

2025

Uniform Design and Construction Standards



for Potable Water Distribution Systems



LAS VEGAS VALLEY
WATER DISTRICT

4th Edition

UNIFORM DESIGN AND CONSTRUCTION STANDARDS
FOR POTABLE WATER DISTRIBUTION SYSTEMS

4th EDITION

2025

*** Participating Agencies ****

LAS VEGAS VALLEY WATER DISTRICT AND DISTRICT MANAGED SYSTEMS
(Big Bend, Blue Diamond, Coyote Springs, Eldorado Valley, Jean,
Kyle Canyon, and Searchlight)
1001 South Valley View Boulevard * Las Vegas, Nevada 89153
www.lvwwd.com

(702) 822-8518

CITY OF HENDERSON
240 Water Street * Henderson, Nevada 89015
www.cityofhenderson.com

(702) 267-3670

CITY OF NORTH LAS VEGAS
2250 Las Vegas Boulevard North * North Las Vegas, Nevada 89030
www.cityofnorthlasvegas.com

(702) 633-1275

CITY OF BOULDER CITY
401 California Avenue * Boulder City, Nevada 89005
www.bcnv.org

(702) 293-9200

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FOREWORD

The Uniform Design and Construction Standards for Potable Water Distribution Systems (UDACS), 4th Edition supersedes the 3rd Edition (2010).

Special provisions and drawings will be provided, when necessary, to supplement or modify these Design and Construction Standards. Agency specific requirements may be included as an addendum to this standard.

The UDACS may be revised by issuance of a supplement to correct errors and omissions found in these Standards and to reflect advanced thinking and the changing construction industry technology. Each supplement will supersede any previous supplement by inclusion of all pertinent portions.

To implement this end, a Specifications Committee, including a representative from each participating Agency, has been organized to continually study and recommend changes to these Standards. Interested parties may address suggested changes and questions to the Committee for Design and Construction Standards for Water Distribution Systems, c/o any participating Agency listed at the beginning of the publication.

The following participating agencies of Clark County, Nevada area have adopted these specifications by Resolution of their staff and/or governing bodies as follows:

LAS VEGAS VALLEY WATER DISTRICT (and District Managed Systems)

Adopted by Deputy General Manager, Engineering/ Operations Pending at Publication Date

CITY OF HENDERSON

Adopted by Resolution Pending at Publication Date

CITY OF NORTH LAS VEGAS

Adopted by Director of Utilities. Pending at Publication Date

CITY OF BOULDER CITY

Adopted by Resolution Pending at Publication Date

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NEVADA DIVISION OF
**ENVIRONMENTAL
PROTECTION**

STATE OF NEVADA
Department of Conservation & Natural Resources

Joe Lombardo, Governor
James A. Settelmeyer, Director
Jennifer Carr, Administrator

December 17, 2024

Nass Diallo, P.E.
Las Vegas Valley Water District
1001 South Valley View Blvd
Las Vegas, NV 89153
nass.diallo@lvvwd.com

**RE: LAS VEGAS VALLEY WATER DISTRICT (NV0000090) PUBLIC WATER SYSTEM
IMPROVEMENT PROJECT: UNIFORM DESIGN AND CONSTRUCTION
STANDARDS FOR POTABLE WATER DISTRIBUTION SYSTEMS, FOURTH
EDITION**

In reply, please reference plan review number (CL-0007263-23)A

Mr. Diallo:

The Nevada Division of Environmental Protection (NDEP), Bureau of Safe Drinking Water (BSDW), has reviewed the Uniform Design and Construction Standards for Potable Water Distribution Systems, 4th Edition (UDACS) initially received on September 15, 2023, and the most recent submittal received electronically on September 17, 2024.

The UDACS 4th Edition is hereby approved and may be used for the design of public water system infrastructure in accordance with NAC 445A.66685.1(g)ⁱ. It is understood by BSDW that the 3rd Edition will no longer be used for the design and construction of potable water infrastructure.

If you have any questions or comments, please contact me at (775) 687-9524 or bgrant@ndep.nv.gov.

Sincerely,

Brendon Grant, P.E.
Engineering Branch Supervisor
Bureau of Safe Drinking Water

cc: Andrea Seifert, P.E., Bureau Chief, BSDW
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December 17, 2024

Re: LAS VEGAS VALLEY WATER DISTRICT (NV0000090) – (CL-0007263-23)A

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ⁱ NAC 445A.66685 Standards for design and construction of system. (NRS 445A.860)

1. Except as otherwise provided in subsection 2, the design and construction of a public water system must comply with the provisions of:

- (a) [NAC 445A.65505](#) to [445A.6731](#), inclusive.
- (b) The *American Water Works Association Standards*, as adopted by reference in [NAC 445A.6663](#).
- (c) Standards 14, 42, 44, 53, 55, 58, 60, 61 and 372 of the American National Standards Institute and NSF International, as adopted by reference in [NAC 445A.6663](#).
- (d) *Manual M14 Recommended Practice for Backflow Prevention and Cross-Connection Control*, as adopted by reference in [NAC 445A.6663](#).
- (e) *Recommended Standards for Water Works*, as adopted by reference in [NAC 445A.6663](#).
- (f) For public water systems in Carson City, Fallon, Reno, Sparks, Yerington, Douglas County, Lander County, Lyon County, Nye County or Washoe County, *Standard Specifications for Public Works Construction*, also known as the “Orange Book,” as adopted by reference in [NAC 445A.6663](#).
- (g) For public water systems in Boulder City, Henderson, North Las Vegas, the Big Bend Water District or the Las Vegas Valley Water District, *Uniform Design and Construction Standards for Potable Water Distribution Systems*, as adopted by reference in [NAC 445A.6663](#).
- (h) *The Uniform Plumbing Code*, as adopted by reference in [NAC 445A.6663](#).
- (i) Any other engineering standards approved by the Division.

2. If there is any conflict between any of the provisions described in subsection 1, the most stringent of those provisions prevails unless a special exception has been granted pursuant to [NAC 445A.6665](#).

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UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER DISTRIBUTION SYSTEMS

SECTION 1

GENERAL REQUIREMENTS

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GENERAL REQUIREMENTS

SECTION 1

1.00 GENERAL STATEMENT

The Las Vegas Valley Water District, and the Cities of Henderson, North Las Vegas, and Boulder City are governmental subdivisions of the State of Nevada which provide municipal water service. The UDACS presented herein have been adopted by the participating Agency's governing body and represent the minimum design and construction criteria for water distribution systems within the participating Agency's jurisdiction. The Contractor will be required to have a copy of these Standards on-site at all times during construction.

Except as expressly set forth in these Standards or otherwise directed by the Agency, the Developer or Contractor shall select the means and methods for constructing facilities in accordance with these Standards. The participating Agency is not concerned with the means and methods, only the results. Construction sequencing shall be coordinated with the participating agency, as necessary. The Developer, Engineer, or Contractor may petition each Agency for a variance to these Standards on a case-by-case basis.

Except as expressly set forth in a written agreement approved by the governing body for the participating Agency, the Developer or the Contractor shall pay all costs of constructing facilities in accordance with these Standards. Except as expressly set forth in a written agreement approved by the participating Agency's governing body, the participating Agency assumes no liability for, and does not agree to pay any costs of constructing facilities. No statements, actions, or omissions of any participating Agency officer or employee may be construed as an assumption of liability for, or an agreement to pay any costs of constructing facilities. The participating Agency's governing body has not delegated any respective Agency officer or employee nor any other person any authority to assume liability for, or agree to pay costs of constructing facilities.

Where there is a conflict between the Agency rules, regulations, or ordinances and these Uniform Design Standards, the Agency rules, regulations, or ordinances shall supersede these Standards.

GENERAL REQUIREMENTS

SECTION 1

1.01 DEFINITIONS

1.01.01 Accessible

When applied to an assembly or equipment, "accessible" means having access thereto, but which first may require the removal of an obstruction. "Readily accessible" means direct access without the necessity of removing any obstruction to gain access.

1.01.02 Agency

The Las Vegas Valley Water District (and District Managed Systems), located at:
1001 South Valley View Boulevard
Las Vegas, Nevada 89153; (702) 822-8518

The City of Henderson, located at:
240 Water Street
Henderson, Nevada 89015; (702) 267-3670

The City of North Las Vegas, located at:
2250 Las Vegas Boulevard North
North Las Vegas, Nevada 89030; (702) 633-1275

The City of Boulder City, located at:
401 California Avenue
Boulder City, Nevada 89005; (702) 293-9200

1.01.03 Agency's Representative

The individual duly authorized by the Agency to act as the agent for an Agency or a jurisdiction.

1.01.04 Air Binding

A condition in which air accumulates in the higher points of a distribution main, thus restricting the flow of water in the main.

1.01.05 Air-Gap

A physical separation between the free-flowing discharge end of a potable water supply pipeline and an open or non-pressurized receiving vessel. An "approved air-gap separation" shall be at least double the supply pipe diameter measured vertically above the vessel's overflow rim and in no case less than one (1) inch (2.54 cm).

GENERAL REQUIREMENTS

SECTION 1

1.01.06 Air-Relief

Releasing of entrapped air during filling or releasing entrained air which will accumulate and cause flow resistance with subsequent downstream pressure loss and even complete flow blockage.

1.01.07 Air Vacuum Air Relief Valve (AVAR)

An air valve placed at the summit of a pipeline (1) to release air automatically and prevent air binding and pressure buildup, or (2) to allow air to enter a line if the internal pressure becomes less than that of the atmosphere.

1.01.08 Alternate Fire Service Meter

(See "Fire Service Meter Type II".)

1.01.09 Altitude Control Valve

A valve that automatically:

- A. Shuts off the flow of water when the water level in a storage structure reaches a predetermined elevation; and
- B. Opens when the water level in the storage structure lowers to a predetermined elevation.

1.01.10 Angle Meter Stop

(See "Meter Stop".)

1.01.11 Appurtenances

Any machinery, appliances, structures, and other parts of the main structure that will enable the main structure to function but are not considered part of the main structure.

1.01.12 Assessor's Parcel Number (APN)

A number found in real property records. This number is assigned by Clark County to identify and track a particular parcel of land.

1.01.13 Aquifer

A geologic formation, group of geologic formations, or part of a geologic formation that is capable of yielding ground water to a well or spring.

GENERAL REQUIREMENTS

SECTION 1

1.01.14 Atmospheric Vacuum Breaker

A device consisting of a float check, a check seat, an air inlet port, and possibly a shutoff valve immediately upstream, designed to allow air to enter the downstream water line to prevent backsiphonage.

1.01.15 Auxiliary Water Supply

A supply of water or system for the supply of water which is available to the premises of a customer of a public water system, other than the supply or system of the public water system established to provide water to the premises, including another public water system or any natural source of water.

1.01.16 Average Day Demand

The average daily demand for water over a one (1) year period, as determined by historical data.

1.01.17 Backfill

The material used to refill an excavation.

1.01.18 Backflow

A hydraulic condition, caused by a difference in pressures, that causes non-potable water or other fluid to flow into a potable water system. (See "Backpressure" and "Backsiphonage".)

1.01.19 Backflow Preventer

The physical appurtenance or assembly designed to prevent backflow.

1.01.20 Backflow Prevention Assembly - Approved

An assembly or means that has been investigated and approved by the Agency having jurisdiction. Approval shall be based on favorable laboratory and field evaluation by an approved backflow testing laboratory.

1.01.21 Backflow Testing Laboratory

The Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California; or any other person or entity who the Nevada Division of Environmental Protection authority determines:

GENERAL REQUIREMENTS

SECTION 1

- A. Is competent and possesses the necessary facilities to investigate and evaluate backflow prevention assemblies; and
- B. Adheres to the testing and certification procedures set forth in the American Water Works Association Standards; and
- C. Is independent of any backflow prevention assembly manufacturer; and
- D. Performs one (1) year field evaluation in addition to laboratory testing.

1.01.22 Backpressure

A pressure that can cause water to backflow into the water supply when a user's water system is at a higher pressure than the public water system.

- A. Is caused by pumping, air pressure, steam, or the elevation of piping; and
- B. Could cause a reversal in the normal direction of flow at a particular point.

1.01.23 Backsiphonage

A form of backflow due to a reduction in system pressure which causes a negative or sub-atmospheric pressure to exist at a point in the Agency's water system allowing water from the customer's system to enter the Agency's supply system.

1.01.24 Ball Valve

A valve with the closing and opening mechanism formed in the shape of a ball with a hole. The valve is opened when the hole is aligned with the flow. The valve is closed when the hole is perpendicular to the flow.

1.01.25 Blow Off Assembly

An assembly which consists of a valve that is installed at a low point, or at the end of a pipeline, and is used primarily for purging or blowing off accumulated sediment from low spots or dead-ends in the main and for de-watering lines or reservoirs for repairs or inspections.

GENERAL REQUIREMENTS

SECTION 1

1.01.26 Butterfly Valve

A valve in which a disk rotates on a shaft such that the valve is fully open when the disk is parallel to the axis of the pipe and fully closed when perpendicular.

1.01.27 Bypass Valve

A small valve attached to a much larger valve to equalize pressure against the main valve seat when opening or closing the main valve.

1.01.28 Casing

- A. Conduit made of steel or other accepted materials used as a conduit for a pipe or main, installed through boring or open cut (See "Pipe Casing".); or
- B. A solid piece of pipe used to hold the formation open during the construction or use of a well; or
- C. The enclosure surrounding an impeller, into which the suction and discharge ports are machined.

1.01.29 Cement Grout

A mixture of portland cement, sand, and water which contains at least seven (7) sacks of cement per cubic yard and not more than seven (7) gallons of clean water for each sack of cement.

1.01.30 Cement Slurry

(See "Controlled Low Strength Material [CLSM]", Section 1.01.44 below.)

1.01.31 Certified Backflow Prevention Assembly Tester

A person who is certified by the California/Nevada section of the American Water Works Association to test assemblies designed for the prevention of backflow.

1.01.32 Check Valves

A valve that allows flow in one direction and that closes when the flow tries to reverse.

1.01.33 Chlorination

The disinfecting process of adding chlorine to water to:

GENERAL REQUIREMENTS

SECTION 1

- A. Kill or inactivate organisms that cause disease; or
- B. Act as an oxidizing agent.

1.01.34 Chlorinator

A device used to add chlorine, or a compound that contains chlorine, to water.

1.01.35 Chlorine Residual

Amount of chlorine remaining in the water for protection against recontamination after satisfying the demand of killing disease causing organisms.

1.01.36 Coliform Bacteria

A group of bacteria found in human and animal waste, plant, and soil material. They are considered “indicator organisms” because their presence indicates disease-causing bacteria in water.

1.01.37 Combined Service

A metered service connection through which water is obtained for the dual purpose of fire protection and domestic use.

1.01.38 Commitment for Water Service

A document pursuant to which a supplier of water acknowledges that it has assumed a legal obligation to supply water to property under development or proposed to be developed for residential, commercial, or industrial purposes. The document may indicate that the obligation is subject to certain conditions, including, without limitation, the payment of fees, the dedication of water rights, or the construction and dedication of infrastructure.

1.01.39 Concentric Reducer

A reducer used to connect a larger pipe to a smaller pipe in such a manner as to align the center lines of both pipes.

1.01.40 Concrete

A mixture of Portland cement, aggregates, and water.

GENERAL REQUIREMENTS

SECTION 1

1.01.41 Construction Water

Metered water delivered for construction purposes including, but not limited to, compaction, and dust control.

1.01.42 Contamination

A potable water quality impairment by sewage, industrial fluids, or waste liquids, compounds, or other materials to a degree that creates an actual or potential hazard to the public health.

1.01.43 Contractor

The construction firm properly licensed in the State of Nevada retained to install water facilities in accordance with these Standards.

1.01.44 Controlled Low Strength Material (CLSM)

Backfill material consisting of low strength, self-leveling concrete material per USS 208.02.07 (known as the Blue Book), and as listed on the Interagency Quality Assurance Committee (IQAC) list. Backfill material must have a design compressive strength at an age of twenty-eight (28) days within the ranges required in the table below for the specified class:

- A. Class I (50 to 150 psi): Specified when the maximum strength is of primary concern due to the desire to have material that can be excavated in the future with relative ease.
- B. Class II (150 to 300 psi): Specified where the minimum strength is of primary concern for pipe support.
- C. Class Special (as shown in project specifications or drawings): Specified where project unique criteria, such as erosion control, are the primary concern.
- D. Class I and II CLSM: The mix shall result in a product having a slump in the range of six (6) to ten (10) inches (150 to 250mm), at the time of placement.

1.01.45 Corporation Stops

A water service shutoff valve located on a service lateral at the connection to the water main. This valve cannot be operated from the ground surface because it is buried and there is no valve box. Also called a corporation cock.

GENERAL REQUIREMENTS

SECTION 1

1.01.46 Cross-Connection

An unprotected connection or structural arrangement, whether actual or potential, between a public water system and any other source or system, through which it is possible to introduce into any part of the public water system any used water, industrial fluid, gas, or substance other than the potable water intended to supply the system. The term includes any bypass arrangements, jumper connections, removable sections, swivel, or changeover devices, or other temporary or permanent devices through which, or because of which, backflow can occur.

1.01.47 Cross-Connection Control

The installation of an approved backflow prevention assembly at the water service connection to any customer's premises where it is physically or economically not feasible to find, and permanently eliminate or control, all actual or potential cross-connections within the customer's water system; or, it shall mean the installation of an approved backflow prevention assembly on the service line leading to and supplying a portion of a customer's water system where there are actual or potential cross-connections which cannot be effectively eliminated or controlled at the point of cross-connection.

1.01.48 Curb Stop

A shutoff valve in a water service line buried near the curb of a customer's premises, with a box or housing over the valve extending to the surface of the ground for access to the valve.

1.01.49 Dead-End Mains

A water main which ends in a cap, plug, or blow off. The design and use of dead-end mains is to be avoided (cul-de-sacs) due to water quality problems, and distribution system reliability considerations.

1.01.50 Design and Construction Standards for Wastewater Collection Systems

Minimum design and construction criteria for sanitary sewer systems within the jurisdiction of the participating agencies.

1.01.51 Dedicated Public ROWs

A plot of ground which, by owner definition, has been reserved for the public's use or betterment. The uses are, but not limited to, utilities, roadways, and flood control.

GENERAL REQUIREMENTS

SECTION 1

1.01.52 Detector Tape

A metallic tracer tape or wire which is detectable by electronic finders running along the pipe crown.

1.01.53 Developer

The individual, corporation, or partnership that requires water service, either by a service lateral installation or by constructing a water main extension for proposed or existing structure(s).

1.01.54 Developer's Engineer

(See "Engineer".)

1.01.55 Disinfection

The process of destroying or inactivating pathogenic organisms (bacteria, viruses, fungi, and protozoa) by either chemical or physical means.

1.01.56 Distribution Main

Any pipe in a distribution system that allows a service line connection.

1.01.57 Distribution Storage

(See "Reservoir".)

1.01.58 Domestic Service

A metered service connection through which water is obtained for all purposes, including residential, commercial, and industrial uses, exclusive of fire protection.

1.01.59 Double Check Detector Assembly (DCDA)

An assembly composed of a line-sized, approved, double check valve assembly and a bypass line water meter with an approved, meter-sized, double check valve assembly. Used for fire protection only.

1.01.60 Double Check Valve Assembly

An assembly which:

- A. Is composed of two independently acting, approved check valves; and

GENERAL REQUIREMENTS

SECTION 1

- B. Has tightly closing, resilient seated shutoff valves attached at each end; and
- C. Is fitted with properly located, resilient seated test cocks; and
- D. Has been tested and approved, in accordance with AWWA Standard C510, "Double Check Valve Backflow Prevention Assembly", by an approved backflow testing laboratory.

1.01.61 Double Strap Service Saddle

A "Service Saddle" that has a wide band or two separate bands with two (2) bolts to tighten to achieve a leak-proof seal. (See "Service Saddle".)

1.01.62 Easement

An easement is a granted or acquired legal right in which the title to a specific piece of land remains with the landowner, but another person or organization is given the right to use that land for a distinct purpose.

1.01.63 Eccentric Reducer

A reducer used to connect a larger pipe to a smaller pipe in such a manner that one edge of both pipes is aligned.

1.01.64 Emergency

A situation in which an unusual calamity, including a flood, fire, storm, earthquake, drought, civil disturbance, accidental spill of a hazardous material, or similar occurrence, disrupts the provision of water by a public water system or endangers the quality of water provided by a public water system.

1.01.65 Engineer

The consulting Civil Engineer, licensed in the State of Nevada, who is responsible for the design submitted for a Developer, Owner, or Agency.

1.01.66 Existing public water system

A system for providing to the public, water for human consumption through pipes or other constructed conveyance and is operational.

1.01.67 Final Map

A final map has the meaning ascribed to it in NRS 278.0145.

GENERAL REQUIREMENTS

SECTION 1

1.01.68 Finished Water or Potable Water

Water that is safe and satisfactory for drinking and cooking.

1.01.69 Fire Authority

The county, city, town, special district, or Agency responsible for fire protection in the area of service of a public water system.

1.01.70 Fire Demand

The total quantity of water required for protection from fire, as determined by the fire authority and expressed in gallons per minute for a specified number of hours.

1.01.71 Fire Flow

The rate of the flow of water, as determined by the fire authority and expressed in gallons per minute, which:

- A. Is required for protection from fire; and
- B. Can be delivered from a distribution system at a residual pressure of twenty (20) psi within the distribution system.

1.01.72 Fire Service Meter (Combination - Fire and Domestic)

A meter designed and sized for domestic and fire service, in accordance with AWWA Standard C703, "Cold-Water Meters - Fire Service Type", and AWWA Standard C715, "Cold-Water Meters – Electromagnetic and Ultrasonic Type for Revenue Applications", consisting of one of the following types:

TYPE I:

NOTE: This type of meter is obsolete and no longer in production. While some Type I meters are in existence, none can be installed.

TYPE II:

A main-line turbine meter (Class II) having an UL/FM fire service strainer, with a bypass meter with check valve of appropriate size for measuring domestic low flow rates. The meter shall have an automatic valve mechanism for diverting low flow rates through the bypass meter.

GENERAL REQUIREMENTS

SECTION 1

TYPE III:

A mainline turbine meter (Class II) having an UL/FM fire service strainer.

ULTRASONIC:

A type of flowmeter that measures the velocity of a fluid with ultrasound to calculate volume flow.

ELECTROMAGNETIC:

A magnetic flowmeter, also known as electromagnetic flowmeter, which obtains the flow velocity by measuring the changes of induced voltage of the conductive fluid passing across a controlled magnetic field.

1.01.73 Fire Sprinkler System

A system of piping which is connected to a public water system and has sprinklers that automatically discharge water over the area of a fire.

1.01.74 Flexible Coupling

A joint between two pipes that allows one of the pipes to be deflected without disturbing the other pipe.

1.01.75 Flowable Backfill

(See "Controlled Low-Strength Material [CLSM]", Section 1.01.44 above.)

1.01.76 Gate Valve

A mechanical device used to turn on or shut off the flow of water in a distribution or piping system. It is operated by turning a stem that raises or lowers a disk. This disk covers the flow way, pressing against a seat when closed; it moves into a space above the flow way when open, providing an unrestricted flow.

1.01.77 Globe Valve

A valve that has a round opening to let liquid pass and that closes when a stem is turned to press a disk against the round opening. Globe valves are used in plumbing where numerous openings and closings are anticipated.

1.01.78 Head

A measure of water pressure expressed as the height of a column of

GENERAL REQUIREMENTS

SECTION 1

water in feet or meters that would produce the corresponding pressure. This measurement may be called hydrostatic head.

1.01.79 Head Loss

A reduction in pressure as a result of friction.

1.01.80 Header

A pipe fitting with several branches for the conveyance of water.

1.01.81 Health Authority

The officers and agents of the State of Nevada Division of Environmental Protection, Bureau of Safe Drinking Water:

Southern Nevada Office	375 East Warm Springs Road, Suite 200 Las Vegas, Nevada 89119
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Northern Nevada Office	901 South Stewart Street, Suite 4001 Carson City, Nevada 89701
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1.01.82 Hydraulic Analysis

The engineering process used to determine the pressure and flow requirements for a networked system of water mains and appurtenances either existing or proposed. (See "Section 2.03".)

1.01.83 Hydraulic Grade Line (HGL)

If a pipe is under pressure, the HGL is the level water would rise to in a tube connected to the pipe freely vented to atmospheric pressure. Also, equal to the pressure at a given point in the distribution system, in feet, plus the elevation.

1.01.84 Idler

"Idler" is a length of pipe installed in lieu of a meter. Idlers may only be used if approved by the Agency, and on a short-term, temporary basis while facilities are under construction.

1.01.85 Inspector

The Agency representative authorized to make detailed inspections for compliance with these standards.

GENERAL REQUIREMENTS

SECTION 1

1.01.86 Irrigation Service

A metered service connection through which water is obtained for the sole purpose of meeting the water needs of growing plants.

1.01.87 Isolation Valve

A valve, including a ball valve, butterfly valve, gate valve, globe valve, or other type of valve, installed in a pipeline to shut off the flow of water in a portion of the pipeline for the purpose of inspection or repair.

1.01.88 Junction Node

A point in a hydraulic analysis where there is an input, demand, or known set of values not subject to variation in the analysis.

1.01.89 Maximum Day Demand

The maximum daily demand for water over a one-year period, as determined by historical data.

1.01.90 Mechanical Joint

A flexible connection of two pipes or fittings with a gasket compressed by lugs and bolts.

1.01.91 Mechanically Restrained Joint

A pipe joint which has been secured using a method of thrust restraint in addition to the typical mechanical joint fitting.

1.01.92 Meter Box

An enclosure constructed of approved materials protecting one or more water meters installed in the ground outside and allows access for a person to read the meters.

1.01.93 Meter Stop or Angle Meter Stop

A service fitting with a valve incorporated used in setting water meters to allow a cut off of service.

1.01.94 Mil

One-thousandth part of an inch or .001 inch.

GENERAL REQUIREMENTS

SECTION 1

- 1.01.95 Network Hydraulic Analysis
(See "Hydraulic Analysis".)
- 1.01.96 Nominal Size
The commercial designation used by manufacturers for the diameter of a casing or pipe.
- 1.01.97 Non-Potable
Water that may contain objectionable pollution, contamination, minerals, or infective agents and is considered unsafe, unpalatable, or both for drinking. Non-potable water sources include, but are not limited to, sewer water, storm water, reclaimed water, and dedicated fire lines.
- 1.01.98 Optimum Moisture Content
The water content (expressed in percent, dry weight) at which a given soil can be compacted to its maximum density by means of a standard method of compaction.
- 1.01.99 Owner
The individual, corporation, or partnership who owns the parcel of land to be developed.
- 1.01.100 Peak Hour Demand
The volume of water which must be supplied by a public water system to meet the greatest demand per hour of its customers for any hour during a yearly period.
- 1.01.101 pH
A measure of the acidity or alkalinity of a solution such that a value of seven (7) is neutral on a scale ranging from zero (0) to fourteen (14). Lower numbers represent acidic solutions, and higher numbers represent alkaline solutions.
- 1.01.102 Pipe Casing
A protective conduit into which a pipe is inserted.

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1.01.103 Pipe Zone

The full trench excavation width from the top of the compacted pipe foundation to an elevation at least 12-inches above the outside top of the pipe bell.

1.01.104 Plumbing Code

Except as otherwise modified by local ordinance pursuant to NRS 444.340 to 444.430, inclusive, the International Plumbing Code or Uniform Plumbing Code as adopted by the Agency having jurisdiction.

1.01.105 Potable Water

Water that is safe and satisfactory for drinking and cooking, meeting all applicable standards.

1.01.106 Pressure Reducing Valve (PRV) or Pressure Regulator

A control valve that opens to allow flow if the downstream pressure is less than a certain value and that closes when the set pressure is reached. A pressure reducing valve ensures that the downstream pressure does not become too high. It is used where the distribution pressure is high and in other situations that require reductions from higher-pressure planes to lower-pressure planes.

1.01.107 Pressure Regulating Valve

A device for controlling pressure in a pipeline or pressurized tank.

1.01.108 Pressure Relief Valve

A valve that opens automatically when the water pressure exceeds a preset limit.

1.01.109 Pressure Vacuum Breaker (PVB)

A backflow protection device to prevent water from being drawn back into a water supply when the line is closed. The assembly opens to the atmosphere, thus preventing a vacuum in the line, such as an irrigation line.

1.01.110 Pressure Zones

Geographical areas of a distribution system which are served by a tank, reservoir, or pump system having a specified source head. A pressure zone may be completely isolated from the remaining distribution system,

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or it may be interconnected through open, closed, and pressure regulating valves.

1.01.111 Private Fire Service

An approved service connection through which water is obtained exclusively for fire protection.

1.01.112 Private Water Facilities

"Private Water Facilities" are all water facilities not owned by the Agency after completion.

1.01.113 Property Line Frontage

The length of private property to which a main is being installed essentially parallel to the public ROW or easement. That portion of the property or easement along the ROW.

1.01.114 Proportional Meter

A device where a certain proportion of the total flow is diverted through a bypass meter and measured. The measuring bypass meter gears are adjusted to indicate, on its register dial, the total water volume passing through the whole unit. The flows in the bypass line and the main pipe are proportional to the ratio of the areas of the bypass line and the main pipe.

1.01.115 Public Water Facilities

The water facilities owned, operated, and maintained by the Agency after completion and acceptance.

1.01.116 Public Water System (As Defined By NRS 445A.235)

Any system, regardless of ownership, that provides the public with water for human consumption through pipes or other constructed conveyances, if the system has fifteen (15) or more service connections, as defined in NRS 445A.843, or regularly serves twenty-five (25) or more persons. The term includes:

- A. A facility for the collection, pumping, treatment, storage, or distribution of water which is controlled by the operator of the system and used primarily in connection with the system; and

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- B. A facility for the collection or storage before treatment of water which is not controlled by the operator of the system but is used primarily in connection with the system.

1.01.117 Raw Water

Water that is not suited for human consumption without treatment.

1.01.118 Reaction Blocking

(See "Thrust Block".)

1.01.119 Reclaimed Water (Recycled Water)

Non-potable water that, as a result of treatment of domestic wastewater by a public agency, is suitable for a direct beneficial use or a controlled use that would not otherwise occur. The level of treatment and quality of the reclaimed water shall be approved by the public health authority having jurisdiction.

1.01.120 Reduced Pressure Detector Assembly (RPDA)

An approved assembly designed to protect against non-potable pollution and contamination which is composed of a reduced pressure principle assembly and a bypass that contains a water meter and another reduced pressure principle assembly that has been tested and approved, in accordance with AWWA Standard C511, "Reduced-Pressure Principle Backflow Prevention Assembly", by an approved backflow testing laboratory.

1.01.121 Reduced Pressure Principle Assembly (RPPA)

An assembly that contains:

- A. Two independently acting approved check valves; and
- B. A hydraulically operating, mechanically independent pressure relief valve that is located between the approved check valves and below the upstream check valve; and
- C. Has properly located, resilient, seated test cocks and tightly closing, approved shutoff valves at each end of the assembly; and
- D. Is designed to protect against pollution and contamination under conditions of backsiphonage or backpressure by discharging to the atmosphere; and

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- E. Has been tested and approved, in accordance with AWWA Standard C511, "Reduced Pressure Principle Backflow Prevention Assembly", by an approved backflow testing laboratory.

1.01.122 Reducer

A pipe or pipe fitting that has a smaller opening at one end than at the other end. (See "Concentric Reducer and Eccentric Reducer".)

1.01.123 Residual Pressure

The pressure remaining in the mains of a water distribution system when water is being withdrawn from the distribution system at a particular rate of flow.

1.01.124 Restrained Joints

The use of mechanical means to counter the forces created by internal pressures of a pipe at a valve or fitting, used to stop the flow or change the direction of flow, eliminating or reducing the requirement for thrust blocks and thrust anchors. (See "Mechanically Restrained Joint".)

1.01.125 Sack of Cement

One cubic foot (or 94 pounds) of cement.

1.01.126 Sanitary Sewer

An underground system of sewer lines for the collection and conveyance of wastewater from a home or community.

1.01.127 Sanitary Survey

An on-site evaluation of a public water system to determine whether the water sources, facilities, equipment, processes, administration, operation, and maintenance of the system are adequate for the production and distribution of safe and reliable drinking water.

1.01.128 Service Connection

The point of connection between a public water system and the water system used by a customer of the public water system, at which the public water system loses its authority and control over the water.

If a meter is installed at a connection between a public water system and the water system used by a customer of the public water system, the

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downstream end of the meter shall be considered the point of service connection.

1.01.129 Service Line or Lateral for Water

The pipe and all appurtenances located between a water main of a distribution system and service connection.

1.01.130 Service Saddle

An assembly of circumferential metal strap or straps on a pipe where a connection is to be made which allows for the use of a threaded corporation stop.

1.01.131 Set Point

The pressure or flow that an automatic control is designed to maintain.

1.01.132 Sewer

(See "Sanitary Sewer" or "Storm Drain".)

1.01.133 Sewer Main

Those pipelines designed and installed to receive tributary wastewater flows from one or more service laterals.

1.01.134 Sewer Service Lateral

A pipe or conduit that connects a building or other property to a sewer main.

1.01.135 Soil Bearing Capacity

The maximum unit pressure which a soil will withstand without failure or without settlement to an amount detrimental to the structural integrity or function.

1.01.136 Spacer

A device used to center a carrier pipe within the center of a casing, providing structural support of the carrier pipe.

1.01.137 Spool

A short section of flanged pipe between two (2) fittings.

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1.01.138 Standards

The UDACS, latest edition as amended by each Agency.

1.01.139 Standard Plates

The illustrations in Section 5 of the UDACS, latest revision as amended by each Agency, also referred to as UDACS Plates.

1.01.140 Static Pressure (Head)

When water is not moving, the vertical distance from the specific point of interest to the water surface. The static pressure is the static head multiplied by the specific weight of water.

1.01.141 Storm Drain

A system of channels, pipelines, box culverts, and appurtenances for the collection and conveyance of surface drainage and other materials deposited into and borne by surface water to a point of disposal.

1.01.142 Subdivision

Subdivision has the meaning ascribed to it in NRS 278.320.

1.01.143 Supplier of Water

A person or other entity, including a governmental entity, which owns or operates a public water system.

1.01.144 Surge Pressure

A momentary fluctuation in the pressure of water in a pipeline caused by a sudden change in the velocity or the direction of flow of the water.

1.01.145 Tail Piece

The portion of the service lateral extending from the meter to the property line or backflow device.

1.01.146 Tapping Pit

An excavation used for the purpose of performing a tap (wet or dry) to the distribution system.

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1.01.147 Tapping Sleeve

A sleeve used in making a wet connection where a single branch line is to be tapped into a water main under pressure.

1.01.148 Temporary Fire Hydrant

A fire hydrant classified as "temporary" due to its projected useful life and in no way reflects a lesser standard of construction. Its installation will be the same as a permanent fire hydrant.

1.01.149 Temporary Service

Includes all service connections for temporary delivery of water for use during the construction of subdivisions, other construction projects, and in certain instances, for emergency services.

1.01.150 Tentative Map

Tentative map has the meaning ascribed to it in NRS 278.019.

1.01.151 Thrust Anchor

A block of concrete that is cast in place below a fitting and tied to the fitting with anchor rods for the purpose of anchoring the fitting against vertical thrust.

1.01.152 Thrust Block

A block of concrete, which may contain reinforcing steel, placed, and sized to counteract the thrust or force developed in a water main when it changes direction abruptly.

1.01.153 Transmission Main

Large diameter pipelines used exclusively for moving water from one point to another. Valved outlets, if allowed, are typically at uniform distances and there are no service laterals allowed from the pipe. A water main that transports water from the main supply or source to a distant area where the water is distributed through distribution lines.

1.01.154 Treatment Facility

A facility that contains various processes for the treatment of water for a public water system.

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1.01.155 Type II Backfill Material

An aggregate fill material with a specific sieve analysis, plasticity index and proctor as listed in Section 704 of the Uniform Standard Specifications for Public Works Construction Off-Site Improvements, Clark County, Nevada.

1.01.156 Type III Backfill Material

Also known as Type II Backfill Material (Modified). The soluble sulfate content shall not exceed 0.3 percent by dry weight of soil. The mineral shall be clean, hard, durable, free from any frozen lumps, deleterious matter, and harmful coatings. In addition, thereto, the material shall conform to the gradation requirements of Type II aggregate base as per Section 704 of the Uniform Standard Specifications for Public Works Construction Off-Site Improvements, Clark County, Nevada.

1.01.157 Union

A mechanical coupling or adapter that is used to connect two (2) pieces of pipe.

1.01.158 Vacuum Breaker

A mechanical device that allows air into a piping system and thereby prevents the backflow that could result when a partial vacuum creates a siphoning action. Used only when backsiphonage is present. Not to be used where backpressure is present.

1.01.159 Valve Box

A housing that encloses the operating nut of a valve and extends to the ground surface, allowing an access opening for an operating or valve key to be inserted and connected to the operating nut so that the valve may be opened and closed.

1.01.160 Warning Tape Or Locator Ribbon

A metallic or magnetic tape of the color reserved for the applicable utility (i.e., blue tape for potable water).

1.01.161 Wastewater

Water which, as a result of domestic, commercial, or industrial use, contains physical, chemical, or biological impurities.

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1.01.162 Water Commitment

An Agency determined allocation of water committed to a land parcel (property) which allows for the continued development of that land parcel.

1.01.163 Water Hammer

The phenomenon of pressure oscillation that occurs in pipes when a valve is opened or closed very rapidly, creating a sound similar to someone hammering on a pipe. When a valve position is changed quickly, the water pressure in a pipe increases and decreases in a very quick sequence, potentially causing serious damage to the system.

1.01.164 Water Main

The water pipe, typically located beneath the ground, from which domestic water supply is delivered to the service pipe leading to specific premises. (Also See “Distribution Main” and “Transmission Main”.)

1.01.165 Water Project

The initial construction, renovation, modification, or expansion of the collection, pumping, treatment, storage transmission, or distribution facilities of a public water system.

1.01.166 Water Service Lateral

A pipe that conveys water from a water main to the point of use of the water.

1.01.167 Well (Potable)

A potable water well is any well designed and/or constructed to produce water for consumption by humans or animals, as governed by the Nevada Division of Water Resources (NDWR).

1.01.168 Wet Tap

A connection made to an existing water main in which the main connected to remains in full service during the connection. (Also referred to as a hot tap.)

1.01.169 Zone of Pressure

An area within a distribution system where the pressure in the water main is maintained within certain specified limits.

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1.02 ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphaltic Concrete
ACI	American Concrete Institute
ACP	Asbestos Cement Pipe
ADA	Americans with Disabilities Act
AG	Air Gap separation
ANSI	American National Standard Institute
APN	Assessor's Parcel Number
ASA	American Standard Association
ASTM	American Society of Testing and Materials
AVAR	Air Vacuum Air Relief (valve)
AWS	American Welding Society
AWWA	American Water Works Association
BC	Back of Curb
BM	Benchmark
BSW	Back of Sidewalk
C&G	Curb and Gutter
CIP	Cast Iron Pipe
CL	Centerline
CLSM	Controlled Low Strength Material
CMP	Corrugated Metal Pipe
CRSI	Concrete Reinforcing Steel Institute
DCDA	Double Check Detector Assembly
DCVA	Double Check Valve Assembly
DI	Drop Inlet
DIP	Ductile Iron Pipe (AWWA C151)
DWG	AutoCAD Format Drawing
EL	Elevation
EPA	Environmental Protection Agency
EX	Existing
FG	Finish Grade
FH	Fire Hydrant
FPS	Feet Per Second
FSM	Fire Service Meter
FT	Foot
G	Gas
GA	Gauge
GPM	Gallons Per Minute
HDPE	High-Density Polyethylene
HGL	Hydraulic Grade Line
ID	Inside Diameter
IPC	International Plumbing Code
IPS	Iron Pipe Size
IQAC	Inter-Agency Quality Assurance Committee
LF	Linear Feet
mg/L	Milligrams per Liter
MLCP	Mortar Lined and Coated Pipe (AWWA C200 & C205)

NAC	Nevada Administrative Codes
NAVD 88	North American Vertical Datum of 1988
NEC	National Electric Code
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department Of Transportation
NEMA	National Electric Manufacturers Association
NPLS	Nevada Professional Land Surveyor
NPE	Nevada Professional Engineer
NRS	Nevada Revised Statutes
NSF	National Sanitation Foundation
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
PL	Property Line
POC	Point of Connection
ppm	Parts Per Million
PRV	Pressure Reducing Valve
PSF	Pounds per Square Foot
PSI	Pounds per Square Inch
PVB	Pressure Vacuum Breaker
PVC	Polyvinyl Chloride Pipe (AWWA C900)
RCP	Reinforced Concrete Pipe
ROW	Right-Of-Way
RPDA	Reduced Pressure Detector Assembly
RPPA	Reduced Pressure Principle Assembly
SCCP	Steel Cylinder Concrete Pipe (AWWA C303)
SNHD	Southern Nevada Health District
SNWA	Southern Nevada Water Authority
SNWS	Southern Nevada Water System
SSPC	Steel Structures Painting Council
STA	Station
SW	Sidewalk
UDACS	Uniform Design and Construction Standards for Potable Water Distribution Systems
UPC	Uniform Plumbing Code
USD	Uniform Standard Drawings for Public Works Construction Off-Site Improvements, Clark County Area, Nevada, commonly known as the "Blue Book"
USS	Uniform Standard Specifications for Public Works Construction Off-Site Improvements, Clark County Area, Nevada, commonly known as the "Blue Book"
W	Water

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1.03 REFERENCE TO STANDARDS AND PUBLICATIONS

Any reference made in these Standards or on approved drawings to any specification, standard, method, or publication of any scientific or technical society or other organization shall, in the absence of a specific designation to the contrary, be understood to refer to the specification, standard, method, or publication in effect as of the date the work is performed.

1.04 LINES, GRADES, AND MEASUREMENTS

The Developer's Engineer will be responsible for the establishment of such benchmarks and reference points needed for the water main installations. The Contractor shall be responsible for water facility construction to the lines and grades shown on the approved water plans.

1.05 RIGHT-OF-WAY

All water mains, services, and meters shall be located within dedicated public ROWs or within permanent easements granted to the Agency. The size of the easements shall be as determined by the Agency. (See "Sections 2.04 and 2.24".) All easement documents for residential development must be recorded by the agency prior to final acceptance of the project. Easement documents must be submitted during the project review process. All easement documents for commercial development must be draft approved by the agency prior to approval of the project.

1.06 OVERTIME INSPECTION FEE

Unless otherwise approved by the Agency, the Contractor will be required to pay an overtime inspection fee as established by the Agency for each hour or each portion of each hour thereof, to provide for an Inspector to be present should the Contractor work outside the established normal working hours as established by the Agency. The Contractor will also be required to pay overtime charges for Inspection services during any Agency approved holidays.

1.07 NIGHT WORK

In the event night work is permitted, the Contractor shall provide lighting and other facilities which, in the opinion of the Agency's Representative, are satisfactory and sufficient for proper work inspection and the Agency Representative's safety.

1.08 INSPECTION

1.08.01 Duties of Inspector

Inspectors employed by the Agency will be authorized to inspect all work performed and materials furnished. Such inspection may extend to all, or any part, of the work and to the preparation, fabrication, or manufacture

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of the materials to be used. The Inspector will not be authorized to alter or waive the provisions of the plans and specifications.

The Inspector will, however, have the authority to reject work or materials until any questions at issue can be referred to the Engineer, and a decision made.

Work inspection by an authorized Agency Representative shall not be construed as direct control of the individual workmen and the work. The direct control shall be the sole responsibility of the Developer and/or the Contractor.

1.08.02 Inspection of Work

The Contractor shall furnish the Agency every reasonable facility, as determined by the Agency, for safely ascertaining whether the work is in accordance with the requirements and intention of these Standards.

All materials furnished and all work done under these Standards shall be subject to inspection. Work performed or covered in the absence of prescribed inspection shall be uncovered or taken out and replaced under proper inspection. The entire cost of removing and replacement, including the cost of all materials taken, shall be borne by the Contractor irrespective of whether the work is found to be defective or not.

Failure to reject any defective work or materials shall not in any way prevent later rejection if such defect(s) are discovered, or obligate the Agency to final acceptance.

The Agency's inspection is only for the purpose of ascertaining the work is in accordance with these Standards. The Agency does not assume any responsibility to inspect for the benefit of any person.

1.08.03 Scheduling of Inspection

No work shall begin until the water plans have been approved for construction by the Agency. Following water plan approval, notice shall be given to the Agency two (2) working days prior to the start of construction. Inspections will be requested following Agency established procedures.

1.09 INDEMNITY

The Developer and its Contractor shall indemnify, defend, and hold the Agency, its directors, officers, employees, and related entities harmless from any and all claims, damages, costs, expenses, and attorneys' fees based upon or arising out of alleged acts or omissions of the Developer or its Contractor and their respective officers, employees,

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agents, contractors, licensees, or invitees in connection with the design, construction, and installation of the work.

1.10 GUARANTEE

The Developer shall guarantee that the entire work constructed by the Developer will fully meet all requirements in these Standards. The Developer will perform, at the Developer's own expense, any repairs or replacements made necessary by defects in materials or workmanship supplied by the Developer which become evident within one (1) year after the final acceptance date. Repairs or replacements shall be made in full compliance with the requirements in these Standards, including the test and guarantee requirements set forth herein. The Developer shall hold the Agency harmless from claims of any kind arising from damage due to said defects. The Developer shall make all repairs and replacements promptly upon receipt of verbal notice followed by written orders for same from the Agency's Representative. If the Developer fails to make the repairs and replacements promptly, the Agency may do the work and the Developer shall be liable to the Agency for the cost thereof.

1.11 RULES AND REGULATIONS

The Agency's rules, regulations, and ordinances shall be adhered to at all times. Copies are available at each Agency's office. Regulations as established in Nevada Revised Statutes (NRS) and Nevada Administrative Codes (NAC) shall also be complied with at all times.

1.12 PRE-APPROVED MATERIALS LIST

A Pre-Approved Materials List is available at each Agency's office. This list contains all materials and appurtenances that are pre-approved for installation in the public water system. Any individual, corporation, or other entity may submit to the Agency other materials for approval. Each submittal must include documentation demonstrating, to the Agency's satisfaction, the material meets the technical and performance requirements set forth in these and other applicable standards. In addition, a history of use at other locations and names and phone numbers of contacts for reference is required. The submittal must also demonstrate, to the Agency's satisfaction, the use of the proposed material is in conformance with the Agency's goal of developing a reliable and efficient distribution system with minimal maintenance requirements and maximum life. The individual agencies may be contacted to obtain the specific process for obtaining material approvals within their Agency. Any product not on the Agency's Pre-Approved Materials List will require shop drawing approval.

All manufactured materials (pipe, valves, fittings, meters, etc.) shall be new and suitable for use in municipal potable water distribution systems. All materials must be within two (2) years of manufacture and not showing signs of degradation. Used or refurbished materials are not permitted. Materials shall meet the minimum standards of AWWA, ASTM, NSF, IQAC, or certifying entity acceptable to the Agency. Unless otherwise identified in these Standards, each Agency shall have sole control over the approval and acceptance of materials to be incorporated into its system. Each Agency, at its discretion, may approve, qualify, restrict, or remove materials from its pre-approved

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materials list. Specific approval procedures for new materials and manufacturers are under sole Agency control. References made to particular materials in these Standards do not imply these materials are approved by all Agencies.

UNIFORM DESIGN AND
CONSTRUCTION STANDARDS
FOR POTABLE WATER
DISTRIBUTION SYSTEMS

SECTION 2

UNIFORM
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2.00 GENERAL STATEMENT

The water facilities design shall include planning to meet present and future demands, population projections, per capita consumption, industrial expansion, area population densities, and fire protection requirements. These factors must then be considered to size the mains from the various sources of supply to every point in the system. Other design elements are: piping materials selection (after water and soil corrosiveness considerations), the water main pressure requirements, water main location with reference to property lines, sizing of service lines, location and size of line valves, fire hydrants, special valves, and booster pumps. All water system designs shall be prepared by, or under the direction of, a professional engineer licensed in the State of Nevada.

2.01 WATER DISTRIBUTION SYSTEM PRESSURE ZONES

2.01.01 In general, the Agency's pressure zones are designed to maintain a static pressure of forty-five (45) to one hundred (100) psi. For areas with static pressure greater than one hundred (100) psi, submittals will be required to the Agency for approval.

2.01.02 In areas where a static pressure in excess of eighty (80) psi is realized, individual pressure reducing valves are required to be installed and maintained by the owner/developer in accordance with the Plumbing Code. The Engineer will identify on the water plans the services requiring individual pressure reducing valves.

2.01.03 Design parameters for the minimum water pressure in the various pressure zones, during various flow conditions, are as follows:

- | | | |
|----|----------------------------|----------|
| A. | Static Pressure | 45 psi |
| B. | Maximum Day | 40 psi |
| C. | Peak Hour | 30 psi |
| D. | Maximum Day plus Fire Flow | 20 psi * |

* Meter and backflow protection losses must be accounted for in all development that requires backflow prevention. (See "Section 4" for meter and backflow tables.)

2.01.04 Where multiple pressure zones exist, the Agency having jurisdiction will determine the pressure zone to service the parcel. No parcel will be provided service from multiple pressure zones.

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2.02 WATER DISTRIBUTION MAIN SIZES

2.02.01 General Requirements

- A. All water mains shall be sized based on flow demands and pressure requirements.
- B. The minimum water main size to be installed in the Agency's system shall be eight (8) inches in diameter unless otherwise approved by the Agency. Additionally, the agency may establish minimum water main diameters based on road width or other criteria.
- C. Departures from the minimum requirements will be considered only in special circumstances. Water mains in cul-de-sacs, internal streets within subdivisions, and other areas where water mains will not be extended in the future, may be six (6) inches in diameter if that size water main meets the development's domestic and fire protection water demand requirements. Any departure from minimum requirements identified above shall be justified by a network hydraulic analysis.
- D. Additional requirements for system reliability may be required by the Agency on a case by case basis. Requirements may include, but are not limited to, the need to meet the minimum design criteria for fire flow and domestic requirements with portions of the system out of service such as an adjacent water main or a service point.
- E. A maximum water velocity of twenty (20) fps will be utilized when designing for fire flows and/or other emergency conditions.

2.02.02 Size - Fire Protection

- A. When fire protection is to be provided, system design shall be such that fire flows and facilities are in accordance with the requirements of the Fire Department having jurisdiction. All systems must be designed with a minimum residual pressure of twenty (20) psi on the customer's side of the meter and/or backflow assembly during maximum day plus fire flow conditions.
- B. The Engineer will identify the total fire flow requirements for the project, and the on-site demands to be provided through dedicated fire service(s) or combination fire/domestic service(s) to the on-site system(s). The information will be included on the water plans and/or the Project Data Sheet, as required by the Agency.

