

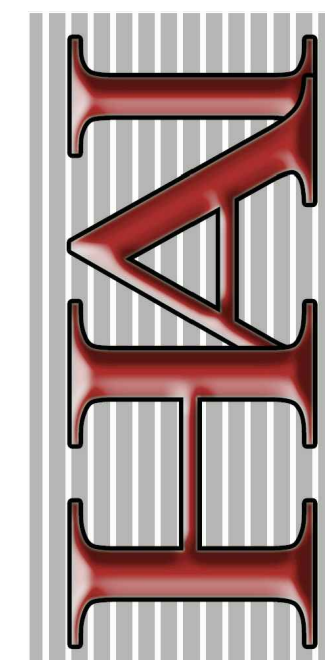
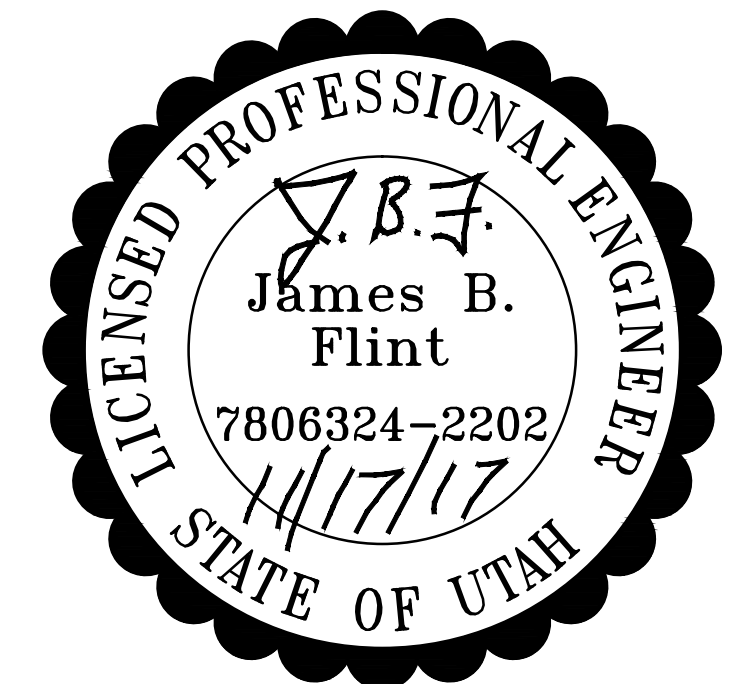
# CITY OF HONEYVILLE CULINARY WATER SYSTEM STANDARD INSTALLATION DRAWINGS



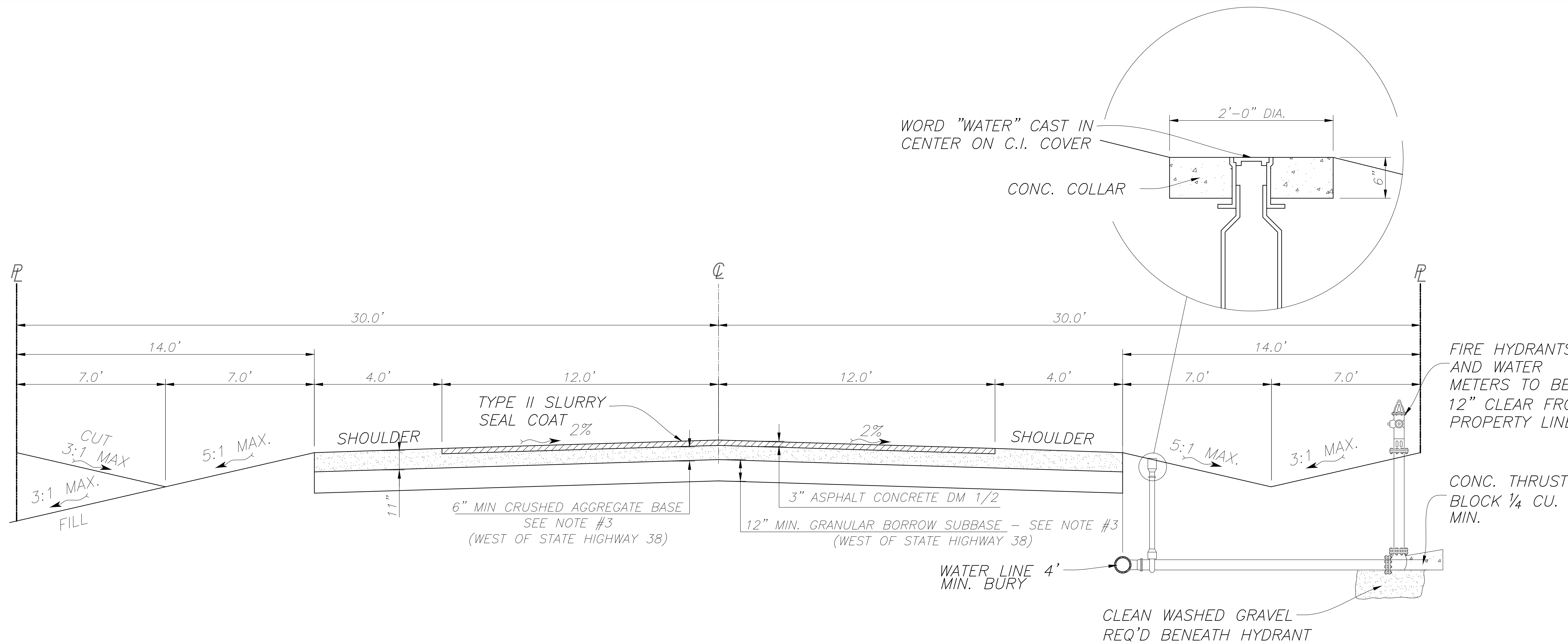
## Standard Drawing Index

- SHEET 1 – TYPICAL STREET IMPROVEMENT DETAILS – 60' RURAL CLASSIFICATION*
- SHEET 2 – TYPICAL STREET IMPROVEMENT DETAILS – 66' RURAL COLLECTOR ROAD CLASSIFICATION*
- SHEET 3 – TYPICAL STREET IMPROVEMENT DETAILS – URBAN CLASSIFICATION*
- SHEET 4 – TYPICAL STREET INTERSECTION – URBAN CLASSIFICATION*
- SHEET 5 – TYPICAL STREET INTERSECTION – RURAL CLASSIFICATION*
- SHEET 6 – CULINARY WATER SYSTEM STANDARD DETAILS*
- SHEET 7 – TYPICAL PRV STATION DETAILS*
- SHEET 8 – LARGE DIAMETER SERVICE METER DETAILS*
- SHEET 9 – CULINARY WATER SYSTEM IRRIGATION SYSTEM BACKFLOW PREVENTER*
- SHEET 10– CULINARY WATER SYSTEM MISCELLANEOUS DETAILS*

*REFER TO THE COMPANION DOCUMENT TITLED "HONEYVILLE CITY WATER SYSTEM SPECIFICATIONS" FOR CULINARY WATER DISTRIBUTION SYSTEM CONSTRUCTION AND DESIGN REQUIREMENTS.*

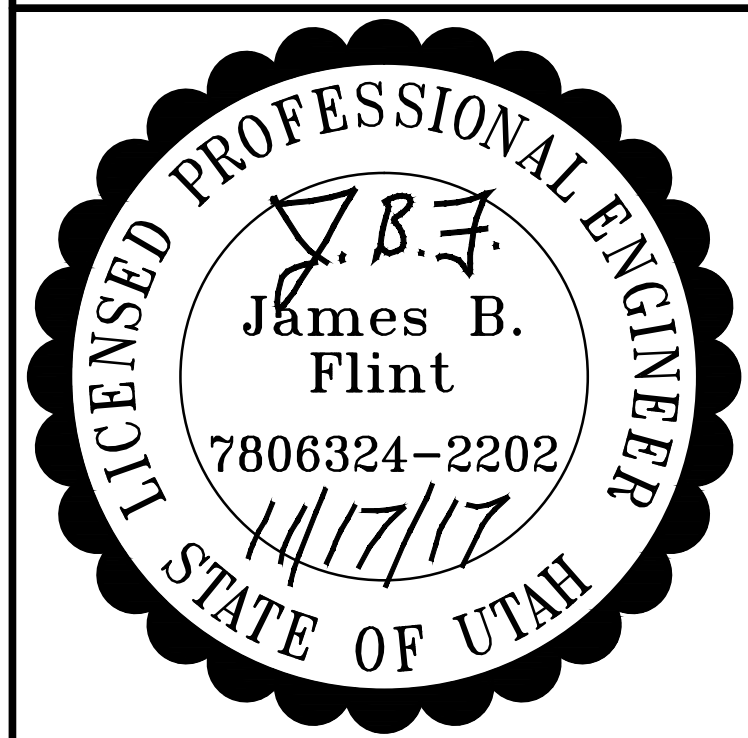


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## TYPICAL 60' R.O.W. STREET SECTION

- NOTES:
- 1 - THIS DRAWING IS NOT TO VERTICAL SCALE. VERTICAL FEATURES ARE EXAGGERATED FOR DRAWING CLARITY.
  - 2 - ALL WATER VALVES ARE TO BE FINISHED WITH CONCRETE COLLARS AT THE SURFACE.



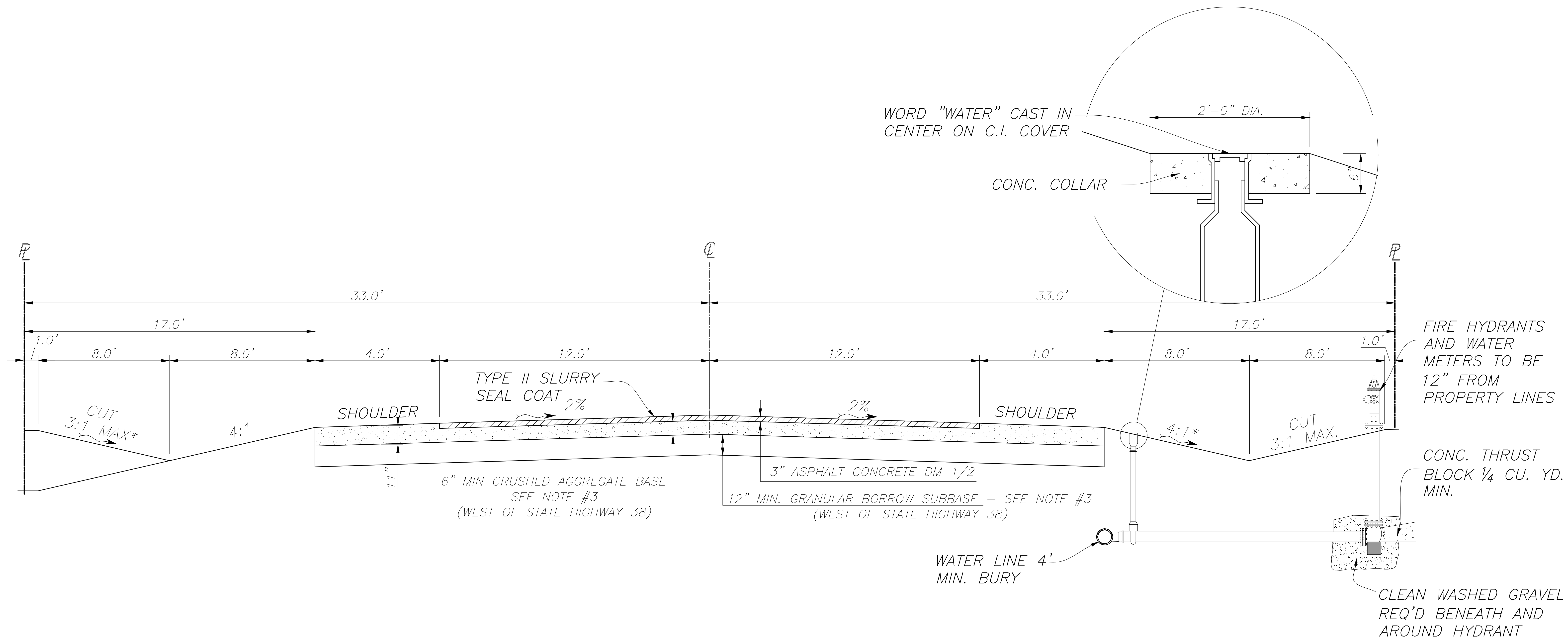
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REVISION DATE:
DATE: 11/17/17
SCALE: NONE

HONEYVILLE CITY WATER SYSTEM CONSTRUCTION STANDARDS
STREET IMPROVEMENT DETAILS 60' RURAL CLASSIFICATION

SHEET:
1
OF 10 SHEETS

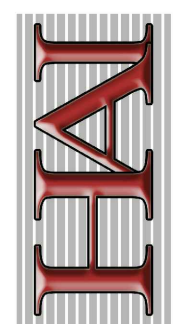
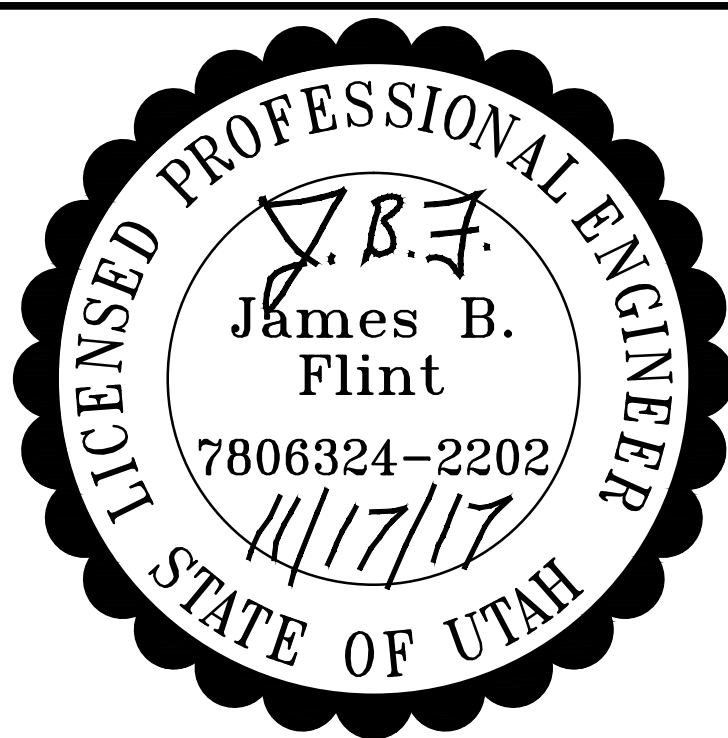




# TYPICAL 66' R.O.W. STREET SECTION (COLLECTOR ROADS)

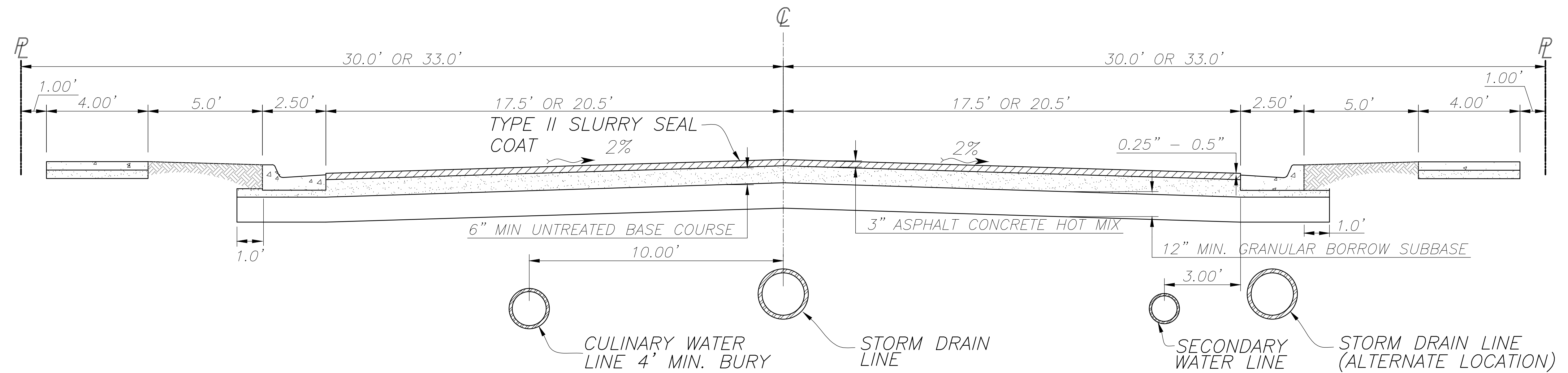
NOTES:

- 1 - THIS DRAWING IS NOT TO VERTICAL SCALE. VERTICAL FEATURES ARE EXAGGERATED FOR DRAWING CLARITY.
- 2 - ALL WATER VALVES ARE TO BE FINISHED WITH CONCRETE COLLARS AT THE SURFACE.



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REVISION DATE:	HONEYVILLE CITY WATER SYSTEM CONSTRUCTION STANDARDS	SHEET:  2  OF 10 SHEETS
DATE: 11/17/17	STREET IMPROVEMENT DETAILS	
SCALE: NONE	66' RURAL COLLECTOR ROAD CLASSIFICATION	

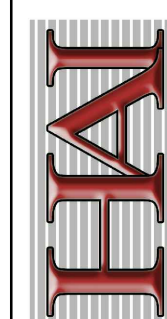
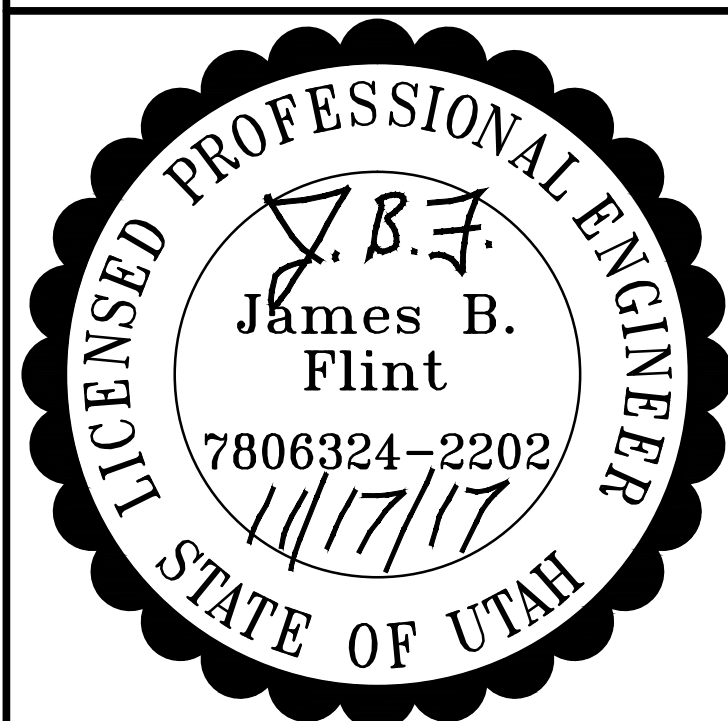


## TYPICAL STREET SECTION

### NOTES:

1 - THIS DRAWING IS NOT TO VERTICAL SCALE. VERTICAL FEATURES ARE EXAGGERATED FOR DRAWING CLARITY.

2 - ALL WATER VALVES, MANHOLES, AND STORM DRAIN JUNCTION BOXES ARE TO BE FINISHED WITH CONCRETE COLLARS AT THE SURFACE.



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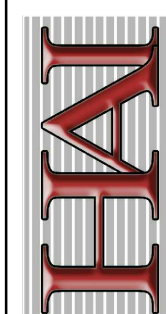
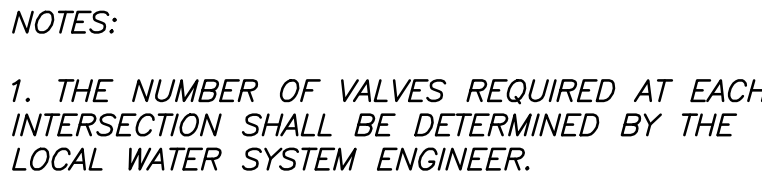
SCALE: NONE

**HONEYVILLE CITY**  
**WATER SYSTEM CONSTRUCTION STANDARDS**  
*STREET IMPROVEMENT DETAILS*  
*URBAN CLASSIFICATION*  
**(½ ACRE OR SMALLER LOT SIZE)**

SHEET:

3

OF 10 SHEETS



REVISION DATE:
DATE: 11/17/17
SCALE: NONE

## HONEYVILLE CITY WATER SYSTEM CONSTRUCTION STANDARDS

TYPICAL STREET INTERSECTION  
URBAN CLASSIFICATION

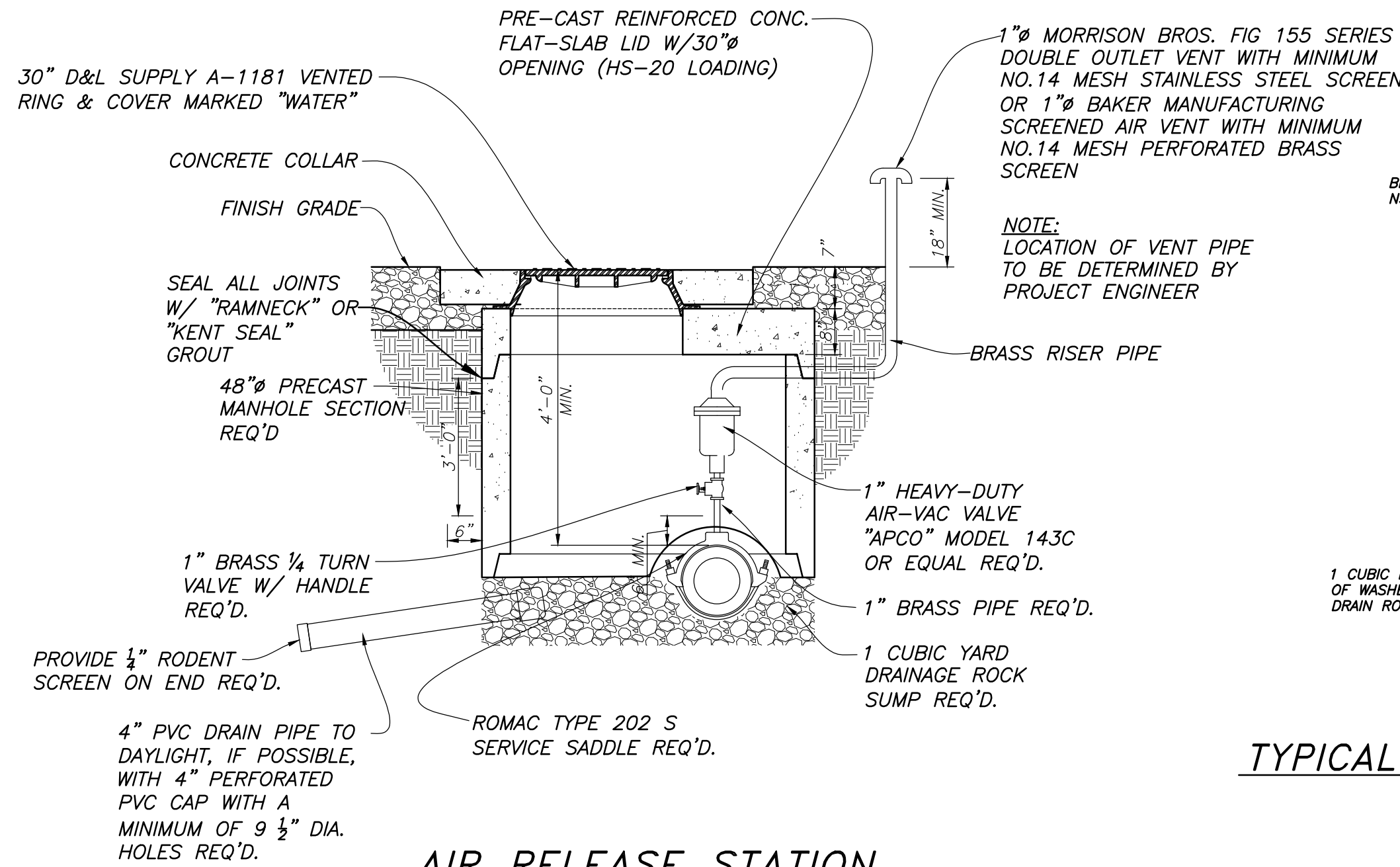
SHEET:

