfill material and compacted to the satisfaction of the City Engineer at the Contractor's expense.

The bottom of trenches shall be accurately graded to provide uniform bearing and support for each length of pipe or undisturbed or compacted soil at every point along its entire length, except at the joints. Bell holes shall be excavated to an extent sufficient to relieve bearing pressure at the bell joint.

#### 6.6.7 PROTECTING EXISTING SERVICES:

The Contractor shall carefully do all necessary excavation to fully expose such services. If the Contractor elects to excavate the trench without first exposing the services, he shall be responsible for any and all damages incurred to the services by reason of his operations and shall immediately arrange for replacement of all damaged services. All additional costs incident to such work by the Contractor shall be considered as incidental to the construction.

#### 6.6.8 SOLID ROCK EXCAVATION:

Solid rock shall include solid rock formations requiring systematic drilling and blasting with explosives and any boulders or broken rock larger than one-half cubic yard in volume. Hardpan or cemented gravel, even though it may be advantageous to use explosives in its removal, shall not be classified as solid rock excavation. Solid rock shall be excavated to a width equal to the outside barrel diameter of the pipe plus 24 inches, and to a grade line not less than six inches below bottom of the pipe bell. Bottom of the trench shall be brought up to grade by backfilling with selected backfill material. The material shall be compacted to the satisfaction of the Engineer.

The Contractor shall notify the City and the local Police Department at least 24 hours prior to any blasting. All blasting shall be done in accordance with local, county and state regulations governing this class of work. Any damage to persons or property resulting from blasting operations shall be the sole responsibility of the Contractor and his surety.

#### 6.6.9 EXTRA EXCAVATION:

Changes in grades of the water main from those shown in the Contract Documents may be necessary because of un-plotted utilities, or for other reasons. If, in the opinion of the Engineer, it is necessary to adjust, correct, relocate or in any way change the line and grade, such changes shall be made by the Contractor under the terms of these Specifications.

#### 6.6.10 UNFORESEEN BURIED OBJECTS ENCOUNTERED IN TRENCH EXCAVATION ON GRADED STREETS:

Where streets have been graded, it is presumed that stumps, railroad ties, buried pavements, etc., will have been removed in the original grading work. Where such unexpected objects are encountered in trench excavation for water mains, they shall be removed and disposed of by the Contractor. In cases where they can be removed by the same equipment or method at hand for excavating, and where it is unnecessary to employ special equipment or to install shoring and bracing, or to increase the trench width or depth more than two feet for any one object, then in that event the removal of such obstructions shall be considered as an incidental part of the Contractor's work.

#### 6.6.11 REMOVAL OF UNSUITABLE MATERIALS:

Wherever in excavating the trench for water mains the bottom of the trench exposes peat, soft clay, quicksand or other material which is unsuitable in the opinion of the City Engineer, such material shall be removed and disposed of by the Contractor. The material thus removed shall be replaced by suitable surplus material obtained from trench excavation within the limits of the project which shall be deposited and compacted in eight-inch layers by mechanical compaction. If surplus material is not available within the limits of the project the Contractor shall furnish

suitable material.

#### 6.6.12 PIPE BEDDING:

Pipe bedding material shall consist of road base or graded granular sand and gravel of which 100% will pass the U.S. Standard one-inch opening and not more than 3% will pass the U.S. No. 200 (wet sieve). Pea gravel or similar gravel products predominantly of one size shall not be used without prior approval of City Engineer. Bedding material will be placed in accordance with the attached Standard Drawing.

Under no circumstances shall mine tailings containing traces of arsenic, lead, strontium, rubidium, or radium be used as bedding material.

#### 6.6.13 BACKFILLING TRENCHES:

PVC Pipe: Backfilling of trenches within the pipe zone (typically from bedding to 12" above the top of pipe) shall be accomplished with 3/4" minus backfill meeting the requirements of the Utah Division of Drinking Water. Backfill above the pipe zone shall be accomplished with the same materials excavated from the trenches unless these materials are found to be unsuitable by the Engineer.

Ductile Iron Pipe: Backfilling of trenches within the pipe zone (typically from bedding to 12" above the top of pipe) shall be accomplished with 1-1/2" minus material meeting the requirements of the Utah Division of Drinking Water. Backfill above the pipe zone shall be accomplished with the same materials excavated from the trenches unless these materials are found to be unsuitable by the Engineer.

Prior to backfilling, all form lumber and debris shall be removed from the trench. Sheeting used by the Contractor shall be removed just ahead of the backfilling unless it is ordered by the Engineer to be left in place.

The initial backfill up to 12 inches over the top and both sides of the pipe shall be evenly and carefully placed, using sand or material free of rocks larger than 3/4" for PVC and 1-1/2" for DIP, hard clods, frozen material or other debris capable of damaging the pipe or its coating. The balance of the material may be placed in uniform layers.

A minimum of 4-inch sand cushion shall be placed between the water main and existing pipelines or other conduits when encountered during construction and as directed by the Engineer.

#### 6.6.14 COMPACTION OF BACKFILL:

On graded streets without pavement or on roadway shoulders and unimproved areas, compaction of backfill may be by mechanical tamping or wheel rolling. Compaction by water settling may be

done under the conditions stipulated in the following Section A.