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- C. The minimum water main size providing fire protection and serving fire hydrants shall be six (6) inches in diameter. A maximum length of one-hundred fifty (150) feet of six (6) inch main serving a fire hydrant from a single source will be allowed. A larger size main will be required for any distance greater than one hundred fifty (150) feet. Larger diameter mains will also be utilized, if necessary, to meet the required minimum fire flow while maintaining minimum residual pressure. A fire hydrant shall not be connected to a main which does not have sufficient fire flow capacity.
- D. Fire hydrants shall conform to the Standards of both the Agency and the Fire Department having jurisdiction. All public fire hydrants shall be located eighteen (18) inches behind the ROW where an easement exists or is provided. Fire hydrants located inside the ROW when easements cannot be obtained must meet the minimum ADA requirements. (See "UDACS Plate 40".)
- E. All water plans must have the approval of the Fire Department having jurisdiction PRIOR to Agency approval.

2.02.03 Oversizing

The Agency may require the Developer to oversize some or all of the proposed water main.

2.03 HYDRAULIC ANALYSES

2.03.01 Submittal of Hydraulic Analyses for Review and Approval

- A. The submission of the hydraulic analysis report is required for every project, unless directed otherwise by the Agency.
- B. Two (2) copies or electronic format, as required by the Agency, of the hydraulic analysis report must be submitted. Listed below are general requirements and specific elements that must be addressed in the hydraulic analysis submittal. The Engineer is encouraged to contact the Agency for guidance in preparing the report.

2.03.02 General

- A. The hydraulic analyses must be signed and sealed by a professional engineer licensed in the State of Nevada.

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- B. The name, address, telephone number and email address of the engineering consultant, developer, and developer's contact person must be identified on the cover of the report.
- C. Each page of the submittal must be numbered.
- D. The name and version of software used for the hydraulic analyses must be identified.

2.03.03 Project Description - The Project Description Shall Include the Following:

- A. A written description of the type of project, location, and existing facilities.
- B. A site map showing the project boundaries.
- C. Development information including:
 - Gross acreage
 - Land use
 - Number of units
 - Anticipated fire flow requirements
 - Development schedule and phasing requirements
 - Assessor's Parcel Number

NOTE: A separate analysis will be required for each development phase. A land use map should be included for larger developments.

- D. If the project is part of an oversizing agreement, indicate so in the report, and use the developer-required pipeline diameter when modeling the project.
- E. Include a legible node map clearly delineating the pipeline alignments, diameters, and lengths, layout and names of streets/roadways in which the pipelines will be installed, the pipe and node numbers used in the analyses, and all fire hydrant locations.
- F. The text and node maps shall use a minimum font size of twelve (12) points.

2.03.04 Source HGL and Demand Calculations

- A. Clearly show the source node provided by the Agency and use the Agency-issued HGLs for that node in the analyses. Enclose a copy of the letter sent by the Agency issuing these HGLs.

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- B. Provide the type and location of meters, backflow assemblies, etc., and account for the associated losses, as required by the Agency.
- C. Calculate on-site and off-site demands using demand factors provided by the Agency for gpm/acre and gpm/unit. Use the factor that produces the greater total demand for each development. Show calculations. Demand factors published by the agency must be used for all hydraulic models related to water network analyses and the sizing of pipelines for new or existing developments. For regional facilities such as pumping stations and reservoirs, the agency, at its sole discretion, may allow the use of system-wide demand factors.

2.03.05 Input Data Tables

- A. Provide input data tables for all pipes modeled. Pipe data tables shall include, at a minimum, pipe numbers as shown on the node map, beginning and ending nodes, lengths in feet, diameters in inches, coefficient of friction, and other pertinent information.
- B. Provide input data tables for all nodes modeled. Junction node data tables shall, at a minimum, include node numbers as shown on the node map, elevation in feet for all nodes using the current NAVD datum recognized by the State of Nevada, node demand in gpm, connecting pipes, and other pertinent information. Demand factors published by the agency must be used for all hydraulic models related to water network analyses and the sizing of pipelines for new or existing developments. For regional facilities such as pumping stations and reservoirs, the agency, at its sole discretion, may allow the use of system-wide demand factors.

2.03.06 Analysis

- A. Separate analyses for Maximum Day, Maximum Day plus Fire Flow, Max Day plus Fire Sprinkler demand, and Peak Hour conditions are required for each phase of the development, as well as for the entire project. In the analyses for Maximum Day plus Fire Flow, the worst-case scenario must be considered.
- B. Fire suppression sprinkler systems shall be designed per the fire codes of the Fire Department having jurisdiction. The design shall not be based on a water pressure greater than ten (10) psi below the available Max Day plus Fire Sprinkler demand residual pressure at the water main, or as directed by the Agency. The design shall also take into consideration the pressure loss(es)

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associated with the lateral, meter, backflow prevention assembly, etc.

- C. Explain any assumptions made as part of conducting the analyses and provide any comments that may ease and expedite the review of the analyses.

2.03.07

Output Data Tables

- A. Output results for pipes shall include, at a minimum, flow rate in gpm, flow velocity in fps, head loss in feet, length in feet, C value, and other pertinent information for each pipe.
- B. Output results for nodes shall include, at a minimum, hydraulic grade in feet, node pressure in psi, elevation, demand, and other pertinent information for each node.
- C. Provide a summary table, for each phase of development, showing the minimum and maximum residual pressures for each condition, and minimum and maximum static pressures.

2.03.08

Miscellaneous

- A. The roughness factors to be used in the analyses should be as follows:

C = 100 for all unlined cast iron pipe
C = 120 for pipe \leq 12-inch in diameter
C = 130 for pipe \geq 14-inch in diameter
- B. When identifying the fire flow available in a network hydraulic analysis, use the hydrant located at the development's weakest point, generally the highest point in the development and/or the last hydrant on a dead end main. A junction node should be placed at the appropriate location in the model to represent the fire hydrant. Fire flows shall be split between hydrants in increments of 1,500 gpm when analyzed at the weakest point hydrants.
- C. The elevation in the hydraulic analyses should preferably be based on a project grading plan or the anticipated final elevation. If a grading plan deviates significantly from the elevations used in the analyses, a revised analysis will be required.
- D. A chart to be used as a guide to determine water consumption for various types of developments should be obtained from the Agency.

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- E. Water plans submitted for review must match the APPROVED Network Analysis as to the diameter of water mains, configuration of the development, and the required fire flow. Any revisions to the water plans may require the resubmittal of a network analysis for review and approval.

2.04 WATER MAIN LOCATION

2.04.01 Main extensions shall be located within a dedicated ROW or private street dedicated for utility purposes, unless specifically approved by the Agency.

- A. Water main locations will be in accordance with the Uniform Standard Drawing, Clark County Area DWG Nos. 501 and 501.1, included in this document as Figure 2, Section 4, and as specified below:

Diameter of Main	ROW Width (Feet)	Main Distance From Back of Curb (Feet)
≤ 12-inch diameter	60'	7.5'
> 12-inch diameter	60'	9'
All diameters of main	80' or greater	10'

Water mains are to be installed within the paved section of the right-of-way and are not permitted to be installed under sidewalks, curb/gutter, roundabouts, landscape areas, walls, etc. Water main relocation may be required by the water agency as a condition of approval. (See "Plates 16 and 17".)

- B. If the dedicated ROW or private street dedicated for utility purposes is not available, the applicant may petition the Agency for an alternate location for the water facilities. Upon Agency approval, a main extension and appurtenances may be located within an exclusive utility easement granted to the Agency (which may include ROW or private streets), as follows:

Diameter of Main	Utility Easement Size (Feet)
Up to 12-inch	30'
16-inch through 24-inch	40'
Greater than 24-inch	50'

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NOTE: Pipe installed at a depth greater than ten (10) feet may require additional easement width, as required by the Agency.

- C. Other utilities may be located in the same easement per Sections 2.04.02 and 2.04.03 or as determined by the Agency. However, easement size may be increased due to the additional utilities. **Use of a joint trench is not permitted.**
- D. Parallel mains are to be avoided, if possible. If allowed, parallel mains will be installed in opposite sides of the ROW whenever possible. In the event conditions do not allow installation in this manner, a minimum of a five (5) foot separation is required between the outside of the mains for maintenance purposes.

- 2.04.02 A distance of no less than three (3) feet horizontally should be provided between water mains and gas mains, or other dry utilities. Use of a joint trench is not permitted.
- 2.04.03 Mains should be located at a distance no less than ten (10) feet horizontally (outside to outside) from any non-potable main (sanitary sewer, storm drain, reclaimed, or raw water irrigation), and eighteen (18) inches vertically above any non-potable main, or as otherwise specified in Section 2.21.
- 2.04.04 Dead-end mains shall be minimized by looping mains whenever practical.
- 2.04.05 Mains installed in a cul-de-sac shall run the full street length ending approximately five (5) feet past the last service as designated on the plans. The distance between the end of the main and the back of the curb at the end of the cul-de-sac shall not be less than ten (10) feet.
- 2.04.06 A minimum of twelve (12) inches vertical clearance between water mains and dry utilities, and six (6) inches vertical clearance between water laterals and dry utilities will be provided to accommodate future maintenance.
- 2.04.07 All work within an existing developed road that is a minimum of 80 feet in right-of-way, or for 12-inch diameter or greater water mains, regardless of right-of-way, will require pothole field verification for the horizontal and vertical locating of existing potable and non-potable utilities prior to plan approval, or as required by the Agency.

2.05 FULL FRONTAGE EXTENSION

Water mains may be required at the Agency's discretion along the entire length of at least one property line frontage of the property to be developed whenever future main extension is possible. The property line frontage is that portion of the property along the

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public ROW. If a parcel to be developed has more than one property line frontage, the Agency may require a water main to be installed along the other frontage(s). The minimum pipe diameter required in the frontage street shall be in accordance with Section 2.02, or as required by the Agency.

2.06 WATER MAIN MATERIALS

The type and class of all existing and proposed water mains shall be clearly identified on the water plans, as included in the Agency Approved Product List. Higher pressure class materials may be specified for special situations as identified by the Engineer or the Agency.

2.06.01 Polyvinyl Chloride (PVC) Pressure Pipe C900

Unless otherwise specified or shown on the drawings, PVC pressure pipe shall be at least Pressure Class 235 and shall conform to AWWA Standard C900, "Polyvinyl Chloride (PVC) Pressure Pipe And Fabricated Fittings, Four (4) Inches Through sixty (60) Inches" (100 mm Through 1,500 mm).

2.06.02 Ductile-Iron Pipe (DIP)

A. Materials

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

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- (2) Three-sixteenth (3/16) inch for fourteen (14) to twenty-four (24) inch.

2.07 WATER MAIN JOINT DEFLECTION

The maximum allowable water main joint deflection for various pipe materials and lengths is listed in the following tables. If these offsets conflict with the pipe manufacturer's recommendation, the more stringent requirement shall apply. Requirements in excess of these deflections identified shall require installation of fittings. However, the number of fittings and pipe joints should be minimized, while maintaining radius requirements. The use of partial lengths of pipe to create additional joints and joint deflections is not authorized. Pipes may be deflected at fitting and pipe joints, with the deflection limited to the pipe being installed. At the discretion of the Agency, a professional, certified land surveyor may be required to verify joint deflections.

For changes in direction exceeding the maximum allowable joint deflection, fittings shall be used. The use of vertical ninety (90) degree bends, with vertical sections of water main, is not allowed for the vertical adjustment of pipeline alignment.

2.07.01 Polyvinyl Chloride (PVC) Pressure Pipe C900

Polyvinyl chloride pipe shall be deflected at the fitting and pipe joints only. The maximum allowable joint deflection shall be as stated in the following table:

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

2.07.02 Ductile Iron Pipe (DIP)

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

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

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

2.08 DEPTH OF COVER

The minimum depth of cover shall be maintained for all pipe unless otherwise specified. Vehicle traffic over the water mains may be restricted until the minimum depth of cover is obtained. Mains shall be installed with the minimum cover specified below. Except for lowered sections of main associated with utility crossings, all mains shall be installed at a depth of ten (10) feet or less to facilitate future maintenance, unless approved by the Agency. Where a grade change is associated with existing pipelines resulting in a depth of cover in excess of ten (10) feet, the Agency reserves the right to require the replacement of the pipeline with the proper depth of cover.

2.08.01 ROW without an Established Street Grade

For installations where the final street grades are not established, the minimum cover shall be sixty (60) inches for mains less than twelve (12) inches, and seventy-two (72) inches for mains twelve (12) inches and greater. The Agency may require additional cover in addition to the cover specified above. The Engineer shall consider possible, and probable, future development and grading to achieve the minimum depth of cover as described in Section 2.08.02 and following development of the area. (See "UDACS Plate 16".)

2.08.02 ROW with an Established Street Grade

Where there is an established street grade, the following minimum depth of cover shall be provided. (See "UDACS Plate 17".):

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ROW (Feet)	Pipe Diameter (Inches)	Minimum Depth of Cover (Inches)
Sixty (60) or less	10-inch and smaller	Forty-two (42)
Sixty (60) or less	Greater than and equal to 12-inch	Sixty (60)
Greater than sixty (60)	10- inch and smaller	Forty-eight (48)
Greater than sixty (60)	12- inch	Sixty (60)
Greater than sixty (60)	Greater than 12- inch	Seventy-two (72) Minimum

NOTE: Depth of cover is the distance from the finished grade to the top of pipe at the pipe location, and not based on the elevations for the center line of road.

2.08.03 NDOT ROW

A sixty (60) inch minimum depth of cover shall be maintained over all water mains and casings located within NDOT ROW. (See "UDACS Plate 18".)

2.08.04 Depth of Cover During Construction

A twenty-four (24) inch minimum depth of cover must be maintained during construction.

2.09 CATHODIC PROTECTION

2.09.01 Existing Test Stations

Existing water facility cathodic protection test stations will be shown on the plans and all test stations to be relocated or adjusted will be identified. Test stations to be protected in place or relocated shall be tested prior to and after relocation by the Agency or a certified Cathodic Protection Specialist, Corrosion Specialist, Professional Corrosion Engineer, or other qualified person authorized by the Agency.

2.09.02 Installation Of New Facilities

For installation of ductile iron or MLCP pipe sixteen (16) inch and larger, the Agency will require a corrosion study to be performed by a Professional Engineer or a certified Corrosion Specialist. At a minimum, additional soils testing for corrosive soil characteristics may be required. Soil testing for Chloride (ppm), Sulfate (ppm), pH, as found soil resistivity (ohm-cm), and saturated soil resistivity (ohm-cm) will be required at a

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minimum. Cathodic protection shall be required at the discretion of the Agency. At the discretion of the Agency, twelve (12) inch ductile iron pipe may also require cathodic protection.

At a minimum, all pipelines sixteen (16) inch and larger will require all joints to be bonded, unless those joints are designed to be electrically isolated, and corrosion test stations located a maximum distance of 1,000 feet.

The corrosion study is to be coordinated with adjacent utilities and systems for stray current where applicable, and shall make clear summary recommendations regarding system type.

Isolation fittings will be required when connecting to an MLCP pipeline or existing ductile iron pipeline twelve (12) inches or larger without cathodic protection. If the existing pipeline is determined to have cathodic protection by the Agency, then both pipelines can be bonded without the isolation fitting. (See "UDACS Plate 73".)

Type T test stations with anodes are required at each end of the pipeline and at intervals of 500 feet.

2.10 PIPE CASING

2.10.01 Steel Casing

Steel casings are required on all pipe installed using boring method, where required to meet specific Union Pacific Railroad (Railroad) and/or NDOT requirements, to provide structural support, or as required under other special conditions. The pipe casing shall be laid true to line and grade with no bends or changes in grade for the full casing length.

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

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

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

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

Where installation of casing may be accomplished by open cut methods, water quality RCP casings may be used in lieu of steel casings, as approved by the Agency. If the casing is required in order to meet the requirements of Section 2.21, the RCP sections must be installed using Agency approved elastomeric joint sealants, in compliance with ASTM C920, "Standard Specifications for Elastomeric Joint Sealants", or joint gaskets. RCP casings installed for future pipeline installations shall be securely sealed with removable bulkheads at both ends in a manner acceptable to the Agency.

2.10.02 Polyvinyl Chloride Pipe (PVC)

Water quality PVC casings may be utilized in lieu of steel casing for protection of the water system (see "Section 2.21"), where installation of pipe does not require boring methods, structural support, or for Railroad and/or NDOT requirements.

2.10.03 Reinforced Concrete Pipe (RCP)

Water quality RCP casings may be utilized in lieu of steel casing for protection of the water system (see "Section 2.21"), where installation of pipe does not require boring methods or structural support, as approved by the Agency.

2.10.04 Pipe Spacers

The pipe shall be symmetrically supported about its centerline inside the casing at each joint end with an Agency approved polyethylene spacer, sized and designed per manufacturer recommendations.

2.10.05 Casing End Caps

The casing ends shall be sealed in a manner acceptable to the Agency. The annular space between the pipe and the casing shall be filled with CLSM I or sand, as required by the Agency.

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2.11 VALVES

2.11.01 Valve Location

Sufficient valves shall be provided on water mains to minimize inconvenience, degradation of fire protection and sanitary hazards during repairs. Valves shall be generally located as follows, unless otherwise approved by the Agency:

- A. At intervals to isolate no more than two (2) fire service connections at any time.
- B. In residential areas to isolate a maximum of thirty (30) services.
- C. A maximum of five (5) valves will be required to isolate any location.
- D. At maximum intervals of five hundred (500) feet (four hundred [400] feet if the building is sprinklered) in commercially zoned areas and residential off-site water mains for distribution mains twelve (12) inches in diameter and smaller, one thousand (1,000) foot intervals for sixteen (16) inches in diameter transmission mains, and one thousand three hundred and twenty (1,320) foot intervals for twenty (20) inch and greater diameter transmission mains. Additional valves may be required by the Agency to meet the requirements of Paragraphs "A" through "C" above.
- E. Valves shall not be located in street gutters, valley gutters, or in driveways.
- F. A valve is required at the end of all temporarily dead-end mains. The valve location is to be a minimum of ten (10) feet upstream of the cap or blow off assembly.
- G. For developments having two (2) or more sources of supply, isolation valves are required such that partial flow can be maintained to the development when any one source is out of service for maintenance or repair.
- H. Valved outlet(s) for future service laterals six (6) inches in diameter and larger may be installed when approved by the Agency. Valved outlet installation approval does not constitute a water commitment. When valved outlet(s) for future service laterals are identified, the following note shall appear on the drawing:

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CONDITIONAL APPROVAL OF VALVED OUTLET (Six [6] inches and larger)

The water plans show one or more valved outlets extending out of paved areas. Installation of these outlets is acceptable; however, if the outlets are incorrectly located or not used for any reason when the property is actually developed, the Developer shall abandon the outlets at the connection to the active main in accordance with the Agency's Standards and at the Developer's expense. Approval of the valved outlet does not provide or imply a water commitment.

- I. A valve immediately adjacent to the water main shall be provided for all laterals greater than two (2) inches in diameter, and for all fire hydrant laterals.
- J. The Agency may require additional valves depending upon the project design.
- K. Downstream valve for all service connections two (2) inch and smaller will be a curb stop and gate valve for four (4) inch and larger backflow devices, as required by the Agency.

2.11.02

Gate Valves

- A. Gate valves may be used on all water main diameters up to, and including, twenty-four (24) inches, as required by the Agency.
- B. Gate valves shall be installed in the vertical position with non-rising stems in all locations, except vaults, unless otherwise specified by the Agency.
- C. A minimum six (6) inch bypass valve and piping for pressure relief shall be provided for all gate valves twenty-four (24) inches in diameter and greater, unless otherwise specified by the Agency.
- D. All gate valves shall be resilient seat unless otherwise specified by the Agency.

2.11.03

Butterfly Valves

Butterfly valves may be used on water mains larger than sixteen (16) inches in diameter; unless a tapping (gate) valve is required, or as required and approved by the Agency. The installation of a valve vault shall be required for all butterfly valves.

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2.11.04 Valve Stem Extensions

Valve stem extensions are required within two (2) feet of finished grade where the distance from the top of the valve box to the top of the operating nut exceeds five (5) feet.

2.11.05 Valve Boxes

Adjustable valve boxes shall be provided for all buried valves. Valve boxes shall be installed in accordance with UDACS Plate 39. Valve boxes shall not be modified from their original manufacturer production at any time.

2.11.06 Special Valves

- A. Combination air and vacuum relief valves (AVAR) may be required within three (3) feet of a pipeline's high points and changes in grade, depending on the main size (typically twelve [12] inches and greater) and terrain, in accordance with UDACS Plate 38.
- B. Pressure regulating valves (PRV) will be required where it is necessary to reduce pressure to a maximum value as defined in Section 2.01.
- C. Check valves are to be used where it is required that the water flow in one direction only.
- D. Blow-off valves are required on all permanent dead-end pipe runs and may be required at stub-out locations. Blow-off valves for these locations shall be installed in accordance with UDACS Plate 36.
- E. Six (6) inch manual blow-off valves for installation for larger diameter mains at low points shall be installed in accordance with UDACS Plate 37, as required by the Agency.
- F. Backflow Prevention Assembly requirements are identified in Section 2.19.

2.11.07 Valve Abandonment

- A. Any stub and valved outlet installed, and subsequently not required, must be abandoned.
- B. For valve abandonment, the following note shall appear on the drawing:

ABANDONED VALVES

All valves to be abandoned shall be abandoned in the closed position, unless shown otherwise, by removing a minimum of the top twenty-four (24) inches of the valve box and collar, and then filling the bottom of the box with a minimum of eight (8) inches of sand or Type II aggregate base. The remaining portion of the valve box shall be filled with concrete having a compressive strength of at least two thousand (2,000) psi. Surface restoration is to be determined by the roadway governing Agency.

- C. If the stub or lateral is to be abandoned, the lateral shall be removed, as required by the Agency. The valve is to be abandoned with the valve in the closed position, unless otherwise specified on the approved drawing, and the following note shall appear on the drawing:

CUT AND CAP

The lateral must be cut within one (1) foot of the abandoned valve, or as shown on plans, and capped. The Contractor shall cut the existing pipe where shown on the drawing and install a cap complete with thrust block. Where a joint or coupling in the existing pipe is uncovered at the cut and cap locations, the installation of a plug may be permitted with Agency approval. A concrete thrust block shall be installed at all cap or plug locations in accordance with the provisions of UDACS Plate 31.

2.12 ABANDONMENT OF MAIN

All pipelines to be abandoned shall be cut and securely capped (all ends). The cut and cap location on the main to be abandoned shall be a maximum of one (1) foot from the valve or point of termination. Any abandoned pipeline larger than twelve (12) inches must be filled with CLSM I (flowable concrete) material.

2.13 CAPPING

A cap or plug with blowoff assembly will be required on the ends of all newly installed mains in accordance with UDACS Plate 36.

2.14 THRUST AND ANCHOR BLOCKS

Thrust blocks are required at all caps, valves, reducers, tees, and fittings used to change the direction of the pipe up to and including twelve (12) inch, and shall be placed

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in accordance with UDACS Plates 30 and 31 for all locations where the soil bearing capacity is three thousand (3,000) psf or greater. A special thrust block design by a NPE for each location of a thrust/anchor block is required if allowable soil bearing capacity is less than three thousand (3,000) psf. If undisturbed material is not present (such as in fill sections), then mechanically restrained joints shall be required.

2.15 MECHANICALLY RESTRAINED JOINTS

Mechanically restrain all joints for all mains sixteen (16) inch and larger, or at the discretion of the Agency. All pipelines, regardless of size, that are installed in a casing must be mechanically restrained. For pipes twelve (12) inch and smaller, mechanically restrained joints at changes in direction may be used at the discretion of the Agency, shall be clearly identified on drawings, and calculations shall be submitted with the project for Agency review and approval.

2.16 SERVICE LATERALS

2.16.01 Location

- A. All service laterals shall be installed in the ROW unless other provisions have been approved by the Agency.
- B. The full-service lateral length between a water main and water meter shall be installed at ninety (90) degrees to the water main horizontal alignment unless otherwise approved by the Agency. A locator ribbon will be installed the entire length of the lateral for all services not installed at right angles to the main.
- C. For service laterals two (2) inches in diameter and smaller, service saddles shall not be closer than eighteen (18) inches to any other service saddle, pipe joint, valve, or fitting.
- D. The non-potable and water laterals leading into the property shall be separated horizontally by a minimum of four (4) feet, the non-potable lateral must be a minimum of one (1) foot lower than the water lateral, and the laterals shall be located in separate trenches, per State and local health requirements. (See "Section 2.21".)
- E. All service laterals shall be located a minimum of ten (10) feet from septic tanks, and a minimum of twenty-five (25) feet from leach beds and/or seepage pits.
- F. The location of all service laterals shall be clearly defined on the drawings, with all services located outside of driveways, aprons, or sidewalk ramps.

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- G. The use of a six (6) inch diameter or larger lateral may be required for services two (2) inches in diameter and smaller if the lateral length is in excess of one hundred (100) feet.

2.16.02

Lateral Installation

- A. Service saddles shall be installed in accordance with the Agency's approved materials list for the type of pipe used.
- B. Corporation stops shall be male iron pipe thread by compression. A corporation stop shall be installed at the water main for all service laterals two (2) inches and smaller.
- C. All services laterals two (2) inches and smaller shall have a minimum lateral diameter equal to the meter size but in no case shall the lateral diameter be less than one (1) inch (i.e., a one [1] inch diameter service lateral is required for five-eighth [5/8] inch, three-quarter [3/4] inch, and one [1] inch meters).
- D. All services three (3) inches and larger shall require a minimum six (6) inch lateral with valve and shall be installed with a material approved by the Agency.
- E. At the Agency's discretion, a service lateral profile may be required when potential conflicts are known to exist when potential conflicts are anticipated and to demonstrate separation requirements will be achieved.

2.16.03

Future Use Laterals

Service laterals two (2) inches in diameter and smaller may be approved for future lots, provided the following conditions are adhered to:

- A. The laterals are to lots identified as a part of a master development and the subdivision map is available in either final or tentative form. Agency approval of the subsequent water plan is required (i.e., future laterals will not be provided for all future lots).
- B. The future laterals will only be installed where the streets over the water main are to be developed or improved with the current project.
- C. The service laterals will be clearly identified on the drawings and the quantity listed as "laterals for future services". Fees may be required by the Agency having jurisdiction for laterals installed as "future services".

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- D. Approval of the future use lateral does not provide or imply a water commitment.
- E. The following note shall be included on the drawing:

FUTURE USE LATERALS (One [1] inch through two [2] inch)

If any of the service laterals to be installed for future lots are incorrectly located or are not used for any reason when the lots are developed, the Developer shall abandon the laterals at the connection to the active main in accordance with the UDACS Standards at the Developer's expense.

Installation of service laterals two (2) inches in diameter and smaller for future lots shall include the service lateral, meter box, angle meter stop, and all fittings per UDACS Plates 1 through 4. The Agency may lock these services to prevent unauthorized water use.

- F. Service laterals will not be approved for future lots not part of a master development or for a development with a different owner.

2.16.04

Service Lateral Removal

- A. When abandoning existing water service assemblies sized two (2) inches and smaller, the following note shall appear on the drawing:

ABANDONMENT OF EXISTING SERVICE LATERALS (Two [2] inch and smaller)

The Contractor shall notify the Agency two (2) full business days prior to the requested removal time to allow the Agency to take the final meter reading. The Contractor may then begin removal procedures for the affected service as follows:

Existing service laterals to be abandoned from existing water mains shall have the corporation stops turned off at the main, a minimum of twelve (12) inches of the lateral cut out near the corporation stops and a brass cap installed on the corporation stop. If the corporation stop is damaged beyond repair or pulled from the existing water main, the main shall be repaired at the Contractor's expense in a manner approved by the Agency. If it is discovered the corporation stop is not watertight, through no fault of the Contractor, the Contractor shall notify the Agency for further direction. The existing meter(s) shall be removed and delivered to the Agency.

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- B. For existing water service assemblies three (3) inches and larger that are to be abandoned, the following note shall appear on the drawing:

***ABANDONMENT OF EXISTING SERVICE LATERALS
(Three [3] inch and larger)***

The Contractor shall notify the Agency two (2) full business days prior to the requested removal time to allow the Agency to take the final meter reading and to notify the Agency's Inspector of the impending work. The Contractor may then begin removal procedures for the affected service as follows:

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

If the valve is to be abandoned in the closed position, the lateral must be cut within one (1) foot of the abandoned valve, or as shown on plans, and capped. Where a joint or coupling in the existing pipe is uncovered at the cut and cap locations, the installation of a plug may be permitted with Agency approval. The Contractor shall install a concrete thrust block in accordance with the provisions of the UDACS Plate 31 at all cap or plug locations.

The existing meter(s) shall be removed and delivered to the Agency. The Contractor shall then remove the vault or a minimum of the vault roof and the top twenty-four (24) inches of the vault walls, and backfill the abandoned vault with Type II material compacted to ninety (90) percent of maximum dry density or CLSM I, as approved by the Agency.

2.16.05

Lateral Relocation

- A. All existing laterals that are to be relocated must first be disconnected from the existing pipeline following abandonment procedures. (See "Section 2.16.04".) The relocated service installation shall comply with Agency's current standards.
- B. If meter box relocation is required, Section 2.16.01.B still applies.

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- C. The lateral may be extended, rather than replaced, if the existing lateral is of approved copper material or sized six (6) inches in diameter or larger, provided the ninety (90) degree angle from the existing water main is maintained. All polyethylene tubing service laterals must be fully replaced, in lieu of extension or splicing, to the Agency's current standards. If approved by the Agency, a maximum of one (1) coupling may be used to extend a copper service lateral two (2) inches or smaller. (See "UDACS Plates 1, 3, and 4".)

2.17 METERS

2.17.01 Size

The meter to be installed will be based on size and service requirements. **The Agency shall have final approval in determining the meter size and type.** The tables included in Section 4, Tables A and B, reflect the AWWA rated capacities for various meter types and sizes. The size for all domestic services shall be based on continuous flow meter capacities when utilizing Peak Hour Demand. Maximum meter flow capacities may be used for maximum domestic demands, when calculated utilizing the applicable plumbing code or other applicable criteria, and fire flow conditions when associated pressure losses are accounted for in the system design.

2.17.02 Agency Provided Meters

- A. All meters two (2) inches and smaller are provided by the Agency and remain the Agency's property.
- B. All meters three (3) inches and larger shall be provided by the developer and must meet the requirements of, be approved by, and remain the property of, the Agency. (See "Agency Approved Product List" for requirements.)
- C. Meters for single family residences with residential fire sprinkler systems will meet American Water Works Association (AWWA) standards for this application.

2.17.03 Installation

- A. All services shall be installed in accordance with UDACS Plates. Meters will not be allowed at locations not contiguous to the property to be served. For services three (3) inches and larger, the following note(s) shall appear on the drawing:

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INSTALLATION OF METER AND VAULT

The meter(s) and vault(s) with traffic bearing cover(s) shall be installed in accordance with the UDACS Vault Drawing No. C-475, latest revision. Precast vaults approved by the Agency may be used in lieu of the cast-in-place vaults.

Any block wall or other fence material and landscaping shall be designed and constructed around the outside of the easement(s), to allow the Agency direct access to the vault(s) and inlet piping from the adjacent ROW,

Easements shall be clearly marked or staked prior to the start of construction.

- B. A bypass line or bypass provision is required for all meters three (3) inches and larger on projects, unless otherwise specified by the Agency.
- C. All meter and meter vaults for services three (3) inches and larger shall be located outside of the ROW (even if there is adequate space for the vault within the ROW) and the appropriate utility easement granted to the Agency, unless otherwise specified by the Agency.

2.17.04 Meter Boxes

- A. All meter boxes shall be located in the sidewalk, sidewalk area, or within a designated easement in accordance with the UDACS Plates. Meter boxes shall NOT be located in driveways, streets, or alley ways.
- B. All meters two (2) inches and smaller shall be installed in an approved meter box, sized per the Agency Approved Products List.
- C. All meters three (3) inches and larger shall be installed above ground, or as approved by the Agency.
- D. Provisions for remote reading devices for all meters shall be provided as required by the Agency.

2.18 EXISTING/ABANDONED PRIVATE WELLS

- 2.18.01 Existing Private Wells To Remain In Service - If the Agency allows a private well to remain in service, the following note shall appear on the drawing:

EXISTING PRIVATE WELLS TO REMAIN IN SERVICE

If the existing private well is to remain in service, an Agency approved backflow prevention assembly shall be installed immediately downstream of the Agency's water meter in accordance with UDACS Plate 8. The new service shall not be activated until the backflow prevention assembly has been successfully tested by the Agency.

2.18.02 Private Wells To Be Removed From Service - The following note shall appear on the drawing:

PRIVATE WELLS TO BE REMOVED FROM SERVICE

The existing private well is to be abandoned. The installation of a backflow prevention assembly will not be required; however, the Agency water service will remain in the locked position until the well has been abandoned (which must be accomplished within thirty [30] days of the installation of the Agency service) or physically disconnected from the onsite system. An inspection of the on-site system will be made by the Agency's Inspection Division to verify the well has been disconnected from the on-site system and the well is no longer functional. The Well Driller's Report must be submitted to the Agency. The State of Nevada Division of Water Resources (Telephone Number 702-486-2770) may be contacted for information concerning requirements and procedures for abandoning wells.

2.19 BACKFLOW

Any connection to the Agency's distribution system shall be made in a manner that protects the public potable water supply from contamination or pollution. Containment shall be achieved by the use of an Agency approved backflow assembly that isolates, within the customer's internal distribution system(s) or the customer's private water system(s), such contaminants or pollutants that could backflow into the public water system.

2.19.01 Application

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

- A. The backflow assembly is not installed or has been removed after installation.

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- B. The backflow assembly has been bypassed.
- C. The backflow assembly is in any way altered.
- D. Any cross-connection or possibility of cross-connection exists.
- E. The backflow assembly receives an “unsatisfactory” test result.

2.19.02 The required backflow prevention assembly type shall be determined by facility use. A partial list of facilities with required backflow prevention is provided in Section 4, Table E – Backflow Assemblies – Type Required. The Agency may require all services to a facility or parcel have an equal level of backflow protection, including size and type of device. Facilities not listed in Table E – Backflow Assemblies – Type Required shall be Agency evaluated for backflow prevention requirements on a case-by-case basis.

2.19.03 Any backflow prevention assembly required herein shall be a model and size approved by the Agency. The term "Approved Backflow Prevention Assembly" shall mean an assembly meeting the Agency's specifications.

2.19.04 When backflow prevention assemblies are required, their installation design shall take into consideration pressure loss across the device and maintenance requirements for critical services. The installation of dual services and/or backflow assemblies are required for critical facilities to minimize the impact of assemblies being taken out of service for maintenance and repair, as directed by the Agency.

2.20 FIRE HYDRANTS

2.20.01 Location and Spacing

- A. All fire hydrants will be installed in accordance with UDACS Plates 40 and 41.
- B. Hydrant spacing and location are ultimately determined by the Fire Department having jurisdiction.
- C. Fire hydrants shall not be located in the following locations:
 - 1. Within six (6) feet of a driveway, curb return, power pole, light standard, or any obstruction.
 - 2. On the circular portion of a cul-de-sac, or within twenty (20) feet of the cul-de-sac radius.

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3. Within three (3) feet of any block wall or fence.
4. As Agency specified.

2.20.02 Materials

Fire hydrants shall be approved by, and conform to the requirements of, the Fire Department having jurisdiction.

2.20.03 Hydrant Drains

- A. Hydrant drains shall not be plugged, and a gravel pocket shall be provided.
- B. Hydrant drains shall not be connected to, or located within ten (10) feet of, non-potable mains.

2.20.04 Temporary Fire Hydrants

- A. Temporary fire hydrants, if allowed, shall be submitted in accordance with the Agency's requirements.

2.20.05 Fire Hydrant Permit

A fire hydrant permit and meter will be required to use a fire hydrant for construction and dust control purposes. Charges for their use will be in accordance with the Agency's Service Rules, latest edition. A backflow assembly shall be required as determined by the Agency.

2.20.06 Relocation/Abandonment of Fire Hydrants

- A. If a hydrant lateral needs to be lengthened, continuing further back in the same direction and at the same depth as the original lateral, the hydrant assembly shall be replaced with a new hydrant assembly approved by the Fire Department having jurisdiction, unless otherwise noted on the plans. The following note shall appear on the drawing:

RELOCATION OF FIRE HYDRANTS (Extension of Existing Lateral)

The Contractor shall remove both the upper and lower barrels of the existing fire hydrant(s) where shown, extend the existing lateral as required, and install a new hydrant(s) at the new location(s) indicated. Installation shall be in accordance with UDACS Plates 40 and 41. The existing fire hydrant shall be delivered to the Agency.

- B. If a hydrant is to be relocated and the hydrant lateral must be abandoned, the following note shall appear on the drawing:

FIRE HYDRANT RELOCATION AND LATERAL ABANDONMENT (Existing Lateral to be Abandoned)

Where shown on the drawing(s), the Contractor shall abandon the existing fire hydrant(s) by removing both the upper and lower barrels of the fire hydrant so that no portion of the remaining fire hydrant assembly is closer than two (2) feet to the existing grade. A new hydrant shall be installed at the new location as indicated on the drawing, in accordance with UDACS Plates 40 and 41. The existing valve shall be abandoned in a closed position, unless shown otherwise, by removing a minimum of the top twenty-four (24) inches of the valve box, and then filling the bottom of the box with a minimum of eight (8) inches of sand or Type II aggregate base. The remaining portion of the valve box shall be filled with concrete having a compressive strength of at least two-thousand (2,000) psi. The lateral shall be cut within one (1) foot of the abandoned valve, or as shown on plans, and capped. Where a joint or coupling in the existing pipe is uncovered at the cut and cap location, the installation of a plug may be permitted, with Agency approval. A concrete thrust block shall be installed at all cut and cap locations in accordance with the provisions of UDACS Plate 31. The existing fire hydrant shall be delivered to the Agency.

- C. If the fire hydrant is to be abandoned, the following note shall appear on the drawing:

FIRE HYDRANT AND LATERAL ABANDONMENT

Where shown on the drawing, the Contractor shall abandon the existing fire hydrant(s) by removing both the upper and lower fire hydrant barrels, so no portion of the remaining fire hydrant assembly is closer than two (2) feet to the existing grade. The existing hydrant shall be delivered to the Agency. The existing valve shall be abandoned in a closed position, unless shown otherwise, by removing a minimum of the top twenty-four (24) inches of the valve box and cover, and then filling the bottom of the box with a minimum of eight (8) inches of sand or Type II aggregate base. The remaining portion of the valve box shall be filled with concrete having a compressive strength of at least two-thousand (2,000) psi. The remaining portion of the lateral shall be cut within

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one (1) foot of the abandoned valve, or as shown on plans, and capped. A concrete thrust block shall be installed at all cut and cap locations in accordance with the provisions of UDACS Plate 31. The existing concrete hydrant pad shall be removed.

D. Vertical Adjustments

Where grades are changed which affect fire hydrants, the Contractor shall make adjustments as necessary to bring the fire hydrant into compliance, without the use of a fire hydrant barrel extension, with UDACS Plates 40 and 41, and Agency requirements.

2.20.07 Fire Department Approval

Approval by the Fire Department having jurisdiction is required PRIOR to obtaining final water plan approval from the Agency. Fire Department approval is also required for revisions to approved plans affecting fire hydrants, fire services, and/or fire flow requirements.

2.21 WATER MAIN AND NON-POTABLE WATER SYSTEM CROSSINGS AND CLEARANCES

This section is intended to provide the criteria for horizontal and vertical separation between water mains and non-potable water systems (sanitary sewer, storm drain, reclaimed, raw water irrigation systems, and private/onsite water systems). Where separation cannot be achieved, either fully or partially, due to site constraints, existing construction conditions, operational considerations, etc., the encroaching facility must meet the mitigation requirements outlined below, in the order identified, and demonstrate that the proposed mitigation options for water and/or non-potable mains are adequate to protect public health and welfare. (See Section 4, Figure 2 – “Water Main and Non-Potable Crossing Separations”).

2.21.01 Parallel Separations (Mains)

NOTE: The sanitary sewer manhole or structure is not considered to be a sanitary sewer main provided the manhole or structure is constructed with water tight gaskets and the water main is greater than eighteen (18) inches above the sanitary sewer main.

- A. The following separations must be maintained between all non-potable mains which parallel water mains six (6) inches and larger.
 - 1. Water mains and non-potable mains shall be installed in separate trenches with at least ten (10) feet of separation measured horizontally from exterior pipe walls.

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2. Water mains shall be placed above non-potable mains whenever possible.
- B. Where the required ten (10) foot separation is not practicable, the Engineer may petition the Agency for approval of one of the following options, in order of priority, and engineer must demonstrate compliance is not possible before moving to the next level of priority:
1. Less than a ten (10) foot horizontal separation with eighteen (18) inches vertical separation, the following will apply:
 - a. Pipes shall be installed in separate trenches.
 - b. Horizontal separation shall be at least five (5) feet from exterior pipe walls and non-potable mains.
 - c. Vertical separation shall be at least eighteen (18) inches between exterior pipe walls with the water main being placed above the non-potable main.
 2. Non-potable gravity mains will comply with the potable water location/separation criteria included in this Section and Section 2.04.
 3. Non-potable pressurized mains shall be constructed of AWWA water quality pressure pipe material. If the non-potable pressurized main is a new installation, the water quality pressure pipe material shall be used from structure to structure, and:
 - a. The non-potable pressurized main should be installed a minimum of eighteen (18) inches below the potable main where possible, and installation at the same level will be avoided to prevent conflicts with tapping the potable main and the construction of potable water laterals.
 - b. Restrained joints are required for potable installation if the non-potable main is installed above the potable main.
 4. Where requirements included in Section 2.21.01.A and Section 2.21.01.B cannot be met, the following provisions will apply:

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- a. All efforts will be made to place the water main above the non-potable main; and
 - b. Horizontal separation shall not be less than six (6) feet from exterior pipe walls; and
 - c. The non-potable main will be constructed using one of the following options, in the following order, and as approved by the Agency(s):
 - (1) Non-potable main up to and including 36-inch diameter shall be AWWA C900. If the non-potable main is a new installation, the C900 material shall be used from structure to structure; or
 - (2) Non-potable main greater than 36-inch diameter may be reinforced concrete pipe (RCP), but shall be constructed with water-tight joints, with elastomeric joint sealant, and 4-inches of cement slurry (CLSM II) encasement of the non-potable main until minimum separation can be achieved. Potable main must also be restrained in the conflict area, and a minimum of 10 feet beyond each side.
5. Where compliance with the requirements set forth in Paragraphs A or B is not feasible, the engineer may petition the Agency for a method of mitigation acceptable to the Nevada Division of Environmental Protection (NDEP).

2.21.02 Crossing Separations (Mains)

The following separations must be maintained between all non-potable mains which cross water mains six (6) inches and larger.

- A. Non-potable mains shall be placed below water mains and shall be separated vertically by at least eighteen (18) inches between exterior pipe walls.
- B. Where the water main is below the non-potable main, or where the water main is above the non-potable main with a vertical separation less than eighteen (18) inches, the following provisions shall apply:

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1. A reasonable effort must be made to place water and non-potable pipeline joints an equal distance from the crossing point. This requirement does not apply to welded joints.
2. A vertical separation of no less than six (6) inches must be maintained and structural support for the non-potable and/or water main must be determined by the Engineer and approved by the Agency having jurisdiction.
3. The non-potable main must be constructed using one of the following options, in the following priority, or as approved by the Agency:
 - a. Non-potable main up to and including 36-inch diameter shall be AWWA C900. If the non-potable main is a new installation, the C900 material shall be used from structure to structure.
 - b. Where a section of potable water main is below a non-potable main, or where the water main is above the non-potable main with a vertical separation less than eighteen (18) inches, the water main shall be constructed of ductile iron pipe ten (10) feet on either side of the crossing. Any exposed joints of the non-potable pipe must be restrained or concrete encased. All water main joints shall be restrained in accordance with the Agency's requirements. The plans shall clearly identify the length of water main to be restrained (i.e., from station "x" to station "y"). The Engineer shall also submit all calculations used to determine the required length of restrained pipe. The water main shall be placed within a steel sleeve in accordance with UDACS Plates 21 or 22, and 23.
- C. Where an existing large diameter water main, twenty-four (24) inches or larger, is below the non-potable main to be constructed, or above the non-potable main with a vertical separation less than eighteen (18) inches, or where the size of the non-potable main prohibits the corrections identified in Paragraph 2.21.02, the following provisions shall apply:

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1. The non-potable main shall be constructed of cast-in-place reinforced concrete with no expansion joints within ten (10) feet of the exterior wall of the water main; or
 2. The non-potable main shall be constructed with precast reinforced concrete sections, installed with watertight elastomeric joint sealant fully encased with CLSM II ten (10) LF past the exterior wall of the water main. Provisions must be made to protect against differential settlement of the non-potable main.
- D. Where a section of potable water main is below a non-potable main, or where the water main is above the non-potable main with a vertical separation less than eighteen (18) inches, the water main shall be constructed of ductile iron pipe ten (10) feet on either side of the crossing. Any exposed joints of the non-potable pipe must be restrained or concrete encased. All water main joints shall be restrained in accordance with the Agency's requirements. The plans shall clearly identify the length of water main to be restrained (i.e., from station "x" to station "y"). The Engineer shall also submit all calculations used to determine the required length of restrained pipe. The water main shall be placed within a steel sleeve in accordance with UDACS Plates 21 or 22, and 23.
- E. Where separation requirements cannot be met using the above provisions, the Engineer may petition the Agency for a method of mitigation acceptable to NDEP.

2.21.03

Service Lateral Crossings and Clearances

For purposes of this section, "service laterals" are those non-potable and water lines extending from a main and terminating on-site. They are generally of smaller diameters (water: one [1] inch to four [4] inch; non-potable: four [4] inch to six [6] inch).

A. Parallel Separation (Service Laterals)

1. Water and non-potable laterals shall be installed a minimum of forty-eight (48) inches apart in separate trenches. Water laterals shall be a minimum of twelve (12) inches above the non-potable lateral.
2. For maintenance purposes, service laterals shall be installed a minimum of forty-eight (48) inches from the exterior of the manholes.

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B. Crossings (Service Laterals)

1. Where a water service lateral crosses a non-potable main or non-potable lateral, it shall be above the non-potable main with a vertical separation of at least eighteen (18) inches.
2. When a non-potable main or non-potable lateral must cross over a water lateral or water main at any distance, or cross under with less than eighteen (18) inches clearance, the provisions of Section 2.21.02.B3 shall apply.
3. Schedule forty (40) PVC sleeves may be used on one (1) inch through two (2) inch copper service laterals ten (10) feet either side of the crossing. One (1) inch laterals require two (2) inch sleeves, and one and a half (1-1/2) inch and two (2) inch laterals require four (4) inch sleeves.
4. If steps 1, 2, and 3 of Section 2.21.03.B are not possible, any relocation of existing water laterals to achieve this clearance must be performed with the approval of and in accordance with the procedures and standards of the Agency responsible for water distribution, or the Engineer may petition the Agency for a method of mitigation acceptable to NDEP.

2.21.04 Non-Potable Water Distribution Pressure

- A. The pressure requirements for the non-potable water system should be based on the system design; however, it is desirable that a pressure differential of ten (10) psi or greater be maintained on-site with the potable water supply having the higher pressure.
- B. Restrained joints are required for non-potable installation if the non-potable line is installed above the potable line, and the pressure of the non-potable line exceeds eighty (80) PSI.

2.22 TAPS SIX (6) INCHES AND LARGER

2.22.01 Materials

- A. Where the tap diameter is greater than seventy-five (75) percent of the nominal pipe diameter being tapped, and for all taps on ACP mains, Agency approved, full circumference gasket and support tapping sleeves shall be used.

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- B. Where the tap diameter is less than or equal to seventy-five (75) percent of the nominal pipe diameter being tapped, mechanical joint or steel fabricated tapping sleeves shall be used for wet taps.

2.22.02 Taps On Steel Cylinder Pipe

Taps on existing steel cylinder pipe may be restricted by the Agency to maintain the reliability and integrity of the large diameter distribution/transmission systems. The Engineer may petition the Agency for approval to tap the main, and when approved, the steel cylinder thickness, as well as the mortar lining and coating thickness, must be noted on all project plans where SCCP or MLCP mains are to be tapped. Details of the installation are to be included on the drawings, and shop drawings are to be submitted to the Agency and approved prior to the start of work. (See "UDACS Plate 35".)

2.23 LINE STOPS

Line stops may be required by the Agency, with or without bypass, to ensure continuous operation of the water system. Line stops are used to temporarily shut down a pipeline system to complete modifications or repairs. They allow a system to operate without any interruption of service. Plans for line stops must include thrust restraint details, and calculations must be provided to the Agency for review. Bypass requirements must be identified on the water plans. Use of the line stop as part of the bypass configuration will require specific approval by the Agency. Details of the installation are to be included on the drawings, and shop drawings are to be submitted to the Agency and approved prior to the start of work. (See "UDACS Plates 34 and 35".)

2.24 EASEMENTS

2.24.01 General Requirements

- A. Easements, where identified and allowed by the Agency, are required whenever the water main, service lateral, meter, backflow assembly, or any associated appurtenances are not located in a public ROW. All easement locations shall be identified on the water plan, as well as any area(s) dedicated as public utility easements to be occupied by water facilities, to facilitate field verification.
- B. Trees, shrubs, and other deep-rooted plants, or decorative rocks, and any block wall/structure (to include footings), or other fence material, shall be designed and constructed around/outside the easement(s) to allow the Agency direct access to the vault(s), backflow assemblies, and piping appurtenances from the adjacent ROW. Pavers or decorative concrete are at the discretion of the Agency. If such items are allowed, they will not be replaced in the

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event of maintenance or replacement of the facilities.

- C. The area within the easement shall be graded to provide drainage away from the vault and/or backflow assembly(ies) to prevent vault flooding and provide access for maintenance.
- D. The area within the easement shall not contain any grades or materials such as large rocks (greater than two [2] inches) that would hinder or restrict ingress/egress for maintenance of the facilities. The maximum slope through common element easements is at the discretion of the Agency.
- E. For the installation of meters and backflow assemblies, the final grade within the easement shall be at an elevation equal to back of sidewalk/ROW to allow safe ingress/egress to facilities. Where conditions prevent the above, upon Agency approval, retaining walls may be provided; however, meters and backflow assemblies shall be accessible from the ROW at all times. A minimum distance of three (3) feet will be provided from the edge of the pad(s) or vault to any fence or wall.
- F. All easement documents must be received by the Agency with owner signature prior to plan approval, and must comply with the Clark County Recorder's Office most current requirements for easement document format.
- G. The Agency may identify other specific requirements or limitations for easements.