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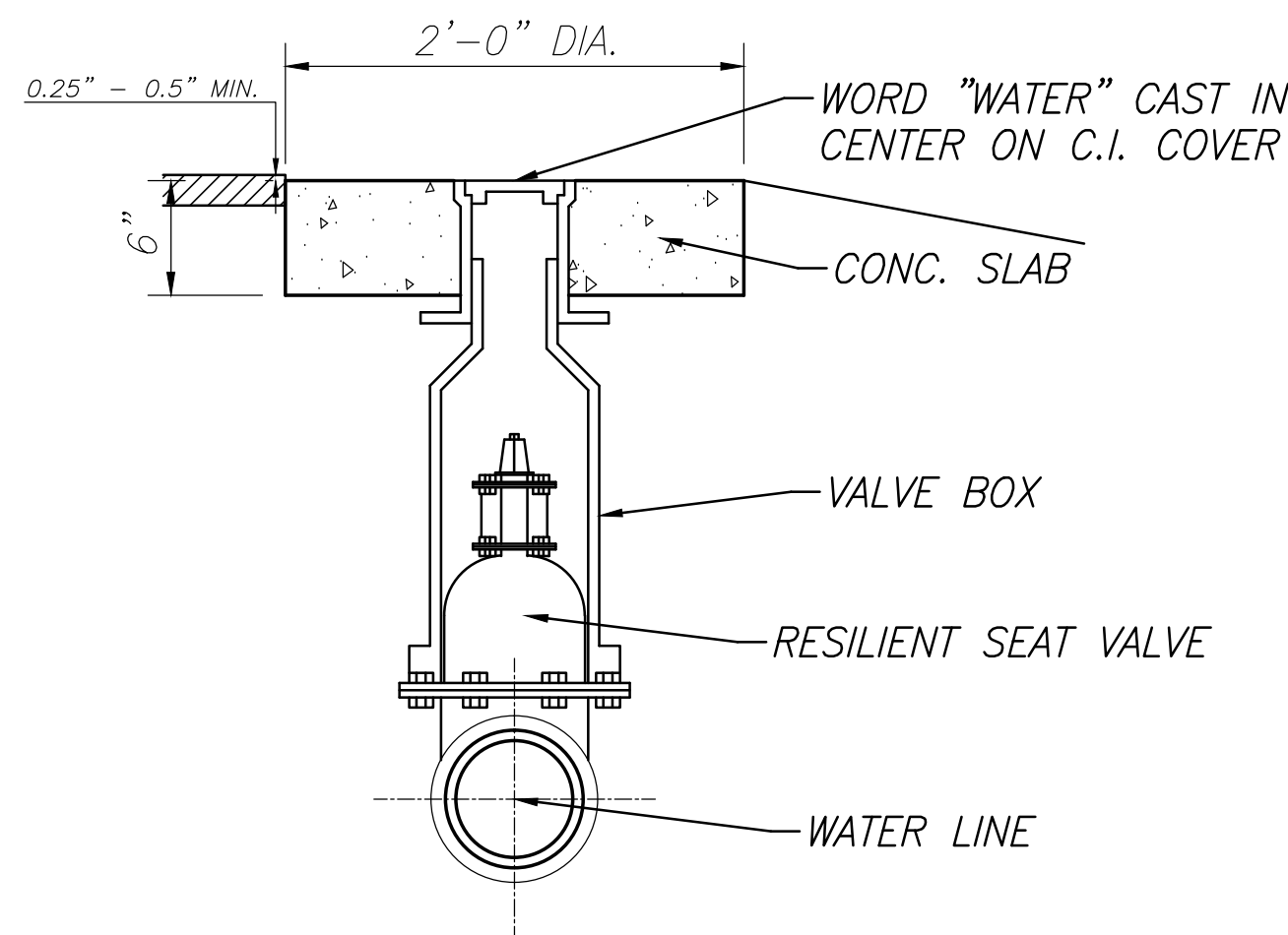




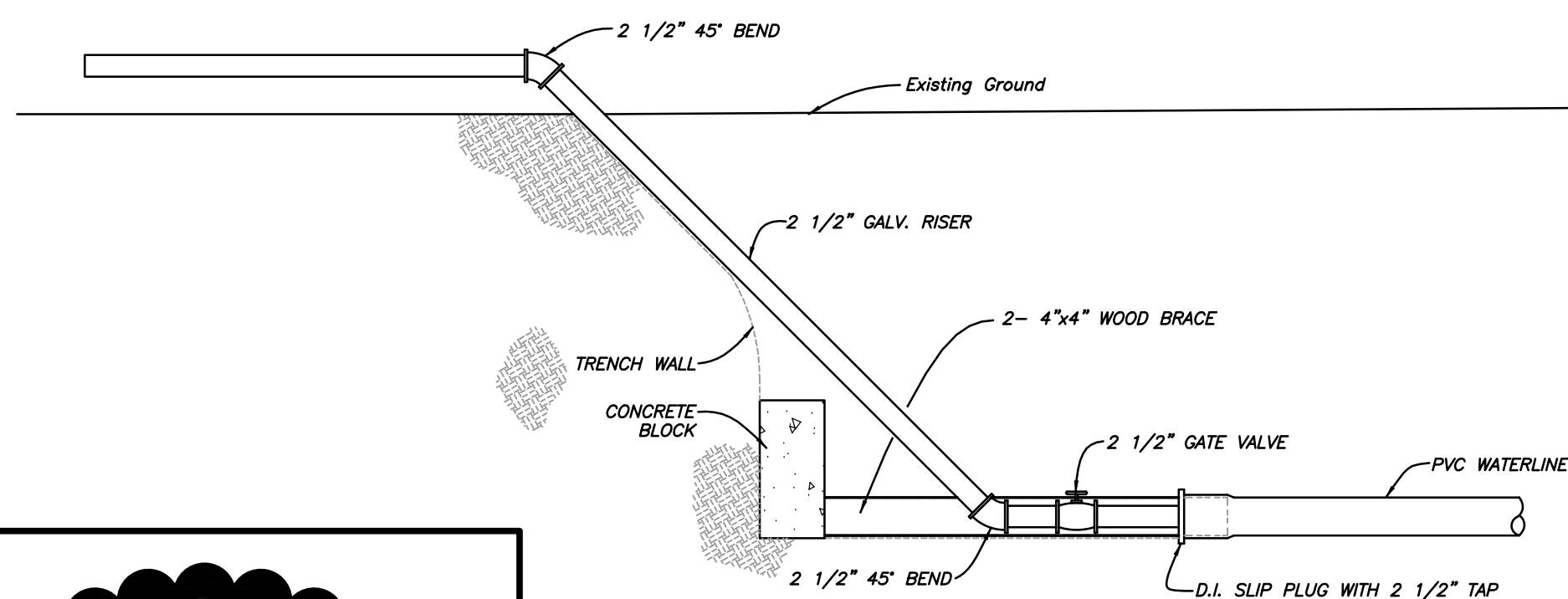




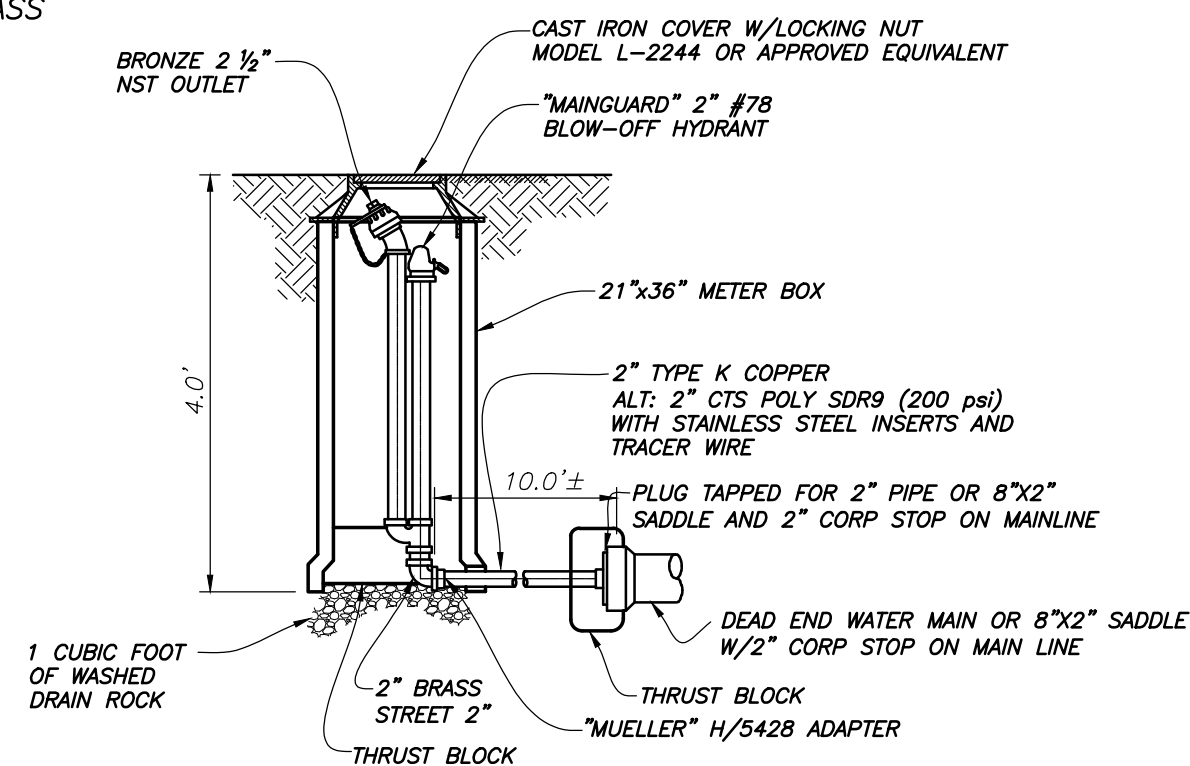
**AIR RELEASE STATION  
FOR 4' BURY WATERLINE**



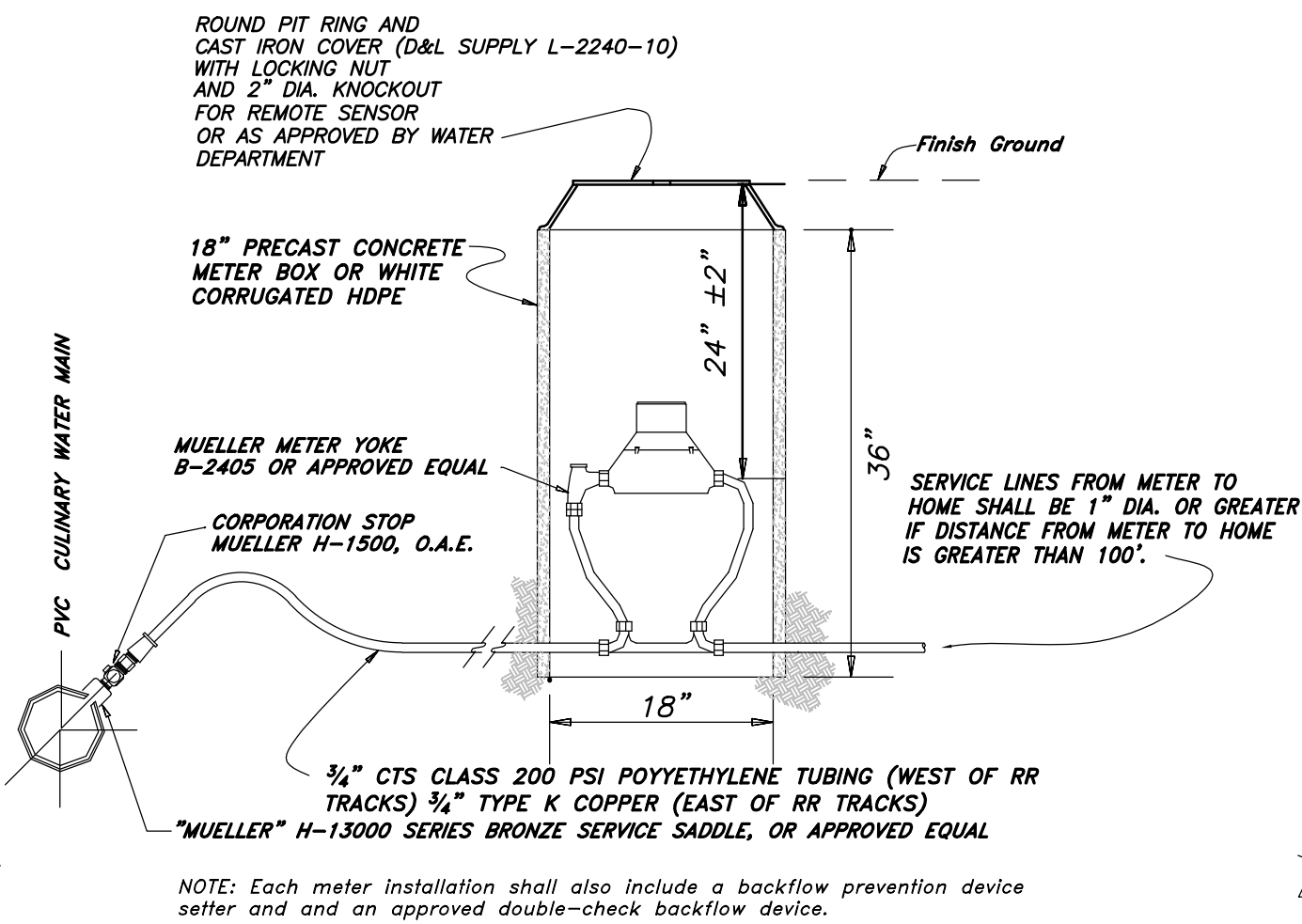
**VALVE BOX**



**TEMPORARY BLOW-OFF DETAIL**

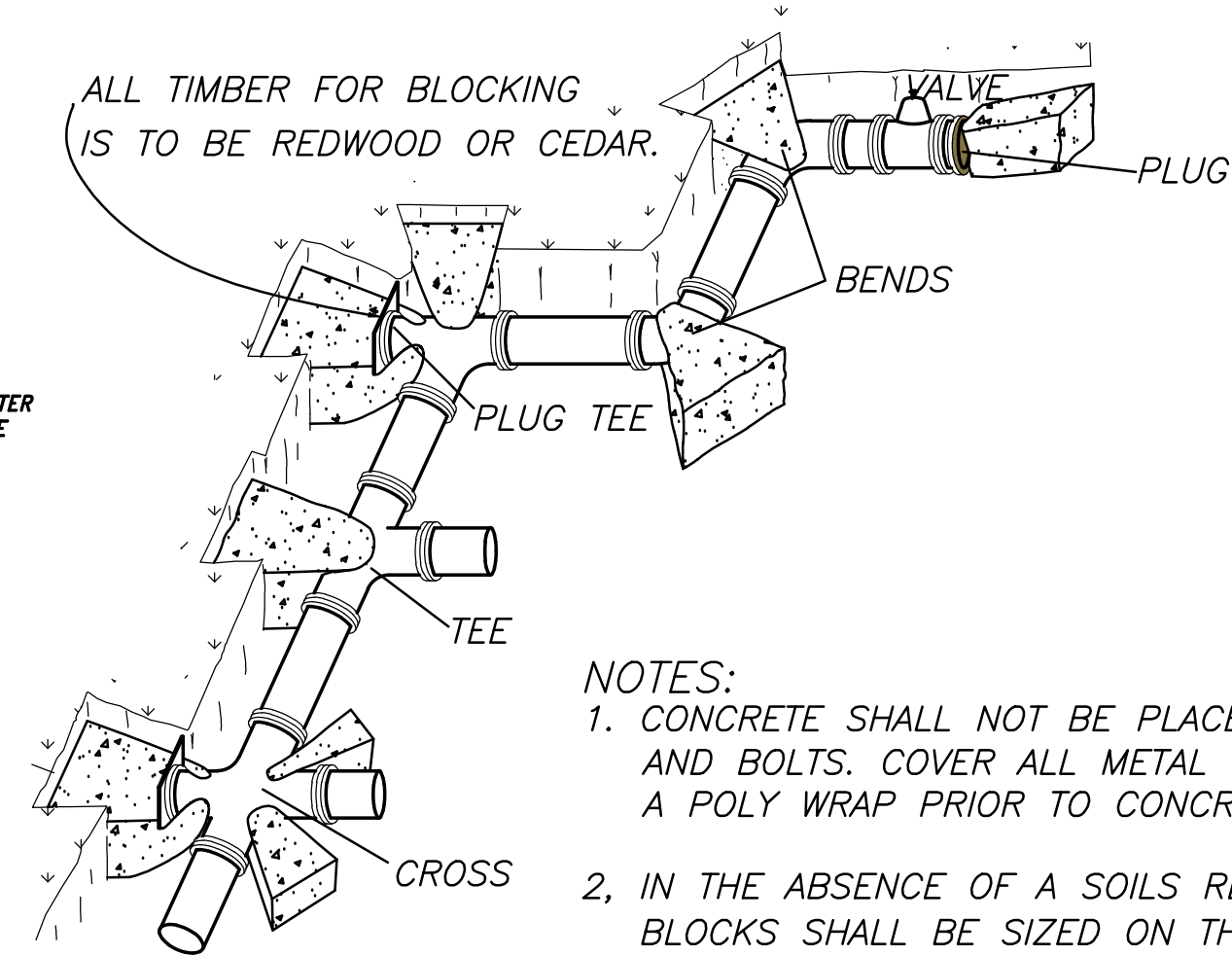


**TYPICAL FLUSH VALVE CONNECTION**



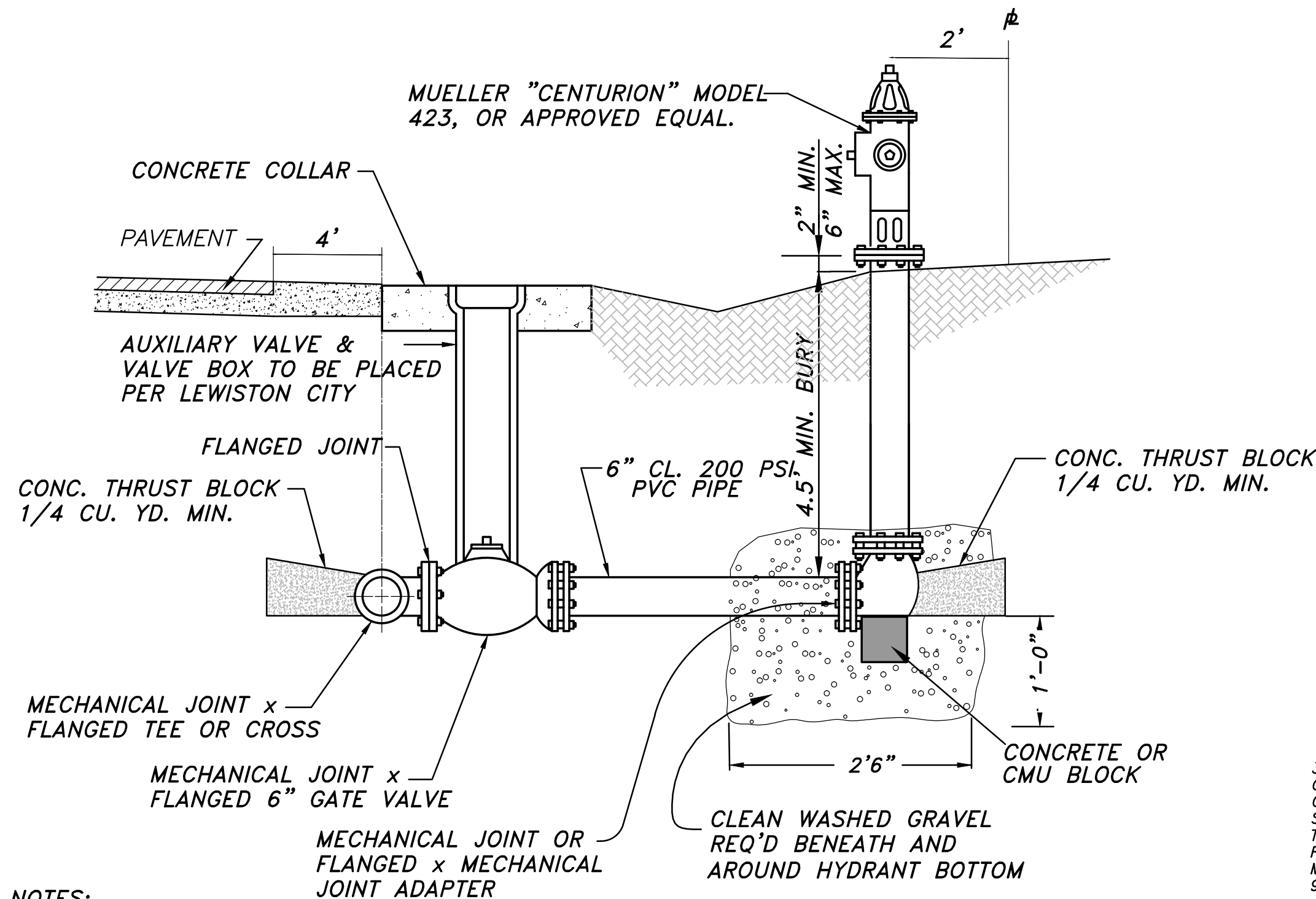
**TYPICAL WATER SERVICE  
CONNECTION**

SERVICE LATERALS IN SUBDIVISIONS SHALL  
EXTEND 20' INSIDE FRONT PROPERTY LINE



- NOTES:
1. CONCRETE SHALL NOT BE PLACED AROUND JOINTS AND BOLTS. COVER ALL METAL CONTACT AREAS WITH A POLY WRAP PRIOR TO CONCRETE PLACEMENT.
  2. IN THE ABSENCE OF A SOILS REPORT, ALL THRUST BLOCKS SHALL BE SIZED ON THE BASIS OF A MAXIMUM LATERAL BEARING VALUE OF 800 P.S.F. AND A THRUST RESULTING FROM 150% OF THE WATERLINE STATIC PRESSURE.
  3. THRUST BLOCKS SHALL BE CONSTRUCTED AT ALL BENDS OF 22 1/2 DEGREES AND GREATER AND BEHIND ALL TEES, FIRE HYDRANTS, AND PLUGS. THEY SHALL BE CONSTRUCTED OF 2000 P.S.I. CONCRETE OR BETTER.

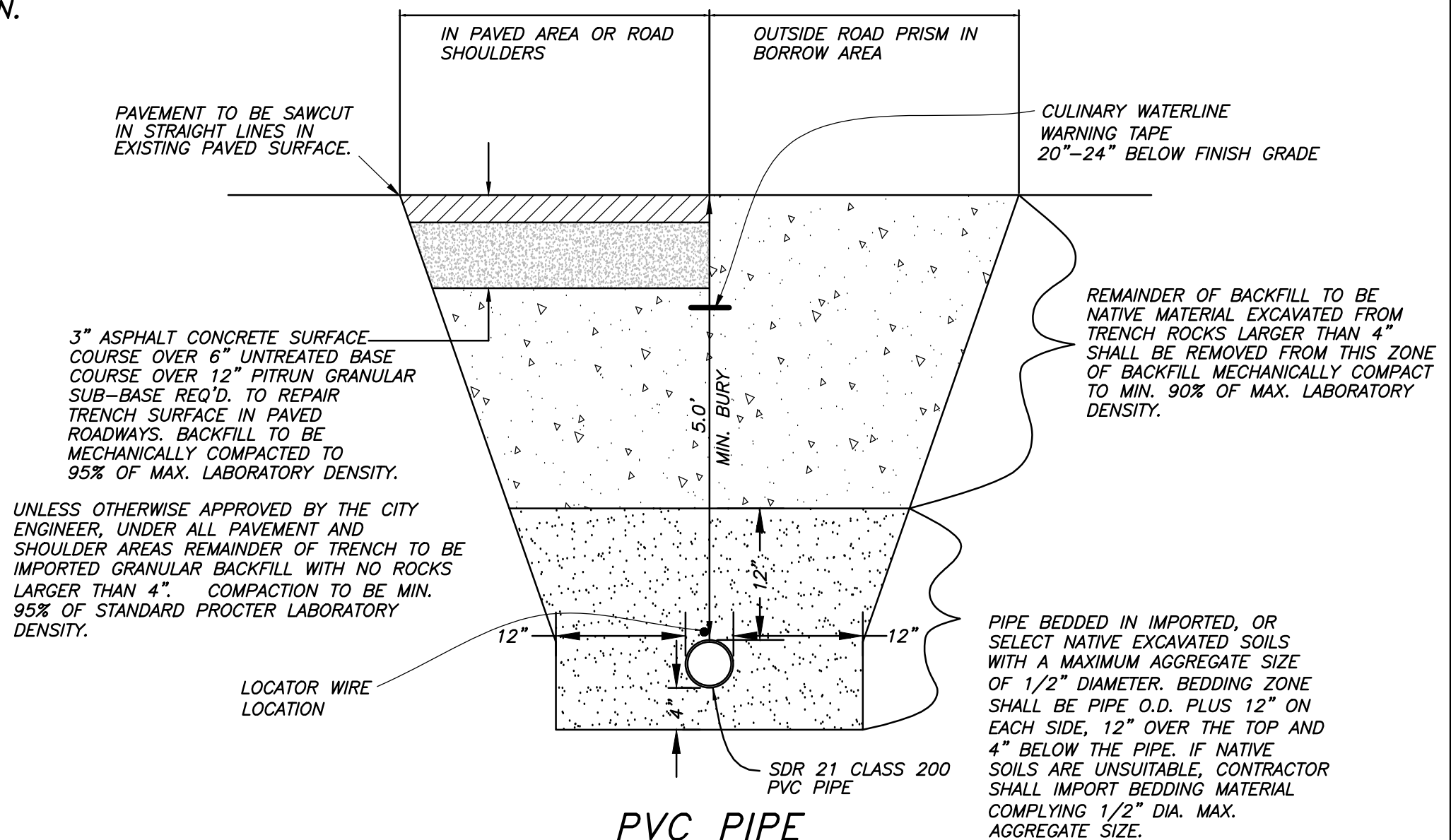
**THRUST BLOCKING DETAIL**



NOTES:

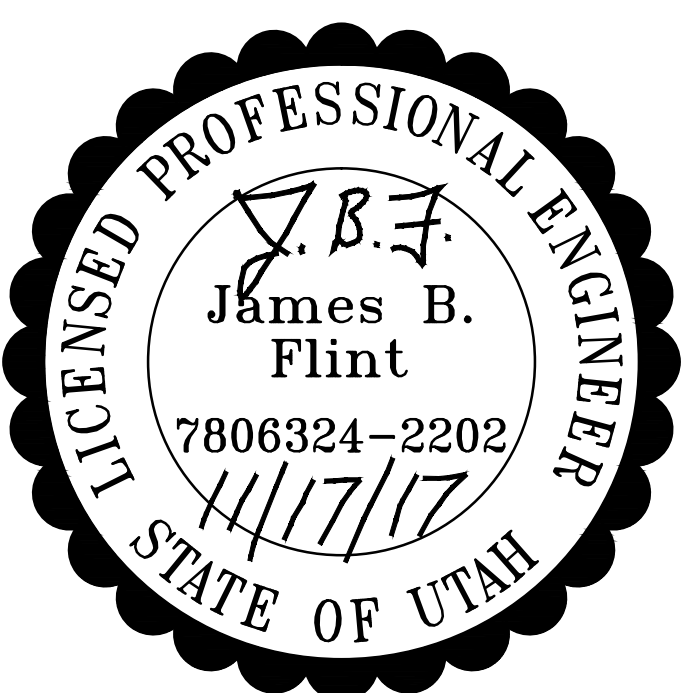
1. MECHANICAL FITTINGS WITH A MINIMUM OF TWO "ALL THREAD" BOLTS PER CONNECTION MAY BE USED IN LIEU OF THE FLANGED FITTINGS SHOWN.
2. FIRE HYDRANTS SHALL BE SPACED AT A MAXIMUM INTERVAL OF 500 FT., OR SO THAT EVERY RESIDENCE IN THE DEVELOPMENT IS WITHIN 250 FT. OF A FIRE HYDRANT.
3. FIRE HYDRANT SHALL HAVE A NOMINAL VALVE OPENING OF 5 1/4" DIA.

