**BENCHLAND WATER DISTRICT**

SPECIFICATIONS

FOR

PRESSURE IRRIGATION

SUMMARY OF MATERIALS SPECIFICATIONS

PROCEDURES FOR DEVELOPMENT REVIEW

GENERAL REQUIREMENTS & DRAWINGS

Most Recent Update: January 2006

Prepared by J-U-B Engineers, Inc.

BENCHLAND WATER DISTRICT

SUMMARY OF MATERIALS SPECIFICATIONS

PRESSURIZED IRRIGATION SYSTEM

Distribution System Lines

For sizes 4-inch through 12-inch:

C-900 PVC, DR-14, working pressure 200 PSI.

Must conform to AWWA C-900-81.

If specific conditions require ductile iron pipe minimum pressure class shall be 350.

For sizes 14-inch and larger:

If specific conditions require ductile iron pipe minimum pressure class shall be 250.

Magnetic Locator Tape, wire and GPS

All irrigation facilities installed shall be located GPS. Benchland shall provide the technical GPS readings upon coordination by Developer and Developer’s contractor.

All pipe shall include a 3-inch magnetic location tape and wire shall be provided by Benchland and installed by the contractor at developers cost.

All irrigation mainline and service laterals must have purple #12 gauge wire run in trench for location.

Distribution System Valves

For sizes 4-inch through 10-inch:

Resilient seated gate valves.

Must conform to AWWA C509.

For sizes 12-inch and larger:

Butterfly valves.

Must conform to AWWA Standard C-504, Class 150-B.

Valves boxes shall be two piece, cast iron, slip type, 51/4-inch shaft with drop lid. Lid shall be marked “BENCHLAND”.

Distribution System Sleeves

Shall be MJ sleeves only.

Air-Vacuum Valves

Minimum size 1-inch. APCO Air and Release Valve, Model 142.

Service Connection Line - Main Line to Box

High density Polyethylene IPS tube. Must meet ASTM D 2737 and AWWA C-901. SDR 9 - 200 psi pressure rating. Use WESTFLEX PE 3408 Gold Label or equivalent.

Compression Connections

Ford Compression of equivalent.

Service Fittings

Brass Tees and ells with Ford Connections or equivalent.

Service Valves

B-11 Ford Ball Valve.

Service Box

113/4- inch by 17-inch standard green fiberglass irrigation box with cover marked “IRRIGATION”. Brooks 1419 series with waterworks pentagon head locking device or equivalent.

Service Connection

1-inch PVC Schedule 40 is capped inside the fiberglass irrigation box at the property line.

General

All specifications not covered under these specifications shall be determined by the District Manager and /or District Engineer.

**PROCEDURES FOR DEVELOPMENT REVIEW FOR SECONDARY WATER**

**SUBDIVISIONS**

1. Preliminary plat

At the time the developer request preliminary plat approval, he should also make written application for secondary water to be provided by Benchland. The written application should include three (3) copies of the proposed preliminary plat. The copies will be redlined indicating the required line sized, valve locations and other appurtenances. One copy will be returned to the City for review with the developer.

1. Final Plat

At the time the developer requests final plat approval three (3) copies of the final plat and construction drawing should be submitted to Benchland for review. Upon review by the Engineer for Benchland written approval or a letter describing needed changes or additions will be sent to the City. If changes are needed the reviewed plans will need to be submitted to Benchland for review prior to final approval.

1. Construction

Once construction of the secondary water lines is ready to begin the developer will need to notify Benchland at least 48 hours in advance. Benchland will have a representative inspect the lines during construction and also be present to observe the results of required tests. Work performed without proper notification of Benchland or not conforming to the standards and specifications of Benchland will not be accepted and service will be withheld until corrective measures are taken to the satisfaction of Benchland.

**PROTECTION OF SECONDARY WATER LINES**

In order to provide the highest possible service levels to pressure irrigation customers, it is important that Benchland be notified of excavation or construction in the area near the secondary water facilities. The City will advise contractors, utility companies and others working within the public right-of-way that secondary water lines are present in each street. Benchland will mark the location of lines within generally accepted standards upon 48 hours prior notification. In emergency situations the time may be less if personnel are available. The City may choose to contact Benchland directly when a request for location of city utilities is made.

G**ENERAL REQUIREMENTS**

**1.01 DESIGN AND INSTALLATION PARAMETERS**

The following guidelines shall be followed in the design and construction of secondary water lines for the Benchland Water District; “Benchland”:

1. All lines shall grade to drain. Each line must be provided with a means of draining the line. All drains must be reviewed and approved by Benchland. Lines may be drained by connection to a lower line that has an adequate drain. If this is not possible a new drain must be installed.
2. All lines must have a minimum of 24-inches of cover. Because the lines must grade to drain there will be many lines or portions of lines that will require more than 24-inches of cover. As-constructed or record drawings should indicate approximate depth at regular intervals along the line.
3. All lines must provide for the discharge of trapped air during the filling process and the introduction of air into the system during draining. The type and location of air inlet and removal facilities shall be approved by Benchland.
4. Service lines shall be installed at property corners and double services shall be installed whenever possible. The service line shall be stubbed under the sidewalk to beyond the property line. There shall be no glue joints or fittings under the sidewalk. Lots from one-half to one acre shall be served by a 1-inch line. Parcels larger than one acre shall be considered on a case by case basis.

**1.02 PRE-CONSTRUCTION CONFERENCE**:

Following approval but prior to commencement of work at the site, the Contractor/Developer shall show the beginning and ending dates of the major items of work at the site.

1. An outline showing the sequences of construction of principle items of work. The outline shall show the beginning and ending dates of the major items of work at the site.
2. A list of names, titles, addresses, and telephone numbers of the Contractor/Developer’s responsible personnel, indicating those who may be reached outside normal working hours.
3. A list of Subcontractors and Materials Suppliers.

Other items may be discussed at this pre-construction conference as determined by the parties.