2.24.02

Size

- A. The easement size required for a water main will be per Section 2.04.01, or as specified by the Agency.
- B. The following chart identifies the minimum easement dimensions for various size meter configurations and meters with Agency owned backflow assemblies or where required by the Agency:

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METER SIZE	METER TYPE	MINIMUM EASEMENT REQUIRED		
		METER ONLY	METER WITH SINGLE BACKFLOW	ABOVE GROUND METER/BACKFLOW ASSEMBLY (OCTAVE METER ONLY)
2" and Smaller	Outside of ROW	6' x 6'	6' x 10'	N/A
3" and 4"	Compound	15' x 15'	15' x 20'	N/A
6" and 8"	Compound	15' x 20'	15' x 25'	N/A
10"	Compound	15' x 20'	15' x 30'	N/A
3" and 4"	Turbine, Type III & Ultrasonic Fire Service	15' x 15'	15' x 20'	15' x 20'
6"	Turbine, Type II, Type III & Ultrasonic Fire Service	15' x 20'	15' x 25'	15' x 25'
8"	Turbine, Type II, Type III & Ultrasonic Fire Service	15' x 25'	15' x 30'	15' x 25' single BF 16' x 25' dual BF
10"	Turbine, Type II, Type III & Ultrasonic Fire Service	15' x 25'	15' x 30'	20' x 25' only dual BF

NOTE: A larger easement may be required by the Agency if the lateral is offset in any manner from the connection to the main, or if dual backflow assemblies are required.

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- C. The following chart identifies the minimum easement size required for various sizes of backflow prevention assemblies or where required by the Agency:

ASSEMBLY SIZE	RPPA & RPDA	MINIMUM EASEMENT REQUIRED:
Backflow Prevention Assembly	Perpendicular to ROW	Parallel to ROW
1" through 2"	6' X 8'	5' X 8'
3" & 4"	12' X 15'	10' X 15'
6", 8" & 10"	15' X 20'	12' X 20'

ASSEMBLY SIZE	RPPA & RPDA	MINIMUM EASEMENT REQUIRED:
Backflow Prevention Assembly	Perpendicular to ROW	Parallel to ROW
Dual 6"	15' X 18'	15' X 18'
Dual 8"	16' X 19'	16' X 19'
Dual 10"	16' X 20'	16' X 20'

NOTE: Above sizes are based on compact assemblies. Size may be adjusted based on specific locations or assemblies, upon Agency approval.

2.25 PLAN SUBMITTAL

2.25.01 General Requirements

All plans submitted to the Agency for review will meet the minimum requirements identified herein, and additional requirements may be established by the Agency for digital submissions. The following will be included in a submittal:

- A. A hydraulic or system analysis for flow and pressure, as required by the Agency, unless previously approved.
- B. A legal map or legal property description of the parcel(s) to be served.
- C. A completed project application, as required by the Agency.

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Copies of submittal checklist may be obtained from the appropriate Agency.

- D. A complete digital submittal of civil improvement plans shall be required in accordance with Agency procedures.
- E. The only acceptable size of the submitted drawings shall be twenty-four (24) inch x thirty-six (36) inch with a horizontal scale between one (1) inch = ten (10) feet, and one (1) inch = fifty (50) feet. All lettering shall be clear, legible, and sized to meet the minimum requirement of the Agency. (See Agency AutoCAD standards and submittal requirements for lettering sizing.)

2.25.02 Water Plan Drawing Submittal Requirements

The requirement for improvement plan submittals shall be at the discretion of each Agency. The checklist will be posted on the Agency web portal describing such requirements. Complete and accurate plan submittals help speed the plan review process. Please use the checklist to ensure that your application includes all of the information necessary for a timely review of your plans. This checklist is provided as a general guideline and is not intended to be all-inclusive. Additional information may be required during the plan review process.

2.25.03 Potholing and Profiling Requirements

- A. Potholing will be required during the design phase on any waterlines crossing other existing utilities, at the discretion of the Agency. See the Agency's checklist for further requirements.
- B. Profiles for all utility crossings shall be provided based on the pothole data.

2.25.04 Above-Ground Structures Additional Drawing Requirements

Above-ground structures and above-ground electrical and mechanical equipment shall be protected against physical damage due to a one-hundred (100) year storm event. Booster pumping stations shall remain fully operational and accessible during a twenty-five (25) year storm event. When required by the Agency, a flood study verifying these requirements must be submitted with the design drawings.

2.25.05 Approval Requirements

- A. Plan Approval
 - 1. All plans submitted to the Agency must be digitally signed and have the stamp of the Engineer of Record, a

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Professional Engineer duly licensed in the State of Nevada, in accordance with NRS 625 and the Nevada Board of Professional Engineers and Land Surveyors.

2. The Developer's Engineer will submit the final set of plans for Agency approval. A final plan must be submitted at the time of approval for all subdivisions, water main extensions, or service connections. If improvements are within NDOT's ROW, the NDOT plans and documentation must be submitted as part of the plan submittal. Standards for this submission will be established by the Agency having jurisdiction.
 3. Prior to Agency water plan approval, the executed agreements, applications, and fees must be submitted and approved by the Agency.
 4. Commercial easements must be draft approved prior to plan approval, or as required by the Agency.
 5. Residential easements must be submitted and draft approved within ninety (90) days of plan approval, or as required by the Agency.
 6. Signature approval of the Fire Department having jurisdiction must be obtained PRIOR to the Agency's approving the final water plan.
 7. All signatures required prior to the Agency approving the final water plan must be less than one (1) year old.
 8. For commercial subdivisions, Covenants, Conditions, and Restrictions (CC&Rs) and Reciprocal Easement Agreements (REAs) may be required to be approved prior to plan approval, or as required by the Agency.
- B. Revised plans must contain a Professional Engineer stamp and signature of the Engineer of Record (See "Section 2.26.01" above), and Fire Department signature, if applicable, for each revision.

2.25.06

Expiration Date

Construction must commence within one (1) year of the approval date shown on the plans, per NAC 445A.6671. All water facility construction must be completed within two (2) years from the date of plan approval, or

as required by the Agency, or the project may be subject to cancellation and must then be resubmitted for review and approval in accordance with the Agency's Service Rules and Requirements. The project may be extended at the discretion of the agency.

2.26 NEVADA DEPARTMENT OF TRANSPORTATION (NDOT) PERMITS

A State Highway Permit is required when working on any water facilities within the ROW of any State owned or maintained road. The application for the permit will be made to the State following Agency procedures, and the developer will be responsible for the application fee. An easement for the Agency should be obtained from any underlying fee owner in the event NDOT does not own the full fee simple interest in the ROW. Prior to performing any work within the ROW, approval by the State must be received. The following note shall appear on the drawing:

NEVADA DEPARTMENT OF TRANSPORTATION (NDOT) PERMIT REQUIRED

An approved NDOT Occupancy Permit shall be obtained through the Agency prior to any construction within the NDOT ROW. Plans showing work in NDOT ROW must show NDOT stationing. The developer assumes all liability for work conducted under the Agency obtained permit through warranty expiration.

2.27 SOUTHERN NEVADA WATER SYSTEM (SNWS)/ SOUTHERN NEVADA WATER AUTHORITY (SNWA)

If the project overlays an area involving existing or future SNWS/SNWA facilities, the Developer's engineer shall submit the plans to SNWS/SNWA for their review parallel with the Agency's review. SNWS/SNWA approval must be obtained PRIOR to Agency water plan approval. The SNWS/SNWA may be contacted by telephone at (702) 822-8518, by FAX at 258-3102, or by mail at P.O. Box 99956, Las Vegas, Nevada 89193-9956.

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3.00 GENERAL STATEMENT

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

3.01 STANDARD SPECIFICATIONS

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

3.02 CONTRACTOR'S LICENSE

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

3.03 CONTRACTOR'S RESPONSIBILITY

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

3.04 APPROVED PRODUCTS AND MATERIALS

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

3.05 ROW ENCROACHMENTS

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

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3.06 CUT SHEETS

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

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

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

3.07 CONSTRUCTION STAKING

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

3.08 RECORD DRAWINGS

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

3.09 EARTHWORK

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

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3.09.01 Excavation

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

3.09.02 Dewatering

Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall be continuous until such time as water can be allowed to rise in accordance with the following provisions. Dewatering shall be conducted such that no concrete footings, floors, or pipelines are placed in water, nor shall water be

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allowed to rise over them until the pipeline has been pressure tested and any concrete or mortar has achieved final set. Water shall not be allowed to rise unequally against walls until design strength is achieved or for a period of twenty-eight (28) days, nor shall water be allowed to rise in pipeline trenches or drained excavations until pipelines or facilities are backfilled or restrained to prevent flotation.

3.09.03 Pipe Bedding

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

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

3.09.04 Pipe Zone Backfill

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

- A. Wet Conditions - In any area where the pipe will be installed below historic groundwater levels or where the trench could be subject to inundation, drain backfill material shall be placed in accordance with UDACS Plates 16 through 18. In the initial stage of placing this type of material, sufficient crushed rock material shall be worked under the pipe haunch to provide adequate side support. Precautions must be taken to prevent pipe movement during material placement under the pipe haunch. Where unstable trench walls exist because of migratory materials such as water-bearing silts or fine sand, the loss of side support through the migratory action shall be prevented. In such cases, the use of CLSM may be necessary to provide needed support. CLSM shall meet the requirements as specified in Subsection 704.03.07 of the "Uniform Standard Specifications For Public Works' (USS) Construction Off-Site Improvements, Clark County Area, Nevada".
- B. Dry Conditions - In any area where groundwater will not be

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

As an additional alternative to the preceding methods, CLSM may be used, or at the Agency's discretion, as specified in Subsection 704.03.07 of the "Uniform Standard Specifications For Public Works' (USS) Construction Off-Site Improvements, Clark County Area, Nevada".

3.09.05 Trench Backfill

Backfill in the pipe trench above the pipe zone shall be in accordance with UDACS Plates 16 through 19, or as required by the Agency.

3.10 PIPE INSTALLATIONS

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

The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source. The Contractor shall keep the pipe interior free from foreign materials and in a clean and sanitary condition until Agency acceptance. All existing exposed piping shall be adequately supported with devices of appropriate design. A detailed pipe support plan must be submitted to the Agency for all trenches greater than six feet in width, or as required by the Agency.

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

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

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

Existing water facility cathodic protection test stations, to be protected in place or relocated, shall be tested prior to and after relocation by the Agency or, at the discretion of the Agency, by a certified Cathodic Protection Specialist, Corrosion Specialist, Professional Corrosion Engineer, or other qualified person authorized by the Agency. All repairs to the cathodic protection facilities that were working on initial testing, but not working on final testing, will be performed at the Contractor's expense.

The contractor must protect and seal all unfinished piping or appurtenances at the end of each day to prevent the entry of any material or contaminants per NAC 445A.67145. The contractor shall keep the pipe interior free from foreign materials and in clean and sanitary condition until Agency acceptance. At the discretion of the Agency, the contractor, at its own expense, shall mitigate any material or contaminants entering the pipe, including the removal and replacement of the impacted section(s).

3.10.01 Polyvinyl Chloride (PVC) Pressure Pipe C-900 (up to 12-inches)

Unless otherwise specified or shown on the drawings, polyvinyl chloride pressure pipe shall be Class 235 and shall conform to American Water Works Association (AWWA) C900, "Polyvinyl Chloride (PVC) Pressure Pipe And Fabricated Fittings Four (4) Inches Through Sixty (60) inches (100 mm Through 1,500 mm)". PVC pressure pipe shall have been manufactured within the eighteen (18) month period prior to installation. PVC pressure pipe shall be manufacturer date coded, and the Agency provided the manufacturer's code for translation. Rubber rings shall conform to ASTM F477, "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe".

A. Fittings

1. Unless otherwise specified or shown on the drawings, all fittings to be used with polyvinyl chloride pressure pipe shall conform to one of the following standards or Agency approved equal, and shall be as included on the Agency's approved materials list:
 - a. AWWA C110, "Ductile-Iron and Gray-Iron Fittings". This standard covers three (3) inch through forty-eight (48) inch ductile iron or gray iron fittings to be used with ductile iron pipe for portable water.
 - b. AWWA C153, "Ductile-Iron Compact Fittings". This standard covers three (3) inch to sixty-four (64) inch ductile-iron compact fittings to be used

with ductile iron pipe for potable water.

2. The contractor may use a flange adapter designed for AWWA C900, "Polyvinyl Chloride (PVC) Pressure Pipe And Fabricated Fittings Four (4) Inches Through Sixty (60) Inches (1 mm Through 1,500 mm)" when connecting PVC pressure pipe to flanged fittings or flanged valves. Pipe ends must be cut smooth and square with no bevel. All flange adapters shall be thoroughly cleaned, coated, and wrapped in accordance with Section 3.15 of these Standards.

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

All fittings shall be ductile iron and shall be lined with cement mortar in accordance with the requirements of AWWA C104, "Cement-Mortar Lining For Ductile Iron Pipe And Fittings". All fittings and joint connections shall be thoroughly cleaned, coated, and wrapped in accordance with UDACS Section 3.15.

B. Installation

1. PVC pressure pipe shall be installed in accordance with AWWA Manual M23, "PVC Pipe - Design And Installation", and AWWA C605, "Underground Installation Of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe And Fittings", and the manufacturer's recommendations, except as otherwise provided herein.
2. PVC pressure pipe shall be connected to four (4) inch through twelve (12) inch asbestos cement pipe only by use of the proper transition couplings approved by the Agency.
3. The manufacturer's recommended pipe lubricant shall be used when making pipe connections by lubricating the spigot end up to, and including, the reference mark. The reference mark on the spigot end must be flush with the bell end after installation. Contractors must use caution to avoid over-insertion or shifting prior to backfill. AWWA standards and the manufacturer's recommendations shall be followed.
4. PVC pressure pipe shall be stored at the job site in a unit package provided by the manufacturer. Pipe and

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gaskets shall not be stored close to a source of heat, and must be kept free of dirt, foreign matter, ozone, oil, and grease. Gaskets shall not be stored exposed to sunlight.

5. PVC pressure pipe, couplings, and rubber rings shall be free from damage and defects in material and workmanship. Rejected, damaged, or defective materials shall be removed from the Site.
6. Remove from site all PVC pressure pipe showing signs of physical damage or ultraviolet exposure, as determined by the Agency.
 - a. Approval of rejected pipe: Provide to the Agency, at no additional cost, documented test results from certified testing laboratory documenting conformance with AWWA standards, as applicable.
 - b. Material showing signs of sun fading or discoloration that have been approved by the Agency shall be placed in a trench with faded or discolored portion in downward position.
7. PVC pressure pipe C-900 shall be deflected - at the joints only. The maximum allowable joint deflection shall be as stated in the following table. For changes in direction exceeding the maximum allowable joint deflection, fittings shall be used.

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

8. As a part of the inspection requirement, an NPLS shall confirm in writing/stamped (official confirmation) that the horizontal/vertical deflections of pipe placement are within the maximum allowable joint deflection per UDACS 2.07.01. The Agency will acquire GPS points of the installed water line upon receipt of an official confirmation from the Surveyor.

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

A. Fittings

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

B. Management and Disposal of ACP

Management and disposal of ACP shall be in accordance with applicable local, state, and federal permits and regulations.

3.10.03 Ductile-Iron Pipe (DIP)

A. Materials

1. Unless otherwise specified or shown on the drawings, ductile iron pipe shall conform to AWWA C151, "Ductile-Iron Pipe, Centrifugally Cast" as follows:
 - a. Up to and including twelve (12) inch: Pressure Class 350.
 - b. Fourteen (14) inch to twenty-four (24) inch: Pressure Class 250, or as required by the Agency.
 - c. DIP pipe fittings shall be true, circular, and concentric with barrel of pipe cut off on plane at right angles to longitudinal axis of pipe. The interior of the pipe and fittings shall have smooth interiors and shall be free from injurious cracks, checks, blisters, broken extremities, and other imperfections.

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2. The lining of DIP shall be as follows:
 - a. Cement mortar lined (double thickness) in accordance with AWWA C104, "Cement-Mortar Lining For Ductile Iron Pipe And Fittings".
 - b. Thickness of cement mortar lining (double thickness) shall be as follows:
 - Not less than one-eighth (1/8) inch for four (4) inch to twelve (12) inch.
 - Three-sixteenth (3/16) inch for fourteen (14) inch to twenty-four (24) inch.
3. Ductile iron pipe installed below grade shall use either mechanical joints, restrained joints, or push on joints conforming to AWWA C111, "Rubber Gasket Joints For Ductile-Iron Pressure Pipe And Fittings", unless otherwise specified by the Agency.
4. Ductile iron pipe installed above grade shall use flanged joints in accordance with AWWA C115, "Flanged Ductile-Iron and Gray-Iron Pipe With Threaded Flanges", unless otherwise specified on the approved plans.

B. Fittings and Couplings

1. Unless otherwise approved and shown on the drawings, all fittings to be used with ductile iron pipe shall conform to quality and wall thickness specified in AWWA Standard C110, "Ductile-Iron And Gray-Iron Fittings", or in AWWA C153, "Ductile-Iron Compact Fittings".
2. Rubber gaskets for sealing ductile iron pipe joints shall conform to AWWA C111, "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings".

C. Installation

1. Ductile iron pipe shall be installed in accordance with AWWA C600, "Installation of Ductile-Iron Mains And Their Appurtenances", and the manufacturer's recommendations except as otherwise provided herein or shown on the drawings.

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2. Transition gaskets may be used to connect four (4), six (6) or eight (8) inch diameter ductile iron pipe to four (4), six (6), or eight (8) inch diameter asbestos cement pipe.
3. Transition couplings or approved fittings may be used to connect four (4), six (6), or eight (8) inch diameter ductile iron pipe to four (4), six (6) or eight (8) inch diameter asbestos cement pipe. A transition coupling must be provided for all transitions ten (10) inch and larger.
4. All fittings and joint connections shall be thoroughly cleaned and coated in accordance with Section 3.15 of these Standards.
5. The maximum allowable joint deflection for push-on type joint and mechanical-joint pipe shall be as follows:

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

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

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D. Polyethylene Encasement

1. All ductile iron pipe, fittings, and joint connections shall be encased as follows:
 - a. Polyethylene encasement in accordance with AWWA C105, "Polyethylene Encasement For Ductile-Iron Pipe Systems"; however, two (2) wraps shall be utilized instead of one (1). The polyethylene film shall have a minimum thickness of eight (8) mils and two (2) wraps shall have a total minimum film thickness of sixteen (16) mils.

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

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

3.10.04 CATHODIC PROTECTION

Commissioning and testing of the cathodic protection system shall be performed by the Contractor. Testing shall be performed by a NACE Certified Cathodic Protection Technician (CP2); data shall be reviewed by a NACE Certified Cathodic Protection Specialist (CP4) or Corrosion Specialist; the report shall be written and signed by a NACE Certified

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Cathodic Protection Specialist (CP4) or Corrosion Specialist; and the report shall be submitted to the Agency.

3.11 INSTALLATION OF PIPE CASING

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

The casing shall be steel fabricated and shall conform to the requirements of ASTM A283, "Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates", Grades B, C, or D. All joints shall be welded. Interior joints shall be ground to a smooth finish. All welding shall be performed by a certified welder in accordance with AWWA C206, "Field Welding of Steel Water Pipe".

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

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

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

Where installation of casing may be accomplished by open cut methods, water quality RCP casings may be used in lieu of steel casings, as approved by the Agency. If the casing is required in order to meet the requirements of Section 2.21, the RCP sections must be installed using Agency approved elastomeric joint sealants or joint gaskets. RCP casings installed for future pipeline installations shall be securely sealed with removable bulkheads at both ends in a manner acceptable to the Agency.

3.12 SOILS TESTING

- A. Contractor Test: Per the Agency's requirements, the Contractor will be required to furnish the Agency a sieve analysis, plasticity index, soluble sulfate, expansion potential, and Proctor of the material when required by the Agency. Agency approval of the sieve analysis, plasticity index, and Proctor will be required prior to using the material. (See "Table G, Backfill Materials", or as required by the Agency and the Clark County Blue Book.) The Contractor shall pay all costs in providing the Proctor and having the sieve analysis and

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plasticity index taken by a soils lab. The Agency Representative shall be present for sampling. The Contractor will be required to furnish an updated Proctor to the Agency prior to any compaction testing. The Proctor will be in accordance with ASTM D1557, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))", and performed by an approved soils laboratory within the previous six (6) months or at the Agency's discretion. If the Agency's Representative determines the backfill material has changed, the Contractor will be required to supply a new Proctor.

- B. Agency Test: The Agency shall take compaction tests. Agency compaction tests shall be paid for by the Agency. The number and location of compaction tests on backfill material will be determined per Agency requirements and procedures.
- C. If the Contractor challenges the Agency's compaction test results, an independent testing lab will be called to take tests using the following method:
 - Proctor: Tests shall be in accordance with ASTM D1557, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))".
 - Sample: In place soils shall be tested in accordance with ASTM D1556, "Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method", Method "D", with the exception no samples shall contain particles larger than three-quarter (3/4) inch.
- D. If the independent soils laboratory test results fail to meet the Agency's Standards, the Contractor shall pay for the test(s) and retest(s). If the test results indicate the Agency standards have been met, the Agency shall pay for the testing. Where compaction tests indicate a failure to meet the required compaction, additional tests will be taken every fifty (50) feet in each direction until the failing area is defined. The entire area between the passing test locations shall be reworked until the proper compaction requirements are achieved.

3.13 CONNECTIONS TO EXISTING FACILITIES

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

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mains shall be tested and disinfected in accordance with Section 3.26 of these Standards.

3.13.01 Connections To Existing Facilities – Dry Taps

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

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

The work plans for making connections to existing facilities that require an existing pipeline shut down, shall be submitted to the Agency, and shall be approved before the Contractor will be allowed to proceed. The Contractor shall notify, by a method approved by the Agency, all affected Agency customers **within twenty-four (24) to forty-eight (48) hours prior to shut down.** Valves at connections to all existing facilities shall be operated by the Contractor, but only in the presence of the Agency's Representative, unless otherwise required by the Agency. If the water will be shut off for an extended period of time, the Agency may require the Contractor to supply water for the Agency's customers.

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

3.13.02 CONNECTIONS TO EXISTING FACILITIES - WET TAPS

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

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

3.14 CONNECTIONS TO EXISTING STEEL CYLINDER PIPE

Prior assessment of existing pipe will be required, or as required by the Agency. Wet taps on existing steel mains (SCCP and MLCP) shall be accomplished using a full fabricated steel wrapper, and designed, at a minimum or as directed by the Agency, in accordance with AWWA Manual M11, "Steel Pipe - A Guide For Design And Installation". (See "UDACS Plate 35".)

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

The Contractor shall, at their sole cost and expense, furnish all wet taps to existing Agency steel pipelines. Such wet taps, including all welding, and coatings shall be made by a company licensed, certified, and bonded by the Nevada Contractor's Board, as approved by the Agency.

3.15 PROTECTIVE COATINGS

3.15.01 References

A. AWWA Standards - most recent editions:

1. AWWA C105, "Polyethylene Encasement for Ductile-Iron Pipe Systems".
2. AWWA C110, "Ductile-Iron and Gray-Iron Fittings".
3. AWWA C116, "Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings".
4. AWWA C213, "Fusion-Bonded Epoxy Coatings and Linings For Steel Water Pipe and Fittings".

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- B. National Sanitation Foundation (NSF) Standard - most recent edition:
 - 1. NSF Standard 61, "Drinking Water System Components - Health Effects".
- C. Society for Protective Coatings (SSPC) Standards - most recent editions.
- D. United States Environmental Protection Agency, Code of Federal Regulations (CFR).

3.15.02 Coating Materials

- A. Type 11 - Multi-Use Epoxy
 - 1. Uses:
 - a. Primer for exposed ferrous surfaces.
 - b. Primer and finish coat for interior exposed ferrous surfaces.
 - c. Repair/touch-up of fusion bonded epoxy finishes.
- B. Type 15 - Fusion Bonded Epoxy
 - 1. Uses:
 - a. Lining and coating submerged ferrous surfaces.
 - b. Finish coat for exposed ferrous surfaces.
- C. Type 20 - Aliphatic Polyurethane
 - 1. Uses:
 - a. Finish coat for exposed ferrous surfaces.
 - b. Finish coat for masonry interior surfaces.
- D. Type 40 - Petroleum Asphaltic
 - 1. Uses:
 - a. Buried ductile iron pipe and fittings.
 - b. In accordance with AWWA C110, "Ductile-Iron And Gray-Iron Fittings".

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E. Type 50 - Wax-Based Coatings

1. Uses:

- a. Buried miscellaneous ferrous equipment.
- b. Buried nuts and bolts.

F. Type 60 - Organic Rich Zinc Coating

1. Uses:

- a. For small local repair of galvanized equipment only.

3.15.03 Application

A. General

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

B. Buried Ductile Iron

1. System type - Petroleum Asphaltic:

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

C. Buried Ferrous Surfaces And Fittings Prior To Wrap

1. System type - Wax based coating:

- a. One coat: Type 50 - wax based coating.
- b. Polyethylene wrap: After coating, wrap surfaces with two layers of eight (8) mil polyethylene film and tightly seal as specified in AWWA C105, "Polyethylene Encasement For Ductile-Iron Pipe Systems".

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2. System Type - Cement Mortar Coating:

- a. Place mortar lining in steel piping and steel plate specials in pipe to thickness specified herein:

- (1) Reinforce lining on steel plate specials larger than sixteen (16) inches in diameter with two (2) inch by four (4) inch number thirteen (13) gage welded steel wire mesh.

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

- (2) Other requirements of mortar lining materials and processes: As specified in AWWA C205, "Cement-Mortar Protective Lining And Coating For Steel Water Pipe - Four (4) Inches (100 mm) and Larger - Shop Applied".

- b. Apply reinforced cement mortar coating over outer surfaces of steel piping and steel plate specials, unless otherwise specified:

- (1) Use Type V cement for mortar coatings (ASTM C150, "Standard Specification for Portland Cement").
- (2) Cement mortar mixture shall consist of one (1) part cement to not more than three (3) parts sand (ASTM C33, "Standard Specification for Concrete Aggregates").
- (3) Use no more than four and one-half (4 1/2) gallons of water per sack of cement.
- (4) Cement mortar and mortar armor coating: One (1) inch thick with permitted tolerance of plus one quarter (1/4) inch.
- (5) Pipe and specials, diameter less than forty-eight (48) inches: Reinforce coating with spirally wound No. twelve (12) gage

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steel wire spaced at one (1) inch centers or with No. fourteen (14) gage steel wire at one-half (1/2) inch centers positioned approximately in center of mortar coating.

- (6) Pipe and specials, diameter forty-eight (48) inches and larger: Reinforce coating with two (2) layers of spirally wound No. twelve (12) gage steel wire spaced at one (1) inch centers or with No. fourteen (14) gage steel wire at one-half (1/2) inch centers positioned at third points of mortar coating.
- (7) Permitted to reinforce coating steel plate specials with two (2) inch by four (4) inch No. thirteen (13) gage welded wire mesh in lieu of wire, positioned in coating as stated above.
- (8) Lap ends of reinforcement strips four (4) inches, and tie or loop free ends to assure continuity of reinforcement.

D. Exposed Ferrous Surfaces

- 1. System type: Epoxy/Polyurethane:
 - a. Primer: Type 11 - Multi-Use Epoxy.
 - b. Finish coat: Type 20 - Aliphatic Polyurethane.

E. Valves and Fittings - As Specified

- 1. System type: Fusion Bonded Epoxy:
 - a. One coat: Type 15 - Fusion bonded epoxy.

F. Galvanized Equipment

- 1. "Hot-Dip" coating:
 - a. As specified in ASTM A123, "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products", and ASTM A153, "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware".

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2. Type 60 - Organic Zinc-Rich Coating

- a. For small local repairs only.

3.16 CONCRETE

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

3.16.01 Cementitious Materials

Cement shall be Portland Cement in accordance with the ASTM C150, "Standard Specification for Portland Cement", Type V for all concrete in contact with the ground, including pipe coatings, and Type II or V for all other concrete.

Fly ash shall be in accordance with ASTM C618, "Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete", Class F.

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

3.16.02 Aggregates

Aggregates shall be obtained from pits approved by the Agency, and shall conform to the ASTM C33, "Standard Specification for Concrete Aggregates". Maximum aggregate size shall be three-quarter (3/4) inch for slabs and walls, and one (1) inch for structural concrete. Footings, foundations, and thrust blocks may use one and one half (1-1/2) inch maximum size aggregate.

3.16.03 Water

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

3.16.04 Forms

- A. Forms shall be designed, fabricated, erected, supported, braced, and maintained so that they will be capable of supporting without failure all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.

- B. Forms shall conform to the shape, lines, and dimensions of the members shown on the drawings and shall be sufficiently tight to prevent leakage of mortar. Forms shall be properly braced and tied to maintain position and shape.
- C. Forms for exposed concrete shall be Fir Plywood, concrete form grade, or faced with tempered hardboard or metal forms resulting in a concrete finish equal to that obtained by the use of plywood forms. Forms for exposed concrete surfaces shall be coated with colorless, non-staining mineral oil specifically manufactured for this purpose.
- D. Forms for unexposed concrete shall be either of the type specified for exposed concrete or wood sheathing boards of uniform thickness, without loose knots, reasonably straight, and butted with tight joints. Forms for unexposed concrete may be coated with form oil or wetted with water before the concrete is placed.
- E. Forms shall be removed in such a manner and at such time as to ensure the structure's safety. The results of strength tests made during construction may be used as evidence that the concrete has attained the required strength. Care shall be taken to avoid spalling concrete surfaces. Tie rod or bolt holes shall be filled solidly with mortar after form removal. Mortar used for filling holes on exposed concrete surfaces shall match the surface in color and texture.

3.16.05

Concrete Mixes

- A. Mix designs shall be in accordance with the Interagency Quality Assurance Committee (IQAC), or as approved by the Agency having jurisdiction.
- B. A mobile mix truck may be allowed at the Agency's discretion.
- C. Concrete compressive strength, aggregate size, and slump shall be in accordance with the following:

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

1. Compressive strength: Twenty-eight (28) day minimum.
2. Reinforced concrete: Minimum six (6) sacks Portland Cement per cubic yard.
3. Unreinforced concrete: Minimum five (5) sacks Portland Cement per cubic yard.
4. Maximum water cement ratio: 0.45 by weight.

3.16.06 Ready Mixed Concrete

- A. Provide a batch ticket to the Agency Representative for each delivered load ready-mixed concrete, indicating:
 1. Volume of concrete.
 2. Weight of cement in pounds.

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3. Total weight of all ingredients in pounds.
4. Time of day at which the materials were batched.
5. In accordance with ASTM C94, "Standard Specification for Ready-Mixed Concrete".

3.16.07 Expansion Joints

The Contractor shall provide expansion joints in concrete slabs where shown on the drawings. Expansion joint filler shall be thick and extend the full slab thickness. Expansion joint filler shall be pre-formed, non-extruding, resilient type constructed of cellular neoprene sponge rubber, extending the full thickness of the slab, in accordance with ASTM D1751, "Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)", or ASTM D1752, "Standard Specification for Preformed Sponge Rubber, Cork, and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction", Type I).

3.16.08 Placing Concrete

- A. Prior to placing concrete, the Contractor shall remove any ponded water from the excavation, and moisten fill for slabs to be placed on fill.
- B. Concrete shall be placed in accordance with ACI Specifications and this Section.
- C. Ready-Mix Equipment:
 1. The volume of concrete for each batch shall not exceed the manufacturer's rated capacity of the mixer.
 2. The Contractor shall ensure sufficient mixing time for the concrete for uniform distribution of materials.
 3. The Contractor shall discharge all concrete from the mixer prior to mixing a new batch.
 4. Ready-mixed equipment shall conform to specifications in accordance with ASTM C94, "Standard Specification for Ready-Mixed Concrete".

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D. Transporting:

1. The Contractor shall transport concrete from the mixer to the place of deposit by methods that will prevent segregation or loss of material.
2. The Contractor shall provide runways when wheelbarrows are used to transport concrete.
3. The Contractor shall not use wheel conveying equipment over reinforcement or support runways on reinforcement.

E. Placing:

1. Concrete shall be deposited in a continuous manner, and as rapidly as possible.
2. Concrete which has attained initial set or has contained mixing water for more than one (1) hour shall not be used.
3. Concrete shall be uniformly distributed during the process of depositing, and in no case after depositing shall any portion be displaced in the forms more than six (6) feet in horizontal direction.
4. Deposit concrete in forms in uniform horizontal layers not deeper than two (2) feet. Place each layer while the previous layer is still workable. No retempering of concrete will be permitted.
5. Concrete will not be allowed to drop freely more than four (4) feet in unexposed work nor more than three (3) feet in exposed work; where greater drops are required, the use of a duct or other Agency approved method shall be employed.
6. Concrete shall not be placed against icy or frost covered earth surfaces.

F. Compacting:

1. Compaction shall be performed by means of internal type vibrators supplemented by rodding and tamping as may be necessary, to maximum practicable density, free from pockets of coarse aggregate in such a manner that surfaces are smooth and free from voids.

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2. Care shall be taken to avoid excessive vibration of concrete, and to avoid segregation of aggregates.
3. Care shall be taken to avoid disturbance of previous lifts where initial set has taken place.
4. The use of form vibrators or form tapping is prohibited.

G. Construction Joints:

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

3.16.09

Adverse Weather Conditions

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

3.16.10

Finishes

- A. Where exposed concrete surfaces are shown on the drawings, the Contractor shall remove any fins and nails and patch defects to match adjacent surfaces in color and texture. All edges that will be exposed shall be chamfered.

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

3.16.11 Curing

- A. Formed concrete shall have the forms left in place for not less than fourteen (14) days, unless otherwise approved by the Agency. If the forms are allowed to be removed within fourteen (14) days, curing shall be continued in accordance with the applicable method, or as directed by the Agency.
- B. Encasement concrete, concrete cradles, and anchor blocks shall be kept moist until covered, and may be covered with earth, per Section 3.09, "Earthwork", no sooner than twenty-four (24) hours after concrete placement.
- C. Concrete slabs may be cured by either of the following methods:

Method 1

After finishing the slab, the surface shall be wetted with a fine spray of water and covered with polyethylene sheeting not less than four (4) mils thick or polyethylene-bonded waterproof paper sheeting. The sheets shall be lapped at least four (4) inches at the sides and the ends and sealed with adhesive tape. Sheeting

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shall be weighted down with wood planks to keep sheeting in contact with the concrete. The Contractor shall repair or replace sheets immediately if damage occurs. The curing period by this method shall be not less than seven (7) days.

Method 2

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

- D. As an alternate to the previously specified curing methods for formed and slab concrete, the Contractor may spray the surface with an Agency approved liquid curing compound, per ASTM C309, "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete", which will not affect the bond of paint to the concrete surface. The curing compound shall be applied in accordance with the manufacturer's instructions immediately after completing the concrete finish or within two (2) hours after form stripping (if stripped in less than fourteen [14] days). Care shall be exercised to avoid seal damage during the curing period. Should the seal be damaged or broken before the curing period expiration, the damage or break shall be repaired immediately by the application of additional curing compound over the damaged or broken portion. The curing film method shall not be used where construction joints are to be made.
- E. Evaporation retarder as approved by the Agency or other means to prevent plastic shrinkage cracking shall be used on slabs in hot weather or other adverse weather conditions that may cause plastic shrinkage cracking, per ASTM C309, "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete".

3.16.12 Grout

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

3.16.13 Mechanical Waterstops

- A. Mechanical waterstops shall be extruded from an elastomeric PVC compound containing plasticizers, resins, stabilizers, and other materials necessary to meet requirements of specifications.
 - 1. Store waterstops to permit free circulation of air around

waterstop material.

2. Provide special fittings fabricated for splices and joints.
3. Style: Centerbulb, flat strip.
4. Only approved waterstops identified on the Approved Products List will be utilized.
5. Mechanical waterstop seals at pipe penetrations must be accessible and adjustable from the inside of the vault.

3.16.14 Sealant

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

3.17 REINFORCING STEEL

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

3.17.01 Materials

Reinforcement steel shall be deformed steel bars, cold-drawn steel wire, or fabricated forms of those materials. Materials shall conform in quality to ASTM A615, "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement", Grade 60.

3.17.02 Installation

- A. Before being positioned, all reinforcement steel shall be free from loose mill, rust scale, and from coatings that may destroy or reduce the bond. Where there is delay in depositing concrete, reinforcement steel shall be reinspected and cleaned when necessary.
- B. Reinforcement steel shall be accurately positioned in accordance with the drawings and secured (at least 50 percent) using annealed iron wire ties or suitable clips at intersections, and shall be supported by concrete, metal or plastic supports, spacers, or metal hangers.

- C. When it is necessary to splice reinforcement at points other than shown on the drawings, the character and location of the splice shall be determined by the Agency. Unless otherwise shown on the drawings or specified, splices shall be lapped a minimum of thirty-two (32) bar diameters.
- D. All bends shall be cold bends accurately bent to shapes and angles as shown on the drawings. All bends shall be made in accordance with ACI 318, "Building Code Requirements for Structural Concrete and Commentary".

3.18 APPURTENANCES

3.18.01 Couplings (Four [4] Inch To Twenty-Four [24] Inch)

- A. Middle ring and follower rings shall be made of carbon steel, per ASTM A53, "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless", or ASTM A512, "Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing", or ductile iron per ASTM A536, "Standard Specification for Ductile Iron Castings". Couplings shall be in sizes to fit the pipe and fittings shown on the drawings. The middle ring shall not be less than one-quarter (1/4) inch in thickness and a minimum of five (5) inches long.
- B. Gaskets shall contain no reclaimed rubber and shall be suitable for use in potable water systems.
- C. All non-buried ferrous surfaces shall be fusion bonded epoxy coated at the factory in accordance with Agency specifications.
- D. All buried couplings shall meet 3.15.03.C coating standards.
- E. Bolts, nuts, and washers for buried couplings: Cadmium plated, high strength, low alloy steel meeting composition requirements of AWWA C111, "Rubber-Gasket Joints For Ductile-Iron Pressure Pipe And Fittings", or stainless steel type 304 or 316.

3.18.02 Gaskets

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

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3.18.03 Insulating Bushings and Unions

Pipe or fittings made of nonferrous metals shall be isolated from ferrous metals by reinforcing nylon insulating pipe bushings or unions. Such insulating bushings and unions must be approved by the Agency prior to installation. Unless otherwise directed by the Agency, provisions for cathodic protection continuity testing across all buried insulating water main fittings must be provided.

3.18.04 Flange Insulation Sets

Flange insulation sets shall contain full-faced gaskets, full-length sleeves, and double washers. Insulation material for the flange insulation sets shall be phenolic resin and flange-faced gaskets shall be neoprene-faced phenolic resin. All insulating materials shall be of type designated by the manufacturer as suitable for use at the operating pressures specified. Flange insulation sets must be approved by the Agency prior to installation. Installation shall be per the manufacturer's recommendation. Unless otherwise directed by the Agency, provisions for cathodic protection continuity testing across all buried insulating water main fittings must be provided. (See "UDACS Plate 73".)

3.18.05 Tapping Sleeves (Other Than Steel Pipe)

- A. Designed for one hundred fifty (150) psi working pressure or as required by the Agency.
- B. Asbestos Cement Pipe: Use stainless steel fabricated tapping sleeves with full circumference gasket. No size on size tap on an ACP will be allowed, or as required by the Agency.
- C. When the wet tap diameter is greater than seventy-five (75) percent of diameter of pipe being tapped, provide either of the following:
 - 1. Mechanical joint tapping sleeves, per Agency approval only.
 - 2. Stainless steel fabricated tapping sleeves.
- D. When the wet tap diameter is less than or equal to seventy-five (75) percent of pipe diameter, provide either of the following:
 - 1. Mechanical joint tapping sleeves, per Agency approval only.
 - 2. Stainless steel fabricated tapping sleeves.

3. Steel fabricated tapping sleeves (for ductile iron only), per Agency approval only.
- E. Steel Fabricated Tapping Sleeves: Split full circle; carbon steel body ASTM A283, "Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates", Grade C; AWWA C207, "Steel Pipe Flanges For Waterworks Service - Sizes Four (4) Inches Through One Hundred Forty-four (144) Inches (100 mm through 3,600 mm", Class D flange, ANSI 150 lb. Drilling; Type 304 stainless steel nuts and bolts, Teflon coated; factory applied fusion bonded epoxy coating.

Mechanical Joint Tapping Sleeves: Split full circle; ductile iron ASTM A536, "Standard Specification for Ductile Iron Castings", or carbon steel ASTM A283, "Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates", Grade C body, AWWA C110, "Ductile-Iron And Gray-Iron Fittings", with three-fourth (3/4) inch NPT test plug; ANSI B-16.1 Class 125 flange and drilling; Type 304 stainless steel nuts and bolts, Teflon coated; AWWA C111, "Rubber-Gasket Joints For Ductile-Iron Pressure Pipe And Fittings", mechanical joint ends; factory applied fusion bonded epoxy coating.
- F. Stainless Steel Fabricated Tapping Sleeves: Split full circle band body, 18-8 Type 304 stainless steel; stainless steel flange, one hundred fifty (150) lb. drilling; Grade 60 full circumference gasket; Type 304 stainless steel nuts, bolts and washers, Teflon coated.

3.18.06 Service Saddles

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

3.18.07 Manhole Frames and Covers

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

UNIFORM CONSTRUCTION STANDARDS

SECTION 3

3.18.08 Valve Boxes and Covers

- A. Cast iron, sliding type, adjustable valve boxes, with covers, shall be provided for all buried valves and shall consist of a top and bottom section with slide type extensions and large bottom base where specified. The cover shall be a drop type with a minimum skirt length of four (4) inches, marked with the word **WATER**, and the lid shall weigh a minimum of twenty-four (24) pounds. Valve boxes and covers shall be installed with materials from the Agency's approved materials list.
- B. Valve boxes shall be installed in accordance with UDACS Plate 39. Valve boxes shall be installed plumb and centered over the valve operating nuts.
- C. Valve extension stems shall be provided where the depth to the top of the operating nut exceeds five (5) feet. The extension stem shall be a one and one-quarter (1-1/4) inch solid steel round shaft fitted with a two (2) inch AWWA nut and a self-centering device. The top of the extension stem operating nut shall be marked with a one and one-half (1-1/2) inch high letter "E".

3.18.09 Brass Pipe and Bronze Fittings

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

3.18.10 Copper Tubing

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

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

3.18.11 Adjustable Pipe Supports

Adjustable pipe supports shall be designed to support pipe from one (1) to four (4) feet above the floor. At any one assembly position, adjustable pipe supports shall have a maximum vertical adjustment of four (4) inches (i.e., a twenty [20] inch pipe support may adjust to twenty-four [24] inch before a taller pipe support is required). Adjustable pipe supports shall be capable of supporting two hundred (200) pounds per inch of pipe diameter. The total bearing area of the adjustable pipe support on the base shall be such that the base load does not exceed five hundred (500) psi at the manufacturer's rated load for the adjustable pipe support. Adjustable pipe supports shall be galvanized or painted in accordance with the provisions of Section 3.15 of these Standards.

3.18.12 Non-Adjustable Pipe Supports

Non-adjustable pipe supports shall be fabricated and installed in accordance with Agency approval. Shop drawings will be required.

3.18.13 Fire Hydrants

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

3.18.14 Service Meter Boxes

Water service meter boxes for meters of nominal size five-eighth (5/8) inch through two (2) inch shall be in accordance with the Agency's approved materials list and UDACS Plates 1, 3, and 4. All water service meter boxes shall be complete with covers. Meter boxes shall not be located in driveways or American Disabilities Act (ADA) ramps.

3.18.15 Flanges

Except as otherwise specified or shown on the drawings, all flanges to be installed on pipe or fittings shall be faced and drilled in accordance with one hundred fifty (150) lb. ASA dimensions, or in lieu thereof, shall be in accordance with the AWWA C207, "Steel Pipe Flanges For Waterworks Service - Sizes Four (4) Inches Through One Hundred Forty-four (144) Inches (100 mm Through 3,600 mm)", Class D or Class E, as applicable. All flanges shall be furnished with flat faces. All pipe flanges shall be attached with bolt holes equally straddling the pipe's vertical axis unless otherwise shown on the drawings. Flange attachment to the pipe shall conform to the applicable requirements of AWWA C207, "Steel Pipe Flanges For Waterworks Service - Sizes Four (4) Inches Through One Hundred Forty-four (144) Inches (100 MM Through 3,600 MM)".

UNIFORM CONSTRUCTION STANDARDS

SECTION 3

3.19 CAPPING

- 3.19.01 For capping a newly installed main, a mechanical-joint cap or push-on cap shall be used (See "UDACS Plate 36"), or as approved by the Agency.
- 3.19.02 If an existing water main is to be abandoned, the water main must be cut and capped in accordance with Section 2.12 of these Standards.

3.20 VALVE ABANDONMENT

All valves to be abandoned shall be abandoned in the closed position, unless shown otherwise, by removing a minimum of the top twenty-four (24) inches of the valve box and then filling the bottom of the box with a minimum of eight (8) inches of sand, the remaining portion of the valve box shall be filled with concrete having a compressive strength of at least four thousand five hundred (4,500) psi.

3.21 THRUST BLOCKS AND ANCHOR BLOCKS

Thrust blocks are required for all caps, valves, reducers, tees, and fittings used to change the pipe direction, unless mechanically restrained in accordance with Section 3.22. Thrust and anchor blocks shall be installed in accordance with UDACS Plates 30 and 31 where the allowable soil bearing capacity is three thousand (3,000) psf or greater. Special thrust block design by an NPE is required for each installation where the allowable soil bearing capacity is identified to be less than three thousand (3,000) psf based on the results of a certified soils laboratory or where undisturbed earth is identified. The Agency shall assume no responsibility for charges associated with verifying soil-bearing capacity.

3.22 MECHANICALLY RESTRAINED JOINTS

Mechanically restrained joints are required for all mains sixteen (16) inch and larger, and may be specified by the Engineer, or as required by the Agency, for pipes smaller than sixteen (16) inches. All pipelines, regardless of size, that are installed in a casing must be mechanically restrained in accordance with Plates 21 through 23. The beginning and ending locations and the restrained length shall be clearly identified on the drawings.

3.23 SERVICE LATERALS

3.23.01 Location

- A. All service laterals shall be installed in the ROW unless other provisions have been approved by the Agency.
- B. The full service lateral length between a water main and water meter shall be installed at ninety (90) degrees to the water main horizontal alignment, unless otherwise approved by the Agency. A locator ribbon shall be installed the entire length of the lateral

UNIFORM CONSTRUCTION STANDARDS

SECTION 3

for all services not installed at right angles to the main.

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

3.23.02 Lateral Installation

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

3.24 BACKFLOW PREVENTION ASSEMBLIES

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

3.24.01 Application

No water service connection to any premises shall be approved, installed, or maintained by the Agency unless the water supply is protected as required by State laws, State regulations, and Agency Standards. Water service to any premises shall not be activated by the

UNIFORM CONSTRUCTION STANDARDS

SECTION 3

Agency if the Agency determines the water service requires a backflow assembly and any of the following conditions prevail:

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

3.25 VALVES

3.25.01 Gate Valves

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

3.25.02 Butterfly Valves

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

3.26 TESTING AND DISINFECTING

- A. All new water facilities shall be pressure tested and disinfected to the Agency’s satisfaction in accordance with the Nevada Division of Environmental Protection requirements. (See “NAC 455A.67145”.) For guidance on chlorine requirements, refer to UDACS Plate 32.
- B. At the direction of the Agency, the contractor will use one of the testing and chlorination methods outlined in AWWA C651, “Disinfecting Water Mains”; C605, “Underground Installation of Polyvinyl Chloride (PVC) And Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe And Fittings”; and C600, “Installation of Ductile-Iron Mains And Their Appurtenances”.

UNIFORM CONSTRUCTION STANDARDS

SECTION 3

- C. Provisions shall be made to provide a water velocity of three (3) feet-per-second while flushing water mains using blow off valves, fire hydrants, or a combination thereof.

3.27 SAFETY

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

3.28 JOINT USE TRENCH

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

3.29 OCCUPANCY PERMITS

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

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

UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER DISTRIBUTION SYSTEMS

SECTION 4

TABLES & REFERENCES

CONTINUE TO THE NEXT PAGE

TABLES & REFERENCES
SECTION 4
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FIGURE

1	TYPICAL UNDERGROUND UTILITY LOCATIONS IN RESIDENTIAL STREETS *	4-10
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* Excerpt from the Uniform Standard Drawings, Clark County Area, also known as the Blue Book, Drawings 501 and 501.1.

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TABLE A
DOMESTIC WATER METER CHART
CHARACTERISTICS

TYPE	DISPLACEMENT (1)			ULTRASONIC AND MAGNETIC (2)			TURBINE (3)		
SIZE	GPM		PSI*	GPM		PSI*	GPM		PSI*
	MAX	CONT	@ MAX GPM	MAX	CONT	@ MAX GPM	MAX	CONT	@ MAX GPM
3/4"	30	15	15	30	30	10			
1"	50	25	15	50	50	10			
1-1/2"	100	50	15	100	100	10			
2"	160	80	15	160	160	10			
3"				350	350	8	435	350	7
4"				600	600	8	750	650	7
6"				1,350	1,350	8	1,600	1,400	7
8"				1,600	1,600	8	2,800	2,400	7
10"							4,200	3,500	7

NOTE:

* Maximum allowable pressure loss at safe maximum operating capacity, per AWWA Standards.

(1) AWWA C700-20: Cold-Water Meters – Displacement Type, Metal Alloy Main Case, Table 1.

(2) AWWA C715-18: Cold-Water Meters – Electromagnetic and Ultrasonic Type For Revenue Applications, Table 1. (This type of meter represents residential and commercial applications where low flow accuracy is of particular concern.)

(3) AWWA C701-19: Cold-Water Meters – Turbine Type, For Customer Service, Table 1. Class II In-line (High Velocity Types – Pressure Losses do not include strainer). If strainer is required, see Table B.

TABLE B
FIRE SERVICE WATER METER CHART
CHARACTERISTICS

TYPE	DISPLACEMENT			ULTRASONIC AND MAGNETIC (1) TYPE II			TURBINE (2) TYPE III		
SIZE	GPM		PSI*	GPM **		PSI*	GPM**		PSI*
	MAX	CONT	@ MAX GPM	MAX	CONT	@ MAX GPM	MAX	CONT	@ MAX GPM
3/4"	30	15	15	30	30	10			
1"	50	25	15	50	50	10			
1-1/2"	100	50	15	150	150	7			
2"	160	80	15	220	220	7			
3"				500	500	7	350	250	11
4"				880	880	7	700	400	11
6"				1,400	1,400	7	1,600	900	11
8"				2,800	2,800	7	2,800	1,600	11
10"				4,500	4,500	7	4,400	2,200	11

NOTE:

- * Maximum allowable pressure loss at safe maximum operating capacity, per AWWA Standards.
- ** Maximum flow rates may be used for fire flow requirements only. Continuous operation flow rates should be used for all other operating conditions.
- (1) AWWA C715-18: Cold-Water Meters – Electromagnetic and Ultrasonic Type For Revenue Applications, Type II, Table 1. This represents commercial applications where low flow is not of primary concern.
- (2) AWWA C703-19: Cold-Water Meters – Fire Service Type, Type III, Table I. Turbine Fire Service Meter and Strainer Without a Check Valve.

