

**UNIFORM DESIGN AND
CONSTRUCTION STANDARDS
FOR POTABLE WATER
DISTRIBUTION SYSTEMS**

SECTION 3

**UNIFORM
CONSTRUCTION
STANDARDS**

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3.00 GENERAL STATEMENT

The UDACS, Section 3, Uniform Construction Standards, is to provide a minimum construction standard guideline to be applied in the construction phase of a project. The Contractor is responsible to perform construction per approved plans, and these standards. Any deviation shall be submitted by the Developer's Engineer for Agency review and approval prior to construction.

3.01 STANDARD SPECIFICATIONS

Whenever the words "Standard Specification" appear on the plans or in these Uniform Design and Construction Standards for Potable Water Distribution Systems, they shall refer to the "**Standard Drawings and Specifications for Public Works Construction Off-site Improvements, Clark County Area, Nevada**", as amended. Unless otherwise specified herein, the "Standard Specifications" shall apply. Where conflicts may arise, the "Uniform Design and Construction Standards for Water Distribution Systems" shall govern.

3.02 CONTRACTOR'S LICENSE

All contractors installing mains, laterals, and appurtenant above-ground and underground structures shall have a valid license of a "Class" and a "Monetary Limit" corresponding to the work to be performed, in accordance with the provisions of the State of Nevada Contractors' License Law and NRS 624. This standard applies to all facilities located within public ROW's and Agency easements which, when completed, will be maintained by the Agency.

3.03 CONTRACTOR'S RESPONSIBILITY

It shall be the Contractor's responsibility to perform construction as per approved plans. A copy of the approved plans, a copy of the current Uniform Design and Construction Standards (UDACS), and any amendments adopted by the Agency shall be onsite at all times. Any additions, deletions, or changes shall first be submitted by the Developer's Engineer for Agency review and approval prior to constructing any said additions, deletions, or changes.

3.04 APPROVED PRODUCTS AND MATERIALS

The Contractor shall use products, materials, and mix designs identified on the Approved Products Listing of the Agency having jurisdiction, unless prior approval is obtained from the Agency.

3.05 ROW ENCROACHMENTS

The Contractor is required to comply with any restrictions imposed by permit(s) from the State, City, County, or other appropriate jurisdictional group.

3.06 CUT SHEETS

Cut sheets must be submitted for Agency approval a minimum of two (2) working days prior to any project construction in which the water main was designed with a specific profile. The cut sheets shall be prepared by, or under the supervision of, and signed by an NPLS or NPE.

Cut sheets will show, at a minimum, the following:

1. Stationing matching the approved plans
2. Hub elevations
3. Invert elevations
4. Cuts
5. Direction and distance of offset
6. Street names
7. Job title
8. Date of preparation
9. Benchmark data
10. Names of surveyors
11. Fittings, valves, and other appurtenant items

3.07 GRADE LINE

When the water main design has a profile with grades, the Agency may require a grade line be set at the designed grades prior to installing any pipe. A laser may be used in lieu of a grade line.

3.08 CONSTRUCTION STAKING

The Agency requires construction staking to include the offset, station, and the cut printed at each hub. Hubs shall be at fifty (50) foot (or less) stations, and every ten to twenty-five (10 - 25) feet on curved lines (depending on the curve radius), as required by the Agency, and ten (10) foot intervals in intersections with heavy traffic conditions.

3.09 RECORD DRAWINGS

Upon construction completion, and prior to the release of any bonds, the Contractor shall submit certified as-builts to the Developer's Engineer, as required by the Agency. At a minimum, as-builts shall include: distance between all valves and fittings, lateral locations at the property line, alignment changes, and existing utilities crossing the water main. The Engineer will provide the Agency with record drawings on mylars of good quality or in a digital format compatible with AutoCAD, at the Agency's option. The record drawings must reflect the certified as-builts, and be submitted prior to final Agency project acceptance and/or prior to issuing a Certificate of Occupancy.

3.10 EARTHWORK

The Contractor shall perform all earthwork required to construct all facilities, pipelines, and appurtenances as specified or shown on the drawings.

3.10.01 Excavation

- A. Excavations, including the manner of supporting excavations and provisions for access to trenches, shall conform to applicable Federal and State Industrial Safety requirements. All work shall be conducted in a manner to prevent damage to the work or adjoining property.
- B. Pipeline excavations shall be open-cut trenches with vertical sides up to the pipe crown, unless otherwise shown on the drawings or provided herein. The trench bottom shall have a minimum width as per the UDACS Plates. For rigid pipe, where the trench width is not defined by UDACS Plates, the trench width shall be designed by the Developer's Engineer and approved by the Agency. Compaction of foundation, bedding, and initial backfill shall extend to the trench wall.
- C. Whenever the excavation is made below the grade shown on the drawings, the over-excavated trench shall be backfilled to the required grade with suitable material, as defined herein, and said material shall be brought to optimum moisture content and compacted by mechanical means to at least ninety (90) percent of maximum density in layers not exceeding six (6) inches in thickness.
- D. Excess material and excavated material determined unsuitable for backfill by the Agency's Representative shall be removed from the work site.
- E. The Contractor shall provide a uniform, stable, base to the grade shown on the plans or to the minimum depth required.
- F. Where an unstable or running soil condition is encountered in the trench wall, such as may be found by excavation below groundwater, this condition shall be stabilized by an approved material before laying the pipe.
- G. Whenever the excavation exceeds the maximum allowed trench width per the Standard Plates, the Developer shall provide a recommended correction by a licensed soils engineer or backfill the pipe zone with CLSM II.

3.10.02 Dewatering

Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall be continuous until such times as water can be allowed to rise in accordance with the following provisions. Dewatering shall be conducted such that no concrete footings, floors, or pipelines are placed in water nor shall water be allowed to rise over them until the pipeline has been pressure tested and any concrete or mortar has achieved final set. Water shall not be allowed to rise unequally against walls until design strength is achieved or for a period of twenty-eight (28) days, nor shall water be allowed to rise in pipeline trenches or drained excavations until pipelines or facilities are backfilled or restrained to prevent flotation.

3.10.03 Pipe Bedding

The requirements for backfill materials are identified in UDACS Plates 16 through 19.

- A. The pipe shall be bedded to line and grade with uniform and continuous support for a firm base. Blocking shall not be used to bring the pipe to grade.
- B. When the pipe being installed is provided with elastomeric seal joints, bell holes shall be excavated in the bedding material to allow for unobstructed joint assembly. Care shall be taken that the bell hole is no larger than necessary to accomplish proper joint assembly. When the joint has been made, the bell hole shall be carefully filled with bedding or haunching material to provide for adequate pipe support throughout its entire length.

3.10.04 Pipe Zone Backfill

The requirements of this section will be adhered to except where more restrictive standards are recommended by the pipe manufacturer.

- A. Wet Conditions - In any area where the pipe will be installed below historic groundwater levels or where the trench could be subject to inundation, drain backfill material shall be placed to the pipe crown. In the initial stage of placing this type of material, sufficient crushed rock material shall be worked under the pipe haunch to provide adequate side support. Precautions must be taken to prevent pipe movement during material placement under the pipe haunch. Where unstable trench walls exist because of migratory materials such as water-bearing silts or fine sand, the loss of side support through the migratory action shall be prevented. In such cases, the use of CLSM may be necessary to provide needed support. CLSM shall meet the requirements as

specified in Subsection 704.03.07 of the “Uniform Standard Specifications For Public Works’ (USS) Construction Off-Site Improvements, Clark County Area, Nevada”.

- B. Dry Conditions - In any area where groundwater will not be experienced at any time above the level of the foundation material and where the trench will not be subject to inundation, Type II material (See “UDACS Plates 16 through 19”) shall be placed in the pipe zone. The backfill material shall be placed to the pipe spring line and compacted by hand or mechanical tamping. In the initial stage of placing this material, sufficient Type II material shall be worked under the pipe to provide adequate side support to prevent pipe movement during this stage of backfilling. The initial backfill material shall be placed in two (2) stages; one to the pipe crown, and the second to a point at least twelve (12) inches over the pipe crown. Each stage shall be compacted by hand or mechanical tamping to the required density.

As an additional alternative to the preceding methods, CLSM may be used, as specified in Subsection 704.03.07 of the “Uniform Standard Specifications For Public Works’ (USS) Construction Off-Site Improvements, Clark County Area, Nevada”.

3.10.05 Trench Backfill

Backfill in the pipe trench above the pipe zone shall be in accordance with UDACS Plates 16 through 19.

3.11 PIPE INSTALLATIONS

Prior to commencing excavation, the Contractor shall have materials, labor, and equipment on the job site suitable for making emergency repairs to the existing water system should the existing facilities be damaged by the Contractor's operations.

