

CHAPTER 3 CULINARY WATER

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SECTION 3.1

INTRODUCTION AND GENERAL POLICIES

3.1.1 SCOPE

The design and construction of culinary water mains and other appurtenances in South Jordan City shall comply with these standards herein called "Culinary Water Design and Construction Standards", or the permit requirements of various governing bodies, except where specific modifications have been approved, in writing, by the City Engineer. All submitted plans shall be stamped and signed by a civil engineer, registered in the State of Utah, and all work shall be in accordance with good engineering practices. Approval of these plans for water installation will not be construed as a commitment for water services.

This document sets forth the procedure for designing and preparing plans and specifications for culinary water systems built for the City. Wherever there are differences between these standards and other county, state or federal regulations, the most stringent or highest requirement shall govern.

3.1.2 INTERPRETATION

The City Engineer shall decide all questions of interpretation of "good engineering practices" being guided by the various standards and manuals to include those published by the American Water Works Association (AWWA) and American Public Works Association (APWA).

3.1.3 DEFINITIONS AND TERMS

Whenever in these specifications or in any document or instruments where these specifications govern, the following terms, abbreviations or definitions are used, the intent and meaning shall be interpreted as follows:

ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standards Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
O&M	Operations and Maintenance

IBC	International Building Code
IPC	International Plumbing Code

Pipe Types:

AC	Asbestos Cement
CI	Cast Iron
CMP	Corrugated Metal Pipe
DIP	Ductile Iron Pipe
HDPE	High Density Polyethylene
ML & C Steel	Mortar Lined and Coated Steel Pipe
PB	Polybutylene
PE	Polyethylene
PVC	Poly-Vinyl Chloride
RC	Reinforced Concrete

DEFINITIONS

“Acceptance” Field acceptance is the time when the Engineering Department inspector approves the physical installation of the water system. The City Engineer acceptance or final acceptance follows field acceptance and is when the City Engineer approves both physical improvements as well as the administrative items associated with development, and the Public Works Department accepts ownership and operations and maintenance responsibilities.

“Approved” Unless specifically otherwise indicated, this shall mean approval by the City Engineer.

“Backbone Pipeline” A main pipeline which delivers flow to a main section of the (Transmission Pipeline) service area.

“City” South Jordan City, Utah

“City Engineer” City Engineer shall mean the City Engineer of South Jordan City, or the person(s) engaged by the City and authorized to perform the duties assigned to the City Engineer, and shall include any deputies and representatives.

“Contractor” Anyone who does construction work in the City.

“County” Salt Lake County, Utah

“Developer” An individual or organized group; partnership, corporation, etc.; proposing to subdivide or improve land which will require culinary water from the City's system.

“Developers Engineer” The engineer licensed by the State of Utah as a civil engineer, employed by the developer, under whose direction construction plans, profiles and details of the work are prepared and submitted to the City for review and approval.

“Distribution Pipeline” Waterlines which are connected to transmission pipelines and are usually smaller pipelines of 12”-inches and smaller.

“Easement” A recorded document in which the landowner gives the City permanent right to construct and maintain a waterline across private property.

“Engineer” A professional engineer or firm of professional civil engineers appointed by and acting for the Engineering Department in the case of a City sponsored capital project. In the case of a developer sponsored project, the term refers to the engineer hired by the developer and may also be referred to as “developer’s engineer”.

“Engineering Department” The City department responsible for planning, designing, and construction of the City’s culinary water system.

“Fire Department” South Jordan City Fire Department.

“Fire Service Line” A line whose sole function is to serve a particular building or property with fire protection.

“House Plumbing” Plumbing fixtures, devices and piping within a building or structure including pipes on the property from the meter.

“Inspector” An employee or agent of the City engaged to observe and record field compliance with design criteria, plans, and construction standards.

“Main Line” Main line pipelines area also referred to as “Backbone or Transmission Pipelines”, which are typically larger than 8 inches in diameter.

“Offsite Waterline” A water line beyond project boundaries connecting the water lines with the City’s system.

“Plans” Drawings of water pipeline, reservoirs.

“Pressure Zone” The culinary water pressure zone within the City system as defined by an upper and lower elevation.

“Public Works Department” The City department responsible for operations and maintenance of the City’s culinary water system.

“Required” Unless specifically otherwise indicated, this shall mean a requirement of the City Engineer.

“Required Fire Flow” A requirement established for each project as determined by the South Jordan City Fire Department using International Fire Code (IFC) guidelines.

“Secondary Water” Water used for irrigation purposes within the City within a separate secondary water system.

“Service Lines” The line between the distribution pipeline and the culinary water meter within the public right-of-way.

“Service Zone” See pressure zone.

“Sewer or Sewerage” Wastewater main or wastewater.

“Staff Engineer” An engineer employed by the City and designated by the City Engineer to act on the City’s behalf.

“Standard Drawing” Where not specified to the contrary, this refers to standard drawings attached to these standards.

“Subdivision Water Lines” The system of street water lines and service lines constructed by the developer within an approved subdivision.

“Water Purveyor” Agency or company supplying water.

3.1.4 APPLICABLE CODES AND POLICY

Ordinances, requirements and applicable standards of governmental agencies having jurisdiction within the City's service area shall be observed in the design and construction of water systems. Such requirements include but are not limited to current revisions of the following:

1. The International Plumbing Code as amended by the Building Department, South Jordan City, Utah.
2. Municipal Code of South Jordan City
3. Road encroachment regulations of South Jordan City, State of Utah, and Salt Lake County, as applicable.
4. Standard Specifications - American Public Works Association, State of Utah Chapter, Standard Specifications, current Edition.
5. American Water Works Association.
6. International Building Code (IBC)

A complete listing of all reference material is included in the back of these standards.

3.1.5 GENERAL METER POLICY

Unless otherwise approved by the City Engineer, a separate culinary water meter shall be installed for each individual owner. Therefore, each unit of a townhouse or condominium with separate ownership will have its own culinary water meter. A single ownership apartment building can have one meter for the building.

3.1.6 ENGINEERING DEPARTMENT JURISDICTION

The Engineering Department is responsible for the approval of plans and inspection of all public water lines and service lines, within the public right-of-way and parking lots of the City's culinary water service area.

3.1.7 PUBLIC WORKS DEPARTMENT JURISDICTION

The Public Works Department is responsible for the operation and maintenance of all public main water lines and service lines, within the public right-of-way of the City's water service area. Where repairs or replacement of a service line on the City side of the meter are required subsequent to initial construction, it shall be the responsibility of the Public Works Department, except in the case of a service upgrade. In which case, the owner or customer will be billed for the work. Conversely, repairs or replacement on the customer side of the meter will generally be the responsibility of the property owner.

3.1.8 FIRE PROTECTION WITHIN CITY

Within South Jordan City, fire protection is provided by the South Jordan City Fire Department.

3.1.9 DEVELOPER ENGINEER'S RESPONSIBILITY

These standards establish uniform policies and procedures for the design and construction of the City culinary water system. They are not intended to be a substitute for engineering knowledge, judgment or experience. These procedures shall be reviewed by the developer's engineer and shall be applied as necessary to the project. Proposed deviations to these standards shall be submitted in writing, prior to preliminary plat and or development project approval.

It is the developer engineer's responsibility to be aware of the City's Culinary Water System Master Plan for water system improvements and to indicate any main line relocations, extensions or over-sizing on the preliminary subdivision plat. A complete version of the master plan is available for review at the City's Engineering Department. This responsibility shall include investigating any changes from the Master Plan necessitated by development subsequent to the Master Plan, although the above shall not relieve the developer from the responsibility to provide an approved system consistent with Engineering Department requirements. Verification of the adequacy of the surrounding water system rests jointly with the Engineering Department and the developer.

All plans, specifications, reports or documents shall be signed and stamped by a registered professional engineer seal. A wet stamp is required on all documents except reproducible plans, where a stamp on the original is acceptable.

A preliminary review and or signature of the City on the plans do not in any way relieve the developer's engineer of the responsibility to meet all requirements of the City. The plans shall be revised or supplemented at any time it is determined that the City's requirements have not been met. Generally, plans that are signed as being authorized for construction will not require revisions based upon subsequent revisions to these standards, however, when in the Engineering Department's opinion, a change to the project is necessary, based upon a significant change in the standards, which significantly affects public safety, future maintenance costs, or similar concerns, such a change may be required during construction by the City Engineer.

3.1.10 REFERENCED SPECIFICATIONS

References to standards such as AWWA , APWA – Utah Chapter, or ASTM shall refer to the latest edition or revision of such standards unless otherwise specified.

3.1.11 CITY ENGINEER ACCEPTANCE

The City Engineer will not accept the culinary water system until all applicable requirements of these standards and of the South Jordan City Municipal Code have been met.

3.1.12 METRIC UNITS

The City uses Standard English units; therefore these standards do not contain metric conversions because of the extent of numerical data or information.

3.1.13 REQUIREMENTS FOR FINAL ACCEPTANCE

A. GENERAL

"Acceptance" of a project by the City occurs in several stages. In this regard there are several appropriate terms:

"Partial Field Acceptance for Occupancy Clearance Purposes". This may be given when occupancy is requested for certain units with a development project where the entire water system is not to a state of completion where it could be termed field accepted. In no event can occupancy clearances be given where satisfactory service cannot be assured. Also, clearance for occupancy does not imply that the City has waived any right to insist on repairs or corrections of punch list items subsequently identified in a final inspection of the entire water system.

"Field Acceptance". This is the term when the Engineering Inspector and Public Services Director (or his representative) jointly inspect the project and agree that all requirements as shown on the approved drawings and as specified in these Standards have been met.

"Final Acceptance". This is the term when the City Engineer formally accepts the water system.

B. FIELD ACCEPTANCE

After satisfactory completion of the improvements, the Engineering inspector will provide a field acceptance letter to the City Engineer. However, it shall be the developer's responsibility to initiate action and to supply the required administrative items prior to official City Engineer acceptance of the improvements.

C. "AS-BUILT DRAWINGS" ORIGINALS

Original "As-built Drawings" in the form of a PDF file and a .dxf file shall be submitted to the Engineering Department. The "As-built Drawings" shall reflect the actual improvements made and give the accurate location of all new/or relocated facilities. The following certificate shall be signed and shall appear on the cover sheet of the culinary water plans:

<u>"As-built Drawings" Certificate</u>		
I hereby certify that the work shown on Drawing No. _____, Sheets _____ through _____ marked "As-built Drawings" has been constructed in conformance with lines and grades and requirements as shown on said plans, drawings and referred specifications.		
Registered Civil Engineer	R.C.E Number	Date

It should be emphasized that the responsibility for accurate record drawings must involve active participation by the developer's engineer during the project. All changes, whether done through the formal change order or revision process or whether done as a field adjustment should be reflected on the record drawings.

D. ITEMIZED COST/ADDITIONAL FEES

A certified and itemized copy of the cost of the facilities offered for dedication shall be submitted. Such certification shall consist of copies of the signed contractual agreement with any change orders. If the final cost is found to be more than the originally approved engineer's cost estimate, developer shall pay the City an additional amount of plan check fee and inspection fee, based on the difference between the estimate and the final cost, and based on the current rates of such fees.

E. OTHER ADMINISTRATIVE ITEMS/INCLUDING EASEMENTS

Depending upon the project, there can be other administrative items required before final acceptance. Examples are unpaid invoices, contractual requirements involving easements, etc.

F. APPROVAL FOR ACCEPTANCE

When all requirements (field and administrative) have been met, staff will prepare a notice of acceptance of the improvements and exoneration of the performance and labor and

material bonds (10 percent of the bonds remains in force until it is fully exonerated; generally this is for the two-year maintenance and guarantee period). The South Jordan City Municipal Code contains additional requirements for final acceptance.

Whereas, the normal maintenance and guarantee period is two year and the bond retention is 10% of the final cost of construction; both of these may be increased if in the opinion of the Engineering Department the normal period and amount are not sufficient.

G. STATUS DURING MAINTENANCE AND WARRANTY PERIOD

The developer/contractor is responsible during the warranty period for the proper performance and maintenance of the water system and for material and workmanship defects. Should City crews have to perform any work to correct these items, the costs may be invoiced to the developer/contractor.

H. EXONERATION OF BOND

Ninety percent (90%) of the final cost of the development will normally be exonerated upon acceptance by the City Engineer. Ten percent (10%) will be retained for the one year warranty period and then released.

SECTION 3.2

DESIGN CRITERIA

3.2.1 CITY WATER SYSTEM

- A. General. South Jordan City is the only water provider within South Jordan City. The City's service area generally includes the region west of US Interstate 15 (1-15) to U-111 and between 9400 South and 11800 South and coincides with the City's boundaries. A map showing the service area is contained in the master plan document.

The City's Engineering Department is responsible for all studies, design and construction for these facilities and the Public Works Department is responsible for all operations and maintenance of the culinary water facilities.

- B. Jordan Valley Water Conservancy District (JVWCD). All culinary water supplied to the City's distribution system is purchased from the Jordan Valley Water Conservancy District (JVWCD).
- C. System Description. It should be noted that the City has a complete master plan for its culinary water system which recommends a number of capital improvement projects be built as well as operational changes made to this system. As certain projects are constructed, the operation of the water system will change including the consolidation of water service zones and the reduction of pressures. As design of water systems is anticipated, every effort needs to be made to coordinate efforts with the Engineering Department to ensure present water system requirements are met as well as providing for the future configuration of the water system. The latest version of the master plan should always be considered, and discussed with the engineering department.

3.2.2 WATER MAIN PRESSURES, CAPACITIES AND SIZES

- A. Quantity of Flow. For a residential project, the quantity of flow should be derived from the state code values and either the known number of units or an estimated number of units based upon the particular zoning for the area. In this regard, the South Jordan City Community Development Department should be consulted. In general, estimates based upon rough approximations using ground slope are not approved because they can be very misleading.

An alternative method for quantity of flow projects involving commercial, industrial, greenbelt areas or schools, etc. The preferable method is to estimate the flow requirements for each building or area and then combine the results. AWWA and the Uniform Plumbing Code can be useful tools for this work.

- B. Fire Flow Requirements. South Jordan City generally follows the requirements of the International Fire Code (IFC) as might be modified upwards by the South Jordan Fire Department, which provides fire protection service within the City.

It is the developer's responsibility to demonstrate through calculations that the required fire flow can be met while the City's water system is under a maximum day demand. The calculations shall assume that fire flow is achieved from storage not relying on pumping stations. Under fire flow conditions including the maximum daily requirement, the residual pressure in the system shall be no less than 25 psi. The only exception is for a fire hydrant located adjacent to or near a reservoir when there are no domestic water services between the fire hydrant and the reservoir or where it can be determined that residual pressures less than 25 psi will not adversely impact domestic customers. In making the calculation, the City mains must be considered with respect to their head loss.

Computer analysis is required on all development submittals. It is the developer's responsibility to provide said analyses stamped by a professional engineer.

C. Pressure. Water mains shall be designed to provide for service pressures between 55 psi and 110 psi with the following provisions:

1. Service pressure shall mean the pressure at the house or building and shall be interpreted to be the static pressure available with the service reservoir at no more than one-half full.
2. Where pressures would exceed 135 psi, special approval is required and installation of separate pressure regulators ahead of the meters or a pressure regulating station on the main line.
3. Dynamic pressure within any portion of the pipe network to not drop below 25 psi at any time.
4. For all pipe networks where the source node pressure is less than or equal to 50 psi, demonstrate that the proposed pipe network friction losses do not exceed 10 psi as compared to the City provided source node pressure.
5. For all pipe networks where the source node pressure is greater than 50 psi demonstrate that the proposed pipe network friction losses do not exceed 10 psi, as compared to the City provided source node pressure.
6. Some developments may be required to install pressure regulators when bordering another pressure zone boundary.

D. Velocity. Water mains shall be designed to provide a mean velocity not more than 7 feet per second under peak day or peak instantaneous flow conditions.

E. Hydraulics. Each development will be required to provide a hydraulic flow model for the development under consideration. This hydraulic model must be compiled in a data format compatible with EPANET or WaterCAD. In order to obtain the software, please access one of the two resources below:

- 1) This software is available online at the following URL:
<http://www.epa.gov/ORD/NRMRL/wswrd/epanet.html>

2) The software is also available on CD from the South Jordan City Engineering Department at a fee.