On all graded streets, the backfill shall be compacted to 95% of the maximum density as determined by the Compaction Control Tests specified in AASHTO T-180 and verified by the methods specified in ASTM D2922 (AASHTO T-238) or ASTM D1556 (AASHTO T-191). The compaction can be reduced to 90% for areas where vehicle traffic will never occur.

A. Water Settling of Trenches: Water settling is only allowed in sandy soil conditions where no clays are present and in other soil conditions under full time inspection by a City Inspector. Where water settling of trenches is used, the jetting method shall be utilized. Jets shall be inserted throughout the length of the backfilled area and shall be slowly forced down to the bottom of the trench and then slowly withdrawn until the trench backfill is saturated with water. The jetting operations shall be completed as close behind the pipe laying and backfilling as practicable.

After the water-settled trench has set for several days, any depression in the trench shall be filled and mounded up over the trench, and then further compacted by the use of heavy rubber-wheeled equipment or equivalent as approved by City Engineer.

B. Equipment for Water Settling Trenches: The Contractor shall furnish all hose and equipment necessary for jetting operations. The minimum size of hose and equipment shall be such as to provide not less than thirty-five (35) pounds per square inch pressure at the discharge. The jet shall be a rigid iron pipe with a minimum diameter of one (1) inch.

C. Source of Water for Water Settling: Source of water will depend upon local conditions and shall be as provided in the Special Conditions. Where no provision for water is made in the Special Conditions, the Contractor shall make his own arrangements for it.

D. Compaction of Backfill under Special Conditions: At locations where paved streets, driveways or sidewalks will be constructed or reconstructed over the trench, or where provided for in the Special Conditions or directed by the Engineer, the backfill shall be spread in layers and be compacted by mechanical tampers. In such cases the backfill material shall be placed in successive layers, not exceeding eight (8) inches in loose thickness and each layer shall be compacted with mechanical tampers to the density directed by the Engineer.

#### 6.6.15 GRAVEL BASE COURSE FOR TRENCH BACKFILL:

Selected backfill material above the pipe zone shall consist of gravel base course with 100% of the material passing the 1-1/2" square opening.

#### 6.6.16 BORING:

Water lines and service lines installed across and under existing pavement shall be bored or pulled unless authorized by the City to install by open trenching.

## 6.7 PIPE INSTALLATION FOR WATER MAINS:

### 6.7.1 GENERAL:

Pipe shall be installed in accordance with the manufacturer's specifications and instructions for installing the type of pipe used unless modified or changed in the Special Conditions. The Contractor shall provide all tools and equipment including any special tools designed for installing each particular type of pipe used.

### 6.7.2 CONSTRUCTION:

A. Dewatering of Trench: Where water is encountered in the trench, it shall be removed during pipe-laying operations and the trench so maintained until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. Trench water shall not be allowed to enter the pipe at any time.

B. Handling of Pipe: All types of pipe shall be handled in such manner as will prevent damage to the pipe, pipe lining or coating. Damage to pipe, pipe lining or coating shall be repaired to the satisfaction of the Engineer or the damaged pipe shall be removed from the job and methods of handling corrected to prevent further damage.

Threaded pipe ends shall be protected by couplings or other means until laid.

The pipe and fittings shall be inspected for defects and cast iron pipe, while suspended above grade, shall be rung with a light hammer to detect cracks.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and relaid. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other effective seal approved by the City Engineer to ensure absolute cleanliness inside the pipe.

C. Laying of Pipe on Curves: Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints. If the pipe is shown curved on the Approved Plans and no special fittings are shown, the Contractor cannot assume that the curves can be made by deflection of the joints with the standard lengths of pipe. The Contractor is responsible for verifying the maximum degree of curvature allowed according to AWWA for the type and size of pipe he is installing. If shorter lengths are required, the Approved Plans shall indicate maximum lengths that can be used.

Maximum deflections at pipe joints and laying radius for various pipe lengths are as found in the following standards:



Ductile Iron Pipe	AWWA C600, Table 6
	Mechanical Joints
Ductile Iron Pipe	AWWA C600, Table 5
	Push-On Joints
Concrete Cylinder Pipe	AWWA C303, Section 4.3
Steel Pipe O-Ring Joints	See Manufacturer's Recommendations
Steel Pipe Welded Joints	See latest AWWA Specifications
PVC	AWWA C900

When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be made wider on curves for this purpose.

The City Engineer may require the Contractor to run a mandrel through each section of curved water line to verify maximum deflection.

#### 6.7.3 LAYING DUCTILE IRON PIPE:

A. Joints for Ductile Iron Pipe: Joints for ductile iron pipe shall consist of one of the two following types unless otherwise provided in the Special Conditions:

1. Mechanical joints
2. Rubber gasket joints (Push-On)

B. All ductile iron pipe and fittings shall be encased in 8 mil polysock or sheet material installed per the manufacturers recommendations. Elimination of Polysock encasement for pipe only may be waived by the city upon request if justified based on soil conditions.