The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source. The Contractor shall keep the pipe interior free from foreign materials and in a clean and sanitary condition until Agency acceptance. All exposed piping shall be adequately supported with devices of appropriate design.

Trenches shall be in a reasonably dry condition when the pipe is laid. Necessary facilities shall be provided for lowering and properly placing the pipe sections in the trench without damage. The pipe shall be laid carefully to the lines and grades shown without grade breaks unless designed with such, or to the minimum depths shown on the drawings, and the sections shall be closely jointed to form a smooth flow line.

Exceptional care shall be taken in placing the pipe and making the field joints. Concrete thrust blocks, per UDACS Plate 31, shall be provided at the locations and per sizes shown on the drawings.

Pipe locator ribbon, detector ribbon wire, and/or locator balls, per Agency specification, shall be installed over all pipe in accordance with UDACS Plate 15.

At times when pipe laying is not in progress, the open pipe end shall be sealed with a tight fitting cap or plug to prevent foreign matter entering the pipe. This provision shall apply at all times during construction until such time that the pipe has been accepted by the Agency.

3.11.01 Polyvinyl Chloride (PVC) Pressure Pipe C-900

Unless otherwise specified or shown on the drawings, polyvinyl chloride pressure pipe shall be Class 150 DR 18 and shall conform to AWWA Standard C900, "Polyvinyl Chloride (PVC) Pressure Pipe And Fabricated Fittings Four (4) Inches Through Twelve (12) inches For Water Distribution". Polyvinyl chloride pressure pipe shall have been manufactured within the eighteen (18) month period prior to installation. Polyvinyl chloride pressure pipe shall be manufacturer date coded and the Agency provided the manufacturer's code for translation. Rubber rings shall conform to the "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe" (ASTM F477).

A. Fittings

1. Unless otherwise specified or shown on the drawings, all fittings to be used with polyvinyl chloride pressure pipe shall conform to one of the following standards or Agency approved equal, and shall be as included on the Agency's approved materials list:
 - a. AWWA Standard C110, "Ductile-Iron and Gray-Iron Fittings, Three (3) Inches Through Forty-eight (48) Inches For Water".
 - b. AWWA Standard C153, "Ductile-Iron Compact Fittings For Water Service".
2. The contractor may use a flange adapter designed for AWWA Standard C900, "Polyvinyl Chloride (PVC) Pressure Pipe And Fabricated Fittings Four (4) Inches Through Twelve (12) Inches For Water Distribution" when connecting polyvinyl chloride pressure pipe to flanged fittings or flanged valves. Pipe ends must be cut smooth and square with no bevel. All flange adapters shall be

thoroughly cleaned, coated, and wrapped in accordance with Section 3.16 of these Standards.

3. Fittings are not to be placed under curb, gutter, or sidewalk.

All cast iron fittings shall be lined with cement mortar in accordance with the requirements of AWWA Standard C104, "Cement-Mortar Lining For Ductile Iron Pipe And Fittings For Water". All fittings and joint connections shall be thoroughly cleaned, coated, and wrapped in accordance with UDACS Section 3.16.

B. Installation

1. Polyvinyl chloride pressure pipe shall be installed in accordance with the AWWA Manual M23, "PVC Pipe - Design And Installation", and AWWA Standard C605, "Underground Installation Of Polyvinyl Chloride (PVC) Pressure Pipe And Fittings For Water", and the manufacturer's recommendations, except as otherwise provided herein or shown on the drawings.
2. Polyvinyl chloride pressure pipe shall be connected to four (4) inch through twelve (12) inch asbestos cement pipe only by use of the proper transition couplings approved by the Agency.
3. The manufacturer's recommended pipe lubricant shall be used when making pipe connections by lubricating the spigot end up to, and including, the reference mark. The reference mark on the spigot end must be flush with the bell end after installation. AWWA standards and the manufacturer's recommendations shall be followed.
4. Polyvinyl chloride pressure pipe shall be stored at the job site in a unit package provided by the manufacturer. Pipe and gaskets shall not be stored close to a source of heat, and must be kept free of dirt, foreign matter, ozone, oil, and grease. Gaskets shall not be stored exposed to sunlight.
5. Polyvinyl chloride pressure pipe, couplings, and rubber rings shall be free from damage and defects in material and workmanship. Rejected, damaged, or defective materials shall be removed from the Site.
6. Remove from Site all polyvinyl chloride pressure pipe

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showing signs of physical damage or ultraviolet exposure, as determined by the Agency.

- a. Approval of rejected pipe: Provide to the Agency, at no additional cost, documented test results from certified testing laboratory documenting conformance with AWWA standards, as applicable.
 - b. Material showing signs of sun fading or discoloration that have been approved by the Agency shall be placed in a trench with faded or discolored portion in downward position.
7. Polyvinyl chloride pressure pipe C-900 shall be deflected - at the joints only. The maximum allowable joint deflection shall be as stated in the following table. For changes in direction exceeding the maximum allowable joint deflection, fittings shall be used.

Pipe Size (inches)	Maximum Joint Deflection (degrees)	Maximum Pipe End Offset 20 Foot Pipe Lengths (inches)	Minimum Radius of Curvature (feet)
6 – 12	1	4.187	1,150

3.11.02 Polyvinyl Chloride (PVC) Pressure Pipe C-905

Unless otherwise specified or shown on the drawings, all sixteen (16) inch through twenty-four (24) inch diameter polyvinyl chloride pressure pipe shall conform to AWWA Standard C905, "Polyvinyl Chloride (PVC) Pressure Pipe And Fabricated Fittings, Fourteen (14) Inches Through Forty-eight (48) Inches For Water Transmission And Distribution". The minimum pressure rating and corresponding minimum dimension ratio shall be as follows:

Design Pressure 200 PSI
Minimum Pressure Rating 235 PSI
Minimum Dimension Ratio DR-18

Polyvinyl chloride pressure pipe shall have been manufactured within the eighteen (18) month period prior to installation. Polyvinyl chloride pressure pipe shall be date-coded and the Agency provided the

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manufacturer's code for translation. Rubber rings shall conform to the "standard specification for elastomeric seals (gaskets) for joining plastic pipe" (ASTM 477).

Polyvinyl chloride pressure pipe shall be deflected at the joints only. The maximum allowable joint deflection is limited and shall not exceed manufacturer recommendations. In general, fittings shall be used for all changes in direction.

Max Joint Deflection (degrees)	Maximum Pipe End Offset 20 Foot Pipe Lengths (inches)	Minimum Radius of Curvature (feet)
1	4.187	1,150

A. Fittings

1. Unless otherwise specified or shown on the drawings, all fittings to be used with polyvinyl chloride pressure pipe shall conform to one of the following standards or Agency approved equal, and shall be as included on the Agency's approved materials list:
 - a. AWWA Standard C110, "Ductile Iron and Gray Iron Fittings, Three (3) Inches Through Forty-eight (48) Inches For Water.
 - b. AWWA Standard C153, "Ductile Iron Compact Fittings For Water Service".
2. All cast iron fittings shall be lined with cement mortar in accordance with the requirements of AWWA Standard C104, "Cement-Mortar Lining For Ductile Iron Pipe And Fittings For Water". All fittings and joint connections shall be thoroughly cleaned, coated, and wrapped in accordance with UDACS Section 3.16.

B. Installation

1. Polyvinyl chloride pressure pipe shall be installed in accordance with AWWA Standard C905, "Polyvinyl Chloride (PVC) Pressure Pipe And Fabricated Fittings, Fourteen (14) Inches Through Forty-eight (48) Inches For Water Transmission And Distribution", and the manufacturer's recommendations, except as otherwise provided herein or shown on the drawings.

2. The manufacturer's recommended pipe lubricant shall be used when making pipe connections by lubricating the spigot end up to and including the reference mark. The reference mark on the spigot end must be flush with the end of the bell after installation. AWWA Manual M-23, "PVC Pipe - Design And Installation", and the manufacturer's recommendations shall be followed.
3. Polyvinyl chloride pressure pipe shall be stored at the job site in a unit package provided by the manufacturer. Pipe and gaskets shall not be stored close to a source of heat and must be kept free of dirt, foreign matter, ozone, oil, and grease. Gaskets shall not be exposed to sunlight.
4. Polyvinyl chloride pressure pipe, couplings, and rubber rings shall be free from damage and defects in material and workmanship. Rejected, damaged, or defective materials shall be removed from Site.
5. Remove from Site all polyvinyl chloride pressure pipe showing signs of physical damage or ultraviolet exposure, as determined by the Agency.
 - a. Approval of rejected pipe: Provide to the Agency, at no additional cost, documented test results from certified testing laboratory documenting conformance with AWWA standards, as applicable.
 - b. Material showing signs of sun fading or discoloration that have been approved by the Agency shall be placed in a trench with faded or discolored portion in downward position.
6. Where required, restrained joints will be utilized in lieu of thrust blocks unless otherwise shown on the drawings.