- F. Sizing of Mains. Water mains shall be a minimum of 8 inches in diameter. Fire hydrant runs serving one fire hydrant are to be included in this category. See Utah State Code, for further information.
- G. Pipe Networks. The City requires the use of "looped" pipe systems unless otherwise approved by City Engineer. A water main more than 400' long shall be looped. Not more than two (2) hydrants can be out of service due to a single main break. Two sources of supply are required whenever there are two (2) or more fire hydrants installed on a single system

3.2.3 SELECTION OF PIPE TYPES AND CLASS

- A. General. These standards cover main lines up to and including 12 inches in diameter. Pipes larger than 12 inches in diameter shall meet with approval from the City Engineer. See Utah State Code, for further information. HDPE can be used on approval of City Engineer.
- B. Main Pipelines. In general, main lines shall be either polyvinyl chloride (PVC), for pipes 8" to 12". HDPE may be used for borings upon approval of City Engineer. See AWWA.
- C. Service Lines. These shall be $\frac{3}{4}$ ", 1, 1 $\frac{1}{2}$, and 2 inch or larger. Service lines less than 2 inches type IPS Poly is approved as described in later sections of this document. Larger service lines shall be PVC pipe. Service lines shall be capable of taking pressure up to the same level as the main line. Service laterals will not be allowed on water mains larger than 14 inch unless approved by the City Engineer and the Public Works Department.

3.2.4 LOCATION OF LINES AND FIRE HYDRANTS (Streets)

- A. Water Mains. The water centerline shall be located in the road way, between curb to curb, within the north/east shoulder of the road. In case of utility conflicts, any proposed change to the water main location must be approved by the City Engineer. Separation requirements between any wastewater, storm lines and water lines are listed below.

The maximum depth of culinary water lines shall be 5 feet deep and the minimum is 4 feet, unless otherwise approved by the City Engineer.

When protection of the water line is considered, the minimum vertical distance of 18 inches must be maintained when the water line is installed over the sewer/storm line. If this distance cannot be maintained because of physical obstructions or the water line must be placed under the sewer/storm line, the sewer/storm line must be constructed with any of the following:

- A) Extra heavy cast iron or ductile iron pipe.
B) Encasement with 4 inches minimum of concrete or sleeving with water quality pipe.

Each of these provisions must be extended for 10 feet on either side of the water line at 90 degrees to the crossing.

Special care is required where storm drains or other pipes cross above flexible pipes to avoid deflection problems when other lines are installed. No joints are allowed in the water pipe within 10 feet of such a crossing.

Sewer and other pollution sources which are parallel with water lines shall have a minimum separation of 10 feet horizontal, at points where water and sewer lines cross a minimum vertical separation of 18 inches is required.

When an area outside the tract or development project area can be logically served by extension of the water main in future streets or easements, the pipeline shall extend to the subdivision/project boundary or to the end of a paved street in a manner facilitating future extensions.

- B. Fire Hydrants. Fire hydrants are generally located by the South Jordan City Fire and Engineering Departments. The Engineering Department does recommend that where possible a fire hydrant location correspond to that required for a blow-off structure. That is because a fire hydrant will serve as a blow-off and is easy to locate.
- C. Not more than two (2) hydrants can be out of service due to a single main break. Two sources of supply are required whenever there are two (2) or more fire hydrants installed on a single system

The South Jordan City Fire and Engineering Departments use the following criteria to locate fire hydrants:

<u>Type of Construction</u>	<u>Fire Hydrant Spacing</u>
Residential single family dwelling, duplex	500 feet
Commercial & apartments	400 feet

NOTE: Fire hydrant shall be no further than 150 feet + from furthest corner of any building site. Plans are to be reviewed by Fire Department to determine fire hydrant placement. Fire hydrants shall be located a minimum of 2.0 feet behind the face of any curb as shown on Standard Drawings. In residential areas the hydrant should be placed at an intersecting lot line.

- D. Criteria for the Separation of Water Mains and Waste Water (Sewer) Lines:
 - 1. General. Proper separation of wastewater and water systems is necessary to reduce the potential for an outbreak of waterborne diseases.

2. Basic Separation Standards. The AWWA or Utah State Code has set forth specific standards for the separation of water lines from other utilities. When water mains and sanitary sewers are not adequately separated, the potential for contamination of the water supply increases. Therefore, when adequate physical separation cannot be attained an increase in the factor of safety should be provided by increasing the structural integrity of both the pipe materials and joints.
3. Exceptions to Basic Separation Standards. Exceptions must be approved by City Engineer.
4. Special Provisions. See Utah State Code for a list of special provisions.

3.2.5 LOCATION OF WATER LINES (EASEMENTS)

Installation of culinary water lines within easements should be avoided where a reasonable alternate solution exists. Unless there are either physical limitations or extreme economic penalties, water lines should be installed within street right of way. Another acceptable instance would be where a looped system of benefit to a particular zone can be gained through the use of an easement. When easements are required, there shall be careful consideration of how the line is to be maintained and/or replaced, if necessary. Where easements are necessary and where the side slope (perpendicular to the pipe) exceeds 25 percent (1 vertical to 4 horizontal) then the plans shall clearly indicate appropriate contours within the easement.

In general, the line within an easement shall be accessible by conventional maintenance vehicles traveling over paved roads or driveways unless otherwise approved.

Service lines should not be connected to a main line within an easement unless specifically approved.

- A. Width. Water easements for pipes up to 18 inches in diameter should normally be a minimum of 15 feet wide. However, additional easement width shall be required where the depths of pipe are excessive or where deemed necessary. The plans should clearly indicate any known block walls, pavement, trees or other obstructions within a proposed easement. Such items are contrary to Engineering Department policy and require special approval. Included with such approval may be a monetary obligation towards the operation and maintenance of the water line within the easement; also, the "as-built" drawings shall indicate such approval and such installations.
- B. Pipeline Location. Pipelines shall generally be placed in the center of easements; only in unusual circumstances will a line be approved which is closer than 5 feet from the easement edge. Unless specifically otherwise approved, the line shall be straight without horizontal bends or deflections.

3.2.6 DEPTH OF WATER MAINS

The standard minimum depth of cover to the top of the pipe is 4 feet for all water lines. The standard maximum depth of cover to the top of pipe is 5 feet for all water lines, unless approved by the City Engineer prior to construction.

In achieving the above depths it must be recognized that numerous grade changes to achieve 48 inch depths of cover are not desirable and the designer shall blend the requirement for a reasonably straight pipeline with those for a relatively uniform depth.

Increases in depth may be required where future road improvements could potentially remove some of the existing cover or where there are other conflicting utilities. Pipelines placed in open, unpaved terrain shall generally have a minimum cover of 4 feet minimum.

3.2.7 LOCATION AND SIZE OF VALVES

Valves shall be located at locations allowing for the isolation of particular pipe segments in the event repairs or replacements are needed. In general, all branches at major intersections shall be valved unless otherwise approved. Further, branches at minor intersections shall be valved when necessary to facilitate future repairs without causing multiple streets to be without water.

See these City Standards and Specifications and Utah State Code for valve location and size. All pipeline valves shall be the same nominal size as the pipeline.

3.2.8 AIR AND VACUUM ASSEMBLIES

A. Types of Valves.

1. Low profile "combination air release valves" combine both the air release and air & vacuum valves as described above and it is this type of valve, which is generally specified in the City system.
2. See standard drawings.

B. Location. Combination air release valves shall be located at all significant high points along the pipeline and in locations where air may become trapped or as approved or required by the Engineering Department. Where feasible the slope of the waterline shall be adjusted to place the high point and air release valve on a lot line, rather than matching the high point of the street centerline.

C. Sizing. In order to somewhat simplify the selection of the combination air release valves, the following is provided as guidelines for determining the size:

1. Determine the maximum rate of flow which can occur in the line:

$$\begin{aligned} \text{Rate in CFS} &= Q \text{ (gpm)} && \text{under filling conditions} \\ &= 7.48 \text{ gallons/cu.ft} \end{aligned}$$

$$\text{Rate in CFS} = 0.087 (SD5)^{(1/2)} \quad \text{under draining conditions}$$

S = Slope or gradient (ft. per foot)

D = Diameter of pipe in inches

- Using the value in "1" above, the size should be:

CFS Rate	Valve Size
0-5	1"
5-15	2"

- For most installations involving 8 inch pipelines, the valve will be 1 inch size.
- For steel pipelines a further consideration is the collapsing pressure and the designer should investigate this in accordance with manufacturer instructions.

3.2.9 BLOWOFF ASSEMBLIES

- General. Blowoff assemblies are placed at low spots in the line to facilitate line drainage and to allow the removal of sediments which accumulate in low areas of the pipeline. See Standard Drawings. Also, fire hydrants perform the same functions as a blowoff and therefore can be substituted for them. Providing a bottom outlet tee, used to connect to the main line. Design Engineers are encouraged to avoid blowoffs by utilizing fire hydrants.

On dead end lines (i.e., cul-de-sacs and future stubs) where there is not a fire hydrant at the end of the line, the engineer should specify the construction of a blow-off valve to drain and clear the line. An air release valve should be used in place of a blow off if the end of the line is significantly higher than the intersecting main line.

- Sizing. Blowoffs should be sized according to the following criteria:

- The particular section of pipeline should be capable of being drained within 2-4 hours.
- The blowoff should be capable of creating a minimum velocity of 2.5 fps in the pipeline for the removal of sediments.

3.2.10 DESIGN FOR PROPER FLUSHING

Proper flushing of water mains and the prevention of sediment buildup are important aspects of the City's maintenance program. Therefore, the following should be considered:

- Unnecessary intermediate low points in the lines should be eliminated wherever possible to prevent spots for sediment accumulation.
- The flushing techniques mentioned in this guide should be followed.
- Any new waterlines shall be flushed in accordance with AWWA before connecting to existing system.

3.2.11 HORIZONTAL AND VERTICAL CURVES

In curved streets, the water line shall generally follow the street curvature. Joint deflections shall not exceed 1% or manufacturer's recommendations, whichever is more stringent. No pipe bending allowed. Where there is a grade break exceeding the allowable deflections in a coupling or joint, then appropriate fittings will be required or a vertical curve should be used in lieu of the grade break.

If changes in grade or alignment cannot be accomplished with joint deflections, then standard fittings are available with bends of 90, 45, 22-1/2 or 11-1/4 degrees.

3.2.12 PROPER SIZING OF WATER METERS AND SERVICE LINES

- A. General. The American Water Works Association (AWWA) publishes excellent references for discussion of water meter sizing.
- B. Meter Sizing. Water meters are designed to deliver a maximum flow for short periods of time with a lower flow capacity for sustained usage without damage or above-normal wear occurring to the meter. The selection of the type and size of the meter should be based only on the flow requirement and the type of use not on the pressure loss through the meter.

If there is a known expansion program or increased meter usage can be anticipated in the future, then provision should be made for larger facilities in the future. When this occurs, the meter should be installed for the needs at the time but also with a meter box and connections that are adequate for future requirements.

The Engineering Department in collaboration with the Public Works Department will approve the meter type.

- C. Service Line Sizing. Proper service line sizing is a function of the maximum anticipated flow rates and the allowable pressure loss for adequate pressure. If pressure to the structure is questionable or if flows are anticipated to increase in the future, it is better to oversize the service line than to oversize the meter. The service size from the main to the meter will be the same size as the meter. Any upsizing of the water service, after the service and meter have already been installed, must take place on the home / business side of the water barrel. No bushings are allowed on the water meter setter or the saddle.

3.2.13 LOCATION OF METER BOXES, FIRE HYDRANTS, AND COMBINATION AIR RELEASE ASSEMBLIES

- A. Meter Boxes. These shall be located as shown on the Standard Drawings; these shall be kept out of any driveways, walkways or any other hard surfaces (2 feet minimum separation). On a case by case basis City Engineer may approve water meters located within hard surfaces, however, a meter vault may be required with a manhole style lid. Water meters shall be centered on the front of the lot or up to 10 feet off center towards the downhill side of the lot in order to accommodate the driveway location on the uphill side of a residential lot. Water meters shall be located in the park strip. The contractor shall place a brass disk in the top back of the curb at

the locations of the house services. Stamped “W” for culinary water. The disks are supplied and installed by the contractor. No obstruction, fixed object, above ground utility, AC unit or similar may be installed within 5 feet of a water meter barrel.

- B. Fire Hydrants. These shall be located at least 2 feet (0.6 m) behind the curb, and 5 feet from any obstruction.
- C. Combination Air Release Assemblies. Locate these with particular attention to minimize the visual impact by locating them near property lines rather than in the middle of the front yard area.
- D. Policy on Irrigation Meters. Where the parkways or side landscaping strips along streets are to be irrigated, a separate meter must be installed on each side of the street. In such cases, running an irrigation line from the meter to the other side of the street is not allowed.
- E. Moving Existing Water Meters. When warranted by site conditions, a water meter location MAY be moved on a case-by-case basis, as approved by the City Engineer or his/her designee. The following conditions and standards shall apply:
 - 1. Where the water main is located in the park strip on the side of the street where the meter is to be relocated.
 - a. The existing service line shall be abandoned at the water main and a new service shall be tapped at the water main perpendicular to where the meter is to be located.
 - 2. Where the water main is located in the street or in the park strip across the street from where the meter is to be relocated.
 - a. The meter may be moved without having a new service tap and the existing meter being abandoned at the main.
 - b. The water line service on the “STREET SIDE” of the new relocated meter will be permitted to tie back into the original water service line placed from the water main to the original meter location. As a part of the encroachment permit, the City will survey this newly installed water service line. Until the City Inspector has passed the installation and surveyed the line, it cannot be backfilled.
 - 3. In both conditions 1 and 2 above, a new water line service shall be constructed from the “HOME SIDE” of the new relocated meter to the house in a straight line with no fittings. As a part of the encroachment permit, the City will verify and survey this newly installed water service line. Until the City Inspector has passed the installation and surveyed the line, it cannot be backfilled.

4. Contractor will obtain an encroachment permit and pay the fee associated with the permit.
5. Tracer wire must be placed over the water service.
6. The contractor shall place two brass disk markers in the top back of the curb, one at the original location of the water meter and the other at the new location. Stamped "W" for culinary water. The disks are supplied and installed by the contractor.
7. Only solid Insta-tight by Insta-tight fittings will be used, no threads.
8. No crimping of the service line will be allowed.

F. Commercial Landscape Meters. All commercial development is required to install a separate landscape meter.

Where a median strip must be irrigated, the meter may either be in the side parkway or in the median strip, providing that at either location the meter is easily accessible and protected from being covered by landscape materials or other obstructions. The Engineering Department reserves the right to select all meter locations.

3.2.14 STRUCTURAL REQUIREMENTS

- A. Under Roads. All structures and pipe placed under public roads shall be of sufficient strength to support with an adequate factor of safety the backfill, road surfacing and loading per AASHTO Standard Specifications (truck loading with impact). Higher loading can be specified by the Engineering Department or as required by design.
- B. Other Pipes and Structures. Water lines designed to cross under or over other pipes or structures shall be protected from damage and shall be constructed to prevent endangering the other pipe or structure. In this regard, particular attention should be given to the possibility and prevention of settlement caused damage. Also, where future replacement of any line may be extremely difficult due to the pipe or structure, special design consideration may be required. Any of the standard drawings, which detail various encasements or other protection, may be required in such instances.
- C. Flexible Joints. Flexible joints, which will allow for differential settlements or other movement of water pipe lines or structures, adjacent pipe and adjacent structures, shall be provided where waterlines enter encasements or other structures. Flexible joints shall be within a minimum of 24 inches (600 mm) of such structure unless otherwise approved.
- D. Thrust Blocks. Sized per APWA, restrained with MegaLug followers or equivalent and thrust blocks unless otherwise approved. These are required in the following locations:
 1. At abrupt changes in grade or alignment requiring tees or elbows.

2. At changes in pipe size.
 3. At dead ends of lines.
 4. At locations subject to sudden thrust, such as valves and hydrants.
- E. Steep Grades. Water lines laid on grades steeper than 8 percent which are not under nor intended to be under pavement should be examined for possible erosion protection. Where the slope exceeds 35 percent (1.43 horizontal to vertical) a redwood check dam (See Standard Drawings) shall be installed across the trench line at 20 foot intervals to reduce erosion.