#### 6.7.4 JOINTING MECHANICAL JOINT PIPE:

The outside diameter of the spigot end of bell-and-spigot pipe varies with the type, size and class of pipe. There is only one joint size for each diameter of mechanical joint pipe. Thus, difficulty may be met when attempts are made to connect existing bell-and-spigot pipe to mechanical joint pipe. When such a connection must be made, an adapter having a fitting bell and a mechanical joint socket shall be used.

A. Cleaning and Assembling Joint: The last 8 inches outside of the spigot and inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter from the joint, and then painted with a soap solution made by dissolving one-half cup of granulated soap in one gallon of water. The ductile iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland.

B. Bolting of Joint: The entire section of the pipe shall be pushed forward to seat the spigot end of the bell. The gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. The ductile iron gland shall be moved along the pipe into position for bolting, all of the nuts inserted, and the nuts screwed up tightly with the fingers. All nuts shall be tightened with a torque wrench. The torque for various sizes of bolts shall be as follows:

Size Inch	Range of Torque Ft.-Lbs.
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1-1/4	90 - 120

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland.

#### 6.7.5 JOINTING RUBBER GASKET JOINT PIPE:

Cleaning and Assembling Joint: The inside of the bell shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating) and other foreign matter from the joint. The circular rubber gasket shall be flexed inward and inserted in the gasket seat provided in the socket and released with the gasket fitting over the bead in a gasket seat.

A thin film of gasket lubricant shall be applied to the inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other solution supplied by the pipe manufacturer and approved by the City Engineer.

The spigot end of the pipe shall be cleaned and entered into the rubber gasket in the socket, using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the bottom of the socket, using a forked tool or jack-type tool or other device approved by the City Engineer. Pipe which is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.

Field cut pipe lengths shall be filed or ground to resemble the spigot end of manufactured pipe.

#### 6.7.6 LAYING PVC PIPE:

Only persons competent in the opinion of the City Engineer or Public Works Director at laying plastic pipe shall be employed on this phase of the work, and complete suitable equipment necessary for the execution of same is required. Any incompetency observed by the Engineer must be rectified at his request, and where improper equipment or lack of same appears to be impairing the quality or speed of the work, such adjustments in same shall be made to the Engineer's satisfaction.

The pipe, fittings, and valves shall be placed in the trench with care. Under no circumstances shall pipe or other materials be dropped or dumped into the trench. The pipe shall not be dropped in a manner which would cause scratching of the pipe surface. An excessive amount of scratching of the surface of the pipe will be considered cause for rejection.

When requested by the Engineer, all PVC pipe will be tested after laying and backfilling by pulling a deflection detection device. The device shall verify less than 5% deflection in all pipe sections.

#### 6.7.7 CONNECTIONS TO EXISTING MAINS:

- A. All connections to water mains in use shall be made by the Contractor unless otherwise provided in the Special Conditions.
- B. The Contractor shall notify the City at least 48 hours in advance of such connections.
- C. Existing City water lines can only be shut down by crews authorized by the City.
- D. The Contractor shall also provide written notice giving the date of the notice, the date and time of the shutdown, and the duration of the shutdown. Major shutdowns shall only occur between 2:00 a.m and 7:00 a.m.
- E. The maximum time allowed for shutdown shall be 4 hours. If the Contractor should need more than the above limit, it shall be necessary to turn on the water for at least 1 hour before the next period of shutdown begins.

All crosses or other specials required to be inserted in any main already in use shall be furnished and set by the Contractor. The Contractor shall furnish the special, as shown on the Approved Plans, and all other material required. He shall make all necessary excavations to assure gradual transition between the new and existing water main, and he shall perform all necessary backfilling to the requirements of Sections 6.6.12 and 6.6.13.

#### 6.7.8 DISRUPTION OF SERVICE:

Where the connection of new work to old requires interruption of service and notification of customers affected, the City, the Engineer, and the Contractor shall mutually agree upon a date for connections which will allow ample time to assemble labor and materials, and to notify all customers affected. The Contractor will be required to notify all affected customers and the City 24 hours in advance of service being interrupted.

#### 6.7.9 WET TAP CONNECTIONS:

Where connections are made between new work and existing pipe lines, such connections shall

be made in a thorough, neat manner using suitable and proper fittings to suit the conditions encountered. Each connection with an existing water line shall be made at a time under conditions which will least interfere with normal user consumption and as authorized by the City. Suitable facilities shall be provided for proper dewatering, drainage and disposal of all water removed from the dewatered lines and excavations without damage to adjacent property. Where bolted flexible couplings or transitions are required, they shall be constructed of material corresponding to the pipe indicated in the following table:

<u>TYPE OF PIPE</u>	<u>COUPLING MATERIAL</u>
Steel Pipe	Ductile Iron or Steel
Ductile Iron Pipe (earth covered or inaccessible to periodic inspection)	Ductile Iron or Cast Iron
Ductile Iron Pipe (accessible to periodic inspection and painted)	Ductile, Cast Iron or Steel
Polyvinyl Chloride	PVC or Ductile Iron

Couplings shall be equal to Smith-Blair, Dresser, Blair, or Rockwell.