3.11.03 Asbestos Cement Pipe (ACP) (FOR REPAIR AND MODIFICATION OF EXISTING LINES ONLY)

A. Fittings

1. Unless otherwise approved and shown on the drawings, all fittings to be used with existing asbestos cement pipe shall be either cast iron or ductile iron, and shall be as included on the Agency's approved materials list.

2. Joints made between asbestos cement pipe and cast iron valves and fittings shall be sealed with an Agency approved rubber ring gasket, unless otherwise shown on the drawings. After assembling the joint, the rubber ring gasket position shall be checked with a suitable gauge. Rubber ring gaskets shall be located an even distance from the face of the valve or fitting, for the full pipe circumference. Precaution shall be taken while jointing to prevent dirt from entering the joint space.

B. Disposal of Asbestos Cement Pipe

Disposal of asbestos cement pipe shall be in accordance with local, state, and federal regulations.

3.11.04 Ductile-Iron Pipe (DIP)

A. Materials

1. Unless otherwise specified or shown on the drawings, ductile iron pipe shall conform to AWWA Standard C151, "Ductile-Iron Pipe, Centrifugally Cast, For Water" as follows:
 - a. Up to and including twelve (12) inch: Pressure Class 350.
 - b. Fourteen (14) inch to twenty-four (24) inch: Pressure Class 250, as required by the Agency.
 - c. Twenty-four (24) inch diameter: Pressure Class 250, or as required by the Agency.
2. The lining of ductile iron pipe (DIP) shall be as follows:
 - a. Cement mortar line (double thickness) in accordance with AWWA Standard C104, "Cement-Mortar Lining For Ductile Iron Pipe And Fittings For Water".
 - b. Thickness of cement mortar lining (double thickness) shall be as follows:
 - Not less than one-eighth (1/8) inch for four (4) inch to twelve (12) inch.

- Three-sixteenth (3/16) inch for fourteen (14) inch to twenty-four (24) inch.
 - 3. Ductile iron pipe installed below grade shall use either mechanical joints, restrained joints, or push on joints conforming to AWWA Standard C111, "Rubber Gasket Joints For Ductile-Iron Pressure Pipe And Fittings", unless otherwise specified.
 - 4. Ductile iron pipe installed above grade shall use flanged joints in accordance with AWWA Standard C115, "Flanged Ductile-Iron Pipe With Ductile-Iron Or Gray-Iron Threaded Flanges", unless otherwise specified on the approved plans.
- B. Fittings and Couplings
- 1. Unless otherwise approved and shown on the drawings, all fittings to be used with ductile iron pipe shall conform to quality and wall thickness specified in AWWA Standard C110, "Ductile-Iron And Gray-Iron Fittings, Three (3) Inches Through Forty-eight (48) Inches For Water", or in AWWA Standard C153, "Ductile-Iron Compact Fittings For Water Service".
 - 2. Rubber gaskets for sealing ductile iron pipe joints shall conform to AWWA Standard C111, "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings".
- C. Installation
- 1. Ductile iron pipe shall be installed in accordance with AWWA Standard C600, "Installation of Ductile-Iron Water Mains And Their Appurtenances", and the manufacturer's recommendations except as otherwise provided herein or shown on the drawings.
 - 2. Transition gaskets may be used to connect four (4), six (6) or eight (8) inch diameter ductile iron pipe to four (4), six (6), or eight (8) inch diameter asbestos cement pipe.
 - 3. Transition couplings or approved fittings, may be used to connect four (4), six (6), or eight (8) inch diameter ductile iron pipe to four (4), six (6) or eight (8) inch diameter asbestos cement pipe. A transition coupling must be provided for all transitions ten (10) inch and larger.

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4. All fittings and joint connections shall be thoroughly cleaned and coated in accordance with Section 3.16 of these Standards.

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

PUSH-ON TYPE DIP JOINT					
Pipe Size (Inches)	Deflection Angle (Degrees)	Maximum Offset (Inches)		Radius of Curvature (Feet)	
		18' Length	20' Length	18' Length	20' Length
4" - 12"	2.5°	9"	10"	415'	460'
14" - 24"	1.5°	6"	6"	690'	765'

MECHANICAL TYPE DIP JOINT					
Pipe Size (Inches)	Deflection Angle (Degrees)	Maximum Offset (Inches)		Radius of Curvature (Feet)	
		18' Length	20' Length	18' Length	20' Length
4"	4.0°	15"	17"	260'	290'
6"	3.5°	13"	15"	295'	330'
8" - 12"	2.5°	9"	10"	415'	460'
14" - 24"	1.5°	6"	6"	690'	765'

D. Polyethylene Encasement

1. All ductile iron pipe, fittings, and joint connections shall be encased as follows:
 - a. Polyethylene encasement in accordance with AWWA Standard C105, "Polyethylene Encasement For Ductile-Iron Pipe Systems"; however, two (2) wraps shall be utilized instead of

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one (1). The polyethylene film shall have a minimum thickness of eight (8) mils and two (2) wraps shall have a total minimum film thickness of sixteen (16) mils.

Nominal Pipe Diameter (inches)	Minimum Polyethylene Width (inches)	
	Flat Tube	Sheet
4	16	32
6	20	40
8	24	48
10	27	54
12	30	60
14	34	68
16	37	74
18	41	82
20	45	90
24	54	108

2. The Contractor shall repair any damage to the polyethylene film as described within AWWA Standard C105, "Polyethylene Encasement For Ductile-Iron Pipe Systems", or shall replace all damaged polyethylene film sections.
3. Provide minimum two (2) inch wide polyethylene tape.

3.12 INSTALLATION OF PIPE CASING

The Contractor shall furnish and install all pipe casing as specified herein, as shown on the approved drawings and UDACS Plate 23. The casing shall be laid true to grade and line with no bends or changes in grade for the casing's full length.

The casing shall be steel fabricated and shall conform to the requirements of ASTM A283, Grade B, C, or D. All joints shall be welded. Interior joints shall be ground to a smooth finish. All welding shall be performed in accordance with AWWA Standard C206, "Field Welding of Steel Water Pipe".

Casing wall thickness shall be in accordance with UDACS Plate 23. The wall thickness for casing installations over twenty-five (25) feet below finished grade shall be determined by a Nevada Licensed Professional Engineer. Casing wall thickness for installations under railroad tracks shall be determined by a Nevada Licensed Professional Engineer and approved by the Union Pacific Railroad.

Casings installed by jack and bore method shall be installed to the grade shown on the drawings, with a maximum vertical deviation of + zero (0)^o and - two (2)^o, and a maximum horizontal deviation of \pm two (2)^o provided the alignment does not conflict with other utilities and/or rights-of-way.

The water pipe installed in the casing shall be supported by Agency approved casing spacers, and installed in accordance with the manufacturer's recommendations. After pipe installation, the casing shall be sealed, and Agency approved end seals shall be installed per the manufacturer's recommendations.

Where installation of casing may be accomplished by open cut methods, water quality RCP casings may be used in lieu of steel casings, as approved by the Agency. If the casing is required in order to meet the requirements of Section 2.22, the RCP sections must be installed using Agency approved elastomeric joint sealants or joint gaskets. RCP casings installed for future pipeline installations shall be securely sealed with removable bulkheads at both ends in a manner acceptable to the Agency.

3.13 SOILS TESTING

- A. Contractor Test: The Contractor will be required to furnish the Agency a sieve analysis, plasticity index, soluble sulfate, expansion potential, and Proctor of the material when required by the Agency. Agency approval of the sieve analysis, plasticity index, and Proctor will be required prior to using the material. The Contractor shall pay all costs in providing the Proctor and having the sieve analysis and plasticity index taken by a soils lab. The Agency Representative shall be present for sampling. The Contractor will be required to furnish an updated Proctor to the Agency prior to any compaction testing. The Proctor will be in accordance with ASTM D-1557, and performed by an approved soils laboratory within the previous six (6) months or at the Agency's discretion. If the Agency's Representative determines the backfill material has changed, the Contractor will be required to supply a new Proctor.
- B. Agency Test: The Agency shall take compaction tests. Agency compaction tests shall be paid for by the Agency. The number and location of compaction tests on backfill material will be determined per Agency requirements and procedures.

C. If the Contractor challenges the Agency's compaction test results, an independent testing lab will be called to take tests using the following method:

Proctor: Tests shall be in accordance with ASTM D-1557.

Sample: In place soils shall be tested in accordance with ASTM D-1556, Method "D", with the exception no samples shall contain particles larger than three-quarter (3/4) inch.