**TYPICAL FIRE HYDRANT  
INSTALLATION**



**PVC PIPE  
BEDDING AND BACKFILL DETAIL**

- SPECIAL WATER USE NOTES:
1. IF IRRIGATION OR SECONDARY WATER IS AVAILABLE FOR THE PROPERTY BEING DEVELOPED, ALL OUTSIDE WATERING OR OTHER OUTSIDE USES SHALL BE DONE WITH A SECONDARY WATER SYSTEM PROVIDED BY THE DEVELOPER OR LANDOWNER. NO CULINARY WATER MAY BE USED FOR OUTSIDE USE IN THIS CASE.
  2. IF NO SECONDARY WATER IS AVAILABLE FOR THE PROPERTY BEING DEVELOPED, ALL OUTSIDE WATERING WITH CULINARY WATER IS LIMITED TO ONE-THIRD ACRE PER RESIDENTIAL LOT PER THE WATER SYSTEM WATER CONSERVATION AND MANAGEMENT PLAN.



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REVISION DATE:  
DATE: 11/17/17  
SCALE: NONE

**HONEYVILLE CITY  
WATER SYSTEM CONSTRUCTION STANDARDS**  
**CULINARY WATER SYSTEM  
STANDARD DETAILS**

SHEET:  
**6**  
OF 10 SHEETS

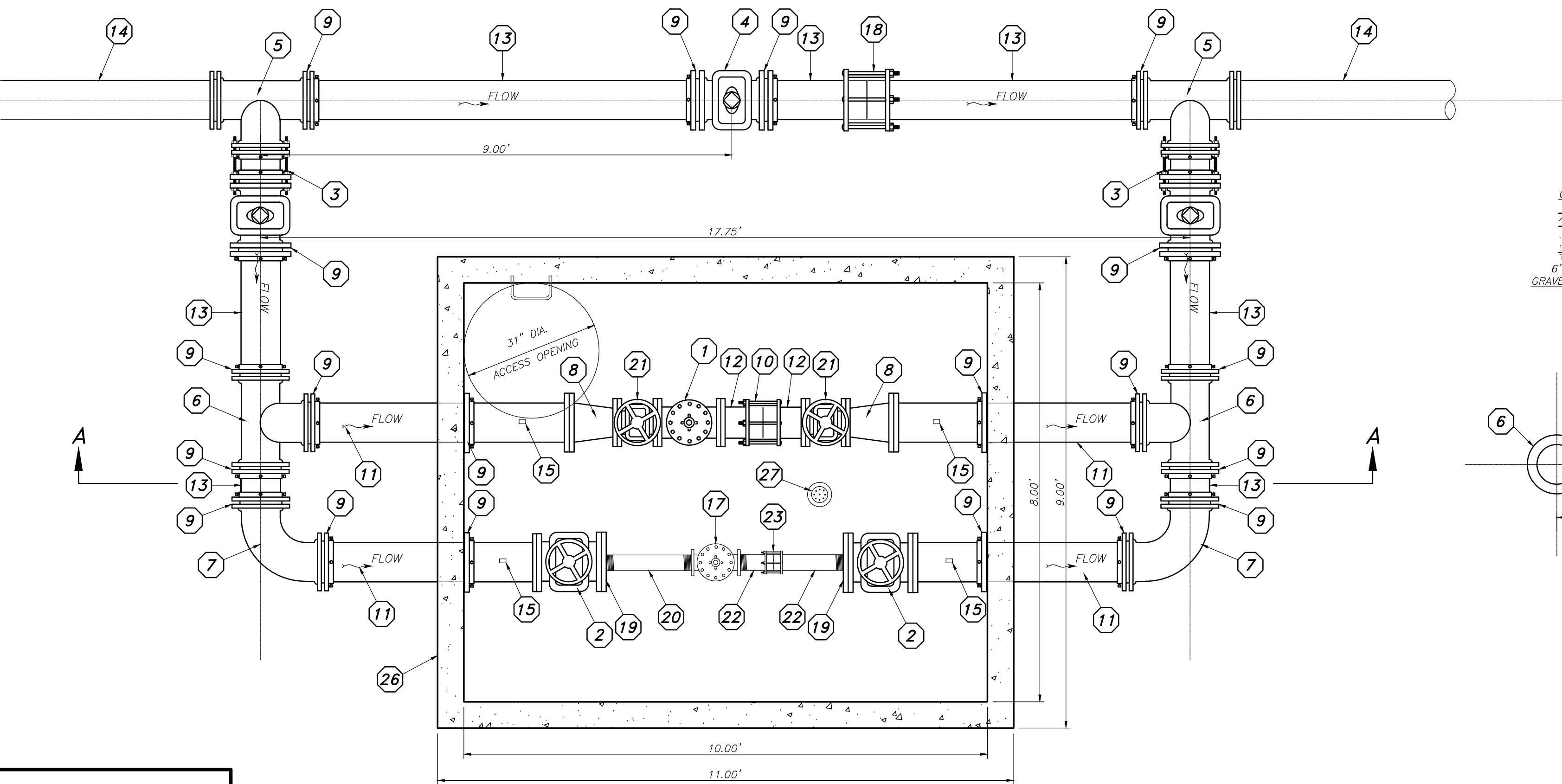


NOTES:

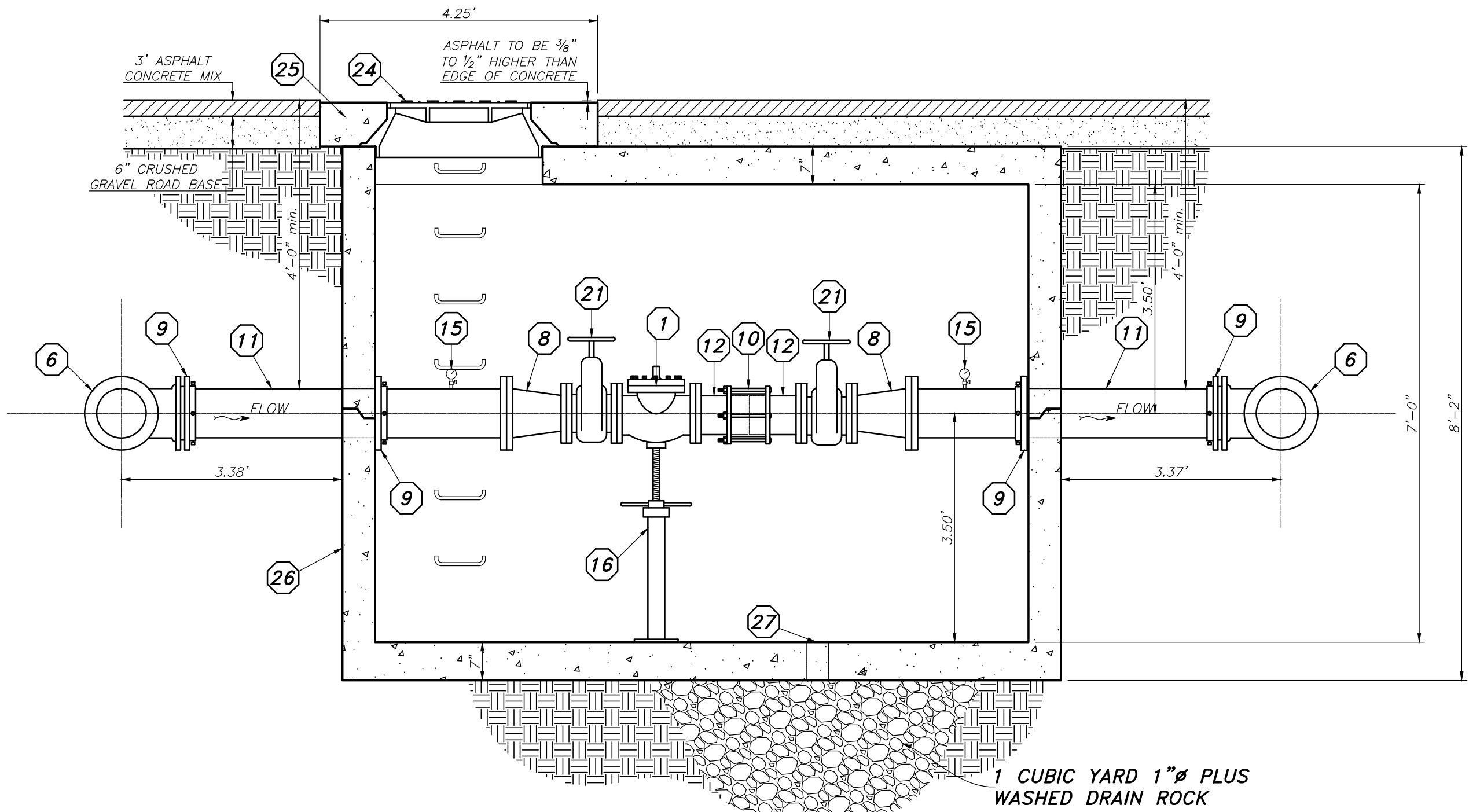
1. ALL CONSTRUCTION AND ACTIVITIES ASSOCIATED WITH THE PROJECT CONSTRUCTION SHALL COMPLY WITH STATE OF UTAH ADMINISTRATIVE RULE 309-500 SERIES FOR PUBLIC DRINKING WATER SYSTEMS.
2. THE DETAIL SHOWN HEREON IS TYPICAL FOR AN EIGHT-INCH DISTRIBUTION WATERLINE. THE MAIN PRESSURE REDUCING VALVE SHALL BE ONE SIZE SMALLER THAN THE DISTRIBUTION LINE. THE SMALLER BYPASS PRV VALVE SHALL ALWAYS BE 2-INCH DIAMETER PLUMBED AS SHOWN UNLESS OTHERWISE SPECIFIED BY THE WATER SYSTEM ENGINEER OR PROJECT ENGINEER.
3. CONCRETE THRUST BLOCKS SHALL BE PROVIDED BEHIND ALL TEES AND ELBOWS PER STANDARD DRAWING SHEET 4.
4. THE CHAMBER SHALL BE DRAINED TO DAYLIGHT IF POSSIBLE. SEE AIR RELEASE CHAMBER DETAIL ON STANDARD DRAWING SHEET 4 FOR PIPE DRAIN TO DAYLIGHT DETAIL.
5. ALL METALLIC OR DUCTILE IRON PIPE BURIED OUTSIDE THE CHAMBER SHALL BE POLY WRAPPED PER THE STANDARD AND SUPPLEMENTAL SPECIFICATIONS.
6. ALL METALLIC FITTINGS BURIED OUTSIDE THE CHAMBER SHALL BE POLY WRAPPED PER THE STANDARD AND SUPPLEMENTAL SPECIFICATIONS.

KEY NOTES:

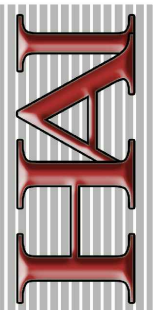
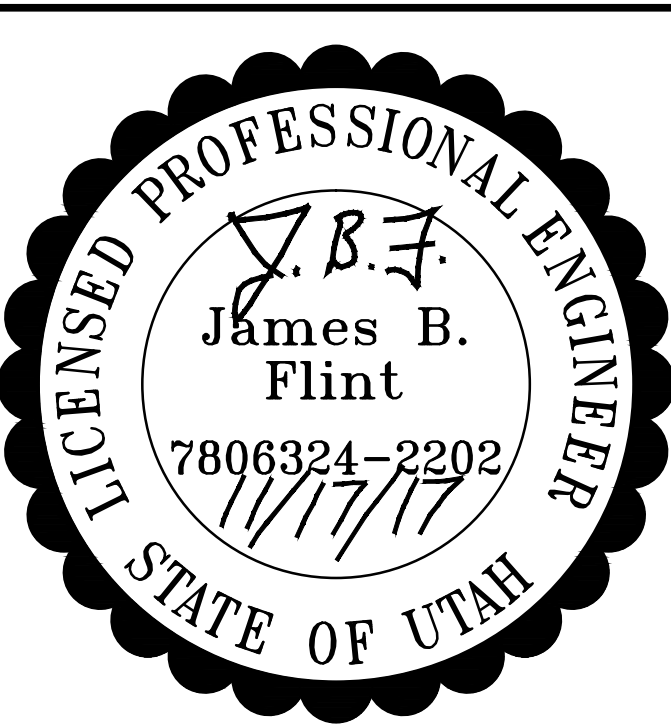
- 1 6" CLA-VAL CO. 90G-01TCSBJ PRESSURE REDUCING VALVE; 30 TO 300 PSI RANGE REQ'D.
- 2 8" FLANGED RESILIENT SEAT VALVE WITH HANDWHEEL OPERATOR REQ'D.
- 3 8" M.J.xM.J. RESILIENT SEAT VALVE AND VALVE BOX. SECURE VALVE TO TEE WITH 2 ALL THREAD BOLTS REQ'D AS SHOWN
- 4 8" M.J.xM.J. RESILIENT SEAT VALVE AND VALVE BOX REQ'D.
- 5 8"x8"x8" M.J.xM.J. TEE REQ'D
- 6 8"x8"x8" M.J.xM.J. TEE REQ'D
- 7 8"x90" M.J. BEND REQ'D.
- 8 8"x6" FLANGED REDUCER REQ'D.
- 9 8" MEGA-LUG JOINT RESTRAINT FOLLOWERS REQ'D.
- 10 6" ROMAC 501 COUPLER OR APPROVED EQUAL REQ'D.
- 11 8"x6' LONG FLXPE DUCTILE IRON PIPE SPOOL REQ'D. (CUT TO FIT); POLY WRAP PIPE OUTSIDE OF VAULT
- 12 6"x2' LONG FLXPE DUCTILE IRON PIPE SPOOL REQ'D (CUT TO FIT)
- 13 8" CLASS 50 DUCTILE IRON PIPE REQ'D (CUT TO FIT); POLY WRAP
- 14 8" SDR 21 CLASS 200 PVC WATERLINE
- 15 0-160 PSI 2.5" LIQUID FILLED PRESSURE GAUGE WITH STOP COCK TAPPED INTO PIPE SPOOL REQ'D
- 16 PRE-MANUFACTURED SCREW-JACK ADJUSTABLE PIPE SUPPORT REQ'D (1 EACH PER PRV VALVE)
- 17 2" CLA-VAL CO. 90G-01YCSBJ PRESSURE REDUCING VALVE; 30 TP 300 PSI RANGE REQ'D.
- 18 8" ROMAC 501 COUPLER REQ'D. OR APPROVED EQUAL.
- 19 8" FLANGE WITH 2" TAP REQ'D.
- 20 2"x18" LONG SCHEDULE 40 GALV. STEEL THREADED x THREADED SPOOL REQ'D.
- 21 6" RESILIENT SEAT VALVE WITH HANDWHEEL OPERATOR REQ'D.
- 22 2"x24" LONG SCHEDULE 40 GALVANIZED THREADED x PE STEEL PIPE SPOOL REQ'D. (FIELD CUT TO FIT)
- 23 2" COMPRESSION OR MECHANICAL COUPLER REQ'D.
- 24 RC30RC RING AND COVER REQ'D. D&L SUPPLY A-1180 SOLID COVER MARKED "WATER". (OR APPROVED EQUAL)
- 25 CIRCULAR CONCRETE COLLAR REQ'D AS SHOWN.
- 26 AMCOR 8'x10' PRECAST UTILITY VAULT REQ'D. (OR APPROVED EQUAL)
- 27 4" DRAIN OPENING REQ'D.



P.R.V. STATION PLAN VIEW  
(NOT TO SCALE)



P.R.V. STATION SECTION A-A  
(NOT TO SCALE)



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REVISION DATE:

DATE: 11/17/17

SCALE: NONE

Honeyville City  
Water System Construction Standards

CULINARY WATER SYSTEM  
TYPICAL PRV STATION DETAILS

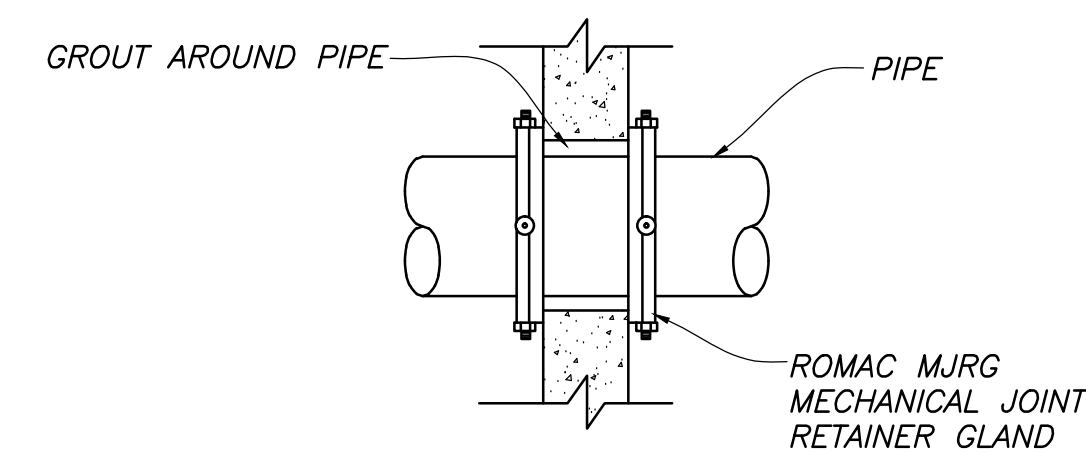
SHEET:

7

OF 10 SHEETS

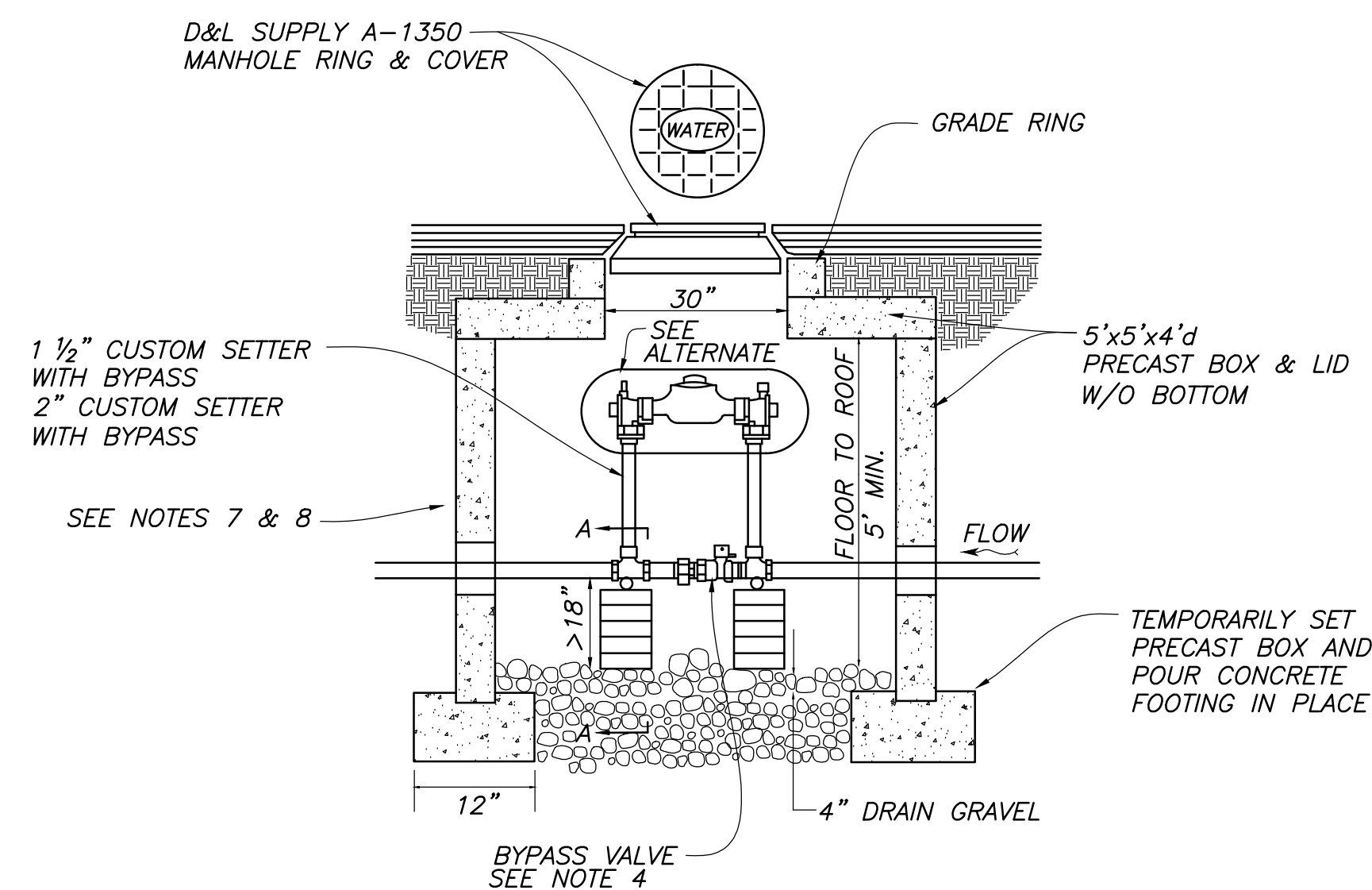


- 
- 5' 2 1/2"
- 12"
- 2 1/2" x 3/4"
- 14"
- 3/4"  $\phi$  (4) REQ'D
- 3/4"  $\phi$  (6) REQ'D
- HOT DIP GALVANIZE  
AFTER FABRICATION