**1.03 CODES AND STANDARDS:**

Where codes and standards are referred to they shall be current, approved copies. It shall be the duty of the supplier of any material on this work to submit evidence, if requested, that his material is in compliance with the applicable codes and standards.

**1.04 STATE AND LOCAL LAWS:**

The Contractor/Developer shall conform to all applicable state and local laws in carrying out the work.

G**ENERAL REQUIREMENTS**

**1.05 APPROACH TO WORK:**

The work must proceed in a systematic way with a minimum of inconvenience to the public. The Contractor/Developer will confine his operations to as small a length of work per crew as feasible.

Each pressure irrigation line on the Drawings must be flushed, tested, and ready to be placed into service prior to the placement of any final road surfacing (asphalt).

The Contractor/Developer shall be responsible to obtain all necessary permits and to comply with all applicable ordinances of the city where the work is being performed.

**1.06 NOTIFICATION OF CUSTOMERS:**

In the event that the service will be interrupted to pressure irrigation customers they must be notified at least 24 hours in advance.

**1.07 WEATHER CONDITIONS:**

In the event of temporary suspension of work, or during inclement weather, the Contractor/Developer will, and will cause his subcontractors to protect carefully his and their work materials against damage or injury from the weather including extended exposure of PVC pipe to sunlight. If, in the opinion of Benchland any work or material shall have been damaged or injured by reason of failure on the part of the Contractor/Developer or any of his subcontractors to so protect his work, such materials shall be removed and replaced at the expense of the Contractor/Developer.

**1.08 OPERATION AND MAINTENANCE MANUALS:**

The Contractor/Developer shall furnish Benchland six (6) sets of all operation and maintenance manuals, drawings, diagrams, etc. For all pumps, motors, control panels, valves, meters, etc.

**1.09 GUARANTEE OF WORK:**

In lieu of actual installation of the pressure irrigation improvements required by this resolution, the Contractor/Developer shall guarantee the installation thereof by one of the methods specified as follows:

1. The Contractor/Developer may furnish and file with the Benchland Water District a bond with corporate surety or an irrevocable letter of credit from a bank chartered under the laws of the State of Utah or the United States of America and having an office in the State of Utah, in an amount equal to 100% of the cost of the pressure irrigation improvements, as estimated by the Benchland Engineer, to assure the installation of such improvements within a period of two years immediately following the approval of the subdivision plat by the City or County. The bond shall be approved by the Board of Trustees and the Benchland Attorney; or
2. The Contractor/Developer may deposit in escrow or trust account with an escrow holder or trustee approved by the Board of Trustees an amount equal to 100% of the pressure irrigation improvement cost as determined by the Benchland Engineer, under an escrow agreement to assure the installation of said pressure irrigation improvements within two years from the date of approval of the subdivision plat by the City or County. The escrow agreement shall be approved by the Board of Trustees.

G**ENERAL REQUIREMENTS**

Such bond or surety shall be reduced to 10% of the original amount bonded upon acceptance of the pressure irrigation improvements, and shall remain in force for a period of two (2) complete irrigation seasons after the Construction Completion Inspection for purposes of guaranteeing all pressure irrigation improvements. The minimum sum to be retained shall in no case be less than $3,000.00.

The Contractor/Developer shall make all repairs to and maintain the facility in good condition during that time with no cost to Benchland. It is further agreed and understood that the determination of the work rest with the Benchland Manager. His decision upon the matter shall be final and binding upon the Contractor/Developer. Whenever, in the judgment of the Benchland Manager, said work shall be in need of repairs, he shall cause a written notice to be served upon the Contractor/Developer, and thereupon the Contractor/Developer shall undertake and complete such repairs. In the event the Contractor/Developer refuses or neglects to make the necessary repair, the Board of Trustees may order the work done, using the proceeds from the bond, letter of credit, or escrow to defray expenses.

**1.09 EMERGENCY REPAIRS - SHARED SAVINGS:**

The Contractor/Developer shall deposit monies in the form of a shared savings account, in the name of Benchland Water District, in a financial institution licensed under laws of the State of Utah. The amount shall be equal to ten percent (10%) of the cost of the subdivision pressure irrigation improvement bond. These monies shall be used of emergency repairs, i.e., broken water lines, loss of service repairs caused by water line breakage, where safety is the prime factor. All repairs classified a s “Emergency” shall be so determined by the Benchland Manager. Where possible, Benchland will notify the responsible person(s) in writing at least two days before repairs are to be detrimental to the health and/or safety of persons living in the District. However, if no response occurs within two (2) working days, and depending on the severity of the repairs done. The Benchland Water District reserves the right to withdraw funds for necessary emergency repairs at any time independently of the Contractor/Developer. In the event monies are withdrawn for emergency repairs, it shall be the responsibility of the Contractor/Developer to deposit additional monies to bring the account up to the original amount deposited in the shared savings account. The monies deposited in the shared account, along with the accrued interest, and all District control of the account, will be released by Benchland at the time the Pressure Irrigation Improvement Bond money is released.

**1.10 GENERAL:**

All specifications not covered under these specifications shall be determined by the Benchland Manager and/or the Benchland Engineer.

**TRENCH EXCAVATION AND BACKFILL**

**2.01 CONTROL OF GROUNDWATER:**

All trenches shall be kept free from water during excavation, fine grading, pipe laying and jointing, and pipe embedment operations. Where the trench bottom is mucky or otherwise unstable because of the presence of groundwater, and in all cases where the static groundwater is above the bottom of any trench or bell hole excavation, such groundwater shall be lowered to the extent necessary to keep the trench free from water and the trench bottom stable when the work within the trench is in progress. Surface water shall be prevented from entering trenches.

**2.02 TRENCH EXCAVATION:**

Excavation for pipelines shall follow the line and grade shown on the plans. Trenches shall be excavated to the depths and widths required to accommodate the construction of the pipelines, as follows:

* 1. **Normal Excavation:**

Except in ledge rock, cobble rock, stones, or water saturated earth, mechanical excavation of trenches shall not extend below an elevation four inches above the bottom of the pipe after placement in its final position. All additional excavation necessary for preparation of the trench bottom shall be made manually.