D. If the independent soils laboratory test results fail to meet the Agency's Standards, the Contractor shall pay for the test(s) and retest(s). If the test results indicate the Agency standards have been met, the Agency shall pay for the testing. Where compaction tests indicate a failure to meet the required compaction, additional tests will be taken every fifty (50) feet in each direction until the failing area is defined. The entire area between the passing test locations shall be reworked until the proper compaction requirements are achieved.

3.14 CONNECTIONS TO EXISTING FACILITIES

The Contractor shall make Agency approved connections to existing facilities as shown on the drawings. The Contractor shall notify the Agency at least two (2) business days prior to beginning any connections to the existing facilities. All pipe connection to existing main and fittings shall be swabbed internally with an approved chlorine solution. All connections shall be made in the presence of the Agency's Representative. When the new work involves new water main installation, the new mains shall be tested and disinfected in accordance with Section 3.27 of these Standards.

3.14.01 Connections To Existing Facilities – Dry Taps

Dry connections to existing facilities shall be made only at locations shown on the drawings, shall be made at times which will cause the least inconvenience to the water consumer, and shall be planned to minimize the duration of any shut down. No valves are to be operated without an Agency representative present.

Existing facilities will not be shut down for connections to new facilities without prior Agency approval. In no case shall an existing pipeline be shut down for a total of more than twenty-four (24) hours (a maximum of three shut down periods, shut down should not exceed eight (8) hours each). Shutdowns for longer periods will require provisions for temporary service approved by the Agency and coordinated with the Agency's customers.

The work plans for making connections to existing facilities that require an existing pipeline shut down, shall be submitted to the Agency and shall be approved before the Contractor will be allowed to proceed. The Contractor shall notify, by a method approved by the Agency, all affected Agency

customers at least twenty-four (24) hours prior to shut down. Valves at connections to all existing facilities shall be operated by the Contractor, but only in the presence of the Agency's Representative, unless otherwise required by the Agency. If the water will be shut off for an extended period of time, the Agency may require the Contractor to supply water for the Agency's customers.

The Agency cannot guarantee a watertight shut down where connections or repairs to existing facilities are required. The Contractor shall ensure all labor and equipment is available to remove fugitive water that may impede construction at all times. Coordination with Agency must take place prior to any trial shutdown. Contractor shall install temporary service to verify proper shutdown in the event no other appurtenances are available.

3.14.02 CONNECTIONS TO EXISTING FACILITIES - WET TAPS

The Contractor shall furnish and install, at his sole cost and expense, all tapping fittings and valves for all wet taps on existing Agency pipelines. The Contractor shall notify the Agency a minimum of two (2) business days prior to the time the wet tap is requested to be made.

Upon Agency acceptance of the tapping fittings and valves as having been properly installed and having passed the required pressure test, the Contractor will be allowed to tap the main. Unless otherwise shown on the drawings or specified in these Standards, the Contractor will furnish all labor and equipment, and will perform, at his sole cost and expense, all wet taps on existing Agency pipelines.

3.15 CONNECTION TO EXISTING STEEL CYLINDER PIPE

Wet taps on existing steel mains (SCCP and MLC) shall be accomplished using a full fabricated steel wrapper, and designed in accordance with AWWA Manual M11, "Steel Pipe - A Guide For Design And Installation". (See "UDACS Plate 35".)

When an existing pretensioned steel cylinder concrete pipe is cut for the installation of a new steel plate special, the rod wrap on the existing pipe shall be welded to the steel cylinder on either side of the section to be cut prior to making the cut, to ensure the pipeline integrity is not impaired. Excess rod wrap shall be wrapped firmly around the pipe parallel to the cut, lapped a minimum of one and one-half (1½) laps, and welded in place to provide a continuous wrap parallel to the cut.

The Contractor shall, at his sole cost and expense, furnish all wet taps to existing Agency steel pipelines. Such wet taps, including all welding, shall be made by one of the following companies or by company (ies) listed in the Agency Addenda Section:

American Piping Services, Inc.
6625 South Valley View Blvd., Suite 200
Las Vegas, NV 89118
Telephone: (702) 362-3622

International Flow Technologies, Inc.
30230 Los Alamos Road
Murrieta, CA 92563
Telephone (800) 221-3332 and (909) 926-4849

Tap Master
8414 West Farm Road, Suite 180-246
Las Vegas, NV 89131
Telephone (888) 982-7627

T. D. Williamson, Inc.
5727 South Lewis Ave., Suite 300
Tulsa, OK 74105-7144
Telephone: (888) 839-6766

3.16 PROTECTIVE COATINGS

3.16.01 References

- A. American Water Works Association (AWWA) Standards - most recent editions:
 - 1. AWWA C105: Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 2. AWWA C110: Ductile-Iron and Gray-Iron Fittings, Three (3) Inch through Forty-eight (48) Inch For Water.
 - 3. AWWA C116: Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings For Water Supply Service.
 - 4. AWWA C213: Fusion-Bonded Epoxy Coating For The Interior and Exterior of Steel Water Pipelines.
- B. National Sanitation Foundation (NSF) Standard - most recent edition:
 - 1. NSF Standard 61: Drinking Water System Components - Health Effects.
- C. Society for Protective Coatings (SSPC) Standards - most recent editions.

- D. United States Environmental Protection Agency, Code of Federal Regulations (CFR).

3.16.02 Coating Materials

- A. Type 11 - Multi-Use Epoxy
 - 1. Uses:
 - a. Primer for exposed ferrous surfaces.
 - b. Primer and finish coat for interior exposed ferrous surfaces.
 - c. Repair/touch-up of fusion bonded epoxy finishes.
- B. Type 15 - Fusion Bonded Epoxy
 - 1. Uses:
 - a. Lining and coating submerged ferrous surfaces.
 - b. Finish coat for exposed ferrous surfaces.
- C. Type 20 - Aliphatic Polyurethane
 - 1. Uses:
 - a. Finish coat for exposed ferrous surfaces.
 - b. Finish coat for masonry interior surfaces.
- D. Type 40 - Petroleum Asphaltic
 - 1. Uses:
 - a. Buried ductile iron pipe and fittings.
 - b. In accordance with AWWA Standard C110, "Ductile-Iron And Gray-Iron Fittings, Three (3) Inches Through Forty-eight (48) Inches For Water.
- E. Type 50 - Wax-Based Coatings
 - 1. Uses:
 - a. Buried miscellaneous ferrous equipment.

b. Buried nuts and bolts.

F. Type 60 - Organic Rich Zinc Coating

1. Uses:

a. For small local repair of galvanized equipment only.

3.16.03 Application

A. General

1. Prepare surfaces and apply coatings in accordance with manufacturer's instructions.
2. Primer, intermediate, and finish coat: Compatible and from same manufacturer.
3. Field repair coatings as recommended by manufacturer.

B. Buried Ductile Iron

1. System type - Petroleum Asphaltic:
 - a. Factory applied, one coat: Type 40 - Petroleum Asphaltic.
 - b. Field repair as needed.

C. Buried Ferrous Surfaces And Fittings Prior To Wrap

1. System type - Wax based coating:
 - a. One coat: Type 50 - wax based coating.
 - b. Polyethylene wrap: After coating, wrap surfaces with two layers of eight (8) mil polyethylene film and tightly seal as specified in AWWA Standard C105, "Polyethylene Encasement For Ductile-Iron Pipe Systems".
2. System Type - Cement Mortar Coating:
 - a. Place mortar lining in steel piping and steel plate specials in pipe to thickness specified herein:
 - (1) Reinforce lining on steel plate specials larger than sixteen (16) inches in diameter

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with two (2) inch by four (4) inch number thirteen (13) gage welded steel wire mesh.

Pipe Diameter (Inches)	Lining Thickness (Inches)	Tolerances (Inches)
Less than 24	5/16	-1/16, + 1/8
24 through 36	1/2	-1/16, + 1/8
Greater than 36	5/8	-1/16, +3/16

- (2) Other requirements of mortar lining materials and processes: As specified in AWWA Standard C205, "Cement-Mortar Protective Lining And Coating For Steel Water Pipe - Four (4) Inches And Larger - Shop Applied".
- b. Apply reinforced cement mortar coating over outer surfaces of steel piping and steel plate specials, unless otherwise specified:
- (1) Use Type V cement for mortar coatings (ASTM C150).
 - (2) Cement mortar mixture shall consist of one (1) part cement to not more than three (3) parts sand (ASTM C33).
 - (3) Use no more than four and a half (4 1/2) gallons of water per sack of cement.
 - (4) Cement mortar and mortar armor coating: One (1) inch thick with permitted tolerance of plus one quarter (1/4) inch.
 - (5) Pipe and specials, diameter less than forty-eight (48) inches: Reinforce coating with spirally wound No. twelve (12) gage steel wire spaced at one (1) inch centers or with No. fourteen (14) gage steel wire at one half (1/2) inch centers positioned approximately in center of mortar coating.
 - (6) Pipe and specials, diameter forty-eight (48) inches and larger: Reinforce coating with two (2) layers of spirally wound No. twelve (12) gage steel wire spaced at one (1) inch centers or with No. fourteen (14)

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gage steel wire at one half (1/2) inch centers positioned at third points of mortar coating.