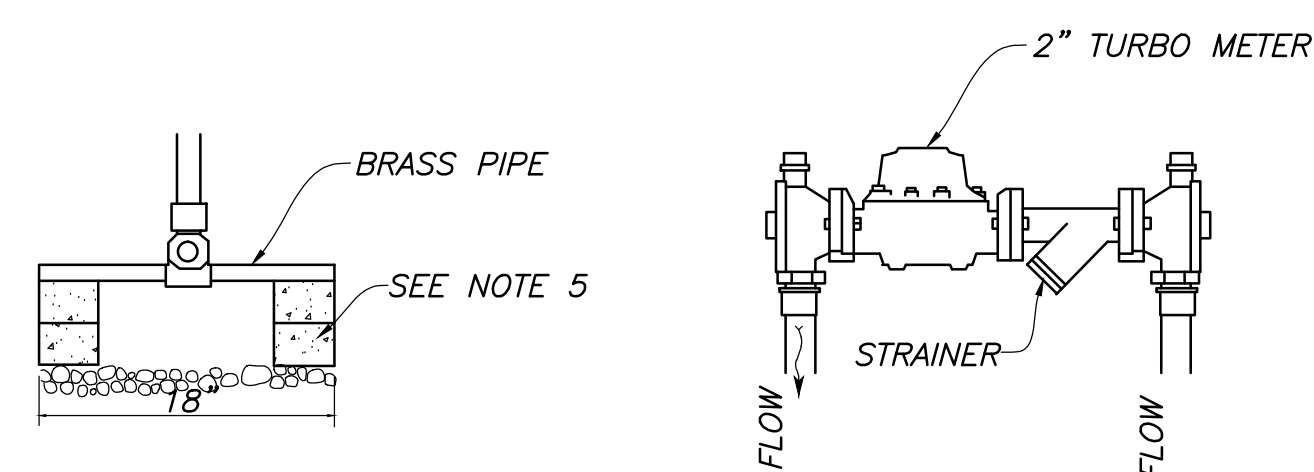


WALL PENETRATION DETAIL

LADDER DETAIL



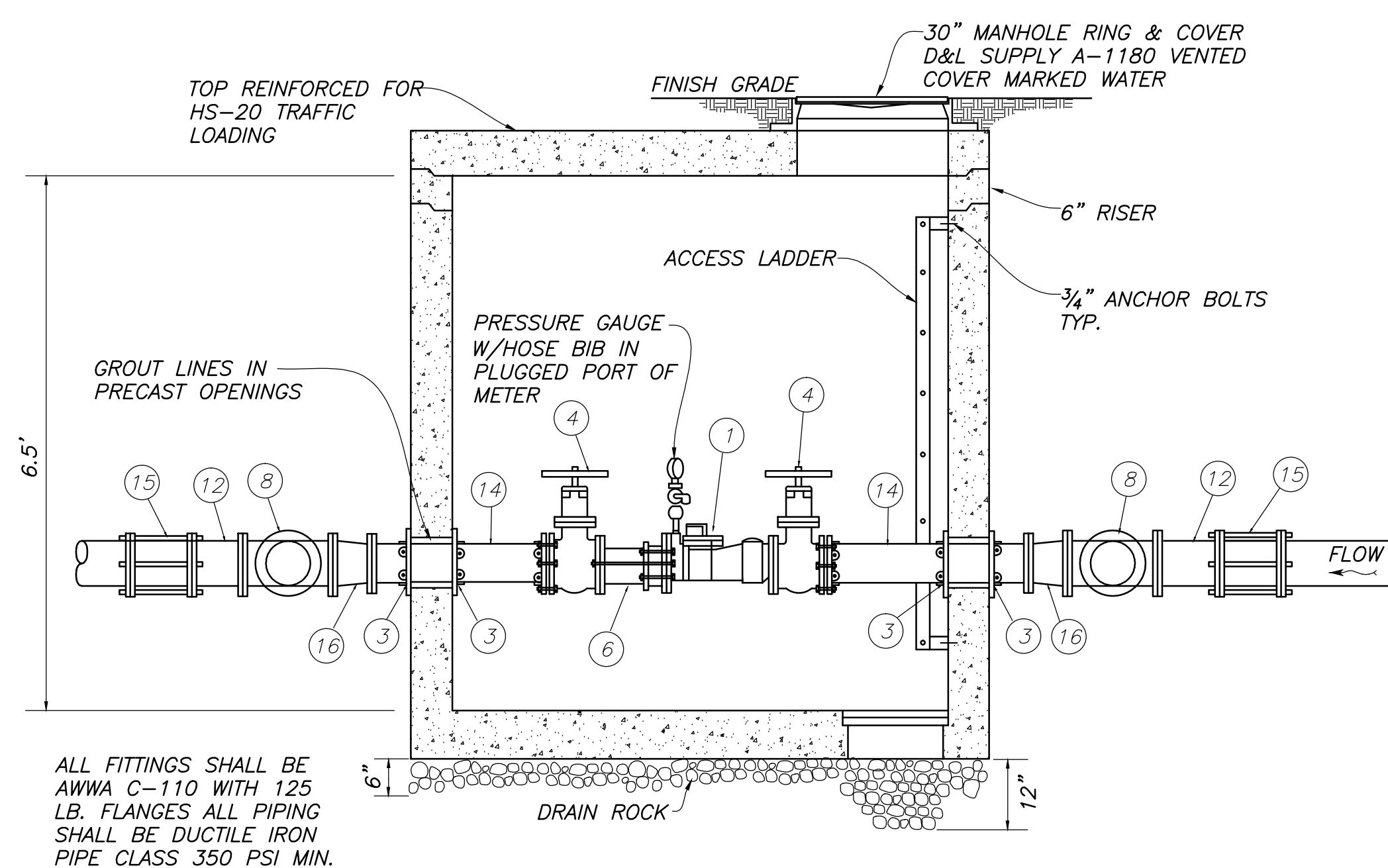
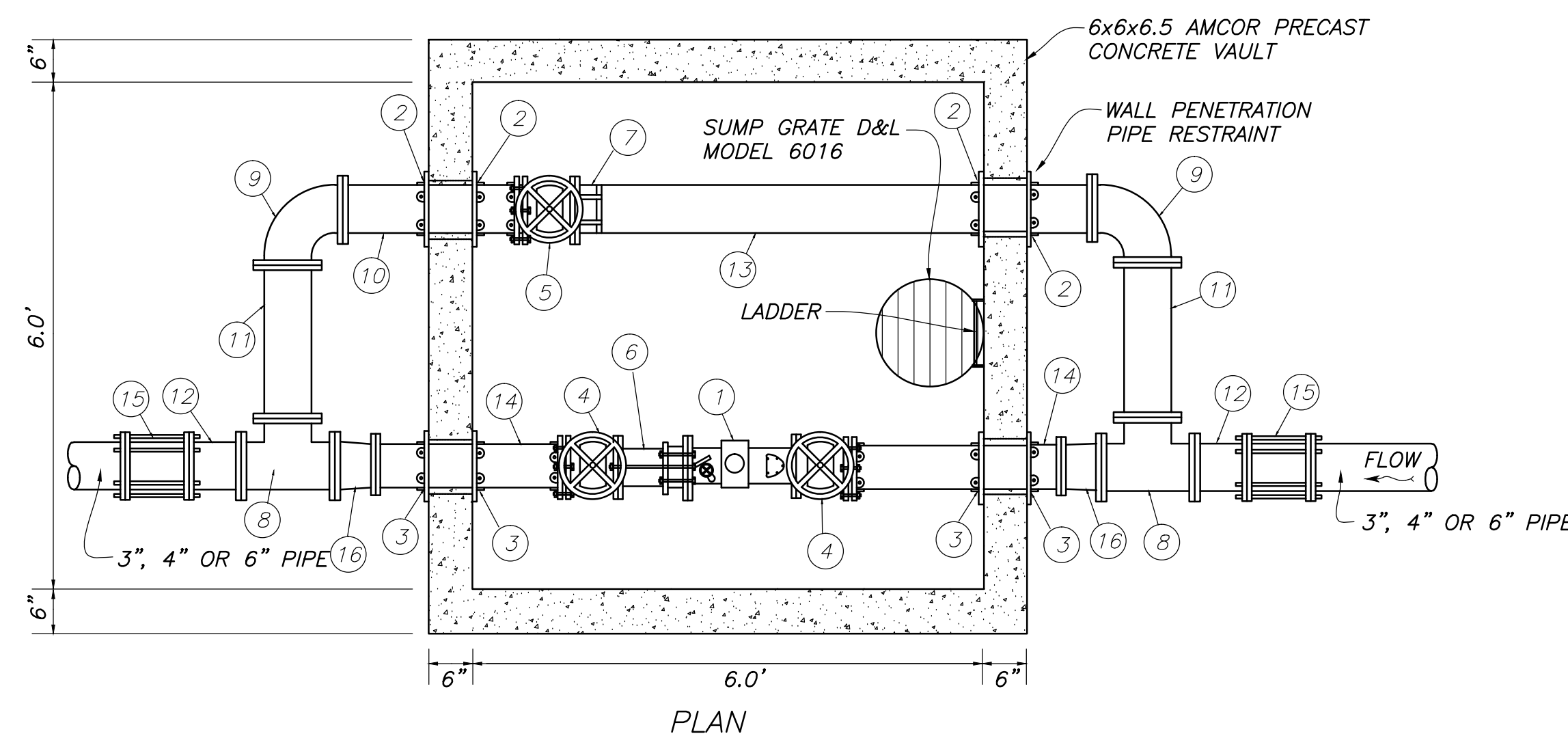
SECTION



SECTION A-A

ALTERNATE  
TURBO METER  
INSTALLATION  
SEE NOTE 3

1 1/2" AND 2" METER

SECTION

3"-6" WATER METER STATION

PIPE & FITTING SCHEDULE (3" METER)					
NO.	DESCRIPTION	TYPE	3" LINE	4" LINE	6" LINE
1	SENSUS METER W/STRAINER (SEE NOTE 1)	FL	W-350DR	W-350DR	W-350DR
2	ROMAC MJRG MECHANICAL JOINT RETAINER GLAND		3"	4"	6"
3	ROMAC MJRG MECHANICAL JOINT RETAINER GLAND		3"	3"	3"
4	RESILIENT SEAT GATE VALVE W/HANDWHEEL	FLxFL	3"	3"	3"
5	RESILIENT SEAT GATE VALVE W/HANDWHEEL	FLxFL	3"	4"	6"
6	ROMAC FCA501 FLANGED COUPLING ADAPTER	FLxPE	3"	3"	3"
7	ROMAC DJ400 DISMANTLING JOINT	FLxFL	3"	4"	6"
8	TEE	FL	3"	4"	6"
9	90° ELBOW	FL	3"	4"	6"
10	SPOOL PIECE	FLxPE	3"x30"	4"x30"	6"x30"
11	SPOOL PIECE	FLxFL	3"x31"	4"x29"	6"x26"
12	SPOOL PIECE	FLxPE	3"x12"	4"x12"	6"x12"
13	SPOOL PIECE	FLxPE	3"x56"	4"x56"	6"x54 1/2"
14	SPOOL PIECE	FLxPE	3"x56"	3"x56"	3"x56"
15	ROMAC 501 FLEXIBLE PIPE COUPLING	FLxPE	3"x23"	4"x26 1/2"	6"x22 3/4"
16	REDUCER	FLxFL	-	4"x3"	6"x3"

NOTE 1: OR APPROVED EQUIVALENT

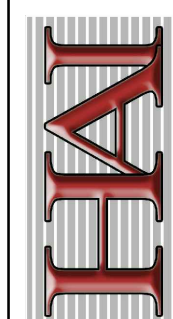
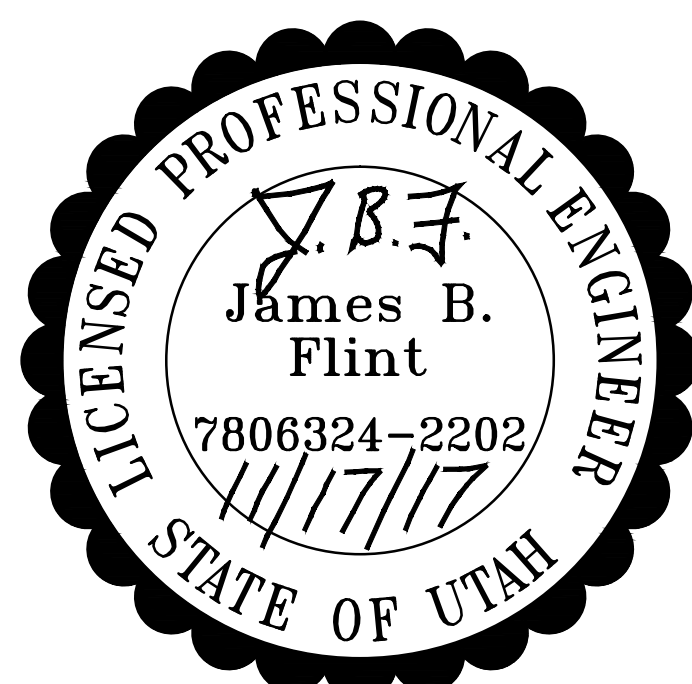
PIPE & FITTING SCHEDULE (4" METER)				
NO.	DESCRIPTION	TYPE	4" LINE	6" LINE
1	SENSUS METER W/STRAINER (SEE NOTE 1)	FL	W=100DR	W=100DR
2	ROMAC MJRG MECHANICAL JOINT RETAINER GLAND		4"	6"
3	ROMAC MJRG MECHANICAL JOINT RETAINER GLAND		4"	4"
4	RESILIENT SEAT GATE VALVE W/HANDWHEEL	FLxFL	4"	4"
5	RESILIENT SEAT GATE VALVE W/HANDWHEEL	FLxFL	4"	6"
6	ROMAC FCA501 FLANGED COUPLING ADAPTER	FLxPE	4"	4"
7	ROMAC DJ400 DISMANTLING JOINT	FLxFL	4"	6"
8	TEE	FL	4"	6"
9	90° ELBOW	FL	4"	6"
10	SPOOL PIECE	FLxPE	6"x30"	6"x30"
11	SPOOL PIECE	FLxFL	6"x29"	6"x26"
12	SPOOL PIECE	FLxPE	6"x12"	6"x12"
13	SPOOL PIECE	FLxPE	4"x56"	6"x54 1/2"
14	SPOOL PIECE	FLxPE	4"x56"	4"x56"
15	ROMAC 501 FLEXIBLE PIPE COUPLING	FLxPE	4"x26 1/2"	6"x22 3/4"
16	REDUCER	FLxFL	-	6"x4"

NOTE 1: OR APPROVED EQUIVALENT

PIPE & FITTING SCHEDULE (6" METER)			
NO.	DESCRIPTION	TYPE	6" LINE
1	SENSUS METER W/STRAINER (SEE NOTE 1)	FL	W-2000DR
2	ROMAC MJRG MECHANICAL JOINT RETAINER GLAND		6"
3	ROMAC MJRG MECHANICAL JOINT RETAINER GLAND		6"
4	RESILIENT SEAT GATE VALVE W/HANDWHEEL	FLxFL	6"
5	RESILIENT SEAT GATE VALVE W/HANDWHEEL	FLxFL	6"
6	ROMAC FCA501 FLANGED COUPLING ADAPTER	FLxPE	6"
7	ROMAC DJ400 DISMANTLING JOINT	FLxFL	6"
8	TEE	FL	6"
9	90° ELBOW	FL	6"
10	SPOOL PIECE	FLxPE	6"x30"
11	SPOOL PIECE	FLxFL	6"x26"
12	SPOOL PIECE	FLxPE	6"x12"
13	SPOOL PIECE	FLxPE	6"x54 1/2"
14	SPOOL PIECE	FLxPE	6"x56"
15	ROMAC 501 FLEXIBLE PIPE COUPLING	FLxPE	6"x22 3/4"
16	REDUCER	FLxFL	-

NOTE 1: OR APPROVED EQUIVALENT

CONSTRUCTION REQUIREMENTS: WHERE APPLICABLE, AND UNLESS OTHERWISE SPECIFIED, CONSTRUCTION OF PUBLIC WORKS, FACILITIES AND INFRASTRUCTURE SHALL COMPLY WITH THE 2012 EDITION OF THE AMERICAN PUBLIC WORKS ASSOCIATION MANUAL OF STANDARD SPECIFICATIONS WHICH ARE ADOPTED BY REFERENCE AS A COMPANION DOCUMENT TO THESE DRAWINGS. RESOLUTION OF ANY INCONSISTENCIES BETWEEN THESE DRAWINGS AND THE ADOPTED SPECIFICATIONS WILL BE MADE BY THE SYSTEM ENGINEER.



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SCALE: NO SCALE

# Honeyville City Water System Construction Standards

## LARGE DIAMETER SERVICE METER DETAILS

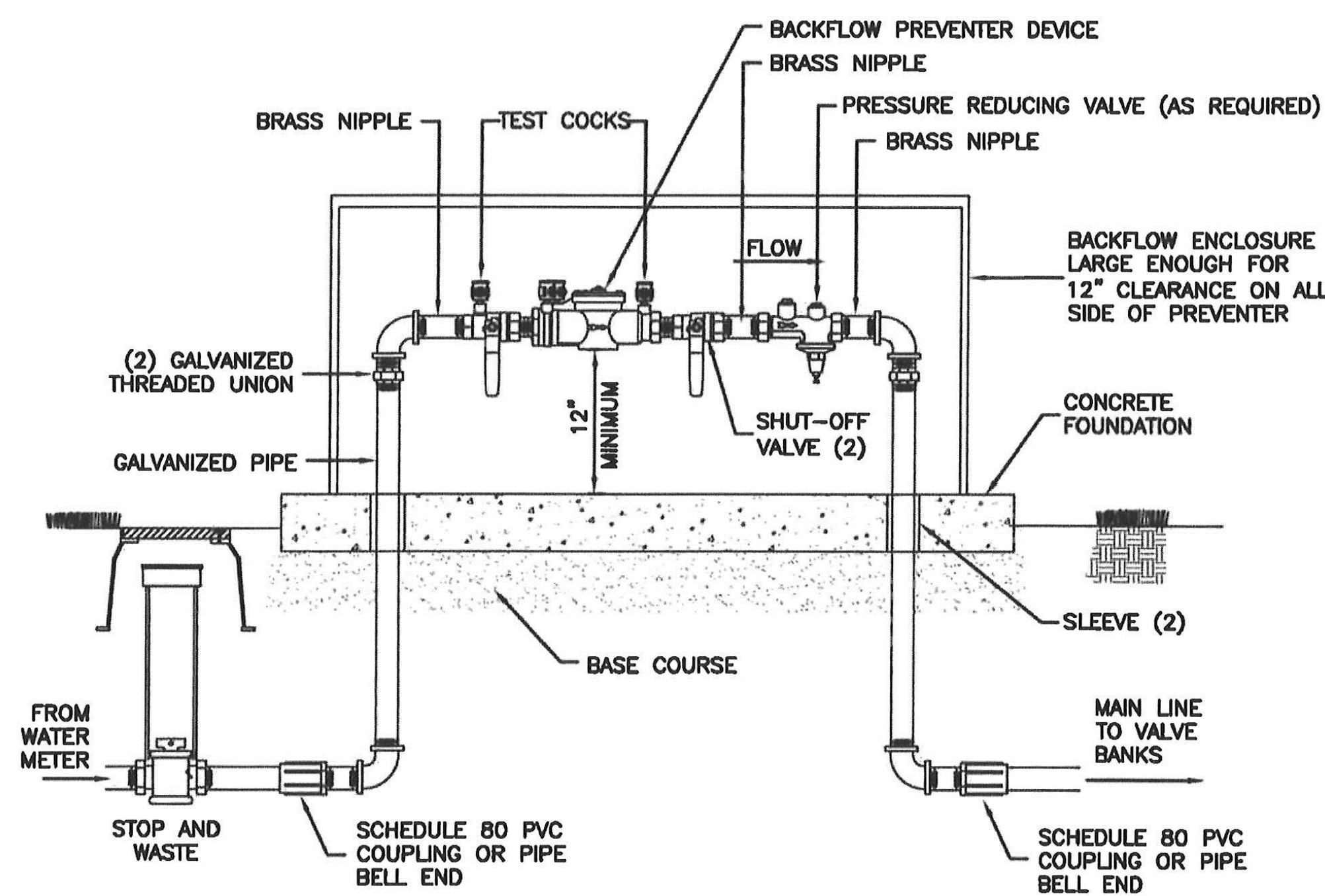
SHEET:

A hand-drawn diagram consisting of two overlapping circles. The circles are drawn with simple black outlines and are positioned such that they share a common intersection area.

OF 10 SHEETS



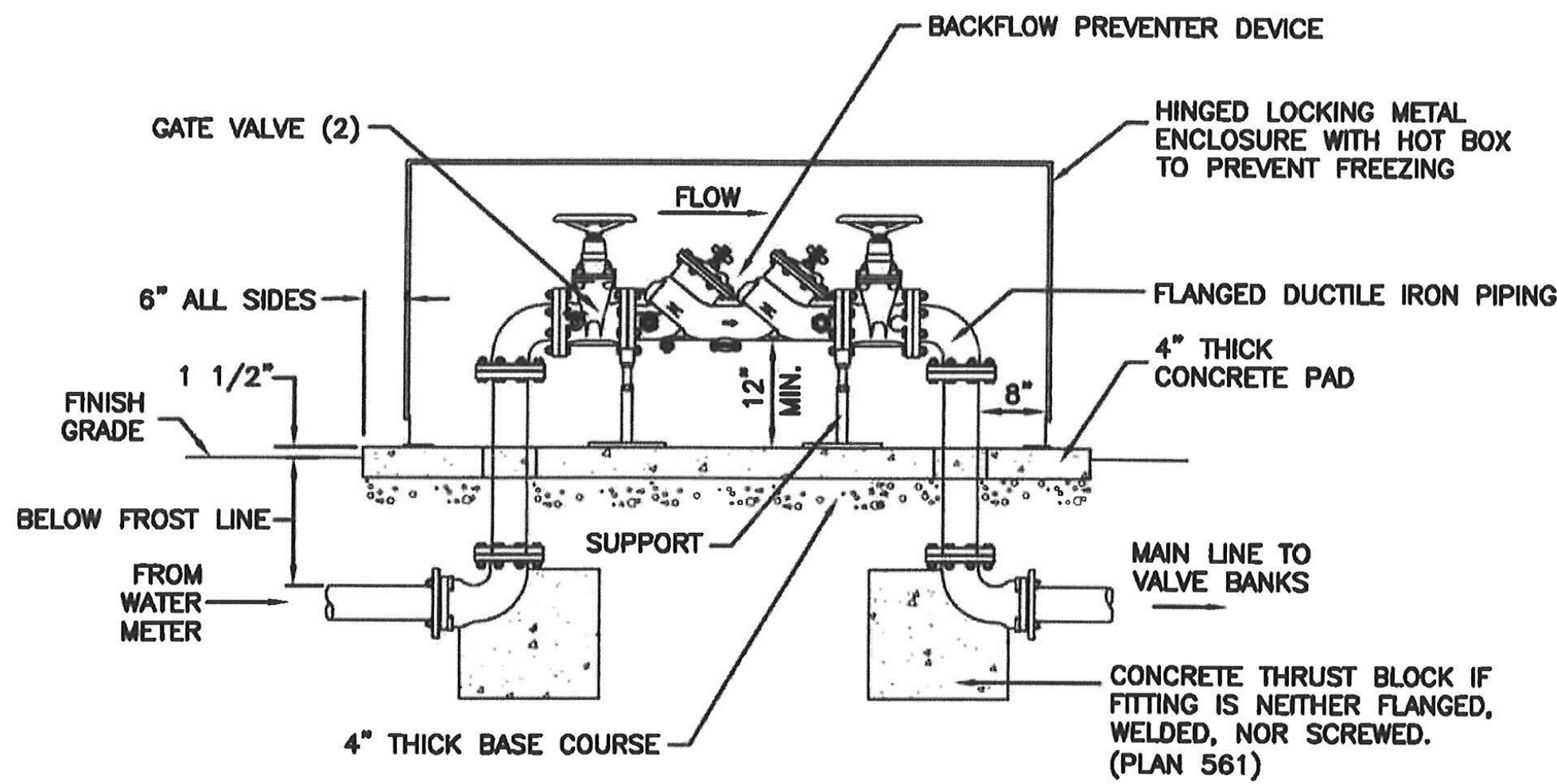
**LESS THAN 3" DIAMETER**



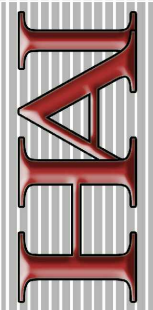
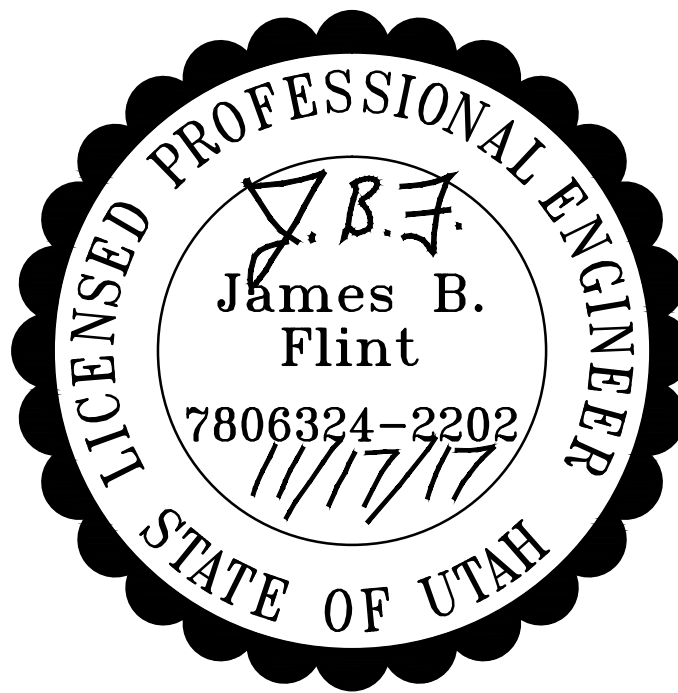
INSTALLATION OF BACKFLOW DEVICES SHALL CONFORM  
TO THE STATE ADOPTED PLUMBING CODE

**Irrigation System  
Backflow preventer**

**3" AND LARGER**



**Irrigation System  
Backflow preventer**



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REVISION DATE:

DATE: 11/17/17

SCALE: AS NOTED

Honeyville City  
Water System Construction Standards

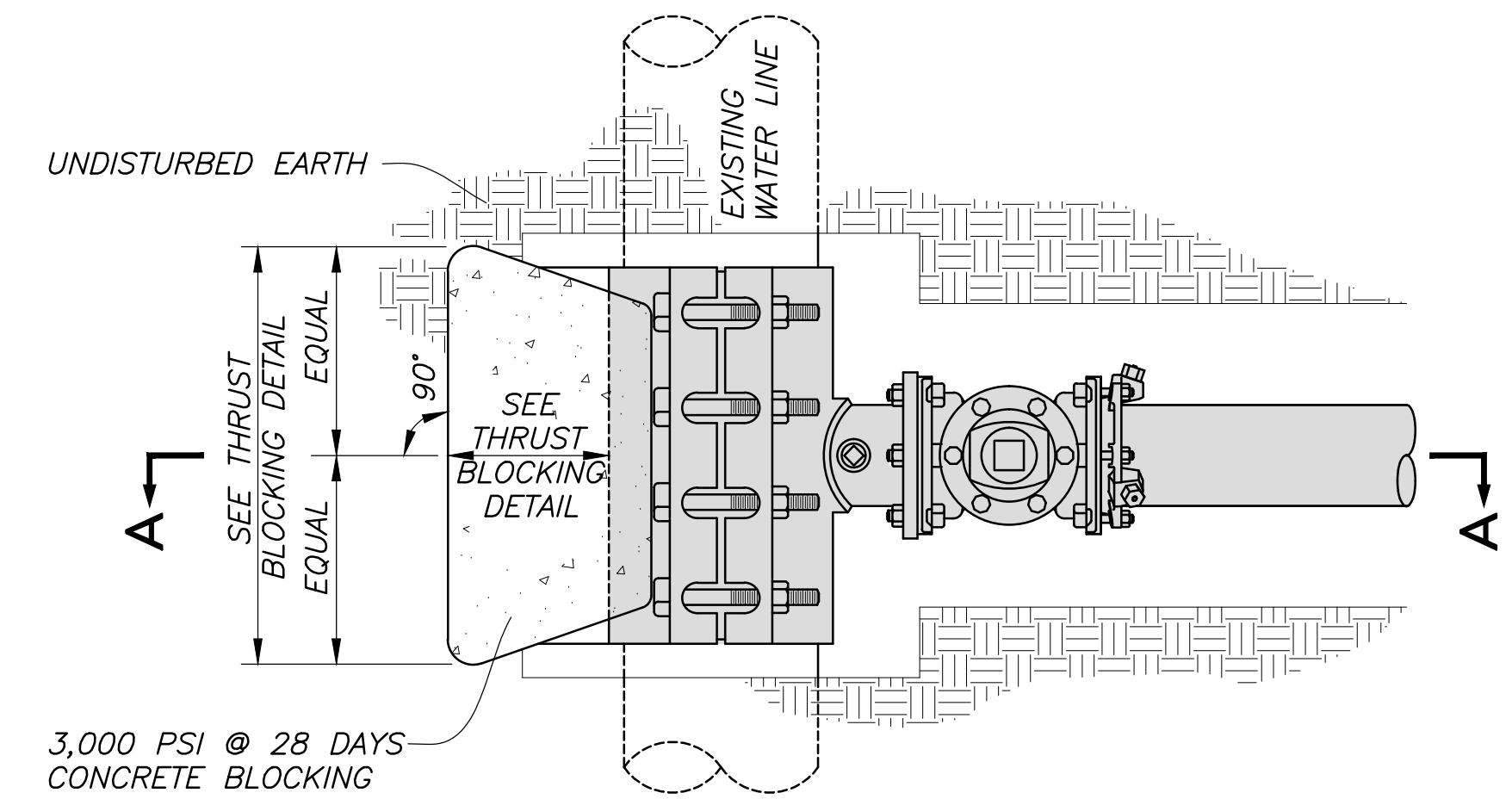
CULINARY WATER SYSTEM  
IRRIGATION SYSTEM BACKFLOW PREVENTER

SHEET:

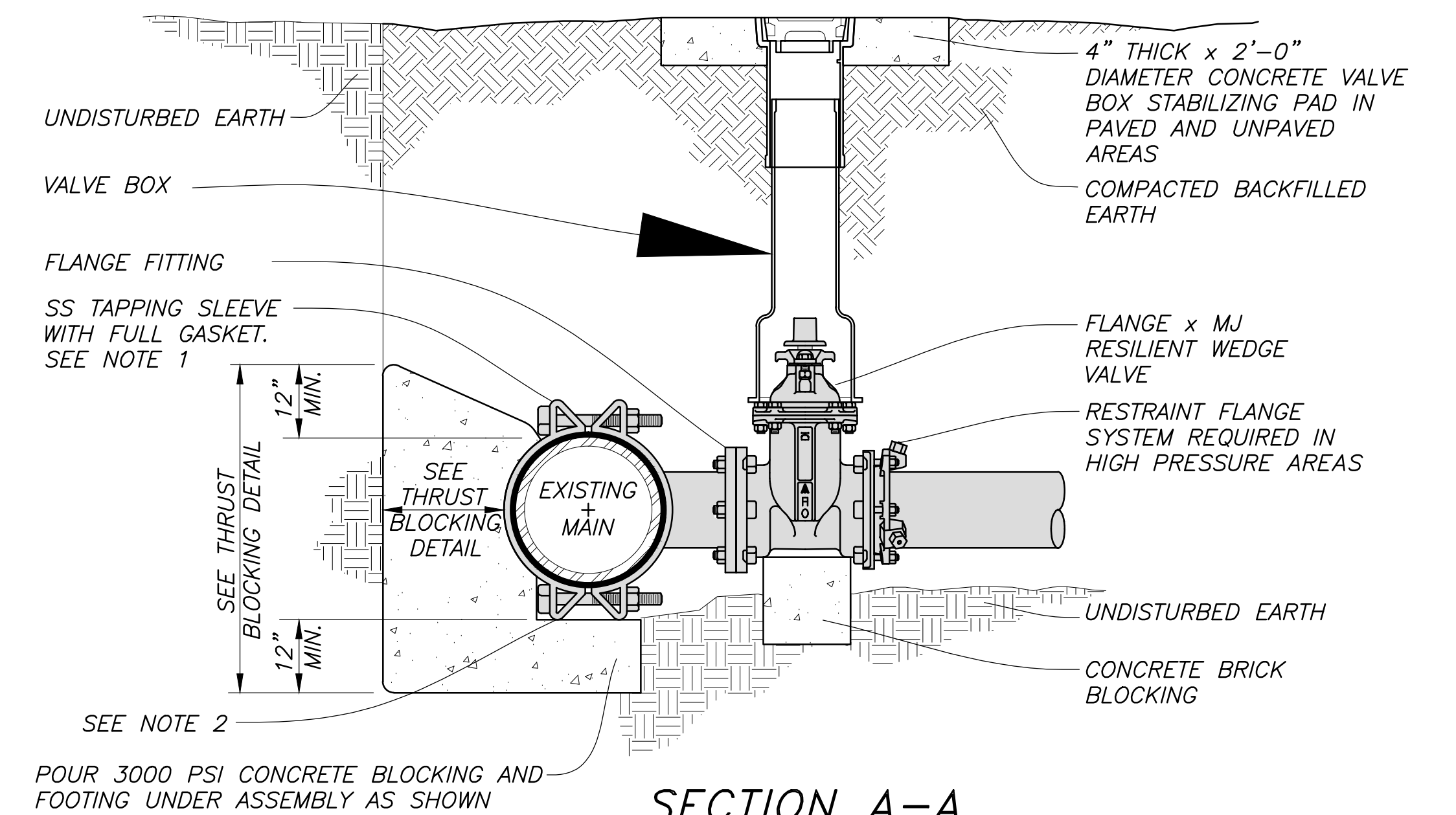
9

OF 10 SHEETS





PLAN VIEW



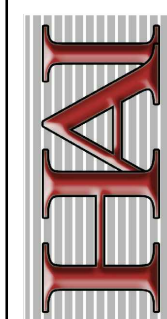
SECTION A-A

NOTES:

1. Concrete blocking is to be formed to ensure accesibility to fittings and poured against undisturbed earth.
2. Fittings are to be completely wrapped with plastic, prior to pouring concrete.
3. Concrete to be minimum 3,000 psi. @ 28 days.

4" TO 12" STANDARD TAPPING SLEEVE AND VALVE ASSEMBLY DETAIL

SCALE: NONE



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REVISION DATE:  
DATE: 11/17/17  
SCALE: AS NOTED

Honeyville City  
Water System Construction Standards  
CULINARY WATER SYSTEM  
MISCELLANEOUS DETAILS

SHEET:

10

OF 10 SHEETS

## **HONEYVILLE CITY CULINARY WATER SYSTEM SPECIFICATIONS**

This document contains adopted specifications for culinary water distribution system construction and design for the Honeyville City Culinary Water System.

Honeyville City has adopted the 2012 Edition of the American Public Works Association Standard Specifications Developed by the Utah Chapter. The specific individual specification sections adopted by Honeyville City for construction of the culinary water distribution system improvements are listed as follows and attached herewith.

In addition, supplemental specifications for construction and design of water system distribution projects follow the APWA Standard Specification Sections listed below.

### **Standard Construction Specifications**

- 03 40 00 Precast Concrete
- 05 05 10 Metal Galvanizing
- 05 56 00 Metal Castings
- 33 05 05 Ductile Iron Pipe
- 33 05 06 Polyethylene Pipe
- 33 05 20 Backfilling Trenches
- 33 05 23.40 Trenchless Utility Installation
- 33 05 25 Pavement Restoration
- 33 08 00 Commissioning of Water Utilities
- 33 11 00 Water Distribution and Transmission
- 33 11 11 Relocate Water Meters and Fire Hydrants
- 33 12 16 Water Valves
- 33 12 19 Hydrants
- 33 12 33 Water Meter
- 33 13 00 Disinfection



## **DIVISION 03**

## **CONCRETE**

**SECTION 03 40 00**  
**PRECAST CONCRETE**

---

**PART 1 GENERAL**

---

**1.1 SECTION INCLUDES**

- A. Pre-cast concrete, complete with required connecting and supporting devices.

**1.2 REFERENCES**

**A. ACI Standards:**

- 318 Building Code Requirements for Reinforced Concrete.  
This reference standard includes ASTM material standards.

**B. ASTM Standards:**

- A 36: Structural Steel.
- C 478 Precast Reinforced Concrete Manhole Sections.
- C 857 Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
- C 858 Underground Precast Concrete Utility Structures.
- C 891 Installation of Underground Precast Concrete Utility Structures.

**C. AWS Standards:**

- D1.1 Structural Welding Code Steel.
- D1.4 Structural Welding Code Reinforcing Steel.

**D. PCI Standards:**

- Design Handbook.
- MNL-116 Quality Control and Assurance for Plant Production of Prestressed Concrete.
- MNL-117 Quality Control and Assurance for Plant Production of Architectural Precast Concrete.

**1.3 DESIGN CRITERIA**

- A. Design structural precast concrete units, ACI 318 and PCI design handbook.
- B. Design utility precast units, ASTM C 857 and C 858.
- C. Under direct supervision of a design professional who is fully experienced in design of units.
- D. Design units to support required stripping and handling loads, and live, dead and construction loads.
- E. Design component connections to provide adjustment to accommodate misalignment of structure during installation.

**1.4 SHOP DRAWINGS**



- A. Prepare Shop Drawings under seal of a licensed design professional.
- B. Submit Shop Drawings, Section 01 33 00.
- C. Indicate unit locations, unit identification marks, fabrication details, reinforcement, connection details, pertinent dimensions, and erection support points. Unit identification marks to appear on all manufactured units.
- D. Do not proceed with fabrication until Shop Drawings have been accepted.

### 1.5 QUALITY ASSURANCE

- A. Manufacturer:
  - 1. Prestressed: PCI certified.
  - 2. Precast Concrete Units: PCI or NPCA certified
  - 3. Precast Utility Structures and Pipe: ACPA certified.
- B. Transporter: Acceptable to manufacturer.
- C. Erector:
  - 1. Prestressed: PCI certified.
  - 2. Precast: Has five (5) years minimum experience in erecting precast units.
- D. Welders: Certified, AWS D1.1 and AWS D1.4.

### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Handle precast units in positions consistent with their shape and design. Lift and support only from support points indicated on Shop Drawings.
- B. Embedded Lifting or Handling Devices: Capable of supporting units in positions anticipated during manufacture, storage, transportation, and erection.
- C. Block and laterally brace units while stored at manufacturers. Provide lateral bracing that is sufficient to prevent bowing and warping that is clean, nonstaining, and will not inhibit uniform curing of exposed surfaces.
- D. Provide edges of units with adequate protection to prevent staining, chipping, or spalling of concrete.
- E. Unless otherwise approved in writing, do not deliver units to job site until required for installation.

---

## PART 2 PRODUCTS

---

### 2.1 CONCRETE

- A. Above Ground: 5000 psi minimum, Section 03 30 04 and ACI 318.
- B. Underground: Class 4000 minimum, Section 03 30 04 and ASTM C 478 or ASTM C 858.

**2.2 ACCESSORIES**

- A. Connecting and Supporting Devices: Steel, ASTM A 36.
- B. Bolts, Nuts, and Washers: High-strength steel. Section 05 05 23.
- C. Reinforcement: Grade 60 billet steel bars, Section 03 20 00 plain finish

**2.3 FABRICATION**

- A. Maintain plant records and quality control program during production of structural precast concrete. Make records available to ENGINEER.
- B. Use molds which are rigid and constructed of material that will result in uniform finished products.
- C. If self consolidating concrete is NOT used, vibrate concrete to ensure proper consolidation, elimination of unintentional cold joints, and minimize entrapped air on surface.
- D. Fabricate required connecting devices, plates, angles, items fit to steel framing members, bolts and accessories.
- E. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are sufficiently embedded, anchored and properly located.
- F. Ensure finished surfaces of precast structural units are uniform.
- G. Cure units under identical conditions to develop specified concrete quality, and minimize appearance blemishes such as non-uniformity, staining or surface cracking.

**2.4 DESIGN DEVIATIONS**

- A. Deviation: Provide installation equivalent to basic intent without additional cost to OWNER. Deviations from exact required cross-section will be permitted only with approval.
- B. Manufacturer's Proposed Design: Supported by complete design calculations and drawings. When requested, submit design calculations for review bearing seal and signature of a licensed design professional.

**2.5 OPENINGS**

- A. Provide required openings, six (6) inches or larger. If approved, smaller sizes may be field constructed by coring or sawing.

**2.6 FINISHES**

- A. General: Required finish will be described in one of the following paragraphs. If no finish is indicated or selected by ENGINEER, provide Standard Finish.
- B. Standard Finish: Produced in forms such as plastic or metal lined that impart a smooth finish to the concrete. Small surface holes, normal form joint marks, minor chips and spall are acceptable if approved. Major or unsightly imperfections, honeycomb or structural defects are not acceptable.
- C. Commercial Finish: Produced in forms such as plywood or lumber that impart texture to concrete. Remove fins and large projections. Fill holes over 3/8 inch. Make faces true and well defined. Correct exposed ragged edges by rubbing or grinding.



- D. Architectural Grade A Finish: Produced in forms such as plastic or metal lined that impart smooth finish to concrete. Fill holes over 1/4 inch in diameter with sand-cement paste. Grind smooth form offsets or fins over 1/8 inch. Coat with neat cement paste using float. After paste coat has dried, rub with burlap to remove loose particles.
- E. Architectural Grade B Finish: Produced in forms such as plastic or metal lined that impart smooth finish to concrete. Fill holes over 1/4 inch in diameter with sand-cement paste. Grind smooth form offsets or fins over 1/8 inch.
- F. Special Finishes: Sandblasting, acid washing, retarders or form liners as approved by ENGINEER. Special finishes require submittal of two 12 x 12 inch Samples showing a representative color and texture to be used.
- G. Painted Finishes: On concrete to be painted, use a form release agent acceptable to the paint manufacturer.

## **2.7 REPAIR**

- A. Repair of damaged units is acceptable if structural integrity or appearance is not impaired.

## **2.8 ALLOWABLE TOLERANCES**

- A. Length: Plus or minus 3/4 inch, or plus or minus 1/8 inch per 10 feet of length, whichever is greater, or as indicated.
- B. End Squareness: 1/2 inch maximum.
- C. Blockouts: 1 inch of centerline location indicated.

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# **PART 3 EXECUTION**

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## **3.1 INSTALLATION**

- A. Do not install precast units until concrete has attained its design compressive strength.
- B. Install members plumb, level, and in alignment within PCI MNL-116 or PCI MNL-117 and indicated limits of erection tolerances.
- C. Clean weld marks or other marks, debris, or dirt from exposed surfaces of units.
- D. Install underground utility precast units per ASTM C 891.

## **3.2 PERFORMANCE REQUIREMENTS**

- A. Conduct inspections, perform testing, and make repairs or replace unsatisfactory precast units as required.

- B. Rejection: Units may be rejected for any one of the following:
1. Exceeding specified installation tolerances.
  2. Damaged during construction operations.
  3. Exposed-to-view surfaces which develops surface deficiencies.
  4. Other defects as listed in PCI MNL-116 or PCI MNL-117.

END OF SECTION



# **DIVISION 05**

## **METALS**

## SECTION 05 05 10 METAL GALVANIZING

---

### PART 1 GENERAL

---

#### 1.1 SECTION INCLUDES

- A. Application of a zinc coating on fabricated metal items.
- B. Repair of damaged galvanized surfaces.

#### 1.2 REFERENCES

##### A. ASTM Standards:

- A 123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- A 153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- A 780 Repair of Damaged Hot-Dip Galvanized Coatings.
- B 6 Zinc (Slab Zinc).
- E 376 Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods.

##### B. Federal Standards:

- TT-P-641 Primer Coating, Zinc Dust - Zinc Oxide (for Galvanized Surfaces).

##### C. Military Standards:

- P-21035 Paint, High Zinc Dust Content, Galvanizing Repair.

#### 1.3 QUALITY ASSURANCE

- A. When requested, verify weight of zinc coating in accordance with ASTM E 376.

---

### PART 2 PRODUCTS

---

#### 2.1 ZINC METAL

- A. Use zinc for coating that conforms to ASTM B 6 and is at least equal to the grade designated as "Prime Western".

---

**PART 3 EXECUTION**

---

**3.1 GALVANIZING**

- A. Provide a zinc coating for those items indicated or specified to be galvanized as follows:
  - 1. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strips 1/8 inch thick and heavier.
  - 2. ASTM A 153 for galvanizing iron and steel hardware.

**3.2 WEIGHT OF COATING**

- A. Apply zinc on 1/8 inch to 3/16 inch thick steel at a rate of at least two (2) ounces per square foot of surface area.
- B. Apply zinc on 1/4 inch and thicker steels at a rate of at least 2.3 ounces per square foot with no individual test measuring less than two (2) ounces per square foot of surface area.

**3.3 REPAIR OF DAMAGED COATING**

- A. Shop Damage: Repair galvanized surfaces by the metallizing, hot stick or zinc rich paint, ASTM C 780 process.
- B. Field Damage: Repair cut, burned or uncoated surfaces by coating with a dust-zinc oxide paint conforming to FS TT-P-641 or MIL P-21035.

END OF SECTION



**SECTION 05 56 00**  
**METAL CASTINGS**

---

**PART 1 GENERAL**

---

**1.1 SECTION INCLUDES**

- A. Castings for grates, frames and covers for Manholes, catch basins, tree wells, monument boxes, water meters, etc.

**1.2 REFERENCES**

**A. ASTM Standards:**

- A 27 Steel Castings, Carbon, for General Application.
- A 48 Gray Iron Castings.
- A 148 Steel Castings, High-Strength, for Structural Purposes.
- B 22 Bronze Castings For Bridges and Turntables.
- B 584 Copper Alloy Sand Castings For General Applications.
- D 1187 Asphalt-Base Emulsion for Use as Protective Coatings for Metal.
- E 10 Brinell Hardness of Metallic Materials.

**1.3 SUBMITTALS**

- A. Shop Drawings, Section 01 33 00.
- B. Manufacturer's affidavit certifying materials comply with Part 2 requirements. (X-ray certification mandatory).

**1.4 QUALITY ASSURANCE**

- A. Make castings true to pattern in form and dimension and free from defects that would affect the service value of the casting.
- B. Repair minor defects that do not impair the strength of a casting.
- C. Reject castings that show injurious defects revealed by X-ray or machining operations.

**1.5 PRODUCT DELIVERY, HANDLING AND STORAGE**

- A. Deliver and handle castings and gratings to prevent warping, rusting and damage.
- B. Store all items on flexible surface and protect items from adverse environmental conditions.

---

**PART 2 PRODUCTS**

---

**2.1 STEEL CASTINGS**

- A. High Strength Steel Castings For Structural Purposes: ASTM A 148, Grade 80-50, except that the steel shall contain not less than 0.60 percent of manganese and not less than 0.20 percent silicon.
- B. Mild-to-Medium Carbon Steel Castings For General Applications, ASTM A 27: Grade 65-35 with a minimum Brinell hardness number of 130 when tested in accordance with ASTM E 10.

**2.2 GRAY IRON CASTINGS**

- A. All castings not specifically classified below shall conform to the requirements of ASTM A 48, Class 30:
  - 1. Grate, frame, cover castings sets for utilities, ASTM A 48, Class 35.
  - 2. Railings, railing posts and wheel guards; ASTM A 48, Class 40.
  - 3. Rockers, rocker plate bearings and bearing plates for bridges; ASTM A 48, Class 50.

**2.3 BRONZE CASTINGS**

- A. Expansion and Bearing Plates: Alloy C, ASTM B 22.
- B. Ornamental Tablets, Railings, Miscellaneous Ornaments and Fixtures: Alloy 1B, ASTM B 584.

---

**PART 3 EXECUTION**

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**3.1 PREPARATION**

- A. Fit bearing surfaces of flush fitting machined castings together firmly without rocking. ENGINEER reserves the right to reject rocking sets.
- B. Ensure castings are boldly filleted at angles and the arises are sharp and true. Unless indicated otherwise all letters shall be heavily raised and spaced to secure a uniform and balanced effect over the entire area of the panel.
- C. Before castings are removed from the foundry, ensure they are cleaned and the parting lines, gates, and risers are ground flush.
- D. Ensure sets are coated in quality ASTM D 1187 asphalt paint unless galvanized or bronze sets are specified or required.

**3.2 INSTALLATION**

- A. Furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation of castings.
- B. Adjust Street Fixtures elevation; Section 33 05 14.

- C. Install countersunk flat head screw security bolts flush with top of grate.

### 3.3 **CLEANING**

- A. Clean all castings free of grease, dirt, burrs, etc.

END OF SECTION



# **DIVISION 33**

## **UTILITIES**

**SECTION 33 05 05**  
**DUCTILE IRON PIPE**

---

**PART 1 GENERAL**

---

**1.1 SECTION INCLUDES**

- A. Ductile iron pipe, couplings, fittings, and joint materials.

**1.2 REFERENCES**

A. **AWWA Standards:**

- C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
- C110 Ductile-Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids.
- C111 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- C115 Flanged Ductile-Iron and Gray Iron Pipe with Threaded Flanges.
- C151 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- C600 Installation of Ductile-Iron Water Mains and Their Appurtenances.

---

**PART 2 PRODUCTS**

---

**2.1 PIPE AND FITTINGS**

A. Buried Applications:

1. Class 52 or pressure class 350 psi ductile iron pipe, AWWA C151 with push-on joints, AWWA C111.
2. Cement lining for all pipe and fittings, AWWA C104.
3. Class 250 fittings with AWWA C110 joints.
4. Coupler with mechanical joint fittings, AWWA C104, C110, and C111.
5. Rubber gasket slip-on pipe joints, AWWA C111 with gasket lubricant.

6. Bronze wedges with current capacity of 400 amps each for each joint as follows:

<b>Pipe Diameter</b>	<b>No. of Wedges</b>
less than 10"	2
10"	3
12"	4
greater than 12"	6

- B. Above Ground Applications: As buried applications, except use bolted flanged fittings, AWWA C104, C110, and C115.

## 2.2 COVERINGS

- A. Buried Mechanical Joints: Grease and eight (8) mil vinyl wrap plastic cover.

---

## PART 3 EXECUTION

---

### 3.1 INSTALLATION

- A Follow AWWA C600 requirements, pipe manufacturer's instructions and the following.
1. Gravity Systems: Section 33 31 00 (sanitary sewer) or Section 33 41 00 (storm drainage systems) and ASTM D 2321.
  2. Pressure Systems: Section 33 12 19 (water distribution and transmission) and AWWA C900 or ASTM D 2774.
  3. Underground Irrigation Systems: Section 32 84 23, (underground irrigation system) and ASTM D 2855.

END OF SECTION

**SECTION 33 05 06**  
**POLYETHYLENE PIPE**

---

**PART 1 GENERAL**

---

**1.1. SECTION INCLUDES**

- A. Polyethylene pipe, couplings, fittings and joint materials.

**1.2 REFERENCES**

**A. AASHTO Standards:**

- M 252 Corrugated Polyethylene Drainage Pipe.
- M-294 Corrugated Polyethylene Drainage Pipe 300-1200 mm Diameter.
- MP7-97 Corrugated Polyethylene Pipe – 1350 and 1500 mm Diameter.

**B. ASME Standards:**

- B1.1 Unified Inch Screw Threads (UN and UNR Thread Form), Supplement.

**C. ASTM Standards:**

- A 307 Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- D 2239 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Inside Diameter.
- D 2321 Underground Installation of Flexible Thermoplastic Sewer Pipe.
- D 2657 Heat Joining of Thermoplastic Pipe and Fittings.
- D 2774 Underground Installation of Thermoplastic Pressure Piping.
- D 3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- D 3350 Polyethylene Plastics Pipe and Fittings Materials.
- F 477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- F 1055 Electofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.



## 1.4 DEFINITIONS

- A. **Standard Dimension Ratio (SDR):** Average diameter of pipe divided by the minimum wall thickness. The diameter may be either inside or outside measurement depending upon which standard is referenced.
- B. **Code Designation:** A rating system by the Plastic Pipe Institute for smooth wall polyethylene pipe materials. The designation PE 3408 designates the type of plastic pipe (PE), the grade (34), and the hydrostatic design stress measured in units of 100 psi (08) at 23 deg C.

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## PART 2 PRODUCTS

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### 2.1 SMOOTH WALL PIPE SYSTEMS

- A. Material: PE 3408 per ASTM D 2239 with a minimum cell classification of 345434C per ASTM D 3350.
- B. Pipe: Smooth wall inside and out with an SDR or working pressure rating indicated or accepted by ENGINEER with exterior markings as follows:
  - 1. ASTM Standard Number.
  - 2. Pipe Size.
  - 3. Class and profile number.
  - 4. Production code.
  - 5. Standard dimension ratio.
- C. Fittings:
  - 1. Resin same as pipe.
  - 2. Working pressure same or greater than pipe.
- D. Joints:
  - 1. Thermally welded butt fusion, ASTM D 3261.
  - 2. Flanged, ASTM D 2657.
  - 3. Ultra high molecular weight electro-fusion tape with a polyethylene coupler meeting ASTM F 1055 requirements.

### 2.2 CORRUGATED WALL PIPE SYSTEMS

- A. Material: Polyethylene, ASTM D 3350 with a cell class as required in AASHTO M 252, AASHTO M 294 or AASHTO MP7-97
- B. Pipe: Type S or D unless required otherwise. Corrugations may be either annular or helical.

<u>Type</u>	<u>Description</u>
C	Circular pipe with a corrugated surface inside and out.
CP	Type C pipe with perforations
S	Circular pipe with an outer corrugated wall and a smooth inter wall

- SP     Type S pipe with perforations
- D     Circular pipe with a corrugated wall sandwiched between a smooth outerwall and a smooth inner wall.

C. Fittings:

1. Blow molded with cell class 335420C, ASTM D 3350.
2. Rotational molded with cell class 213320C, ASTM D 3350.
3. Shop or field remanufactured of the same material as the pipe

D. Joints:

1. Bell and spigot with gaskets, ASTM F 477. Foam type weather stripping not allowed.
2. Split corrugated couplings with plastic or stainless steel ties and leak resistant neoprene gasket.

## 2.3 NUTS AND BOLTS

- A. Carbon steel machined heavy hex heads, Class 2 fit, ASTM A 307; Grade B, threads, ASME B1.1.