Great care shall be taken to prevent line contamination when dewatering, cutting, or making connection with existing pipes used for conveyance or distribution of potable water for domestic or public use. The Contractor shall conduct his operations in such a manner that no trench water, mud, or other contaminating substances are permitted to get into the connected line or lines at any time during the progress of the work.

**6.7.10 CONCRETE BLOCKING:**

Concrete thrust blocking shall be placed at bends, tees, and crosses or as directed by the Engineer. Blocking shall be Class 3000 psi (1-1/2" minus aggregate) concrete mix poured in place.

Concrete blocking, when placed as indicated on the Standard Drawing, shall be bearing against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as not to obstruct access to the joints of the pipe or fittings. Payment for blocking will be included in the unit price for water line installed.

**6.7.11 CONTRACTED REPAIR WORK:**

Certain repair work may be specified in the Contract Documents as part of a Contract. This work shall be done as specified/contracted and in accordance with this section.

**6.7.12 ACCIDENTAL REPAIR WORK:**

If, for any reason, the Contractor accidentally cuts an existing water line or in any way disrupts water service, he shall notify the City immediately. It shall be the Contractor's responsibility to immediately repair or replace the damaged pipe at no additional cost to the City.

#### 6.8 TESTING AND DISINFECTING FIELD TESTS:

All pipe and appurtenances shall be subjected to a hydrostatic test after they are laid. The Contractor shall be responsible to assure that each section of pipe between valves shall be tested as soon as possible after laying, or when directed by the Engineer.

At points where pressure reaction and movement may occur, such as at bends, tees and plugs the pipe shall be properly blocked or braced.

Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing. All costs to the Contractor for installing temporary blocking shall be borne by the Contractor. The Contractor shall furnish all pumping apparatus, labor, tools, pressure gauges and other equipment for making the tests.

Where the City has water available for testing, it may be furnished without charge upon arrangement with the City. All costs of tapping and piping shall be borne by the Contractor unless otherwise specified in the Special Conditions. Where water is not available from the City, the Contractor shall provide water from an approved source for testing.

Hydrostatic tests shall be performed on every complete section of water main between two gate valves or equivalent (in the determination of the City Engineer), and each valve shall withstand the same test pressure as the pipe, with no pressure active in the section of pipe beyond the closed gate valves.

All water service connections, for whatever purpose and at whatever time, shall be included in the pressure test. A visual inspection shall be made of each and every connection made to an existing main when, in the determination of the City Engineer, the test procedure specified in this section cannot be accomplished.

Each section of pipe line to be tested shall be slowly filled with water so that the specified test pressure is reached at the highest point in the section of pipe line under test. This pressure shall be corrected to the elevation of the test gauge by means of a pump connected to the pipe in a manner satisfactory to the Engineer.

The Contractor shall subject the pipe to a hydrostatic pressure 50 percent higher than the highest working pressure, but not less than 225 psi, for a period of not less than 1 hour.

All exposed pipes, fittings, valves and joints shall be carefully examined during the test. Any cracked or defective pipes, fittings and valves discovered during the pressure test, shall be removed and replaced by the Contractor with sound material and the test repeated as required, at

the expense of the Contractor. All testing shall be done in the presence of a duly authorized representative of the City.

#### 6.8.1 LEAKAGE TEST:

After the pressure test has been satisfactorily completed, the Contractor shall continue testing the water lines for leakage. The Contractor shall furnish all pumping apparatus, labor, tools, pressure gauges, measuring devices for leakage test, and other equipment required for making the test.

The duration of the leakage test shall be not less than 2 hours. During the leakage test the piping shall be subjected to a minimum hydrostatic pressure of 150% of the working pressure of the supply main, but not more than 200 pounds per square inch, based on the elevation of the highest point of the section of pipe line under test and corrected to the elevation of the test gauge.

Leakage shall be defined as the quantity of water that must be supplied into any section of newly laid pipe line, or any valved section thereof, to maintain pressure within .5 psi of the specified test pressure after the air in the pipe line has been expelled and the pipe has been filled with water.

The allowable leakage in the water lines shall not exceed that specified in the latest revision of AWWA Standard C600 "Installation of Ductile Iron Water Mains and Appurtenances" or the latest revision of AWWA C900 (PVC), or the latest revision of AWWA C200 (Steel). Should any test of the pipe disclose leakage greater than that specified above, the Contractor shall, at his own expense, locate and repair defective joints, disinfect and retest until the leakage is within the specified allowance.

#### 6.8.2 RECORDS AND DOCUMENTATION:

Both the pressure tests and leakage tests shall be recorded by the Inspector. Records shall contain the length of pipe tested, size of pipe, type of pipe, rated working pressure of pipe, time and duration of test(s), pressure(s) used, complete list of test equipment used, list of personnel performing the test(s), and any comments about the test. Three sets of test records shall be submitted to the City bearing the name and signature of the Contractor's authorized test supervisor(s).

#### 6.8.3 TESTING SECTION WITH HYDRANTS INSTALLED:

When hydrants are included with the section of main pipe to be tested, the testing shall be done as specified in Section 6.4.3E.