TABLE C
BACKFLOW PREVENTION ASSEMBLY
CHARACTERISTICS

ASSEMBLY SIZE	RATED FLOW (GPM)	MAX PRESSURE LOSS (PSI)	
		RPPA (1)	RPDA (2)
3/4"	30	20	
1"	50	18	
1 1/2"	100	16	
2"	160	16	
3"	320	15	17*
4"	500	14	16
6"	1,000	14	16
8"	1,600	14	16
10"	2,300	14	16

NOTE:

* The minimum size of device is determined by the Agency.

- (1) RPPA (Reduced Pressure Principal Assembly) - AWWA Standard C511-17, "Reduced-Pressure Principle Backflow Prevention", Table 1.
- (2) RPDA (Reduced Pressure Detector Assembly) - USC FCCCHR Manual, Current Edition, Table 10-1 and Section 10.1.2.7.d - "Design, Operational And Evaluation Specifications For Reduced Pressure Principle-Detector Backflow Prevention Assemblies (RPDA)".

TABLE E
BACKFLOW ASSEMBLIES - TYPE REQUIRED

<u>FACILITY TYPE</u>	<u>REQUIRED BACKFLOW PREVENTION</u>
1. Automotive repair facilities	RPPA
*** 2. Auxiliary water system	RPPA
*** 3. Beverage bottling plants	RPPA
4. Breweries	RPPA
5. Building with house pump and/or water storage tanks	RPPA
6. Buildings with sewage ejectors	RPPA or A.G.
7. Car washes (self-wash and automatic)	RPPA or A.G.
** 8. Centralized heating and air conditioning plants	RPPA
9. Chemical plants	RPPA or A.G.
** 10. Chemically treated potable water systems	RPPA or A.G.
11. Commercial laundries	RPPA or A.G.
*** 12. Dairies, cold storage plants, and ice manufacturers	RPPA or A.G.
13. Dye works	RPPA or A.G.
14. Film processing laboratories	RPPA or A.G.
15. Fire system (Class 1, 2 & 3)	RPDA
16. Fire system with auxiliary supply (Class 4, 5 & 6)	RPDA
** 17. Food processing plants	RPPA
18. Hospitals, mortuaries, medical and dental buildings, sanitariums, nursing and convalescent homes and clinics, chiropractors, X-ray facilities	RPPA or A.G.
19. Irrigation systems, (Premises having separate systems, such as parks, playgrounds, cemeteries, golf courses, schools, estates, ranches, churches.)	RPPA or A.G.
20. Laboratories using toxic materials	RPPA or A.G.
*** 21. Manufacturing, processing, and fabricating plants using toxic and/or non-toxic materials	RPPA
22. Motion picture studios	RPPA or A.G.

TABLE E
BACKFLOW ASSEMBLIES - TYPE REQUIRED
(continued)

<u>FACILITY TYPE</u>	<u>REQUIRED BACKFLOW PREVENTION</u>
*** 23. Multi-storied buildings	RPPA
24. Restricted, classified, or other closed facilities	RPPA or A.G.
25. Sand and gravel plants	RPPA or A.G.
26. Schools and colleges	RPPA or A.G.
27. RV parks	RPPA or A.G.
** 28. Solar heating systems	RPPA
29. Power plants	RPPA or A.G.
30. Veterinary clinics	RPPA or A.G.
31. Where a hemodialysis unit (kidney machine) is used by an individual in his/her home	RPPA or A.G.
** 32. Newspaper or printing publishing	RPPA or A.G.
** 33. Dog grooming shops / pet shops	RPPA or A.G.
34. Commercial swimming pools	RPPA or A.G.
** 35. Church baptismal fonts and irrigation	RPPA or A.G.
36. Metal manufacturing - cleaning, processing, & fabricating plants - plating and etching	RPPA or A.G.
** 37. Multiple service – without known or potential hazards	RPPA
38. Median strip irrigation	RPPA
39. Sewage and storm drainage facilities	A.G.
40. Portable tank and/or vehicular water tankers	A.G.

NOTE: Agency reserves the option to require a higher level of protection for all facilities.

TABLE E
BACKFLOW ASSEMBLIES - TYPE REQUIRED
(continued)

DESCRIPTION OF BACKFLOW PREVENTION:

- A.G. - Air Gap Separation
- RPPA - Reduced Pressure Principle Backflow Assembly
- RPDA - Reduced Pressure Detector Assembly

- ** - Case by case determination
- *** - Dependent on whether the hazard is a health hazard or pollution hazard, determination to be made by the Agency.

NOTE: Any facility which requires an RPPA can also substitute an air gap separation (A.G.), when feasible.

REFERENCES:

For additional information concerning backflow requirements, refer to the State of Nevada, Nevada Administrative Code. (See "NAC 445A.67185 through NAC 445A.67255".)

For information concerning minimum types of protection for particular service connections, refer to the State of Nevada, Nevada Administrative Code. (See "NAC 445A.67195 through NAC 445A.6721".)

TABLE F
INSPECTION CHARGE
STATEMENT OF AUTHORIZATION AND RESPONSIBILITY

_____(AGENCY NAME)

INSPECTION CHARGE AUTHORIZATION

_____ Agency Name	Date: _____
_____ Street Address	Sat./Sun: Holiday _____
_____ City-State-Zip Code	Week Day: _____

JOB NO.: JOB TITLE: OVERTIME WORKED:

PERMITTEE OR CONTRACTOR:

TYPE OF WORK CONSTRUCTED DURING OVERTIME:

CONTRACTOR'S REASON FOR WORKING OVERTIME:

INSPECTOR'S SIGNATURE

CONTRACTOR'S SIGNATURE

Should the Contractor desire to work outside the established normal working hours, as established by each Agency, the Contractor will be required to sign this or a similar document that constitutes approval of an overtime inspection fee. See Section 1.06 of these Standards.

TABLE G
BACKFILL MATERIALS

TYPE II MATERIAL: Type II material shall conform to the following requirements:

<u>Gradation:</u>	<u>Sieve Sizes</u>	<u>Percentage by Dry Weight Passing Sieve</u>
	1-Inch	100
	3/4-Inch	90 - 100
	No. 4	35 - 65
	No. 16	15 - 40
	No. 200	2 - 10
	No. 200 (Modified Type II)	2 - 15 (Modified Type II)
<u>Plastic Limits:</u>	<u>Percentage by Weight Passing No. 200 Sieve</u>	<u>Plasticity Index Maximum</u>
	0.1 - 3.0	15
	3.1 - 4.0	12
	4.1 - 5.0	9
	5.1 - 8.0	6
	8.1 - 11.0	4
	11.1 - 15.0	3

GRANULAR BACKFILL: Granular material shall conform to the following requirements:

<u>Gradation:</u>	<u>Sieve Sizes</u>	<u>Percentage of Weight Passing</u>
	3-Inch	100
	No. 4	35 - 100
	No. 16	25 - 100
	No. 200	0 - 15

Plastic Limits: As specified for Type II material above.

SELECTED BACKFILL: Selected backfill shall conform to the following requirements:

<u>Gradation:</u>	<u>Sieve Sizes</u>	<u>Percentage of Weight Passing</u>
	6-inch	100 **
	3-inch	80 - 100
	No. 4	35 - 100

** Stones or lumps greater than 3-inches in diameter shall not be used within the zone 12-inches from the pipe, structure, or finished subgrade.

<u>Plastic Limits</u>	<u>Percentage by Weight Passing No. 200 Sieve</u>	<u>Plasticity Index Maximum</u>
	0.0 - 10.0	15
	10.1 - 20.0	12
	20.1 - 50.0	10
	50.1 - 80.0	8
	80.1 - 100.0	6

Liquid Limit: LL = Maximum 50

TABLE G
BACKFILL MATERIALS
(continued)

DRAIN BACKFILL: Drain backfill is material conforming to the following gradation:

<u>Screen or Sieve Sizes</u>	<u>Percent Passing</u>
3/4-Inch	100
1/2-Inch	95 – 100
3/8-Inch	70 – 100
No. 4	0 – 70
No. 8	
No. 200	0 - 3

NOTE: All backfill material shall have a water soluble sulfate content of less than 0.3 percent by dry soil weight.

NOTE: Testing methods shall be in accordance with ASTM D-1557, “Standard Test Methods for Laboratory Compaction of Soil Modified Effort”.

(See: <https://www.rtcsnv.com/projects-initiatives/streets-highways/uniform-standard-specifications-and-drawing-archives/>, for the latest edition of the Regional Transportation Commission Uniform Standard Specifications – Section 704, Base Aggregates.)

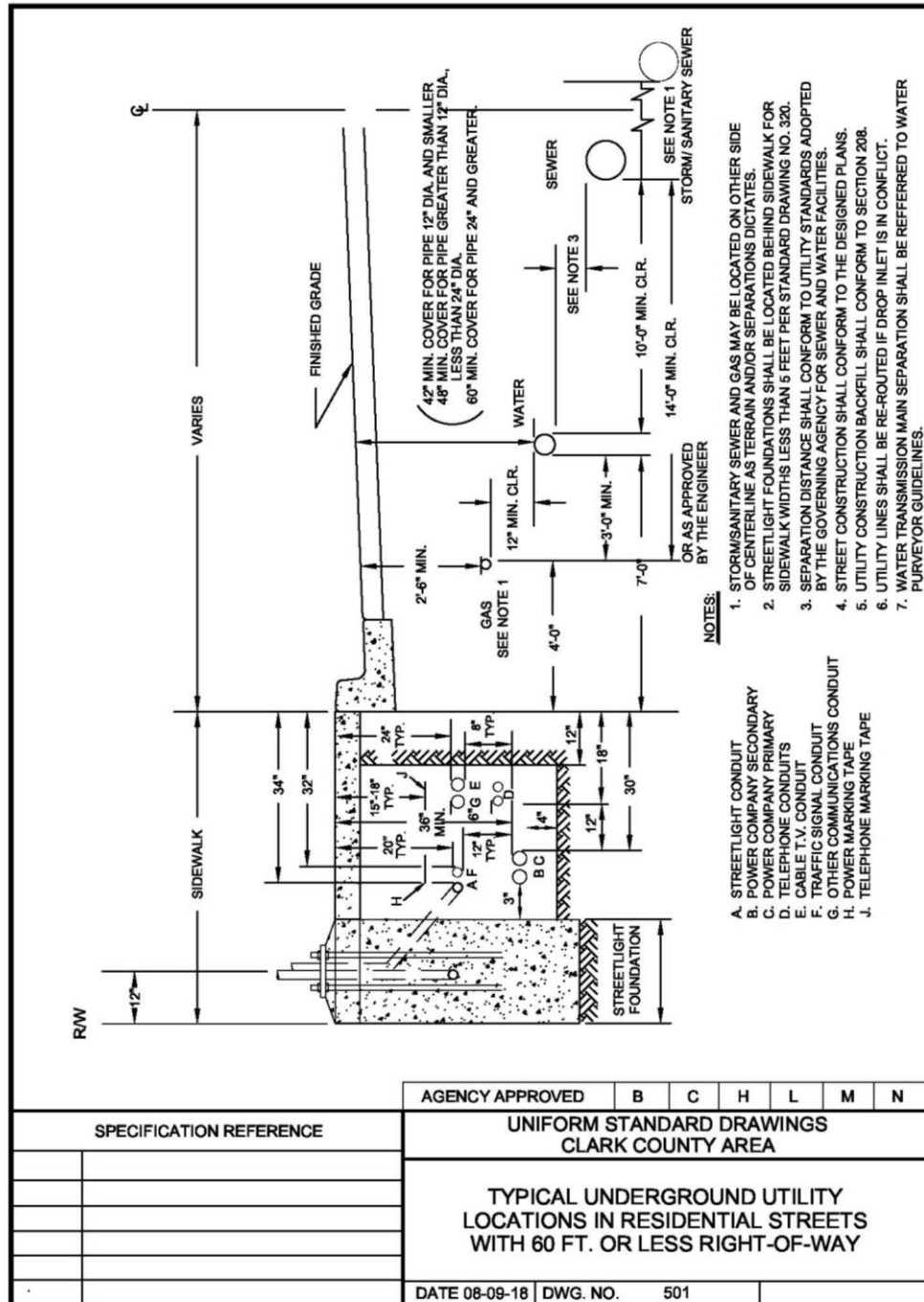
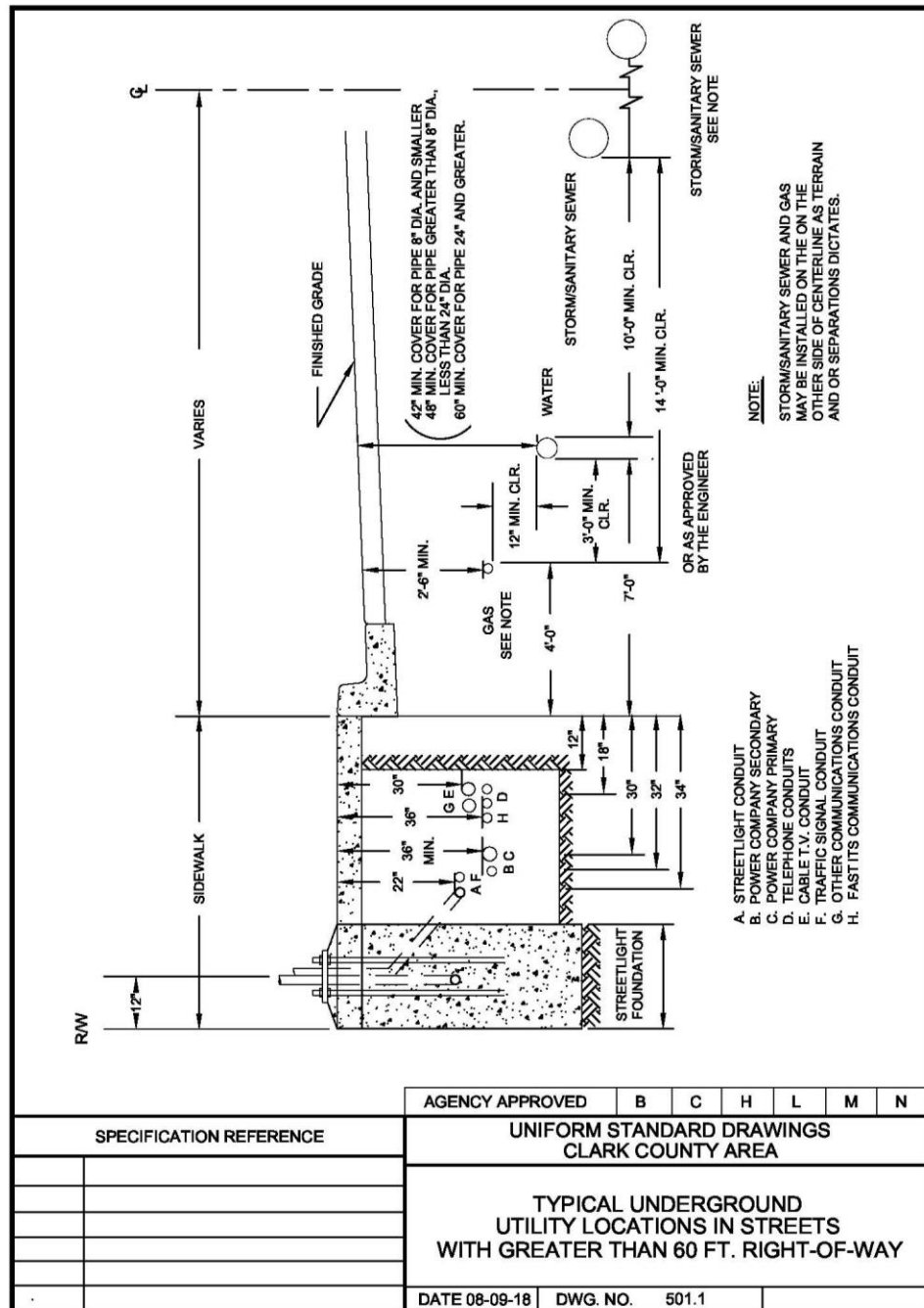
FIGURE 1**TYPICAL UNDERGROUND UTILITY LOCATIONS IN RESIDENTIAL STREETS**(See: https://rtcws.rtcnv.com/mpo/streets/v4_streets_drawings.cfm, for the latest edition.)

FIGURE 1
TYPICAL UNDERGROUND UTILITY LOCATIONS IN RESIDENTIAL STREETS
 (Continued)



(See: https://rtcws.rtcsv.com/mpo/streets/v4_streets_drawings.cfm, for the latest edition.)

FIGURE 2
WATER MAIN AND NON-POTABLE CROSSING SEPARATIONS

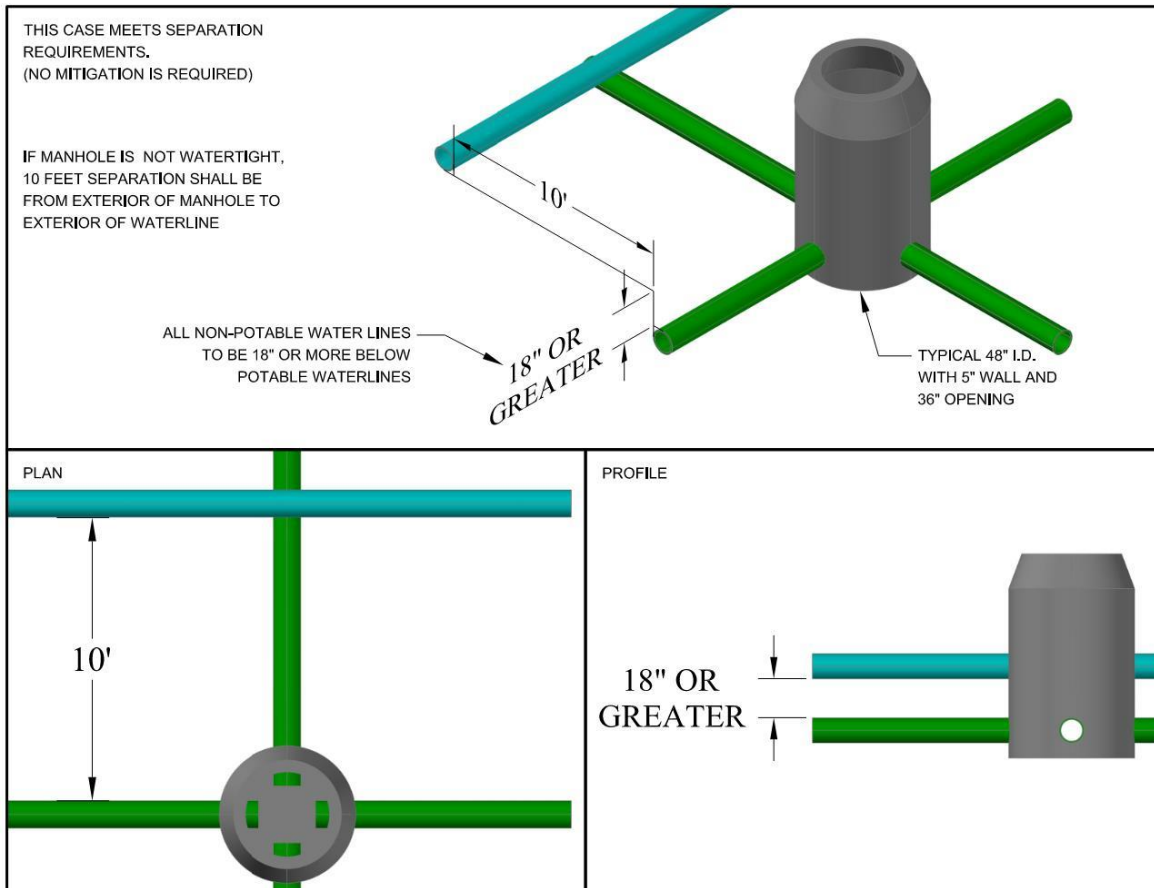


FIGURE 2
WATER MAIN AND NON-POTABLE CROSSING SEPARATIONS
(continued)

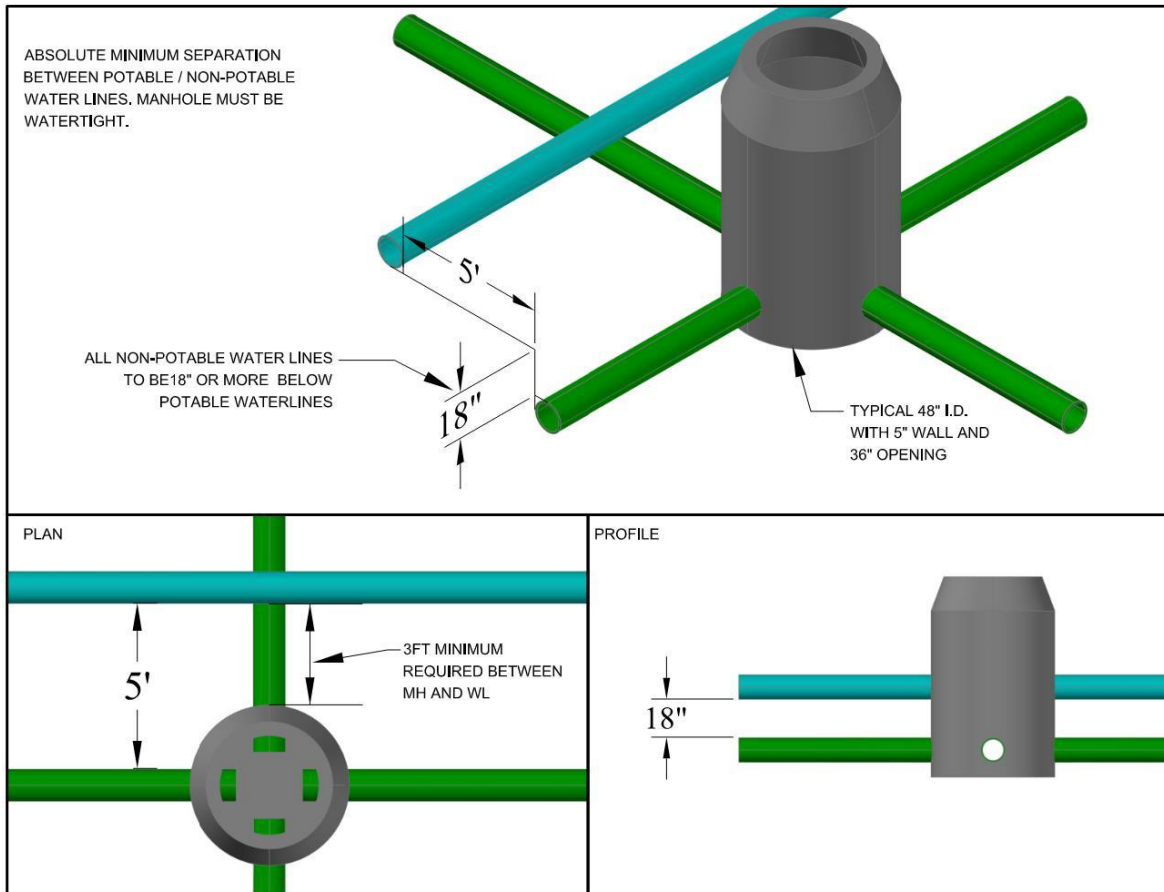


FIGURE 2
WATER MAIN AND NON-POTABLE CROSSING SEPARATIONS
(continued)

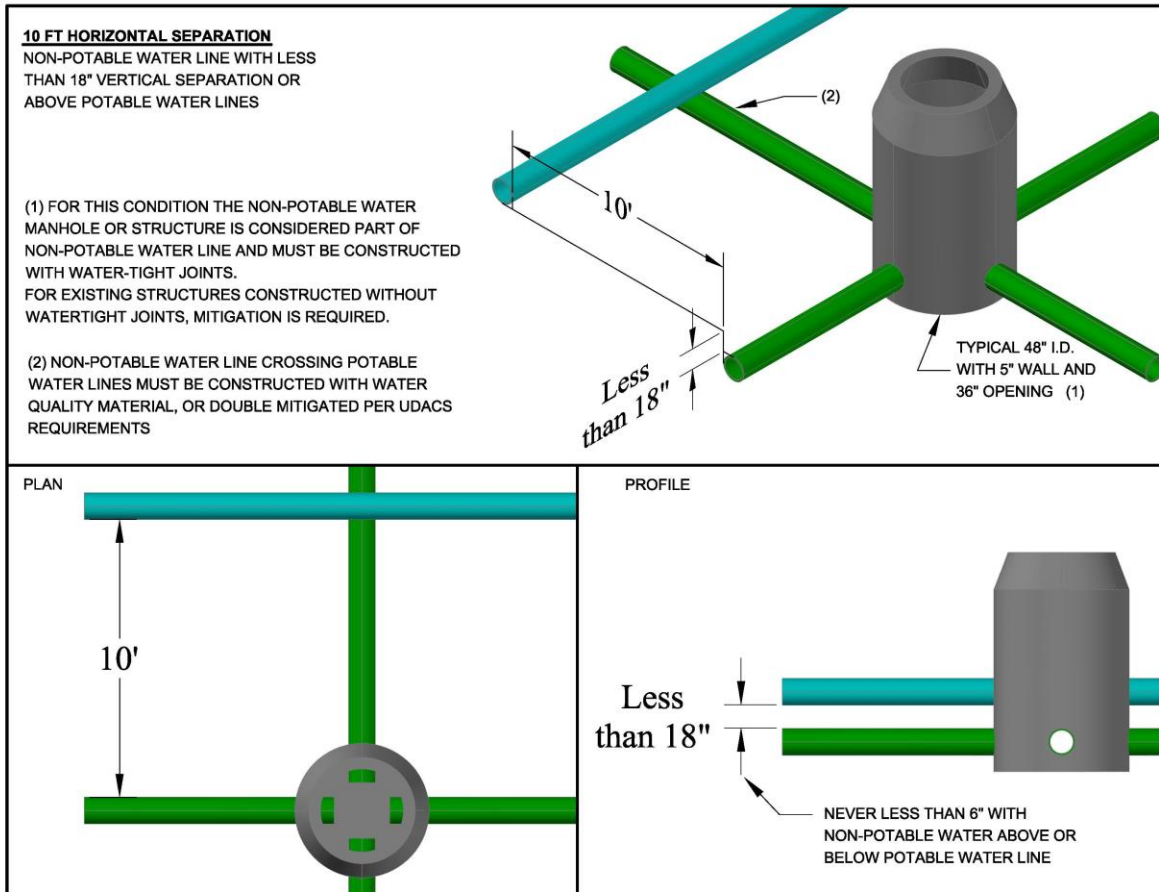
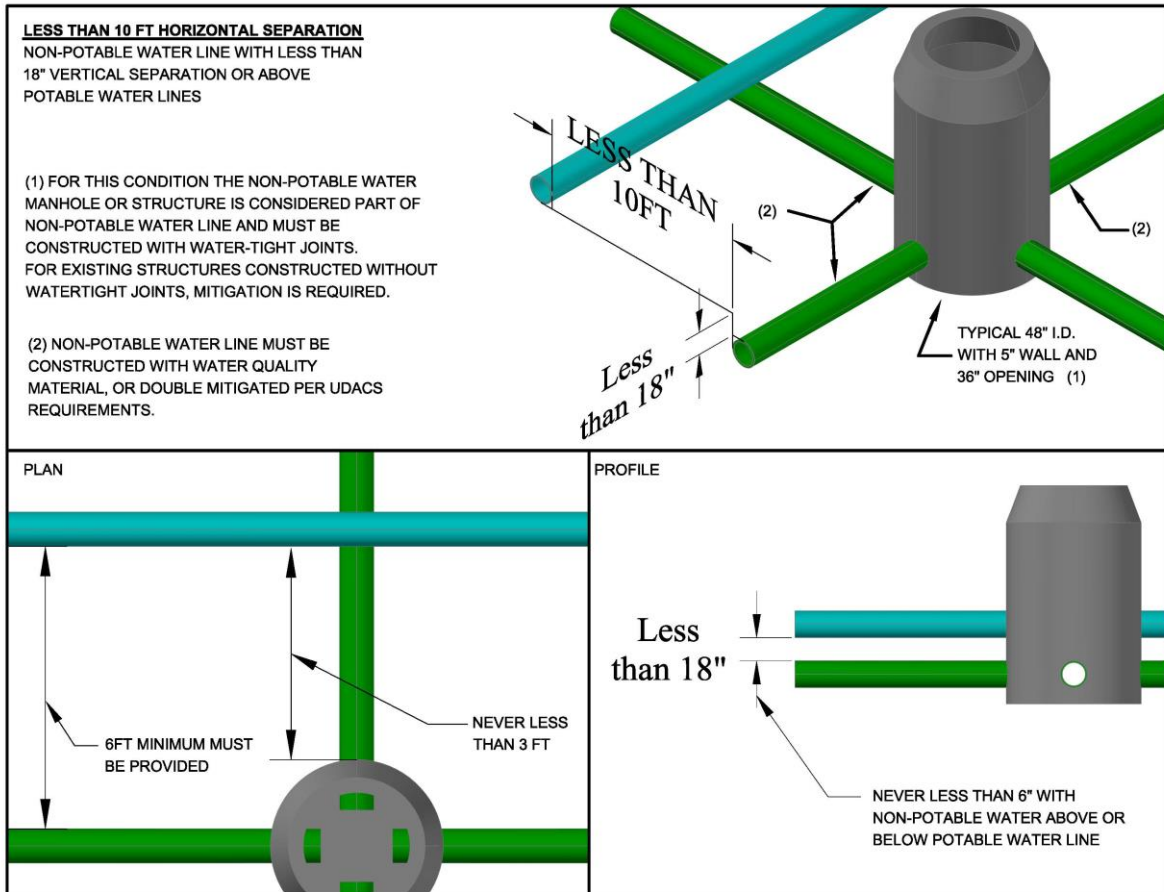


FIGURE 2
WATER MAIN AND NON-POTABLE CROSSING SEPARATIONS
(continued)



CONTINUE TO THE NEXT PAGE

UNIFORM DESIGN AND
CONSTRUCTION STANDARDS
FOR POTABLE WATER
DISTRIBUTION SYSTEMS

SECTION 5

STANDARD
PLATES

CONTINUE TO THE NEXT PAGE

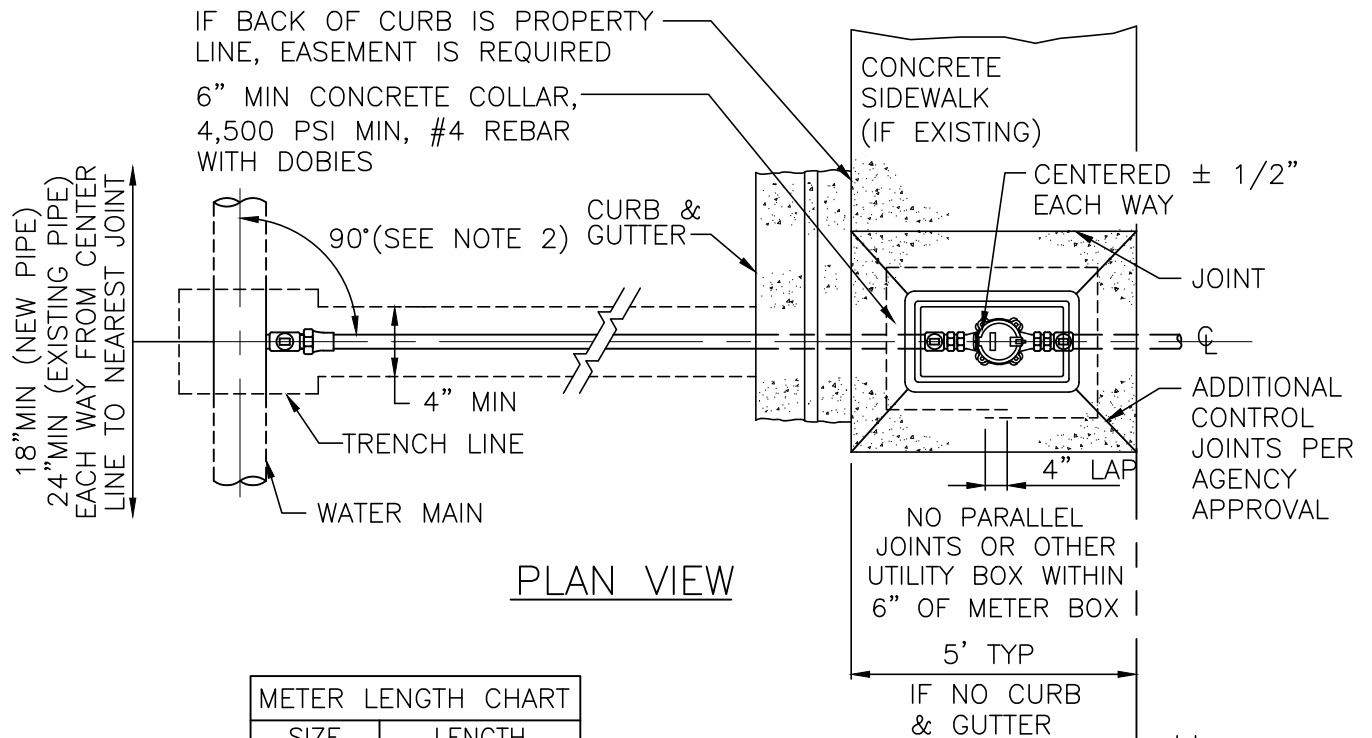
<u>Plate No.</u>	<u>Standard Plate Title</u>
1	New Service Installation with 1" X 3/4" Dual Angle Meter Stops Residential Less than or Equal to 1/4 acre Gross 3/4" Meter Sizes
2	Not used
3	New Service Installation with Dual Angle Meter Stops Commercial & Residential Greater than 1/4 acre Gross 3/4", 1", 1-1/2", and 2" Meter Sizes
4	New Service Installation with Single Angle Meter Stops Commercial & Residential Greater than 1/4 acre Gross 5/8", 3/4", 1", 1-1/2", and 2" Meter Sizes
5	Not used
6	Not used
7	Not used
8	Backflow Prevention Assembly 1" – 2" Diameter
9	Dual Backflow Prevention Assembly 1" – 2" Diameter
10 - 14	Not used
15	Pipe Locator Ribbon and Locator Ball Installation
16	Trench Section Backfill Specification Unimproved Areas
17	Trench Section Backfill Specification Improved Areas
18	Trench Section Backfill Specification Improved and Unimproved Areas (NDOT Street R/W)
19	Trench Section Backfill Specification Notes
20	Over Excavation Trench Detail For 16" and Greater Restrained Pipelines
21	Non-Potable Existing Water Main Crossing
22	Non-Potable New Water Main Crossing
23	Casing Installation

24-29	Not used
30	Anchor Block Details for In-Line Reducers or Gate Valves 6" Through 12" Diameter
31	Thrust Block Installation
32	Chlorination Requirements
33	Not used
34	Excavation for Wet Taps
35	Wet Tap of Existing Steel Mains
36	2" Manual Blow-Off Assembly for PVC or DI Pipe
37	6" Manual Blow-Off Assembly for PVC or DI Pipe (Installation at Low Points on Pipeline)
38	Combination Air Valve Assembly for 2" and 4" Valves (Installation at High Points on Pipeline)
39	Valve Box Installation and Adjustment
40	Fire Hydrant Installation
41	Deep Fire Hydrant Installation
42	Direct Buried 20" and 24" Gate Valves with Bypass on New Pipelines
43-49	Not used
50	New Large Service Installation 3" - 10" Meter Sizes
51-55	Not Used
56	Backflow Prevention Assembly 3" - 10" Diameter
57	Dual Backflow Prevention Assembly 4" - 10" Diameter
58	Dual Conventional Backflow Prevention Assembly 4" - 10" Diameter

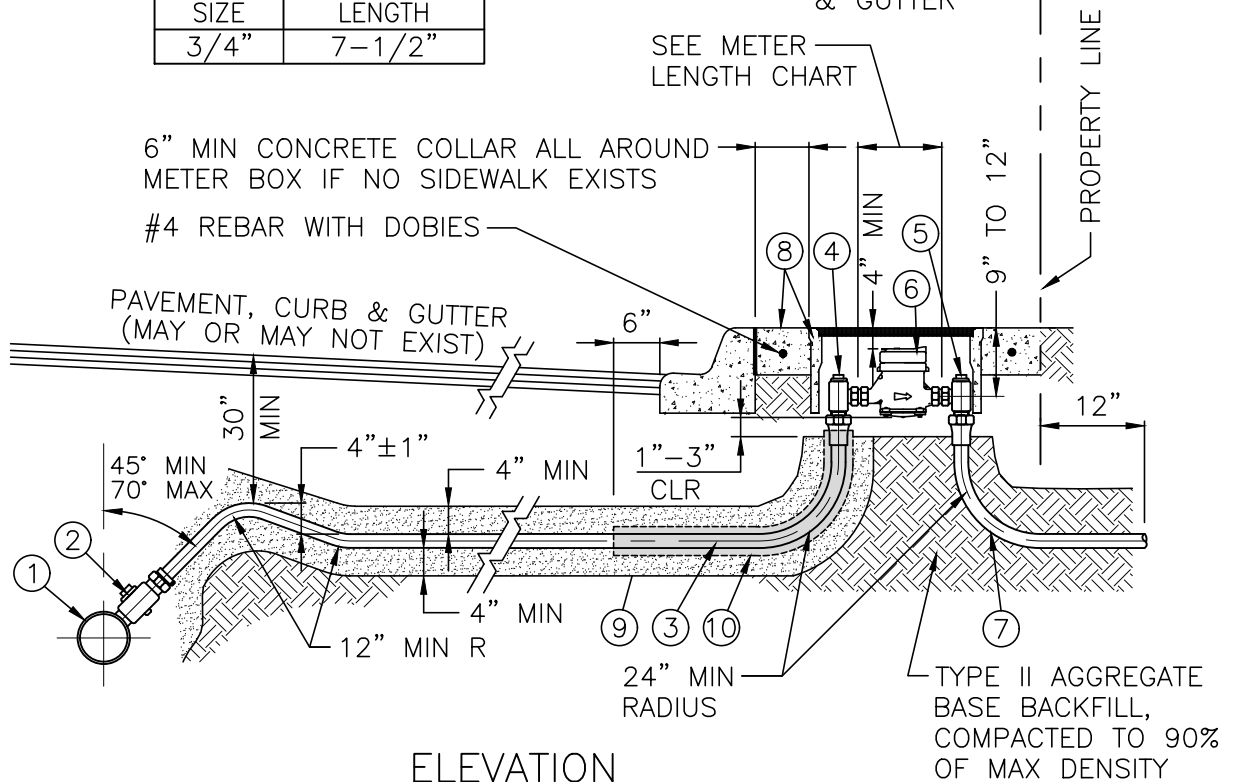
59	Inline Backflow Prevention Assembly 4" - 10" Diameter
60-72	Not used
73	Insulating Flange Detail
74	Not used
75	Vehicular Protection Bollard
C475	Standard Drawing for Meter Vault Plans and Sections

CONTINUE TO THE NEXT PAGE

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



METER LENGTH CHART	
SIZE	LENGTH
3/4"	7-1/2"



FOR NOTES AND LEGEND SEE SHEET 2

NOT
TO
SCALE

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NEW SERVICE INSTALLATION WITH 1" x 3/4" DUAL ANGLE
METER STOPS RESIDENTIAL LESS THAN OR EQUAL TO
1/4 ACRE GROSS 3/4" METER SIZES

PLATE NO.
1
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① SERVICE SADDLE
- ② CORPORATION STOP (BALL TYPE)
- ③ SERVICE LATERAL (1" DIAMETER)
- ④ UPSTREAM 1" x 3/4" BALL ANGLE METER STOP WITH LOCK WING AND WITHOUT LEVER HANDLE
- ⑤ DOWNSTREAM 1" x 3/4" BALL ANGLE METER STOP WITH LOCK WING AND LEVER HANDLE – FEMALE THREAD IPT ON OUTLET
- ⑥ WATER METER, AGENCY SUPPLIED, CONTRACTOR INSTALLED (SEE METER LENGTH CHART)
- ⑦ TAIL PIECE. TAIL PIECE SHALL BE THE SAME SIZE AND MATERIAL AS SERVICE LATERAL UNLESS OTHERWISE SPECIFIED OR IF BACKFLOW ASSEMBLY IS REQUIRED.
- ⑧ METER BOX (1" MIN) INSTALLED TO FINAL GRADE WITH CONCRETE COLLAR, MIN THICKNESS TO MATCH EXISTING/FUTURE SIDEWALK
- ⑨ SAND BACKFILL
- ⑩ PREFORMED POLYFOAM PIPE INSULATION (1/2" MIN), MAY BE USED IN LIEU OF SAND BACKFILL AT METER BOX

NOTES

- 1. ALL CONNECTION TYPES AND MATERIALS ARE AS APPROVED BY THE AGENCY.
- 2. PROTECT SERVICE LATERAL DURING CONSTRUCTION. ENTIRE DAMAGED SERVICE LATERALS WILL REQUIRE LATERAL REPLACEMENT FROM ANGLE METER STOP TO CORPORATION STOP.
- 3. CUL-DE-SAC SERVICE LATERALS MUST FOLLOW THE MOST DIRECT ROUTE POSSIBLE BETWEEN SERVICE SADDLE AND ANGLE METER STOP, HORIZONTAL BENDING RADIUS ALLOWED FOR 1" TUBING IS 12" MIN. MAXIMUM DEFLECTION ANGLE ALLOWED IS 90°.
- 4. FLUSH LATERAL PRIOR TO SETTING METER.
- 5. METERS SHALL BE LOCATED OUTSIDE OF DRIVEWAYS WITHIN EXISTING OR FUTURE SIDEWALK AREAS, OR AS SPECIFIED BY AGENCY.
- 6. ADDITIONAL TRENCH BACKFILL REQUIREMENTS ABOVE SERVICE LATERALS SEE UDACS PLATES 16, 17, 18, AND 19.

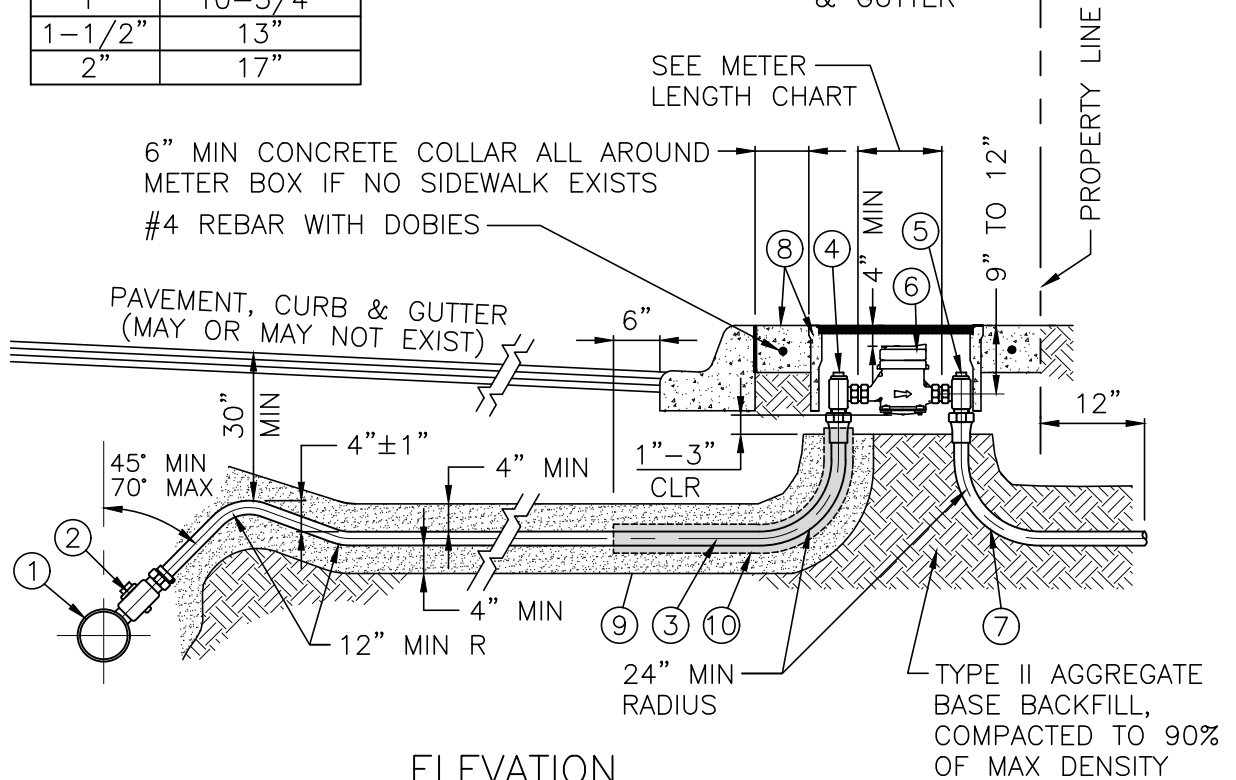
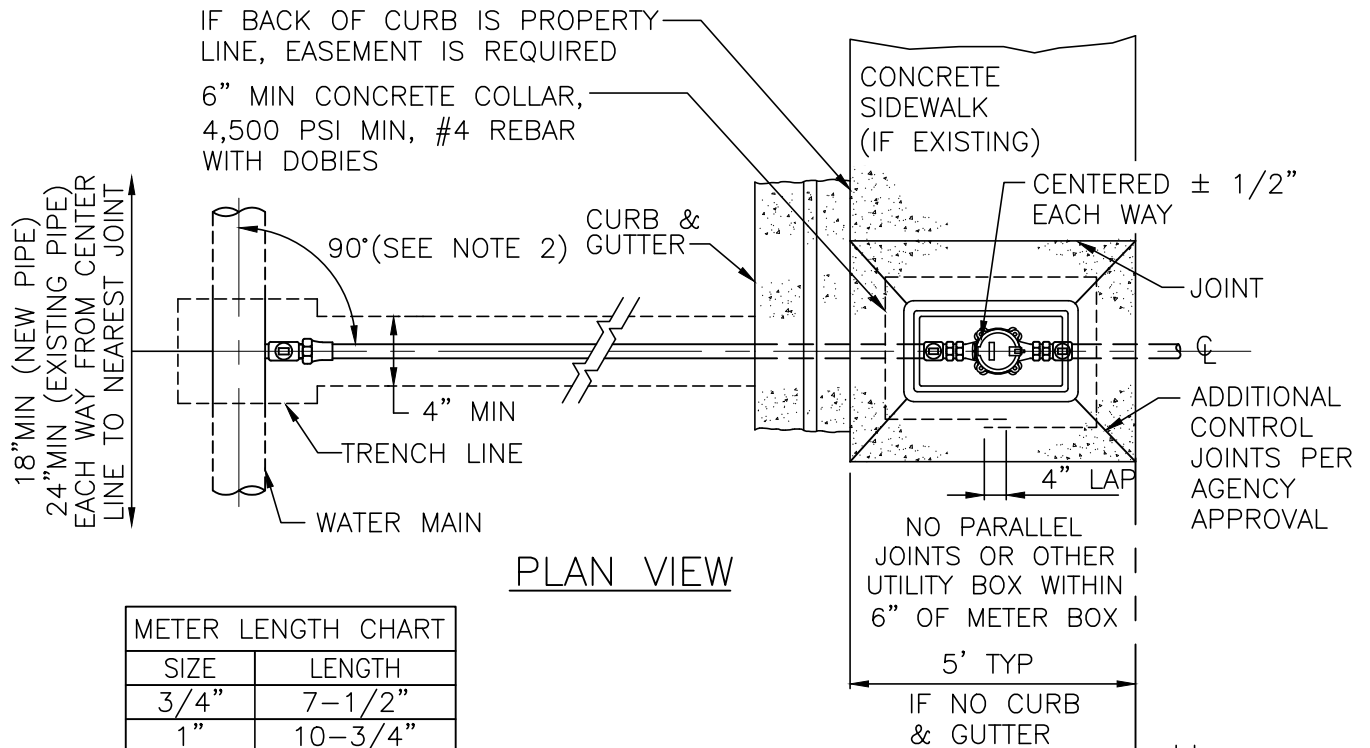
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NEW SERVICE INSTALLATION WITH 1" x 3/4" DUAL ANGLE
METER STOPS RESIDENTIAL LESS THAN OR EQUAL TO
1/4 ACRE GROSS 3/4" METER SIZES

PLATE NO.
1
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



FOR NOTES AND LEGEND SEE SHEET 2

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NEW SERVICE INSTALLATION WITH DUAL ANGLE METER
STOPS COMMERCIAL & RESIDENTIAL GREATER THAN 1/4
ACRE GROSS 3/4", 1", 1-1/2" AND 2" METER SIZES

PLATE NO.
3
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① SERVICE SADDLE
- ② CORPORATION STOP (BALL TYPE)
- ③ SERVICE LATERAL SIZE TO MATCH METER (1" MIN)
- ④ UPSTREAM BALL ANGLE METER STOP TO MATCH METER SIZE (1" x 1" MIN) WITH LOCK WING AND WITHOUT LEVER HANDLE. FOR ALL 3/4" METERS USE A 1" x 3/4" ADAPTER
- ⑤ DOWNSTREAM BALL ANGLE METER STOP TO MATCH METER SIZE (1" x 1" MIN) WITH LOCK WING AND LEVER HANDLE – FEMALE THREAD IPT ON OUTLET
- ⑥ WATER METER, AGENCY SUPPLIED, CONTRACTOR INSTALLED (SEE METER LENGTH CHART)
- ⑦ TAIL PIECE. (1" MIN) TAIL PIECE SHALL BE THE SAME SIZE AND MATERIAL AS SERVICE LATERAL UNLESS OTHERWISE SPECIFIED OR IF BACKFLOW ASSEMBLY IS REQUIRED. INSTALL 1" x 3/4" ADAPTER AT TAIL PIECE FOR 3/4" METERS
- ⑧ METER BOX (SIZE TO MATCH METER, 1" MIN) INSTALLED TO FINAL GRADE WITH CONCRETE COLLAR, MIN THICKNESS TO MATCH EXISTING/FUTURE SIDEWALK
- ⑨ SAND BACKFILL
- ⑩ PREFORMED POLYFOAM PIPE INSULATION (1/2" MIN), MAY BE USED IN LIEU OF SAND BACKFILL AT METER BOX

NOTES

- 1. ALL CONNECTION TYPES AND MATERIALS ARE AS APPROVED BY THE AGENCY.
- 2. PROTECT SERVICE LATERAL DURING CONSTRUCTION. DAMAGED SERVICE LATERALS WILL REQUIRE ENTIRE LATERAL REPLACEMENT FROM ANGLE METER STOP TO CORPORATION STOP.
- 3. CUL-DE-SAC SERVICE LATERALS MUST FOLLOW THE MOST DIRECT ROUTE POSSIBLE BETWEEN SERVICE SADDLE AND ANGLE METER STOP, HORIZONTAL BENDING RADIUS ALLOWED FOR 1" TUBING IS 12" MIN. MAXIMUM DEFLECTION ANGLE ALLOWED IS 90°.
- 4. FLUSH LATERAL PRIOR TO SETTING METER.
- 5. METERS SHALL BE LOCATED OUTSIDE OF DRIVEWAYS WITHIN EXISTING OR FUTURE SIDEWALK AREAS, OR AS SPECIFIED BY AGENCY.
- 6. ADDITIONAL TRENCH BACKFILL REQUIREMENTS ABOVE SERVICE LATERALS SEE UDACS PLATES 16, 17, 18, AND 19.
- 7. ONE ADDITIONAL COMPRESSION COUPLING IS ALLOWED BETWEEN THE CORPORATION STOP, AND THE ANGLE METER STOP IF THE TOTAL LATERAL LENGTH IS GREATER THAN 50' (FOR 1-1/2" OR 2" LATERAL SIZES ONLY). INSTALL LOCATOR BALL AT COUPLING LOCATION WHEN REQUIRED BY AGENCY.