(7) Permitted to reinforce coating steel plate specials with two (2) inch by four (4) inch No. thirteen (13) gage welded wire mesh in lieu of wire, positioned in coating as stated above.

(8) Lap ends of reinforcement strips four (4) inches, and tie or loop free ends to assure continuity of reinforcement.

D. Exposed Ferrous Surfaces

1. System type: Epoxy/Polyurethane:

a. Primer: Type 11 - Multi-Use Epoxy.

b. Finish coat: Type 20 - Aliphatic Polyurethane.

E. Valves and Fittings - As Specified

1. System type: Fusion Bonded Epoxy:

a. One coat: Type 15 - Fusion bonded epoxy.

F. Galvanized Equipment

1. "Hot-Dip" coating:

a. As specified in ASTM A123 and ASTM A153.

2. Type 60 - Organic Zinc-Rich Coating

a. For small local repairs only.

3.17 CONCRETE

The Contractor shall furnish all materials, equipment and labor necessary to complete the concrete work as shown on the drawings as established in the guidelines of the American Concrete Institute (ACI) and the Concrete Reinforcing Steel Institute (CRSI) and as specified herein.

3.17.01 Cementitious Materials

Cement shall be Portland Cement in accordance with the "Specification

for Portland Cement" (ASTM C 150), Type V for all concrete in contact with the ground, including pipe coatings, and Type II or V for all other concrete.

Fly ash shall be in accordance with ASTM C618, Class F.

- A. Substitution ratio: One and one-fifth (1.2) pounds fly ash for each one (1.0) pound of cement.
- B. Maximum fly ash content: Twenty (20) percent of cement removed of specified cement weight.

3.17.02 Aggregates

Aggregates shall be obtained from pits approved by the Agency, and shall conform to the "Standard Specifications for Concrete Aggregates" (ASTM C 33). Maximum aggregate size shall be three-quarter (3/4) inch for slabs and walls, and one (1) inch for structural concrete. Footings, foundations, and thrust blocks may use one and one half (1 1/2) inch maximum size aggregate.

3.17.03 Water

Water shall be potable (clean and free of injurious amounts of acids, alkalies, organic matter or other deleterious substances).

3.17.04 Forms

- A. Forms shall conform to the shape, lines, and dimensions of the members shown on the drawings and shall be sufficiently tight to prevent leakage of mortar. Forms shall be properly braced, and tied to maintain position and shape.
- B. Forms for exposed concrete shall be Fir Plywood, concrete form grade, or faced with tempered hardboard or metal forms resulting in a concrete finish equal to that obtained by the use of plywood forms. Forms for exposed concrete surfaces shall be coated with colorless, non-staining mineral oil specifically manufactured for this purpose.
- C. Forms for unexposed concrete shall be either of the type specified for exposed concrete or wood sheathing boards of uniform thickness, without loose knots, reasonably straight, and butted with tight joints. Forms for unexposed concrete may be coated with form oil or wetted with water before the concrete is placed.
- D. Forms shall be removed in such a manner and at such time as to

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ensure the structure's safety. The results of strength tests made during construction may be used as evidence that the concrete has attained the required strength. Care shall be taken to avoid spalling concrete surfaces. Tie rod or bolt holes shall be filled solidly with mortar after form removal. Mortar used for filling holes on exposed concrete surfaces shall match the surface in color and texture.

3.17.05 Concrete Mixes

- A. Mix designs shall be in accordance with the Interagency Quality Assurance Committee (IQAC), or as approved by the Agency having jurisdiction.
- B. Concrete compressive strength, aggregate size, and slump shall be in accordance with the following:

Type of Construction	Compressive Strength (psi)	Maximum Size Aggregate in Inches	Slump In Inches (Max.)
Slabs, Walls, and Extruded Curb and Gutter	3,000	3/4	4
Pipeline Structures	4,500	1	4
Footing, Foundations, Reinforced Concrete Encasements, Thrust Blocks and Formed Curb and Gutter	3,000	1-1/2	4
Site Underground Conduit Banks: Minimum 3 lbs. Red Pigment/Sack Cement	3,000	3/8	6
CLSM I	50 - 150	3/8	10
CLSM II	150 - 300	3/8	10

- 1. Compressive strength: Twenty-eight (28) day minimum.

2. Reinforced concrete: Minimum six (6) sacks Portland Cement per cubic yard.
3. Unreinforced concrete: Minimum five (5) sacks Portland Cement per cubic yard.
4. Maximum water cement ratio: 0.45 by weight.

3.17.06 Ready Mixed Concrete

- A. Provide a batch ticket to the Agency Representative for each delivered load ready-mixed concrete, indicating:
 1. Volume of concrete.
 2. Weight of cement in pounds.
 3. Total weight of all ingredients in pounds.
 4. Time of day at which the materials were batched.
 5. In accordance with ASTM C94.

3.17.07 Expansion Joints

The Contractor shall provide expansion joints in concrete slabs where shown on the drawings. Expansion joint filler shall be thick and extend the full slab thickness. Expansion joint filler shall be pre-formed, nonextruding, resilient type constructed of cellular neoprene sponge rubber, extending the full thickness of the slab, in accordance with the "Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction" (ASTM D 1751 or ASTM D 1752, Type I).

3.17.08 Placing Concrete

- A. Prior to placing concrete, the Contractor shall remove any ponded water from the excavation, and moisten fill for slabs to be placed on fill.
- B. Concrete shall be placed in accordance with ACI Specifications and this Section.
- C. Ready-Mix Equipment:
 1. The volume of concrete for each batch shall not exceed the manufacturer's rated capacity of the mixer.

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2. The Contractor shall ensure sufficient mixing time for the concrete for uniform distribution of materials.
 3. The Contractor shall discharge all concrete from the mixer prior to mixing a new batch.
 4. Ready-mixed equipment shall conform to specifications in accordance with ASTM C94.
- D. Transporting:
1. The Contractor shall transport concrete from the mixer to the place of deposit by methods that will prevent segregation or loss of material.
 2. The Contractor shall provide runways when wheelbarrows are used to transport concrete.
 3. The Contractor shall not use wheel conveying equipment over reinforcement or support runways on reinforcement.
- E. Placing:
1. Concrete shall be deposited in a continuous manner, and as rapidly as possible.
 2. Concrete which has attained initial set or has contained mixing water for more than one (1) hour shall not be used.
 3. Concrete shall be uniformly distributed during the process of depositing, and in no case after depositing shall any portion be displaced in the forms more than six (6) feet in horizontal direction.
 4. Deposit concrete in forms in uniform horizontal layers not deeper than two (2) feet. Place each layer while the previous layer is still workable. No retempering of concrete will be permitted.
 5. Concrete will not be allowed to drop freely more than four (4) feet in unexposed work nor more than three (3) feet in exposed work; where greater drops are required, the use of a duct or other Agency approved method shall be employed.
 6. Concrete shall not be placed against icy or frost covered earth surfaces.

F. Compacting:

1. Compaction shall be effected by means of internal type vibrators supplemented by rodding and tamping as may be necessary, to maximum practicable density, free from pockets of coarse aggregate in such a manner that surfaces are smooth and free from voids.
2. Care shall be taken to avoid excessive vibration of concrete, and to avoid segregation of aggregates.
3. Care shall be taken to avoid disturbance of previous lifts where initial set has taken place.
4. The use of form vibrators or form tapping is prohibited.

G. Construction Joints:

1. Where shown on drawings, prime construction joints and fill with joint sealant.
2. Use primer supplied by sealant manufacturer.
3. Where shown on drawings, apply sealing grout at construction joints.
4. Brush joint clean prior to grout application.
5. Mix sealing grout in accordance with manufacturer's recommendations.

3.17.09

Adverse Weather Conditions

- A. When the temperature is below forty (40) ° F, or is likely to fall below forty (40) ° F during the twenty-four (24) hour period after placing the concrete, materials shall be heated (not in excess of one hundred forty (140) ° F) so the concrete will have a temperature between fifty (50) ° F and ninety (90) ° F. Plastic covers, curing blankets or other means of protection shall be used to protect the concrete for the twenty-four (24) hour period after placing the concrete.
- B. During hot weather, materials shall be shaded from the sun or otherwise cooled, and the water shall be cooled so the concrete temperature will not exceed ninety (90) ° F at the time of placing the concrete.

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- C. Placing of concrete will not be permitted if, in the opinion of the Agency, wind, rain or inadequate facilities furnished by the Contractor will prevent proper finishing or curing of the concrete.