#### 6.8.4 TESTING EXTENSIONS FROM EXISTING MAINS:

The Contractor shall be responsible for following these procedures. Where an existing water main is extended with new pipe to a new valve, the connection of the new pipe to existing pipe shall not be made until after hydrostatic tests have been made to the required pressure in both

directions against the new gate valve. This shall be accomplished by a temporary cap or plug installed on the end of the new pipe, beyond the new gate, as close as possible to the existing pipe for testing purposes.

The short length of pipe between the temporary cap or plug end with the new gate valve in the closed position, with no hydrostatic pressure active on the opposite side of the gate valve, shall be subjected to the required test pressure. The same test shall be made against the other side of new gate valve when that section of pipe is tested with no hydrostatic pressure active in the short section of pipe toward the existing main pipe.

## 6.9 DISINFECTION OF WATER MAINS:

### 6.9.1 GENERAL:

Before being placed in service, all new water lines and repaired portions or extensions of, existing mains shall be chlorinated in accordance with these standards or AWWA Standard C651 except the disinfecting water shall contain a minimum of 50 ppm of chlorine. The water shall be tested in the presence of the City Inspector to verify the 50 ppm of chlorine.

### 6.9.2 FLUSHING:

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. A tap shall be provided at the end of the main (where applicable) large enough to develop a velocity of at least 2.5 fps in the main. One 2-1/2 inch tap will, under normal pressure, provide this velocity in pipe sizes up to and including 12-inch. The tap shall be provided with a ground-level hose connection with a shutoff valve. Care shall be taken to see that the disinfecting solution is flushed thoroughly from the water supply and the water mains.

Taps required by the Contractor for chlorination or flushing purposes shall be provided by him as a part of the construction of water mains.

Where dry calcium hydrochlorite is used for disinfection of the pipe, flushing shall be done after disinfection. The flushing hydrant shall be installed in the park strip between the sidewalk and curb and gutter and shall be installed in a 36-inch diameter PVC cylinder. Flushing hydrants located in the road shall need approval by the Hyrum City Water Department and shall be installed in a 48-inch vault or manhole.

Care shall be taken to see that the heavily chlorinated water used for disinfecting the water lines shall be flushed thoroughly from the water supply lines and the water mains. The environment into which the chlorinated water is to be discharged shall be inspected and if there is a possibility that the chlorinated discharge will cause damage, a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the chlorine residual remaining in the water. No heavily chlorinated waters shall be permitted to mix with "live" waters such as streams, rivers or

lakes.

6.9.3 REQUIREMENT OF CHLORINE:

Before being placed into service, all new mains and repaired portions of, or extensions to, existing mains shall be chlorinated so that a chlorine residual of not less than 25 ppm remains in the water after standing 24 hours in the pipe. The initial chlorine content of the water shall be not less than fifty (50) parts per million. The two above tests shall be made in the presence of the City Inspector and record made for the City files.

6.9.4 FORM OF APPLIED CHLORINE:

Chlorine shall be applied by one of the methods which follow, to give a dosage of not less than 50 ppm of available chlorine. Calcium Hypochlorite granules must not be used on solvent welded plastic pipe or on threaded-joint steel pipe.

6.9.5 DRY CALCIUM HYPOCHLORITE:

As each length of pipe is laid, sufficient high test calcium hypochlorite (65-70% chlorine) shall be placed in the pipe to yield a dosage of not less than 50 ppm available chlorine, calculated on the volume of the water which the pipe and appurtenances will contain.

The following table gives the amount of calcium hypochlorite (70% available chlorine) to be used for each 20 foot length of pipe to give a concentration of 50 ppm of available chlorine.

Amount of Calcium Hypochlorite for:

Diameter of Pipe Inches	Each 20 ft Length in Tablespoonsful	Pounds Per 1000 ft of Pipe
4	1/2	0.5
6	1-1/2	1.0
8	2-1/2	1.6
10	4	2.5
12	6	3.6
14	8	---

6.9.6 LIQUID CHLORINE:

A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated.

Chlorinating devices for feeding solutions of the chlorine gas, or the gas itself, must provide



means for preventing the backflow of water into the chlorine.

#### 6.9.7 CHLORINE-BEARING COMPOUNDS IN WATER:

A mixture of water and high-test calcium hypochlorite (65-70% CI) may be substituted for the chlorine gas-water mixture. The dry powder shall first be mixed as a paste and then thinned to a 1 percent chlorine solution by adding water to give a total quantity of 7.5 gallons of water per pound of dry powder. This solution shall be injected in one end of the section of main to be disinfected while fitting the main with water in the amounts as shown in the table which follows.

Chlorine Requirements for 100-Ft. Lengths  
of Various Sizes of Pipe

Pipe Size Inches	Volume of 100-ft Length Gals.	Amount Required to 100% Chloride LB.	Give 50 ppm Cl. 1% Chlorine-Water Solution in Gals.
4	65.3	0.027	1/3
6	146.5	0.061	3/4
8	261.0	0.108	1-1/3
10	408.0	0.170	2
12	588.7	0.240	3

#### 6.9.8 SODIUM HYPOCHLORITE:

Sodium Hypochlorite, commercial grade (15% CI) or in the form of liquid household bleach (5% CI) may be substituted for the chlorine gas-water mixture. This liquid chlorine compound may be used full strength if diluted with water and injected into the main in correct proportion to the fill water so that dosage applied to the water will be at least 50 ppm.