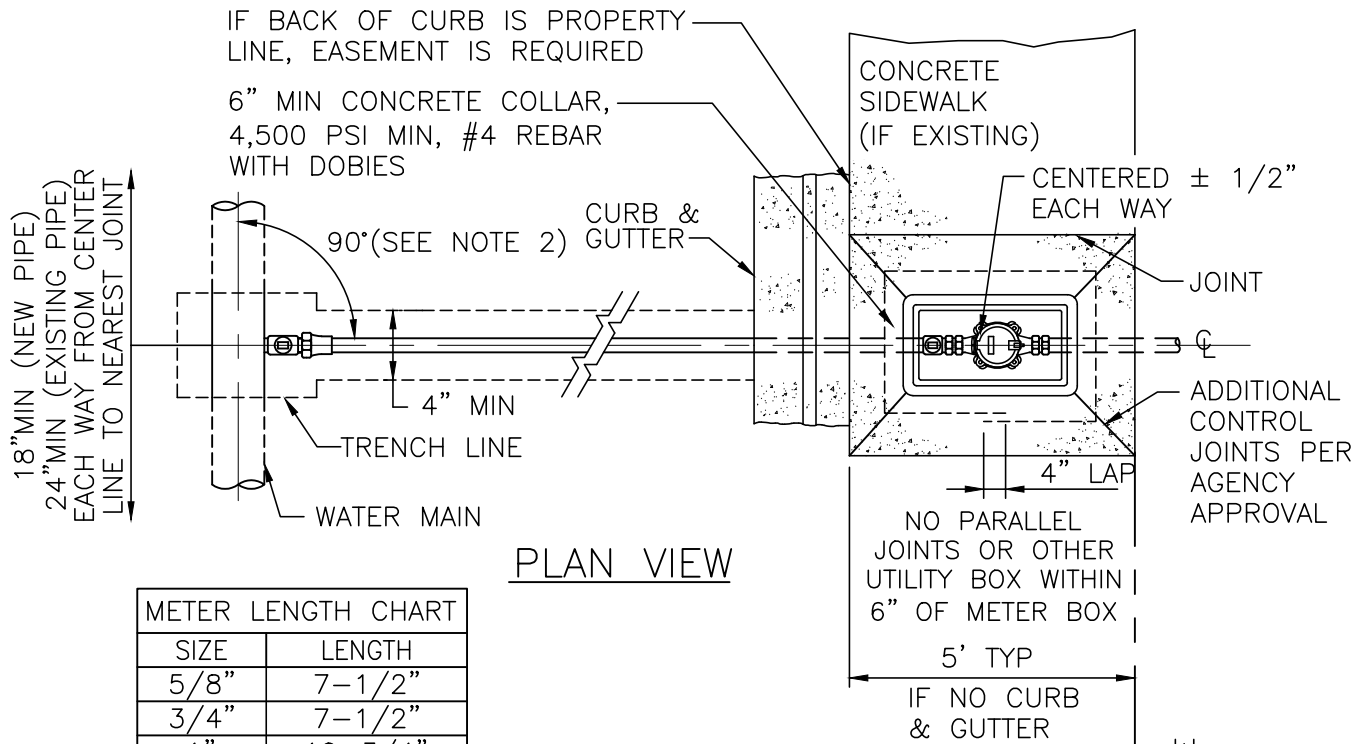
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NEW SERVICE INSTALLATION WITH DUAL ANGLE METER
STOPS COMMERCIAL & RESIDENTIAL GREATER THAN 1/4
ACRE GROSS 3/4", 1", 1-1/2" AND 2" METER SIZES

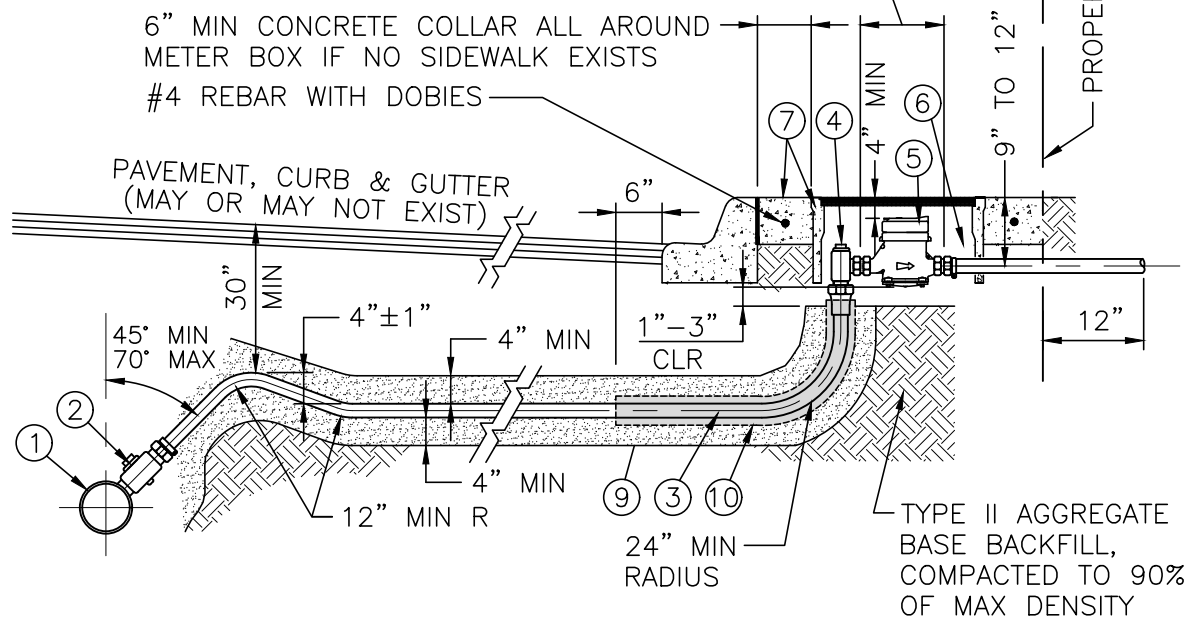
PLATE NO.
3
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



PLAN VIEW

METER LENGTH CHART	
SIZE	LENGTH
5/8"	7-1/2"
3/4"	7-1/2"
1"	10-3/4"
1-1/2"	13"
2"	17"



ELEVATION

FOR NOTES AND LEGEND SEE SHEET 2

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NEW SERVICE INSTALLATION WITH SINGLE ANGLE METER
STOPS COMMERCIAL & RESIDENTIAL GREATER THAN 1/4
ACRE GROSS 5/8", 3/4", 1", 1-1/2" AND 2" METER SIZES

PLATE NO.
4
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① SERVICE SADDLE
- ② CORPORATION STOP (BALL TYPE)
- ③ SERVICE LATERAL. SIZE TO MATCH METER (1" MIN)
- ④ UPSTREAM BALL ANGLE METER STOP TO MATCH METER SIZE (1" x 1" MIN) WITH LOCK WING AND WITHOUT LEVER HANDLE. FOR ALL 5/8" AND 3/4" METERS USE A 1" x 3/4" ADAPTER
- ⑤ WATER METER, AGENCY SUPPLIED, CONTRACTOR INSTALLED (SEE METER LENGTH CHART)
- ⑥ TAIL PIECE (1" MIN). TAIL PIECE SHALL BE THE SAME SIZE AND MATERIAL AS SERVICE LATERAL UNLESS OTHERWISE SPECIFIED (OR IF BACKFLOW ASSEMBLY IS REQUIRED). INSTALL 1" x 3/4" ADAPTER AT TAIL PIECE FOR 5/8" OR 3/4" METERS
- ⑦ METER BOX (SIZE TO MATCH METER, 1" MIN) INSTALLED TO FINAL GRADE WITH CONCRETE COLLAR, MIN THICKNESS TO MATCH EXISTING/FUTURE SIDEWALK
- ⑧ SAND BACKFILL
- ⑨ PREFORMED POLYFOAM PIPE INSULATION (1/2" MIN), MAY BE USED IN LIEU OF SAND BACKFILL AT METER BOX

NOTES

- 1. ALL CONNECTION TYPES AND MATERIALS ARE AS APPROVED BY THE AGENCY.
- 2. PROTECT SERVICE LATERAL DURING CONSTRUCTION. DAMAGED SERVICE LATERALS WILL REQUIRE ENTIRE LATERAL REPLACEMENT FROM ANGLE METER STOP TO CORPORATION STOP.
- 3. CUL-DE-SAC SERVICE LATERALS MUST FOLLOW THE MOST DIRECT ROUTE POSSIBLE BETWEEN SERVICE SADDLE AND ANGLE METER STOP, HORIZONTAL BENDING RADIUS ALLOWED FOR 1" TUBING IS 12" MIN. MAXIMUM DEFLECTION ANGLE ALLOWED IS 90°.
- 4. USE OF 5/8" METERS NOT APPROVED BY ALL AGENCIES.
- 5. FLUSH LATERAL PRIOR TO SETTING METER.
- 6. METERS SHALL BE LOCATED OUTSIDE OF DRIVEWAYS WITHIN EXISTING OR FUTURE SIDEWALK AREAS, OR AS SPECIFIED BY AGENCY.
- 7. ADDITIONAL TRENCH BACKFILL REQUIREMENTS ABOVE SERVICE LATERALS SEE UDACS PLATES 16, 17, 18, AND 19.
- 8. ONE ADDITIONAL COMPRESSION COUPLING IS ALLOWED BETWEEN THE CORPORATION STOP, AND THE ANGLE METER STOP IF THE TOTAL LATERAL LENGTH IS GREATER THAN 50' (FOR 1-1/2" OR 2" LATERAL SIZES ONLY). INSTALL LOCATOR BALL AT COUPLING LOCATION WHEN REQUIRED BY AGENCY.

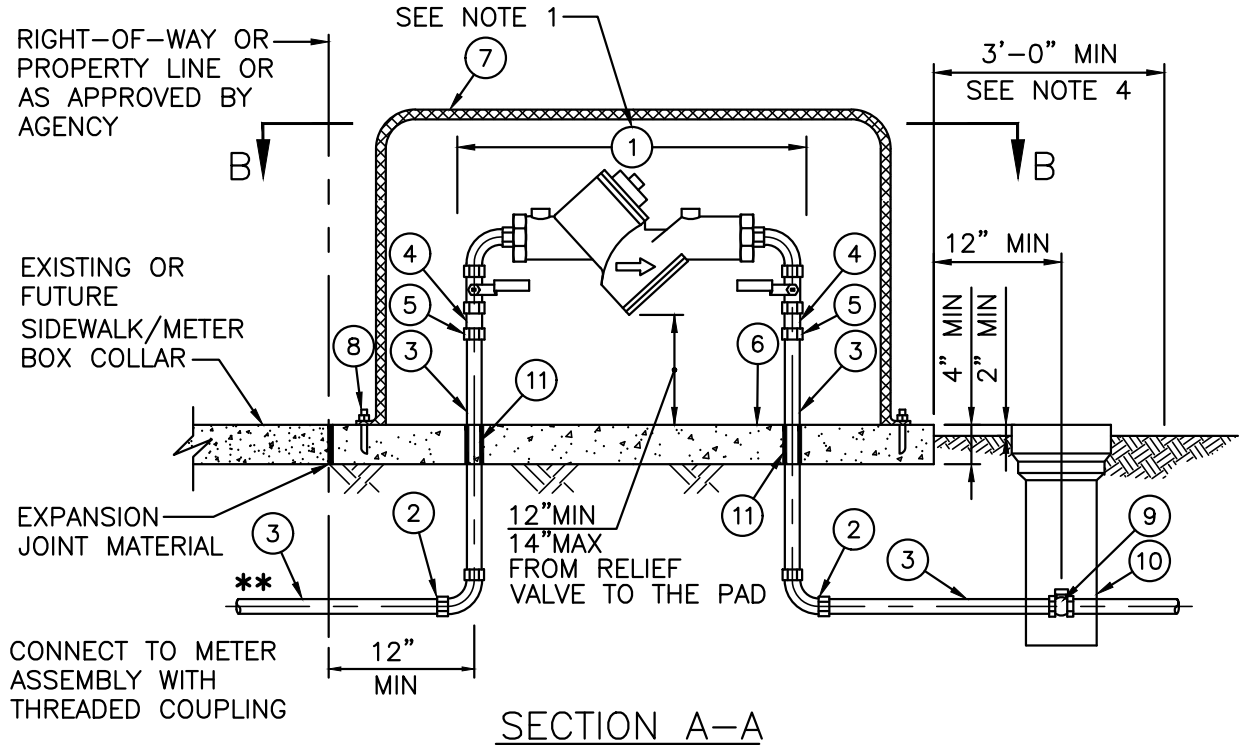
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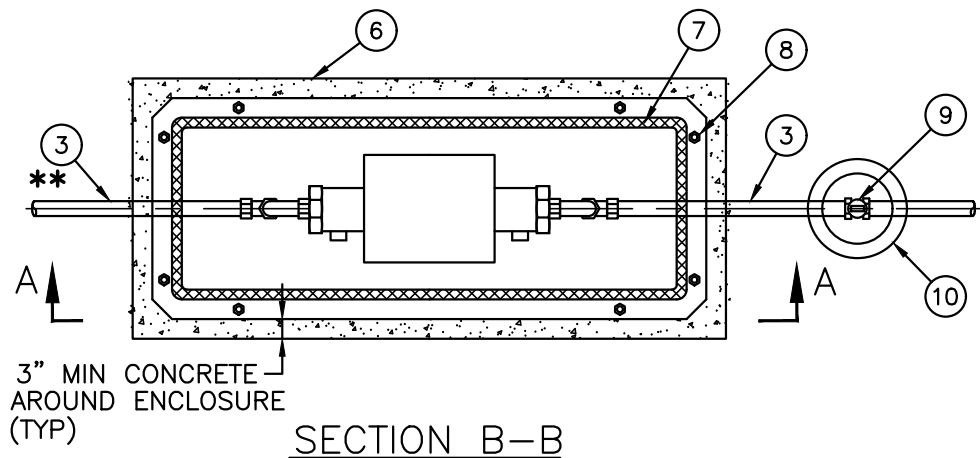
NEW SERVICE INSTALLATION WITH SINGLE ANGLE METER
STOPS COMMERCIAL & RESIDENTIAL GREATER THAN 1/4
ACRE GROSS 5/8", 3/4", 1", 1-1/2" AND 2" METER SIZES

PLATE NO.
4
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



** DEPENDING ON CONFIGURATION, ONE (1) BRASS 90° HORIZONTAL BEND (IPF x IPF) MAY BE INSTALLED BETWEEN METER AND BACKFLOW ASSEMBLY, PER AGENCY APPROVAL.



FOR ADDITIONAL NOTES AND LEGEND SEE SHEET 2

(IPF = IRON PIPE FEMALE, IPM = IRON PIPE MALE, TBE = THREADED BOTH ENDS)

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BACKFLOW PREVENTION ASSEMBLY
1" - 2" DIAMETER

PLATE NO.
8
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① APPROVED BACKFLOW ASSEMBLY
- ② BRASS 90° BEND – IRON PIPE THREAD (IPF x IPF)
- ③ BRASS PIPE – STANDARD – TBE
- ④ BRASS CLOSE NIPPLE
- ⑤ BRASS UNION – IRON PIPE THREAD (IPF x IPF), IF NOT PROVIDED WITH ASSEMBLY
- ⑥ CONCRETE PAD – 4,500 PSI MIN
- ⑦ AGENCY APPROVED ENCLOSURE
- ⑧ ANCHOR PER MANUFACTURERS REQUIREMENTS
- ⑨ BRASS CURB STOP SHUT-OFF, 6" SCHEDULE 80 PVC TOE NIPPLE (THREAD x SLIP) AND A SCH 80 PVC COUPLING FOR CONNECTION TO EXISTING ONSITE PVC PIPING. DIELECTRIC CONNECTION REQUIRED WHEN EXISTING ONSITE PIPING IS METALLIC. INSTALL WITHIN EASEMENT WHEN REQUIRED BY AGENCY
- ⑩ 6" DIA BOX IN NON-PAVED AREAS OR TOP SECTION OF STANDARD VALVE BOX MODIFIED WITH V-NOTCH FOR LATERAL AND VALVE IN PAVED AREAS, PER AGENCY APPROVAL
- ⑪ WRAP BRASS PIPE WITH 10 MIL DIELECTRIC TAPE WITH 1/2 OVERLAP TO PREVENT BONDING

NOTES

- 1. APPROVED BACKFLOW PREVENTION DEVICE INCLUDING ABOVE GRADE PIPING NOT TO BE PAINTED.
- 2. INSTALL BOLLARDS AS REQUIRED. SEE UDACS PLATE 75.
- 3. INSTALL TYPE II AGGREGATE BASE BACKFILL COMPACTED TO 90% OF MAX DENSITY UNDER CONCRETE PAD OR PER AGENCY REQUIREMENTS
- 4. IN ORDER TO ALLOW FOR ACCESS AND MAINTENANCE OF BACKFLOW ASSEMBLIES A MINIMUM OF THREE (3) FEET ADJACENT TO BACKFLOW ASSEMBLY PAD SHALL BE LEVEL AND FREE OF SHRUBBERY AND OBSTRUCTIONS (TYP).
- 5. SECURITY LOCKDOWN DEVICES PER AGENCY APPROVAL.
- 6. IDENTIFICATION TAG ON BACKFLOW ENCLOSURE MAY BE REQUIRED BY AGENCY.
- 7. NO OUTLET, TEE, TAP, TAKE-OFF OR OTHER CONNECTION BETWEEN THE SERVICE CONNECTION AND THE BACKFLOW PREVENTION DEVICE, IN ACCORDANCE WITH NAC 445A.67235

(IPF = IRON PIPE FEMALE, IPM = IRON PIPE MALE, TBE = THREADED BOTH ENDS)

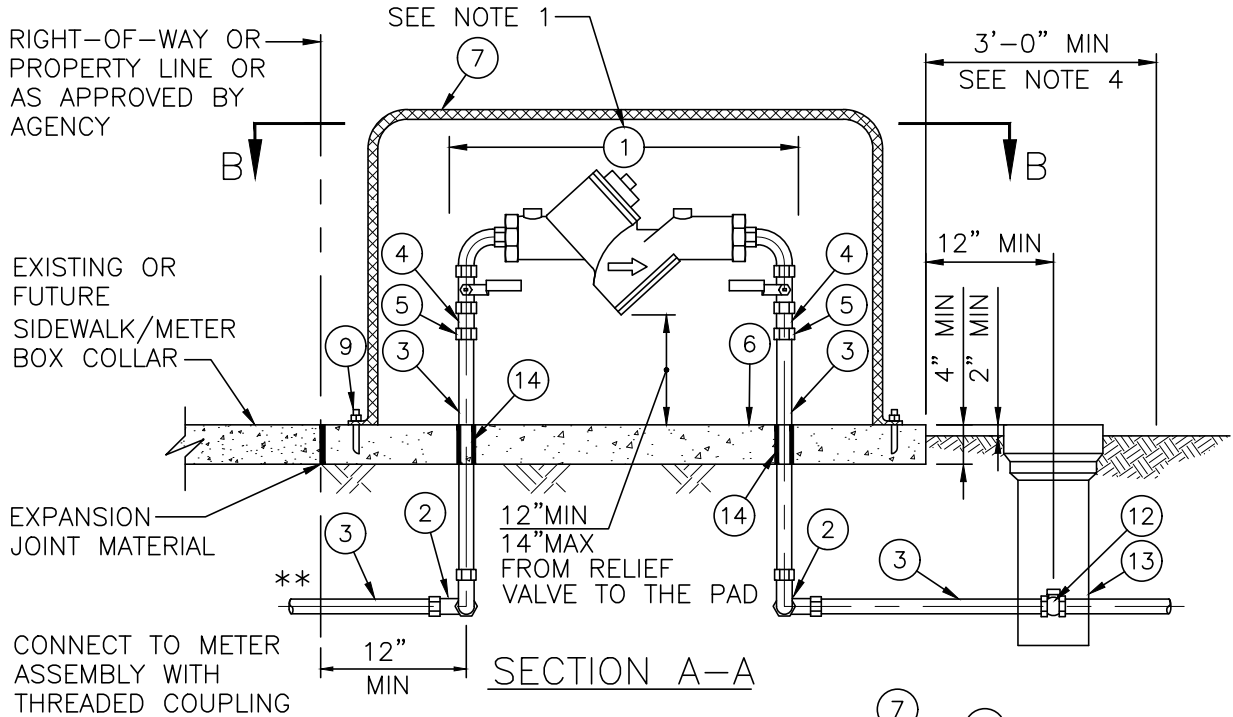
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BACKFLOW PREVENTION ASSEMBLY
1" – 2" DIAMETER

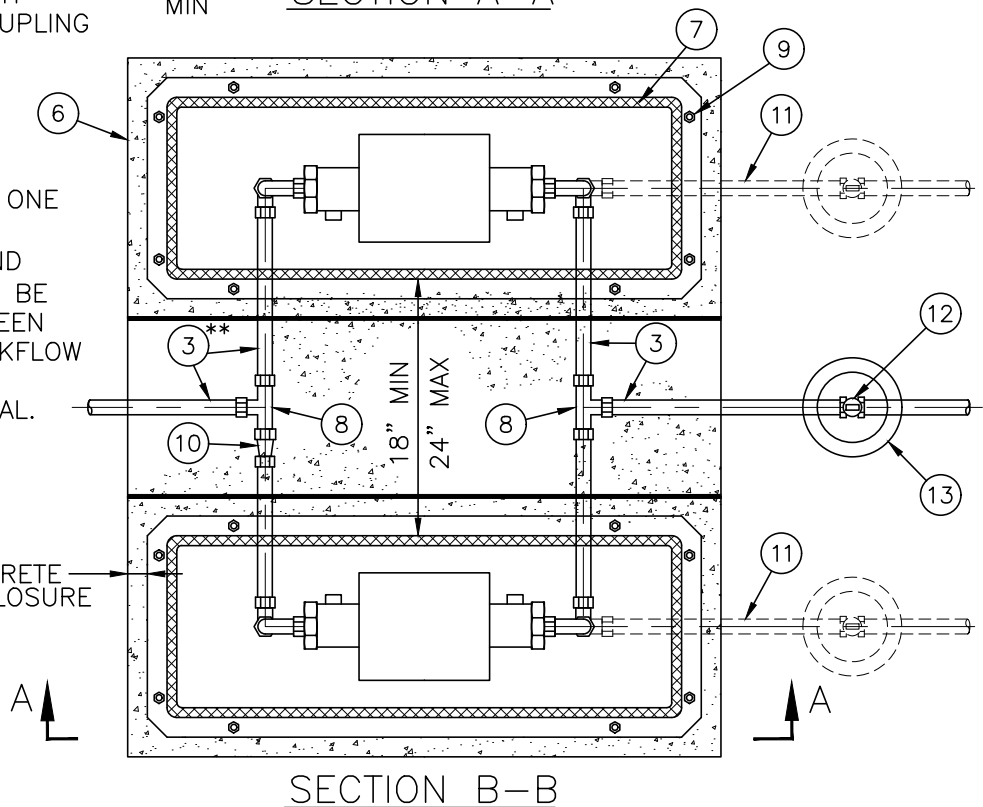
PLATE NO.
8
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



**
DEPENDENT ON
CONFIGURATION, ONE
(1) BRASS 90°
HORIZONTAL BEND
(IPF x IPF) MAY BE
INSTALLED BETWEEN
METER AND BACKFLOW
ASSEMBLY, PER
AGENCY APPROVAL.

3" MIN CONCRETE
AROUND ENCLOSURE
(TYP)



FOR ADDITIONAL NOTES AND LEGEND SEE SHEET 2

(IPF = IRON PIPE FEMALE, IPM = IRON PIPE MALE, TBE = THREADED BOTH ENDS)

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DUAL BACKFLOW PREVENTION ASSEMBLY
1" - 2" DIAMETER

PLATE NO.
9
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① APPROVED BACKFLOW ASSEMBLY
- ② BRASS 90° BEND – IRON PIPE THREAD (IPF x IPF)
- ③ BRASS PIPE – STANDARD – TBE
- ④ BRASS CLOSE NIPPLE
- ⑤ BRASS UNION – IRON PIPE THREAD (IPF x IPF), IF NOT PROVIDED WITH ASSEMBLY
- ⑥ CONCRETE PAD – 4,500 PSI MIN
- ⑦ AGENCY APPROVED ENCLOSURE
- ⑧ BRASS TEE (IPF x IPF x IPF)
- ⑨ ANCHOR PER MANUFACTURERS REQUIREMENTS
- ⑩ REDUCER (IF REQUIRED)
- ⑪ ALTERNATE PIPE ROUTING
- ⑫ BRASS CURB STOP SHUT-OFF, 6" SCHEDULE 80 PVC TOE NIPPLE (THREAD x SLIP) AND A SCH 80 PVC COUPLING FOR CONNECTION TO EXISTING ONSITE PVC PIPING. DIELECTRIC CONNECTION REQUIRED WHEN EXISTING ONSITE PIPING IS METALLIC. INSTALL WITHIN EASEMENT WHEN REQUIRED BY AGENCY
- ⑬ 6" DIA. BOX IN NON-PAVED AREAS OR TOP SECTION OF STANDARD VALVE BOX MODIFIED WITH V-NOTCH FOR LATERAL AND VALVE IN PAVED AREAS, PER AGENCY APPROVAL
- ⑭ WRAP BRASS PIPE WITH 10 MIL DIELECTRIC TAPE WITH 1/2 OVERLAP TO PREVENT BONDING

NOTES

1. APPROVED BACKFLOW PREVENTION DEVICE INCLUDING ABOVE GRADE PIPING NOT TO BE PAINTED.
2. INSTALL BOLLARDS AS REQUIRED. SEE UDACS PLATE 75.
3. INSTALL TYPE II AGGREGATE BASE BACKFILL COMPACTED TO 90% OF MAX DENSITY UNDER CONCRETE PAD OR PER AGENCY REQUIREMENTS
4. IN ORDER TO ALLOW FOR ACCESS AND MAINTENANCE OF BACKFLOW ASSEMBLIES A MINIMUM OF THREE (3) FEET ADJACENT TO BACKFLOW ASSEMBLY PAD SHALL BE LEVEL AND FREE OF SHRUBBERY AND OBSTRUCTIONS (TYP).
5. SECURITY LOCKDOWN DEVICES PER AGENCY APPROVAL.
6. IDENTIFICATION TAG ON BACKFLOW ENCLOSURE MAY BE REQUIRED BY AGENCY.
7. NO OUTLET, TEE, TAP, TAKE-OFF OR OTHER CONNECTION BETWEEN THE SERVICE CONNECTION AND THE BACKFLOW PREVENTION DEVICE, IN ACCORDANCE WITH NAC 445A.67235
(IPF = IRON PIPE FEMALE, IPM = IRON PIPE MALE, TBE = THREADED BOTH ENDS)

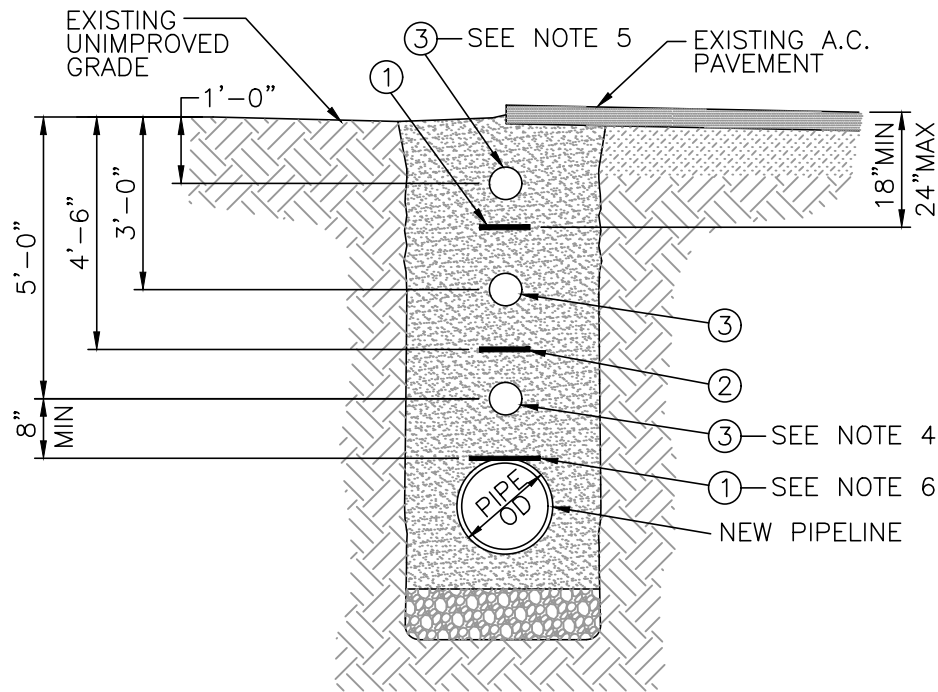
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DUAL BACKFLOW PREVENTION ASSEMBLY
1" – 2" DIAMETER

PLATE NO.
9
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



- ① PIPE LOCATOR RIBBON - 3" WIDTH
- ② PIPE LOCATOR RIBBON - 3" WIDTH (INSTALLED WHEN COVER OF NEW PIPELINE IS 7'-0" OR GREATER)
- ③ LOCATOR BALL - SEE NOTES

NOTES

1. CENTER PIPE LOCATOR RIBBON IN TRENCH AND PLACE OVER ENTIRE LENGTH OF ALL TYPES, MATERIALS, SIZES AND LOCATIONS OF WATER MAINS. RIBBON TYPE AND STYLE (METALLIC OR MAGNETIC) TO BE APPLIED PER AGENCY APPROVAL.
2. INSTALL LOCATOR BALLS AT ALL HORIZONTAL FITTINGS, REDUCERS, CAPS, TEST STATIONS, AT EACH JOINT ALONG DEFLECTED SECTIONS OF PIPELINE, AND EVERY 400 FEET OF PIPELINE. LOCATOR BALLS SHALL BE AGENCY APPROVED. (NOT ALL AGENCIES REQUIRE LOCATOR BALLS)
3. IF A.C. PAVEMENT EXISTS INSTALL LOCATOR BALL AT 3'-0" (TYP).
4. IF A CUT TO FINISH GRADE IS ANTICIPATED INSTALL LOCATOR BALLS AT BOTH 3'-0" AND 5'-0" (TYP).
5. IF A FILL TO FINISH GRADE IS ANTICIPATED INSTALL LOCATOR BALLS AT BOTH 1'-0" AND 3'-0" (TYP).
6. LOCATOR RIBBON IDENTIFYING RESTRAINED PIPE/JOINTS OR HIGH PRESSURE PIPE TO BE TAPED EVERY 20 FEET DIRECTLY TO TOP OF PIPE OR USE SELF-ADHERING RIBBON.

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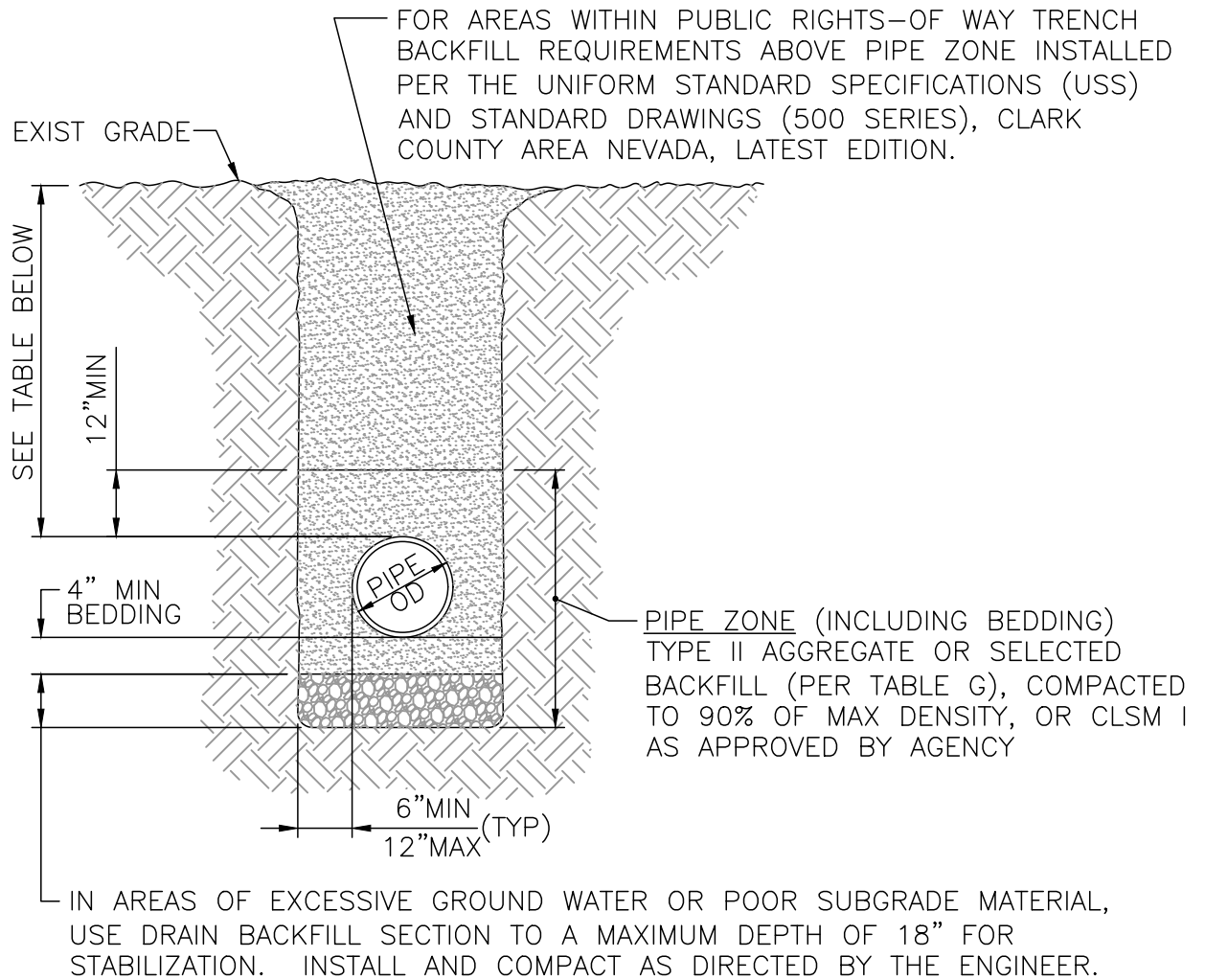
PIPE LOCATOR RIBBON AND LOCATOR BALL INSTALLATION

PLATE NO.

15

SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES:

1. TRENCH SECTION NOTES, SEE UDACS PLATE 19.
2. THE AGENCY MAY REQUIRE AN ADDITIONAL TWO (2) FEET OF COVER IN ADDITION TO THE COVER SPECIFIED BELOW FOR PIPES 16" AND GREATER IN RIGHT-OF-WAY WITHOUT AN ESTABLISHED STREET GRADE.
3. ADDITIONAL TRENCH REQUIREMENTS FOR 16" PIPES AND GREATER, SEE UDACS PLATE 20.

PIPE DIAMETER (INCHES)	DEPTH OF COVER (INCHES)
10" PIPES AND SMALLER	60" MIN
12" PIPES AND GREATER	72" MIN

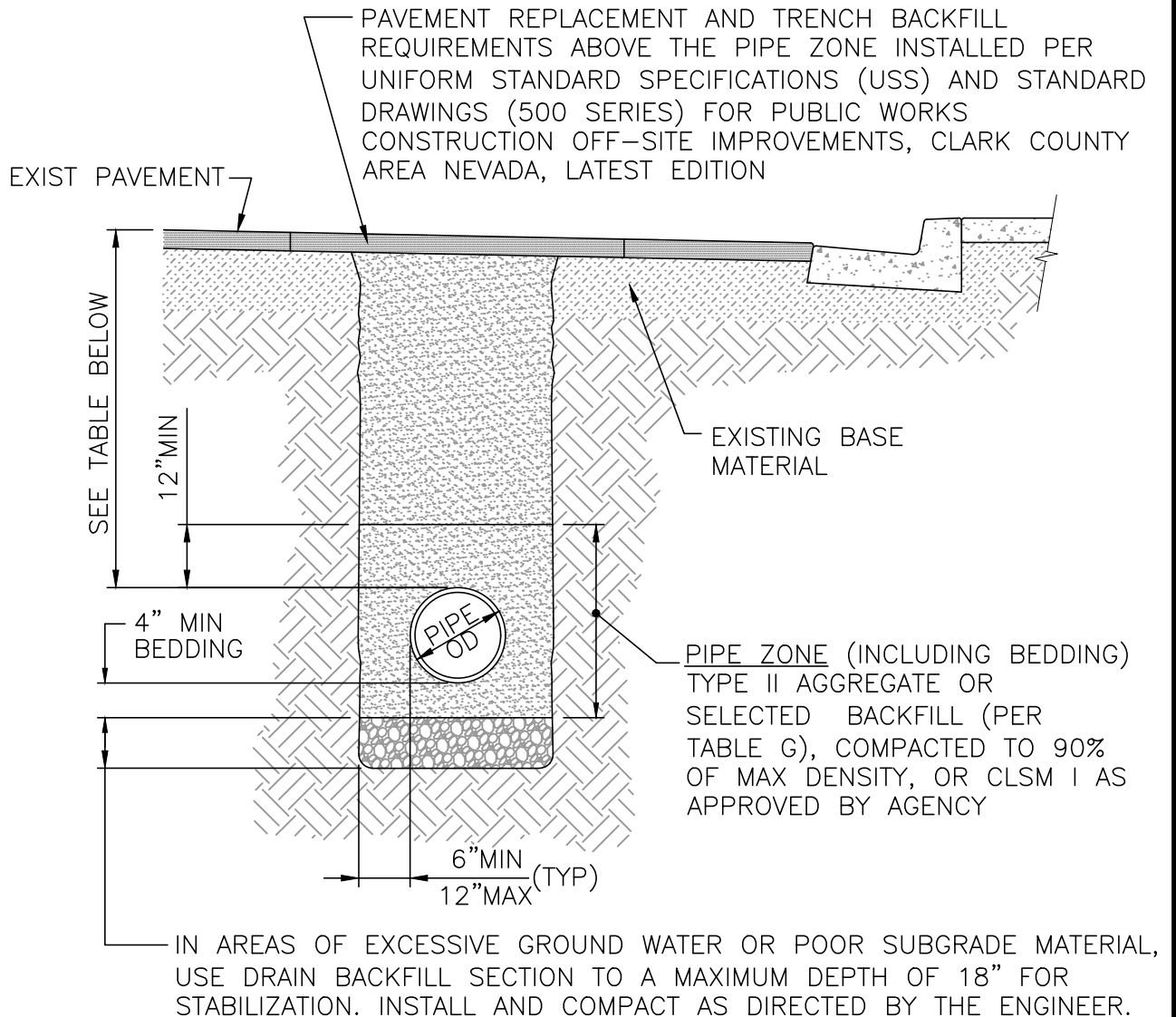
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TRENCH SECTION BACKFILL SPECIFICATION
UNIMPROVED AREAS

PLATE NO.
16
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES:

1. TRENCH SECTION NOTES, SEE UDACS PLATE 19.
2. ADDITIONAL TRENCH REQUIREMENT FOR 16" PIPES AND GREATER, SEE UDACS PLATE 20.

ROW (FEET)	PIPE DIAMETER (INCHES)	DEPTH OF COVER (INCHES)
60' OR LESS	10" PIPES AND SMALLER	42" MIN
60' OR LESS	GREATER THAN OR EQUAL TO 12" PIPES	60" MIN
GREATER THAN 60'	10" PIPES AND SMALLER	48" MIN
GREATER THAN 60'	12" PIPES	60" MIN
GREATER THAN 60'	PIPES GREATER THAN 12"	72" MIN

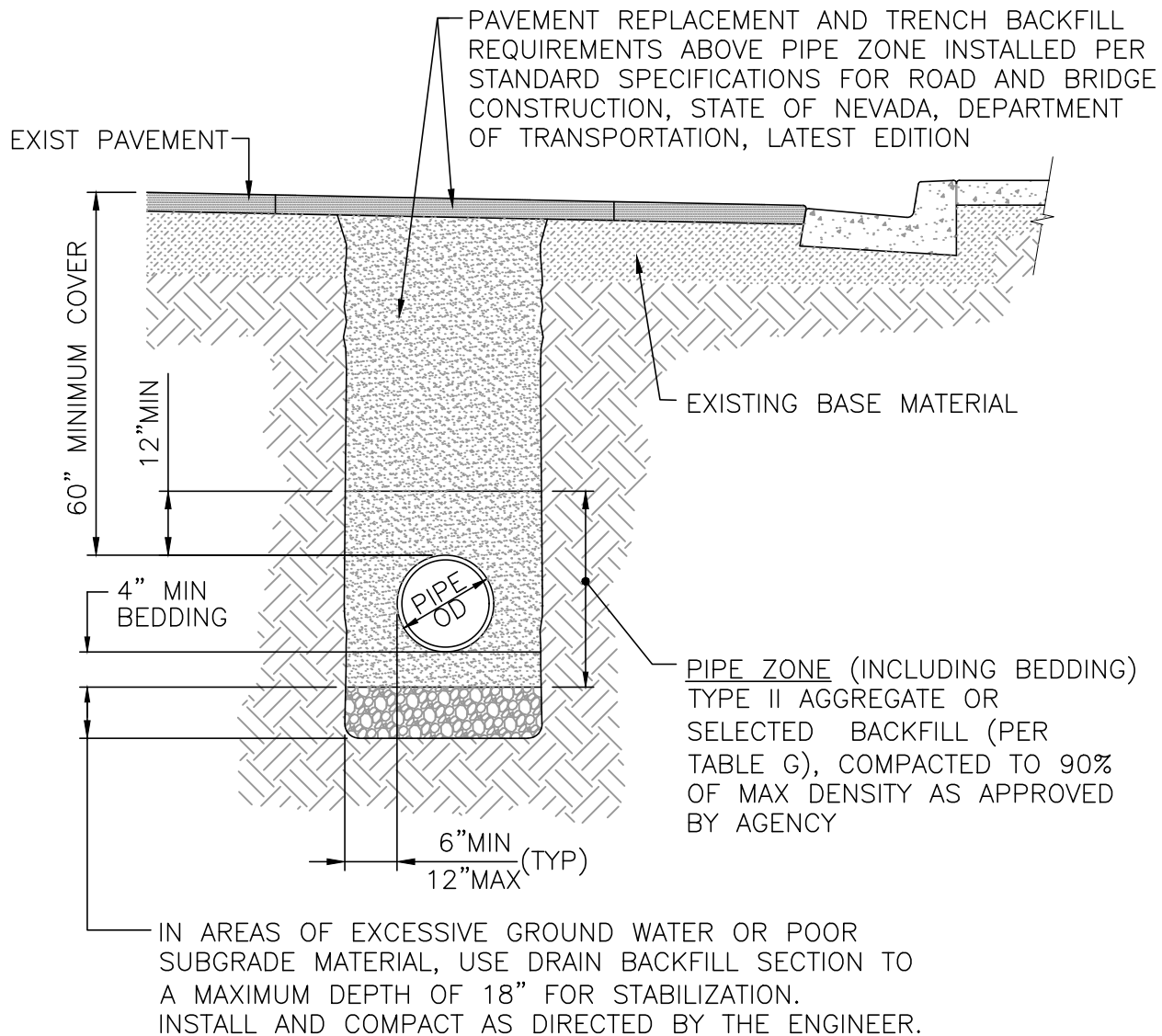
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TRENCH SECTION BACKFILL SPECIFICATION
IMPROVED AREAS

PLATE NO.
17
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES:

1. TRENCH SECTION NOTES, SEE UDACS PLATE 19.
2. ADDITIONAL TRENCH REQUIREMENT FOR 16" PIPES AND GREATER, SEE UDACS PLATE 20.

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TRENCH SECTION BACKFILL SPECIFICATION
IMPROVED AND UNIMPROVED AREAS
(NDOT STREET R/W)

PLATE NO.
18
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

NOTES:

1. REFERENCES:

UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS
CONSTRUCTION OFF-SITE IMPROVEMENTS CLARK COUNTY AREA
NEVADA, LATEST EDITION. (USS AND USD REFERENCES)

INTERAGENCY QUALITY ASSURANCE COMMITTEE (IQAC)

2. ACCEPTABLE METHODS OF COMPACTION

A. BEDDING AND PIPE ZONE AREAS

MECHANICAL COMPACTION OR CLSM I
(AS APPROVED BY AGENCY)

B. ABOVE PIPE ZONE

MECHANICAL COMPACTION OR CLSM I
MECHANICAL COMPACTION ONLY FOR A MINIMUM OF TOP
16" IN PAVED AREAS (AS APPROVED BY AGENCY)

C. NDOT RIGHT-OF-WAY: SEE NDOT PERMIT TERMS AND CONDITIONS

3. CONTRACTOR SHALL ADHERE TO ALL LOCAL, STATE AND FEDERAL SAFETY STANDARDS AND PERMITTING REQUIREMENTS.
4. DURING CONSTRUCTION 24" MINIMUM COVER MUST BE MAINTAINED FROM TOP OF PIPE TO GRADE.
5. MINIMUM COVER IS REFERENCED TO FUTURE FINISHED FINAL GRADES AT PIPE OR TOP OF CASING UNLESS OTHERWISE SHOWN ON PROFILE DRAWINGS.
6. DIAGONAL PAVEMENT REPLACEMENT IS NOT PERMITTED.
7. PLACE/INSTALL PIPE LOCATOR RIBBON AND LOCATOR BALLS PER UDACS PLATE 15. (AS REQUIRED BY AGENCY)
8. INSTALL CONCRETE DAMS AT MAXIMUM INTERVALS OF 400' TO THE HEIGHT OF THE DRAIN ROCK. (AS REQUIRED BY AGENCY)
9. IN THE EVENT OF A CONFLICT BETWEEN THE ABOVE REQUIREMENTS AND THE NDOT PERMIT, THE PERMIT REQUIREMENTS WILL TAKE PRECEDENCE.
10. PLACEMENT OF CSLM I AS APPROVED BY AGENCY.

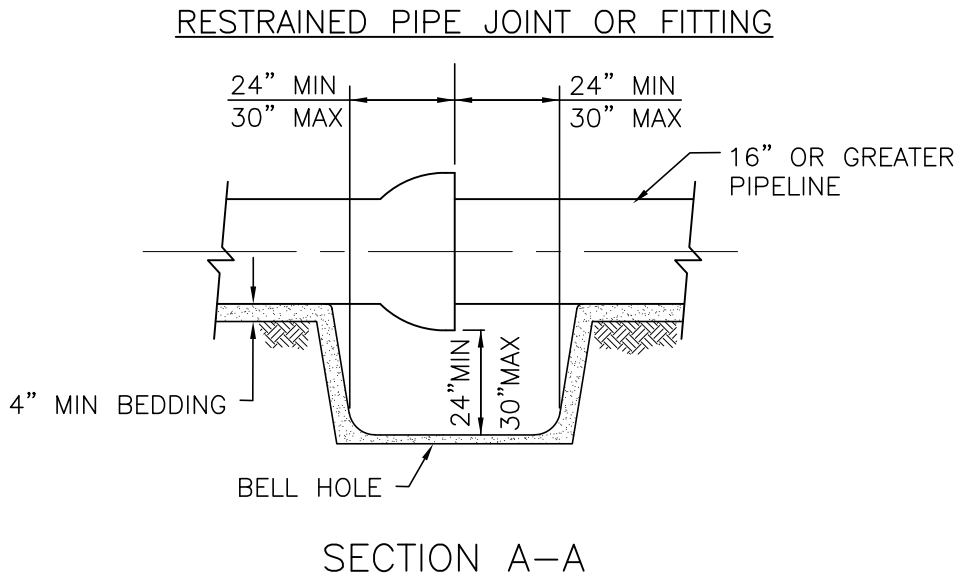
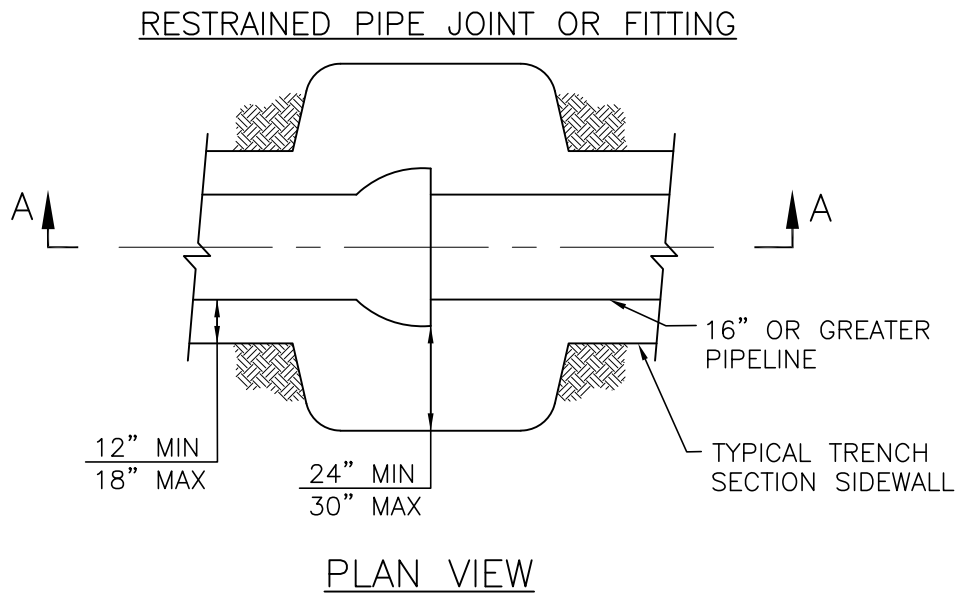
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TRENCH SECTION BACKFILL SPECIFICATION
NOTES

PLATE NO.
19
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES

1. BELL HOLES TO BE EXCAVATED HORIZONTALLY 24" MIN TO 30" MAX FROM OUTER EDGE OF BELL FOR 16" PIPES AND GREATER.
2. CONTRACTOR TO PROVIDE OSHA COMPLIANT SHORING, SLOPING, BENCHING AND TRENCH ACCESS. INSPECTOR MAY FAIL INSPECTION IF SAFE CONDITIONS AND ACCESS ARE NOT PROVIDED.
3. ADDITIONAL TRENCH AND COMPACTION REQUIREMENTS, SEE UDACS PLATE 19.