B. **Authorized Over-Excavation:**

Excavation for trenches in ledge rock, cobble rock, stones, or other material unsatisfactory for pipe foundation shall extend to a depth of at least four inches below the bottom of the pipe. Where unstable earth or muck is encountered in the excavation at the grade of the pipe, a minimum of twelve inches (12") below grade will be removed.

C. **Unauthorized Over-Excavation**:

Where any unauthorized excavation is carried below the elevation required to install the pipe to the grade shown on the drawings, specified in these specifications or directed by Benchland, the excavation shall be back filled in accordance with these specifications for “Imported Granular Material” and “Gravel Foundation for Pipelines and Pipeline Structures”, all at the Contractor/Developer’s expense.

D. **Trench Width:**

The trench shall be excavated such that the pipe is always centered in the trench. The minimum clear trench with at the horizontal diameter of the pipe must not be less than the outside diameter of the pipe plus twelve-inches (12").

**TRENCH EXCAVATION AND BACKFILL**

E. **Trenches in Embankments:**

Before laying pipes that are to be in fill or embankment areas, the embankment shall first be placed and compacted to the specified density to a depth of not less than two feet (2') above the top of the proposed pipe. After placing and compacting the embankment, the trench for the pipe or conduit shall be excavated through the fill and fine graded and the pipe installed as specified.

F. **Fine Grading the Trench Bottom:**

The bottom of the Trench shall be accurately graded and prepared to provide uniform bearing and support on undisturbed soil or compacted gravel foundation at every point along the entire length of the pipe. Bell holes shall be hand excavated after the trench bottom has been fine graded. Bell holes shall be only large enough to permit making the joints and to assure that the pipe is not supported by any portion of the joint or bell.

**2.03** **TRENCH BACKFILL**

* 1. **Imported Granular Material:**
     1. General: When the excavated materials are not satisfactory for pipe foundation, pipe bedding or backfill, as determined by Benchland, the Contractor/Developer shall provide imported granular material. Imported granular material for foundation, bedding and backfill shall be cleaned, crushed rock or gravel free from sod, vegetation and other organic or deleterious material. Slag will not be allowed in the pipe zone.
     2. Gradation: Imported granular material shall conform to the following gradation specifications:

Gravel Foundation Material:

One hundred percent passing a one-inch screen and five percent passing a

one/half-inch screen.

Gravel Bedding Material:

Ductile iron pile – One hundred percent (100%) passing a one-inch screen and five percent passing a # 4 sieve.

PVC or Polyethylene pipe - One hundred percent passing a three/quarter-inch screen and five percent passing a #4 sieve.

Gravel Backfill Material:

One hundred percent passing a three-inch square sieve and fifteen percent passing a 200 mesh sieve.

**TRENCH EXCAVATION AND BACKFILL**

1. **Gravel Foundation for Pipe and Pipeline Structures:**

The gravel foundation is defined as fill material below the bottom of the pipeline structure or accessory. Wherever the trench is excavated below the sub-grade for the pipe, pipeline structure, or accessory the sub-grade shall be replaced with crushed rock or gravel to an elevation sufficiently above the bottom of the pipe so that the trench can be properly fine graded as specified and the pipe will be true to lien and grade. The gravel material shall be deposited over the entire trench width in layers. The layers shall have a maximum uncompacted to 90% of the maximum density of the material.

The material shall then be fine graded in accordance with the specification for “Fine Grading” herein.

1. **Pipe Bedding:**

Pipe bedding is fill material in the pipe zone. The pipe zone is defined as the area from the bottom of the pipe to 12-inches above the top of the pipe, or any area within one-foot of any pipe, pipeline structure or accessory.

Pipe bedding material may be excavated materials consisting of loose earth, sand or gravel having no material larger than 2-inches in any dimension or no greater than one-inch in any dimension for PVC pipe. If the excavated materials are not satisfactory, imported granular material as specified herein shall be used for pipe bedding.

After the pipe is in place, bedding material shall be placed at any point below the mid-point of the pipe simultaneously and uniformly on both sides of pipe in un-compacted layers not to exceed 10-inches or one-half the diameter of the pipe, whichever is less. Bedding material shall be placed with care to prevent displacement of or damage to the pipe during the bedding process. Material shall be scattered alongside the pipe and not dropped into the trench in compact masses.

That section of the pipe zone from the mid-point of the pipe to 12-inches above the top of the pipe shall then be filled with bedding materials and compacted to the density required in these specifications for backfill in this section of the trench.

1. **Trench Backfill:**

The trench shall be backfilled from twelve inches (12") above the top of the pipe to the natural surface level or the finished grade specified on the Drawings. Excavated materials are scattered and do not exceed six-inches (6") in any dimension. Perishable or spongy material shall not be used in backfilling.

Under pavements or other surface improvements the in-place destiny shall be a minimum of ninety-six percent (96%) of laboratory standard maximum dry density as determined by AASHTO T-99 or as required by the local jurisdiction. In shoulders and other area the in-place density shall be a minimum ninety percent (90%) of the maximum dry density as determined by AASHTO T-99 or as required by the local jurisdiction.

**TRENCH EXCAVATION AND BACKFILL**

1. **Compaction and Backfill:**

Backfill shall be compacted by means of sheepsfoot rollers, pneumatic tire rollers, vibrating rollers, or mechanical tampers.

**2.04** **CONTRACTOR/DEVELOPER’S RESPONSIBILITY:**

The Contractor/Developer will be responsible to see that the backfilling, consolidation and compaction are properly and adequately done. Settlement of trenches within a period of one year after final acceptance of the project, shall be considered incontrovertible evidence of inadequate compaction, and the Contractor/Developer shall be responsible for correcting the condition in accordance with the provisions of these Specifications, including the replacement of the surface materials.