---

## PART 3 EXECUTION

---

### 3.1 INSTALLATION

- A. Install pipe per manufacturer's instructions and the following.
1. Gravity Systems: Section 33 31 00 (sanitary sewer) or Section 33 41 00 (storm drainage systems) and ASTM D 2321.
  2. Pressure Systems: Section 33 12 19 (water distribution and transmission) and AWWA C900 or ASTM D 2774.
  3. Underground Irrigation Systems: Section 32 84 23, (underground irrigation system) and ASTM D 2855.
- B. Provide six (6) mil thick polyethylene sheet and tape wrap on steel materials for protection against corrosion after piping installation.

END OF SECTION

**SECTION 33 05 20**  
**BACKFILLING TRENCHES**

---

**PART 1 GENERAL**

---

**1.1 SECTION INCLUDES**

- A. Trench backfill materials.
- B. Trench backfilling requirements.

**1.2 REFERENCES**

**A. ASTM Standards:**

- D 698 Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- D 1557 Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
- D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D 4832 Preparation and Testing of Soil-Cement Slurry Test Cylinders.

**1.3 DEFINITIONS**

- A. **Bedding:** That surface of the excavation or portion of the Pipe Zone below the pipe.
- B. **Pipe Zone:** That zone in a backfilling operation which supports, and surrounds the pipe barrel, and extends to 1 foot above the top of the pipe barrel.

**1.4 SUBMITTALS**

- A. Submit maximum laboratory dry density and optimum laboratory moisture content for:
  - 1. Subgrade material, and
  - 2. Each type of fill to be used.
- B. Submit aggregate batch delivery tickets showing name of material source, serial number of ticket, date and truck number, name of Supplier, job name and location, volume or weight. And aggregate classification or Supplier's identification code.

**1.5 QUALITY ASSURANCE**

- A. Do not change material sources, or aggregate without ENGINEER's knowledge.
- B. Reject backfill material that does not comply with requirements in this Section.
- C. If requested, submit a quality control inspections and testing report describing source and field quality control activities performed by CONTRACTOR and Suppliers.

**1.6 STORAGE**

- A. Safely stockpile backfill materials.
- B. Separate differing materials, prevent mixing, and maintain optimum moisture content of backfill materials.

**1.7 SITE CONDITIONS**

- A. Do not place, spread, or roll any backfill material over material that is damaged by water. Remove and replace damaged material at no additional cost to OWNER.
- B. Control traffic and erosion. Keep area free of trash and debris. Repair settled, eroded, and rutted areas.
- C. Reshape and compact damaged structural section to required density.
- D. Restore any damaged structure to its original strength and condition.
- E. Replace contaminated backfill at no additional cost to OWNER.

**1.8 SEQUENCING**

- A. Coordinate backfilling operation with pipeline commissioning, Section 33 08 00.

**1.9 ACCEPTANCE**

- A. General: Native material may be wasted if there is no additional cost to substitute material acceptable to ENGINEER.
- B. Material: For material acceptance refer to:
  - 1. Common fill, Section 31 05 13.
  - 2. Aggregate base course, Section 32 11 23.
  - 3. Cement treated fill, Section 31 05 15.
- C. Lift Thickness: One test per lot.
- D. Compaction: One test per lot. Verify density using nuclear tests, ASTM D 2922. Compaction standard and Lot sizes as follows:

Table 1: Compaction Standard and Lot Size		
Material	Proctor	Lot Size
Subgrade	Standard	200 linear feet
Common Fill	Standard	200 linear feet per lift 25 square feet of footing area per lift
Aggregate base course	Modified	200 linear feet per lift 25 square feet of footing area per lift
NOTES		
(a) Standard proctor, ASTM D 698.		
(b) Modified proctor, ASTM D 1557.		
(c) Lift thickness above pipe zone before compaction, 8 inches.		

- E. Flowable Fill Strength: Lot size is one (1) day production with sub-lots of 50 cubic yards or part thereof. Verify strength using cylinders, ASTM D 4832.
- F. Grade, Cross Slope: Measured at random locations.

**1.10 WARRANTY**



- A. Correct any settlement of Trench backfill or structures built over Trench backfill at no cost to OWNER.
- B. Restore structures damaged by settlement at no additional cost to OWNER.

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## **PART 2 PRODUCTS**

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### **2.1 BACKFILL MATERIALS**

- A. Common fill, Section 31 05 13. Granular material, CONTRACTOR's choice.
- B. Aggregate base course, Section 32 11 23. Untreated base course.
- C. Cement treated fill, Section 31 05 15. Use a flowable fill so vibration is not required.
- D. Slag or asphalt bearing material NOT ALLOWED in trench.

### **2.2 WATER**

- A. Make arrangements for sources of water during construction and make arrangements for delivery of water to site.
- B. Comply with local Laws and Regulations at no additional cost to OWNER when securing water from water utility company.

### **2.3 GEOTEXTILE FABRIC**

- A. Section 31 05 19. Use woven or non-woven stabilization-separation fabric. Select either moderate MARV or high MARV as needed.

### **2.4 IDENTIFICATION TAPE**

- A. Permanent, bright colored, continuous printed magnetic plastic tape, intended for direct burial service; not less than six (6) inches wide by four (4) mils thick. Tape shall read "**CAUTION: BURIED INSTALLATION BELOW**". Color as follows.

Red	Electric power lines, cables, conduit and lighting cables
Yellow	Gas, oil, steam, petroleum or gaseous materials
Orange	Communications, alarm, signal, cables or conduits
Blue	Potable water
Purple	Reclaimed water, irrigation and slurry lines
Green	Sewer and storm drain lines

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## **PART 3 EXECUTION**

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**3.1 PREPARATION**

- A. Implement the traffic control plan requirements, Section 01 55 26.
- B. Identify required line, levels, contours, and datum.
- C. Stake and flag locations of underground utilities.
- D. Verify:
  - 1. Backfill material meets gradation requirements.
  - 2. Foundation walls are braced to support surcharge forces imposed by backfilling operations, areas to be backfilled are free of debris, snow, ice or water.
  - 3. Trench bottom is not frozen.
- E. If ground water is in the intended backfill zone, dewater.

**3.2 SUBGRADE**

- A. Protect subgrade from desiccation, flooding, and freezing.
- B. Before backfilling over Subgrade, get ENGINEER's review of Subgrade surface preparations.
- C. If Subgrade is not readily compactable, get ENGINEER's permission to stabilize the subgrade:
  - 1. Excavation for Subgrade stabilization is incidental work, Section 31 23 16.
  - 2. Place geotextile fabric. Place acceptable fill in lifts. Compact.

**3.3 PROTECTION**

- A. During installation or repair, plug end of pipe or fitting except when installing next section of pipe or fitting.
- B. Movement of construction machinery over Work at any stage of construction is solely at CONTRACTOR's risk.

**3.4 GENERAL BACKFILLING REQUIREMENTS**

- A. Avoid injuring and displacement of conduit, pipe and structures while compacting soil or operating equipment next to pipeline.
- B. Place geotextile fabrics; Section 31 05 19.
- C. Do not damage corrosion protection on pipe.
- D. Repair or replace damaged pipe at no additional cost to OWNER.
- E. Withdraw sheathing, shoring, piles, and similar supports as backfilling progresses. Backfill and compact all holes left by removals.
- F. Provide sufficient water quality facilities to protect downstream fish and wildlife, and to meet State water quality requirements.
- G. Water settling of trench backfill is not permitted. "Jetting" of trench backfill is prohibited.

**3.5 PIPE ZONE**

- A. Maintain uniform foundation along barrel of pipe with sufficient relief for joint connections.
- B. Use backfill materials meeting pipe manufacturer's recommendations.

Maximum backfill particle size is 3/4 inch for plastic pipe.

- C. Do not permit free fall of backfill material that may damage pipe, pipe finish, or pipe alignment.
- D. Except where piping must remain exposed for tests, fill pipe zone as soon as possible.

### **3.6 TRENCH ABOVE PIPE ZONE.**

- A. Maximum lift thickness before compaction is eight (8) inches.
- B. Fill unauthorized excavations with material acceptable to ENGINEER at no additional cost to OWNER.
- C. Do not damage adjacent structures or service lines.
- D. Install continuous identification tape directly over buried lines 18 inches below finished grade.

### **3.7 MODIFIED BACKFILL LAYER METHOD**

- A. At discretion of CONTRACTOR, backfill may be placed in thicker layers than indicated above subject to the following provisions:
  - 1. CONTRACTOR proves the ability of proposed method to achieve specified average compaction density.
  - 2. ENGINEER, on the basis of test results, approves the system in writing.
- B. Should CONTRACTOR find it necessary to change the method or any part of it, including the source of material, or the rate of placing the material, obtain approval of ENGINEER, who may require a further trial area.
- C. If testing shows a previously approved system is no longer producing the required degree of compaction, make changes to comply.
- D. Where vibration effects are creating environmental problems, make changes to eliminate problems.

### **3.8 TOLERANCES**

- A. Compaction: Ninety-five (95) percent or greater relative to a standard or modified proctor density, Section 31 23 26.
- B. Lift Thickness (before compaction):
  - 1. Eight (8) inches when using riding compaction equipment.
  - 2. Six (6) inches when using hand held compaction equipment.
  - 3. As proven in the modified backfill layer method.
- C. Cement Treated Fill: Compressive strength targets are 60 psi in 28 days and 90 psi maximum in 28 days.

### **3.9 FIELD QUALITY CONTROL**

- A. Test trench backfilling until a compaction pattern acceptable to CONTRACTOR and ENGINEER is achieved. Continue random quality control compaction testing.

**3.10 SURFACE RESTORATION**

- A. Provide temporary paved surfaces where trenches pass through roadways, driveway approaches or sidewalks.
- B. Restore paved surfaces, Section 33 05 25.
- C. Finish landscaped surfaces with grass, Section 32 92 00 or with other ground cover, Section 32 93 13.

**3.11 CLEANING**

- A. Remove stockpiles from site when work is complete. Grade site to prevent free standing surface water.
- B. Leave borrow areas clean and neat.

END OF SECTION



**SECTION 33 05 23.35**  
**TRENCHLESS UTILITY INSTALLATION**

---

**PART 1 GENERAL**

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**1.1 SECTION INCLUDES**

- A. Boring or jacking pipe or box culvert.

**1.2 REFERENCES**

**A. ASTM Standards:**

- A 53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

**1.3 SUBMITTALS**

- A. Details of jacking pit bracing, casing or conduit, and jacking head to be used.
- B. Dimensions and support of pilot tunnel (if used).
- C. Details of steel rails in pilot tunnel (if used), including true line and grade.
- D. Copy of applicable permits from agency having jurisdiction.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Jack conduit to line and grade indicated. Modify jacking operation to correct any deviation. Correct misalignment in line or grade at no additional cost to OWNER.
- B. Methods and equipment used in jacking casing or conduit are CONTRACTOR's choice.
- C. Use workers experienced in jacking operations.

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**PART 2 PRODUCTS**

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**2.1 STEEL CASING**

- A. ASTM A 53, Grade B steel pipe for jacking operations, minimum wall thickness of 0.375 inch, minimum yield stress of 42,000 psi. Use a casing with a diameter equal to the outside bell diameter of the pipe plus four (4) inches minimum.
- B. Fillet weld joints continuous around casing and reinforce joints to withstand jacking operations.

**2.2 CONCRETE PIPE**

- A. Section 33 05 02. When concrete pipe is to be jacked, use a pipe section designed to support the superimposed loads and the loads that may be placed upon the pipe during jacking operations. Use pipe sections that have a watertight joint.

**2.3 SOIL CEMENT**

- A. Cement treated fill, Section 31 05 15.
- B. Grout: Portland cement type, Section 03 61 00.

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**PART 3 EXECUTION**

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**3.1 PREPARATION**

- A. Locate and preserve utilities, Section 31 23 16.

**3.2 JACKING PROCEDURE**

- A. When casing is to be jacked through a plastic clay, continue uninterrupted operations until casing has been jacked between specified limits.
- B. Equip leading section of casing with a jacking head securely attached to prevent any wobble or variation in alignment during jacking operation.
- C. Protect driving end against spalling or other damage, and install sufficient bearing shims to intermediate joints to properly distribute jacking stresses. Remove and replace any section showing signs of failure.
- D. No excavation in excess of outer dimensions of conduit being jacked will be allowed unless approved. Avoid any loss of earth outside jacking head.
- E. Upon completion of jacking operations, pressure grout voids around outside face of the conduit. Grouting around jacked conduit must be started immediately after jacking operations have finished.
- F. During the jacking operation, backpack with soil cement any annular space occurring outside of conduit that could affect any surface structure or facility.

**3.3 PILOT TUNNEL**

- A. Construct tunnel where casing 60 inches or greater inside diameter is to be jacked for a distance greater than 32 feet.
- B. Remove supports for tunnels as jacking progresses.

**3.4 PIPE SUPPORT IN CASING TUNNEL**

- A. Unless indicated otherwise, use redwood skids throughout the length of the pipe tied at every pipe diameter length to brace pipe installed in casing to prevent shifting or flotation during backfilling of annular ring between the casing and carrier pipe.
- B. Backfill annular ring with portland cement grout, Section 03 61 00 unless indicated otherwise.

- C. Install pipe barrels to rest upon support blocks with the pipe bells clearing the casing invert by at least 1/2 inch.
- D. Whenever clay pipe is installed in a casing, use mechanical compression joints.

END OF SECTION

**SECTION 33 05 25**  
**PAVEMENT RESTORATION**

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**PART 1 GENERAL**

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**1.1 SECTION INCLUDES**

- A. Aggregate base restoration.
- B. Concrete base restoration.
- C. Pavement surface restoration.

**1.2 REFERENCES**

**A. APWA (Utah Chapter) Standards:**

- Plan 255 Asphalt concrete T-patch.
- Plan 256 Concrete pavement T-patch.
- Plan 257 Concrete pavement panel replacement.

**B. ACI Standards:**

- 305 Hot Weather Concreting.
- 306 Cold Weather Concreting.

**C. ASTM Standards:**

- A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- C 928 Packaged, Dry, Rapid- Hardening Cementitious Materials for Concrete Repairs.
- C 1315 Liquid Membrane Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- D 4 Bitumen Content.
- D 5 Penetration of Bituminous Materials.
- D 92 Flash and Fire Points by Cleveland open Cup.
- D 95 Water in Petroleum products and Bituminous Materials by Distillation.
- D 113 Ductility of Bituminous Materials.
- D 402 Distillation of Cut-Back Asphaltic (Bituminous) Products.
- D 1664 Coating and Stripping of Bitumen-Aggregate Mixtures.
- D 2041 Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures.
- D 2170 Standard Test Method for Kinematic Viscosity of Asphalts (Bitumens).

### 1.3 SUBMITTALS

- A. Traffic control plan, Section 01 55 26.
- B. Target sieve gradation for aggregate base.
- C. Asphalt pavement mix design.
- D. Portland cement concrete mix design and data sheets for joint filler board, concrete joint sealer, concrete bond breaker, concrete chemical additives, curing agent, and reinforcement.

### 1.4 WEATHER

- A. Asphalt Pavement Restoration:
  - 1. If air and roadbed temperatures in the shade are less than 40 deg F asphalt placement is considered a temporary patch.
  - 2. Remove any temporary patching and provide permanent patch material when temperature exceeds 40 deg F. CONTRACTOR may perform work after cold weather season if authorized in writing by ENGINEER.
- B. Portland Cement Concrete Pavement Restoration:
  - 1. Hot weather, ACI 305. Set retarding admixture may be used if allowed in mix design. Discontinue placement if ambient air temperature exceeds 100 deg F. in the shade.
  - 2. Cold weather, ACI 306. Concrete accelerating admixtures may be used if allowed in mix design. Provide weather protection until 90 percent of design compressive strength. When removing heat, limit temperature change next to concrete surface to 20 deg F. per 12 hours until the concrete surface temperature reaches ambient:
    - a. Use of admixtures or curing agent will not relax cold weather placement and cure requirements.
    - b. Do not use chemical additives to prevent freezing.
    - c. Prevent loss of moisture during protection.

### 1.5 ACCEPTANCE

- A. Aggregate Base: Compaction.
- B. Concrete Base: Strength.
- C. Asphalt Pavement:
  - 1. Compaction.
  - 2. Grade and cross slope of pavement surface.
  - 3. Surface distortion.
- D. Concrete Pavement:
  - 1. Reinforcement placement and concrete strength.
  - 2. Grade and cross slope of pavement surface.
  - 3. Surface distortion.



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**PART 2 PRODUCTS**

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**2.1 MATERIALS**

- A. Aggregate Base: Untreated base course material, Section 32 11 23.
- B. Flowable Fill Base: Section 31 05 15.
- C. Portland Cement Concrete Base Course: Class 4000, Section 03 30 04.
- D. Tack Coat: Grade SS-1, Section 32 12 13.13.
- E. Permanent Marking: Tape or paint, Section 32 17 23.

**2.2 ASPHALT PAVEMENT**

- A. Permanent Warm Weather Asphalt Concrete: AC-20-DM-1/2, Section 32 12 05 unless indicated elsewhere.
- B. Temporary Cold Weather Asphalt Concrete Patching Material: Type MC-250-DM-1/2, Section 32 12 05 with hydrated lime or anti-strip agent as indicated in the mix design.
- C. Pavement Sealing:
  - 1. Slurry Seal: Type RS-1-SS-II, Section 32 01 13.61.
  - 2. Chip Seal: Type MC-250-CS-A, Section 32 01 13.64.

**2.3 CONCRETE PAVEMENT**

- A. Chairs, Bolsters, Bar Supports, Spacers: Section 03 20 00.
- B. Bond Breaker: Paraffin wax, lithium grease, or other semi-solid, inert lubricant.
- C. Fillers and Sealer: Section 32 13 73:
  - 1. Expansion joint filler, F1 sheet 1/2 inch thick.
  - 2. Contraction joint filler (Backer Rod), closed cell: Type 1 round.
  - 3. Contraction joint sealer, HAS1 or HAS4 hot applied.
- D. Adhesive Grout: Epoxy gel type II; Section 03 61 00.
- E. Reinforcement: Grade 60 ksi galvanized or epoxy coated steel, ASTM A 615:
  - 1. Dowel Bar: Smooth with a non-metallic end cap that allows 1/4 inch longitudinal movement of bar.
  - 2. Tie Bar: Deformed.
  - 3. Mat: Deformed.
- F. Normal Set Concrete: Class 4000, Section 03 30 04. Slump range per mix design.

**G. High Early Strength Concrete:**

1. Slump range per mix design, Section 03 30 04:
2. Concrete compressive strength of 3,000 psi minimum in four (4) hours.
3. Cementitious Material: Rapid hardening or very rapid hardening, ASTM C 928.
4. Cement content of mix, per cement manufacturer's recommendations or approved mix design.
5. Non-reactive aggregates in applications subjected to wetting, extended exposure to humid atmosphere, or contact with moist ground.

**H. Curing and Sealing Compound: Membrane type, ASTM C 1315:**

1. Type II Class A or B (white pigmented) for roadway pavement.
2. Clear with red fugitive dye for concrete flat work.

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**PART 3 EXECUTION**

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**3.1 CONSTRUCTION EQUIPMENT**

- A. Paver: Use asphalt concrete lay-down machine for final lift if surface restoration is over a trench in the direction of traffic flow or if trench is a deep (wide surface) excavation.

**3.2 PREPARATION**

- A. Implement the traffic control plan requirements.
- B. At site, post name, address and telephone number of CONTRACTOR to contact in emergencies.
- C. Notify ENGINEER within 24 hours of commencing work of this Section but not less than four (4) hours.
- D. Cutting Pavements: Cut full depth and straight, Section 02 41 14. Remove all bonding inhibitors.

**3.3 AGGREGATE BASE**

- A. Match depth of existing aggregate base or at least eight (8) inches thick.
- B. Place lifts not exceeding eight (8) inches before compaction. Compact each lift to 95 percent or greater relative to a modified proctor density.

**3.4 CONCRETE SUBSTRATE**

- A. Match existing substrate thickness.
- B. Apply concrete bonding compound, Section 03 30 10, to edge of existing concrete.
- C. Place concrete, Section 03 30 10.

**3.5 ASPHALT PAVEMENT RESTORATION**

- A. Follow APWA Plan 255 requirements.
- B. Match existing pavement thickness plus 1 inch, but not less than four (4) inches.
- C. Clean all vertical surfaces that butt against new patchwork. Provide full coverage spray tack coat. Do not spray tack coat on surfaces exposed to public view. Do not apply tack coat by brush.
- D. Place asphalt concrete in lifts not exceeding three (3) inches after compaction. Compact to 94 percent of ASTM D 2041 (Rice density) plus or minus two (2) percent.
- E. Match adjacent surface slopes.
- F. Use lay-down machine for final lift if trench is in direction of traffic flow.

**3.6 CONCRETE PAVEMENT RESTORATION**

- A. Full Depth Restoration:
  - 1. Follow applicable APWA Plan 256 requirements.
  - 2. In vertical load bearing joints, clean vertical surfaces and install tie-bars or dowels. Apply concrete bonding compound, Section 03 30 10.
  - 3. Place concrete. Prevent segregation.
  - 4. Match adjacent surface slopes. Match adjacent surface texture.
  - 5. Saw cut contraction joints.
- B. Partial Depth Restoration:
  - 1. Chip, hydro-blast or saw cut concrete at least one (1) inch deep.
  - 2. Make surfaces free of frost, ice, mud, water, grease, dirt and other materials that hamper bonding.
  - 3. Install bonding agent per manufacturer's recommendations.
  - 4. Place concrete. Prevent segregation.
  - 5. Match adjacent surface slopes. Make surface texture match existing.
- C. Cure:
  - 1. Apply membrane forming compound immediately after placement to protect work from hot or cold weather. Apply total coverage in two (2) directions after texturing. Provide ASTM C 1315 and Section 03 39 00 requirements.
  - 2. Eliminate thermal shock of concrete by keeping cure temperature even throughout extent and depth of concrete patch.
- D. Traffic: Not allowed on the repaired area until concrete strength is achieved.

**3.7 CONCRETE PAVERS**

- A. Screed bedding with a notched and cambered screed board to achieve a crown between existing pavers. Use graded aggregate, geotextile, and bedding sand, Section 32 14 13.
- B. After placement, use a plate-type vibrating compactor to compact pavers. Size compactor to provide at least 5,000 lbf force. Sweep joint sand into the joints and vibrate until joints are full. Remove excess joint sand.
- C. Match adjacent surface grades with no more than 1/4 inch vertical deviation in 10 feet.

**3.8 TOLERANCE**

- A. 1/4 inch vertical deviation from design elevation in 10 feet.
- B. Match adjacent surface slopes.

**3.9 PAVEMENT MARKINGS**

- A. Unless indicated otherwise, repair all damaged Pavement markings with matching material types and installation.

**3.10 REPAIR**

- A. Remove bumps and depressions exceeding 1/4 inch vertical deviation in 10 feet.
- B. Asphalt Pavement: Repair options include mill and inlay, or grinding. Feather edges on asphalt repairs is not allowed. Apply a cationic or anionic tack emulsion to make planed surfaces water resistant.
- C. Concrete Pavement: Repair options include grinding, or slab replacement. Apply a water repelling product over surfaces that are ground to make the surfaces water resistant. Repair or replace any slab that cracks, shrinks, or otherwise fails. Do not allow traffic on repaired area until concrete strength is achieved.

END OF SECTION

**SECTION 33 08 00**  
**COMMISSIONING OF WATER UTILITIES**

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**PART 1 GENERAL**

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**1.1 SECTION INCLUDES**

- A. Identification of testing requirements for potable and non-potable water piping systems.
- B. Warning: DO NOT use hydrostatic pressures described in this Section for air-pressure testing.

**1.2 DEFINITIONS**

- A. **Leakage:** The quantity of water required to maintain specified hydrostatic test pressure after pipeline has been filled with water and air expelled.
- B. **Non-rigid Pipe:** Any pipe that requires bedding and pipe zone backfill material for structural support.

**1.3 SUBMITTALS**

- A. Pipeline Test Report: Submit:
  - 1. Type of test.
  - 2. Identification of pipe system.
  - 3. Size, type, location and length of pipe in test section.
  - 4. Test pressure and time.
  - 5. Video cassette and log of visual examination.
  - 6. Amount of leakage versus allowable.
  - 7. Date of test approval.
  - 8. Signature of test supervisor.
  - 9. Signature of Resident Project Representative witnessing the test.

**1.4 PROJECT CONDITIONS**

- A. Repair pipeline system at no additional cost to OWNER until it passes specified commissioning tests.

**1.5 WARRANTY**

- A. At the end of the one year correction period repeat any test requested by ENGINEER to verify warranty of pipeline performance.

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**PART 2 PRODUCTS**

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**2.1 TESTING MATERIALS**

- A. Medium: Water, air.
- B. Recording Equipment (pressure systems):
  - 1. Supply all equipment and power to perform pressure testing.
  - 2. Secure approval of pressure gages.
  - 3. Locate all gages and recording equipment away from affect of sunshine or unsuitable weather conditions.
  - 4. Place, vents, pressure taps and drains for the test. Repair pipeline at completion of test at no additional cost to OWNER.

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**PART 3 EXECUTION**

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**3.1 PREPARATION**

- A. Notify ENGINEER 48 hours in advance of test.
- B. Carry out selected tests as pipeline construction progresses to ensure construction methods are producing satisfactory results.
- C. Remove debris, sediment and other material from installed pipe before testing. Do not discharge or flush sand, gravel, concrete, debris or other foreign material into any existing pipeline system. Flushing with clean water only will be allowed but with minimal flows to eliminate exceeding capacities of the existing gravity systems. Flushing into existing pressurized water systems will not be allowed.