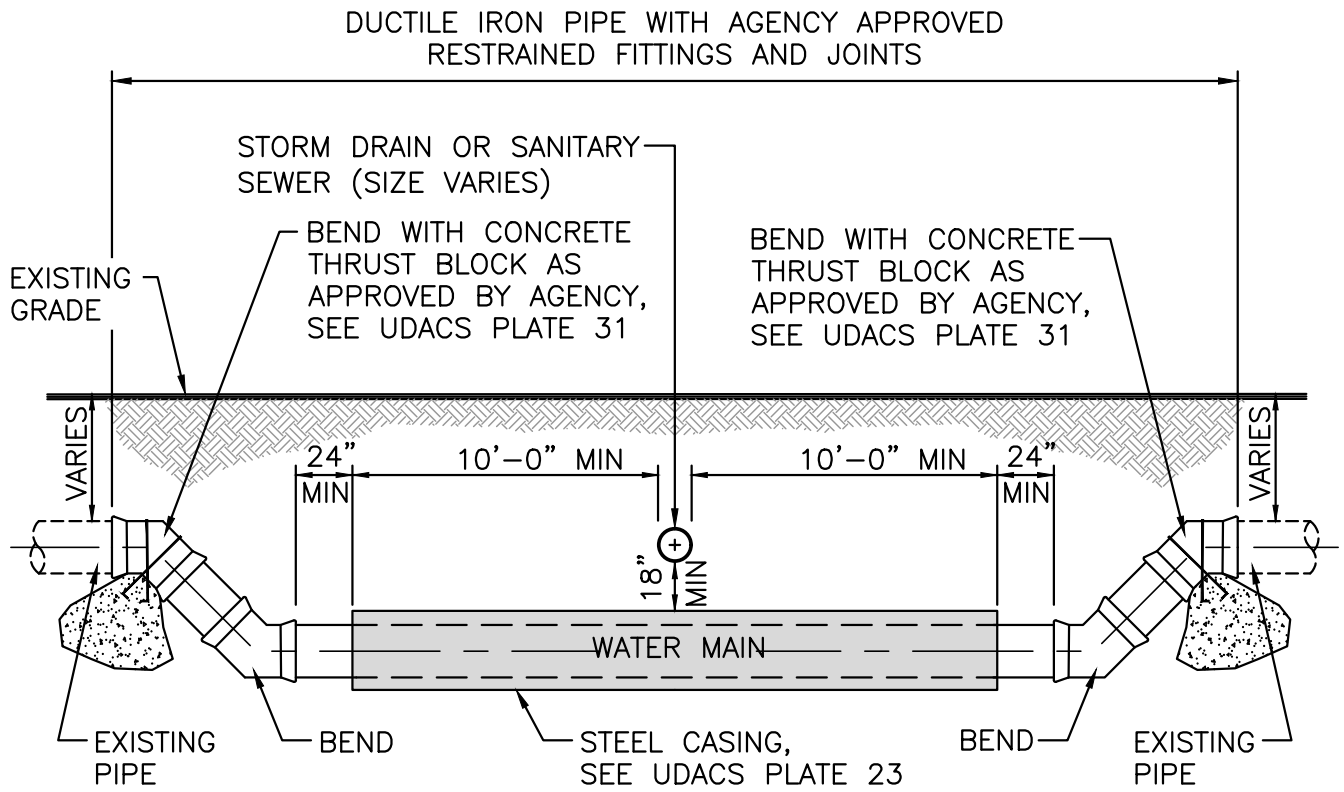
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OVER EXCAVATION TRENCH DETAIL
FOR 16" AND GREATER RESTRAINED PIPELINES

PLATE NO.
20
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES

1. IDENTIFY TRANSITION FROM DUCTILE IRON PIPE TO EXISTING PIPE ON PLANS IF PIPE MATERIAL CHANGES.
2. SEE UDACS PLATES 16, 17, 18, 19 AND 20 FOR TRENCH BACKFILL REQUIREMENTS.

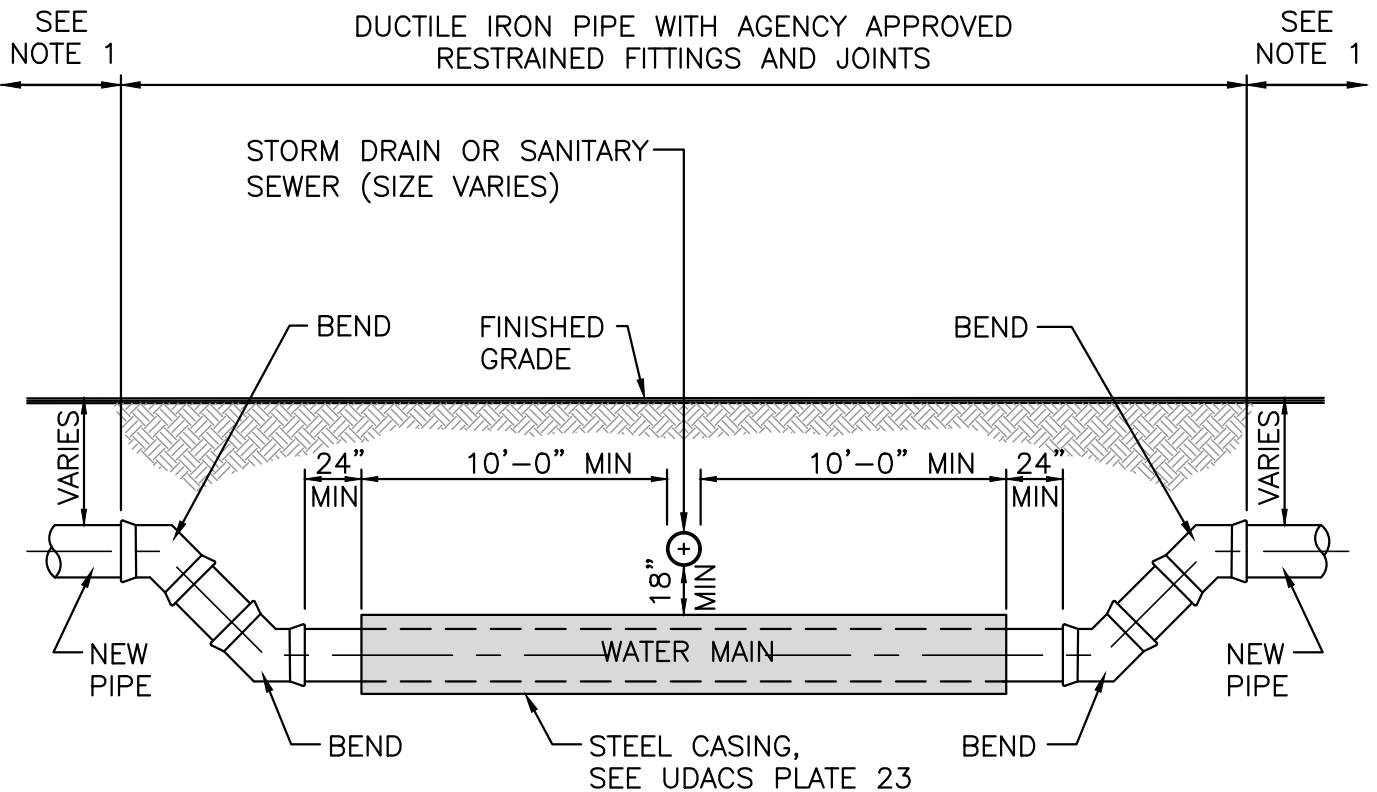
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NON-POTABLE
EXISTING WATER MAIN CROSSING

PLATE NO.
21
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES

1. PROVIDING LENGTH OF RESTRAINED JOINTS PAST BEND.
(SUBMIT CALCULATIONS AND IDENTIFY ON PLANS)
2. TRANSITION FROM DUCTILE IRON PIPE TO EXISTING PIPE ON
PLANS IF PIPE MATERIAL CHANGES.
3. SEE UDACS PLATES 16, 17, 18, 19 AND 20 FOR TRENCH
BACKFILL REQUIREMENTS.

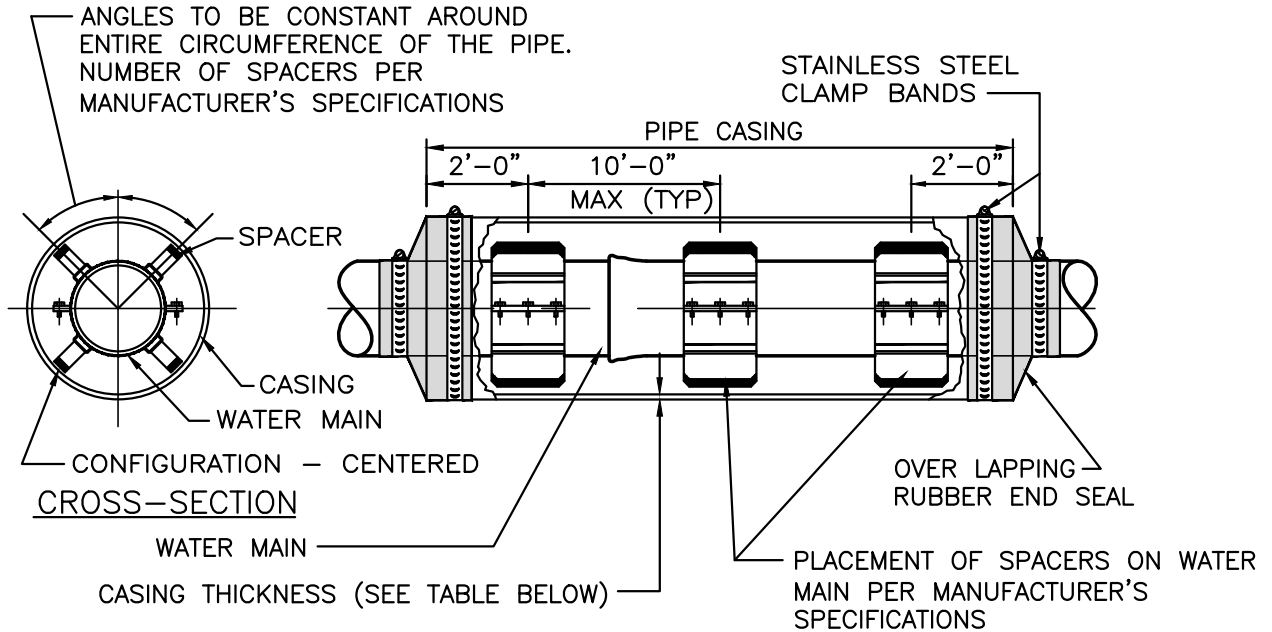
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NON-POTABLE
NEW WATER MAIN CROSSING

PLATE NO.
22
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



CASING TABLE

PIPE SIZE	CASING OD	THICKNESS *
6"	16"	1/4"
8"	18"	1/4"
10"	20"	5/16"
12"	24"	5/16"
16"	30"	3/8"
18"	30"	3/8"
20"	36"	1/2"
24"	42"	1/2"

*CASING INSTALLATIONS OVER 25 FEET BELOW FINISHED GRADE TO HAVE THICKNESS DETERMINED BY A NEVADA LICENSED PROFESSIONAL ENGINEER.

*CASING INSTALLATIONS UNDER RAILROAD TRACKS TO HAVE THICKNESS DETERMINED BY A NEVADA LICENSED PROFESSIONAL ENGINEER AND APPROVED BY UNION PACIFIC RAILROAD.

NOTES:

1. STEEL PIPE CASING MATERIAL SHALL BE ASTM A36, ASTM A283, GRADE C OR D, OR ASTM A139, GRADE B AND FABRICATION SHALL CONFORM TO THE REQUIREMENTS OF AWWA C200. ALL JOINTS SHALL BE WELDED. INTERIOR JOINTS SHALL BE GROUND TO A SMOOTH FINISH. ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWWA C206, "AWWA STANDARD FOR FIELD WELDING OF STEEL WATER PIPE." COATINGS FOR STEEL CASING ARE NOT REQUIRED.
2. STEEL PIPE CASING SHALL BE INSTALLED SYMMETRICAL ABOUT WATER MAIN CENTERLINE (TYP). PIPE CASING SHALL BE LAID TRUE TO LINE AND GRADE WITH NO BENDS OR CHANGES IN GRADE FOR THE FULL LENGTH OF THE CASING.
3. AGENCY APPROVED CASING SPACERS AND END SEALS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS. USE A "CENTERED" CONFIGURATION AND PROVIDE THE MANUFACTURER WITH THE FOLLOWING: (PIPE OD, CASING ID, AND CASING LENGTH).
4. ALL PIPE JOINTS WITHIN THE CASING ARE TO BE EXTERNALLY RESTRAINED.
5. CASING TO BE FILLED (IF REQUIRED). SEE AGENCY FILL MATERIALS AND REQUIREMENTS.
6. CASINGS INSTALLED BY JACK AND BORE METHOD SHALL BE INSTALLED TO THE GRADE SHOWN ON THE DRAWINGS, WITH A MAXIMUM VERTICAL DEVIATION OF +0' AND -2', AND A MAXIMUM HORIZONTAL DEVIATION OF ±2' PROVIDED THE ALIGNMENT DOES NOT CONFLICT WITH OTHER UTILITIES AND/OR RIGHTS-OF-WAY.

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CASING INSTALLATION

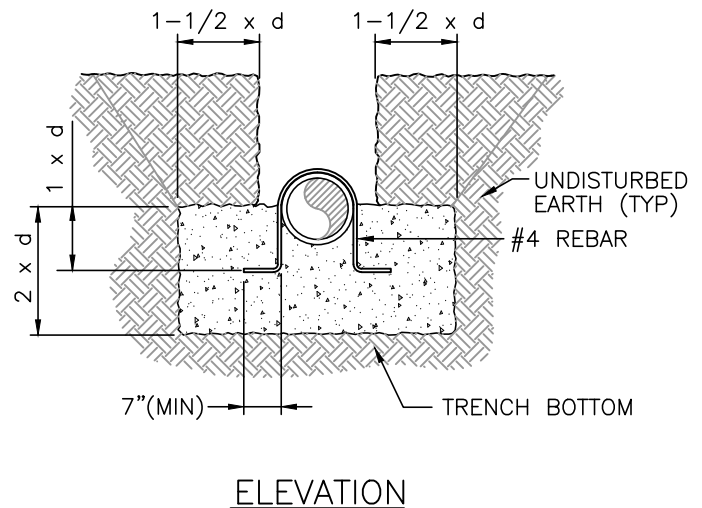
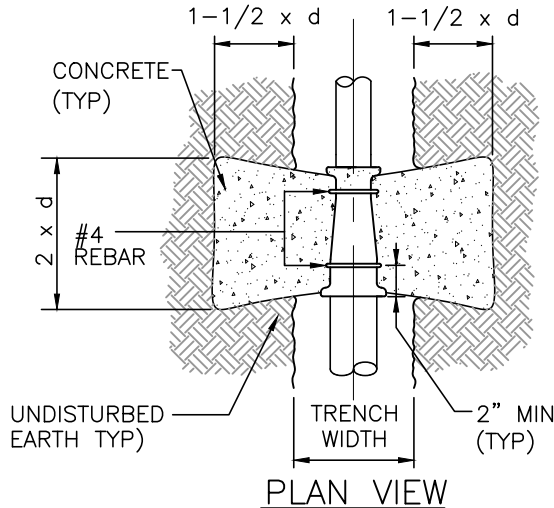
PLATE NO.

23

SHEET 1 OF 1

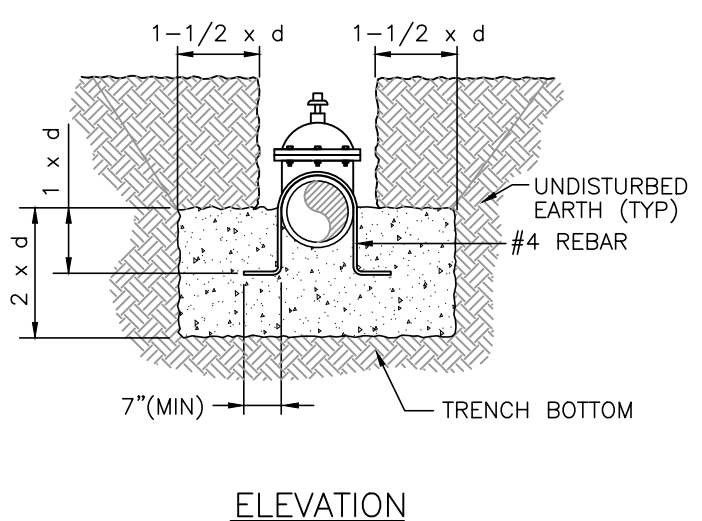
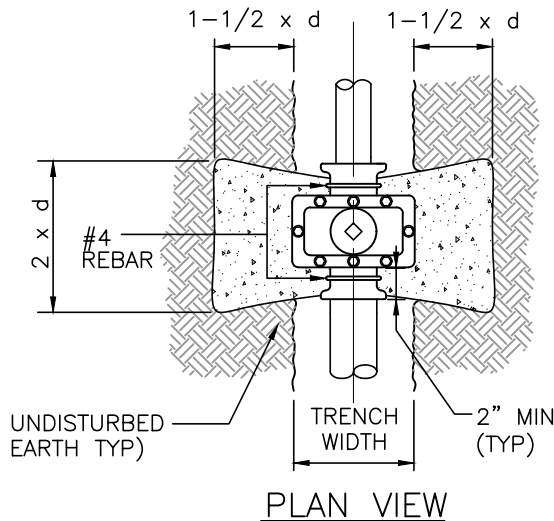
UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND: d = LARGER DIAMETER PIPE SIZE



REDUCERS

LEGEND: d = NOMINAL PIPE SIZE



GATE VALVES

NOTES:

1. ALL CONCRETE SHALL BE 4,500 PSI MIN, 28 DAYS COMPRESSIVE STRENGTH.
2. ALL VALVES, FITTINGS, AND APPURTENANCES SHALL BE COATED AND WRAPPED IN ACCORDANCE WITH SECTION 3, PROTECTIVE COATINGS.
3. EXPOSED (NOT ENCASED IN CONCRETE) REBAR SHALL BE WRAPPED IN 10 MIL DIELECTRIC TAPE.
4. REBAR SHALL BE FORMED AND INSTALLED TO PROVIDE FULL CONTACT ON THE FITTING TO BE RESTRAINED.
5. ALL GATE VALVES, REGARDLESS OF CONNECTION TYPE, REQUIRE AN ANCHOR BLOCK UNLESS INSTALLED AS PART OF A FULLY MECHANICALLY RESTRAINED SYSTEM.

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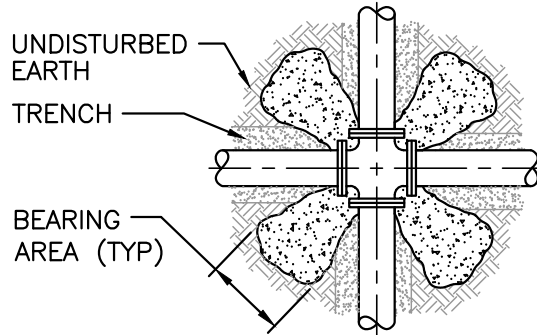
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ANCHOR BLOCK DETAILS FOR
IN-LINE REDUCERS OR GATE VALVES
6" THROUGH 12" DIAMETER

PLATE NO.
30
SHEET 1 OF 1

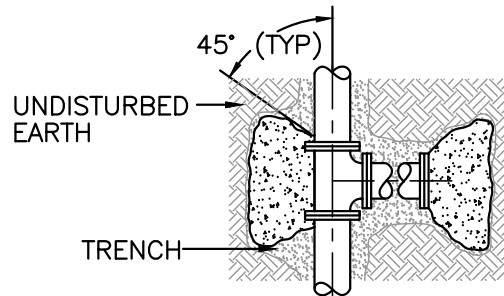
UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

CROSS



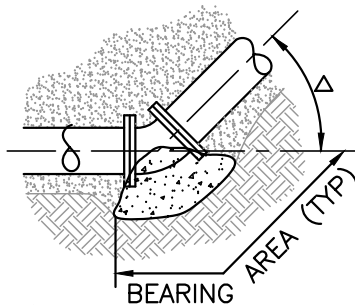
(FIGURE 1)

TEE, PLUG OR CAP



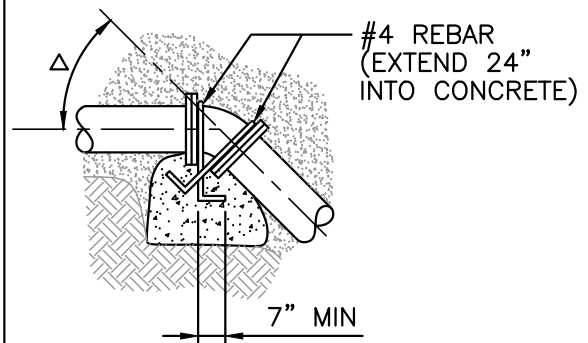
(FIGURE 2)

HORIZONTAL OR UPWARD
VERTICAL BEND



(FIGURE 3)

DOWNWARD VERTICAL BEND



(FIGURE 4)

PIPE ID	BEARING AREA IN SQ FT						CONC/CU YDS		
	FIGURE 1	FIGURE 2	FIGURE 3, Δ				FIGURE 4, Δ		
			90°	45°	22½°	11¼°	45°	22½°	11¼°
4"	2	2	2	2	1	1	1.0	0.5	0.5
6"	2	3	4	2	1	1	1.5	1.0	0.5
8"	3	5	7	4	2	1	3.0	1.5	1.0
10"	4	8	11	6	3	2	4.0	2.5	1.5
12"	6	11	15	8	4	2	6.0	3.0	1.5

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THRUST BLOCK INSTALLATION

PLATE NO.

31

SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

NOTES:

1. VALVES, FITTINGS AND APPURTENANCES SHALL BE COATED AND WRAPPED IN ACCORDANCE WITH SECTION 3, PROTECTIVE COATINGS.
2. EXPOSED (NOT ENCASED IN CONCRETE) REBAR SHALL BE WRAPPED IN 10 MIL DIELECTRIC TAPE.
3. REBAR SHALL BE FORMED AND INSTALLED TO PROVIDE FULL CONTACT ON THE FITTING TO BE RESTRAINED.
4. ALL CONCRETE SHALL BE 4,500 PSI MIN, 28 DAYS COMPRESSIVE STRENGTH. CONCRETE IS TO BE PLACED AGAINST UNDISTURBED EARTH.
5. THE TABLE BELOW DENOTES MINIMUM BEARING AREA OR VOLUME OF THRUST BLOCK. SPECIAL DESIGN CALCULATIONS ARE TO BE SUBMITTED FOR APPROVAL IF ALLOWABLE SOIL BEARING CAPACITY IS LESS THAN 3000 PSF.
6. ALL VERTICAL SURFACES NOT BEARING AGAINST UNDISTURBED EARTH SHALL BE FORMED.
7. MECHANICALLY RESTRAINED JOINTS MAY BE UTILIZED IN LIEU OF THRUST BLOCKS WHEN IDENTIFIED ON THE PLANS BY THE ENGINEER AND APPROVED BY THE AGENCY.
8. USE OF 5° BENDS REQUIRES AGENCY APPROVAL AND CAN BE UTILIZED IN HORIZONTAL ORIENTATION ONLY.
9. ANY PIPE LARGER THAN 12" MUST BE MECHANICALLY RESTRAINED. USE OF THRUST BLOCKS FOR PIPE DIAMETERS GREATER THAN 12" REQUIRES PRIOR AGENCY APPROVAL AND WILL BE EVALUATED ON A CASE BY CASE BASIS.

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THRUST BLOCK INSTALLATION

PLATE NO.
31
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

AMOUNT OF CHLORINE REQUIRED FOR DISINFECTION OF 100 FEET OF PIPE

I.D. OF PIPE	VOLUME OF WATER PER 100'	QUANTITY OF CALCIUM HYPOCHLORITE (65% AVAILABLE CHLORINE)	
		25 P.P.M.	50 P.P.M.
4"	65.3 GALS.	.34 OZ.	.69 OZ.
6"	146.5 GALS.	.77 OZ.	1.54 OZ.
8"	261.0 GALS.	1.37 OZ.	2.75 OZ.
10"	408.0 GALS.	2.15 OZ.	4.29 OZ.
12"	558.7 GALS.	2.94 OZ.	5.88 OZ.
14"	800.0 GALS.	4.21 OZ.	8.42 OZ.
16"	1047.0 GALS.	5.51 OZ.	11.02 OZ.
18"	1300.0 GALS.	6.84 OZ.	13.68 OZ.
20"	1635.7 GALS.	8.61 OZ.	17.22 OZ.
24"	2234.8 GALS.	11.76 OZ.	23.52 OZ.

NOTES

1. CHLORINE MUST BE NSF 61.
2. REQUIRED DOSAGE IS GIVEN IN OUNCES OF 65% CALCIUM HYPOCHLORITE.
3. FOR REFERENCE SEE AWWA MANUAL M20 "WATER CHLORINATION PRINCIPLES AND PRACTICES" APPENDIX 1.
4. ALLOWABLE MAXIMUM IS 50 PPM, OR AS SPECIFIED BY THE AGENCY.
5. ALLOWABLE MAXIMUM DROP IN CHLORINATION AFTER 24 HOURS IS 15 PPM.

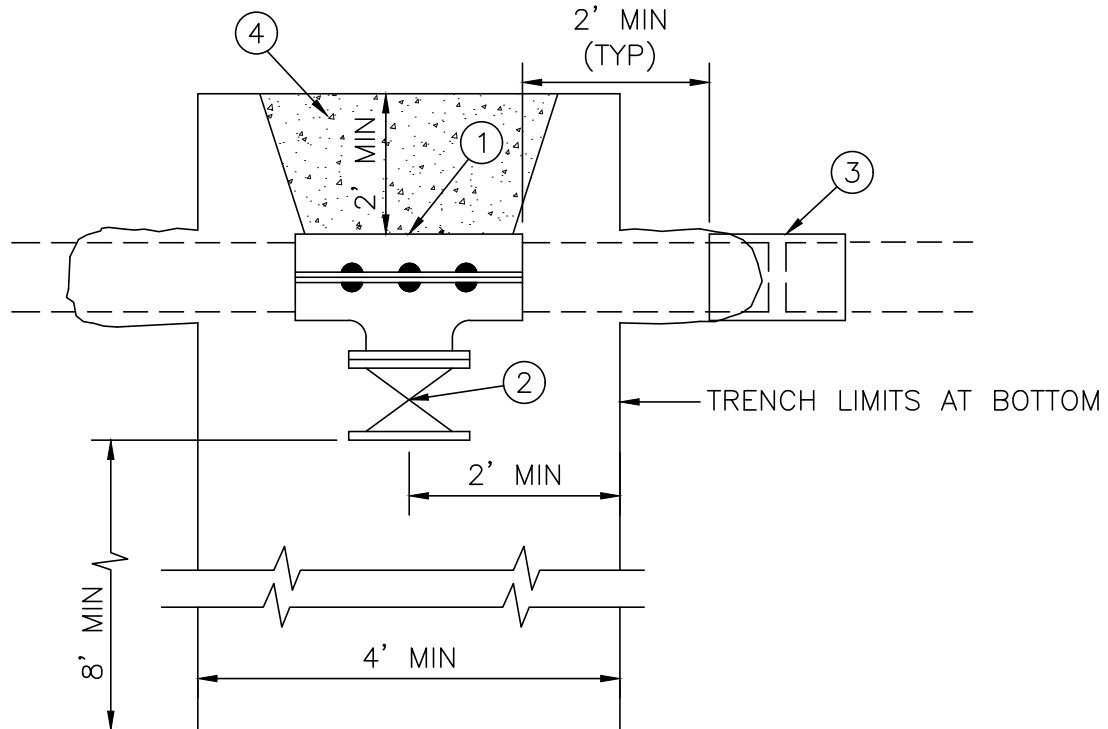
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CHLORINATION REQUIREMENTS

PLATE NO.
32
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



ITEM	DESCRIPTION
①	TAPPING SLEEVE
②	GATE VALVE
③	COUPLING, COLLAR, FITTING, VALVE OR SERVICE SADDLE
④	CONCRETE THRUST BLOCK, SEE UDACS PLATE 31

NOTES

- CLEARANCE FROM A COLLAR OR PIPE JOINT SHALL BE A MINIMUM OF 2 FEET FROM THE EDGE OF TAPPING SLEEVE TO COLLAR OR PIPE JOINT. THE EXISTING PIPE SHALL BE EXPOSED SUFFICIENTLY TO ENSURE THAT SUCH MINIMUM CLEARANCE IS PROVIDED.
- TRENCH SHALL MEET ALL LOCAL, STATE AND FEDERAL REQUIREMENTS.
- VALVE TO BE SUPPORTED DURING THE WET TAP PROCESS.
- USE AN AGENCY APPROVED TAPPING SLEEVE BASED ON PIPE MATERIAL AND TAP SIZE. A 15 MINUTES PRESSURE TEST OF THE TAPPING ASSEMBLY IS REQUIRED PRIOR TO WET TAP
- ALL TAPS TO BE COMPLETED ON HORIZONTAL PIPE ALIGNMENTS ONLY.
- WET-TAP TO BE IN ACCORDANCE WITH UDACS SECTION 3.13

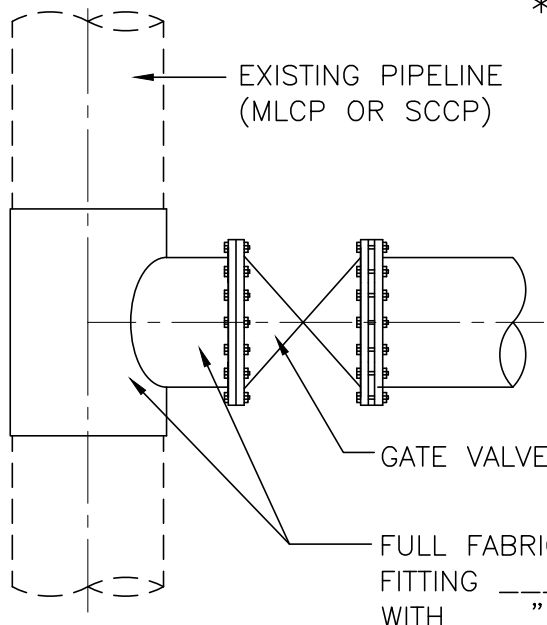
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EXCAVATION FOR WET TAPS

PLATE NO.
34
SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



**** AGENCY TO PROVIDE EXISTING PIPE DATA AND
PRESSURE, ENGINEER TO SHOW ON PLANS**

EXISTING PIPE DATA:

STEEL CYLINDER OD: ____"

CYLINDER THICKNESS: ____"

LINING THICKNESS: ____"

COATING THICKNESS: ____"

ROD THICKNESS: (IF APPLICABLE) ____"

**** ACTUAL SIZE OF
WRAPPER FITTING
TO BE CALCULATED
BY ENGINEER.**

NOTES:

1. TAPPING FITTING SHALL BE FULL WRAPPER DESIGN AND DESIGNED IN ACCORDANCE WITH AWWA MANUAL M11 AND INSTALLED IN ACCORDANCE WITH UDACS SECTION 3.14. SHOP DRAWINGS ARE REQUIRED FOR AGENCY APPROVAL 30 DAYS PRIOR TO START OF CONSTRUCTION.
2. DESIGN PRESSURE = ____ PSI **** AGENCY TO PROVIDE**
3. TEST FABRICATED STEEL TAPPING FITTING PER AGENCY REQUIREMENTS.
4. ALL FERROUS METALS SHALL BE COATED PER SECTION 3, PROTECTIVE COATINGS. APPLY REINFORCED MORTAR COATING AFTER COMPLETION.
5. CONCRETE THRUST BLOCKS TO BE PROVIDED, SEE PLATE 31 OR AS SHOWN ON DRAWINGS.
6. THE EXISTING PIPE SHALL REMAIN IN SERVICE, WITH WATER FLOWING, DURING ENTIRE TAPPING OPERATION, UNLESS OTHERWISE APPROVED BY AGENCY.
7. VERIFY POSITION OF PROPOSED TAP PRIOR TO COMMENCING OPERATION. POSITION TAP AT LEAST 5 FEET FROM JOINT IN EXISTING PIPE.
8. VALVE TO BE SUPPORTED DURING THE WET TAP PROCESS.
9. CONTRACTOR SHALL VERIFY SIZE, THICKNESS, LINING AND COATING OF EXISTING PIPELINE PRIOR TO COMPLETION OF WET TAP.
10. ALL TAPS TO BE COMPLETED ON HORIZONTAL PIPE ALIGNMENTS ONLY.
11. INSTALL INSULATING FLANGE AS REQUIRED BY AGENCY, SEE PLATE 73.
12. WET-TAP TO BE IN ACCORDANCE WITH UDACS SECTION 3.14

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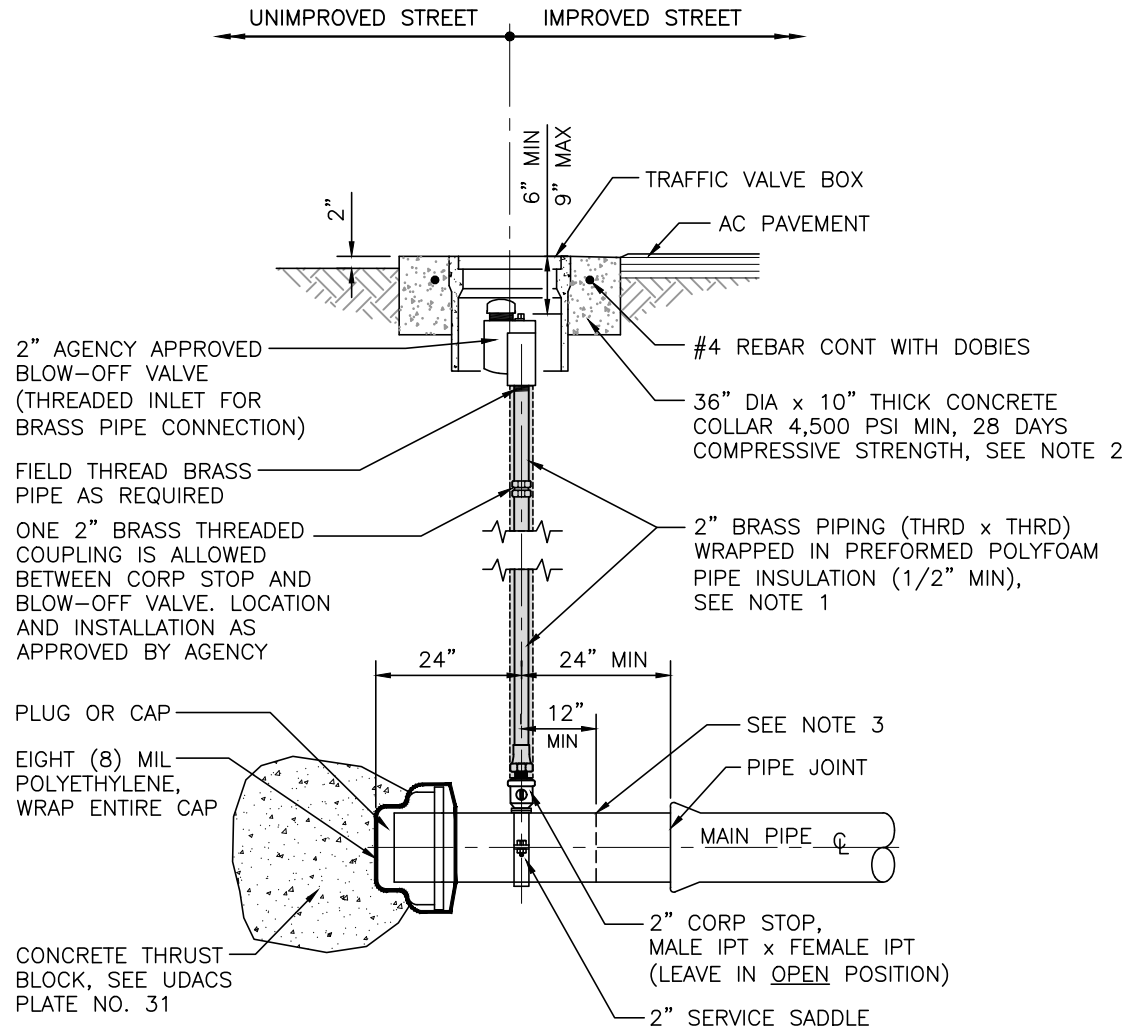
WET TAP OF EXISTING STEEL MAINS

PLATE NO.

35

SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



BLOW-OFF ASSEMBLY INSTALLATIONS WITHIN 60' RIGHT-OF-WAYS OR LESS

NOTES:

1. ALL BRASS PIPING SHALL BE BACKFILLED ALL AROUND WITH 4" MINIMUM OF SAND OR PREFORMED POLYFOAM PIPE INSULATION (1/2" MIN).
2. FINAL RIM ELEVATION TO BE 1/8" TO 1/4" BELOW FINAL STREET GRADE.
3. CUT AND REMOVE EXISTING PIPE 12" MIN BEYOND EXISTING BLOW-OFF SERVICE SADDLE PRIOR TO CONNECTING TO EXISTING PIPELINES.
4. MORE STRINGENT INSTALLATION REQUIREMENTS MAY BE IMPOSED BY THE ENTITY HAVING THE JURISDICTION OVER THE TRAFFIC VALVE BOX INSTALLATION LOCATION.
5. CONTRACTOR TO FORM CONCRETE COLLARS IN UNIMPROVED AREAS WITH SONOTUBE OR AS APPROVED BY AGENCY AND REMOVE PRIOR TO BACKFILL INSTALLATION.
6. INSTALL TYPE II AGGREGATE BASE BACKFILL COMPACTED PER RTC UNIFORM STANDARDS REQUIREMENTS.

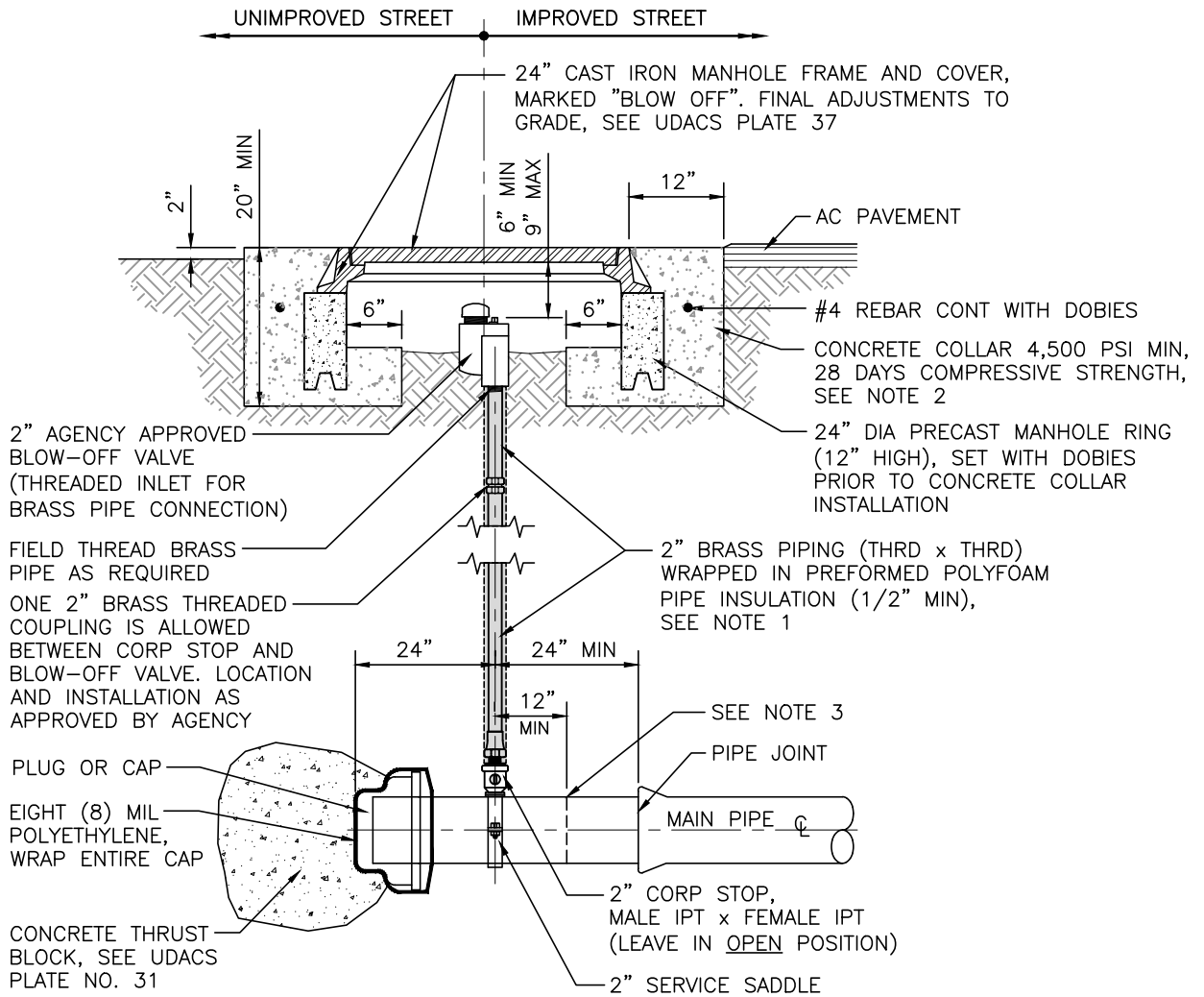
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2" MANUAL BLOW-OFF ASSEMBLY
FOR PVC OR DI PIPE

PLATE NO.
36
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



BLOW-OFF ASSEMBLY INSTALLATIONS WITHIN GREATER THAN 60' RIGHT-OF-WAYS

NOTES:

1. ALL BRASS PIPING SHALL BE BACKFILLED ALL AROUND WITH 4" MINIMUM OF SAND OR PREFORMED POLYFOAM PIPE INSULATION (1/2" MIN).
2. FINAL RIM ELEVATION TO BE 1/8" TO 1/4" BELOW FINAL STREET GRADE.
3. CUT AND REMOVE EXISTING PIPE 12" MIN BEYOND EXISTING BLOW-OFF SERVICE SADDLE PRIOR TO CONNECTING / EXTENDING TO EXISTING PIPELINES.
4. MORE STRINGENT INSTALLATION REQUIREMENTS MAY BE IMPOSED BY THE ENTITY HAVING THE JURISDICTION AT THE MANHOLE INSTALLATION LOCATION.
5. CONTRACTOR TO FORM CONCRETE COLLARS AS APPROVED BY AGENCY IN UNIMPROVED AREAS AND REMOVE PRIOR TO BACKFILL INSTALLATION.
6. INSTALL TYPE II AGGREGATE BASE BACKFILL COMPACTED PER RTC UNIFORM STANDARDS REQUIREMENTS.
7. BLOW-OFF LOCATIONS WITHIN SIDEWALKS, LANDSCAPING OR FUTURE PAVED AREAS THE TRAFFIC VALVE BOX SURFACE OPTION MAY BE USED WHEN APPROVED BY AGENCY.