**PRESSURE PIPE**

**3.01** **DUCTILE IRON PIPE:**

* 1. **Materials:**

Ductile iron pipe shall conform to all requirements of ANSI/AWWA C151/A21.51, “American National Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined molds, for Water or Other Liquids.” Minimum pressure Class will be 250 for pipes larger than 12-inch diameter. Pipes of 12-inch diameter and smaller shall be pressure Class 350.

* 1. **Joints:**

Mechanical Joints:

All mechanical joints shall meet requirements of ANSI/AWWA C111/A21.11. All gasket surfaces shall be smooth and free from imperfections. Gaskets shall conform to test in accordance with specifications and shall be less than one year old.

Push-on Joints:

All push-on joints shall meet the requirements of ANSI/AWWA C111/A21.11 Gaskets shall be free from defects and not over one year old.

Lubricants shall be non-toxic and have no deteriorating effects on gasket materials. It shall not impart taste to water in a pipe. It shall conform in

every way to ANSI 21.11.

Flanged Joints:

Flanges shall meet the requirements of ANSI/AWWA C110/A21.10, “American National Standard for Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch for Water and Other Liquids.” All buried fittings having steel bolts shall be coated with a non-oxide was and wrapped with polyethylene.

Gaskets shall be rubber, either ring or full face, and are 1/8th -inch thick. A gasket for each flanged joint of proper size as shown on the drawings.

* 1. **Coatings and Linings for Ductile Iron Pipe**:

All exterior surfaces of pipe and fittings shall be coated with hot coal tar approximately 1 mil thick. All interior surfaces shall be cement mortar lined with a standard thickness according to ANSI/AWWA C104/A21.4-80.

* 1. **Flanges:**

Flanges when required shall conform to ANSI/AWWA C115/A21.15-83.

* 1. **Fittings:**

Fittings for Ductile Iron Pipe shall conform to the provisions of ANSI/AWWA C110/A21/10-82 or C153/A21.53-58.

**PRESSURE PIPE**

**3.02 PVC PIPE:**

1. **Materials**:

Pipe for the transmission and distribution of water shall be manufactured in accordance with AWWA C900-81, “AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water”. The PVC pipe shall have a cast-iron-pipe-equivalent outside diameter. PVC pipe 14-inches and larger shall be manufactured in accordance with AWWA C905-88, “AWWA Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch”. All PVC pipe 4-inch and larger shall be DR. 14 with a working pressure of 200 PSI. Pipe smaller than 4-inch shall be schedule 40 PVC.

1. **Joints:**

Joints shall be push on rubber gasket type. Lubrication shall be water soluble, non-toxic, non-objectionable in taste and odor imparted to the water, non-supporting of bacteria growth, and have no deteriorating effect on the PVC pipe or rubber gaskets.

1. **Fittings:**

All fittings to be used with the PVC pipe shall be the same as fittings for Ductile Iron Pipe and shall conform to the provisions of ANSI/AWWA C110/A21.10-82.

1. **Magnetic Locator Tape**:

All irrigation facilities installed shall be located GPS. Benchland shall provide the technical GPS readings upon coordination by Developer and Developer’s contractor.

All pipe shall include a 3-inch magnetic location tape and wire shall be provided by Benchland and installed by the contractor at developers cost.

All irrigation mainline and service laterals must have purple #12 gauge wire run in trench for location.

**3.03** **PIPE INSTALLATION:**

* 1. **Cutting:**

Cutting of pipe for closure pieces or for other reasons shall be done in a neat and workmanlike manner by a method recommended by the manufacturer. After cutting, the pipe shall be beveled and field to prevent gasket damage in joint assembly.

* 1. **Dewatering of Trench:**

Where water is encountered in the trench, it shall be removed during pipe laying operations and the trench so maintained until the ends of the pipe are sealed. See “Control of Ground water” in Division 2 Trench - Excavation and Backfill.

**PRESSURE PIPE**

* 1. **Laying of Pipe:**

The pipe and pipe coating (where applicable) shall be inspected for defects before installation. Any defects shall be repaired or the pipe shall be replaced, whichever is deemed necessary by the Engineer.

All pipe shall be laid and maintained to the required lines and grades with fittings and valves at the required locations.

All pipe, fittings and valves shall be carefully lowered from the truck when unloading or when installing into the trench. This should be done one piece at a time in order to prevent damage to pipe materials and protective coatings and linings. Under no circumstances shall materials be dropped or dumped from the truck or into the trench.

The Contractor/Developer shall take the necessary precautions such that foreign materials do not enter into the pipe. No debris, tools, or other materials shall be placed in the pipe during laying operations. When laying of pipe is not in progress, the pipe shall be closed by a water-tight plug.

Maximum deflections at pipe joints shall not exceed the joint specifications of AWWA C600 of latest revision, or the recommendations of the pipe manufacturer.

Deflections in PVC pipe shall be made by longitudinal bending of the barrel of the pipe rather than deflecting the pipe joints. Longitudinal bending shall be limited to eighty percent (80%) of the manufactures recommended minimum bending radius.

* 1. **Pipe Bedding:**

All pipes shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.

In the event trench materials are not, in the judgment of the Engineer, satisfactory for pipe bedding, imported granular bedding will be required.

* 1. **Thrust Blocking:**

Thrust blocking shall be applied at all tees, valves, plugs, caps and at bends deflecting 221/2 degrees or more. The fitting shall be encased in a protective plastic wrap before the thrust block is poured. Reaction blocking shall be concrete having a compressive strength of not less than 3,000 pounds per square inch at 28 days. Blocking shall be placed between undisturbed soil and the fitting to be anchored. The blocking shall be so placed that the pipe and the fittings will be accessible for repair.