Slopes above 35 percent (1.43 horizontal to 1 vertical) shall require sand \ cement bags be placed along the trench line at the intervals specified in the Standard Drawings to reduce the flow of water within the pipe trench.

Where steep grades are present welded pipe or joint pipe may be required.

3.2.15 FIRE SERVICE LINES

- A. Above ground assemblies must be adequately treated to prevent freezing, depending on where Post Indicator Valve (PIV) and Wall Indicator Valve (WIV) are.
- B. All underground fire lines that service automatic fire sprinkler systems shall be no smaller than six (6) inches in diameter and have a PIV between the water main and the building. If a PIV isn't feasible due to site constraints, a WIV may be used with the approval of the City Engineer or Fire Code Official. For a WIV to be allowed, another valve must be installed on the fire service line back at the connection to the water main, which will be maintained by the City as part of it's culinary water system. All fire line material shall be ductile iron (ductile iron from the PIV to the building or ductile iron from the water main to the WIV).
- C. Post Indicator Valves (PIV) shall be between 6 and 40 feet from buildings not exceeding three stories or equivalent in height and between 30 and 40 feet on buildings in excess of three or more stories in height or equivalent. The fire lines should be ductile iron pipe from PIV to building. Above ground assemblies must be adequately treated to prevent freezing, depending on where PIV and WIV are.

SECTION 3.3

MATERIALS

3.3.1 GENERAL REQUIREMENTS

This section discusses the materials involved in culinary water pipeline systems and associated construction activities. The materials selected have been chosen for their strength, durability and ease of maintenance. All materials, unless specifically approved otherwise, shall be new and unused. All water facility construction materials used must be as listed on the South Jordan City pre-approved materials and manufacturers listing for new facilities, latest revision or specifically approved on the plans.

Where applicable, American Water Works Association (AWWA), APWA or other standards have been referenced and it shall be the responsibility of the developer/engineer/contractor to be familiar with those standards to insure compliance.

In some instances, particular manufacturers and product names have been mentioned as being approved. Other products may also meet the requirements, but must be first approved in writing by the Engineering Department. One factor, which may be considered by the Engineering Department in any consideration of other products, is the need for standardization. If at any time the Engineering Department believes that the use of a specific product must either be halted or changed, the City Engineer has the authority to make the change.

3.3.2 TESTING AND FINAL ACCEPTABILITY OF MATERIAL

The Engineering Department shall require such tests and certifications as deemed necessary to show that the specified materials have been employed. Notwithstanding prior factory or yard inspections, the City Engineer and Public Works Department shall have the right to reject any damaged or defective materials found on the job, and order its removal from the site.

3.3.3 MAIN LINE PIPE MATERIALS

A. PVC Pipe - All materials which may contact drinking water, including plastic pipes, gaskets, lubricants and O-rings shall be ANSI - certified as meeting the requirements of NSF Standard 61, Drinking Water System Components. All pertinent water system components should be appropriately stamped with the NSF logo for field verification.

1. Pipe. PVC pipe shall conform to the quality and strength requirements of AWWA C900, which covers PVC (polyvinyl chloride) pipe in size 4-12 inches. *Each* length of pipe shall be clearly marked with the following:
 - a. Nominal size and O.D. base, i.e., 6 inch cast iron pipe size
 - b. Material code "PVC 1120"
 - c. Dimensional ratio, i.e., DR 25 where DR is equal to thickness "divided by" diameter. City requires DR18 unless approved by City Engineer.
 - d. AWWA Pressure class, i.e., PC 150, minimum
 - e. AWWA designation "AWWA C900"

- f. Manufacturer's trade name and production record code
- g. Seal (mark) of testing agency

The standard laying length shall be 20 feet (plus or minus) two feet in all classes and sizes. A maximum of 15 percent may be furnished in random lengths of not less than 3 feet each (minimum).

One gasket shall be furnished with each length of elastomeric-gasket bell-end pipe and two gaskets shall be furnished with each coupling where couplings are used.

Pipe surfaces shall be free from nicks, scratches, and other blemishes. The joining surfaces of pipe spigots and of integral bell and sleeve reinforced bell sockets shall be free from gouges or other imperfections that might cause leakage. "Sunburned" pipe is not acceptable.

2. Joint Mechanisms. The joints shall be any of the following:

- a. Integral Wall - Thickened bell end (bell and spigot with rubber gasket)
- b. Integral sleeve reinforced bell end
- c. Elastomeric gasket couplings

PVC solvent cement joints, although allowed by AWWA are not approved.

3. Couplings and Fittings. Where couplings are used, they shall meet the requirements of AWWA. Couplings shall be as furnished by the manufacturer. Couplings shall be marked with same information as the pipe. Double Band Brass saddles only, no direct tap. Megalug following ring or an approved equivalent shall be used on all fittings.

Cast or ductile iron fittings can be used with PVC; this is discussed in a later section.

4. Electrically Bonded Connections.
As approved by the City Engineer.

5. Factory Tests and Inspection. All materials shall be inspected and tested in a normal air-dry condition by the manufacturer prior to shipment for conformance to the stated requirements. The Engineering Department shall at all times have the right to inspect the work and materials in the course of manufacture and to make or witness such tests as required in these specifications, or as deemed advisable, in lieu of the preceding, the manufacturer shall upon request submit a certificate certifying that the materials meet the requirements of this specification. All testing will be done in recognized testing laboratories within the State of Utah approved by the City Engineer.

B. Ductile Iron Pipe. (*With approval of City Engineer*) - The City will only consider the use of this pipe type for pipelines 14 inches or larger and which meet the following requirements:

- 1. Pipe. The pipe shall conform to AWWA for both quality and strength. Each pipe shall include the letters "DI" or word "DUCTILE" to indicate the pipe material. Pressure rating is 250 psi minimum.

2. Joints. These shall be of the rubber gasket push-on joint type conforming to the requirements of AWWA and being of the "tyton" type.
3. Fittings. All fittings shall conform to AWWA.
4. Lining and Coating. Unless otherwise approved, the internal surfaces shall be lined with a uniform thickness of cement mortar and then sealed with a bituminous coating in accordance with AWWA.

The outside surface shall be protected with a polyethylene encasement furnished and installed in accordance with AWWA.

Construction of this pipeline type may require full-time inspection from offloading of the material to completion of testing.

5. Cathodic protection may be required if deemed necessary by the City Engineer.

3.3.4 MAIN LINE FITTINGS

- A. Ductile Iron Fittings. These fittings shall meet the requirements of AWWA. All fittings shall be rated for 250 psi. This standard covers, but is not limited to, fittings with combinations of ends including mechanical joints, and flange. The fitting types are as follows:

- 90, 45, 22-1/2, and 11-1/4 degree bends
- Tees and crosses, reducers, caps & plugs, connecting pieces, flanged bends, flanged tees and crosses, flanged reducers.

Bolt ends shall be coated with Poly FM grease and each fitting wrapped in 10 mil Polyethylene sheeting after installation.

- B. Flanges, Bolts and Gaskets. They shall be flat-faced and meet the requirements of AWWA and should be AWWA standard steel hub flanges, Class E (275 psi) (these flanges meet ANSI). The flanges shall be marked with the size, name or trademark of manufacturer and with the AWWA class, i.e. "E".

- New bolts and nuts shall be zinc plated.
- New gaskets shall be of the drop-in gasket type, 1/8 inch thick.
- New flange connections shall comply with AWWA.

- C. Mechanical Joint Fittings. This is a bolted joint of the stuffing box type. Each joint has a bell provided with an exterior flange having bolt holes or slots, and a socket with gaskets to receive the plain end of the pipe or fitting.

All mechanical joints shall be mega lug follower gland or approve equivalent and meet AWWA. That standard covers the joint as well as gaskets and bolts.

- D. Flanged Coupling Adapters. These are used to connect plain end pipe to flanged valves, pumps, meters, etc. They eliminate the need for both a flanged spool and coupling. Generally, they are available in sizes through 12 inches. Submit material type to City Engineer for approval.
- E. Plastic Film Wrap. This wrap shall be used around all buried valves, bolted flanges and other fittings.

The polyethylene film shall be 10 mils in thickness. The length shall be sufficient to firmly attach the film to the pipe on either side of the valve, flange or fitting. The following minimum flat sheet widths shall be used for the specified valve sizes:

Nominal Valve or Flange Size (inch)	Minimum Flat Sheet Width (inch)
4	24
6	24
8	24
10	30
12	36
16	48
18	48

At the contractor's option, tubular material may be purchased and cut with one side to fold out to the required width.

Tape for securing the polyethylene wrap shall be 2 inches wide adhesive tape such as Polyken No. 900 (Polyethylene), Scotchrap No. 5 (Polyvinyl), or approved equal. The tape shall be such that the adhesive will bond securely to both metal surfaces and polyethylene film.

3.3.5 SERVICE LINE MATERIALS AND FITTINGS

The materials covered in this section include the service line pipe, corp stop and saddles as well as the valves inside the meter box. Where specific manufacturers' products are listed, it should be understood that other products that are equivalent may be used if approved in writing. This section is written as if the minimum service line size is 3/4 inch. However, in certain low pressure areas 1 inch service lines, with approval, may be used. In those cases, the fittings shall be selected accordingly. All brass fittings must conform to the new no-lead rule.

- A. Poly Pipe (IPS). This pipe material is approved for all service lines for 3/4 inch to 2 inch service lines. It shall meet the requirements of AWWA. The pipe shall be marked with the following:
1. Nominal size
 2. Material code; i.e., PE 3406 or PE 3408
 3. On pipe, the dimension ratio

4. AWWA pressure class
5. AWWA designation AWWA
6. Manufacturer's name or trade mark
7. Seal of testing agency

Fittings shall have similar information on them. The symbol "NSF" means that it is approved for potable water systems by the National Sanitary Foundation.

The polyethylene shall be type "PE 3406" which is a high-density type. The pressure class shall be 160 psi for cases where the main line pipe is Class 150. The product is not approved where main line is above Class 150. For comparison purposes, the following dimensional ratios are provided:

Send manufactures specs to engineer to be approved. PE pipe shall use stainless steel liners or inserts connections to compression fittings.

- B. Service Saddles. These shall be of the double strap brass type made of bronze with bronze nuts. The thread shall be corporation (or tapered thread). Submit specs for approval by City Engineer.
- C. Corporation Stops. These shall be bronze with a corporation thread on the inlet side. One inch stops shall be standard type and 2 inch corporation stops shall be of the ball valve type. The outlet for the pipes shown below shall be as follows:

TABLE 3-10

Service Pipe	Corp Stop Outlet
¾ and 1 inch IPS-Poly	Insta-tight
1 ½ inch IPS-Poly	Compression for IPS-Poly
2 inch IPS-Poly	Compression for IPS-Poly

- D. Angle Meter Stop. These shall be bronze and in the 1 inch size they shall be a standard angle meter stop. In a 2 inch size they shall be a flanged angle meter stop. Refer to the table below.

TABLE 3-11

Service Line	Angle Meter Stop	Inlet
¾"	Standard Ball Style	Insta-tight
1"	Standard Ball Style	Insta-tight
1-1/2" or 2"	Flanged Angle Ball Style	Compression

1. All services shall be same size as meter.

3.3.6 METER BOXES AND VALVES

The meter boxes up to 36" diameter shall be HDPE material with a reading lid. All water meter boxes shall be located outside of driveway and walkway areas, no concrete within 2' of edge of lid, unless exception is granted as outlined in section 3.2.13. All valves shall be located outside of driveways, gutters, curbs and alley gutters.

Meter boxes shall be sized according to the following:

Service Line Size (IPS)	Meter Box Diameter
3/4"	18"
1"	24"
1 1/2" – 2"	36"
2" <	see Standard Drawing 3100

3.3.7 WATER METERS

All water meters are to be a Badger Meter equipped with an Absolute digital Encoder with pit set 100W Itron ERT (Encoder Receiver Transmitter) module with remote antenna kit and comply with the no-lead rule. All meter lids need to be recessed for transmitter. The City will install residential and commercial meters. Commercial meters that require a vault will be installed by the contractor with an onsite City inspector present.

3.3.8 MAIN LINE VALVES

A. Butterfly Valves: Shall be used on pipelines greater than 12 inches.

1. General. Butterfly valves shall be Av-Tek DEX, Vag EKN, or approved equivalent and shall be of the Double Eccentric (Double Offset) design. Valves shall be tightly closing, rubber-seated valves conforming to AWWA. Valves must be Class 150-B designed for tight shut-off up to 150 psi. Valve disc shall rotate 90 degrees from fully open to tightly closed position.
2. Valve body. Shall be cast iron with integrally cast mechanical joints, ends for the pipe or flanged ends.

3. Valve operators. Shall be of the manual worm gear rated for the appropriate service conditions. Actuators shall be equipped with a 2 inch AWWA square operating nut. They shall be sealed and gasketed and lubricated for underground service. The actuator shall be capable of withstanding an input torque of 450 foot-pounds (ft.-lbs.) at extreme operator position without damage.
 4. Painting. See Section 3.3.16.
 5. Marking. The manufacturer shall show on the valve the valve size, manufacturer, class and year of manufacture.
 6. Approved valves. Shall be AWWA approved valves.
 7. All valves must be accessible with a 6 ft valve key.
 8. Valve box to be in 4'x5'x6" concrete pad.
- B. Resilient-Seated Gate Valves. This specification pertains to resilient-seated gate valves for underground service 3 inches to 12 inches in size where design-working pressures are less than 200 psi. Resilient-seated gate valves shall be Mueller or AFC with couplings only. And shall generally be of the same size as the main in which they are installed. All such valves shall be of the non-rising stem type, with O-ring seal, equipped with 2 inch square operating nut, which shall turn to the left in a counter-clockwise direction to open the valve. Valve bodies and gates shall be manufactured of ductile iron with internal working parts machined from the grades of bronze specified in the AWWA. Alpha connections don't require Mega Lugs.
- C. Tapping Sleeves and Valves.
1. Tapping sleeves. Tapping sleeves shall be of high tensile cast iron construction specifically designed to withstand the strains and vibrations of the tapping machine, and shall be stainless steel with rubber gasket and flanged ends.
- The tapping sleeve must have gaskets at each end of the sleeve. Sleeves with only an O-ring around the tapped hole are not approved.
- D. Valve Stacks and Covers. The valve stack shall be cast iron, 8 inches in diameter (See Standard Drawing No. 3040).
- The valve box caps for culinary shall have "Water" cast into the metal lid. For secondary the lid shall be cast with symbolism for irrigation.

3.3.9 COMBINATION AIR RELEASE ASSEMBLIES

- A. Metal Assembly. As discussed in Section 3.2.8, the combination air release assembly has both the features of an air release valve and an air and vacuum valve. Both units shall be housed in a cast iron body and all internal parts such as the float, bushings, level pins, seat

and baffle shall be either stainless steel or brass as furnished by the manufacturer. All assemblies shall be rated at 300 psi maximum operating pressure.
The inlet threads shall be iron pipe threads of the same size as the valve.

- B. Metal Housing or "Can". Shall be per Standard Drawing Nos. 3070 and 3075.
- C. Ball Valves. 2 inches and smaller exposed with a female iron pipe thread on each end and tee head.
- D. Guard Posts. See Section 3.3.17. Air vacs need "T" and ¾ reduce wire hose bed for sample.

3.3.10 BLOW-OFF ASSEMBLIES

- A. See Standard Drawings

3.3.11 FIRE HYDRANT ASSEMBLIES (SEE STANDARD DRAWINGS)

- A. Hydrant Type. Fire hydrants for single family detached residential areas shall meet AWWA and have a 6 inch flanged inlet with two 2-1/2 inch and one 4 ½ inch valved outlets with National Standard fire hose threads. Fire hydrants for commercial and industrial projects and multiple dwelling areas shall have one 4 ½ inch and two 2-1/2 inch outlets. Where the required flow exceeds 3,000 gpm. The outlets shall be protected with caps attached to the hydrant head with a chain, other specific requirements are:
 1. The hydrant upper portion (above ground) may consist of either one or two sections.
 2. Hydrant materials are listed in AWWA.
 3. Hydrants shall be designed for a minimum working pressure of 150 psi (per AWWA).
 4. Hydrant flanges shall contain six equally spaced bolt holes of 7/8 inch diameter on a 9-3/8 inch diameter.
 5. All hydrants shall be permanently marked with the manufacturer's name and the year of manufacture.
 6. See standard drawings for location of auxiliary valve and hydrant.