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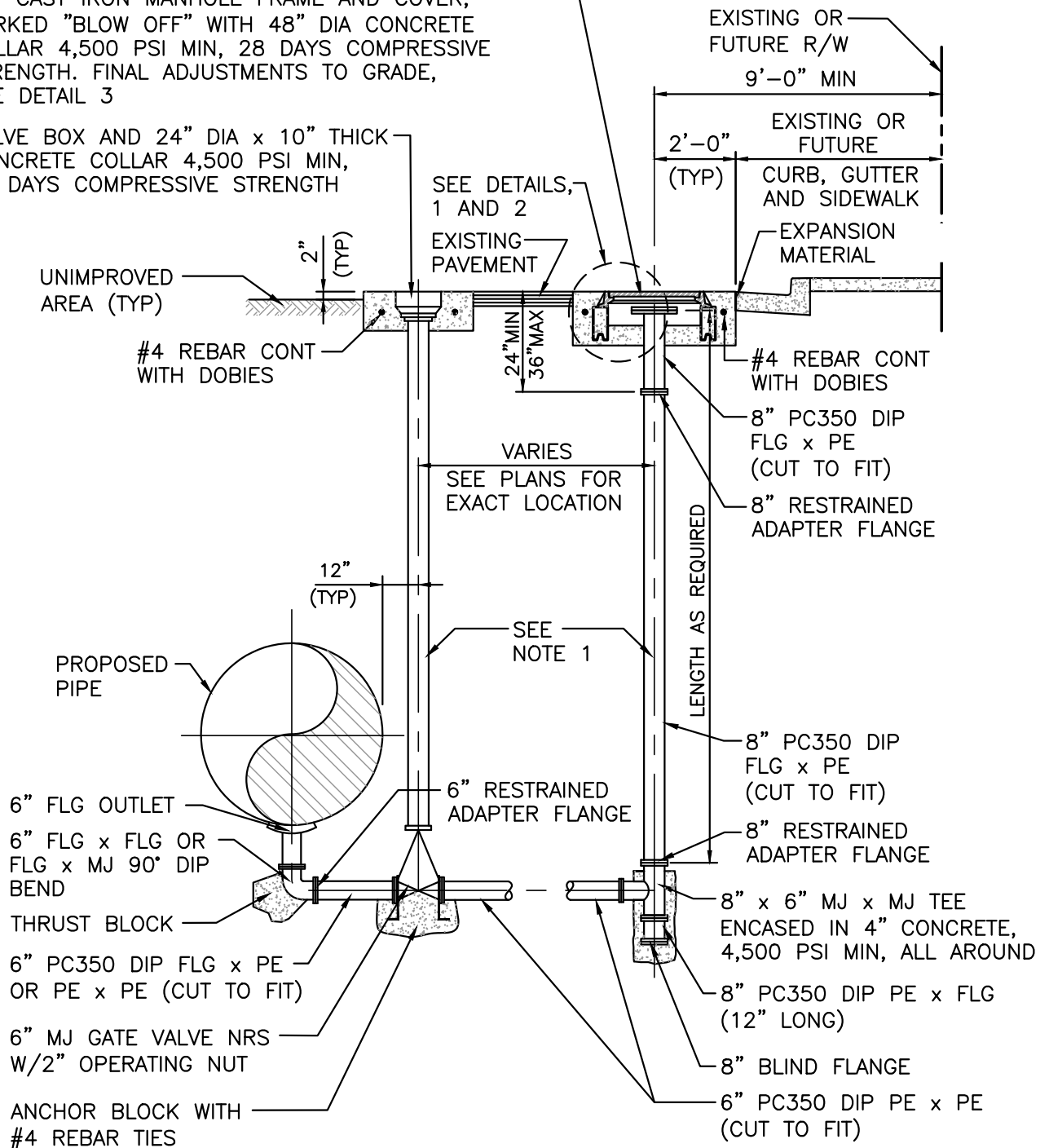
2" MANUAL BLOW-OFF ASSEMBLY
FOR PVC OR DI PIPE

PLATE NO.
36
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

24" CAST IRON MANHOLE FRAME AND COVER, MARKED "BLOW OFF" WITH 48" DIA CONCRETE COLLAR 4,500 PSI MIN, 28 DAYS COMPRESSIVE STRENGTH. FINAL ADJUSTMENTS TO GRADE, SEE DETAIL 3

VALVE BOX AND 24" DIA x 10" THICK CONCRETE COLLAR 4,500 PSI MIN, 28 DAYS COMPRESSIVE STRENGTH



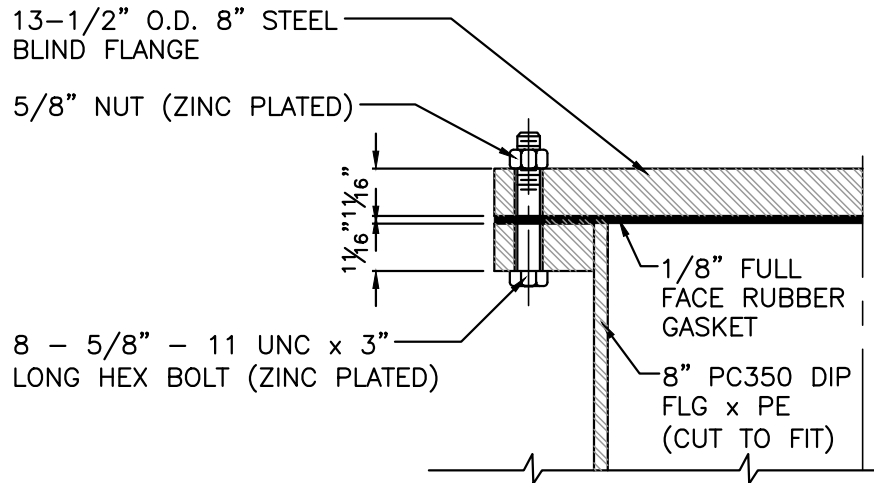
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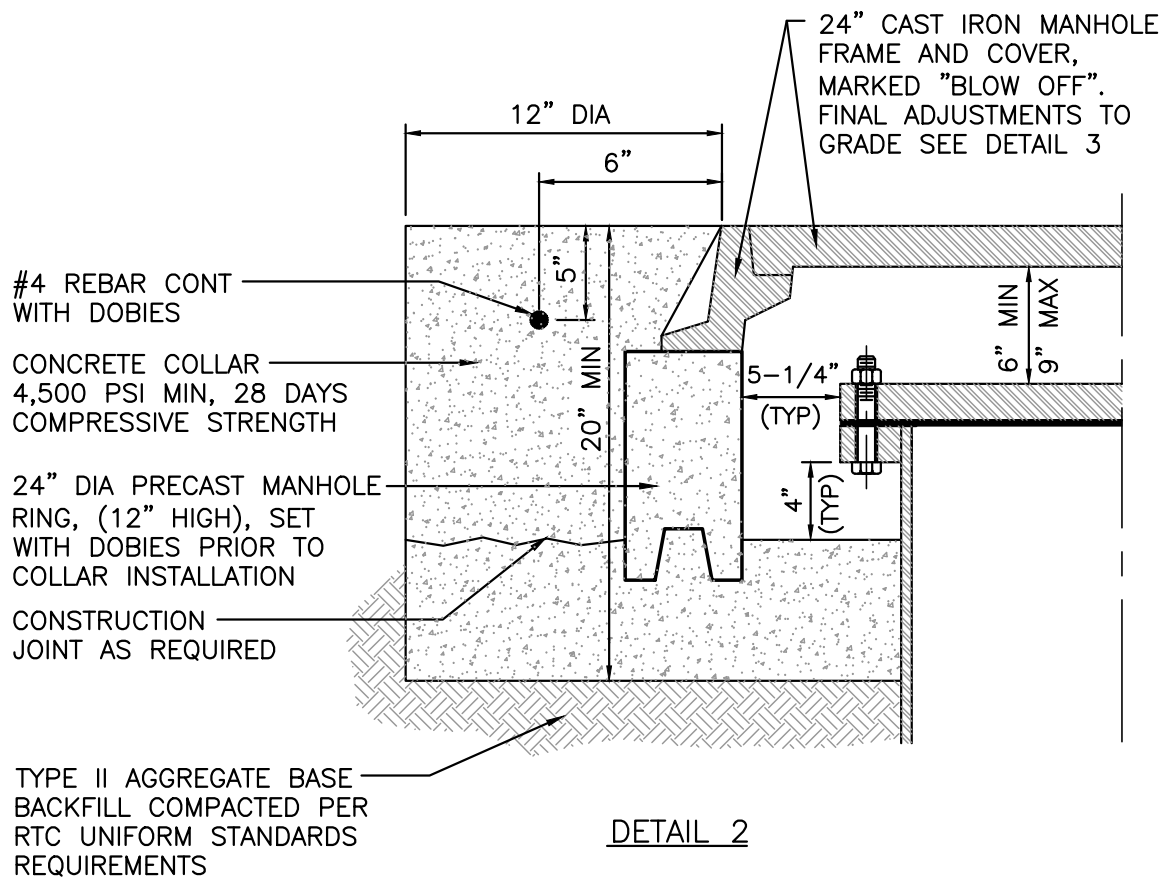
6" MANUAL BLOW-OFF ASSEMBLY
FOR PVC OR DI PIPE
(INSTALLATION AT LOW POINTS ON PIPELINE)

PLATE NO.
37
SHEET 1 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



DETAIL 1



DETAIL 2

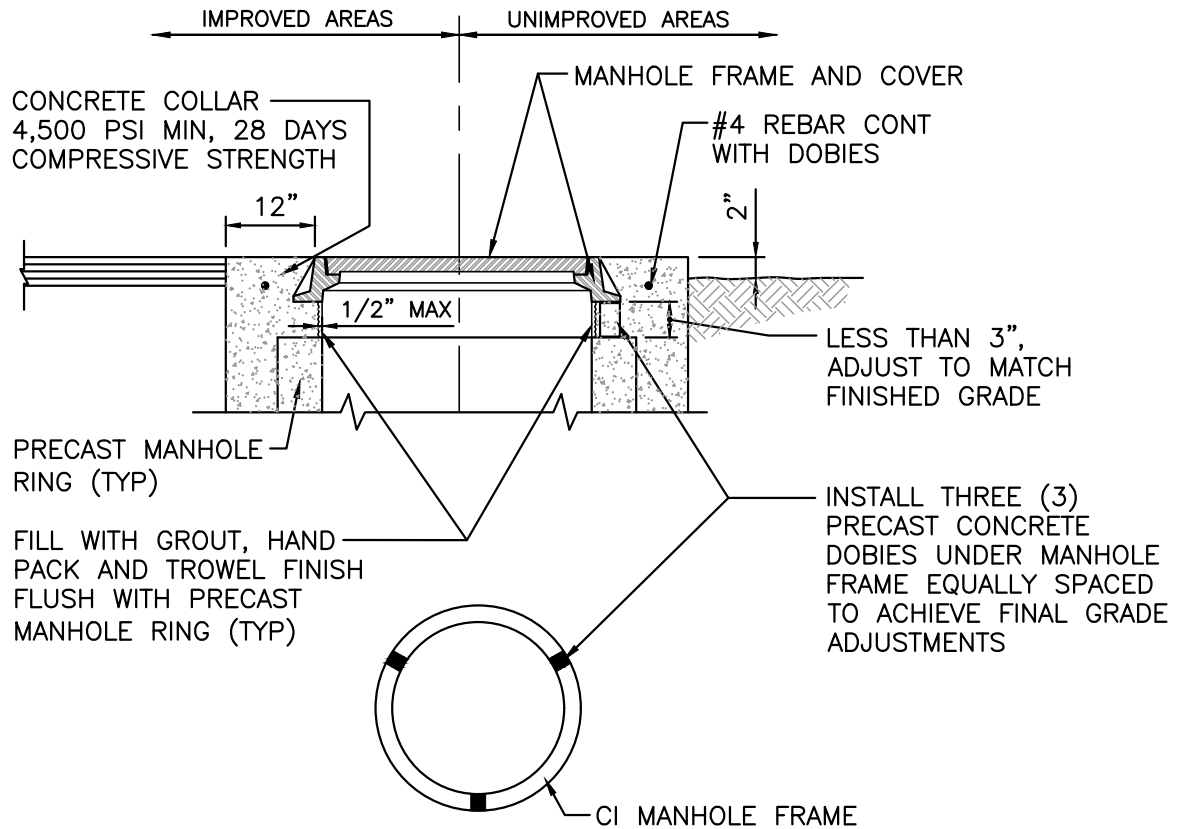
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6" MANUAL BLOW-OFF ASSEMBLY
FOR PVC OR DI PIPE
(INSTALLATION AT LOW POINTS ON PIPELINE)

PLATE NO.
37
SHEET 2 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



DETAIL 3

NOTES

1. SUPPORT AND STABILIZE VALVE BOX DURING BACKFILL INSTALLATION TO AVOID DAMAGE TO VALVE AND BLOW-OFF ASSEMBLY.
2. ALL CONCRETE TO BE 1/8" TO 1/4" BELOW FINAL STREET GRADE.
3. CONTRACTOR TO FORM CONCRETE COLLAR IN UNIMPROVED AREAS WITH SONOTUBE OR EQUAL AND REMOVE PRIOR TO BACKFILL INSTALLATION (TYP).
4. ALL MJ FITTINGS AND CONNECTIONS TO BE RESTRAINED (TYP).
5. ALL VALVES, FITTINGS AND APPURTENANCES TO BE COATED AND WRAPPED PER SECTION 3, PROTECTIVE COATINGS.
6. INSTALL TYPE II AGGREGATE BASE BACKFILL COMPACTED PER RTC UNIFORM STANDARDS REQUIREMENTS.

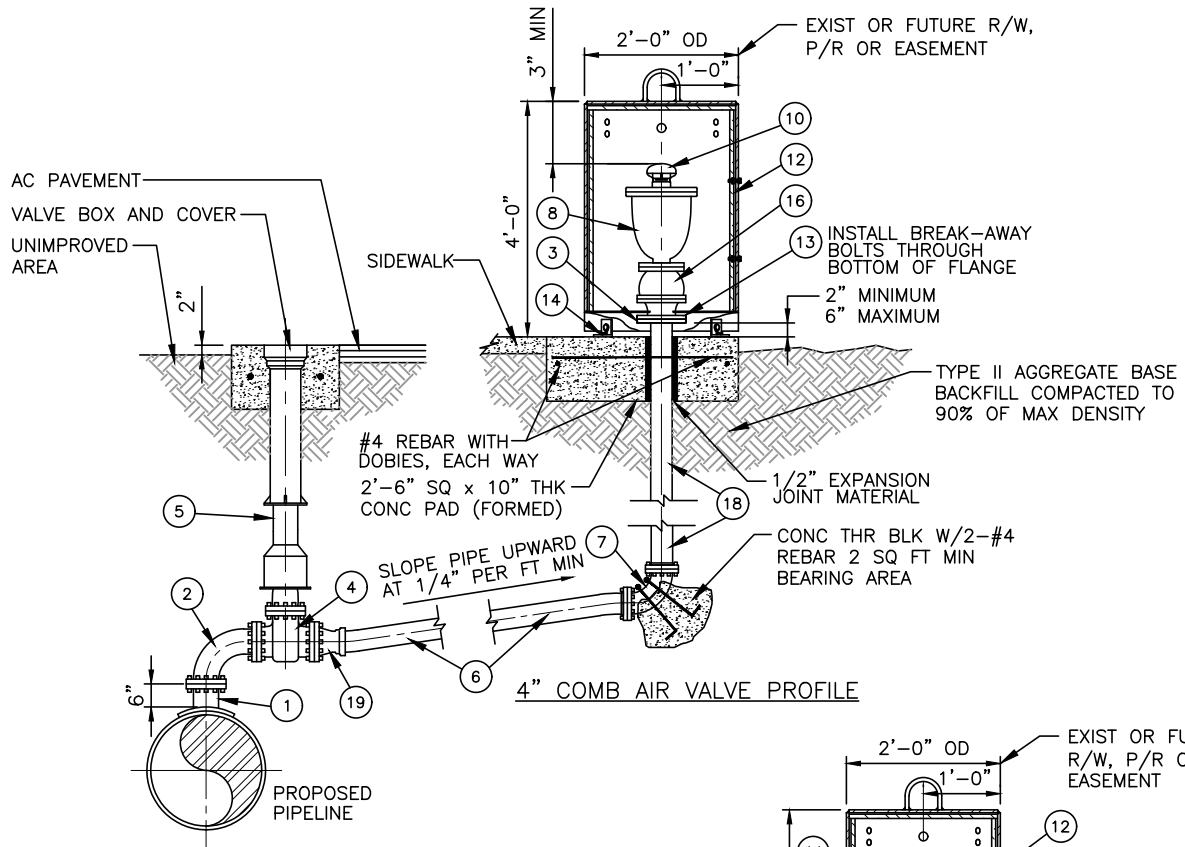
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6" MANUAL BLOW-OFF ASSEMBLY
FOR PVC OR DI PIPE
(INSTALLATION AT LOW POINTS ON PIPELINE)

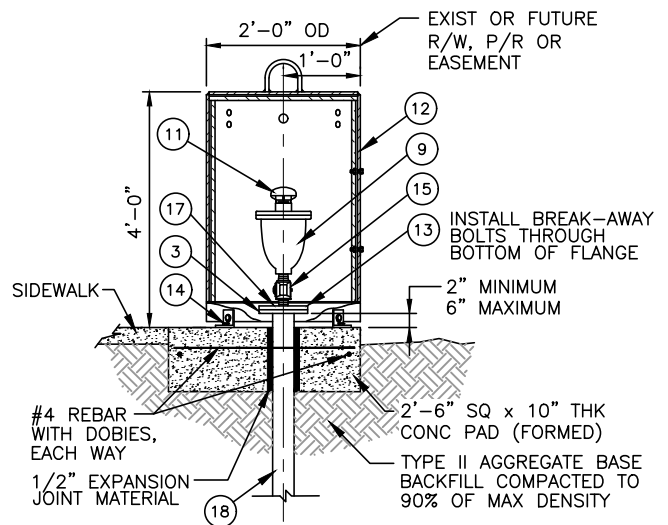
PLATE NO.
37
SHEET 3 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



LEGEND

- ① 6" FLG STL OUTLET FOR MLC STL PIPE, FLG TEE FOR DIP OR PVC
- ② 6"- 90° FLG DUCTILE IRON BEND
- ③ COMPANION FLANGE
- ④ 6" FLG x FLG GATE VALVE W/2" OPERATING NUT
- ⑤ VALVE BOX AND COVER
- ⑥ 4" DUCTILE IRON PC350 PIPE OR 4" PVC C900 PRESSURE CLASS 235 PIPE
- ⑦ 4" - 90° MJ x MJ DUCTILE IRON BEND
- ⑧ 4" COMBINATION AIR VALVE, FLANGED INLET
- ⑨ 2" COMBINATION AIR VALVE, THREADED INLET
- ⑩ 4" MUSHROOM VENT CAP OR INVERTED J WITH 22 - 24 STAINLESS STEEL MESH SCREEN (1FT MIN ABOVE FINISHED GRADE)
- ⑪ 2" MUSHROOM VENT CAP OR INVERTED J WITH 22 - 24 STAINLESS STEEL MESH SCREEN (1FT MIN ABOVE FINISHED GRADE)
- ⑫ 2'-0" OD x 4'-0" HIGH AGENCY APPROVED FIBERGLASS ENCLOSURE, OR STEEL COVER WITH AGENCY APPROVAL
- ⑬ 5/8"-11NC BREAK-AWAY ZINC PLATED HEX HD BOLT, HEX NUT AND LOCKWASHER
- ⑭ 1/2" DIA x 8" J-BOLT
- ⑮ 2" CORP STOP, THREADED BOTH ENDS
- ⑯ 4" BALL VALVE - QUARTER TURN - FOR 4" COMB AIR VALVE ASSY
- ⑰ 4" x 2" THREADED STL REDUCING FLANGE
- ⑱ 4" DUCTILE IRON PC350 PIPE FL X PE
- ⑲ 6" x 4" FLG x MJ DUCTILE IRON REDUCER



2" COMB AIR VALVE PROFILE

NOTE:

ALL EXPOSED FERROUS METAL SHALL BE COATED PER SECTION 3. EXTERIOR COLOR TO BE WHITE.

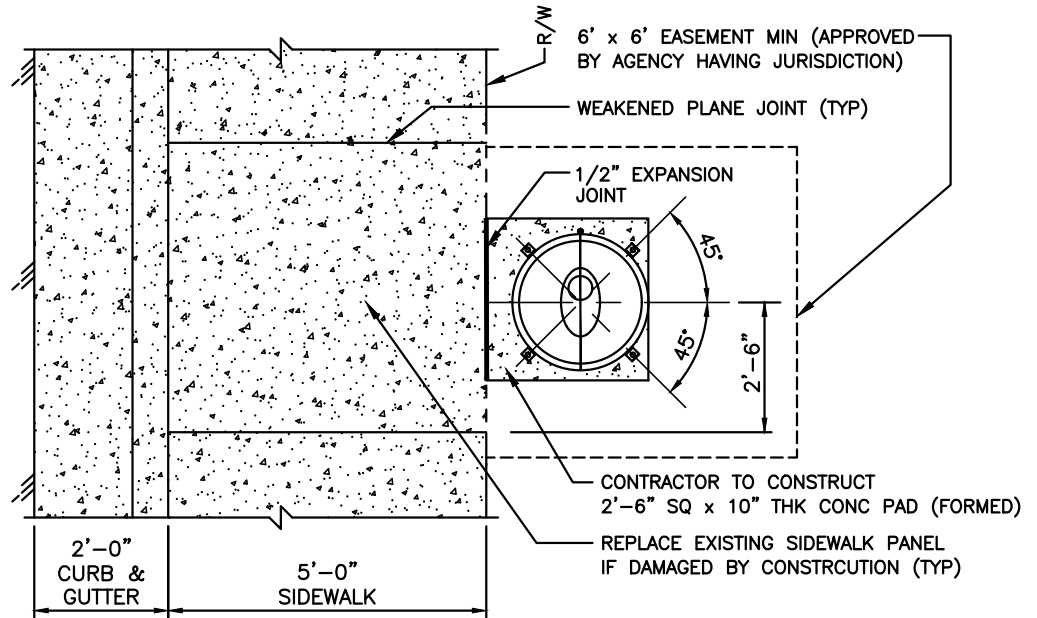
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COMBINATION AIR VALVE ASSEMBLY
FOR 2" AND 4" VALVES
(INSTALLATION AT HIGH POINTS ON PIPELINE)

PLATE NO.
38
SHEET 1 OF 3

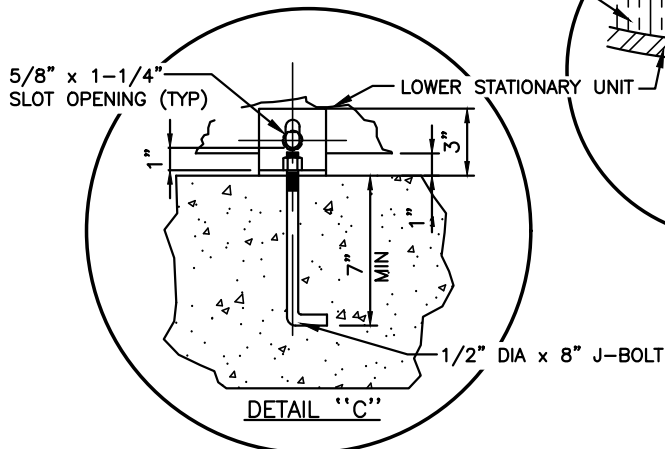
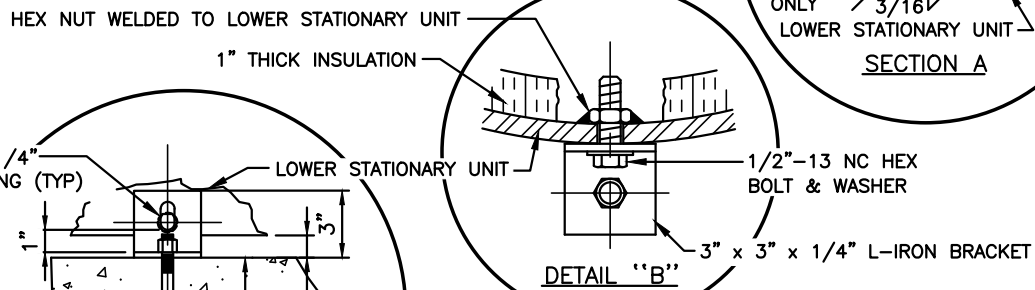
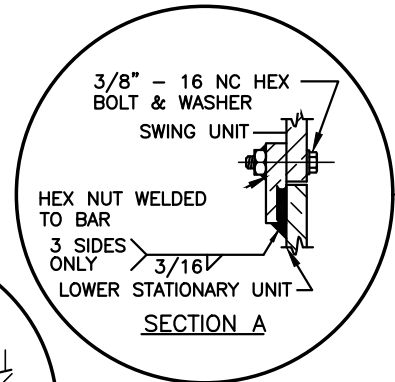
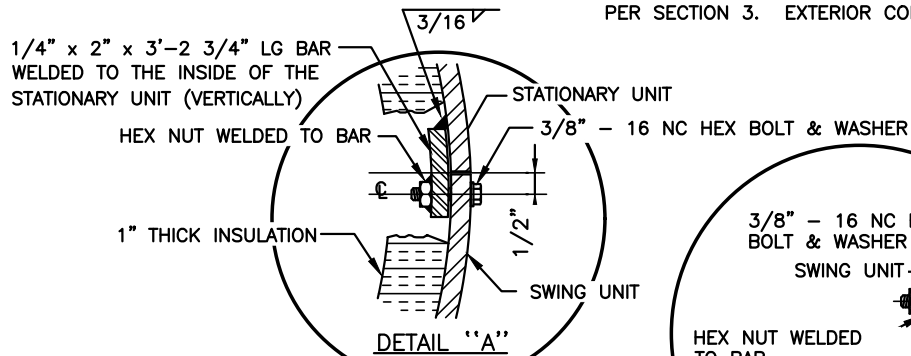
UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



PLAN VIEW

NOTE:

ALL EXPOSED FERROUS METAL SHALL BE COATED PER SECTION 3. EXTERIOR COLOR TO BE WHITE.



AN AGENCY APPROVED COVER MAY BE SUBSTITUTED WHEN SUBMITTED AND APPROVED (TYP)

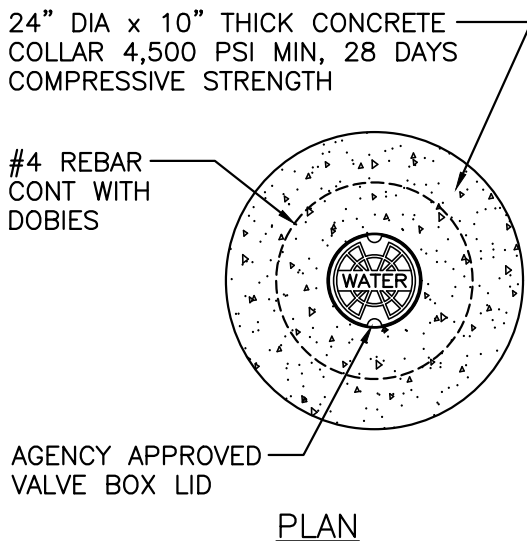
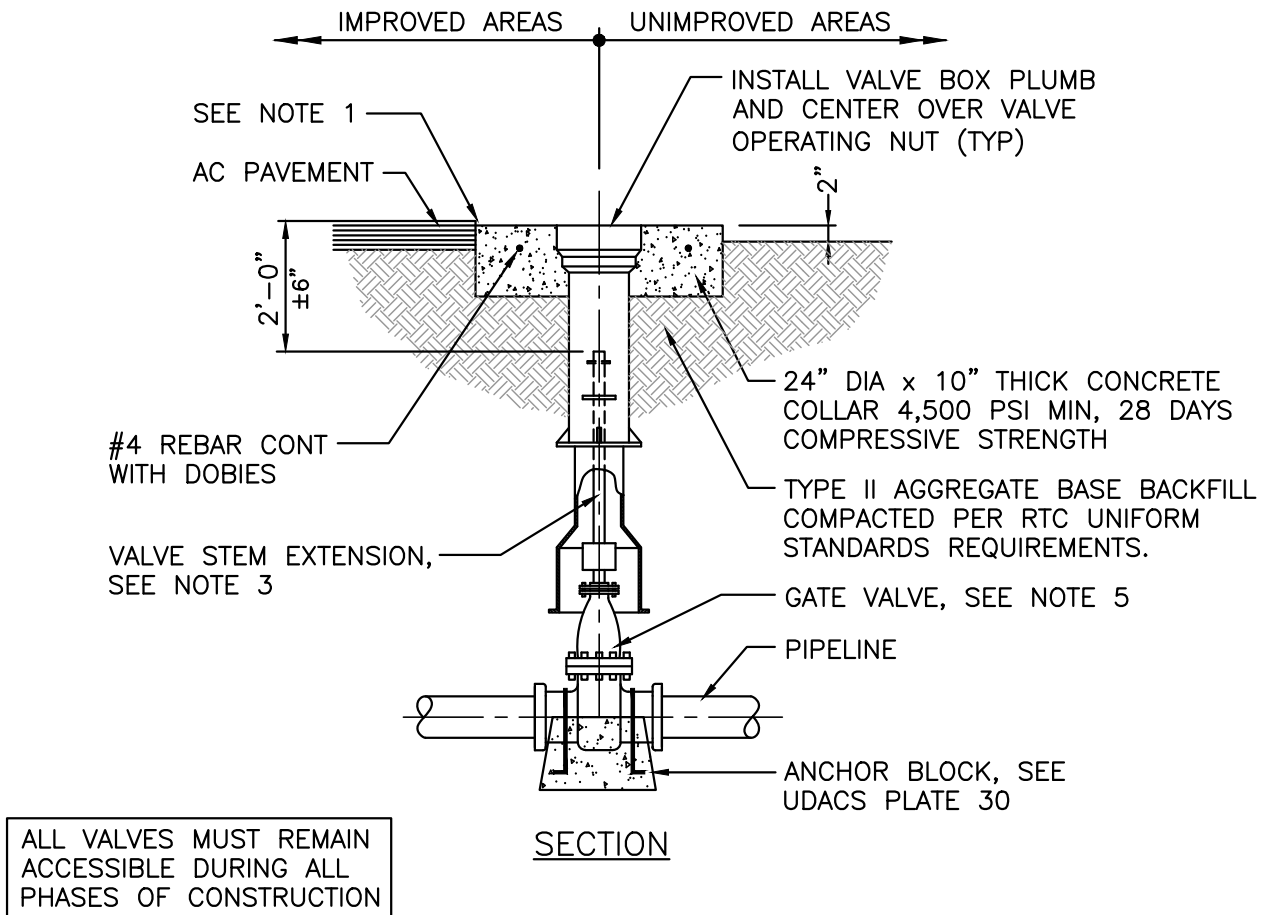
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COMBINATION AIR VALVE ASSEMBLY
FOR 2" AND 4" VALVES
(INSTALLATION AT HIGH POINTS ON PIPELINE)

PLATE NO.
38
SHEET 3 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES

1. FINAL RIM ELEVATION TO BE 1/8" TO 1/4" BELOW FINAL STREET GRADE.
2. MORE STRINGENT INSTALLATION REQUIREMENTS MAY BE IMPOSED BY THE ENTITY HAVING THE JURISDICTION OVER THE VALVE BOX INSTALLATION LOCATION.
3. A VALVE STEM EXTENSION SHALL BE PROVIDED TO WITHIN TWO FEET OF FINISHED GRADE WHERE THE DEPTH TO THE OPERATING NUT EXCEEDS FIVE FEET.
4. CONTRACTOR TO FORM CONCRETE COLLAR IN UNIMPROVED AREAS WITH SONOTUBE OR EQUAL AND REMOVE PRIOR TO BACKFILL INSTALLATION.
5. ALL GATE VALVES TO BE INSTALLED IN VERTICAL POSITION.

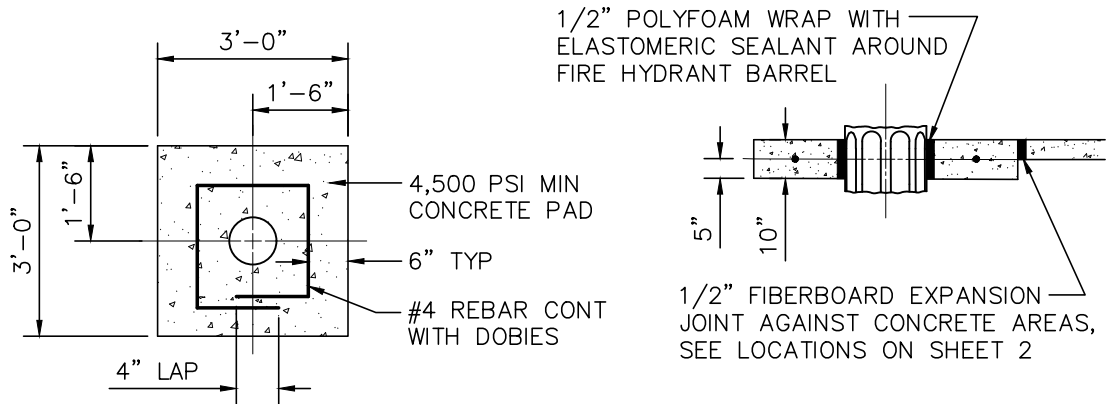
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VALVE BOX
INSTALLATION AND ADJUSTMENT

PLATE NO.
39
SHEET 1 OF 1

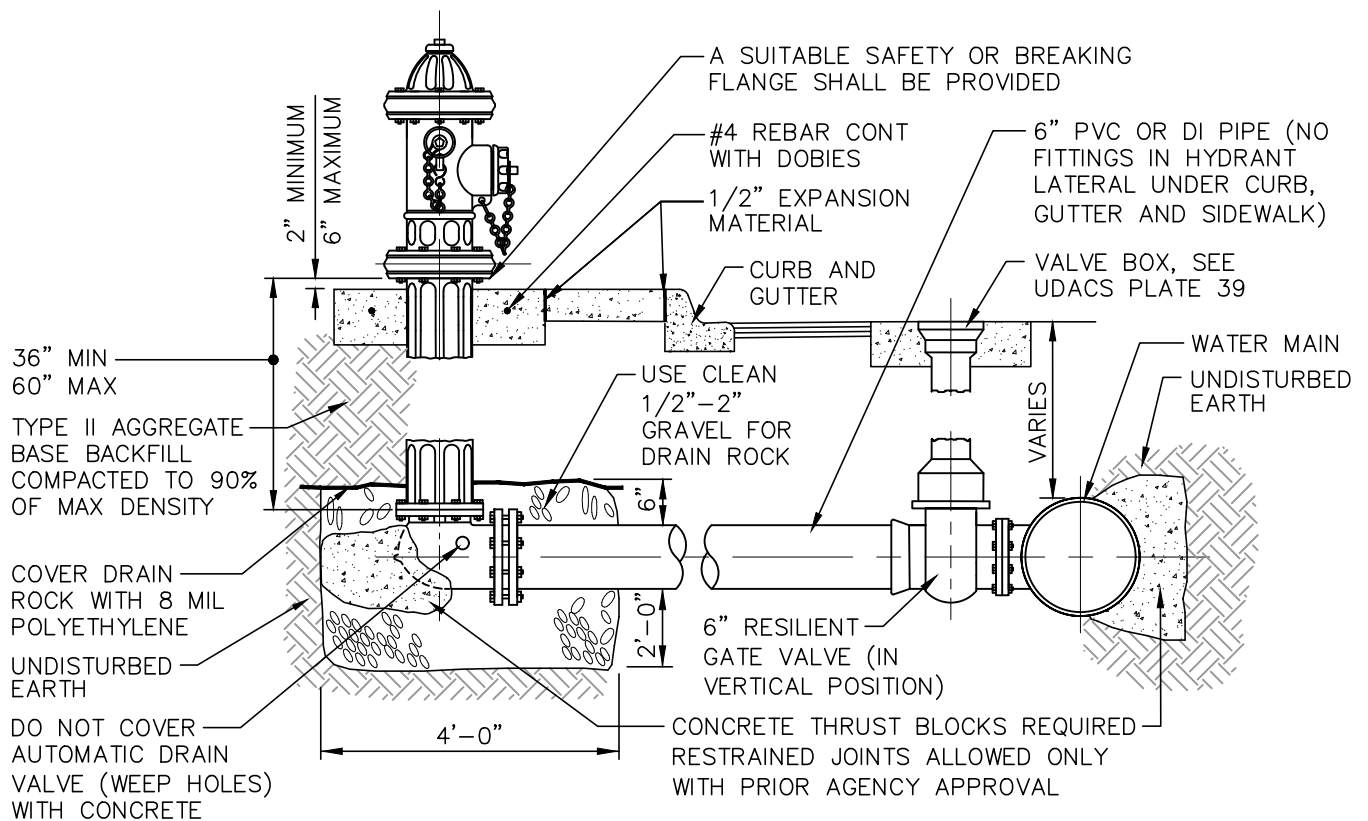
UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



PAD DETAIL

NOTE

SEE SHEET 2 FOR LOCATION CONDITIONS OF FIRE HYDRANTS, AND FIRE HYDRANT PADS.



HYDRANT ASSEMBLY DETAIL

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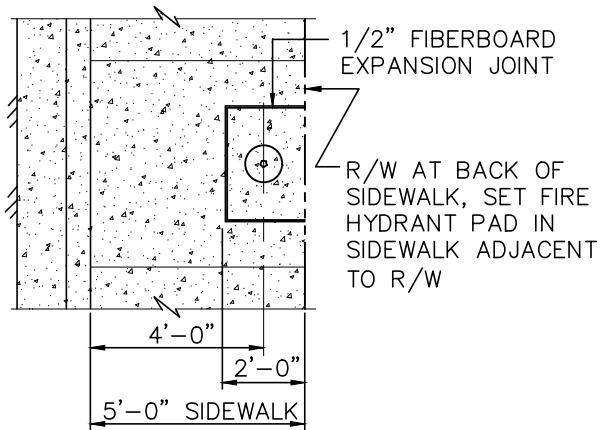
FIRE HYDRANT INSTALLATION

PLATE NO.

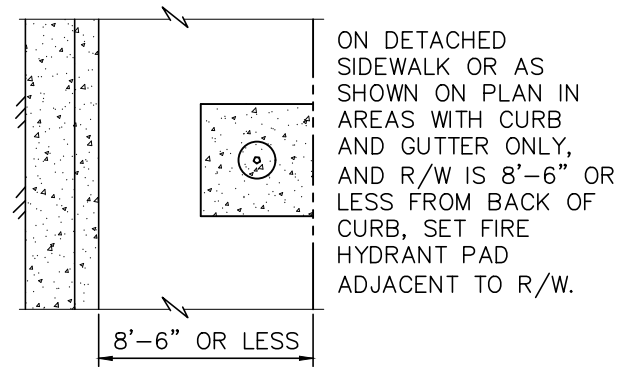
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SHEET 1 OF 4

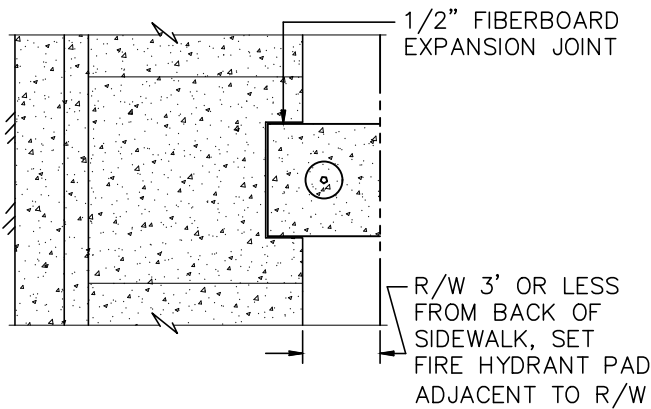
UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



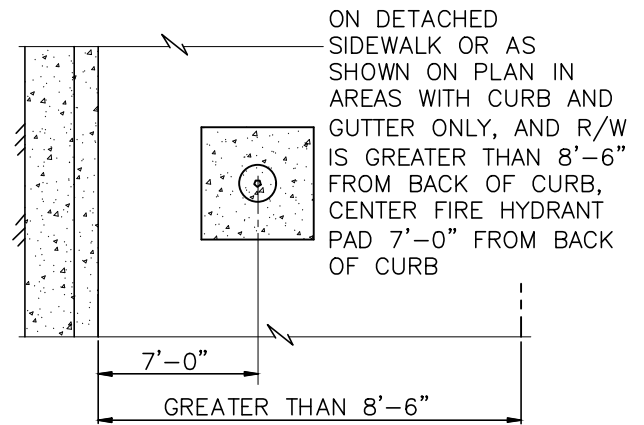
CONDITION A



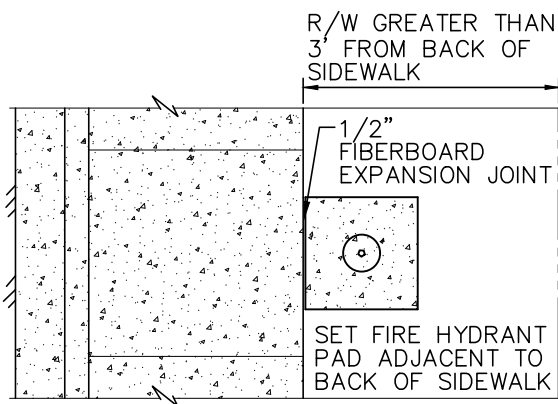
CONDITION D



CONDITION B



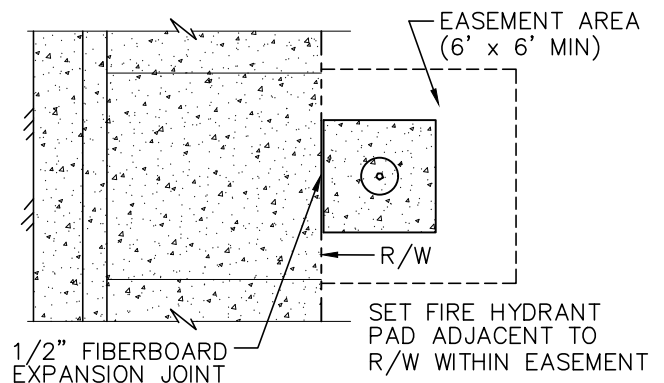
CONDITION E



CONDITION C

IF NO SIDEWALK, CURB AND GUTTER EXISTS, SET FIRE HYDRANT PAD ADJACENT TO R/W AS SHOWN IN CONDITION D ABOVE.

CONDITION F



CONDITION G

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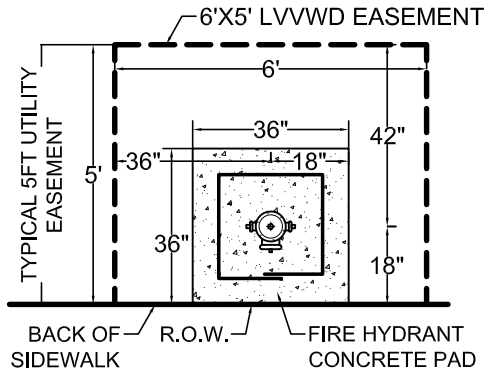
FIRE HYDRANT INSTALLATION

PLATE NO.

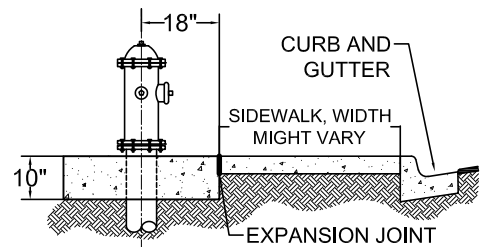
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SHEET 2 OF 4

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



PLAN VIEW

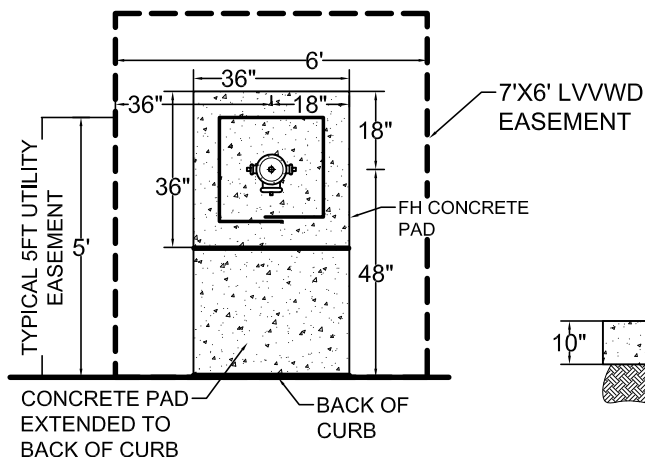


SECTION VIEW

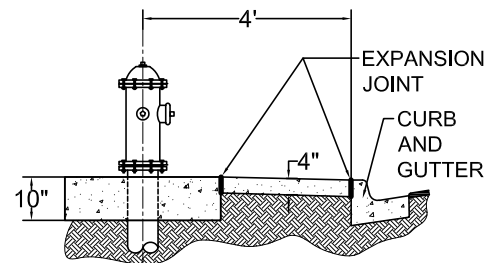
NOTES

1. FIRE HYDRANT TO BE INSTALLED PER UDACS PLATE 40 (OR 41 WHERE APPLICABLE)
2. NO SHRUBS, WALLS OR WALL FOOTING ALLOWED WITHIN LVVWD FIRE HYDRANT EASEMENT

FIRE HYDRANT LOCATION IN AREAS WITH SIDEWALK



PLAN VIEW



SECTION VIEW

NOTES

1. FIRE HYDRANT TO BE INSTALLED PER UDACS PLATE 40 (OR 41 WHERE APPLICABLE)
2. NO SHRUBS, WALLS OR WALL FOOTING ALLOWED WITHIN LVVWD FIRE HYDRANT EASEMENT
3. ANY DEVIATION FROM THIS DETAIL MUST BE APPROVED BY WATER AGENCY AND FIRE DEPARTMENT

FIRE HYDRANT LOCATION IN AREAS WITHOUT SIDEWALK

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FIRE HYDRANT INSTALLATION

PLATE NO.

40

SHEET 3 OF 4

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE REQUIREMENTS AND APPROVED FIRE HYDRANT INSTALLATION GUIDES OF THE FIRE DEPARTMENT HAVING JURISDICTION.
2. NO HYDRANT SHALL BE LOCATED WITHIN 25 FEET OF ANY STRUCTURE OR 6 FEET OF A DRIVEWAY, POWER POLE, LIGHT STANDARD, OR ANY OTHER OBSTRUCTION. FOR WALLS, FENCE, AND PLANTER LOCATIONS, A PERIMETER AROUND THE HYDRANT MEASURING A MINIMUM OF 3 FEET FROM ITS CIRCUMFERENCE SHALL BE MAINTAINED CLEAR OF ALL OBSTRUCTIONS AT ALL TIMES. HYDRANTS MUST BE LOCATED A MINIMUM OF 6 FEET AWAY FROM THE BEGINNING OF A TURNING RADIUS.
3. 6" FIRE HYDRANT LATERAL SHALL BE THE SAME PRESSURE CLASS AS THE DISTRIBUTION MAIN.
4. DUCTILE IRON PIPE TO BE ENCASED WITH TWO LAYERS EIGHT MILS THICK POLYETHYLENE FILM. DO NOT ENCASE FIRE HYDRANT BARREL UNLESS APPROVED BY AGENCY.
5. ALL FIRE HYDRANTS SHALL BE REPAINTED AS REQUIRED IF DAMAGED DURING INSTALLATION.
6. MAXIMUM FIRE HYDRANT LATERAL DEFLECTION SEE UDACS SECTIONS 2.07 AND 3.11.
7. ADDITIONAL CLEARANCE FROM THE FRONT OF FIRE HYDRANT TO BACK OF CURB MAY BE REQUIRED BY THE AGENCY.
8. NO FIELD MODIFICATIONS TO ADJUST FOR HEIGHT ARE PERMITTED. THE HYDRANT MAY NOT BE ALTERED IN ANY WAY FROM HOW IT WAS MANUFACTURED AND ASSEMBLED.
9. 1/2" PRE-MOLDED EXPANSION JOINT AROUND BARREL. FIBERBOARD OR PRE-MOLDED FOAM WITH ELASTOMERIC SEALANT.

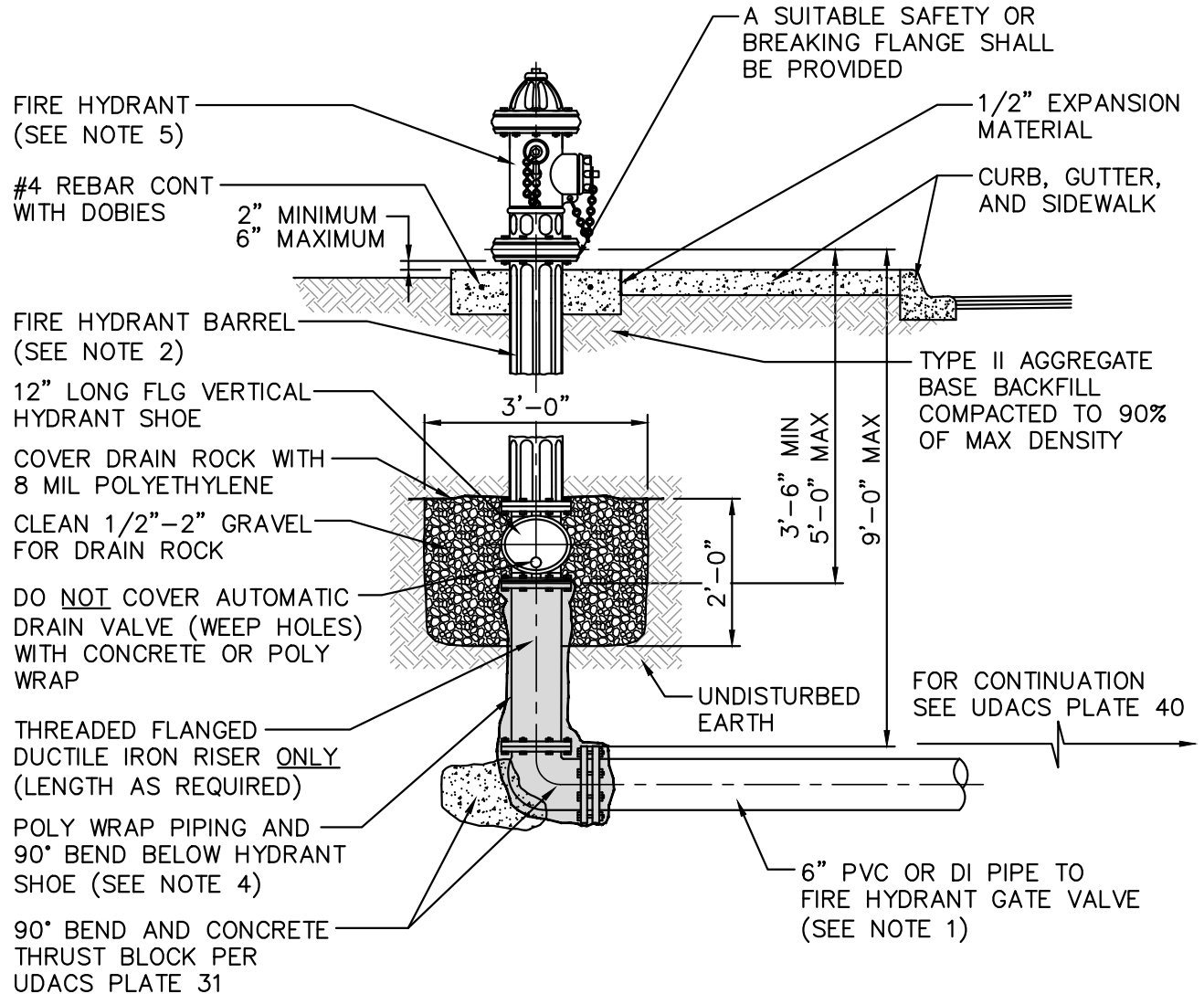
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FIRE HYDRANT INSTALLATION

PLATE NO.
40
SHEET 4 OF 4

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES

1. INSTALL 45° BENDS AS REQUIRED IN STREET TO ACHIEVE UDACS FIRE HYDRANT LATERAL DEPTH REQUIREMENTS. VERTICAL ADJUSTMENT BENDS ARE NOT TO BE INSTALLED UNDER CURB, GUTTER OR SIDEWALK AREAS.
2. NO FIRE HYDRANT BARREL SHALL BE LONGER THAN 5'-0".
3. WHEN FIRE HYDRANT LATERAL IS DEEPER THAN 5'-0" INSTALL VERTICAL HYDRANT SHOE AND FLG DUCTILE IRON RISER.
4. DUCTILE IRON PIPE AND FITTINGS TO BE ENCASED WITH TWO (2) LAYERS EIGHT MILS THICK POLYETHYLENE FILM. DO NOT ENCASE FIRE HYDRANT BARREL OR SHOE.
5. SEE UDACS PLATE 40 FOR ADDITIONAL FIRE HYDRANT INSTALLATION REQUIREMENTS.

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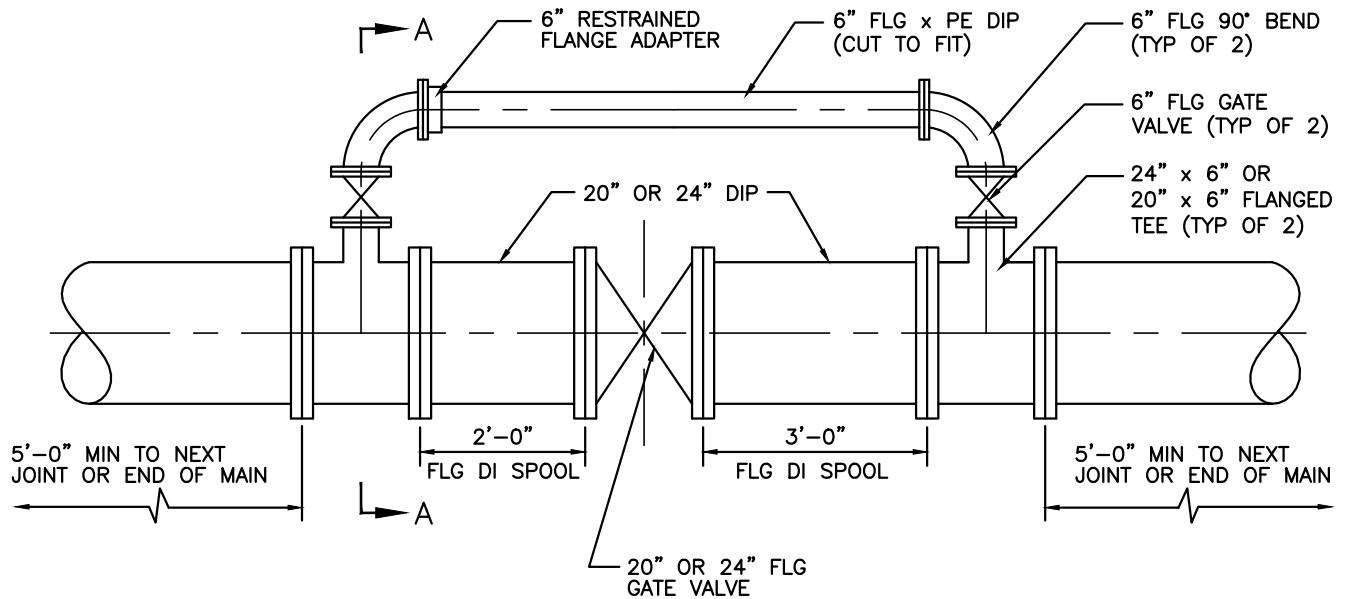
DEEP FIRE HYDRANT INSTALLATION

PLATE NO.

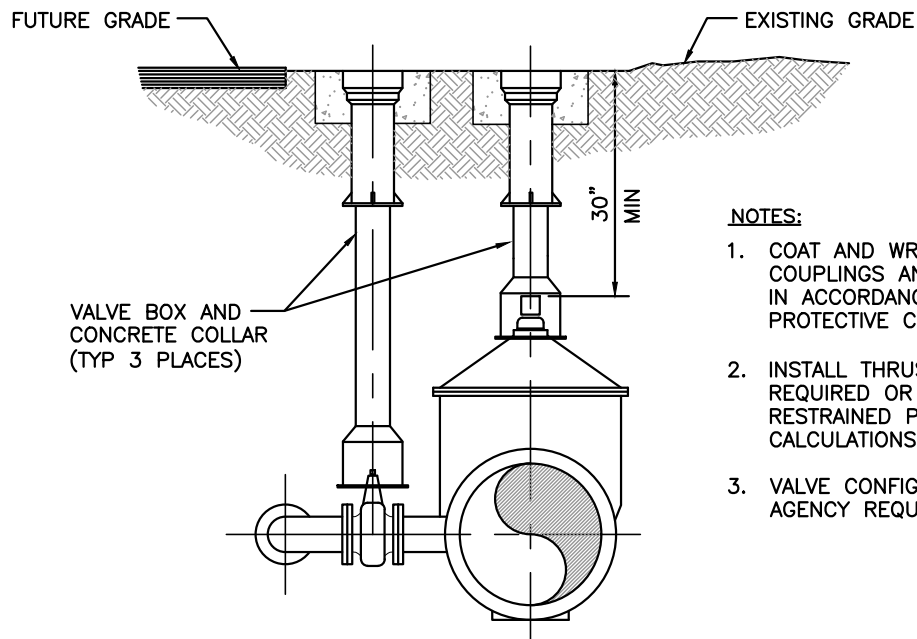
41

SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



PLAN



SECTION A-A

NOTES:

1. COAT AND WRAP VALVES, FLANGES, COUPLINGS AND OTHER EXPOSED METAL IN ACCORDANCE WITH SECTION 3, PROTECTIVE COATINGS.
2. INSTALL THRUST/ANCHOR BLOCKS AS REQUIRED OR IDENTIFY LENGTH OF RESTRAINED PIPE ON PLANS AND SUBMIT CALCULATIONS FOR AGENCY APPROVAL.
3. VALVE CONFIGURATIONS MAY VARY PER AGENCY REQUIREMENTS.