3.17.10 Finishes

- A. Where exposed concrete surfaces are shown on the drawings, the Contractor shall remove any fins and nails and patch defects to match adjacent surfaces in color and texture. All edges that will be exposed shall be chamfered.
- B. Floor slabs shall be true plane surfaces with a tolerance of one-quarter (1/4) inch in ten (10) feet and shall be finished monolithically. Floor slabs shall be sloped to drain where shown on the drawings. Unless otherwise shown or specified, all interior floor slabs shall receive a steel trowel finish. The concrete shall be screeded with a straight-edge to bring the surface to the required finish level then tamped to force the coarse aggregate away from the surface, and then floated to prepare the surface. When surface water has disappeared, the surface shall be steel-troweled to a smooth and impervious finish, free from trowel marks.
- C. In lieu of hand finishing, the Contractor may use a power finishing machine provided, in the opinion of the Agency, the results are as good, or better, than those obtained by hand finishing.
- D. When approved by the Agency, the vacuum process may be used in dehydrating and finishing floor slabs.
- E. Exterior flatwork shall be finished by screeding and floating to flatten the surface followed by jointing, edging and Fresno troweling to remove float lines. After sufficient time, a light broom finish shall be applied.

3.17.11 Curing

- A. Formed concrete shall have the forms left in place for not less than fourteen (14) days, unless otherwise approved by the Agency. If the forms are allowed to be removed within fourteen (14) days, curing shall be continued in accordance with the applicable method, or as directed by the Agency.

B. Encasement concrete, concrete cradles, and anchor blocks shall be kept moist until covered, and may be covered with earth, per Section 3.10, no sooner than twenty-four (24) hours after concrete placement.

C. Concrete slabs may be cured by either of the following methods:

(Method 1)

After finishing the slab, the surface shall be wetted with a fine spray of water and covered with polyethylene sheeting not less than four (4) mils thick or polyethylene-bonded waterproof paper sheeting. The sheets shall be lapped at least four (4) inches at the sides and the ends and sealed with adhesive tape. Sheeting shall be weighted down with wood planks to keep sheeting in contact with the concrete. The Contractor shall repair or replace sheets immediately if damage occurs. The curing period by this method shall be not less than seven (7) days.

(Method 2)

As soon as the free water has disappeared from the finished concrete surface, the concrete shall be covered with water-saturated curing mats and kept continuously wet for not less than seven (7) days.

D. As an alternate to the previously specified curing methods for formed and slab concrete, the Contractor may spray the surface with an Agency approved liquid curing compound which will not affect the bond of paint to the concrete surface. The curing compound shall be applied in accordance with the manufacturer's instructions immediately after completing the concrete finish or within two (2) hours after form stripping (if stripped in less than fourteen (14) days). Care shall be exercised to avoid seal damage during the curing period. Should the seal be damaged or broken before the curing period expiration, the damage or break shall be repaired immediately by the application of additional curing compound over the damaged or broken portion. The curing film method shall not be used where construction joints are to be made.

E. Evaporation retarder as approved by the Agency or other means to prevent plastic shrinkage cracking shall be used on slabs in hot weather or other adverse weather conditions that may cause plastic shrinkage cracking.

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3.17.12 Grout

All grout shall be a non-shrink, non-metallic grout Type V cement approved by the Agency.

3.17.13 Mechanical Waterstops

A. Mechanical waterstops shall be extruded from an elastomeric polyvinylchloride compound containing plasticizers, resins, stabilizers and other materials necessary to meet requirements of specifications.

1. Store waterstops to permit free circulation of air around waterstop material.
2. Provide special fittings fabricated for splices and joints.
3. Style: Centerbulb, flat strip.
4. Only approved waterstops identified on the Approved Products List will be utilized.

3.17.14 Sealant

Where shown on the drawings, or otherwise approved, construction joints shall be primed and filled with joint sealant. The primer used shall be supplied by the sealant manufacturer. The sealant shall be polyurethane polymer designed for bonding to concrete that is continuously submerged in water.

3.18 REINFORCING STEEL

The Contractor shall furnish, fabricate, and install all reinforcement steel shown on the drawings and described in these specifications. The work shall include the installation of all tie wires, clips, supports, and other appurtenances necessary to meet the specification requirements and produce finished concrete structures in accordance with the Concrete Reinforcing Steel Institute (CRSI) and the American Concrete Institute (ACI) guidelines.

3.18.01 Materials

Reinforcement steel shall be deformed steel bars, cold-drawn steel wire, or fabricated forms of those materials. Materials shall conform in quality to the "Specifications for deformed Billet-Steel Bars for Concrete Reinforcement", Grade 60 (ASTM A615).

3.18.02 Installation

- A. Before being positioned, all reinforcement steel shall be free from loose mill, rust scale, and from coatings that may destroy or reduce the bond. Where there is delay in depositing concrete, reinforcement steel shall be reinspected and cleaned when necessary.
- B. Reinforcement steel shall be accurately positioned in accordance with the drawings and secured using annealed iron wire ties or suitable clips at intersections, and shall be supported by concrete, metal or plastic supports, spacers, or metal hangers.
- C. When it is necessary to splice reinforcement at points other than shown on the drawings, the character and location of the splice shall be determined by the Agency. Unless otherwise shown on the drawings or specified, splices shall be lapped a minimum of thirty-two (32) bar diameters.
- D. All bends shall be cold bends accurately bent to shapes and angles as shown on the drawings. All bends shall be made in accordance with ACI 318.

3.19 APPURTENANCES**3.19.01 Couplings (Four (4) Inch To Twenty-Four (24) Inch)**

- A. Middle ring and follower rings shall be made of carbon steel, per ASTM A53 or ASTM A512, or ductile iron per ASTM A536. Couplings shall be in sizes to fit the pipe and fittings shown on the drawings. The middle ring shall not be less than one-quarter (1/4) inch in thickness and a minimum of five (5) inches long.
- B. Gaskets shall contain no reclaimed rubber and shall be suitable for use in potable water systems.
- C. All ferrous surfaces shall be fusion bonded epoxy coated at the factory in accordance with Agency specifications.
- D. Bolts, nuts, and washers for buried couplings: Cadmium plated, high strength, low alloy steel meeting composition requirements of AWWA Standard C111, "Rubber-Gasket Joints For Ductile-Iron Pressure Pipe And Fittings", or stainless steel type 304 or 316.

3.19.02 Gaskets

Gaskets shall be one-eighth (1/8) inch thick, cloth-inserted rubber sheet or Agency approved equal. Flanged gaskets shall be full-face, and shall cover the entire inside surface of the blind flange.

3.19.03 Insulating Bushings and Unions

Pipe or fittings made of nonferrous metals shall be isolated from ferrous metals by reinforcing nylon insulating pipe bushings or unions. Such insulating bushings and unions must be approved by the Agency prior to installation.

3.19.04 Flange Insulation Sets

Flange insulation sets shall contain full-faced gaskets, full-length sleeves, and double washers. Insulation material for the flange insulation sets shall be phenolic resin and flange-faced gaskets shall be neoprene-faced phenolic resin. All insulating materials shall be of type designated by the manufacturer as suitable for use at the operating pressures specified. Flange insulation sets must be approved by the Agency prior to installation. Installation shall be per the manufacturer's recommendation.

3.19.05 Tapping Sleeves (Other Than Steel Pipe)

- A. Designed for one hundred fifty (150) psi working pressure unless otherwise approved by the Agency.
- B. Asbestos Cement Pipe: Use mechanical joint tapping sleeves or stainless steel fabricated tapping sleeves with full circumference gasket.
- C. When the wet tap diameter is greater than seventy-five (75) percent of diameter of pipe being tapped, provide either of the following:
 - 1. Mechanical joint tapping sleeves.
 - 2. Stainless steel fabricated tapping sleeves.
- D. When the wet tap diameter is less than or equal to seventy-five (75) percent of pipe diameter, provide either of the following:
 - 1. Mechanical joint tapping sleeves.
 - 2. Stainless steel fabricated tapping sleeves.

3. Steel fabricated tapping sleeves (for ductile iron only).

- E. Steel Fabricated Tapping Sleeves: Split full circle; carbon steel body ASTM A283 Grade C; AWWA Standard C207, "Steel Pipe Flanges For Waterworks Service - Sizes Four (4) Inches Through One Hundred Forty-four (144) Inches, Class D flange, ANSI 150 lb. Drilling; Type 304 stainless steel nuts and bolts, Teflon coated; factory applied fusion bonded epoxy coating.
- F. Mechanical Joint Tapping Sleeves: Split full circle; ductile iron ASTM A536 or carbon steel ASTM A283 Grade C body, AWWA Standard C110, "Ductile-Iron And Gray-Iron Fittings, Three (3) Inches Through Forty-eight (48) Inches, For Water", with three-fourth (3/4) inch NPT test plug; ANSI B-16.1 Class 125 flange and drilling; Type 304 stainless steel nuts and bolts, Teflon coated; AWWA Standard C111, "Rubber-Gasket Joints For Ductile-Iron Pressure Pipe And Fittings", mechanical joint ends; factory applied fusion bonded epoxy coating.
- G. Stainless Steel Fabricated Tapping Sleeves: Split full circle band body, 18-8 Type 304 stainless steel; stainless steel flange, one hundred fifty (150) lb. drilling; Grade 60 full circumference gasket; Type 304 stainless steel nuts, bolts and washers, Teflon coated.