**PRESSURE PIPE**

* 1. **Connections to Existing Water Lines**:

Information from “as-constructed” drawings may or may not be accurate as to size, type of material or location. The Contractor/Developer will be responsible to determine the proper fittings and materials required, obtain Benchland’s approval of the planned connection, and perform the construction in a suitable fashion. All valves for connecting to the existing mainline will be shut down by Benchland personnel only. Please note: 24 hours prior notice is required.

**3.04** **TESTING AND FLUSHING:**

1. **General:**

All water lines shall be tested and flushed as outlined in this section.

1. **Testing:**

Test shall be made upon completion of system installation or any valved portion thereof. All test shall be made in the presence of a Benchland Representative.

Lines shall be slowly filled with water, venting off all air. If required, the taps shall be provided at line high points to bleed off the air and after testing these shall be plugged. A minimum pressure of 50% in excess of the maximum line operating pressure shall be maintained on the portion being tested for a minimum period of two hours, using either pneumatic or hydraulic means to maintain the pressure. Maximum leakage during the test shall not exceed one-half (½) gallon per inch of diameter per 1000 feet of pipe. Suitable means shall be provided by the Contractor/Developer for determining the quantity of water lost by leakage under the test pressure. No pipe installation will be accepted until the leakage is less than the allowable. Repairs of pipelines shall be made in a manner approved by Benchland.

1. **Flushing:**

After pressure testing, all pipelines shall be flushed. Flushing shall be accomplished through valves at the end of each line. The Contractor/Developer shall provide for a 2.5-foot per second flushing velocity in the line. The following is the flow quantity required to provide a 2.5-foot per second flushing velocity:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Pipe Size Flow**

**(Inches) (gpm)**

2 26

4 100

6 220

8 390

10 610

12 880

**VALVES AND COUPLINGS**

**4.01** **RESILIENT SEATED GATE VALVE:**

Valves in sized 4" through 10" shall be of the iron body, non-rising bronze stem, resilient seated type, manufactured to equal or exceed all applicable AWWA standards of C-509 latest revision and all specific requirements outlined in these specifications.

* 1. Valves shall open left and be provided with 2" square operating wrench nuts unless otherwise specified.
  2. The disc shall have integrally cast ASTM B-62 bronze stem nut to prevent twisting, binding or angling of the stem. Designs with loose stem nuts are not acceptable.
  3. Bronze valve stems shall be interchangeable with stems of the double disc valves of the same size, direction of opening and manufacture.
  4. All internal ferrous surfaces shall be coated, holiday free, to a minimum thickness of 4 mils with a two part thermo setting epoxy coating. Said coating shall be non-toxic, impart no taste to the water, formulated from materials deemed acceptable in the Food and Drug Administration Document Title 21 of the Federal Regulations on food additives, Section 121.2514 entitled Resins and Polymeric Coatings. It shall protect all seating and adjacent surfaces from corrosion and prevent build-up of scale or tuberculation.
  5. The sealing element shall be secured to the disc with self locking stainless steel screws, and it shall be field replaceable, and shall be such that it cannot be installed improperly.
  6. Stem failure from over torquing in either the open or closing position shall occur externally at such a point as to enable the stem to be safely turned by use of a readily available tool after exposure of the valve through excavation.
  7. Valve design shall incorporate a positive metal to metal stop to prevent over-compression of the sealing element.
  8. A full faced composition gasket placed between machined body and bonnet flanges is required to eliminate cold flow or creep action present with “O” ring gasketed bodies.
  9. Valves shall have a test plug in the bonnet area to vent air and allow line pressure testing.
  10. The exterior of the valves shall be Asphalt Varnish, Jan-P-450. If exterior epoxy is used, all bolts and nuts shall be made of Stainless Steel to prevent galvanic corrosion of said nuts and bolts due to insulation from the ferrous valve and line.

**VALVES AND COUPLINGS**

**4.02 BUTTERFLY VALVE:**

Unless otherwise noted, all valves 12" and larger shall be butterfly valves conforming to the latest revision of AWWA Standard C504, Class 150-B, and comply with the following:

1. Valve bodies shall be cast iron, ASTM A-126 Class B. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125; or mechanical joint in accordance with AWWA C-111. All mechanical joint end valves shall be furnished complete with joint accessories (bolt, nuts, gaskets, and glands). All valves shall conform with AWWA Standard C-504, Table 3, Laying Lengths for Flanged Valves and Minimum Body Shell Thickness for all Body Types.
2. Valve disc shall be ductile iron ASTM A-536, grade 65-45-12. Valve disc shall be of the offset design providing 360 degree uninterrupted seating.
3. The resilient seat shall be natural rubber bonded to an 18-8, Type 304 stainless steel retaining

ring secured to the disc by 18-8, Type 304 stainless steel screws. The seat shall be capable of mechanical adjustment in the field and field replaceable without the need for special tools.

* 1. Valve shafts shall be 18-8, Type 304 stainless steel. Shafts shall be of the two piece stub design and attached to the disc by means of “O” ring sealed taper pins with lock nuts.
  2. The valve assembly shall be furnished with a non-adjustable factory set thrust bearing designed to center the valve disc at all times.
  3. Shaft bearings shall be contained in the integral hubs of the valve body and shall be self-lubricated sleeve type.
  4. Valve shaft seal shall consist of “O” Rings. Where the valve shaft projects through the valve body for actuator connection, the “O” Ring packing seal shall be field replaceable as a part of a removable bronze cartridge.
  5. When manual actuators are required they shall be of the traveling nut design capable of withstanding 450 foot pounds of input torque against the open and closed stops. All actuators shall have adjustable mechanical stop limits. The closed position stop shall be externally adjustable. Valves shall be installed with the shaft horizontal unless otherwise directed by the Engineer and shall be provided with a 2" square operating nut for manually operating the valve with a “T” handle wrench.
  6. All valves shall be coated with epoxy in conformance to AWWA Standard C-550, latest revision. Interior wetted ferrous surfaces shall be coated a nominal 10 mils thick for long life; and body exterior shall have a minimum of 3 to 4 mils coating thickness in order to provide superior base for field-applied finish coats.