**3.2 ALIGNMENT AND GRADE TEST**

- A. Do not allow line and grade of pipe to vary more than 1/2 inch in 10 feet and not more than 1 inch variance from true line at any location.
- B. Do not allow grade of pipe to vary more than 1/4 inch in 10 feet for all design grades less than or equal to 1 percent and not more than 1/2 inch total variance from true grade at any location. Also, do not allow grade of pipe to vary more than 1/2 inch in 10 feet for all design grades greater than 1 percent and not more than 1 inch total variance from true grade at any location. Theses tolerances shall be acceptable provided that such variation does not result in a level or reverse sloping invert.
- C. The variation in the invert elevation between adjoining ends of pipe due to eccentricity of joining surface and pipe interior surfaces shall not exceed 1/64 inch per inch of pipe diameter, or 1/4 inch maximum.

**3.3 PRESSURE TEST**

- A. Air Test: Per pipe manufacturer's recommendation.
- B. Hydrostatic test: Two (2) tests are required, pressure and volume.
  - 1. Provide 225 psi test pressure for two (2) hours unless required otherwise.
  - 2. Provide air release taps at pipeline's highest elevations and expel all air before the test. Insert permanent plugs after test has been

completed.

3. No piping installation will be acceptable until the leakage is less than the amount allowed by industry standards for the type of pipe material being tested or if no standard prevails then the number of gallons per hour as determined by the formula:

$$Q = \frac{LD * \text{square root of } P}{133,200}$$

Where

Q = allowable leakage, in gallons per hour.

L = length of pipe under test in feet.

D = nominal diameter of pipe in inches.

P = average test pressure, in pounds per square inch (gage).

- C. Locate and repair defective joints and retest until the leakage rate is less than allowable.
- D. Repair any noticeable leakage even if total leakage is less than allowable.

### 3.4 OBSTRUCTION AND DEFLECTION TEST

- A. Obstructions: Maximum protuberance is 1 inch.
- B. Deflections:
  1. Do not use mechanical pulling equipment when passing mandrels through pipe.
  2. Maximum reduction of internal diameter in any plane measured full length of installation and not less than 30 days after installation as follows:
    - a. Polyvinyl chloride pipe, 7.5 percent.
    - b. High density polyethylene pipe, five (5) percent.
    - c. Ductile iron pipe, three (3) percent.
    - d. Corrugated metal pipe, 7.5 percent.
  3. Recommend an alternate method of measurement if mandrel testing would cause damage to internal pipe coating.

### 3.5 INFILTRATION TEST

- A. Maximum is 50 gallons per inch diameter per mile per 24 hours.

### 3.6 VIDEO TEST

- A. Run water through gravity system prior to video inspection.
- B. Conduct test at least 30 days after backfill and prior to installation of pavements.
- C. ENGINEER to be present during video inspection.
- D. Inspect measure and record host pipe conditions using digital video recording equipment in MPEG 1 format with 352x240/320x240x30 fps resolution and audio bit rate of 256 Kbps.
- E. Identify the date, pipe reach, slope, upstream and downstream manhole numbers, and manhole to manhole footage.

- F. Provide video inspection log as a computerized data report with a map of the system inspected with appropriate identification labels as referenced in the video.

### **3.7 TRACER WIRE CONTINUITY TEST**

- A. Test all tracer wire sections for continuity.

### **3.8 PIPE TESTING SCHEDULE**

- A. Landscape Irrigation - Gravity System:

- 1. Grade test: All laterals drain.

- B. Landscape Irrigation – Pressure System:

- 1. Grade test: All lateral pipe drains.

- 2. Pressure test.

- 3. Operational Testing:

- a. Perform operational testing after hydrostatic test is complete; backfill is in place and sprinkler heads adjusted to final coverage.

- b. Demonstrate system meets coverage requirements and automatic controls function properly.

- c. Coverage requirements are based on operation of 1 circuit at a time.

- C. Sanitary Sewers:

- 1. Alignment and grade test.

- 2. Obstructions and deflection test.

- 3. Infiltration test for gravity pipeline systems.

- 4. Pressure test for pressure pipeline systems.

- 5. Video inspection. For lateral replacements constructed by bursting, camera in presence of ENGINEER.

- 6. Air test.

- D. Subdrains:

- 1. Grade test: All pipelines drain.

- 2. Obstructions and deflection test.

- E. Storm Drains:

- 1. Alignment and grade test.

- 2. Obstructions and deflection test.

- 3. Infiltration test for gravity pipeline systems.

- 4. Pressure test for pressure pipeline systems.

- 5. Video inspection for all mains and laterals.

- 6. Air test

- F. Potable Water System:

- 1. Obstruction and deflection test.

2. Pressure test.
  3. Disinfection (Section 33 13 00).
  4. Tracer wire continuity test.
- G. Secondary Nonpotable Water System
1. Obstruction and deflection test.
  2. Pressure test.
  3. Flushing (See Section 33 13 00 disinfection not required).
  4. Tracer wire continuity test.

END OF SECTION

**SECTION 33 11 00**  
**WATER DISTRIBUTION AND TRANSMISSION**

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**PART 1 GENERAL**

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**1.1 SECTION INCLUDES**

- A. Water distribution and transmission pipe systems, identification, valves, boxes, service connections and accessories.
- B. This section is applicable to potable and non-potable water pressure systems.

**1.2 REFERENCES**

- A. **American Concrete Pipe Association (ACPA) Standards.**
- B. **APWA (Utah Chapter) Standards:**
  - Plan 255 Asphalt Concrete "T" Patch.
  - Plan 256 Concrete Pavement Patch.
  - Plan 381 Trench Backfill.
  - Plan 382 Pipe Zone Backfill.
  - Plan 521 3/4" and 1" Meter.
  - Plan 522 1-1/2" and 2" Meter.
  - Plan 541 Water Service Line.
  - Plan 542 Water Service Line Loop.
  - Plan 543 Watermain Loop.
  - Plan 551 3/4" and 1" Service Taps.
  - Plan 552 1-1/2" and 2" Service Taps.
  - Plan 561 Direct Bearing thrust Block.
  - Plan 562 Tie-Down Trust Restraints.
  - Plan 574 Cover Collar for Water Valve Boxes.
- C. **AWWA Standards:**
  - C600 Installation of Ductile-Iron Water Mains and Their Appurtenances.
  - C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
  - C800 Underground Service Line Valves and Fittings.
  - C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. Through 3 in., for Water Service.
  - M11 Manual for Steel Pipe - Design and Installation.
- D. **Copper Development Association (CDA) Standards.**
- E. Applicable water company requirements standards.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Depth of Cover:
  - 1. Minimum as indicated in local building code from top of pipe to ground surface. 72 inches maximum unless ENGINEER authorizes otherwise.
  - 2. If less cover, provide additional protection to withstand frost and external loads.
- B. Remove any section of pipe already placed that is found to be defective or damaged. Relay or replace without additional cost to OWNER.

### 1.4 SUBMITTALS

- A. Product data: Submit manufacturer's technical product data and installation instructions.
- B. Commissioning: Submit testing data indicated in Section 33 08 00.
- C. Record Documents, Section 01 78 39: Include details of underground structures, connections, thrust blocks and anchors. Show interface and spatial relationship between piping and adjacent structures.
- D. Operating and Maintenance: Submit data, Section 01 78 23. Include maintenance data, parts list, product data and Shop Drawings.

### 1.5 SITE CONDITIONS

- A. Minimize neighborhood traffic interruptions. Barricade stockpiles.
- B. Secure acceptance of pipeline lateral tie-in work.
- C. Repair public and private facilities damaged by CONTRACTOR.
- D. Do not operate any currently active water valve until its owner and water company's permission is secured.

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## PART 2 PRODUCTS

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### 2.1 PIPES AND FITTINGS

- A. Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, and capacities indicated. Use only NSF approved products in drinking water systems. All such products shall be appropriately stamped with the NSF logo.
- B. Where not indicated, provide proper selection as determined by installer and acceptable to ENGINEER to comply with installation requirements.
- C. Provide sizes and types of equipment connections for fittings of material that matches pipe material used in the piping system. Where more than one type of material or product option is indicated, selection is installer's choice.
- D. Provide pipe fittings and accessories of same material and weight or class as pipe, with joining method indicated or recommended by manufacturer.

### 2.2 VALVES



- A. Section 33 12 16.

### 2.3 VALVE BOX

- A. Buried Valves in Traffic Areas: Cast iron two (2) piece slip sleeve type, 5-1/4 inch shaft, with a drop lid.
- B. Buried Valves in Non-Traffic Areas: Cast iron two (2) piece screw adjustable sleeve of height required for installation.
- C. Markings: Cast appropriate utility lettering on cover.

### 2.4 VALVE CHAMBER

- A. Basin: Class 4000 concrete floor and walls.
- B. Steps: Plastic, cast into sidewalls greater than four (4) feet deep.
- C. Top: Flat slab class 4000 concrete.
- D. Frame and Cover: Scoriated asphalt coated, heavy duty ductile iron conforming to Section 05 56 00 with flat top design and appropriate utility lettering. Shape and size required.

### 2.5 MORTAR, GROUT, AND CONCRETE

- A. Mortar: Portland cement, Section 04 05 16.
- B. Grout: Portland cement, Section 03 61 00.
- C. Concrete:
  - 1. Cast-in-place: Class 4000, Section 03 30 04.
  - 2. Precast: Class 5000, Section 03 40 00.

### 2.6 TAPPING SADDLES

- A. Bronze alloy or stainless steel saddles with stainless steel straps (double straps on pipes over 12 inches diameter).
- B. Straight threads. Tapped threads not allowed.
- C. Rated working pressure, 300 psi minimum.
- D. Neoprene Buna N gaskets.

### 2.7 SERVICE CONNECTION

- A. Taps: Saddle clamp or direct type. Provide plastic spacers or nipples to separate non-similar metals.
- B. Service Line:
  - 1. Copper Pipe: Type K, Section 33 05 03 with 200 psi compression fittings according to AWWA C800.
  - 2. Polyethylene Pipe: AWWA C901 with 200 psi compression fittings, and ratings according to AWWA C800.

## 2.8 ACCESSORIES

- A. Bolts, Nuts, Washers: Steel, Section 05 05 23.
- B. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.
- C. Corporation Stops: All bronze, straight threads, full port, ball valve.
- D. Hydrant and Valve: Dry barrel, Section 33 12 19.
- E. Water Meter and Valve: Section 33 12 19.
- F. Grease: Non-oxide food grade required where in contact with potable water. Non-oxide poly-fm for all exposed buried metal surfaces for bolts, nuts, washers, restraints, etc.
- G. Polyethylene Sheet: Six (6) mil thick minimum.
- H. Joint Restraints: Acceptable to ENGINEER prior to installation.

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## PART 3 EXECUTION

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### 3.1 EXAMINATION

- A. Verify trench excavation is ready to receive work, and dimensions, and elevations are as required.
- B. Commencing installation means acceptance of existing conditions.

### 3.2 PREPARATION

- A. Excavation, Section 31 23 16. Hand trim to required elevations. Correct over excavations.
- B. Remove stones or other hard matter that manufacturer stipulates may damage pipe during embedment or impede backfilling or compaction.
- C. Examine areas and conditions under which materials and products are to be installed. Do not proceed with system installation until unsatisfactory conditions have been corrected in manner acceptable to system installer.
- D. Clearly identify and promptly set aside defective or damaged pipe.
- E. Use pipe cutting tool acceptable to pipe manufacturer.

### 3.3 LAYOUT

- A. Comply with Utah administrative rules R309-550. As a minimum locate potable water pipe at least 18 inches vertical and 10 feet horizontal edge to edge between water and sewer lines. Place water lines above sewer line.
- B. Where potable water pipe crosses under gravity-flow sewer lines, fully encase sewer pipe in concrete for a distance at least 10 feet each side of the crossing:
  - 1. Do not locate any joint in the water line within 36 inches of the crossing.

2. Encase water line if it is within 24 inches of a sewer force main or a sewer inverted syphon.
  3. Encase sewer main joints in concrete if joints are horizontally closer than 36 inches to the water line.
- C. Do not put potable water lines in the same trench with sewer lines, storm drains or electric wires.

### **3.4 INSTALLATION - PIPE AND FITTING**

- A. General:
1. Seal each open end of pipeline at end of day's work.
  2. Grease all bolts and nuts then apply polyethylene sheet and tape wrap.
- B. Steel Pipe: AWWA M11.
- C. Ductile Iron Pipe: AWWA C600.
- D. Copper Tube: CDA "Copper Tube Handbook".
- E. Polyethylene Pipe: For three (3) inches and smaller pipe follow AWWA C901. Install all other sizes per manufacturer's installation instructions.
- F. Polyvinyl Chloride Pipe: AWWA C605.
- G. Concrete Pipe: ACPA "Concrete Pipe Handbook".
- H. Wedges: Install metal wedges on metal pipe systems. Grease and plastic wrap exposed metal wedges.

### **3.5 INSTALLATION – CONCRETE THRUST BLOCK**

- A. APWA Plan 561 or 562.
- B. Do not make hydrostatic tests of Section 33 08 00 until thrust block concrete has cured for at least five (5) days.
- C. Provide thrust blocks on all plugs, caps, tees, hydrants and vertical or horizontal elbows.
- D. Provide stainless steel or epoxy coated steel tie rods and clamps or shackles to restrain thrust.
- E. Unless indicated otherwise or directed by ENGINEER, place base and bearing sides of thrust blocking directly against undisturbed earth.
- F. Sides of thrust blocking not subject to thrust may be placed against forms. Place thrust blocking so joint fittings will be accessible for repair.

### **3.6 INSTALLATION - VALVE AND VALVE BOX**

- A. Valves:
1. Ensure all parts are in working order.
  2. Set location of valves outside of sidewalk limits, driveway approach and other pedestrian or vehicular interference.
  3. Install plumb with stem pointing up.
  4. Grease all exposed bolts and nuts then apply polyethylene sheet and tape wrap.

**B. Air Relief Valves:**

1. At high points in water mains where air can accumulate, air may be removed by means of hydrants or air relief valves.
2. DO NOT use automatic air relief valves where flooding may occur.

**C. Valve Box:**

1. Set over valve nut so operator's key is plumb with clearance in valve box when opening and closing the valve. Riser must NOT rest on valve or pipe system.
2. Adjust riser to finish grade and clean all dirt or foreign material out of riser.
3. Install concrete cover collar in paved surface, APWA Plan 574.

**3.7 INSTALLATION – JOINT RESTRAINTS**

- A. Without Thrust Blocks: Install joint restraints with all valves for the distance acceptable to the ENGINEER.
- B. With Thrust Blocks: Install joint restraints for the distance approved by the ENGINEER where concrete block design exceeds three (3) cubic yards, for vertical bends, where soil is disturbed, or where undisturbed soil bearing capacity is less than 1000 pounds per square foot.

**3.8 INSTALLATION – TAPS**

- A. APWA Plan 551 or 552.
- B. Apply for and pay for applicable permits from water company for size and location of tap to water main. Comply with all connection requirements of water company.
- C. Make service taps with a tapping machine acceptable to water company. Use teflon tape on all taps unless indicated otherwise.
- D. Minimum distance between taps is 24 inches, with a five (5) degree stagger. Do not make service taps within 24 inches of the end of pipe. Install taps at 60 degrees from vertical, or authorized by ENGINEER.
- E. Service saddles are required on all taps except, 3/4 inch or 1 inch taps to new ductile iron pipe
- F. Grease all exposed bolts and nuts then apply six (6) mil thick polyethylene sheet and tape wrap.

**3.9 INSTALLATION – SERVICE LINE**

- A. Replacing Existing Water Service Line: APWA Plan 541.
  1. Follow AWWA C800, Utah drinking water Rules and Regulations and International Building Code requirements.
  2. When replacing water service lines, replace non-copper pipe with:
    - a. Type K copper pipe, Section 33 05 03, or
    - b. Polyethylene pipe, AWWA C901
  3. Minimum pipe diameter 3/4 inch, maximum 3 inches.
  4. Distance from nearest joint or existing tap is 24 inches minimum unless a greater distance is required by pipe manufacturer.

- B. Looping Existing Water Service: APWA Plan 542.
  - 1. Minimum pipe diameter is one (1) inch.
  - 2. Use liquid nitrogen to spot freeze active service lines. Pinching tools used to close active service lines may be used only if allowed in writing by ENGINEER.
  - 3. Soldered joints or connections not allowed.
  - 4. For copper to iron connections use a brass pack joint compression coupling with joint locking device.
  - 5. For copper-to-copper connections use a brass compression fittings. Flared end fittings are not allowed.
- C. Meter box: APWA Plan 521 or 522. Install meter box back of curb, outside of sidewalk, outside of driveway approaches, or other vehicular or pedestrian interference.

### 3.10 INSTALLATION – WATERMAIN LOOP (SYPHON)

- A. APWA Plan 543.
- B. Existing water mains may not match standard size. Excavate to obtain actual pipe diameter and match size.
- C. Do not shutdown pipeline until couplings and fittings are on site. Coordinate shutdown with water company.
- D. Connections to steel or transite pipe require transition couplings or sleeves with transition gaskets.
- E. Grease all exposed bolts and nuts then apply six (6) mil thick polyethylene sheet and tape wrap.
- F. Provide thrust blocks except where joints are welded. Follow details shown on drawings.

### 3.11 DISINFECTION

- A. Section 33 13 00.
- B. After disinfection, legally dispose of disinfection water.

### 3.12 BACKFILLING

- A. Before Backfilling:
  - 1. Secure ENGINEER's acceptance of brass wedge installation and concrete thrust block installation.
  - 2. For pressure pipe testing follow Section 33 08 00 requirements and for disinfection follow Section 33 13 00 requirements.
- B. Trenches: Section 33 05 20:
  - 1. Pipe zone backfill, APWA Plan 382.
  - 2. Trench backfill, APWA Plan 381.
- C. Landscapes: Section 31 23 23.

**3.13 SURFACING RESTORATION**

- A. Roadway Trenches and Patches: Section 33 05 25:
  - 1. Asphalt concrete "T" patch, APWA Plan 255.
  - 2. Concrete pavement patch, APWA Plan 256.
- B. Landscapes: Turfs and grass, Section 32 92 00 or Ground Cover, Section 32 93 13 as applicable.

END OF SECTION



**SECTION 33 11 11**  
**RELOCATE WATER METERS AND FIRE HYDRANTS**

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**PART 1 GENERAL**

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**1.1 SECTION INCLUDES**

- A. Relocate existing water meters or fire hydrants because of changes in grade or installation of new improvements that conflict with existing meter and hydrant locations.

**1.2 REFERENCES**

**A. APWA (Utah Chapter) Standards:**

Plan 543 Fire hydrant replacement or relocation.

**B. AWWA Standards:**

C203 Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape – Hot-Applied.

C502 Dry-Barrel Fire Hydrants.

**1.3 JOB CONDITIONS**

- A. Secure utility company permit to do relocation work and pay applicable fees.
- B. Secure utility company approval of joints, connections, and pipe installations before commencing backfill operations.

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**PART 2 PRODUCTS**

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**2.1 HYDRANTS**

- A. Use existing hydrant unless contracted to provide a new unit.

**2.2 WATER SERVICE METERS**

- A. Use existing water meter and yoke unless contracted to provide a new unit.

**2.3 CONCRETE**

- A. Class 3000 or 4000 cast-in-place, Section 03 30 04.

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**PART 3 EXECUTION**

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**3.1 PREPARATION**

- A. Before commencing work, coordinate location and shutdown of utility lines with utility company and residents, Section 01 31 13.
- B. Protect existing hydrants and meters from damage.

- C. Control ground water, surface water, storm water.
- D. Control pedestrian and vehicular traffic, Section 01 55 26.
- E. Provide all excavation backfill, compaction, connections, testing, and surface restorations to make the installation complete.

### **3.2 MOVE EXISTING HYDRANT**

- A. APWA Plan 546. Relocate to location indicated.
- B. Do not disturb location of hydrant lateral tee at water main.
- C. The method of harnessing the hydrant (reshackling or reblocking) shall match existing conditions or approval of ENGINEER.
- D. Install hydrant so base flange is even with or less than four (4) inches above grade of surrounding surface.
- E. Use same type of pipe material as used for existing hydrant piping unless indicated otherwise.
- F. Use mechanical and flange joint fittings unless required otherwise. Use only new tees, fittings, and bends.
- G. Coat all weld connections and damaged areas of metal piping with coal tar enamel. Follow AWWA C203 requirements. Tape wrap coatings.

### **3.3 RECONNECT EXISTING HYDRANT**

- A. Hydrant reconnection shall meet new work requirements indicated in Section 33 12 19.
- B. When existing tee on water main is to be moved to new location, seal and shackle old tee.

### **3.4 HYDRANT BARREL EXTENSION**

- A. Follow AWWA C502 to extend barrel, operating stem and flanged adapters in design material and workmanship so hydrant base flange is even with or less than four (4) inches above grade of surrounding surface.

### **3.5 MOVE WATER METER AND BOX**

- A. Verify with water company for use of Type K copper pipe (Section 33 05 03) or polyethylene pipe (Section 33 05 06) from main to meter yoke.
- B. Follow installation procedure in Section 33 12 33. In paved surfaces, follow procedure in Section 33 05 14 when adjusting structures to grade.

### **3.6 FIELD QUALITY CONTROL**

- A. Hydrostatic tests, Section 33 08 00.
- B. Disinfection, Section 33 13 00.

END OF SECTION

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**SECTION 33 12 16**  
**WATER VALVES**

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**PART 1 GENERAL**

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**1.1. SECTION INCLUDES**

- A. Gate, butterfly, plug, check, pressure reducing, pressure relief, control valves and their installation.

**1.2 REFERENCES****A. AWWA Standards:**

- C111 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- C504 Rubber-Seated Butterfly Valves.
- C508 Swing-Check Valves for Waterworks Service, 2 In. Through 24 In. NPS.
- C509 Resilient-Seated Gate Valves for Water and Sewerage Systems.
- C550 Protective Interior Coatings for Valves and Hydrants.
- C600 Installation of Ductile-Iron Water Mains and Their Appurtenances.

**1.3 SUBMITTALS**

- A. Provide technical information for evaluating quality of valve. As a minimum include dimensions, weights, materials lists and operation charts.

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**PART 2 PRODUCTS**

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**2.1 VALVES - GENERAL****A. Underground:**

- 1. Less than three (3) inches: Screwed ends.
- 2. 3 inches and larger: Flanged or mechanical joint ends. Non-rising stem. Two inches square operating nut. Low alloy steel bolts, AWWA C111.

- B. Submerged or Above Sewage or Water:
  - 1. Valve body bolts per manufacturer's recommendations.
  - 2. For joining valve to piping system use stainless steel nuts and bolts, Section 05 05 23.
- C. Below an Operating Deck: Provide shaft extension from the valve to deck level.
- D. Above Ground: Non-rising stems equipped with a hand wheel.
- E. Manually Operated Valves Over six (6) feet Above Operating Level: Provide chain operated handles.
- F. Clearance: Install so handles clear all obstruction when moved from open to closed.
- G. Rated Working Pressure: 150 psi if not indicated.
- H. Coating: Interior, AWWA C550. Exterior per manufacturer's recommendation.

## **2.2 GATE VALVES**

- A. AWWA C509.
- B. 3 inches through 48 inches, cast iron body, bronze mounted, non-rising stem with "O" ring seals.
- C. Open counterclockwise.

## **2.3 BUTTERFLY VALVES**

- A. AWWA C504.
- B. 3 inches through 48 inches, cast iron body, bronze mounted.
- C. Short body if disc will not interfere with adjacent fittings or long body at CONTRACTOR's option.
- D. Wafer Valves: Subject to ENGINEER's approval.

## **2.4 ECCENTRIC PLUG VALVES**

- A. Material: Cast iron body, bronze mounted, non-lubricated, eccentric, quarter-turn type with resilient face plugs, ductile iron discs with upper and lower shafts integral.
- B. Markings: Indicate open and close position.
- C. Port Areas: At least 82 percent of full pipe area.
- D. Resilient Seat Seals: Buna N, field replaceable.

## **2.5 CHECK VALVES**

- A. AWWA C508.
- B. Less than three (3) inches: Y-pattern, bronze, regrinding, swing check valve, 200 psi working pressure.
- C. 3 inches and larger: Iron body, bronze mounted, swing valves with stainless steel hinge pins and outside weight and lever if not indicated otherwise.

**2.6 PRESSURE REDUCING VALVES - SERVICE LINE**

- A. Operation: Capable of reducing a varying higher upstream pressure to an adjustable constant lower downstream pressure.
- B. Spring and nylon reinforced diaphragm type construction.
- C. Equip with Y-strainer upstream of valve.

**2.7 PRESSURE REDUCING VALVES - MAIN LINE**

- A. Operation: Capable of maintaining an adjustable constant downstream pressure regardless of upstream pressure.
- B. Type: Hydraulically operated using a direct-acting, spring-loaded, normally open, pilot valve controlled diaphragm:
  - 1. Single removable seat and a resilient disc. No "O" ring type discs permitted. No external packing glands permitted. No pistons operating main valve or pilot controls permitted.
  - 2. Y-strainers on pilot controls, variable closing and opening speed controls and a valve position indicator.
- C. Rating: 250 psi working pressure.
- D. Connection: Flanged.
- E. Pressure Gage: Upstream and downstream of valve capable of accurately measuring system pressures.

**2.8 PRESSURE RELIEF VALVES**

- A. Operation: Maintain a constant upstream pressure by passing or relieving excess pressure.
- B. Closed Valves: Drip-tight.
- C. Type: Hydraulically operated, pilot control using a diaphragm with a single removable seat and resilient disc.
- D. Pilot Controls: Direct acting, adjustable between 20 and 200 psi, spring-loaded diaphragm valve.
- E. Rating: 250 psi working pressure.
- F. Connection: Flanged.