3.19.06 Service Saddles

Only Agency approved service saddles will be installed except where otherwise authorized by the Agency's representative. Service saddles shall not be installed closer than twenty-four (24) inches to the pipe end, nor closer than eighteen (18) inches to any other service saddle.

3.19.07 Manhole Frames and Covers

Except as otherwise shown on the drawings, manhole frames and covers shall be Agency approved and designed for a clear opening of thirty-six (36) inches in diameter and marked with the word **WATER**. Six (6), one (1) inch diameter holes shall be provided in the lid, equally spaced around the circumference of a sixteen (16) inch diameter circle.

3.19.08 Valve Boxes and Covers

- A. Cast iron, sliding type, adjustable valve boxes, with covers, shall be provided for all buried valves and shall consist of a top and bottom section with slide type extensions and large bottom base where specified. The cover shall be a drop type with a minimum skirt length of four (4) inches, marked with the word **WATER**, and the lid shall weigh a minimum of fourteen (14) pounds. Valve

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boxes and covers shall be installed with materials from the Agency's approved materials list.

- B. Valve boxes shall be installed in accordance with UDACS Plate 39. Valve boxes shall be installed plumb and centered over the valve operating nuts.
- C. Valve extension stems shall be provided where the depth to the top of the operating nut exceeds five (5) feet. The extension stem shall be a one and one-quarter (1¼) inch solid steel round shaft fitted with a two (2) inch AWWA nut and a self-centering device. The top of the extension stem operating nut shall be punch marked with a one and one-half (1½) inch high letter "E".

3.19.09 Brass Pipe and Bronze Fittings

All brass pipe and bronze fittings shall conform to ASTM B43 "Standard Specification for Seamless Red Brass Pipe, Standard Sizes, and ASTM B62 "Standard Specification for Composition Bronze or Ounce Metal Castings".

3.19.10 Polyethylene (PE) Tubing

All polyethylene tubing shall conform to AWWA Standard C901, "Polyethylene (PE) Pressure Pipe And Tubing, One Half (1/2) Inch Through Three (3) Inch, For Water Service" and ASTM D2737 "Standard Specification for Polyethylene (PE) Plastic Tubing".

3.19.11 Copper Tubing

Copper tubing shall be seamless annealed copper tube and shall conform to ASTM B88 "Standard Specification for Seamless Copper Water Tube" and shall be Type K. Unless otherwise shown on the drawings or Standard Plates, all connections to copper tubing shall be made with compression couplings.

- A. Copper tubing shall be wrapped with two layers of six (6) mil polyethylene film or tape, tightly sealed, if soil tests indicate aggressive soil conditions, or as required by the Agency.
- B. An approved polyethylene coated copper tubing may be utilized in lieu of the double wrap identified in Paragraph "A". This material shall also be used under all concrete and decorative surfaced access drives.

3.19.12 Adjustable Pipe Supports

Adjustable pipe supports shall be designed to support pipe from one (1)

to four (4) feet above the floor. At any one assembly position, adjustable pipe supports shall have a maximum vertical adjustment of four (4) inches (i.e. a twenty (20) inch pipe support may adjust to twenty-four (24) inch before a taller pipe support is required). Adjustable pipe supports shall be capable of supporting two hundred (200) pounds per inch of pipe diameter. The total bearing area of the adjustable pipe support on the base shall be such that the base load does not exceed five hundred (500) psi at the manufacturer's rated load for the adjustable pipe support. Adjustable pipe supports shall be painted in accordance with the provisions of Section 3.16 of these Standards.

3.19.13 Non-Adjustable Pipe Supports

Non-adjustable pipe supports shall be fabricated and installed in accordance with UDACS Plate 74.

3.19.14 Fire Hydrants

Unless otherwise shown on the drawings or as directed by the Agency's Representative, all fire hydrants shall be installed in accordance with approved water plans, and UDACS Plates 40 and 41, and shall be painted in accordance with the requirements of the Fire Department having jurisdiction.

3.19.15 Service Meter Boxes

Water service meter boxes for meters of nominal size five-eighth (5/8) inch through two (2) inch shall be in accordance with the Agency's approved materials list and UDACS Plates 1 through 7. All water service meter boxes shall be complete with covers. Meter boxes shall not be located in driveways.

3.19.16 Flanges

Except as otherwise specified or shown on the drawings, all flanges to be installed on pipe or fittings shall be faced and drilled in accordance with one hundred fifty (150) lb. ASA dimensions, or in lieu thereof, shall be in accordance with the AWWA Standard C207, "Steel Pipe Flanges For Waterworks Service - Sizes Four (4) Inches Through One Hundred Forty-four (144) Inches, Class D or Class E, as applicable. All flanges shall be furnished with flat faces. All pipe flanges shall be attached with bolt holes equally straddling the pipe's vertical axis unless otherwise shown on the drawings. Flange attachment to the pipe shall conform to the applicable requirements of AWWA Standard C207, "Steel Pipe Flanges For Waterworks Service - Sizes Four (4) Inches Through One Hundred Forty-four (144) Inches".

3.20 CAPPING

3.20.01 For capping a newly installed main, a mechanical-joint cap or push-on cap or plug shall be used (See “UDACS Plate 36”), or as approved by the Agency.

3.20.02 If an existing lateral is to be abandoned, the lateral must be cut and capped. The Contractor shall cut the existing pipe where shown on the drawing, and install a mechanical joint cap. Where a joint or coupling in the existing pipe is uncovered at, or near, the cut and cap locations, a plug may be permitted, with Agency approval.

3.21 VALVE ABANDONMENT

All valves to be abandoned shall be abandoned in the closed position, unless shown otherwise, by removing a minimum of the top twenty-four (24) inches of the valve box and then filling the bottom of the box with a minimum of eight (8) inches of sand, the remaining portion of the valve box shall be filled with concrete having a compressive strength of at least two-thousand (2,000) psi.

3.22 THRUST BLOCKS AND ANCHOR BLOCKS

Thrust blocks are required for all caps, valves, reducers, tees, and fittings, not positively anchored to the pipeline, used to change the pipe direction. Thrust and anchor blocks shall be installed in accordance with UDACS Plates 30 and 31 where the allowable soil bearing capacity is three thousand (3,000) psf or greater. Special thrust block design by a NPE is required for each installation where the allowable soil bearing capacity is identified to be less than three-thousand (3,000) psf based on the results of a certified soils laboratory or where undisturbed earth is identified. The Agency shall assume no responsibility for charges associated with verifying soil-bearing capacity.

3.23 MECHANICALLY RESTRAINED JOINTS

Mechanically restrained joints are required for all mains sixteen (16) inch and larger, and may be specified by the Engineer for pipes smaller than sixteen (16) inches. The beginning and ending locations and the restrained length shall be clearly identified on the drawings.

3.24 SERVICE LATERALS

3.24.01 Location

A. All service laterals shall be installed in the ROW unless other provisions have been approved by the Agency.

B. The full service lateral length between a water main and water meter shall be installed at ninety (90) degrees to the water main horizontal alignment, unless otherwise approved by the Agency.

A locator ribbon shall be installed the entire length of the lateral for all services not installed at right angles to the main.

- C. For service laterals two (2) inches in diameter and smaller, service saddles shall not be closer than twenty-four (24) inches from the pipe end, nor closer than eighteen (18) inches to any other service saddle or pipe joint.
- D. The sewer and water laterals leading into the property shall be separated horizontally by a minimum of four (4) feet, and located in separate trenches, per State and local health requirements.

3.24.02 Lateral Installation

- A. Service saddles shall be installed in accordance with the Agency's approved materials list for the type of pipe being used.
- B. Corporation stops shall be male iron pipe thread by compression connection. A corporation stop shall be installed at the water main for all service laterals two (2) inches and smaller.
- C. All services three (3) inches and larger require a minimum six (6) inch in diameter service lateral. The service lateral diameter shall equal the meter size for two (2) inch and smaller meters, or as approved by the Agency, but in no case shall the lateral diameter be less than one (1) inch.
- D. If the service lateral material is Polyethylene (PE), the lateral must be of one (1) pipe length. Couplings are not allowed for PE pipe. For any abrasions or breaks, the lateral must be replaced in its entirety.
- E. If the service lateral material is copper tubing, the lateral must be one (1) pipe length. Couplings are not allowed for one (1) inch copper tubing service laterals. One (1) coupling will be allowed in copper service laterals, one and a half (1/2) inch and two (2) inch diameter, over forty (40) feet in length. For any kinks, crimps, or breaks, the lateral must be replaced in its entirety.