**VALVES AND COUPLINGS**

**4.03 VALVE BOXES:**

All buried valves shall be installed complete with two-piece, cast iron, screw type, 5 - 1/4" shaft valve box with drop lid. The lid shall have the word “Benchland” cast in the metal.

Valve and valve boxes shall be installed where shown on the drawings. Valves and valve boxes shall be set plumb. Valve boxes shall be centered directly over the valve. Valves shall be aligned with property lines where possible. Earth fill shall be carefully tamped around the valve box to a distance of four (4) feet on all sides of the box, or to the undisturbed trench face if less than four (4) feet. Valves shall have the interiors cleaned of all foreign matter before installation.

All valve boxes shall be installed as nearly to grade as possible. After the pavement is in place, the valve boxes shall be raised to grade, the surrounding asphalt shall be neatly cut to form a circular opening 2'-6" in diameter with the valve box centered, and a concrete collar shall be cast around the box.

**4.04 COUPLINGS:**

Couplings shall be MJ ductile iron sleeve type for both ductile iron and PVC pipe. Couplings shall be of the straight, transition, or reducing style as required by the specific installation. All steel fittings and bolts shall be coated with a non-oxide coating and wrapped with polyethylene.

**RESTORATION OF SURFACE IMPROVEMENTS**

**5.01 GENERAL:**

The contractor/Developer shall be responsible for the protection and the restoration or replacement of any improvements existing on public or private property at the start of work or placed there during the progress of the work.

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

The following are minimum requirements. The Contractor/Developer shall comply with all requirements of the local jurisdiction. Where there exists a discrepancy between these requirements

and those of the local jurisdiction the more restrictive shall apply.

**5.02 REMOVAL OF PAVEMENT, SIDEWALKS, CURBS, ETC:**

The pavement, sidewalk, curb and gutter, driveway, etc. shall be cut vertically along the lines forming the trench, or nearest full joint, in such a manner as to not cause damage to adjoining pavement, sidewalk, curb and gutter, driveway, etc. The portion to be removed shall be broken up in a manner that will not cause damage to the pavement or concrete outside the limits of the trench; however, any pavement damaged by operations outside the limits of the trench shall be replaced at the Contractor/Developer’s expense. Broken paving materials shall be removed immediately form the site of the work.

**5.03 MATERIALS:**

Materials used for repair or replacement of surface improvements shall be equal to or better than the material removed:

1. **Untreated Base Course:** Untreated base course shall comply with State of Utah Standard Specifications for Road and Bridge Construction, latest edition. Benchland Water District

shall take samples of the untreated base course on a random basis. All materials not meeting

the tolerance requirements shall be removed from the project and replaced with specification material.

1. **Bituminous Surface Course:** The bituminous surface shall be hot-rolled plant mix in accordance with State of Utah Standard Specifications of Road Construction, latest edition.
2. **Concrete:** Concrete shall be minimum six bag mix and shall comply with all requirement of the local jurisdiction.

**5.04 RESTORING BITUMINOUS, CONCRETE, OR ASPHALT STREET SURFACES:**

Where trenches are in or cross bituminous or concrete surfaced roads, traffic lanes, driveways, parking areas, etc., the bituminous or concrete surface shall be cut, restored as quickly as there is sufficient quantity to make it practical, weather permitting, and maintained as follows:

**RESTORATION OF SURFACE IMPROVEMENTS**

* 1. Before Excavation: All existing asphalt or concrete surfaces shall be cut to a square edge before excavation.
  2. Temporary Graded Surface: Until resurfacing can be done in paved areas a temporary gravel surface shall be placed deep enough to provide a minimum of six-inches (6") below the bottom of the bituminous surface and shall be brought flush with the paved surface.
  3. Preparation for Paving: The area over trenches to be resurfaced shall be graded and rolled with a roller weighing not less than 12 tons, or with the rear wheels of a five-yard truck loaded to capacity, until the subgrade is firm and unyielding. Mud or other soft or spongy material shall be removed and the void filled with gravel and rolled and tamped thoroughly in layers not exceeding six inches in thickness. The edges of trenches which are broken down during the making of subgrade shall be removed and trimmed neatly before resurfacing.

Before any permanent resurfacing is placed, the Contractor/Developer shall trim the existing paving to clean, straight lines as nearly parallel to the centerline of the trench as practicable.

Existing bituminous paving shall be cut back a minimum of six-inches beyond the limits of any excavation or cave-in along the trench so that the edges of the new paving will rest on at least six-inches (6") of undisturbed soil.

* 1. Bituminous Surface: The bituminous surface shall be restored by standard paving practices to a minimum thickness of three-inches (3"). If the existing pavement is thicker than three-inches the Contractor/Developer shall match the existing.

Pavement restoration shall include priming of pavement edges with Type MC-70 bituminous material and placing rolled plant hot mix bituminous material to the level of the adjacent pavement surfaces.

**5.05 GRAVEL SURFACE:**

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

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

Passing 1-inch sieve 100 %

Passing ½ “sieve 79 - 91 %

Passing # 4 sieve 49 - 61 %

Passing # 16 sieve 27 - 35 %

Passing # 200 sieve 7 - 11 %

**RESTORATION OF SURFACE IMPROVEMENTS**

**5.06 MISCELLANEOUS IMPROVEMENTS:**

It shall be the Contractor/Developer’s responsibility to restore to their original condition all irrigation canals, levees, culverts, gates, fences, drainage ditches, and all such improvements which are cut or disturbed during construction. Topsoil in farming areas or along road edges shall be stored separate from subsoil during pipe trench excavation. Topsoil shall be replaced during backfill operations as nearly as possible to its original condition, thereby assuring suitable soil for re-seeding.