Approved fire hydrant is the Mueller Super Centurian A-423 or Clow Medallion. Fire hydrant type and location are to be approved by the Fire Department and Public Services. Spacing for residential is 500' and for commercial is 400'.

- B. Hydrant Lateral. Six (6) inch PVC pipe shall be used. Hydrant laterals shall be C900. See Section 3.3 for material specifications. Also see Section 3.3.4 for fittings description. Thrust block sizes are covered in Standard Drawings.
- C. Hydrant Valve. Shall be a 6 inch valve (see Section 3.3.8) as shown in standard drawing for PVC pipe. The valve shall be stacked to the surface using materials discussed in Section 3.3.8.
- D. Painting. See Section 3.3.16.

- E. Bolts. Break away flange to attach the fire hydrant to the extension spool. Bolts are not to be located in concrete pad.
- F. Mains to Fire Hydrants. Separate lines used only for fire hydrants shall be a minimum of 8 inches in diameter. Actual size to be determined by Engineering Department.
- G. Hydrant base and auxiliary valve shall be placed in a 4'x5'x6" thick concrete pad.

3.3.12 PIPE TRENCH MATERIALS

Refer to Standard Drawings for trench cross section terminology. See also APWA current standards.

- A. Within Pipe Zone. The pipe zone extends from 6 inches below pipe to 18 inches above the top of the pipe. The material within this zone shall be clean, well-graded imported sand, see APWA for correct material type. Warning tape and tracer wire shall be in the pipe zone. No chips are allowed within the pipe zone.
- B. Above Pipe Zone. The materials shall conform to the requirements of the APWA current standards or current AASHTO standards. The material supplied for the area above the pipe zone shall be compacted to a minimum 96-percent density modified proctor.
- C. Special Slurry Backfill. The Engineering Department may require the backfill above the pipe zone to be flowable fill per APWA.
- D. References See AASHTO.

3.3.13 ROAD WAY MATERIALS

Pavement materials for resurfacing of trenches cut into existing pavement shall comply with the requirements of the South Jordan City Standards. Asphalt, aggregate base and aggregate sub-base specifications are those set by the latest published edition of APWA.

3.3.14 CONCRETE MATERIAL

Approved concrete material shall be based on the 28 day compressive design strength see APWA.

3.3.15 PAINTING

- A. General. This section will only cover the paint materials. "Painting" as it relates to construction is discussed in Section 7.20. All paint colors shall be as specified or as selected by the Public Works Department. Paints shall be delivered to the job site in original, unopened cans or packages bearing the brand name and manufacturer's name.

Paints specified shall be used unless specific written approval is obtained in advance to use other products.

3.3.16 MARKER POSTS

In easements or where required on the plans, marker or guard posts shall be installed per the requirements of the Engineering Department. Where no vehicular traffic could be anticipated, the posts shall be 4x4 inch by 5 foot-6 inch dense structural grade redwood surfaced on all four sides and chamfered on the top. They shall be set into the ground 30 inches.

SECTION 3.4

PLAN PREPARATION

3.4.1 GENERAL

The Engineering Department has established procedures, which must be followed in the preparation of plans. Deviations from these requirements, unless specifically authorized will be cause for rejection by the Engineering Department. All engineers preparing plans should have in their possession a complete set of these Standards. All work shall be in ink on mylar sheets.

The engineer has a distinct responsibility to follow the progress of the work and to submit change orders or to incorporate "as-built" information on the drawings. "As-built" information is to be submitted on Mylar and DXF disc to the city.

It should be understood that the responsibility for accuracy and completeness of the drawings rests with the developer's engineer. By signing the drawings, the City Engineer attests to the fact that they have been reviewed and that the City Council has authorized construction.

3.4.2 SHEET SIZE AND MARGINS

Overall dimensions 24x36 inch (500mm x 750mm). Margins shall be 2 inches (50mm on left, all others 1/2 inch (13mm).

3.4.3 SIGNATURE BLOCK

All sheets of the plans shall have an approved signature block. The approval blocks shall be signed before any construction occurs. Any changes to the plans after initial approval shall be shown as revisions and shall be approved by the Engineering Department.

3.4.4 COVER SHEET

This shall be the first sheet in the set and shall contain:

- A. Index Map. An index map with an overall plan at a scale of one inch = 300 feet showing general layout of waterlines, sizes, valve and fire hydrant locations, named streets, subdivision boundaries, lot boundaries and numbers, a sheet index and other pertinent information. The cover sheet shall include a note as to the pressure zone by number and elevation. Care must be exercised to make sure scale and orientation are correct since these index maps are used to produce a water atlas and incorrectly drawn maps will have to be redrawn.
- B. Vicinity Map. A vicinity map with a scale of one inch = 1,000 feet showing subdivision boundary, streets, adjacent subdivisions, major streets outside of subdivision boundaries and the location of the bench mark.

- C. Bench Marks. All bench marks used in the project shall be graphically shown on this sheet and the elevations, descriptions, locations, etc., spelled out as illustrated below:

B.M. No. _____	Elev _____	F.B. _____	Page _____
Type of Marker _____			
Location _____			

All elevations used in preparation of standard plans shall be based on Salt Lake County Surveyor's office information.

- D. General Notes. The general notes shall be shown on the cover sheet and need not be shown on the other sheets. The general notes shall include a note requiring compliance with these standards and 5 day notice prior to beginning construction (see Section 4.11).

- E. Water Service Certification. Water service certification is required and shall be worded as follows:

<u>CERTIFICATION</u>	
I hereby certify that the water system as shown on Drawing Number ____ Sheets ____ through ____ has been designed to adequately provide each and every lot (or facilities) of this subdivision (project) with proper water pressure and fire flow.	
Registered Civil Engineer _____	RCE No. _____ Date _____

If the project does not involve specific lots, then substitute the words "...designed to adequately provide for the development said system is intended to serve."

Further, the engineer's Utah registration stamp including license expiration date shall be placed on the cover sheet.

- F. As-built Materials List. On the cover sheet shall be a block to be used for as-built information. It shall be as follows:

MATERIAL LIST			
ITEM	SUPPLIER OR MANUFACTURER	MODEL/TYPE NO.	NO.
Pipe			N/A
Services			
Fire Hydrants			
Valves			
Brass Products			

Prior to submittal of as-built drawings, the developer's engineer shall complete the pertinent information.

"As-built" certification is also required. The wording shall be as follows:

<u>"AS-BUILT" CERTIFICATE</u>	
I hereby certify that the work shown on Drawing Number _____ Sheet _____ through _____ inclusive, marked "as-built" has been constructed in conformance with lines and grades as shown on said plans and referred specifications.	
Registered Civil Engineer _____	RCE No. _____ Date _____

G. City Engineer's Certification for Approval to Construct. Appropriate designation for City Engineer approval to construct, located above title block (number and date to be completed by the Engineering Department).

Approved for Construction. _____ City Engineer	Date _____
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3.4.5 PLAN OF CULINARY WATER SYSTEM

Plan drawings shall show location of water mains, service line locations and other structures in relation to survey lines and stations. Included shall be blowoffs, combination air release valves, main line valves, fire hydrants, thrust blocks, etc. Provide all data for horizontal deflections or curves and indicate limits of any easements. Any known pad locations, which are adjacent to an easement, should be shown as well as fences, walls, trees, etc., which are within the easement. Show and label on the plans, the size and ownership of all existing and/or proposed underground utilities that cross or parallel the waterline. Facilities of other water purveyor mains shall be included on the plans where they exist.

3.4.6 PROFILE OF CULINARY WATER SYSTEM

If a profile drawing is required. Profiles shall show the grade, including any vertical curve data, size and type of pipe and the distances involved with pipe types or sizes. Any special encasement required to carry loads on the pipe shall also be shown. Items such as valves and the other structures or appurtenant features listed for the plan shall also be shown on the profile. Show elevations to 0.01 foot of waterline top of pipe. Any pipe line 2 inches (50mm) or more in diameter which crosses the waterline and especially wastewater, gas, telephone, power, storm drains, television and oil lines, shall be shown and labeled on the profile. The grade of major paralleling lines within 5 feet (1.5m) of the waterline shall be shown as dashed.

The City is not responsible for the accuracy of the location of these underground lines, and approval of water plans by the City does not constitute a representation as to the accuracy of the location of, or the existence or nonexistence of any underground utility, pipe or structure within the limits of the project.

3.4.7 GRAPHIC SCALES AND NORTH ARROW

All plan and profile sheets shall contain:

- A. A graphic scale, horizontal as well as vertical, illustrated such that a true representation is produced when the plans are reduced in size, and they shall be as follows:

Horizontal 1 inch = 40 feet (25mm = 7.6m)

Vertical 1 inch = 4 feet (25mm = 1.2m)*

- B. A north arrow oriented toward the top or to the right only, or as approved. Generally, north shall be oriented towards the top or right hand side of the sheet.

3.4.8 PROCEDURE FOR APPROVAL

Approval for improvement plans consists of two phases. Each phase consists of a series of requirements, which must be met before final acceptance.

- A. Requirements for authorization of construction (See Section 5 of these Standards).
B. Requirements for final acceptance (See Section 11 of these Standards).

3.4.9 PLAN CHECKING LIST

The following list is intended as a guideline to assist the preparer; it is not represented to be a complete list of requirements.

Check List Plan Checking and Project Requirements

Culinary Water

Cover Sheet.

Standard size, title block, signature block. Revision and engineer's block
Key and vicinity map
Include lot numbers and lot lines. Sheet index
Pressure zone and elevation
Adjacent subdivisions and street layout
Bench mark
Design and as-built certificates
Pressure in project and fire flow requirement. General notes
Blue stake alert note. Engineer's stamp and expiration date

General Design

- Conform to master plans
- Check for oversizing requirements
- Check for pressure and fire flow
- Selection of pipe type(s)
- For any tie-ins to the City's existing system, provide instructions relative to sequencing
- Timing and thrust blocks

Plan & Profile Sheets

- Graphic scales
- North arrows
- Water line stationing left to right
- Elevations to top of pipe
- Proper burial
- Curve data if there are curves
- Pipe sizes and type(s)
- Street, curb dimensions, street names
- Lot boundaries
- Easements including line bearings
- Angle points - show deflection angle right or left moving up station
- Show valves, fire hydrants, comb, air release and blowoffs
- Fire Department approval of fire hydrant type and location
- Meter boxes not located in sidewalk, show detail
- Lot numbers and pad elevations
- Size of all meters and indicate for irrigation where appropriate
- Line separation between any parallel pipes is normally 4 feet O.D. to O.D
- Thrust blocks

Administrative Before Construction of Main(s)

- Cost estimate
- Inspection and plan check fee. Bonds and insurance.
- Fire flow calculations
- Water Availability letter
- SWPPP & Notice of Intent

Administrative During or After Construction to Main(s)

- Change Order Fee
- Meter installation requests

3.4.10 STANDARD LANGUAGE FOR DEDICATION OF FACILITIES TO CITY

The following language is intended as an example of standard language for the dedication of facilities to the City. It shall be modified if necessary to fit a particular set of circumstances.

- A. Grant Deed, Quit claim Deed, Bill of Sale or Other. All of its rights, title and interests in and to the water system, pipelines, manholes and appurtenances thereto as located in, on, over, under and across streets, easements and rights-of-way shown on Subdivision __ as per map thereof recorded in Book, Page __, and shown on the easements) as per Document No. __ recorded on _____ of Official Records, in the Office of the County Recorder, County of Salt Lake, State of Utah.

- B. Easement Deed. An easement and right-of-way to lay, construct, repair, maintain, operate, renew and replace pipeline and appurtenances incidental thereto for the transportation of water with the rights to ingress and egress to and from same, in, over, under and across the following described real property in the County of Salt Lake, State of Utah, and rights to disturb the surface of the easement area or surface improvements constructed by the servient tenement wherein the responsibility for replacement or restoration shall belong to the servient tenement unless otherwise specified herein.

See Appendix C for the exact language required by the City for property quit claim deeds and easements.

3.4.11 STANDARD NOTES

The standard notes should be included on the cover sheet. They are subject to change to suit the needs of the Engineering Department. Please see current standard notes.

SECTION 3.5

FEES, CHARGES AND REQUIREMENTS FOR AUTHORIZATION OF CONSTRUCTION

3.5.1 GENERAL

The authority for fees/charges is generally established in the South Jordan City Municipal Code. Specific fee/charge amounts are adopted by either City Council resolutions or ordinances. All fee/charge amounts are only adopted following the conducting of public hearings by the City Council as required by law. Copies of the current documents are available from the City.

3.5.2 SUBMITTAL OF MYLAR PRINTS (PLAN CHECK)

Two sets of the Mylar prints of the proposed water improvements, one copy of the final subdivision plat (where appropriate), one complete set of other than water improvement plans, and one copy of the developer's engineer's estimate shall be submitted. Plans illustrating an incomplete design and drafting detail may not meet minimum standards and may be just cause for a rejection of the first plan check. The developer or developer's engineer shall submit preliminary plans completed in accordance with these standards. The developer and the developer's engineer should be aware that projects involve several plan check/ submittals before the drawings are deemed to be in satisfactory condition. Also required will be fire flow calculations including the criteria used in determining the size of the lines and adequacy of transmission facilities including reservoirs.

3.5.3 SPECIAL PROVISIONS

If there are unusual conditions which would require substantial deviation from the City Culinary Water Design and Construction Standards, particularly with respect to service pressures, such deviations should be submitted in writing prior to preliminary plat and/or development project approval.

3.5.4 EASEMENTS

Any easements necessary must have deeds submitted for checking or must be shown on the subdivision plat before recordation.

3.5.5 AGREEMENTS, BONDS, AND INSURANCE CERTIFICATES

City staff will provide the developer with the proper forms and developer shall submit the following:

- A. Insurance Policy Certificates. Insurance certificate with limits as stated in the "Agreement". Attention is particularly called to the City's requirements concerning submittal of an "Accord" form. The insurance certificate shall include general liability, auto liability and worker's compensation insurance in amounts as required by the Engineering Department or City Attorney. The City, its officers, employees and agents, shall be named as additional

insureds. The notice of cancellation period must be no less than 60 days. Any reference in the cancellation clause to "endeavor to" or "but failure to mail such notice shall impose no obligation or liability of any kind upon the company" must be deleted. Also, the words "This certificate is issued as a matter of information only and confers no rights on the certificate holder" must be deleted. If disclaimers cannot be deleted from the Accord form, then a signed warranty letter must be attached to the certificate.

B. City's Accord Form. The City reserves the right to request that the City's Accord form be utilized.

C. Payment Bond. A Payment Bond (Labor and Materials) in triplicate and notarized, equivalent to 100 percent of the estimated cost.

3.5.6 WATER AVAILABILITY LETTER

Prior to, or concurrent with, any City Engineer authorization to construct facilities or prior to any parcel receiving water service (one or both may be applicable), the Engineering Department shall issue a water availability letter indicating that the subject property lies within the City's service area and that the City will provide water service. This service is subject to certain terms, conditions and limitations as outlined in the water availability letter, as required by the Municipal Code or as required by these Standards. For subdivisions, the issuance of a water availability letter by the Engineering Department shall precede recordation.

3.5.7 APPROVAL FOR CONSTRUCTION

Upon receipt of all documents, bonds, fees and checking for all documents, bonds and fees, the staff shall prepare a memorandum to the City's Planning Department indicating the Engineering Department's concerns have been addressed and the project is ready for City Council approval, from an Engineering Department perspective.

Public Infrastructure Construction plans will require the signature of the City Engineer on a Mylar plan set. After the City of South Jordan development engineer says that your plans are approved and ready for signature the Design Engineer shall submit a set of the approved plans. This set will then be signed by the City Engineer. The signed set will be returned to the Design Engineer for the following copies to be returned to the City for use during construction: 2 – 11 x 17, 1 – original full size, and one full size copy.

At the completion of the work two sets of as-built plans on Mylar will be submitted to the City. In addition a set of as-built plans shall be submitted in a dxf electronic format. The City will not release the project to the warranty period until these plans are submitted and found accurate by the City Engineering Inspector.

If there are changes to be made to the plans after the signature of the City Engineer that are considered to be significant, the original Mylar sheet with the changes in a bubble shall be submitted for a revision signature of the City Engineer. Minor changes can be addressed on the as-built plans.