#### 6.9.9 POINT OF APPLICATION:

The preferred point of application of the chlorinating agent is at the beginning of the pipe line extension or any valved section of it, and through a corporation stop inserted by the utility in the horizontal axis of the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made by the utility on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of application may be used when approved or directed by the Engineer.

#### 6.9.10 RATE OF APPLICATION:

Water from the existing distribution system, or other source of supply, shall be controlled to flow very slowly into the newly laid pipe line during application of the chlorine. The rate of chlorine gas-water mixture or dry gas feed shall be in such proportion to the rate of water

entering the newly laid pipe that the dosage applied to the water will be at least 50 parts per million.

6.9.11 PREVENTING REVERSE FLOW:

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. Check valves may be used if desired.

6.9.12 RETENTION PERIOD:

Treated water shall be retained in the pipe at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 25 parts per million.

6.9.13 CHLORINATING VALVES AND HYDRANTS:

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.

6.9.14 FINAL FLUSHING AND TESTING:

In the process, chlorine treated water shall be thoroughly flushed from the newly laid pipe until the replacement water throughout its length shows, upon test, the absence of chlorine. In the event chlorine is normally used in the source of supply, then the tests shall show a residual not in excess of that carried in the system.

After flushing, the Engineer will arrange for taking samples by the utility or by health authorities.

6.9.15 BACTERIOLOGICAL SAMPLES:

The Contractor shall take 3 bacteriological samples from the installed pipeline with the Inspector present. The locations of the samples shall be at intervals along the pipeline as directed by the Engineer. The sampling bottles and methods used shall be in accordance with the Utah State Board of Health, "Public Drinking Water Regulations," or other similar applicable regulating agencies. Sample results shall be sent to the City Administrator and the City Water Superintendent. The City will then transport the samples to the State Health Department or other approved testing laboratory.

6.9.16 RECORDS AND DOCUMENTATION:

All disinfection operations shall be recorded by the Contractor. Records shall contain the length of pipe disinfected, size of pipe, type of pipe, location of pipe, date, time and duration of

disinfecting operations, complete list of equipment used and personnel performing the disinfection, and any comments about the disinfection operations. Three sets of these records shall be submitted to the City, bearing the name and signature of the persons performing the disinfection.

6.9.17 REPETITION OF FLUSHING AND TESTING:

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained. Failure to get a satisfactory test shall be considered as failure of the Contractor to keep the pipe clean during construction, or to properly chlorinate the main, and no additional payment will be made for reflushing and rechlorinating.

6.10 SECONDARY PRESSURE IRRIGATION INSTALLATIONS:

6.10.1 DESIGN CRITERIA:

- A. All secondary pressure irrigation installations shall comply with these standards.
- B. Preliminary design shall be submitted to Hyrum City and to the City Engineer at least two weeks prior to the next regularly scheduled meeting of the Planning and Zoning Commission.
- C. Construction of the project shall not begin until complete plans and any modifications to these specifications have been approved, in writing, by the City.
- D. No part of the pressure irrigation system shall be put into operation until approval to do so has been given, in writing, by the City.
- E. Plans shall be stamped, signed and dated by a professional engineer, registered in the State of Utah, who has experience in designing pressure irrigation water projects and who will be responsible for the design.

6.10.2 SERVICE LINES:

Service lines connected to the public irrigation system shall meet the following criteria:

- A. Service lines shall be installed by a General Utility Contractor licensed and bonded in Utah.
- B. Service lines will be schedule 80 PVC pipe composed of PVC compounds meeting the requirements of ASTM D1784. Other pipe must be approved by the City Engineer prior to installation.
- C. Service lines shall have a nominal inside diameter of not less than (1") one inch nor

greater than (2") two inches unless approved by the City.

D. Each dwelling unit shall be served by an individual service line. Multi-family dwelling units may be served otherwise where approved by the City.

E. Service lines shall not be located under driveways.

F. Maintenance of the line from the home to the main line shall be the responsibility of the property owner.

G. Valves on service lines shall be equipped with adjustable 4" cast iron valve box riser with 5-1/4" cast iron lid labeled "IRRIGATION".

#### 6.10.3 DESIGN PERIOD:

The irrigation system shall be designed to serve the ultimate service area and shall be based on the best information available, including area master plans, current zoning regulations and approved planning and zoning reports when available.

#### 6.10.4 DESIGN CAPACITY:

The distribution system shall be designed to insure that a minimum of 20 psi exists at all points within the system during peak instantaneous demand conditions.

#### 6.10.5 SECONDARY IRRIGATION MAIN SIZE:

All secondary irrigation mains shall be 6 inches in diameter or larger provided that the instantaneous peak flows meet the requirement of paragraph 6.8.4.

#### 6.10.6 WATER MAIN DEPTHS:

Irrigation lines shall be installed to a minimum depth of (3') three feet to the top of the pipe.