**5.07 RESTORATION OF SURFACES:**

Unless otherwise directed, all street surfacing, curbs, gutters, sidewalks, driveways, or other hard surface that must be removed in the performance of the work shall be restored in kind by the Contractor/Developer in accordance with the Specifications contained herein. Deviation of more than one-fourth inch (1/4") between old and new work or within new construction shall be corrected. Such measurement shall be made from a ten foot (10') minimum length straight edge. Adjoining surfaces between old and new must be flush.

**5.08 CLEANUP:**

At the completion of each area of work all equipment, barricades, and similar items shall be removed from the area. All excess material will be removed. All rocks larger than two inches (2") shall be removed from the surface. Adjacent borrow pits and road shoulders used for storage of excavating materials will be smoother and returned to its original contour.

**5.09 PAVEMENT MARKINGS:**

The Contractor/Developer will be responsible for restoration of pavement markings on all City and/or County roadways. Restoration of pavement markings shall conform to the applicable local and state specifications.

On roadways under UDOT jurisdiction temporary pavement markings shall be provided for any removed or obliterated markings. The temporary markings shall conform to UDOT standards and specifications. Permanent pavement markings will be replaced by UDOT.

**SPECIAL VALVES**

**6.01 GENERAL:**

This section covers all specialized valves including Pressure Reducing Valves, Air Vacuum Valves and 2-inch Air Blow-off Assembly.

**6.02 AIR - VACUUM VALVES:**

Air - Vacuum Valves shall be designed to release large quantities of air from the pipe during the time of filling and admit large quantities of air into the pipe during the time of draining.. When water raises into the valve it shall cause a float to raise and close the air escape opening. The valve shall remain closed as long as there is pressure in the pipeline. The float shall be precision formed and seat against a resilient seal. When the pipeline pressure at the valve drops below atmospheric pressure, the float shall drop away from the seal and allow the entrance of a large volume of air. The valve body may be made of metal or plastic, and it shall operate trouble free at pressures up to 200 PSI. It shall be 1-inch nominal size with a 1-inch threaded base connection. The valve shall be the APCO Air and Release Valve, model 142 or equivalent. The valve shall be placed in a manhole cone with a vented cover.

**6.03 2-INCH AIR BLOW-OFF ASSEMBLY AT TEMPORARILY DEAD ENDED LINES ONLY:**

The piping air removal valve assembly consists of a bronze service clamp, Mueller Model H-13490, clamped in place in locations as indicated on the plans. Tapping through a 2-inch female connection will be accomplished with standard tapping equipment before the system is filled. A 2-inch ell with compression fitting installed as shown on detail and galvanized steel pipe installed. A 2-inch bronze gate valve with screwed ends is installed where the box is located. Install a short nipple and 90° ell with vertical rises. All threads except the fire hose connection shall be standard pipe threads. The fire hose connection shall have standard fire hose connection threads for a 2 ½ -inch fire hose. A fire hose cap with chain secured to the stand pipe shall be installed at the end of th vertical stand pipe. For units installed near curb and gutter an 11 3/4 -inch by 17-inch standard green fiberglass irrigation box with cover shall be installed over the 2-inch gate valve and20inch stand pipe. A sign shall be attached to or embossed on the cover indicating as follows: “IRRIGATION AIR RELEASE”. Box shall be locking type as manufactured by Brooks Products, Inc. Model 1419 body with a 1419 cover bolt down or equivalent. For units installed where there is no curb and gutter, the irrigation box shall be a 48-inch by 3-feet (48"x3') manhole cone section with a 24 - inch CI manhole ring and grate equal to D&L Supply C-2670 as shown on Drawings.

**6.04 PRESSURE REDUCING VALVES:**

Pressure reducing valve shall be Clayvalve or approved equivalent in the sizes shown on the drawings. The valve shall conform to the following:

Body Size: As shown on the drawings

Body Material: 18-8 Stainless Steel

Liner Material: Silicone, 70 durometer

Liner Retainer: Yes

Flange Class: ANSI 150 lb.

The control system shall be Clayvalve and shall be adjustable for a discharge pressure form 15 to 85 PSI. All control tubing and gages shall be controlled by ball isolator valves. Opening and closing speed control shall be provided.

**SPECIAL VALVES**

**6.05 PILOT CONTROL FILTER:**

Each pressure reducing station shall be equipped with a pilot control filter. Each filter shall have a 100 micron filter mesh screen and the filter shall be operable for inlet pressures in excess of 25 PSI. Filters shall utilize a backflush type cleaning system to purge the filter of collected sand and sediment. Filters shall be Rollseal Model F76 or equivalent.

**6.06 PRESSURE GUAGE**:

Pressure Gauges shall be two and one-half inch by one-quarter inch (2 ½ “X 1/4 “), 160 PSI range, oil or glycerin filled, brass or stainless steel case and + one and one-half percent (1 ½ %) accuracy. Provide one-quarter inch (1/4") shut off cock, rated 200 PSI.

**SERVICE CONNECTION**

**7.01 GENERAL:**

This section covers the installation of service connection and components to homeowner’s property line.

**7.02 SERVICE SADDLE SPECIFICATIONS:**

(For use with AWWA C-900 Ci O.D. for PVC plastic pipe.)

All service clamps shall be of a “Full encirclement design,” and shall be O.D. controlled, which design will eliminate the possibility of pipe crushing due to the over torquing of the nuts upon installation.

All service clamps shall be manufactured of brass cast in conformance to AWWA C-800, General Section - 1, Paragraph 1.2 (ASTM B-62).

The two sides of the clamp shall be held together by high quality Silicon Bronze Hex bolts ( in sizes 1" and over) or Silicon Bronze Slotted Screws ( in sizes under 1"), no dissimilar metals shall be allowed at this point thus eliminating the possibility of galvanic corrosion.

All service clamps shall be Ford Model S-91 Series and Romac 305 Series for 14" or larger.