The purpose of this is to insure that the City Engineering Inspector is inspecting the approved set of plans. This will also insure that the Developer's contractor has the approved set of plans to build the project with.

No construction should occur before the plans are signed and before the proper five day Engineering Department notification has been given. This notification will allow time for a preconstruction meeting with all interested parties. The Engineering Department and the developer have a direct relationship via the documents outlined above. Therefore, to the extent possible, correspondence and verbal communication should be between these parties rather than between the Engineering Department and the contractor or subcontractors where the developer is excluded.

3.5.8 SERVICE LINE, FIRE HYDRANT OR METER INSTALLATION

In general, the developer will install the required service lines, fire hydrants, meter boxes and setters as part of the development project. For residential projects, the South Jordan Public Works Department will supply and install the water meter. Meters for commercial developments will be supplied by the South Jordan Public Works Department and installed by the developer.

Service line and fire hydrant connections to existing City owned pipelines will be inspected by an inspector from the Engineering Department.

Service saddles will be required on all services.

3.5.9 SPECIAL CHARGES

If there are items requiring special approval, the Engineering Department may require deposition of funds or agreements for funds in the future to provide for operation and maintenance of the substandard system.

3.5.10 MAIN LINE EXTENSION AND OVERSIZING AGREEMENTS AND LOCAL SHARES

The South Jordan City Municipal Code discusses this subject. In general, if any developer desires to enter into a reimbursement agreement with the City, such arrangements shall be made prior to the time that authorization to construct the waterlines (or system) is given by the City Council. The reimbursement agreements for main line extensions involve future payments to the developer installing the improvements if and when the City receives funds from other benefiting properties. In the case of a City contribution for over sizing a line, no City contribution can be considered unless the line is 10" or greater in diameter

3.5.11 FEES FOR PLAN CHECKING AND TESTING OF BACKFLOW DEVICES

Fees for plan checking (Engineering Review Fees) are outlined in City Council resolutions and require City approved tester provided by the Public Works Department.

SECTION 3.6

CONSTRUCTION STAKING

3.6.1 GENERAL REQUIREMENTS

Construction staking is the responsibility of the developer, his engineer or contractor. When the term 'construction staking' is used, it should be remembered that it encompasses construction pipeline markings, which may not involve any staking, such as markings on pavement. Stakes or marks will be set parallel to the pipeline alignment at an offset distance and direction agreed upon with the contractor, but in no case shall construction stakes be offset more than 10 feet. Stakes or marks will be set at no greater interval than 50 feet on straight alignments when the pipeline slope is 0.6 percent or more. For horizontally curved pipelines at less than 0.6 percent slope the stake or mark interval shall be 10 feet and for curved pipelines above 0.6 percent slope and for straight pipelines below 0.6 percent slope the stake or mark interval shall be 25 feet.

3.6.2 PRESERVATION OF STAKES

Construction stakes or construction markings shall be carefully preserved by the contractor until after the completed work has been accepted by the City. If two or more consecutive stakes are knocked out during construction, new stakes shall be set at the contractor's expense.

3.6.3 SERVICE LINES

For each service line, a stake shall be placed near the property line, referenced to show its location. If the meter box installation is not anticipated prior to field acceptance, then the stake shall be a minimum 2x4 inch redwood post 2 feet in length with 18 inches buried, painted blue on the top 3-4 inches.

3.6.4 "AS-BUILT DRAWINGS"

The stationing for each service line is required on the "as-built" drawings.

SECTION 3.7

CONSTRUCTION

3.7.1 GENERAL REQUIREMENTS

This section describes the use of materials and workmanship to be employed in construction of the culinary water system. The developer/engineer shall prepare such general and special specifications as are necessary to define the nature and location of the work, contractual arrangements, payment for work and any other matters concerning the owner or his contractor; these items are not discussed within the standards presented here.

- A. Use of This Section. The construction section is intended to highlight the features of construction, which are deemed to be most significant. In any construction activity, the recommendations of the manufacturer of a product, if more stringent, should apply.

There are a number of construction activities, which pertain to all pipe types, and these will be presented first. Specialized activities unique to a particular pipe type will be covered separately.

See AWWA and APWA standards.

- B. Protection/Operation of Existing Water Systems. A primary concern of the Engineering and Public Works Departments is the protection and operation of the existing water system. No developer or contractor will be allowed to operate any existing water valves or to cause a shutdown of any portion of the City's water system without prior approval from the Public Works Department. In general, Public Works Department personnel will do any operation of valves in a planned shutdown. Any planned shutdown should be set up via work order with the water department at minimum 3 working days in advance. Shutdowns will only be allowed if no other reasonable alternative exists, such as the use of a hot-tap connection in lieu of a cut-in tee. When shutdowns are required in a part of the City system, the City will expect evaluation of whether the shutdown should be done during the day or during the night. Contractor/developer economics shall be weighed less heavily in the decision than in the interruption and inconvenience to existing customers. Any shutdown shall involve a thorough 48 hours notification plan for existing customers as well as the provision of bottled water, water tanks, etc., where appropriate. Notification shall be done by contractor.
- C. Quality of Materials. Materials and equipment to be incorporated into the work shall be new. In case a reference is not clear as to which of several available grades is desired, the highest quality material shall be used. When construction bids are received directly by the City such bids shall show the proposed pipe material and the manufacturer's name and specifications, if more than one type is allowed.

Contractor shall have at the job site or be able to supply upon request, certified copies of factory or laboratory test reports showing the strength characteristics of any materials used in the work. For all reinforced concrete work, the contractor shall furnish in advance of

pouring concrete and, the mix design and calculated concrete strength as prepared by the concrete supplier.

- D. Substitutions. Where articles or materials are specified by brand or trade name, alternate materials or articles equal to those specified may be approved provided the request for approval is in writing accompanied by supporting data, in ample time to permit investigations without delaying the work. Unless substitutions have received prior approval, no deviation from the Standards will be allowed.
- E. Defective Work. Any defective materials or workmanship, which become evident within two years after field acceptance of completed work shall be replaced or repaired without cost to the City. Refusal of the contractor to correct defective work will be considered just cause for exclusion from performing future work to be connected to the City's system. Such exclusion does not impair the City's right to bring legal action to correct the deficiencies as well as to withhold release/exoneration of cash/letter of credit bond and payment bond.
- F. City Inspection, Field Acceptance and Warranty Period. The Engineering Department is responsible for inspection of all excavation, pipe laying including appurtenant structures, trench backfill within the pipe zone and testing. All such work shall be available for inspection at all times. It will be the contractor's responsibility to provide a 24 hour notice to the Engineering Department prior to the start of any work. Such notification will allow for scheduling a preconstruction meeting between interested parties. Failure to provide proper notification may delay the starting date since the Engineering Department may not be able to inspect the work and cannot accept any work for which inspection has not been arranged. It must be emphasized that the primary responsibility for compliance with all City requirements and standards rests with the developer and/or contractor. Any acceptance of a portion of the work by a construction inspector does not relieve the developer/contractor of this basic responsibility.

Field acceptance is made by the inspector and will not coincide with the date of City Engineer acceptance of the work. However, the two year warranty period for all work shall begin as of City Engineer acceptance. As mentioned in Section 7.1.E., any defective work discovered during this period shall be repaired or replaced and a new one year period will begin for that corrected work. The new one year period cannot end before the two year warranty period.

All holiday or weekend and after hours inspection will be subject to additional and overtime charges.

- G. Public Relations. The contractor shall conduct its affairs in a manner which will lessen the disturbance to residents in the vicinity of the work. In this regard, standard working hours as specified in the Municipal Code and shall be observed unless prior approval is received, which also includes City observed holidays. The job site shall be maintained in a condition which shall bring no discredit to the City or its personnel, and all affected private improvements shall be restored to their original condition or better.

3.7.2 PERMITS

The following permits may be required of the contractor:

- A. Right of Way Encroachment. Where construction will encroach into the public right-of-way or easements, the contractor shall obtain all necessary permits. Within South Jordan City right-of-way, the permit is secured from the Public Works Department. And within the County areas, a similar permit is required from the County. State roads require a permit from UDOT.
- B. Explosives. Where the contractor anticipates the use of explosives in conjunction with the water construction, a blasting permit shall be first obtained from the South Jordan Fire and Police and Engineering Departments, and all nearby property owners shall be notified. These permits are discretionary and may not be given.
- C. Other Permits. Other permits may also be required by other agencies, which must be applied for and obtained by the developer or his contractor. Certain permits are also required as part of the development conditioning process which must be provided prior to beginning construction of the project.

3.7.3 SHIPMENT AND DELIVERY

All pipes shall be braced and stilled to prevent damage during shipment. Any damaged pipe or fittings delivered and unloaded at trench side shall be removed by the contractor from the work site. An Engineering inspector must be in attendance to inspect the pipe prior to its removal from the transport vehicle. The inspector must also be in attendance when the pipe is being offloaded from the transportation vehicle or the City may reject the pipe.

With steel ML & C pipe (mortar lined & coated), the offloading of the pipe as well as placement in the trench shall be done with straps at each end. Chains shall not be allowed to come into contact with the pipe.

3.7.4 CLEARING AND GRUBBING

- A. General. Clearing and grubbing which consists of removal of objectionable material from the right-of-way shall be done with caution such that existing wastewater improvements, adjacent property and trees and shrubbery that are not to be removed shall be protected from injury or damage. A UPDES permit shall be obtained prior to starting any work.

Within water easements or rights-of-way, trees, shrubs, fences and all other improvements that have to be removed to permit construction and which are intended for replacement, shall be replaced in kind or size (excluding native trees under 2 inch diameter or native brush) or with approved substitutes unless permission to exclude such replacement is obtained from the owner/agency or granted by the Engineering Department. Replacement trees shall have a minimum diameter at breast height (DBH) recommended by the American Association of Nurserymen, but shall be larger if so required.

- B. Removal and Disposal of Material. The contractor shall be responsible for leaving the site in a neat and finished appearance, free from debris or objectionable material.

3.7.5 UTILITIES, EXISTING FACILITIES, AND CONCRETE REMOVAL

- A. Abandonment. Refer to Section 8.0 regarding abandonment of existing water lines and/or structures.
- B. Utilities and Existing Facilities. Whether expressly indicated on the drawings or not, all contractors shall call Blue Stakes prior to any construction. Failure to do so shall not relieve the contractor of any liability associated with disturbance/ breakage of existing utilities. In case it shall be necessary to remove any such utilities, facilities or any portions thereof, the contractor shall notify the Engineering Department and the owner of the structure. The contractor shall not interfere with said utility and/or facility structures until disposition of the obstruction to the work has been determined and/or notice to relocate or remove has been given by the Engineering Department and authorized agent of the owner of the utility and/or facility so affected.

The fact that any underground utility and/or facility is not shown on plans shall not relieve the contractor's responsibility to comply with these standards. It shall be the contractor's responsibility to ascertain prior to commencing work the existence of any underground utilities or facilities which may be subject to damage by reason of operations performed by the contractor.

The Public Works Department will provide service line location services of existing services upon request and with satisfactory notification in advance.

- C. Concrete, Masonry or Mortared Construction Removal. At locations shown on plans, portions of existing concrete pavement, curbs, gutters, sidewalks, foundations and other concrete or mortared structures shall be removed to the lines and elevations specified. Concrete structures or objects not shown or noted on the plans shall be removed where necessary and disposed of by the contractor.

Concrete removal operations in connection with the reconstruction of existing structures shall be performed without damage to any portion of the structure that is to remain in place. If damage occurs, the contractor shall repair any such damage at his own expense, to the satisfaction of the Engineering Department. Repair/replacement of any sidewalks, curbs and/or gutters shall be to the satisfaction of the Engineering Department, as appropriate. Where existing reinforcement is to be incorporated in new work, such reinforcement shall be protected from damage and shall be thoroughly cleaned of all adhering material before being embedded in new concrete.

3.7.6 EXCAVATION AND TRENCHING

- A. General. Trench excavation shall consist of all excavation involved in the grading and construction of the water line as shown on plans. The contractor shall perform all excavation of every description and of whatever substances encountered, to depths indicated on the drawings or otherwise specified or required. During excavation, material

suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. The material piles shall also not obstruct existing sidewalks or driveways. All excavated materials not required or unsuitable for backfill shall be removed. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water from any source accumulating therein shall be removed by pumping or by other approved methods. Such sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel. No other utility lines may be placed in the same trench with water lines.

Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if, in the opinion of the Engineering Department, the pipe or duct can be safely and properly installed and backfill can be properly tamped in such tunnel sections.

- B. Excavation. Excavation for water lines shall be made only after pipe and other necessary materials are delivered on the work site. After such delivery, trench excavation shall proceed as rapidly as possible, and the pipe installed and the trench backfilled without undue delay.

Where rock excavation is required, the rock shall be excavated to a minimum overall depth of 6 inches (150 mm) below the trench depths indicated on the drawings or specified. Over depths in the rock excavation and unauthorized over depths shall be backfilled with the same material as the bedding zone. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Engineering Department, is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with an appropriate material between coarse sand and crushed rock to provide a stable foundation.

- C. Shoring. All shoring for open excavations shall conform to the State of Utah, Department of Industrial Relations, and Division of Industrial Safety "Construction Safety Orders (O.S.H.A)."

The contractor shall be responsible for adequately shored and braced excavations so that the earth will not slide, move or settle, and so that all-existing improvements of any kind will be fully protected from damage and for safety of workers.

No shoring once installed shall be removed until the trench has been approved for backfill operations. Removal of shoring shall only be accomplished during backfill operations and in such a manner as to prevent any movement of the ground or damage to the pipe or other structures.

The contractor shall obtain and pay for all permits for any excavations over 4 feet in depth into which a person is required to descend or any excavation less than 4 feet in depth in soils where hazardous ground movement may be expected and into which a person is required to descend.

- D. Trench Width and Grade. The width of the trench within the pipe zone shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed the amount detailed in the standard drawings. See standard Drawings
- E. Pipe Subgrade. The trench bottom shall have a flat or semi-circular cross section. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of each joint except for required "bell holes" at joints. A coupling hole shall be excavated as necessary with sufficient length, width and depth to permit assembly and provide a minimum clearance of 3 inches (75 mm) below the coupling for a length of 6 inches (150 mm) beyond the coupling.

3.7.7 PIPE BEDDING AND LAYING

- A. General. This portion of the work includes the furnishing of all materials and their proper assembly to result in a first class waterline installation.

Where choices are allowed, the contractor shall select such materials and construction methods as will result in a completed project in full accordance with these Standards. In that regard, refer to the standard drawings for additional details.

The contractor is warned that the approved water pipeline design is based upon a proper combination of pipe strength and pipe support. No acceptance will be given unless the work of trenching, bedding, laying, backfilling and compaction is conscientiously done in accordance with the procedures outlined in these Standards as well as APWA and AWWA.

Except as otherwise approved or included in permits, the maximum length of open trench at any one time shall be 500 feet.

Deflection angle shall not exceed 2 ½ degrees per 13-foot section of pipe for pipe sizes smaller than 14 inches and shall not exceed 2 degrees for pipe sizes between 14 inches and 16 inches.

Grades shall be transferred from ground surface to the bottom of the trench by experienced workers, using not less than three consecutive grade points in common, so that variations from a straight grade may be readily detected. Each length of pipe shall be laid on firm, approved bedding material as specified and shall have full bearing for its entire length between bell holes excavated in said bedding material to allow for unobstructed assembly of all joints. Adjustments of pipe to line and grade shall be made by scraping away or filling in and tamping approved material under the body of the pipe. No wedging or blocking with wood or soil to support the pipe will be permitted. Under no circumstances will a contractor be allowed to dump backfill materials on top of a pipe which is not continuously supported in its final grade position.

In such manner as to form a close concentric joint with the adjoining pipe, following manufacturer's instructions for the specific jointing method being used. Pipe shall not be laid when the engineer or inspector determines that the condition of the trench or weather is unstable. Trenches shall be kept free from water until sufficient backfill has been applied to keep the pipe in place. At times when work is not in progress, open ends of pipe and fittings

shall be securely closed to the satisfaction of the inspector so that no trench water, earth or other substance will enter the pipe or fittings. Pipe or fittings damaged during assembly shall be removed and replaced. All fittings to be coated Poly FM grease and wrapped with 8-mil thick polyethylene.