#### 6.10.7 DRAINS:

Drains shall be provided at low points in the mains and at all dead ends so the lines can be completely drained in the fall.

#### 6.10.8 VALVES:

Valves shall be placed in the system to that sections of the pipe, no longer than one thousand feet, may be isolated and shut off from the rest of the system so repair may be made with a minimal amount of water connections put out of service. When connecting to existing or new lines at tees, a minimum of three valves shall be installed. Where crosses are used, a minimum

of four valves shall be used.

6.10.9 MATERIAL REQUIREMENTS:

A. GENERAL:

Unless specifically designated otherwise in each case, all materials and equipment furnished for permanent installation in the work shall conform to applicable standard specifications and shall be new, unused and undamaged when installed or otherwise incorporated in the work. No material or equipment shall be used by the Contractor for any purpose other than that intended or specified. All materials not conforming to these specifications shall be specifically approved in writing by the City prior to delivery to the jobsite. Any material or equipment found not conforming with City Standards and Specifications is subject to rejection.

B. PIPE FOR WATER MAINS:

(As previously specified in Section 6.2)

6.10.10 VALVES FOR PRESSURE IRRIGATION SYSTEMS:

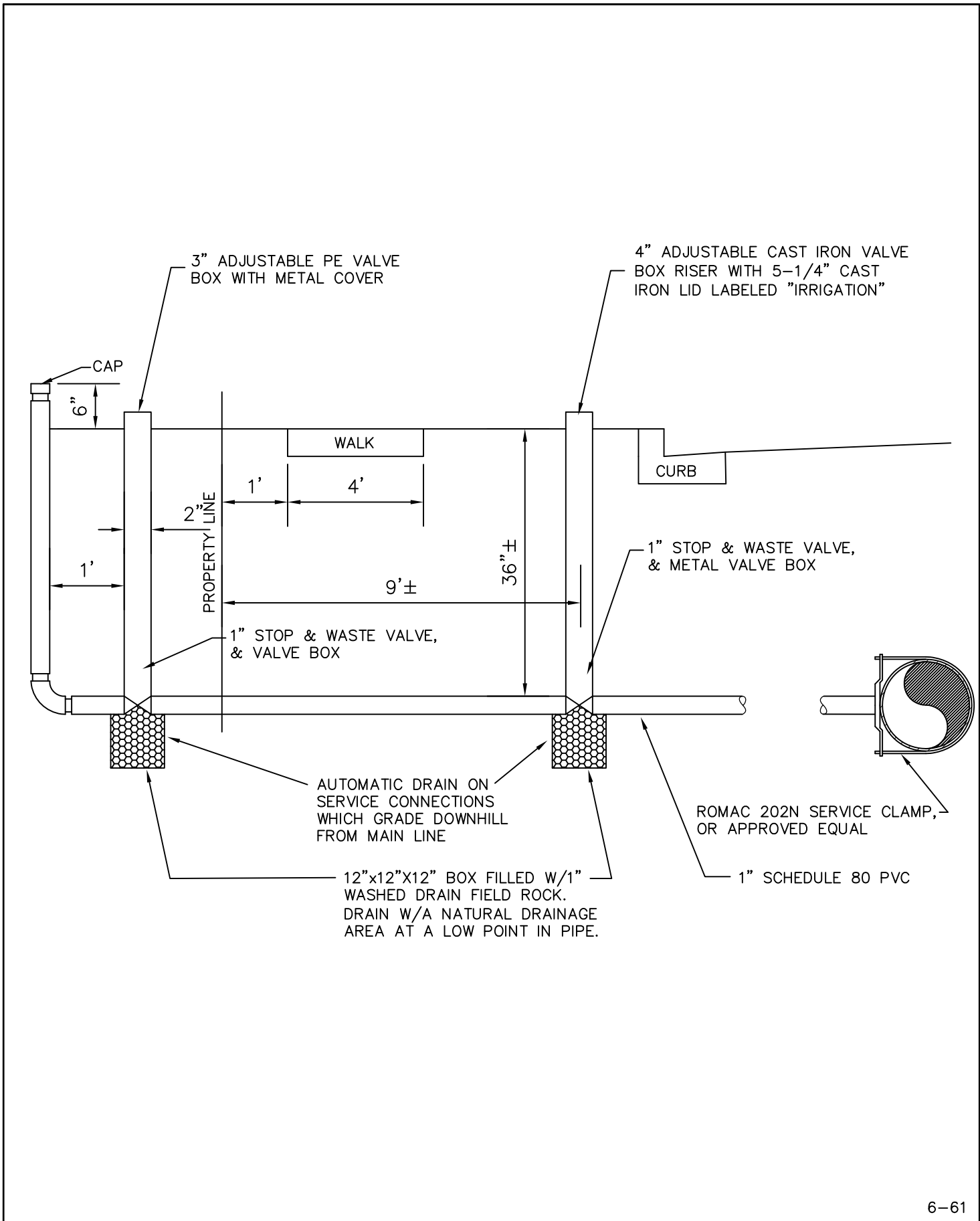
All valves installed in pressure irrigation systems shall conform to Section 6.2.3 A and B.