**7.03 POLYETHYLENE TUBING:**

Pipe for the transmission of irrigation water from main to utility box shall be Polyethylene IPS tube. Polyethylene IPS tube shall be manufactured in accordance with the standard specification for Polyethylene (PEP plastic tubing as issued by the American Standard for Testing and Materials under ASTM D 2737 and AWWA C-901.)

Material designation code: Polyethylene PE 3408

Elastic Extrusion Compound: Type III, Class C, Grade 34, as defined in ASTM D 1248

Standard pipe dimension ratio IPS (SDR) 9 - 200 PSI pressure rating.

All tubing for service lines shall be cut and installed in a neat and workmanlike manner by a method recommended by the manufacturer.

Tubing shall be WESTFLEX PE 3408 Gold Label or equivalent.

**SERVICE CONNECTION**

**7.04 COMPRESSION CONNECTION:**

* 1. The interior surface of the coupling nut, including threads, shall have a baked on, fluorocarbon coating to reduce assembly friction and prevent the gasket from turning and twisting during tightening. The nut shall bottom on a cast or machined shoulder on the body when properly assembled. This design will provide a visual check to assure connection is properly assembled.
  2. The sealing gasket shall be of molded synthetic rubber (ASTM D-2000) with molded in place bronze spring (ASTM A-134 Alloy #6) to eliminate the possible cold flow of the gasket between the pipe and fitting. A gripper band of hardened stainless steel (ANSI Type 401) shall be fitted into the gasket. When the gasket is compressed it will cause the gripper ring to distort the pipe giving the fitting a high resistance to pull out. The gripper band shall overlap itself to prevent cold flow of the gasket into the cavity under the band.
  3. When Ford compression fittings are used with P.E. Pipe, Stainless Steel pipe stiffeners are required to be used to eliminate cold flow of plastic pipe.
  4. All fittings are to be for IPS Polyethylene pipe.
  5. The minimum pullout load for the fitting when used with PE plastic pipe shall be as follows for each given size:

SIZE MINIMUM PULL OUT (FT. LBS.)

1" 400

1 ½ “ 500

2" 500

FORD COMPRESSION COUPLINGS AND FITTINGS OR EQUIVALENT ARE TO BE USED ON ALL P.E. PLASTIC PIPE INSTALLATIONS.

**7.05 SERVICE FITTINGS:**

All service fittings such as brass tees, and brass ells shall be Ford connections.

**7.06 B-11 BALL VALVE:**

These valves shall be closed bottom design and sealed against external leakage at the top by means of a non-adjustable resilient pressure actuated seal, and shall be provided with a secondary resilient seal disposed above the pressure seal for added protection of the bearing surfaces against ground water infiltration. All curb valves shall be quarter turn valves and the fully open integral parts of the key and body. The maximum pressure rating shall be 175 PSI water at a maximum temperature of 180 degrees Fahrenheit.

All fittings are to be IPS, used on IPS (Iron Pipe Size) Polyethylene pipe. No CTS polyethylene pipe or fittings are to be used.

Curb stop valves shall be FORD B-11 BALL VALVE CONFIGURATION.

**SERVICE CONNECTION**

**7.07 SERVICE BOX:**

Service box shall be an 11 3/4"-inch by 17-inch standard green fiberglass irrigation box with cover. Service Box shall be installed over the 1-inch to 2-inch service line where it branches to the respective homeowner’s property. A sign shall be attached or embossed to or on the cover indicating as follows: “IRRIGATION.” Box shall be Brooks 1419 series utility box with lid recessed and shall be provided with Waterworks Pentagon Head locking device or equivalent.

**7.08 PVC PIPE:**

Pipe for the transmission of irrigation water from the PVC FIPT adapter to the home owners property line shall be schedule 40 PVC pipe. Pipe shall be manufactured to meet the requirements of Materials - ASTM D-1784, and Cell Class - ASTM D12454A. Joints shall be of solvent manufacturer of the pipe. A solvent weld cap will be installed on the end of the pipe at the property line. No joints will be allowed under sidewalks or other paved surfaces.

For lots up to one-half acre the service line stubbed to the property shall be 1-inch. For lots larger than one-half acre and up to one acre the service line stubbed to the property shall be 1-inch or larger to be determined by the Benchland Engineer.

**BENCHLAND WATER DISTRICT**

**RIGHT-OF-WAY REQUIREMENTS**

All persons are advised of the following right-of-way, or easement, requirements of Benchland Water District:

1. Benchland Water District has the unrestricted right to install, construct, maintain, access, and operate its equipment, pipeline, and other facilities within the Benchland easement identified on this plat map, above and below the ground.
2. Benchland Water District has the right to require (at the landowner’s expense) removal of any obstructions located within the easement, including without limitation structure, fences, trees, and vegetation.
3. All structures and building that interfere with Benchland’s rights under Section 1 above are prohibited.
4. Wooden and/or chain link fences are not permitted on the right-of-way, unless:

They cross the right-of-way at an angle that is not less than 30° to the pipeline and they follow the property line; and

A full 36" gate is installed in each fence crossing for patrol and maintenance access.

Landscaped areas are permitted within the right-of-way and over the pipeline as long as Benchland is notified of development plans and approves all proposed work prior to construction. Trees are not permitted within the right-of-way. Placement of lawn within the right-of-way does not require approval.

Concrete and/or asphalt are not permitted within the easement without the prior written consent of Benchland Water District.

Other utilities may be installed within the easement, only with the prior written consent of Benchland Water District. Such utilities must maintain a minimum of three feet parallel clearance (five feet preferred). These clearances must conform to existing state and federal regulations. A minimum of 12" of clearance must be maintained at the crossing point between other utilities and the Benchland pipeline.

A minimum of 24 inches, and not more than four feet, of cover shall be maintained over the center line of Benchland pipeline at all times, unless government regulations require more cover.

All vertical changes in ground contour either within the easement or adjacent to the easement are not permitted, without Benchland prior written consent. Such proposed changes in ground contour must be submitted to Benchland Water District for consideration and written approval, prior to construction.

Updated 01/27/2006