**2.9 CONTROL VALVE**

- A. Globe: Diaphragm actuated, single seated, composition disc, hydraulically operated.
- B. Pilot Controls: Externally mounted, four-way, solenoid pilot valve with self cleaning strainers and diaphragm type check valves:
  - 1. Equipped with a limit switch for pump control.
  - 2. Equipped with a built-in lift check valve to prevent flow reversal.
- E. Rating: 250 psi working pressure.
- F. Connection: Flanged.
- G. Solenoids and Limit Switch: Supplied with operating voltage indicated.

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**PART 3 EXECUTION**

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**3.1 INSTALLATION**

- A. Flush all lines before valve installation.
- B. In ductile iron water mains, AWWA C600.
- C. Install butterfly valve shafts vertical in vault boxes and horizontal otherwise.

END OF SECTION



**SECTION 33 12 19  
HYDRANTS**

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**PART 1 GENERAL**

---

**1.1 SECTION INCLUDES**

- A. Dry-barrel fire hydrants, valves, piping and accessories.

**1.2 REFERENCES****A. APWA (Utah Chapter) Standards:**

- Plan 511 Fire hydrant with valve.
- Plan 561 Direct bearing thrust block.
- Plan 562 Tie-down thrust restraints.

**B. AWWA Standards:**

- C110 Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids.
- C111 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- C209 Cold-Applied Tape Coatings for the Exterior of Special Section, Connections, and Fittings for Steel Water Pipelines.
- C210 Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
- C213 Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel water Pipelines.
- C214 Tape Coating Systems for the Exterior of Steel Water Pipelines.
- C502 Dry-Barrel Fire Hydrants.
- M17 Manual for Installation, Operation, and Maintenance of Fire Hydrants.

**1.3 PRODUCT HANDLING**

- A. Package fire hydrants, gate valves, and valve boxes for protection against dirt and damage during shipment and storage.
- B. Do not plug drain hole.

**1.4 SUBMITTALS**

- A. Product Data: Manufacturer's technical product data and installation instructions.
- B. Shop Drawings: Show interface and spatial relationship between piping and adjacent structures.
- C. Field Quality Control Reports: For system commissioning.

## 1.5 JOB CONDITIONS

- A. Notify appropriate fire department as soon as hydrant is removed or placed in service.

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## PART 2 PRODUCTS

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### 2.1 DRY-BARREL FIRE HYDRANT

- A. AWWA C502.
- B. Cast iron compression type, opening against pressure and closing with pressure, base valve design, 150 psi working pressure, with 1/4 inch diameter minimum tapping and bronze plug in standpipe:
  - 1. Size: 5-1/4 inch valve opening.
  - 2. Direction to Open Hydrant: Counterclockwise.
  - 3. Size and Shape of Operating and Cap Nuts: Pentagon. 1-1/2 inch point to flat.
  - 4. Hose Nozzles: Two 2-1/2 inch national standard thread, cap, gasket and chain.
  - 5. Pumper Nozzle: One 4-1/2 inch national standard thread, cap, gasket and chain.
  - 6. Depth of Burial: 48 inches or consistent with main depth.
  - 7. Connection to Main: Six (6) inches flanges or mechanical joint.
  - 8. Pressure: 150 psi working pressure and 300 psi hydrostatic pressure.
  - 9. Inlet Bottom Connection: Six (6) inches mechanical joint or flanged in accordance with AWWA C110 and AWWA C111, designed to allow separation at the sidewalk or ground level when hydrant is sheared off.
  - 10. Automatic Drain: Opens as the hydrant is closed.

### 2.2 PIPE AND FITTINGS

- A. Ductile Iron: Section 33 05 05. Standard drilling with joints per AWWA C110.
- B. PVC: Section 33 05 07.
- C. Steel: Section 33 05 09. Standard drilling, 150 lb.
- D. Spool: Schedule 40 steel, epoxy lined, exterior wrapped with minimum six (6) mil thick polyethylene sheet and tape wrap, AWWA C210 or C213 and C209 or C214 with two welded in place 150 lb. steel ANSI B 16.5 slip on flanges.

### 2.3 VALVES

- A. Gate Valve: Section 33 12 19.
- B. If indicated, furnish an auxiliary six (6) inch diameter valve with end connections as required.

**2.4 ACCESSORIES**

- A. Bolts, Nuts, Washers: Stainless steel, Section 05 05 23.
- B. Anchorages: Provide anchorages for tees, wyes, crosses, plugs, caps, bends, valves, and hydrants. After installation, apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of ferrous anchorages.
- C. Thrust Blocks: Concrete Class 2000 minimum cast-in-place, Section 03 30 04.
- D. Valve Box, Valve Chamber: Section 33 12 19.

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**PART 3 EXECUTION**

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**3.1 PREPARATION**

- A. Excavation, Section 31 23 16.

**3.2 INSTALLATION**

- A. Install hydrant according to APWA Plan 511 and AWWA M17.
- B. Install hydrants, valves, and valve boxes as indicated and located. Hydrants shall not be connected to or located within 10 feet of a sanitary sewer or storm drain.
- C. Install so bottom of hydrant base flange is above grade four (4) inches plus or minus two (2) inches.
- D. Point 4-1/2 inch pumper nozzle to face the street.
- E. Drain holes at base of hydrant to remain clear with a minimum of 1 cubic yard of clean sewer rock (Section 32 11 23) placed around hydrant base and drain. Place sheet plastic over gravel to prevent silting.
- F. Coal tar and tape wrap steel pipe.
- G. Grease all buried nuts, bolts, and steel ancillaries then wrap with six (6) mil thick polyethylene sheet and tape wrap.
- H. Install thrust blocks according to APWA Plan 561 or 562.

**3.3 BACKFILLING**

- A. Secure water company permission to commence backfilling operation.
- B. Trenches, Section 33 05 20.
- C. Structures, Section 31 23 23.
- D. Landscaping, Section 32 91 19.
- E. Pavements, Section 32 05 10.

**3.4 PAINT**

- A. Paint buried portion of hydrant with two coats of coal tar enamel or asphalt.
- B. Paint hydrant barrel and caps with one coat primer and final coat per water company paint standards.

**3.5 FIELD QUALITY CONTROL**

- A. Commissioning, Section 33 08 00.
- B. Disinfection, Section 33 13 00.

END OF SECTION

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**SECTION 33 12 33**  
**WATER METER**

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**PART 1 GENERAL**

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**1.1 SECTION INCLUDES**

- A. Water meters, service connections, materials.

**1.2 REFERENCES**

- A. **AWWA Standards:**

- C704 Cold-Water Meters - Propeller Type for Main Line Applications.

- C800 Underground Service Line Valves and Fittings.

**1.3 SUBMITTALS**

- A. Manufacturer's test records for range and accuracy of meter being furnished.
- B. Equipment material diagram and parts schematic.

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**PART 2 PRODUCTS**

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**2.1 METERS FOR SYSTEM PIPING**

- A. Materials and Construction: AWWA C704:
  - 1. Cast iron bodies, 175 psi working pressure, flanged connections.
  - 2. Built-in straightening vanes.
  - 3. Working pressure 150 psi.
  - 4. Polyethylene plastic propeller.
  - 5. Stainless steel shaft with stainless steel ball bearings, lubricated by means of a single pressure fitting.
- B. Accuracy: Plus or minus two (2) percent of scale for velocities over 1 foot per second.
- C. Totalizer: Six digits reading in units required.

**2.2 METERS FOR SERVICE PIPING**

- A. Provided by OWNER unless indicated otherwise.

**2.3 SERVICE LINE, VALVES, AND FITTINGS**

- A. Service Pipe: Copper, Section 33 05 03 or smooth wall polyethylene, Section 33 05 06. The service pipe between main and meter and to a point not less than 1 foot from the public way side of the property line cannot exceed the meter size.
- B. Service Valves and Fittings: AWWA C800.
- C. Meter Setters: Brass, with angle fittings, saddle nuts and gaskets.
- D. Corporation Stops and Angle Valves: Invert key design.
- E. Bypasses: Not allowed on any service installation without approval of ENGINEER.

**2.4 METER BOXES**

- A. Meters to 1" Service: Plastic or asphalt-dipped corrugated metal. Fiber meter boxes not acceptable.
- B. Meters 1-1/2" and Larger: Reinforced concrete with a minimum clearance of 12" from each side of meter plumbing.
- C. Cover: Ductile or cast iron with utility inscription

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**PART 3 EXECUTION**

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**3.1 INSTALLATION**

- A. Install meter box, meter setters, valves, etc. at indicated locations. If not indicated, install in street right-of-way parking strip or at a location approved by ENGINEER.
- B. Install meter setters level and horizontal. Provide suitable pipe lengths to prevent stress.
- C. DO NOT operate utility agency's main line valves. Contact agency if valves are to be operated. If required by water utility agency notify affected water users, Section 01 31 13.
- D. OWNER Supplied Meters: Installed by CONTRACTOR unless indicated otherwise.

END OF SECTION



**SECTION 33 13 00**  
**DISINFECTION**

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**PART 1 GENERAL**

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**1.1 SECTION INCLUDES**

- A. Disinfection of potable water system.
- B. Test and report results.

**1.2 REFERENCES**

**A. AWWA Standards:**

- A100 Water Wells.
- B300 Hypochlorites.
- B301 Liquid Chlorine.
- C651 Disinfecting Water Mains.
- C652 Disinfection of Water-Storage Facilities.

**B. State of Utah Standards:**

Public Drinking Water Regulations, Part 2, Section 12.

**1.3 DEFINITIONS**

- A. **Disinfectant Residual:** The quantity of disinfectant in treated water.
- B. **ppm:** Parts per million.

**1.4 SUBMITTALS**

- A. CONTRACTOR's evidence of experience in disinfection.
- B. Bacteriological laboratory's certification.
- C. Disinfection Report: Three (3) copies containing:
  - 1. Date issued.
  - 2. Project name and location.
  - 3. Treatment contractor's name, address and phone number.
  - 4. Type and form of disinfectant used.
  - 5. Time and date of disinfectant injection started.
  - 6. Time and date of disinfectant injection completed.
  - 7. Test locations.
  - 8. Initial and follow-up disinfectant residuals in ppm for each outlet tested.
  - 9. Time and date of flushing start.
  - 10. Time and date of flushing completion.
  - 11. Disinfectant residual after flushing in ppm for each outlet tested.
  - 12. Flush water disposal location and acceptance by local agency.

D. Bacteriological Report: Three (3) copies including:

1. Date issued.
2. Project name and location.
3. Laboratory's name, certification number, address, and phone number.
4. Time and date of water sample collection.
5. Name of person collecting samples.
6. Test locations.
7. Time and date of laboratory test start.
8. Coliform bacteria test results for each outlet tested.
9. Certification that water conforms or fails to conform to bacterial standards of State of Utah public drinking water regulations.
10. Bacteriologist's signature.

**1.5 QUALITY ASSURANCE**

- A. Bacteriological Laboratory: Certified by State of Utah if laboratory is other than OWNER's laboratory.

**1.6 PRODUCT HANDLING**

- A. Store and protect disinfectant in accordance with manufacturer's recommendations to protect against damage or contamination. Do not use unsuitable disinfectant.
- B. Follow all instruction labeling for safe handling and storage of disinfectant materials.

**1.7 REGULATORY REQUIREMENTS**

- A. Conform to State of Utah public drinking water regulations.

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**PART 2 PRODUCTS**

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**2.1 DISINFECTANT**

- A. AWWA B301. Liquid chlorine 99.5 percent pure by volume.
- B. AWWA B300. Sodium hypochlorite not less than 100 grams per liter available chlorine.
- C. AWWA B300. Calcium hypochlorite 65 to 70 percent available chlorine by weight in granular form.
- D. Powder, tablet, or gas according to manufacturer's specification.

**2.2 ALKALI**

- A. Caustic soda or soda ash.

**2.3 ACID**

- A. Hydrochloric (muriatic).

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**PART 3 EXECUTION**

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**3.1 PREPARATION**

- A. Provide necessary signs, barricades, and notices to prevent accidental exposure to disinfecting materials, consuming disinfecting water, or disturbing system being disinfected.
- B. Make sure potable water system is complete, clean, and that the system to be disinfected is not connected to an existing system.

**3.2 DISINFECTION OF WATER LINES**

- A. Use one method defined under AWWA C651 that is acceptable to ENGINEER.
- B. After pressure testing per Section 33 08 00, flush system through hydrants or if a hydrant does not exist, install a tap of sufficient size to provide 2.5 feet per second flushing velocity in the line.
- C. Starting at outlet closest to water source, bleed water from each outlet until chlorine residual reaches outlet. Repeat process at each outlet throughout system.
- D. Collect a bacteriological water sample at end of line to be tested. If sample fails bacteriological test, flush system and retest. Continue flushing and retesting until a good sample is obtained.
- E. If flushing does not produce a passing bacteriological test disperse disinfectant throughout system to obtain 10 to 25 ppm of free chlorine residual.
- F. Flush the chlorinated water from the main until chlorine measurements show concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use.
- G. After a passing bacteriological test sample is obtained, let the system relax for 24 hours. Flush and collect a subsequent bacteriological sample for testing. If the subsequent test passes then water line is acceptable.

**3.3 DISINFECTION OF CULINARY WELLS**

- A. Use one method defined under AWWA A100 that is acceptable to ENGINEER.
- B. Do not start disinfection until well is thoroughly cleaned.
- C. Use a disinfecting solution containing a minimum of 50 ppm residual chlorine.
- D. Flush system after disinfection.

**3.4 DISINFECTION OF WATER STORAGE RESERVOIRS**

- A. Use one method defined under AWWA C652 that is acceptable to ENGINEER.
- B. Do not start disinfection until water storage tank is thoroughly cleaned.
- C. Provide and use necessary safety equipment for workers in contact with disinfectant or gasses.
- D. Flush system after disinfection.

**3.5 FIELD QUALITY CONTROL**

- A. Bacteriological Test:
  - 1. Collect samples for testing no sooner than 16 hours after system flushing.
  - 2. Analyze water samples per State of Utah requirements.
  - 3. If bacteriological test proves water quality to be unacceptable, repeat system treatment.
  - 4. Do not place water systems into service until a passing bacteriological test is made. Provide a copy of the passing test to ENGINEER.
- B. Disposal of Disinfectant:
  - 1. Legally dispose of disinfecting water and ensure no chlorine buildup or damage to the environment.

END OF SECTION

**Supplemental Specifications For Construction  
and Design Of Water System Distribution Projects**

**I. WATER MAIN DESIGN**

**1. Water Main Design, Minimum Water Main Size (R309-550-5(4))**

- a. The minimum distribution water main size not serving a fire hydrant shall be 4 inches in diameter, unless the proposed water main pipe will serve picnic sites, parks, semi-developed camps, primitive camps or roadway rest-stops. The minimum distribution water main size in which a fire hydrant is to be connected shall be 8 inches in diameter unless a hydraulic analysis indicates that required flow and pressures can be maintained by 6-inch lines.

**2. Water Main Design, Fire Protection (R309-550-5(5))**

- a. The design of the distribution system shall be consistent with fire flow requirements as determined by the local fire code official. If the local fire authority does not specify the minimum fire flow requirements, the distribution shall be designed to provide a minimum of 1,000 gallons per minute (GPM) while maintaining a minimum of 30 psi residual pressure to all connections to the water distribution system during average-day peak demand plus the specified fire flow.
- b. The location of fire hydrants shall be consistent with State-adopted fire code as determined by the local fire code official, however, fire hydrants shall be spaced at no greater than 500 feet apart along public corridors, and/or, every dwelling shall be located within 250 feet of a fire hydrant.
- c. If a fire hydrant does not exist within 250 feet of a new dwelling being constructed along a public corridor where an existing distribution main line exists, the property owner(s) shall be required to install a new fire hydrant in accordance with Honeyville City Water System Standards Drawings and Specifications and connect it to the existing water distribution main line in the public corridor to provide for adequate fire protection for the dwelling. All costs associated with furnishing and installing the fire hydrant shall be the responsibility of the private property owner(s) of the new dwelling.
- d. The owners of new dwellings which are constructed further than 250 feet from a public corridor shall be required to extend an 8" water distribution main line to a point on the property in which a fire hydrant can be connected to and placed within 250 feet of the dwelling. The main waterline and the fire hydrant shall be dedicated to and owned and maintained by the City of Honeyville. The private property owner shall be required to construct a minimum 16-foot wide all weather surface road along the waterline to the fire hydrant and grant to the City of Honeyville a 30-foot wide waterline and access road easement. The water meter and service connection for the dwelling shall be connected to the 8" fire hydrant

line within 10 feet of the fire hydrant but no closer than 5 feet to said fire hydrant. All costs associated with furnishing and installing the fire hydrant shall be the private property owner(s) of the new dwelling.

**3. Water Main Design, Geologic Considerations, contaminated soils (R309-550-5(6))**

- a. The character of the soil through which water mains are to be laid shall be considered. Special design and burial techniques shall be employed for by the City of Honeyville in areas of geologic hazard (e.g., slide zones, fault zones, river crossings, etc.) Water supply conduits and major service lines crossing known fault areas should be either designed to accommodate significant differential movement of the ground, or be valved immediately above and below the points of the fault crossing to allow control of water flow, in case of pipe rupture during an earthquake event.
- b. Water systems should be designed to provide alternative flow paths for major conduits in regions of known geologic hazards.

**4. Water Main Design, Corrosive Soils and Waters (R309-550-5(9))**

- a. Consideration shall be given to the buried pipe system and component materials to be used when corrosive soils or waters will be encountered. All buried metallic fittings or components shall be thoroughly wrapped in 6 mil polyethylene sheeting and tape wrapped to the fitting to prevent contact with the native soils. All buried water pipe lines shall be of PVC or polyethylene material and no special treatment is required in soils in the Honeyville region.

**5. Water Main Design, Special Conditions In Areas of Contamination (R309-550-5(10))**

- a. A preliminary field evaluation shall be performed to determine if there is any potential for the distribution waterlines to be installed areas with contaminated soil. Soil sampling and testing may be required by the water system or project engineer to further evaluate suspect soil conditions. Where distribution systems are installed in areas of contaminated soils:
  - (i) pipe and joint materials which are not susceptible to contamination, such as permeation by organic compounds, shall be used; and,
  - (ii) non-permeable materials shall be used for all portions of the system including water mains, service connections, and hydrant leads.
  - (iii) all soil in the pipe trench shall be replaced with granular borrow backfill from a non-contaminated source with a maximum aggregate size of ½" diameter in the pipe backfill zone per the trench detail shown on Standard Drawing Sheet 6 and granular backfill borrow with aggregate size no larger than 4" diameter in the remainder of the trench. The soil replacement area shall extend to 6" below the bottom of the pipe to 12" on each side of the pipe and to the surface of the trench.



6. **Water Main Design, Water Mains and Other Sources of Contamination (R309-550-5(11))**
  - a. Caution shall be exercised when locating water mains at or near certain sites such as sewage treatment plants or industrial complexes. Individual septic tanks shall be located and avoided. The Division of Drinking Water shall be contacted to establish specific design requirements prior to locating water mains near a source of contamination.
  - b. All new water distribution lines for the Honeyville City Culinary Water System shall be colored blue and metallic utility warning tape shall be buried in the distribution line trench with the words "WATERLINE BURIED BELOW" clearly printed on the warning tape. Installation of the warning tape shall conform to the trench detail on Standard Drawing Sheet 4.
  - c. Consideration should be given to providing appropriate separation between water and other utilities for operational and contamination reasons.
7. **Water Main Design, Isolation Valves (R309-550-5(8))**
  - a. Valves shall be located not more than 500 foot intervals in commercial districts and not more than one block or 800 foot intervals in other districts. The water system and/or project engineer shall determine on a case by case basis if additional valves are required other than those specified above, especially in subdivisions or developments where multiple distribution main lines are joined together at intersections.

## **II. COMPONENT MATERIALS AND DESIGN**

1. **Component Materials and Design, ANSI/NSF Standard for Health Effects (R309-550-6(1))**
  - a. All materials that may come in contact with drinking water, including pipes, gaskets, lubricants and O-Rings, shall be ANSI-certified as meeting the requirements of ANSI/NSF Standard 61, Drinking Water System Components - Health Effects. To permit field-verification of this certification, all components shall be appropriately stamped with the NSF logo.
2. **Component Materials and Design, Asbestos and Lead (R309-550-6(2))**
  - a. The use of asbestos cement pipe (commonly referred to as Transite) shall not be allowed.
  - b. Pipes and pipe fittings installed after January 4, 2014, shall be "lead free" in accordance with Section 1417 of the Federal Safe Drinking Water Act. They shall be certified as meeting ANSI/NSF 372 or Annex G of ANSI/NSF 61, *except, that the Community Fire Safety Act of 2013 exempts fire hydrants from the lead free requirements of Section 1417.*

3. **Component Materials and Design, Used Materials (R309-550-6(4))**
  - a. Previously used distribution pipe, fittings, valves, or other distribution system components are prohibited from use in construction of new distribution lines or for any repairs made to the distribution system
4. **Component Materials and Design, Air Relief Valves and Blow-offs (R309-550-6(6.a))**
  - a. At high points in water mains where air can accumulate, provisions shall be made to remove air by means of hydrants or air relief valves.
  - b. The open end of the air relief vent pipe from automatic valves shall be provided with a #14 mesh, non-corrodible screen and a downward elbow, and where possible, be extended to at least one foot above grade. Alternatively, the open end of the pipe may be extended to as little as one foot above the top of the pipe if the valve's chamber is not subject to flooding, or if it meets the requirements of (7) Chamber Drainage.
  - c. Blow-offs or air relief valves shall not be connected directly to a sewer.
  - d. Adequate number of hydrants or blow-offs shall be provided to allow periodic flushing and cleaning of water lines.
  - e. The air relief valve shall be installed in a manner to prevent it from 'valve shall be provided to permit servicing of an air relief valve.
5. **Component Materials and Design, Chamber Drainage (R309-550-6(7.b))**
  - a. Chambers shall be provided with a drain to daylight, if possible. Where this is not possible, underground gravel-filled absorption pits may be used if the site is not subject to flooding and conditions will assure adequate drainage. Sump pumps may also be considered if a drain to daylight or absorption pit is not feasible.

### **III. SUPPLEMENTAL CONSTRUCTION REQUIREMENTS**

1. **Separation of Water Mains and Transmission Lines from Sewers, Basic Separation Standards (R309-550-7(1.b))**
  - a. The horizontal distance between water lines and sanitary sewer lines shall be at least 10 feet. Where a water main and a sewer line must cross, the water main shall be at least 18 inches above the sewer line. Separation distances shall be measured edge-to-edge (i.e., from the nearest edges of the facilities).
  - b. Water mains and sewer lines shall not be installed in the same trench.
  - c. Where local conditions make it impossible to install water or sewer lines at separation distances required by subsection (a), the sewer pipes are in good condition, and there is not high groundwater in the area, it may be acceptable if the design includes a minimum horizontal separation of 6 feet and a minimum vertical clearance of 18 inches with the waterline being above. In order to determine whether the design is acceptable, the following information shall be submitted as part of the plans for review:

- (i) reason for not meeting the minimum separation standard;
- (ii) location where the water and sewer line separation is not being met;
- (iii) horizontal and vertical clearance that will be achieved;
- (iv) sewer line information including pipe material, condition, size, age, type of joints, thickness or pressure class, whether the pipe is pressurized or not, etc.;
- (v) water line information including pipe material, condition, size, age, type of joints, thickness or pressure class, etc.;
- (vi) ground water and soil conditions; and,
- (vii) any mitigation efforts.

If the basic separation standards as outlined in subsections (a) through (c) above cannot be met, an exception to the rule can be applied for with additional mitigation measures to protect public health, in accordance with R309-105-6(2)(b).

**2. Installation of Water Mains, Dropping Pipe into Trench (R309-550-8(4))**

- a. Under no circumstances shall the pipe or accessories be dropped into the trench.

**3. Installation of Water Mains, Burial Cover (R309-550-8(5))**

- a. Distribution waterlines shall be buried a minimum of 4 feet from top of pipe to finish ground surface, except in the UDOT road right-of-ways where 5 minimum bury is required.

**4. Installation of Water Mains, Pressure and Leakage Testing (R309-550-8(7))**

- a. All types of installed pipe shall be pressure tested and leakage tested in accordance with AWWA Standard C600-10.

**5. Installation of Water Mains, Surface Water Crossings (R309-550-8(8))**

- a. Above Water Crossings
  - (i) The pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.
- b. Underwater Crossings
  - (i) A minimum cover of 2 feet or greater, as local conditions may dictate, shall be provided over the pipe.
- c. When crossing water courses that are greater than 15 feet in width, the following shall be provided:
  - (i) Pipe with joints shall be of special construction, having restrained joints for joints within the surface water course and flexible restrained joints at both edges of the water course.

- (ii) Isolation valves shall be provided on both sides of the water crossing at locations not subject to high ground water or flooding, so that the section can be isolated for testing or repair.
- (iii) A means shall be provided, such as a sampling tap, not subject to flooding, to allow for representative water quality testing on the upstream and downstream sides of the crossing.
- (iv) A means shall be provided to pressure test the underground water crossing pipe.

**6. Installation of Water Mains, Sealing Pipe Ends During Construction (R309-550-8(9))**

- (a) The open ends of all pipelines under construction shall be covered and effectively sealed at the end of the day's work. Service lines shall be capped until connected for service after the main distribution line has been adequately disinfected.

**7. Service Connections and Plumbing, Plumbing & Service Meters and Building Service Line (R309-550-11(2 & 5))**

- (a) Water services and plumbing shall conform to the State-adopted Plumbing Code.
- (b) Pipes and pipe fittings installed after January 4, 2014, shall be "lead-free" in accordance with Section 1417 of the federal Safe Drinking Water Act. They shall be certified meeting the ANSI/NSF 372 or Annex G of ANSI/NSF 61.