6.10.11 BLOW-OFF HYDRANT:

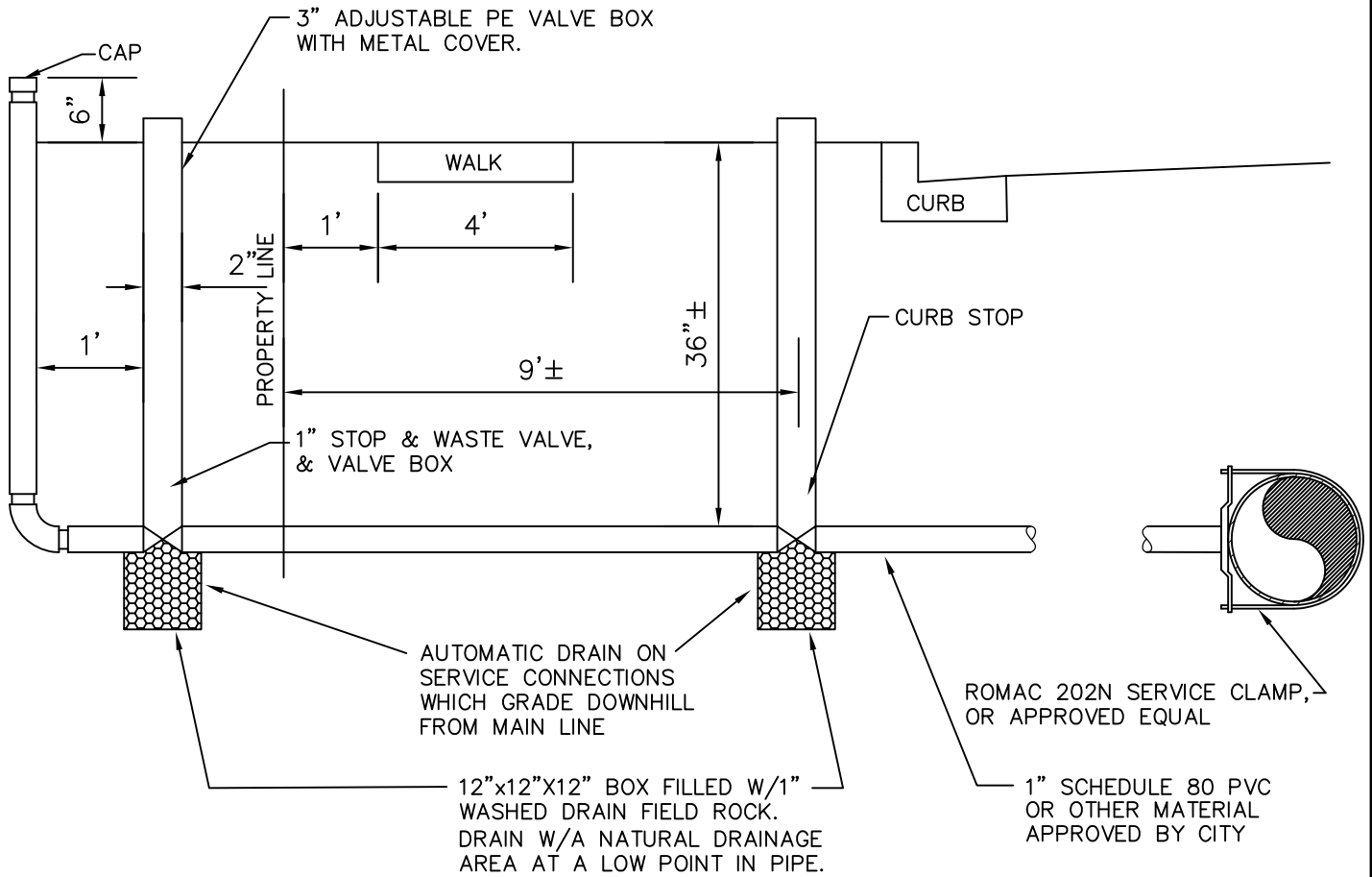
Blow-off hydrants shall be non-freezing, self-draining type, with an overall length of 4.5 feet set underground in a 36" valve box. Hydrants will be furnished with a 2" FIP inlet, a non-turning operating rod, and open to the left. All working parts shall be of bronze-to-bronze design, and be serviceable from above grade with no digging. The outlet shall be a 2-inch FIP coupling with plug, as manufactured by Kupferle Foundry Co., or approved equal.

6.10.12 TESTING:

3. All pipe shall be flushed in accordance with applicable specifications of Section 6.9.2 to remove any solids or foreign material that may be lodged in the pipe. The pipe shall then be subjected to a leakage test in accordance with Section 6.8.1. The pipe shall be tested at a minimum hydrostatic pressure of 150% of the working pressure of the supply main, but not more than 200 pounds per square inch, based on the elevation of the highest point of the section of pipe line under test and corrected to the elevation of the test gauge..



SECONDARY IRRIGATION SERVICE CONNECTION



6-61

# SECONDARY IRRIGATION SERVICE CONNECTION

REV. 12-05