3.25 BACKFLOW PREVENTION ASSEMBLIES

Agency approved backflow prevention assemblies shall be installed where shown on the approved plans in accordance with the current Agency Rules and Regulations and the applicable Standard Plates. Services requiring backflow prevention assemblies will not be placed in operation without the Agency's approval.

3.25.01 Application

No water service connection to any premises shall be approved, installed, or maintained by the Agency unless the water supply is protected as required by State laws, State regulations, and Agency Standards. Water service to any premises shall not be activated by the Agency if the Agency determines the water service requires a backflow assembly and any of the following conditions prevail:

- A. The backflow assembly is not installed or has been removed after installation.
- B. The backflow assembly has been by-passed.
- C. The backflow assembly is in any way altered.
- D. Any cross-connection or possibility of cross-connection.
- E. The backflow assembly receives an “unsatisfactory” test result.

3.26 VALVES3.26.01 Gate Valves

- A. All gate valves will be resilient seat unless specified otherwise, manufactured in accordance with AWWA Standard C509, “Resilient-Seated Gate Valves For Water Supply Service”, and AWWA Standard C515, “Reduced-Wall, Resilient-Seated Gate Valves For Water Supply Service”, and as approved by the Agency.
- B. Unless otherwise specified by the Agency, gate valves shall be installed in the vertical position.

3.26.02 Butterfly Valves

Water mains fourteen (14) inches in diameter and larger may use butterfly valves as required by the Agency, unless a tapping (gate) valve is required. Butterfly valves shall be manufactured in accordance with AWWA Standard C504, “Rubber-Seated Butterfly Valves”, and as approved by the Agency.

3.27 TESTING AND DISINFECTING

The Contractor shall furnish all equipment, labor and materials required for testing and disinfecting the potable water pipe. Water for testing and disinfecting will be furnished by the Agency from locations approved by the Agency. Disinfection shall be

accomplished by chlorination. All chlorine dosages, chlorinating, and testing operations shall be approved by, and done in the presence of, the Agency Representative.

3.27.01 Hydrostatic Testing

- A. The Contractor may hydrostatically test ductile iron pipe and polyvinyl chloride pipe twenty-four (24) inches in diameter and smaller with either the joints covered or exposed. Testing with exposed joints will not be allowed in wash areas. If the pipeline is tested with the joints exposed, the trench shall be partially backfilled. After the pipeline, or section thereof, has been completely filled with water, it shall be allowed to stand under a slight pressure for not less than twenty-four (24) hours to allow the pipe to absorb what water it will and to allow the escape of air from any air pockets. All valves four (4) inches and larger shall be hydrostatically tested in the closed position with the test pressure maintained on one side and atmospheric pressure on the other side. Each valve shall be driptight.
- B. The pipeline hydrostatic test shall consist of holding the test pressure on each pipeline section for a period of at least two (2) hours. The test pressure at the lowest point in the pipeline, or section thereof, being tested shall be two hundred (200) psi unless otherwise specified by the Agency.

Allowable leakage shall not exceed the limits for ductile iron pipe and polyvinyl chloride pipe as stated in AWWA Standard C605, "Underground Installation Of Polyvinyl Chloride (PVC) Pressure Pipe And Fittings For Water", Table 1, AWWA Standard C600, "Installation Of Ductile-Iron Water Mains And Their Appurtenances", Table 6, and AWWA Manual M23, "PVC Pipe - Design And Installation", Table 22 respectively. All leaks, both noticeable and above allowable limits, shall be corrected.

- C. When a new pipeline is required to be connected to the valved stub-out of an existing pipeline and when no services are connected to the existing stub-out, the Contractor may:

(Method 1)

Install the new pipeline to within one pipe length of the existing stub-out and install a cap or plug, along with a temporary blow-off assembly and a concrete thrust block on the new pipeline. Upon the completion of a successful test of the new pipeline performed in accordance with the provisions of Subsection 3.27 of these Standards, and obtainment of a bacteriological health sample from the new pipeline whose results meet the requirements of Section 3.27 of these Standards, the Contractor

shall remove the temporary blow-off assembly by removing the corporation stop at the main, and inserting a brass plug into the service saddle. The contractor shall also remove the thrust block, and make the final connection of the new pipeline into the existing water main stub. The Contractor shall swab the closure piece with a two Hundred (200) part-per-million concentration of chlorine at the point of final connection.

(Method 2)

Connect the new pipeline directly to the existing stub-out, and perform the hydrostatic pressure test and leakage test and the disinfection process of the new pipeline against the closed existing pipeline control valve. However, if this method is used, the Contractor shall assume all risk and responsibility for any failure of the existing stub-out or existing control valve and shall repair or replace any damaged portions thereof at his sole cost and expense. If the existing control valve on the stub-out is shown to the Agency to not be watertight prior to pressure and testing, the Contractor shall use Method 1 only. If the Contractor is unable to achieve a successful hydrostatic pressure test or leakage test due to apparent leakage of existing control valves, the Contractor, at his sole cost and expense, shall disconnect from the existing system and test the new pipeline by Method 1.

- D. If the existing pipeline valved stub-out has service(s) connected between the valve and the point of connection with the new pipeline, the Contractor shall use Method 1, or may elect to install a gate valve at the point of connection, at his own expense.

3.27.02

Disinfection

- A. Disinfection shall be accomplished by chlorination before the pipe is placed in service, either at the same time or after the pipe has been pressure tested.
- B. A chlorine-water solution shall be applied by means of a solution-feed chlorinating device. The chlorine-water solution shall be fed at a rate to ensure the water filling the pipeline to be disinfected will have a residual chlorine concentration of fifty (50) ppm. Care shall be taken to prevent the highly chlorinated water in the pipeline being treated from flowing back into the pipeline supplying the water.
- C. Chlorinated water shall be retained in the pipeline long enough to destroy all nonspore-forming bacteria. This period shall be at least twenty-four (24) hours. After the chlorine-treated water has

been retained for the required time, the chlorine residual at the pipeline extremities and at other representative points shall be at least ten (10) ppm.

- D. During the process of chlorinating the pipelines, all valves and other appurtenances shall be operated while the pipeline is filled with the heavily chlorinated water.
- E. Following chlorination, all treated water shall be thoroughly flushed from the pipelines and fittings at their extremities. (See "UDACS Plate 33").
- F. Following the final flushing, the pipeline shall be filled with water and left full.
- G. The Contractor shall be responsible for providing connections and apparatus necessary to obtain samples of water for bacteriological testing from the pipeline after final flushing is complete, but before the pipeline is placed into service. Samples will be drawn by the Agency at locations to be designated by the Agency. Bacteriological analysis will be performed by the Agency having jurisdiction. Should the initial treatment fail to produce satisfactory pipeline disinfection, as evidenced by the bacteriological tests, the chlorination procedure shall be repeated until acceptable results are obtained. Sampling will only be performed in accordance with the Agency's requirements. The Contractor shall also be responsible for dechlorination of treated/chlorinated water, to ensure that all discharges comply with the effluent limitations per the Nevada Division of Environmental Protect (NDEP) requirements.
- H. Upon completion of chlorination and testing, the Contractor shall remove any solution-feed chlorinating device or water sampling apparatus from the pipeline.

3.27.03 Accidental breakage/Pressure Loss in Distribution System

In the event of a pressure loss, the contractor shall contact the Agency immediately to determine the course of action for disinfection per the Agency's operation procedures.

3.27.04 Traffic Barricade and Control Plan

The Contractor shall be responsible for furnishing and providing barricade and traffic control at and around all work areas, whether located on public or private property, throughout the work duration. A traffic plan approved by the applicable jurisdictional organization shall be submitted to the Agency, as required. The Contractor shall comply with the barricade and traffic control plan.

3.28 SAFETY

The Contractor shall be required to adhere to all Federal, State, and local safety standards.

3.29 JOINT USE TRENCH

The Agency does not allow the joint use of any waterline trench.

3.30 OCCUPANCY PERMITS

The Agency is participating in the Occupancy Permit or Certificate of Occupancy (C of O) System(s) when initiated by the Building Department(s). Requirements established by enacted ordinances, along with other requirements established by the Building Department, must be met before an Occupancy Permit can be issued for your structure(s).

The Agency's Inspection staff will examine and test all construction within the public ROW or dedicated easements until it conforms to the Agency specifications. A Certificate of Occupancy cannot be provided for projects with major deficiencies such as density failures, unsatisfactory pressure test and/or water samples, incomplete facilities, or facilities not constructed to approved plans.