- B. Pipe Laid on Bedding vs. Earth Mounds. The key elements to the pipe bedding are that the pipe ultimately be continuously supported and that the full 6 inches of bedding material (imported sand or better) be placed under the pipe. Where pipe is to be laid where considerable amounts of rock or cobble stone or groundwater are present, then the continuous bedding method shall be used. Earth mounds may be used, if specifically approved by the Engineering Inspector, in areas exhibiting ideal pipe laying conditions where there is clear demonstration that the 6 inch bedding material will be placed after the pipe is laid in the trench.

For the continuous bedding method, the trench bottom shall be over excavated a minimum of 6 inches and brought back to grade with imported bedding material. Prior to lowering pipe into the trench, coupling holes shall be excavated in the bedding with sufficient length, width and depth to permit assembly and provide a minimum of 2 inches below the coupling.

For the earth mound method, the mounds shall be compacted firmly and be of a size adequate to suspend the pipe 6 inches above the trench bottom while maintaining the pipe true to grade. Each length of pipe shall be laid on two mounds with the center of each placed at approximately one-fifth the distance from each end. Coupling holes shall provide a minimum clearance of 2 inches.

After assembly, the trench zone shall be properly backfilled with imported bedding material. The bedding material shall then be compacted utilizing appropriate methods to provide a firm and uniform bedding throughout the entire length of pipe. With caution tape 18" above pipe and trace wire.

C. Pipe Laying For PVC Pipe.

1. Lowering of pipe and accessories into trench. Pipe shall not be lowered into the trench until the pipe bed has been brought to grade. Dirt and other foreign matter shall be removed from the interior and the machined ends before lowering into the trench. Pipe and accessories shall be lowered carefully into the trench by hand or with suitable equipment in a manner that will prevent damage to pipe and fittings or injury to the installers. The sealing surfaces of all materials shall be kept clean during installation.
2. Pipe Joints. The machined ends of pipe to be jointed, coupling grooves and rubber rings shall be cleaned immediately before assembly, and assembly shall be made as recommended by the manufacturer. Care should be taken not to reverse the gasket when placed in the bell. The pipe joint must not be deflected either vertically or horizontally beyond 1 degree.
3. Unless otherwise approved in writing based on manufacturer instruction, stabbing or swinging the pipe into position is not acceptable for pipes above 10 inches in diameter. For smaller pipes it may be used providing the following is done:

- a. The minimum length of swing necessary to join the pipe should be used,
- b. The pipe end must be in perfect alignment with the receiving coupling,
- c. The pipe end must be thoroughly lubricated,
- d. The joints shall be "gauged" after installation,
- e. Methods meet the approval of the Engineering Department.
- f. The contractor is aware that this procedure, if not properly executed, can result in impact damage (cracks) in either the pipe coupling or the pipe spigot.

Gasket lubricants shall be NSF approved and water-soluble specially prepared for use in potable water systems. After assembly, proper location of the gaskets shall be gauged with a manufacturer supplied feeler gage.

When pipe laying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line.

Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent floatation. Any pipe that has floated shall be removed from the trench and the bedding corrected.

4. Length of pipe at fittings and rigid structures. When rigid joints are formed by caulked materials or by bolts with rubber ring seals, such as fittings, the length of 8 inch diameter and smaller pipe fitted into the bell of the fittings shall not exceed 3 feet-3 inches and the length of 10 inch diameter and larger pipe shall not exceed 6 feet-6 inches. At least one flexible joint shall be used between two adjacent rigid joints.
5. The laying of PVC C900 pipe is similar to that of other pipe with the following exceptions: Because it is a plastic product, the pipe should be covered with an opaque material if it is to be stored outside for a prolonged period of time (45 days).

D. Pipe Laying For Ductile Iron Pipe. Ductile iron pipe shall be laid in accordance with manufacturer instructions and in general compliance with the applicable procedures as listed for PVC pipe. Where specified, the Engineering Department may request a specification for such installation practices. Specific attention shall be given to the placement of the polyethylene encasement wrap and any tapping of the pipeline for services and/or other main connections.

3.7.8 THRUST BLOCKS, SUPPORTING OF VALVES, ETC.

- A. Supporting of Valves. Valves and fittings shall be supported by the trench bottom and shall be independent of the pipe. When pouring thrust blocks around a fitting, the concrete should be around the fitting and not the joint.
- B. Thrust Blocks. These shall be placed as shown on the plans or as required by the Standard Drawings. Care shall be taken to insure that the concrete is poured against undisturbed ground and the fitting to be anchored. Contractor to provide thrust blocks as required.

3.7.9 HOT TAPPING

Hot tapping shall only be done in the presence of the Engineering and Public Works Departments' representatives. Water mains will be hot tapped as called out on the approved plans. Under special circumstances, when a contractor submits a request for a shutdown contrary to the approved plans and the request is approved at the discretion of the City Engineer or designee, the contractor must provide 48 hour notice to neighbors and those affected. If businesses are impacted by the shutdown it will be done after hours and all overtime fees for City personnel, equipment and vehicles must be paid in advance.

Previous sections discuss the tapping sleeve and valve requirements.

The tapping mechanism shall be of the self-purging type so that cutting chips are removed from the tapping machine and do not enter the pipeline. Tapping sleeve shall be placed 3' from any fitting or bell end. Hot tap may be cancelled by city staff due to weather, time or unsafe work conditions.

3.7.10 SERVICE CONNECTIONS AND SERVICE LINES

Saddles are to be installed after hydrostatic tests have passed and while mainline is pressurized to operational pressure. With AC pipe the Engineering Department may require the developer/contractor to replace a section of pipe. The specified tapping method shall be listed in the construction drawings.

Service connections on the opposite sides of the pipe are not allowed. Connections shall have a minimum of 3 feet of separation from any fittings, service connections, and joints in the pipe.

As shown on the Standard Drawings, service connections to the main where IPS poly is used for the service line shall be made at 15 degrees above horizontal (spring line).

In all metal-to-metal threaded connections, use either Teflon tape or sealing compound.

Service lines shall be one continuous length from the main to the meter "snaked" within the trench to allow for expansion or contraction.

All service lines shall meet backfill and compaction requirements within City right of way.

3.7.11 INSTALLATION OF VALVES AND FITTINGS

Valves and fittings shall be installed at the locations and grades shown on the plans. The following items comprise a checklist:

- A. The weight of the valve or fitting is to be taken by firm ground or blocking and not the pipe.
- B. All materials are covered in previous sections.
- C. Valves and all bolted connections shall receive a plastic film wrap and Poly FM grease installed as follows: The valves shall be wrapped by passing the flat sheet of film under the valve bottom and bringing the ends up around the body to the stem and securing it in place

with 2 inch strips of the plastic adhesive tape. The polyethylene shall be secured around the valve stem in such a manner as to leave the stem free to operate. The film shall be brought completely around the flanges and secured to the pipe with a plastic adhesive tape on either side of the valve, flange or fitting.

- D. All bolted connections shall be performed in an even manner by a series of tightening steps so that no portion of the bolted connection is overstressed.
- E. All valves in landscaped areas to be place in a concrete pad 4'x5'x6"

3.7.12 INSTALLATION OF AIR RELEASE AND BLOWOFF ASSEMBLIES

Combination air release and blow off assemblies shall be installed as shown in the Standard Drawings. The developer/contractor shall locate the combination air release cans and blow off vaults in a suitable location with respect to the adjacent properties, preferably at a side lot line. This shall include locating them closer to property lines rather than in the middle of a property where there could be future objections from the property owner. The service line to the assembly shall have a positive grade to prevent accumulations of air. Landscaping and irrigation adjacent to vaults shall drain away from vaults.

Dielectric connections with PVC tape wrap shall be provided at all connections between steel and brass or bronze. See the Standard Drawings.

3.7.13 INSTALLATION OF FIRE HYDRANT ASSEMBLIES

Fire hydrant assemblies are to be installed in accordance with the general instructions contained in the AWWA. Hydrants should be placed on a lot line, where feasible. Special attention is called to the following:

- A. The 2 feet setback from the curb face must be adhered to regardless of whether the curb is next to a private street or within a private street or parking lot. The 2 feet dimension is from the curb face to the nearest portion of the fire hydrant and is not to the fire hydrant centerline.
- B. The elbow in the fire hydrant bury must be anchored on a concrete thrust block.
- C. The fire hydrant shall be positioned so that the bolts between the extension piece and the hydrant are accessible, both top and bottom within the limits shown in the Standard Drawings. If the hydrant is either too low or too high, it shall be corrected.
- D. Painting all metal surfaces above ground including any extensions. It is suggested that the extension piece be painted before pouring the sidewalk.
- E. Hydrants and auxiliary valve to be placed in a concrete pad 4'x5'x6" thick.

3.7.14 INSTALLATION OF METER BOXES, PRESSURE REGULATORS

- A. General. Specific installation details are shown in the standard drawings. Information concerning the sizing of meters is presented in a previous section. In all cases, the Engineering Department will select the meter type and install the meter after proper arrangements have been made.
- B. Meter Boxes. These shall be set with the longitudinal axis perpendicular with the street and located center of lot or center of park strip with respect to the curb. Under no circumstances shall they be located within driveways
- C. Jurisdiction. All pipes on the customer side of the meter box are under the jurisdiction of the South Jordan City Building Department, if the property is within City boundaries.
- D. Pressure Regulators. Wherever the normal operating pressure at the house or building exceeds 80 psi, then a pressure regulator is required. For convenience, the houses or buildings requiring regulators are shown on the plans, but this does not relieve the developer/contractor of responsibility to check the pressure of each house or building. The types of regulators and their installation are as required by the Building Department.

TRACER WIRE AND CAUTION TAPE

Tracer wire should be added and put up through every valve box including auxiliary valve boxes for Fire Hydrants. Tracer wire needs to be continuous with no breaks in service throughout the entire system. Tracer wire should be 14 gauge wire coated solid copper with moisture resistant nut (grease nut). The tracer wire shall be 2' above the lid; this is known as "Engineer's Slack". The tracer wire should be placed below the spring line and under the haunches.

Caution or Warning Tape should be placed 18 inches above all the mains and all six inch diameter pipes and larger service laterals and shall be blue in color, to signify culinary water.

3.7.15 BACKFILL AND COMPACTION

- A. General. There are several distinct zones to be considered in the backfilling procedure as follows.
 - 1. Pipe Zone. This area is from the trench bottom to 18.5 inches above the pipe. This zone is to be backfilled under the strict jurisdiction of the Engineering Department.
 - 2. Above the pipe zone but below pavement subgrade and including the subgrade and pavement backfill and compaction in existing streets shall be in accordance with the APWA/AASHTO requirements, and with the City land development specifications. In both cases, the filling of trenches shall be subject to approval by the City or Engineering inspector who shall have full authority to order compaction tests to demonstrate the actual backfill density.

- B. Backfilling Pipe Zone. Sand, as specified in APWA or AASHTO, must be used and shall be placed in the pipe zone with particular attention to getting material to the underside of the pipe and fittings to provide a firm support along the full length of the pipe. Care shall be exercised in backfilling to prevent damage to the pipe or coating, as applicable. Backfill in the pipe zone may be either compacted by hand tamping methods or flooded into place in a single lift without hand working. In no case shall sufficient water be applied to float the pipe.

Acceptability of compaction in the pipe zone will be determined primarily by visual inspection and probing by the City's inspector to determine that no voids exist in the backfill. The backfill within the pipe zone shall meet the requirements of 96 percent relative compaction.

- C. Backfilling above Pipe Zone. The sequence of backfilling and compaction above the pipe zone (in public right-of-way, i.e., streets) shall be testing for pipe and joint leakage will be done after consolidation of the backfill to the top of the subgrade zone and after service lines have been installed to the property lines.

Backfill, compaction and resurfacing shall be scheduled so that existing public streets may be opened to normal traffic in accordance with the City right of way permit, and so that the backfill operations closely follow the pipe laying avoiding open trenches overnight.

The trenches or excavations shall not be backfilled without prior inspection by the Engineering Department. Such inspection does not relieve contractor from compliance with the testing of the waterline which should be conducted after final assembly of main and service lines in consolidation of backfill as described above. Contractor shall assume the cost of removal and replacement of backfill necessary for correction of defective conditions revealed by testing.

If no pavement is to be placed, the backfill zone between the top of the pipe zone and the bottom of the subgrade zone or ground surface may be filled with approved select backfill. It shall be placed in lifts not exceeding 12 inches in un-compacted thickness, and compacted by mechanical means so as to obtain 96 percent relative density, except for the subgrade zone, consisting of the space under pavement and/or shoulder to finished road grade which shall be filled and compacted to the prevailing City requirements, without flooding or jetting.

If the work is in private property and not subject to public agency requirements, excavations shall be final, backfilled, compacted and finished to match original conditions as interpreted by the Engineering Department as further described in Section 10.0 - Water System and Work Area Final Clean-up.

In traffic areas within public right-of-way where pavement is to be replaced, the City or County requirements may call for flowable fill mixture to be used for trench backfill. This requirement will generally apply to repair trenches, which are 2 feet or less in width. For trenches wider than 2 feet, the Engineering Departments may approve the aforementioned procedures. It must be emphasized that the specific requirements above the pipe zone are within the jurisdiction of the Engineering Department and developers/contractors shall have

a responsibility to investigate and comply with all applicable requirements. Backfill under pavement shall be compacted to 96% modified proctor.

- D. Compaction Tests. These tests shall be taken as determined by the Engineering Department. The developer/contractor shall make all necessary excavation for the tests at locations selected by the Engineering Department, and shall refill and compact these excavations to the specified densities.

3.7.16 RESURFACING AND RESTORATION

If the water work shall occur in streets where no paving exists, the contractor shall, in accordance with City requirements contained in the APWA and AASHTO Standards, leave the completed trenches compacted road base for finish grading, placement and paving by others.

If the work is within existing City, County or State streets, any required surfacing shall be in accordance with the City, County or State excavation permits.

If the work has disturbed or damaged existing private streets, alleys, driveways or other improved surfaces, the damaged portions shall be removed and restored, including the provision of adequate sub-grade where these operations have disturbed the original material at no cost to the City.

Substructures removed or damaged on public or private property shall be restored or replaced unless such structures are designated on plans "to be abandoned". Such structures include but are not limited to trees, bushes, plantings, groundcover, mailboxes, fences and sprinkler systems.

Any temporary paving, barricades, fencing or special provisions required by public agencies shall be furnished by the contractor as required.

3.7.17 BORING AND JACKING OPERATIONS

- A. General. Placement of pipe by boring or jacking methods requires special Engineering Department approval for each instance. However, as a general guideline, the following shall pertain:
1. Except for the use of air or water, the methods and equipment used in boring and jacking operations shall be optional to the contractor provided that the Engineering Department reviews them prior to any work.
 2. The placement of pipe shall be to the lines and grades shown on the plans.
 3. Voids remaining outside the pipe (or carrier pipe if applicable) shall be backfilled with 200 psi concrete.

4. Where a casing pipe is used, it shall be no less than 8 inches greater in diameter than the pipe to be installed, however engineer and contractor may need to size casing larger to fit joint restraints in casing. The City requires stainless steel tie-down restrains with tumbuckles only. 5/8" rebar is not acceptable.
 5. The placement of pipe in casings shall be supported with casing spacers.
 6. All joints in casing shall be restrained.
- B. Bores. The boring machine shall cut a true circular bore to the required line and grade. The bored tunnel shall be no more than 2 inches larger in diameter than the maximum outside diameter of the casing or water pipe to be installed.
- C. Jacked Steel Casings. In addition to applicable portions above, the following shall pertain:
1. Where casings are used, the size and wall thickness of the casing shall be at the contractor's option except that the minimum casing thickness shall be not less than 3/8 inch.
 2. Field joints of steel casings shall be welded with a continuous circumferential weld.
 3. Prior to backfilling the annular space between the pipe and casing, the pipeline shall be tested.
 4. The annular space shall be backfilled with washed concrete sand blown or rammed into place until the entire cavity is filled. Concrete bulkheads shall be placed at each end of the cased section to retain the backfill material.

3.7.18 CONCRETE AND MORTAR WORK

- A. Concrete.
1. Material. Concrete used for encasements, filling, blocking, piers and other typical water construction applications shall be transit-mixed concrete from a supervised batch plant which issues certified delivery tickets with each load, showing the mix proportions, mixing time, truck departure time and water added. Such certified tickets will be handed to the inspector at the time of delivery. Ready-mixed concrete shall be batched and handled in accordance with ASTM. Job mixed concrete shall be limited to that needed for patching and minor non-structural uses requiring one sack of cement or less. In these cases, the materials and workmanship shall be the same as if transit-mixed concrete had been used. The 28 day compressive design strength of concrete shall be chosen according to its intended use.
 2. Placement. Concrete shall be placed in clean forms before its initial set begins, using the minimum amount of mixing water required for good workability. Concrete shall be worked into forms by rodding or vibrating to secure a dense homogeneous mass free from voids and rock pockets. All concrete shall be vibrated unless the inspector approves solely rodding to avoid having the concrete run out of the forms or trench.

3. Finish. Concrete surfaces where required shall be steel trowelled to a smooth hard surface free from ridges, holes and surface roughness. Exposed walls shall be left with a surface finish comparable to that obtained with new plywood forms. Slabs and walkways shall be finished with a wood float unless otherwise specified. Corners and edges shall be neatly beveled. Surface defects shall be repaired to match the surrounding concrete.

B. Mortar. Mortar for general work (exclusive of ML & C steel pipe) shall consist of one part Type II Portland cement and two parts of sand, by volume, thoroughly mixed in a dry state before adding sufficient water to give the mortar a proper trowelling consistency.

3.7.19 CONSTRUCTION WATER

The developer/contractor shall not take un-metered water from the City's culinary water system. Instead, he or she shall sign up at the Public Works Department for one or more construction meters after receipt of a deposit amount. The developer/contractor is not to move the construction meters. Charges for construction water are covered by City Council Resolution. The developer/contractor is put on notice that unpaid invoices will result in removal of the construction meter.

3.7.20 PAINTING

They shall be opened and mixed at the job site and shall comply with AWWA. Workmanship shall be of a kind and quality meeting the requirements of the best standards of the painting industry. Skilled and experienced painters shall do all work. Surfaces to be painted shall first be thoroughly cleaned to remove dirt, loose scale, rust, oil, grease and/or other foreign matter immediately prior to painting. Cleaning shall be done with abrasives, scrapers, wire brushes and/or other approved means.

Each coat shall be applied in such a manner as to assure an even, smooth, uniform adhering coat free from dirt, runs, brush marks and laps, and shall be applied as recommended by the manufacturer.

Painting will not be permitted when rain, fog or condensation may damage freshly painted surfaces or when inclement weather can be anticipated. The contractor at his expense shall replace fresh paint damaged by the elements. Drop cloths shall be used to protect floors, equipment, piping and other exposed surfaces from spattering and spillage. Paint shall be allowed to dry thoroughly between applications of successive coats. The manufacturer's recommended the City Engineer as to when the next coat of paint may be applied will use time between coats as a guide. The Engineering Department must give approval before successive coats are applied, unless otherwise approved. The contractor shall notify the Engineering Department after surface preparation and after the application of each successive coat of paint. Spray painting will not be permitted unless specifically authorized by the Engineering Department.

3.7.21 SAFETY

Wherever the contractor is aware of unsafe operations, such should be discontinued immediately. Also, if the inspector is aware of such conditions and informs the contractor of it, it will be the contractor's responsibility to comply. In such instances, the advice shall not be construed as implying any City liability.

Essential to proper safety is adherence to all MUTCD work area traffic control requirements and as specified by the Engineering Department. 3M Diamond Grade sheeting, or an approved equivalent, is required for all construction signage.

Contractor is to submit to the City a copy of their annual OSHA permit and the letter notifying OSHA of their work on the City's project.

SECTION 3.8

ABANDONMENT

3.8.1 GENERAL

The developer's engineer shall indicate all existing water lines and water appurtenances which are to be abandoned on the drawings. In general, abandoned lines, which are in service, will be replaced with a parallel line of equal or larger size, and the engineer shall demonstrate in any case that the abandonment does not adversely affect the water system. In the event the water plans show one or more valved outlets are incorrectly located or not used for any reason when the property is developed, the developer shall abandon the outlets at the connection to the active main as approved by the City Engineer.

All abandonment and construction techniques shall be discussed with the Engineering Department inspector and approved prior to any such work.

3.8.2 WATER SYSTEM APPURTENANCES

Water system appurtenances associated with lines to be abandoned shall be removed by the contractor/developer and given to the City if salvageable.

SECTION 3.9

TESTING AND DISINFECTING WATER MAINS

3.9.1 GENERAL

This section applies to new water main construction as well as the repair of or connection to existing water mains within the City.

All completed water lines, as well as the service lines and appurtenant structures will be tested by and at the expense of the contractor in the Engineering Department inspector's presence prior to field acceptance of the work. The contractor must correct all defects in workmanship or materials that become evident by inspection or testing at any time during the work. Testing will be done after the complete installation and compaction of all underground utilities, except as modified below. Contractor shall provide appurtenances to perform pressure test and disinfections as required by the City Engineer. The contractor shall provide positive isolation of proposed culinary water lines from existing lines, as approve by the City, during construction, testing, chlorinating, and final connection procedures as specified in the AWWA.

3.9.2 HYDROSTATIC TESTING

- A. General Requirements. In this section, the procedures used for testing cement mortar line and coated steel pipe will first be presented and then any differences for PVC or ductile iron pipe will be presented under a separate subsection. The purpose of the hydrostatic test is both to test for the ability of the pipeline to withstand pressure and to test for an acceptable leakage. 5 lb increment gages shall be used.

After the pipe and all appurtenances have been laid and backfilled and compacted sufficiently for required restraint, they shall be subjected to a 2 hour hydrostatic pressure test. This test shall consist of subjecting the pipeline to a hydrostatic pressure of 200 psi. This value for the test pressure shall be used for most installations. However, where the operating pressure exceeds 125 psi as called out on the cover sheet of the drawing then the test pressure shall not be less than 225 psi for Class 150 pipe or 250 psi for Class 200 pipe. This test pressure shall be at the low point in the section being tested and shall be corrected to the elevation of the test gauge. Test locations shall be designated by the Engineering Department. The pressure test or retest shall be conducted any time after trench backfill compactive effort with heavy-duty compacting equipment having an overall weight in excess of 125 pounds.

The maximum length of pipe to be included in any one test shall be not more than 2,500 feet or the distance between valves, whichever is less. The contractor shall provide suitable test bulkheads, blocking and fittings to permit such sectionalizing.

- B. Preparation. After chlorine and Bac-T has passed. During this period no pressure need be maintained on the line although some pressure, say 50 psi, will help to saturate the line and remove the air. While filling and immediately prior to testing, all air shall be expelled from the pipeline and whenever practical, water should be introduced from the low end of new

system to facilitate the elimination of air in the pipeline prior to testing. Where air valves or other suitable outlets are not available for releasing air before applying the test, approved taps and fittings shall be installed and later securely plugged. All equipment used for the hydrostatic test must be disinfected.

- C. Procedure. The pipeline pressure shall be stable at 200 psi for 2 hours.
- D. Differences for PVC Pipe. The soaking period requirement is not as critical for PVC pipe since the walls do not absorb water and become saturated. AWWA recognizes a 2 hour leakage and pressure test.
- E. Differences for Ductile Iron Pipe. As with PVC pipe, the soaking period is not critical unless the pipe is mortar lined. Then a minimum 24 hour period is required.

3.9.3 ROLE OF FLUSHING

All mains shall be flushed with potable water after completion of disinfection test. The primary purpose of this function is to remove the sediments and miscellaneous products of construction and flush high chlorine from line. Please see AWWA for requirements

3.9.4 DISINFECTING WATER MAINS

This section presents essential procedures for disinfecting new and repaired water mains. All new mains shall be disinfected before they are pressured tested. All water mains taken out of service for inspection, repair, or other activities that might lead to contamination of water shall be disinfected before they are returned to service. All work is to be done in conformance to AWWA.

3.9.5 FINAL FLUSHING

See current AWWA standards for final flushing.

Contractor shall pay for water if Bac-T Samples fail and another flush is required.

- A. Clearing the main of heavily chlorinated water. After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main. This shall be done until chlorine measurements show that the concentration in the water leaving the main is less than one mg/l.
- B. Disposing of heavily chlorinated water. The environment into which the chlorinated water is to be discharged shall be inspected. If, in the opinion of the Engineering Department inspector, there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. Federal, state and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

3.9.6 BACTERIOLOGICAL TESTS

- A. General. After final flushing and before the main is placed in service, the Public Works Department will sample the water and test for bacteriologic quality. Tests will not be allowed after 12:00 p.m. on Thursdays and not at all on Fridays. Samples shall be taken of water that has stood in the new main for at least 24 hours after final flushing has been completed.
- B. Standard conditions. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one set of samples shall be collected from every 1,200 feet of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for bacteriological quality in accordance with *Standard Methods for the Examination of Water and Wastewater*, and shall show the absence of coliform organisms.
- C. Special conditions. If trench water has entered the new main during construction or, if in the opinion of the Engineering Department inspector, excessive quantities of dirt or debris has entered the new main, bacteriological samples shall be taken at intervals of approximately 200 feet and shall be identified by location. Samples shall be taken of water that has stood in the new main for at least 24 hours after final flushing has been completed.
- D. Sampling procedure. Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate as required by *Standard Method for Examination of Water and Wastewater*. No hose or fire hydrant shall be used in the collection of samples.
- E. Record of Compliance. The record of compliance shall be the bacteriological test results certifying the water sampled from the new water main to be free of coliform bacteria contamination, and to be equal to or better than the bacteriological water quality of the distribution system. The Public Works Department is responsible for conducting the bacteriological testing for the project. Once the results are received by the Public Works Department, they will send a copy of the test results to the Engineering Department for their records and will also transmit a copy to the State of Utah, Division of Drinking Water.

3.9.7 RE-DISINFECTION

If the initial disinfection fails to produce satisfactory bacteriological results, the new main may be re-flushed and shall be re-sampled. If check samples also fail to produce acceptable results, the main shall be re-chlorinated by the continuous feed or slug method of chlorination until satisfactory results are obtained. The first initial flush will not cost but each flush there after will be paid for by the contractor.

3.9.8 FINAL CONNECTION TO EXISTING MAINS

Water mains and appurtenances must be completely installed, flushed and disinfected and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system. Sanitary construction practices must be followed during installation of the final connection, so that there is no contamination of the new or existing water main with foreign material or groundwater. Once the waterline has been tested, approved and

City water is flowing through the pipe, only City personnel are authorized to shut down and charge the waterline.

- A. Connections equal to or less than one pipe length. The new pipe, fittings, and valve(s) required for the connection may be spray-disinfected or swabbed with a minimum one percent solution of chlorine just prior to being installed if the total length of connection from the end of a new main to the existing main is equal to or less than 18 feet.
- B. Connection greater than one pipe length. The pipe required for the connection must be set up aboveground, disinfected, and bacteriological samples taken as described above if the total length of connection from the end of a new main to the existing main is greater than 18 feet. After satisfactory bacteriological sample results have been received for this 'pre-disinfected' pipe, the pipe can be used in connecting the new main to the active distribution system. Between the times that satisfactory bacteriological sample results are received and the time the connection piping is installed, the ends of this piping must be sealed with plastic wraps or watertight plugs or caps.

3.9.9 DISINFECTION PROCEDURES WHEN CUTTING INTO OR REPAIRING EXISTING MAINS

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

- A. Trench treatment. When an existing main is opened, either by accident or by design, the excavation will likely be wet and may be badly contaminated from nearby wastewater lines. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from such pollution. Tablets have the advantage in such a situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.
- B. Swabbing with hypochlorite solution. The interior of all pipe and fittings (particularly couplings and sleeves) used in making the repair shall be swabbed or sprayed with a one percent hypochlorite solution before they are installed.
- C. Flushing. Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations permit, flushing toward the work location from both directions is recommended. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water is eliminated.
- D. Slug chlorination. When practical, in addition to the procedures above, the section of main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated as described previously in this Section, except that the dose may be increased as much as 300 mg/L and the contact time reduced to as little as 15 minutes. After chlorination, flushing shall be resumed and continued until discolored water is eliminated, and the water is free from noticeable chlorine odor.

- E. Sampling. Bacteriological samples shall be taken after repairs are completed to provide a record for determining the procedure's effectiveness. If the direction of flow is unknown, then samples shall be taken on each side of the main break. If positive bacteriological samples are recorded, then the situation shall be evaluated by the City who will determine corrective action, and daily sampling shall be continued until two consecutive negative samples are recorded.

3.9.10 SPECIAL PROCEDURE FOR CAULKED TAPPING SLEEVES

Before a tapping sleeve is installed, the exterior of the main to be tapped shall be thoroughly cleaned and wiped down with a one percent hypochlorite solution. The interior surface of the sleeve, the annulus and other portions of the sleeve, which might come in contact with drinking water, shall also be lightly dusted with calcium hypochlorite powder prior to its installation.

3.9.11 TESTING FOR FIRE FLOW OR PRESSURE

In selected cases, the Engineering Department may require a check of the fire flow or pressure following construction. In such instances, the developer/contractor shall assist either the Public Services and Engineering departments or the South Jordan City Fire Department, as appropriate.

SECTION 3.10

WATER SYSTEM AND WORK AREA CLEAN-UP

3.10.1 FINAL PROJECT CLEAN-UP

During construction the Contractor must take care to not track dirt, mud or other debris from the construction site onto adjacent City streets or private property. Vehicles must either be washed down prior to leaving the construction site or the Contractor must employ a sweeper to clean the streets as needed. The details, penalties, etc. are contained in the City's Municipal Code.

Once all pipeline systems have been installed, pressure tested, chlorinated and flushed, the system can be field accepted provided the necessary clean-up has occurred. All structures including fire hydrants shall be properly painted where required and free from dirt, concrete or other spattered materials. Also, the work site will be cleaned of construction debris by the contractor. All private improvements damaged during construction shall be restored to at least the original condition of said improvements including but not limited to trees, shrubs, curbs, gutters, sidewalks, fences, grass, etc. Filled excavations in private property shall be neatly finished in a manner to facilitate natural drainage and eliminate hazards to persons or property. Also, all requirements of the Engineering Department, as appropriate, shall have been met. The project shall be left in a final condition which brings no discredit to the City.

SECTION 3.11

CROSS CONNECTIONS AND BACKFLOW PREVENTION

3.11.1 GENERAL

A cross connection is any physical connection or arrangement of piping or fixtures which may allow nonpotable water or industrial fluids or other material of questionable quality to come in contact with potable water inside a distribution system. Bypass arrangements, jumper connections, insufficient air gaps, removable sections, swivel or change-over devices and other temporary or permanent devices through which, or because of which, backflow can occur are considered cross connections.

Cross connections may be regarded as direct or indirect. A direct connection is an arrangement whereby a safe water system is physically joined to any other system. An indirect connection is an arrangement whereby unsafe water or other substance may be blown, pulled by vacuum, or otherwise diverted into a safe water system.

To understand cross connection and backflow prevention, several other terms need definition. "Backflow" is generally defined as the flow of any liquids, gases or other substances into the distribution pipelines of a potable supply of water from any other source or sources than the intended one. For backflow to occur, two conditions must be present:

1. A link must exist between the potable and the nonpotable system;
2. The resultant flow produced by the differential pressure must be toward the potable system. If both systems are at pressures greater than atmospheric (positive pressure), backflow due to "back-pressure" occurs. A pump, elevated tank, difference in grade or boiler can create a backpressure that is greater than the pressure in the potable system.

If the potable system is at a pressure less than atmospheric (negative pressure), the atmospheric pressure on the foreign liquid will force it toward the partial vacuum and "back-siphonage" occurs. Back-siphonage is the drawing up, or siphoning, of a liquid or material into a potable water system.

3.11.2 JURISDICTION, AUTHORITY, REFERENCES

South Jordan City requirements for backflow prevention are covered in the Municipal Code with additional reference to the regulations of the State's Plumbing Code. The developer/contractor should be familiar with the applicable sections of the Municipal Code.

The Water Superintendent or his/her authorized representatives, for the City is an individual within the Public Works Department, who is responsible for ensuring that the assemblies are properly installed, maintained and tested. The various protective assemblies are to be installed, maintained and tested by and at the expense of the property owner.

3.11.3 TYPES OF BACKFLOW PREVENTION

As described below, there are several different types of prevention protection assemblies. The "Reduced Pressure Principle Assembly" and "Double Check Valve" are used respectively to prevent backflow and back-siphonage. The "Air Gap" and "Pressure or Atmospheric Vacuum Breakers" are used for prevention of back siphoning.

- A. Reduced Pressure Principle Assembly (RP): Commonly referred to as an RP or RPZ, this assembly consists of two independently acting check valves, together with an automatically operating pressure differential relief valve located between the two check valves. The first check valve reduces the supply pressure at a predetermined amount so that during normal flow, and at cessation of normal flow, the pressure between the two check valves shall be lower than the supply pressure. If either check valve leaks, the relief valve will discharge to atmosphere. This will maintain the pressure in the zone between the two check valves lower than the supply pressure. The unit also has two shutoff valves (one upstream and one downstream of the checks) and four properly located test cocks for field testing. This assembly requires testing by a state certified technician upon installation or repair and annually thereafter.
- B. Reduced Pressure Principle Detector Check is specifically designed for use on fire protection systems that utilize culinary water and chemicals only pipeline installations. The assembly protects potable water supplies from possible contamination through cross connection to fire service pipelines by preventing the return of "degraded fire system waters" into the water distribution system. This unit is also used to detect leakage or unauthorized use of water from fire system lines, which usage is immediately registered on the low flow meter on the unit. This assembly requires testing by a State certified technician upon installation or repair and annually thereafter.
- C. Double Check Valve: The double check valve assembly is composed of two single, independently acting check valves. The unit also has two tightly closing shutoff valves located at each end of the device and four properly located test cocks for field testing. This assembly requires testing by a state certified technician upon installation or repair and annually thereafter.
- D. Double Check Detector Check: Specifically designed for use on fire protection systems that utilize culinary water only. The assembly protects potable water supplies from possible contamination through cross connection to the fire service pipelines by preventing the return of "degraded fire systems water" into the water distribution system. This unit is also used to detect leakage or unauthorized use of water from fire system lines, which usage is immediately registered on the low flow meter on the unit. This assembly requires testing by a State certified technician upon installation or repair and annually thereafter.
- E. Air Gap: An air gap is a physical separation between the free flowing discharge end of a potable pipeline and an open or non-pressure receiving vessel. To have an acceptable air gap, the end of the discharge pipe has to be at least twice the diameter of the pipe above the topmost rim of the receiving vessel, but in no case can this distance be less than one inch. If the discharge pipe is cut at an angle to minimize splash the air gap must be measured from the middle of the angle.

- F. Pressure Vacuum Breaker: The pressure vacuum breaker (PVB) is an assembly that contains within a single body, an internally loaded check valve and a loaded air opening valve which opens to admit air whenever the pressure within the body of the device approaches atmospheric. The body of the assembly has two tight closing shutoff valves and it is fitted with test cocks, appropriately placed, for testing the assembly. This assembly requires testing by a State certified technician upon installation or repair and annually thereafter.
- G. Spill Proof Vacuum Breaker: The spill-proof vacuum breaker (SUB) is an assembly that contains within a single body an internally loaded check valve and an internally loaded air inlet valve located on the discharge side of the check valve. The body of the assembly has two tight closing shutoff valves and it is fitted with an appropriately located test cock and bleed/vent valve. This assembly requires testing by a State certified technician upon installation or repair and annually thereafter.
- H. Atmospheric Vacuum Breaker: An atmospheric vacuum breaker (AVB) has a moving element inside, which during flow prevents water from spilling from the device and during cessation of flow, drops down to provide a vent opening. This device should not remain under pressure for long durations (over 12 hours) and it cannot have any valves downstream from it. This is not a testable device but should be inspected regularly for proper operation.

3.11.4 REQUIREMENTS

The following is provided:

A. Reduced Pressure Principle Assembly (RP)

General: Use where cross connections are known or probably will exist which cannot be eliminated and where the degree of severity is judged by the Water Superintendent or his/her representative, to warrant more than a double check valve.

Specific Examples:

1. Water service to industrial or commercial facilities where chemicals are used within the premises, which could potentially be harmful to the City system.
2. Water service to hospitals and doctors' offices for humans and animals.
3. All sprinkler and irrigation systems that connect to the culinary water system.
4. Fire sprinkler systems using chemical additives.
5. Water service to mortuaries.
6. Service connections to home or buildings which also use water from wells or auxiliary storage.

B. Reduced Pressure Principle Detector Check.

General: Use where fire service line that uses culinary water and chemicals

Specific Example:

1. Fire service line for sprinklerized building that uses chemicals

C. Double Check Valve Assembly

General: Use where a cross connection possibly exists where the substance would be objectionable, but not necessarily hazardous to health.

Specific Examples:

1. Service connections to homes or buildings where the meter connection is too large for a setter.
2. Water service to buildings, which use products, which might impart an objectionable taste, odor or color but would not be hazardous.
3. Food processing plants.
4. Low hazard water connections.

D. Double Check Detector Valve Assembly:

General: Use where there is no other meter between the water source and the fire service line that uses only culinary water and no chemical additives.

Specific Example:

1. Fire service line for a building using a sprinkler system.

E. Air Gap.

General: Use where there is a connection to any premise using a dangerous or toxic substance in toxic concentrations or sewer connections. The air gap shall be located as close as possible to the service inlet and all piping between the inlet and receiving tank shall be entirely visible, if these conditions can't be met, then use an RP assembly may be approved by the Water Superintendent.

Specific Example:

1. A commercial installation where an air gap is approved.
2. All connections to sewage or sewer drain lines.

F. Pressure Vacuum Breaker (PVB) or Spill Proof Vacuum Breaker (SVB)

General: This unit can only be used where only backsiphoning conditions apply. There can be no back-pressure. The unit can have shutoff valves downstream of the assembly. The PVB/SVB must be installed at least 12" (300 mm) above the highest outlet or tank.

Specific Example:

1. Chemical feeders installed on washing machines or janitor sinks.
2. Hose lines with down stream valves
3. Dishwashers, etc.

G. Atmospheric Vacuum Breaker (AVB).

General: There should be no possibility of back-pressure. This device cannot have any shutoff valves downstream of the device. It must be installed at least 6" (150 mm) above the highest outlet or tank.

Specific Example:

1. Washing machine, dishwasher, other miscellaneous equipment

3.11.5 INSTALLATION

- A. General: In terms of installation, there is an essential difference between "service" and "internal" protection. Service protection is a backflow assembly installed outside of the building, but on the customer side of the meter (with the exception of the detector check valve, which doesn't have a meter). These assemblies are specifically intended to protect the City water system regardless of other protective assemblies or devices inside the building.

Internal protection devices are installed within the building or facility at each point of cross connection.

- B. Service Protection Assemblies. The owner/developer submits drawings of the building to the Building Department, which may require an outside or service protection assembly. Also, the Public Works Department's Cross Connection Control officer may require service protection after a survey of the facility once under construction or occupied unless internal cross connections are abated to the satisfaction of the Cross-Connection Officer. In either case, the owner/developer should make arrangements with the Cross Connection Control officer for inspection.

Once installed, the assembly will be recorded on the cross connection control records and tested as discussed in Section 12.7.

- C. Internal Protection. The installation of these assemblies and devices falls under the jurisdiction of the Building Department and as approved to the satisfaction of the Engineering Department.

3.11.6 APPROVED DEVICES

The listing of the current approved backflow prevention assemblies is issued by the Utah Department of Environmental Quality, Division of Drinking Water and is available through their office. The City's Water Division may also be consulted for the currently approved list.

3.11.7 TESTING AND MAINTENANCE

All backflow prevention assemblies are to be tested annually by a state certified tester and tested following all repairs or maintenance. Owners of all assemblies that have been recorded on Public Works Department records will be notified yearly of this responsibility and a form must be completed by the tester and returned to the Public Works Department.

All backflow prevention assemblies must be tested within ten (10) working days of initial installation. The owner should notify the City within twenty-four (24) hours of installation.

SECTION 3.12

RESERVOIRS AND PUMPING STATIONS

3.12.1 GENERAL

Reservoirs or storage tanks work in conjunction with the pipeline and pumping stations to supply water for both the domestic and fire fighting purposes. These facilities must be designed for reliability. They must also be designed to be aesthetically pleasing with emphasis on minimization of their visibility, particularly with regards to any visual corridor. This section is not a design document; rather, it is a limited discussion of a few key points.

3.12.2 RESERVOIR STORAGE

Reservoir storage is made up of two components; emergency storage and regulatory storage. Emergency storage includes a sufficient volume to supply the highest anticipated fire flow within a particular zone. Regulatory storage is the volume required to supply the withdrawals from the system, which exceed the average rate of water production (or inflow).

The emergency storage can be calculated by identifying the single highest fire flow demand in accordance with the guidelines of the South Jordan City Fire Department.

Regulatory storage is a function of the ultimate population served and the conversion of average uses to maximum daily uses.

3.12.3 RESERVOIR STRUCTURAL DESIGN

Reservoirs (tanks) must be designed to withstand all expected forces internal pressure, wind load, earthquake load, the dead load of the structure and the live loads of the water when completely filled.

For steel tanks, AWWA is the applicable standard for the welded tanks and is the applicable standard for factory coated bolted steel tanks.

Reinforced concrete or pre-stressed concrete reservoirs are to be designed to the standards of the American Concrete Institute (ACI).

3.12.4 GENERAL RESERVOIR DESIGN PARAMETERS

- A. All new reservoirs shall be located below ground.
- B. All reservoirs shall have an altitude valve with a bypass.
- C. All new reservoirs shall have ladders with safety cages.

3.12.5 PUMPING STATION DESIGN

Pumping stations shall be designed with at least two pumps so that at least one unit can be considered a standby unit. Further, in any station, the required pumping capacity must be met with one pump of the largest size out of service.

Each pump station shall be capable of supplying the maximum daily flow plus that flow necessary to replace one full fire flow storage in a period of 72 hours (3 days). Each pump station will have one standby pump with a capacity of the largest undivided pump at that station. At every pump station it is required that a control system be set up so that each pump operates approximately the same amount of time in any given period. Pump motors shall be of the high efficiency variety wherever it can be shown that the extra cost for the motor is less than the present value of 15 years of reduced energy costs.

3.12.6 SYSTEM CONTROL AND DATA ACQUISITION (SCADA) SYSTEM

All reservoir levels and key pumping station parameters (i.e., pump run, pump call, pump off, flow rate, pump hours, valve malfunctions, etc.) are telemetered by the Public Works Department which houses the SCADA computer and central control.

3.12.7 PRESSURE REDUCING STATIONS/FLOW CONTROL STATIONS

Pressure Reducing or Regulating Valves (PRV) are utilized to control pressures between distribution zones within the distribution system. The Engineering or Water Department may choose an FCV application depending on system needs. When water main extension plans are submitted for review and water availability analysis, the need for a PRV or FCV installation will be determined and located based on existing pressure zones and the existing distribution system layout on a case-by-case basis to be determined by the Engineering and Water Departments. In certain situations, the water department shall require monitoring of the valve(s) and vault via SCADA equipment. SCADA equipment shall be designed and purchased through Siemens Water Technologies with preapproval from the Water Department on final product. For RTU cabinet and pedestal design see details.

Cla-val or preapproved equivalent shall be used in all main line pressure reducing or flow control applications. Appurtenances shall include stainless steel pilot valves, a position indicator with site glass, speed valves for both open and closed applications, brass or SS 'Y' type strainers, glycerin filled pressure gauges on both high and low side of the PRV valve, and applicable valves on all appurtenances. Isolation ball valves must accompany all gauge lines. An in line tee shall be between the gauge isolation valve and the gauge; a hose bib shall be installed at the tee. The PRV shall have upstream and downstream isolation valves on the inside of the vault.

SECTION 3.13

WATER SYSTEM MODELING REQUIREMENTS

A water system model will be required on all final plan reviews. The following guidelines are provided.

3.13.1 Modeling Instructions

- A. In order to conduct hydraulic modeling, the developer will need to contact the City Water Division (801) 253-5230 to make arrangements to field test the water pressure at the site. The lower pressure between the field-test pressure and the pressure zone map (attached to this document and on the city website) should be used for design. The development engineer can assume that this source node serves as a fixed grade node or tank supply. Hydraulic modeling results will be provided to the City as part of the final development review submittal.
- B. City staff will integrate the development water model within the overall City system water model and evaluate the proposed development to ensure that the proposed development meets the required hydraulic conditions. In the event that development creates additional upstream impacts from the City supplied source node, the development engineer may be required to work with the City to identify appropriate system improvements to adequately serve development needs.

3.13.2 Deliverables

- The developer must submit an electronic version of the water model in the most updated version of EPANET or WaterCAD.
- The water model must contain **five (5) scenarios** showing Peak Instantaneous Flows, Peak Day Flows, Average Day Flows, Low Demand Flows, and Peak Day with Fire Flows.
- A report containing applicable spreadsheets showing all calculations stamped and signed by a Professional Engineer.
- A Utility Plan (11" X 17" is fine) containing waterline plans for the site.
- A Vicinity or Site Map of the area under review.

3.13.3 Demand Summation

For purposes of compiling the projected demand of any given development, calculate and compile the demand associated with each component noted above. The developer must provide a spreadsheet summary that identifies each demand component and sums the total demand components for each flow condition required for modeling.

3.13.4 Scenario Demand Assumptions

For Pressure Zones 1,2,3: (See attached map)

Flow Demand Scenario	Peaking Factor	Recommended Values for Water Demand Modeling
Average Daily (ADF)	1.0	0.5 gpm/ERC (Equivalent Residential Connection)
Peak Daily (PDF)	2.3	1.15 gpm/ERC
Peak Instantaneous (PIF)	4.6	2.3 gpm/ERC
Low Demand	0.4	0.2 gpm/ERC

For Pressure Zones 4,5,6: (See attached map)

Flow Demand Scenario	Peaking Factor	Recommended Values for Water Demand Modeling
Average Daily (ADF)	1.0	0.4 gpm/ERC
Peak Daily (PDF)	2.3	0.92 gpm/ ERC
Peak Instantaneous (PIF)	4.6	1.84 gpm/ ERC
Low Demand	0.4	0.16 gpm/ ERC

3.13.5 Fire Flow Demand Assumptions

Fire Flow Demand Condition	Required Flow	Required Duration
Small Residential (< 3600 SF)	1000 gpm	2 hours
Large Residential (> 3600 SF)	1750 gpm	2 hours
Other Uses	As determined by Fire Marshal on a case by case basis.	As determined by Fire Marshal on a case by case basis.

3.13.6 Non-Residential Assumptions per Land Use Type

In some instances there could be a land use type incorporated within a development that will require consideration within demand allocations. For example, a park or open space area contained within a residential development. In order to consider these types of uses, the following conversion table is provided to estimate flows.

Future Land Use Designation	Average Day Demands (Multiply by Peaking Factor for Different Scenarios)
C-C, C-N, C-F (Commercial)	2.0 gpm/acre*
MN-RD, M-U south, MU-Gate, M-UN Gate, MU-Comm, M-U city, BH-MU (Mixed Use)	2.6 gpm/acre*
PC (Large Master Planned Com)	1.73 gpm/acre*
OS (Office Space)	1.22 gpm/acre*
CI, IF (Industrial)	2.0 gpm/acre*

*Based on the South Jordan City Culinary Water Master Plan dated September of 2006.

3.13.7 Demand Summation

For purposes of compiling the projected demand of any given development, calculate and compile the demand associated with each component noted above. The developer must provide a spreadsheet summary that identifies each demand component and sums the total demand components for each flow condition required for modeling.

3.13.8 Flow Modeling Assumptions

- A. The hydraulic model must be compiled in a data format compatible with either EPANET or WaterCAD. EPANET was chosen for use by the City due to the fact that it is public domain software and may be acquired free of charge. In order to obtain the software, please access one of the two sources below:
 1. This software is available online at the following URL:
<http://www.epa.gov/ORD/NRMRL/wswrd/epanet.html>
 2. The software is also available on CD from the South Jordan City Water Division at a cost of \$5.00 (to cover the cost of reproduction).
- B. In completing the modeling, the development engineer will need to demonstrate that a number of conditions are met with the original model.
 1. Demonstrate that dynamic pressures within any portion of the pipe network do not drop below 20 psi at any time.

2. Demonstrate that pipe velocities under Peak Day and Peak Instantaneous conditions do not exceed 7 feet per second (fps).