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DIRECT BURIED 20" AND 24" GATE VALVES
WITH BYPASS ON NEW PIPELINES

PLATE NO.

42

SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LARGE SERVICE INSTALLATION DETAILS AND
REQUIREMENTS FOR ABOVE-GROUND METER ASSEMBLIES
TO BE PROVIDED BY THE APPROVING AGENCY

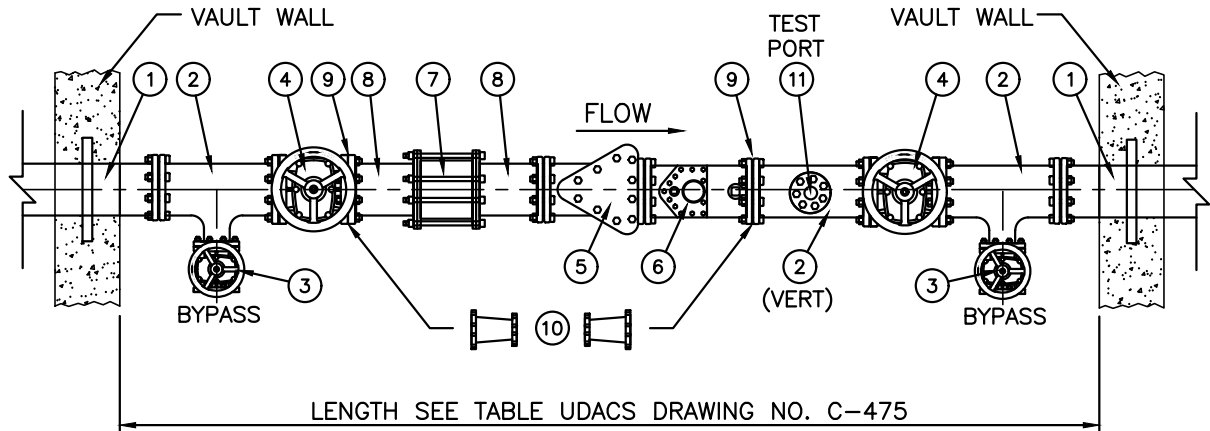
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NEW LARGE SERVICE INSTALLATION
3" TO 10" METER SIZES

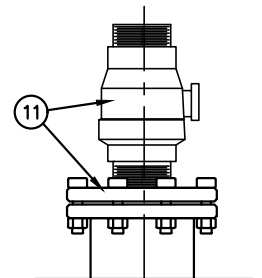
PLATE NO.
50
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



ITEM NO.	DESCRIPTION	QTY.
①	22" FLANGED WALL SPOOL WITH THRUST RING	2
②	FLANGED DUCTILE IRON TEE	3
③	4" FLANGED GATE VALVE, 4" x 2" TAPPED BLIND FLANGE AND 2" BRONZE THREADED PLUG	2
④	FLANGED GATE VALVE	2
⑤	AGENCY APPROVED STRAINER (IF REQUIRED)	1
⑥	AGENCY APPROVED METER	1
⑦	SLEEVE TYPE COUPLING	1
⑧	FLANGED x PLAIN END SPOOL (ADJUST LENGTH AS REQUIRED)	2
⑨	INSTALL ADJUSTABLE PIPE SUPPORTS	2
⑩	INSTALL FLANGED REDUCER (SEE NOTE 4)	2
⑪	6" x 2" TAPPED BLIND FLANGE, 2" CORP STOP (MALE IPT x MALE IPT)	1

TEST PORT
DETAIL



NOTES

1. GATE VALVES SHALL BE NON-RISING STEM OR AS APPROVED BY AGENCY.
2. ALL PIPING, FITTINGS, AND APPURTENANCES SHALL CONFORM TO APPLICABLE AGENCY SPECIFICATIONS.
3. ALL PIPING, FITTINGS, AND APPURTENANCES TO BE FACTORY EPOXY COATED AND LINED.
4. 3" OR 4" METER REQUIRES 6" PIPING AND VALVES WITH 6" x 3" OR 6" x 4" REDUCER AS SHOWN.
5. SEE UDACS C-475 FOR VAULT DESIGN AND STRUCTURAL REQUIREMENTS.

LARGE SERVICE INSTALLATION WITH BYPASS
IN BELOW-GROUND METER VAULT

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NEW LARGE SERVICE INSTALLATION
3" TO 10" METER SIZES

PLATE NO.
50
SHEET 2 OF 2

PLATE NO.
56
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① APPROVED REDUCED PRESSURE PRINCIPLE ASSEMBLY (RPPA)
APPROVED REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA)

ALL ASSEMBLIES TO BE LEAD-FREE FACTORY COATED OR STAINLESS STEEL AS APPROVED BY AGENCY. ABOVE GRADE PIPING TO BE PAINTED, SEE SECTION 3, PROTECTIVE COATINGS
- ② THREADED FLG x PE DUCTILE IRON PIPE, PRESSURE CLASS 350 (CUT TO FIT)
- ③ 1/2" FIBERBOARD AT SIDEWALK/PAD AND POLYFOAM WRAP WITH ELASTOMERIC SEALANT AROUND PIPE
- ④ FLG x MJ OR FLG x FLG 90° DUCTILE IRON BEND (WITH SETTER). NO SETTER REQUIRED FOR 3" ASSEMBLIES
- ⑤ RESTRAINED ADAPTER FLANGE
- ⑥ CONCRETE PAD – 4,500 PSI MIN (4" THICK) WITH WELDED WIRE FABRIC, 4 x 4 – W1.4 x W1.4 ON DOBIES
- ⑦ AGENCY APPROVED ENCLOSURE, ANCHOR PER MANUFACTURERS REQUIREMENTS
- ⑧ #4 REBAR. (WRAP EXPOSED PORTION OF REBAR WITH 10 MIL DIELECTRIC PLASTIC TAPE WITH 1/2 OVERLAP)
- ⑨ SHUT-OFF GATE VALVE TO MATCH PIPE SIZE (6"MIN) WHEN REQUIRED BY AGENCY. PER UDACS PLATE 30 & 39 ADDITIONAL DI REDUCERS REQUIRED FOR 4" PIPES AND SMALLER
- ⑩ OS & Y VALVE INSTALLATIONS VALVE STEM TO MAINTAIN 1" (MIN) CLEARANCE FROM INSIDE WALL OF ENCLOSURE OR AS APPROVED BY AGENCY
- ⑪ RETAINING WALL, FENCE, OTHER OBSTRUCTION OR EDGE OF EASEMENT AREA.
- ⑫ DI FLG CONCENTRIC REDUCER PER UDACS PLATE 30. 6" x 3" FOR 3" ASSEMBLIES OR 6" x 4" FOR 4" ASSEMBLIES

NOTES

1. ENCLOSURE SIZE AND CONCRETE PAD TO BE DETERMINED USING MINIMUM CLEARANCES SHOWN, AND AGENCY REQUIREMENTS.
2. PIPE SETTER MAY BE OMITTED WITH PRIOR APPROVAL BY THE AGENCY.
3. DIFFERENCE IN ELEVATION NOT PERMITTED AT 90° BENDS BELOW GRADE, UNLESS PRIOR APPROVAL OBTAINED FROM THE AGENCY.
4. INSTALL BOLLARDS AS REQUIRED. SEE UDACS PLATE 75.
5. APPROVING AGENCY MAY REQUIRE INSTALLATION OF A REDUCER. INSTALL REDUCER PRIOR TO AND/OR AFTER 90° BEND ON INLET/OUTLET PIPING.
6. IN ORDER TO ALLOW FOR ACCESS AND MAINTENANCE OF BACKFLOW ASSEMBLIES AND SHUT-OFF VALVE A MINIMUM OF THREE (3) FEET ADJACENT TO ASSEMBLY SHALL BE LEVEL AND FREE OF SHRUBBERY AND OBSTRUCTIONS (TYP).
7. IDENTIFICATION TAG ON BACKFLOW ENCLOSURE MAY BE REQUIRED BY AGENCY.
8. THERE SHALL BE NO UNPROTECTED CONNECTION ON THE WATER SERVICE LINE BETWEEN THE MAIN AND THE BACKFLOW PREVENTION DEVICE IN ACCORDANCE WITH NAC 445.67235 & 445A.6724

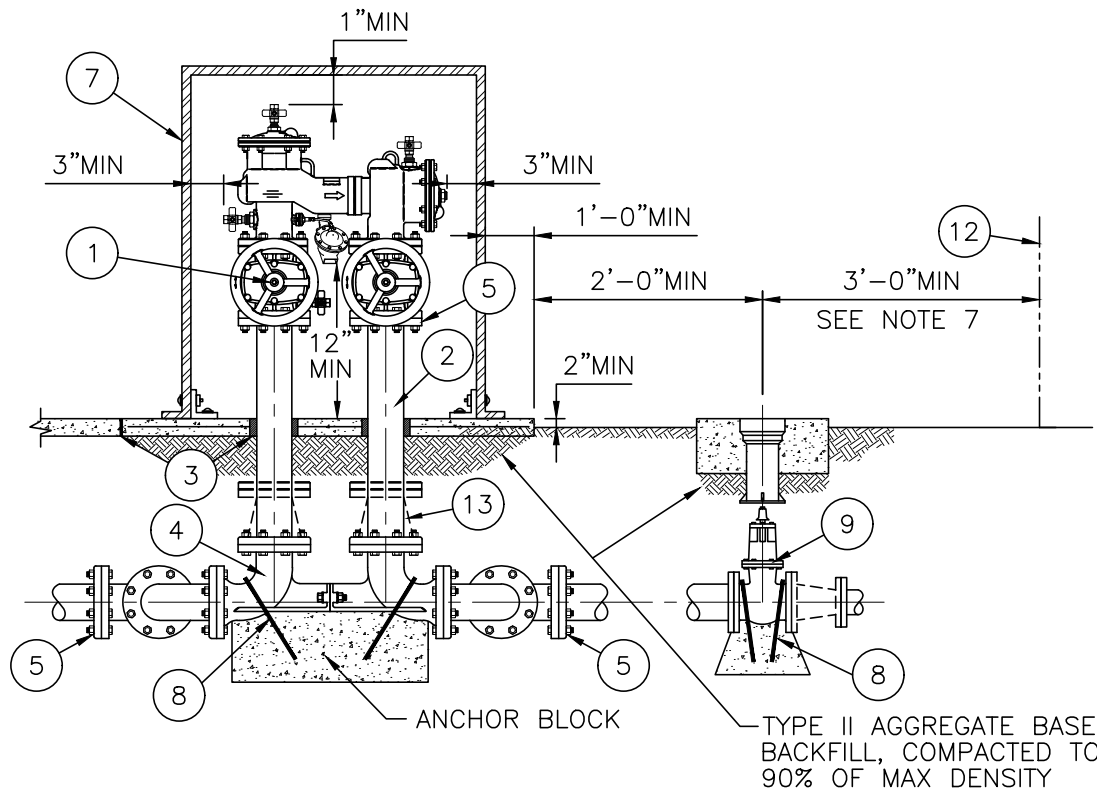
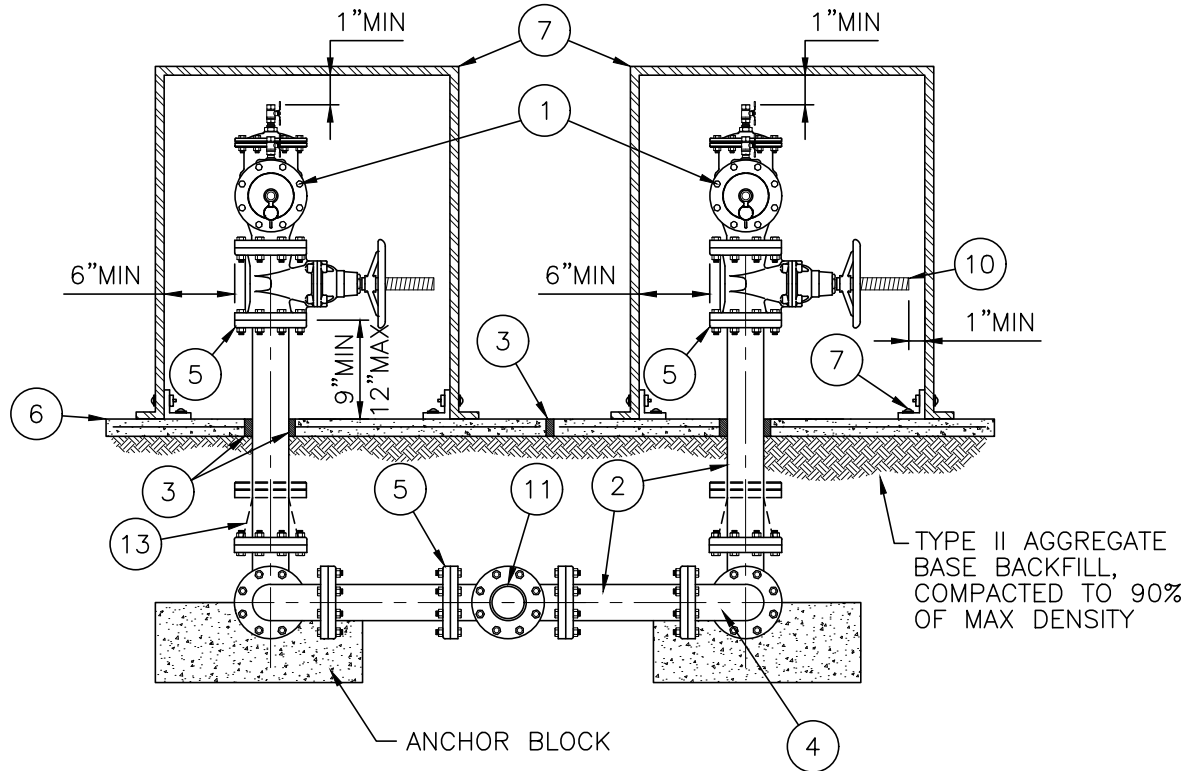
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BACKFLOW PREVENTION ASSEMBLY
3" – 10" DIAMETER

PLATE NO.
56
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



SEE SHEET 3 FOR LEGEND AND NOTES

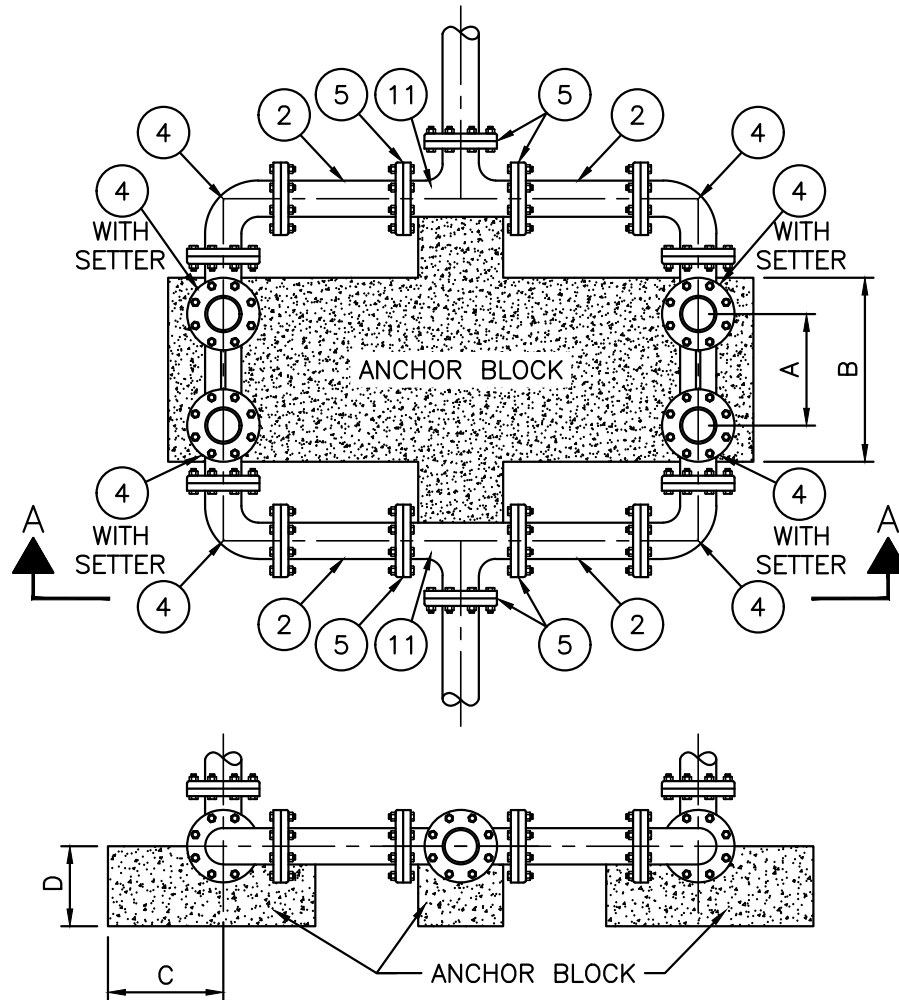
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DUAL BACKFLOW PREVENTION ASSEMBLY
4" - 10" DIAMETER

PLATE NO.
57
SHEET 1 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



SECTION A-A

NOTE
FORM ANCHOR BLOCK AS SHOWN. DO NOT
ENCASE PIPING OR FLANGES WITHIN CONCRETE.

ANCHOR BLOCK SIZING REQUIREMENTS

ASSY SIZE	4"	6"	8"	10"
A	16"	16"	18-1/2"	21"
B	26"	26"	30"	36"
C	21"	21"	24"	27"
D	12"	12"	16"	20"

SEE SHEET 3 FOR LEGEND AND NOTES

NOT
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DUAL BACKFLOW PREVENTION ASSEMBLY
4" - 10" DIAMETER

PLATE NO.
57
SHEET 2 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① APPROVED REDUCED PRESSURE PRINCIPLE ASSEMBLY (RPPA)
APPROVED REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA)

ALL ASSEMBLIES TO BE LEAD-FREE FACTORY COATED OR STAINLESS STEEL AS APPROVED BY AGENCY.
ABOVE GRADE PIPING TO BE PAINTED, SEE SECTION 3, PROTECTIVE COATINGS
- ② FLG x PE DUCTILE IRON PIPE (CUT TO FIT), PRESSURE CLASS 350 FLG x FLG DUCTILE IRON PIPE,
PRESSURE CLASS 350
- ③ 1/2" FIBERBOARD AT SIDEWALK/PAD AND POLYFOAM WRAP WITH ELASTOMERIC SEALANT AROUND PIPE
- ④ FLG x FLG 90° DUCTILE IRON BEND (WITH SETTER FOR BACKFLOW ASSEMBLY BENDS)
- ⑤ RESTRAINED ADAPTER FLANGE
- ⑥ CONCRETE PAD – 4,500 PSI MIN (4" THICK) WITH WELDED WIRE FABRIC,
4 x 4 – W1.4 x W1.4 ON DOBIES
- ⑦ AGENCY APPROVED ENCLOSURE, ANCHOR PER MANUFACTURERS REQUIREMENTS
- ⑧ #4 REBAR. (WRAP EXPOSED PORTION OF REBAR WITH 10 MIL DIELECTRIC PLASTIC TAPE WITH 1/2
OVERLAP)
- ⑨ SHUT-OFF GATE VALVE TO MATCH PIPE SIZE (6"MIN) WHEN REQUIRED BY AGENCY PER UDACS PLATE
30 & 39. ADDITIONAL DI REDUCERS REQUIRED FOR 4" PIPES AND SMALLER
- ⑩ OS & Y VALVE INSTALLATIONS VALVE STEM TO MAINTAIN 1" (MIN) CLEARANCE FROM INSIDE WALL OF
ENCLOSURE OR AS APPROVED BY AGENCY
- ⑪ FLG x FLG DUCTILE IRON TEE (CONNECT TO TEE WITH NEW FLANGED PIPE OR RESTRAINED FLANGE
ADAPTERS).
- ⑫ RETAINING WALL, FENCE, OTHER OBSTRUCTION OR EDGE OF EASEMENT AREA.
- ⑬ DI FLG REDUCER. ECCENTRIC 6" x 4" FOR 4" ASSEMBLIES

NOTES

1. ENCLOSURE SIZE AND CONCRETE PAD TO BE DETERMINED USING MINIMUM CLEARANCES SHOWN,
AND AGENCY REQUIREMENTS.
2. PIPE SETTER MAY BE OMITTED WITH PRIOR APPROVAL BY THE AGENCY.
3. DIFFERENCE IN ELEVATION NOT PERMITTED AT 90° BENDS BELOW GRADE, UNLESS PRIOR
APPROVAL OBTAINED FROM THE AGENCY.
4. INSTALL BOLLARDS AS REQUIRED. SEE UDACS PLATE 75.
5. APPROVING AGENCY MAY REQUIRE INSTALLATION OF A REDUCER. INSTALL REDUCER PRIOR TO
AND/OR AFTER 90° BEND ON INLET/OUTLET PIPING.
6. ADDITIONAL SPOOLS MAY BE INSTALLED TO ADJUST TO EXISTING SITE CONDITIONS AS APPROVED
BY THE AGENCY.
7. IN ORDER TO ALLOW FOR ACCESS AND MAINTENANCE OF BACKFLOW ASSEMBLIES AND SHUT-OFF
VALVE A MINIMUM OF THREE (3) FEET ADJACENT TO ASSEMBLY SHALL BE LEVEL AND FREE OF
SHRUBBERY AND OBSTRUCTIONS (TYP).
8. IDENTIFICATION TAG ON BACKFLOW ENCLOSURE MAY BE REQUIRED BY AGENCY.
9. THERE SHALL BE NO UNPROTECTED CONNECTION ON THE WATER SERVICE LINE BETWEEN THE
MAIN AND THE BACKFLOW PREVENTION DEVICE IN ACCORDANCE WITH NAC 445.67235 &
445A.6724

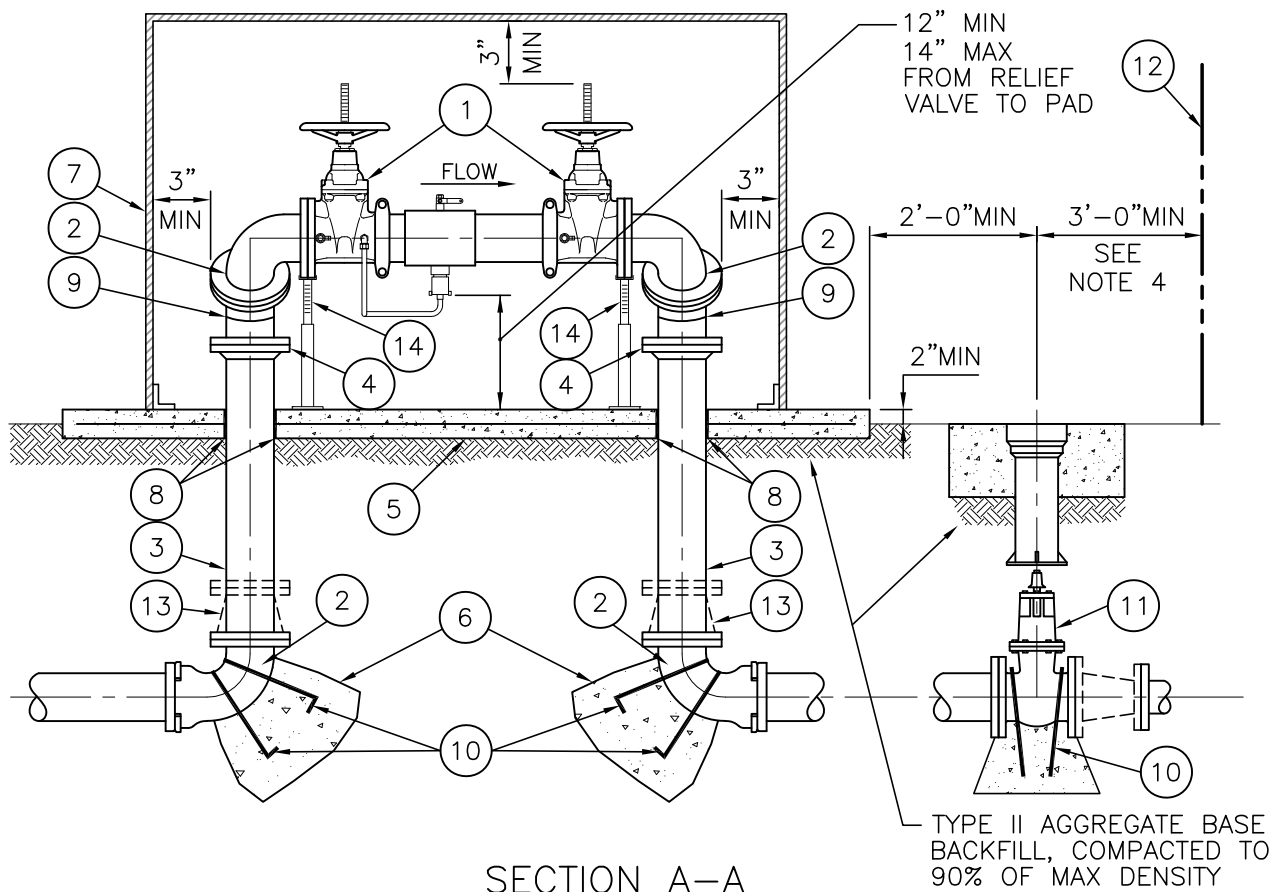
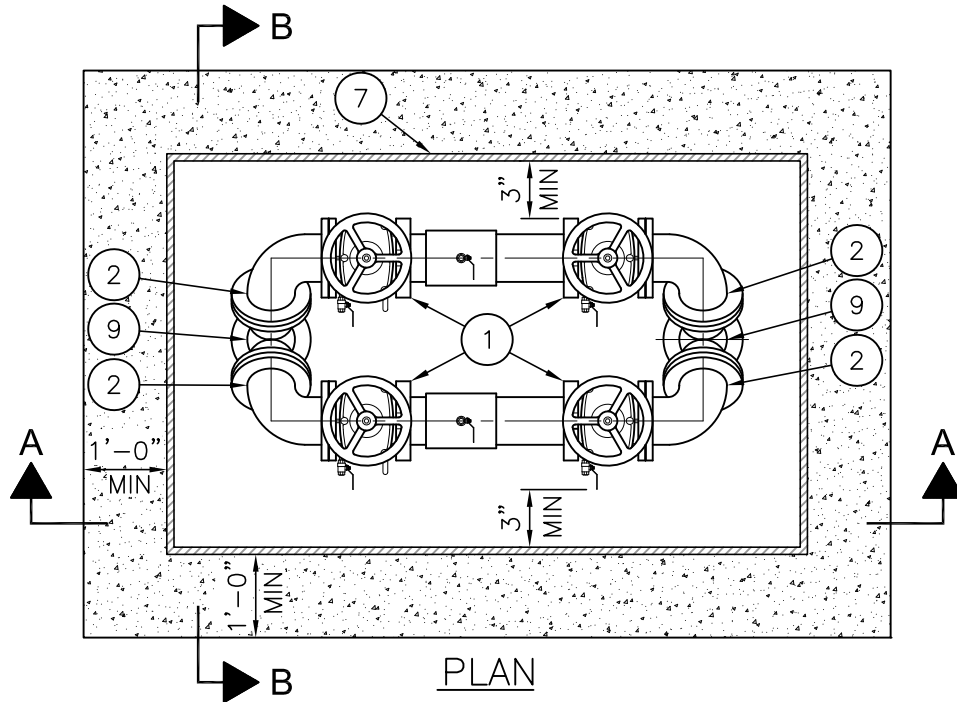
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DUAL BACKFLOW PREVENTION ASSEMBLY
4" – 10" DIAMETER

PLATE NO.
57
SHEET 3 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



SEE SHEET 3 FOR LEGEND AND NOTES

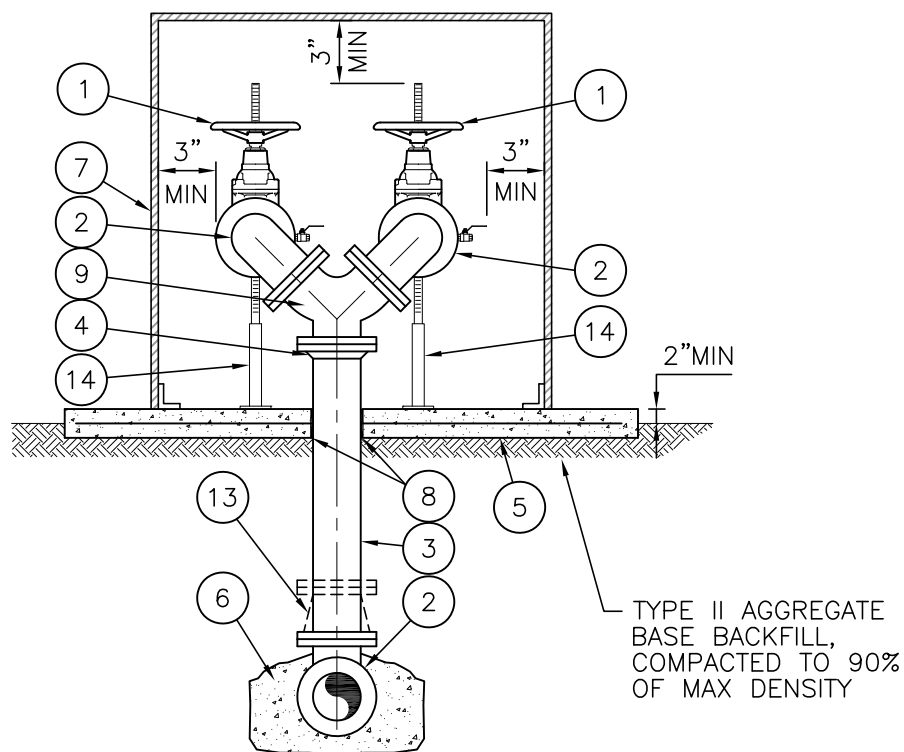
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DUAL CONVENTIONAL BACKFLOW PREVENTION ASSEMBLY
4" - 10" DIAMETER

PLATE NO.
58
SHEET 1 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



SECTION B-B

SEE SHEET 3 FOR LEGEND AND NOTES

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DUAL CONVENTIONAL BACKFLOW PREVENTION ASSEMBLY
4" - 10" DIAMETER

PLATE NO.
58
SHEET 2 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① APPROVED REDUCED PRESSURE PRINCIPLE ASSEMBLY (RPPA)
APPROVED REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA)

ALL ASSEMBLIES TO BE LEAD-FREE FACTORY COATED OR STAINLESS STEEL AS APPROVED BY AGENCY. ABOVE GRADE PIPING TO BE PAINTED, SEE SECTION 3, PROTECTIVE COATINGS
- ② FLG x FLG (ABOVE GRADE), FLG x MJ (BELOW GRADE) DUCTILE IRON 90° BEND
- ③ FLG x PE DUCTILE IRON PIPE (CUT TO FIT), PRESSURE CLASS 350 FLG x FLG DUCTILE IRON PIPE, PRESSURE CLASS 350
- ④ RESTRAINED ADAPTER FLANGE
- ⑤ CONCRETE PAD – 4,500 PSI MIN (4" THICK) WITH WELDED WIRE FABRIC, 4 x 4 – W1.4 x W1.4 ON DOBIES
- ⑥ CONCRETE THRUST/ANCHOR BLOCK
- ⑦ AGENCY APPROVED ENCLOSURE, ANCHOR PER MANUFACTURERS REQUIREMENTS
- ⑧ 1/2" FIBERBOARD AT SIDEWALK/PAD AND POLYFOAM WRAP WITH ELASTOMERIC SEALANT AROUND PIPE
- ⑨ FLG x FLG DUCTILE IRON WYE (CONNECT TO WYE WITH NEW FLANGED PIPE OR RESTRAINED FLANGE ADAPTERS)
- ⑩ #4 REBAR. (WRAP EXPOSED PORTION OF REBAR WITH 10 MIL DIELECTRIC PLASTIC TAPE WITH 1/2 OVERLAP)
- ⑪ SHUT-OFF GATE VALVE TO MATCH PIPE (6"MIN) INSTALLED WHEN REQUIRED BY AGENCY PER UDACS PLATE 30 & 39. ADDITIONAL DI REDUCERS REQUIRED FOR 4" PIPES
- ⑫ RETAINING WALL, FENCE, OTHER OBSTRUCTION OR EDGE OF EASEMENT AREA.
- ⑬ DI FLG REDUCER. ECCENTRIC 6" x 4" FOR 4" ASSEMBLIES
- ⑭ AGENCY APPROVED ADJUSTABLE PIPE SUPPORT

NOTES

- 1. ENCLOSURE SIZE AND CONCRETE PAD TO BE DETERMINED USING MINIMUM CLEARANCES SHOWN, AND AGENCY REQUIREMENTS.
- 2. TOP OF CONCRETE PAD TO BE FLUSH WITH SIDEWALK WHEN POURED AGAINST SIDEWALK OR VAULT.
- 3. INSTALL BOLLARDS AS REQUIRED, SEE UDACS PLATE 75.
- 4. IN ORDER TO ALLOW FOR ACCESS AND MAINTENANCE OF BACKFLOW ASSEMBLIES AND SHUT-OFF VALVE A MINIMUM OF THREE (3) FEET ADJACENT TO ASSEMBLY SHALL BE LEVEL AND FREE OF SHRUBBERY AND OBSTRUCTIONS (TYP).
- 5. IDENTIFICATION TAG ON BACKFLOW ENCLOSURE MAY BE REQUIRED BY AGENCY.
- 6. THERE SHALL BE NO UNPROTECTED CONNECTION ON THE WATER SERVICE LINE BETWEEN THE MAIN AND THE BACKFLOW PREVENTION DEVICE IN ACCORDANCE WITH NAC 445.67235 & 445A.6724

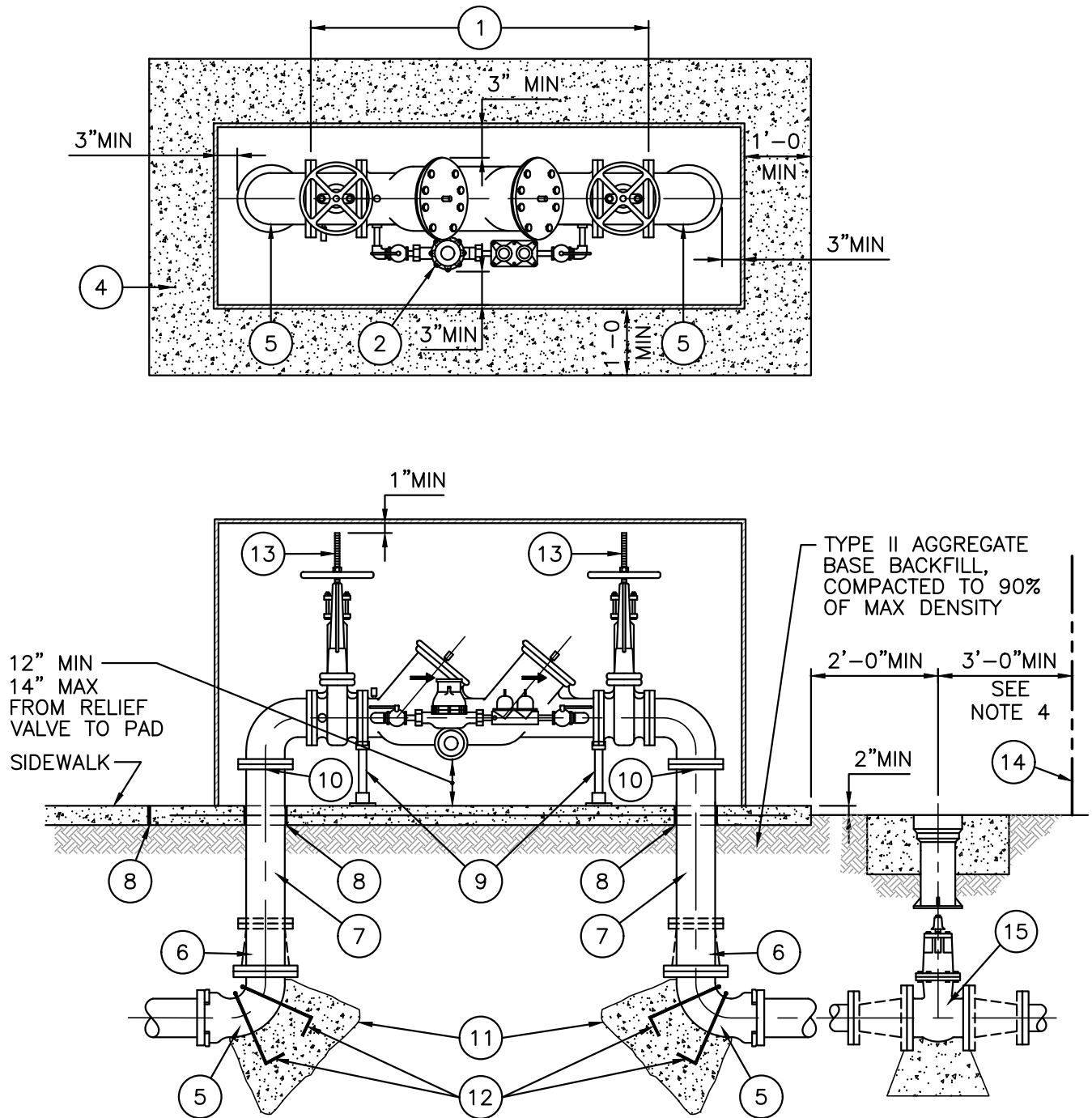
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DUAL CONVENTIONAL BACKFLOW PREVENTION ASSEMBLY
4" – 10" DIAMETER

PLATE NO.
58
SHEET 3 OF 3

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



SEE SHEET 2 FOR LEGEND AND NOTES

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INLINE BACKFLOW PREVENTION ASSEMBLY
4" - 10" DIAMETER

PLATE NO.
59
SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

LEGEND

- ① APPROVED REDUCED PRESSURE PRINCIPLE ASSEMBLY (RPPA)
APPROVED REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA)

ALL ASSEMBLIES TO BE LEAD-FREE FACTORY COATED OR STAINLESS STEEL AS APPROVED
BY AGENCY. ABOVE GRADE PIPING TO BE PAINTED, SEE SECTION 3, PROTECTIVE COATINGS
- ② BYPASS METER WITH RPPA
- ③ AGENCY APPROVED ENCLOSURE, ANCHOR PER MANUFACTURERS REQUIREMENTS
- ④ CONCRETE PAD – 4,500 PSI MIN (4" THICK) WITH WELDED WIRE FABRIC,
4 x 4 – W1.4 x W1.4 WITH DOBIES
- ⑤ FLG x FLG (ABOVE GRADE), FLG x MJ (BELOW GRADE) DUCTILE IRON 90° BEND
- ⑥ DI FLG REDUCER. CONCENTRIC 6" x 4" FOR 4" ASSEMBLIES
- ⑦ FLG x PE DUCTILE IRON PIPE (CUT TO FIT), PRESSURE CLASS 350 FLG x FLG DUCTILE
IRON PIPE, PRESSURE CLASS 350
- ⑧ 1/2" FIBERBOARD AT SIDEWALK/PAD AND POLYFOAM WRAP WITH ELASTOMERIC SEALANT
AROUND PIPE
- ⑨ AGENCY APPROVED ADJUSTABLE PIPE SUPPORT
- ⑩ RESTRAINED ADAPTER FLANGE
- ⑪ CONCRETE THRUST/ANCHOR BLOCK
- ⑫ #4 REBAR. (WRAP EXPOSED PORTION OF REBAR WITH 10 MIL DIELECTRIC PLASTIC TAPE
WITH 1/2 OVERLAP)
- ⑬ OS & Y VALVE INSTALLATIONS VALVE STEM TO MAINTAIN 1" (MIN) CLEARANCE FROM
INSIDE WALL OF ENCLOSURE OR AS APPROVED BY AGENCY.
- ⑭ RETAINING WALL, FENCE, OTHER OBSTRUCTION OR EDGE OF EASEMENT AREA.
- ⑮ SHUT-OFF GATE VALVE TO MATCH PIPE (6"MIN) INSTALLED WHEN REQUIRED BY AGENCY.
ADDITIONAL DI REDUCERS REQUIRED FOR 4" PIPES

NOTES

1. ENCLOSURE SIZE AND CONCRETE PAD TO BE DETERMINED USING MINIMUM CLEARANCES
SHOWN, AND AGENCY REQUIREMENTS.
2. TOP OF CONCRETE PAD TO BE FLUSH WITH SIDEWALK WHEN POURED AGAINST SIDEWALK
OR VAULT.
3. INSTALL BOLLARDS AS REQUIRED, SEE UDACS PLATE 75.
4. IN ORDER TO ALLOW FOR ACCESS AND MAINTENANCE OF BACKFLOW ASSEMBLIES AND
SHUT-OFF VALVE A MINIMUM OF THREE (3) FEET ADJACENT TO ASSEMBLY SHALL BE
LEVEL AND FREE OF SHRUBBERY AND OBSTRUCTIONS (TYP).
5. IDENTIFICATION TAG ON BACKFLOW ENCLOSURE MAY BE REQUIRED BY AGENCY.
6. THERE SHALL BE NO UNPROTECTED CONNECTION ON THE WATER SERVICE LINE BETWEEN
THE MAIN AND THE BACKFLOW PREVENTION DEVICE IN ACCORDANCE WITH NAC 445.67235
& 445A.6724

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INLINE BACKFLOW PREVENTION ASSEMBLY
4" – 10" DIAMETER

PLATE NO.
59
SHEET 2 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS

SEE BELOW FOR BOLTS, NUTS
AND OTHER HARDWARE
REQUIREMENTS

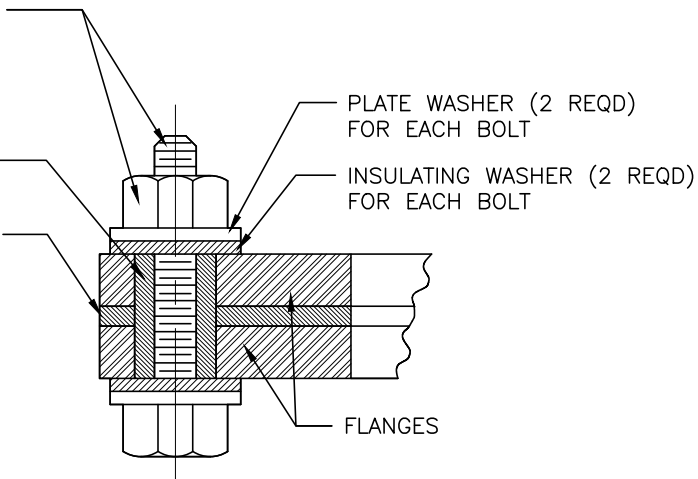
INSULATING SLEEVE (1 REQD)
EACH BOLT

INSULATING GASKET (1 REQD)

PLATE WASHER (2 REQD)
FOR EACH BOLT

INSULATING WASHER (2 REQD)
FOR EACH BOLT

FLANGES



FLANGES - BURIED OR EXPOSED LOCATIONS:

DUCTILE IRON OR GRAY IRON PIPES:

STANDARD: AWWA C115

BOLTS: ASTM A307 GRADE A

NUTS: ASTM A563 AND ANSI/ASME B1.1 CLASS 2A

OTHER: MATERIALS ZINC PLATED, ASTM B633, SERVICE CLASS 1, TYPE II

NOTES: USE A307 BOLTS WITH RUBBER FLANGE GASKETS ONLY, BOLTING PRODUCT MARKINGS PER ASTM A307; OTHERWISE USE ASME B18.2.1 BOLTS AND ASME B18.2.2 NUTS. BURIED LOCATIONS REQUIRE PROTECTIVE COATING

STEEL PIPES:

STANDARD: AWWA C207

BOLTS: ASTM A193/A193M GRADE B7

NUTS: ASTM A194/A194M GRADE 2H HEAVY HEX NUTS OR ASTM A563 HEAVY HEX NUTS FOR 1" AND SMALLER

OTHER: WASHERS ASTM F436. MATERIALS ZINC PLATED, ASTM B633, SERVICE CLASS 1, TYPE II

NOTES: BOLTING PRODUCT MARKINGS PER ASTM A193/A193M AND ASTM A962/A962M. BURIED LOCATIONS REQUIRE PROTECTIVE COATING.

FLANGES - SUBMERGED, VAULTS, ENCLOSURES, OR SUMPS:

DUCTILE IRON, GRAY IRON PIPES OR STEEL PIPES:

STANDARD: AWWA C115

BOLTS: ASTM F593 TYPE 316 GRADE AF (UP TO 1-1/2")

NUTS: ASTM A563 AND ANSI/ASME B1.1 CLASS 2A.

COAT SURFACES OF NUT WITH XYLAN 1000 SERIES FLUOROPOLYMER

OTHER: WASHERS SS304

NOTES: BOLTING PRODUCT MARKINGS PER ASTM T-316, 316, F593G, OR F593H

NOTES

1. TORQUE BOLTS PER INSULATING FLANGE SET MANUFACTURE'S RECOMMENDATIONS (TYP).
2. COAT AND/OR WRAP IN ACCORDANCE WITH SECTION 3, PROTECTIVE COATINGS.
3. ALL HARDWARE REFERENCED ARE SUBJECT TO CHANGE DEPENDING ON THE APPROVING AGENCY REQUIREMENTS. PRIOR AGENCY APPROVAL IS REQUIRED BEFORE INSTALLATION.

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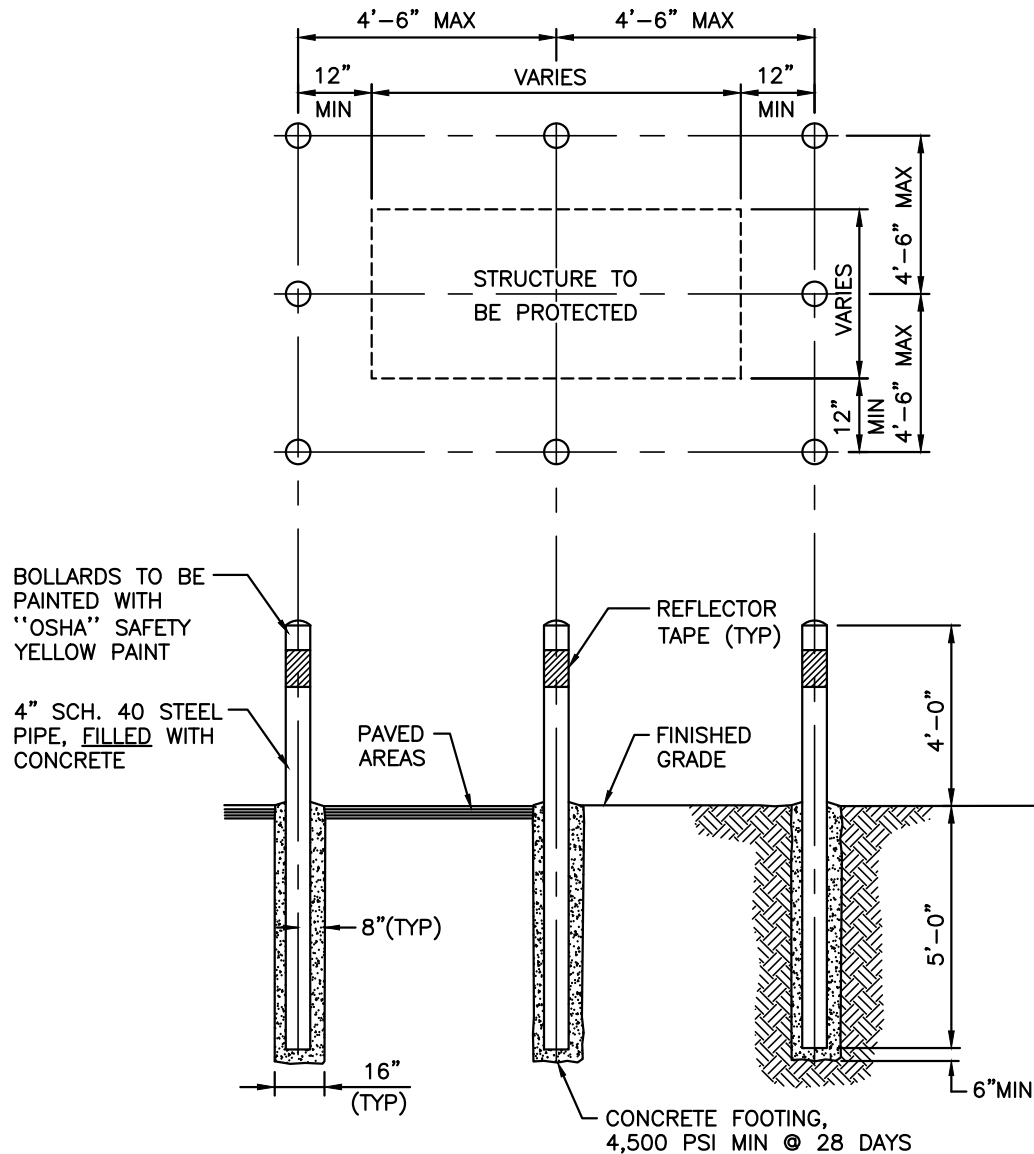
INSULATING FLANGE DETAIL

PLATE NO.

73

SHEET 1 OF 1

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES

1. PLACE 6" WIDE, YELLOW CLASS 4 REFLECTIVE TAPE (PER STANDARD SPECIFICATIONS, SECTION 716), 4" DOWN FROM TOP, FOR FULL DIAMETER ON ALL BOLLARDS.
2. CONTRACTOR TO ASSURE THAT BOLLARDS ARE PLACED TO ALLOW FULL ACCESS TO THE PROTECTED FACILITY.
3. BOLLARDS ON SIDES NOT ACCESSIBLE TO VEHICLES MAY BE OMITTED BY THE AGENCY.

PERMANENT VEHICULAR PROTECTION BOLLARD INSTALLATION

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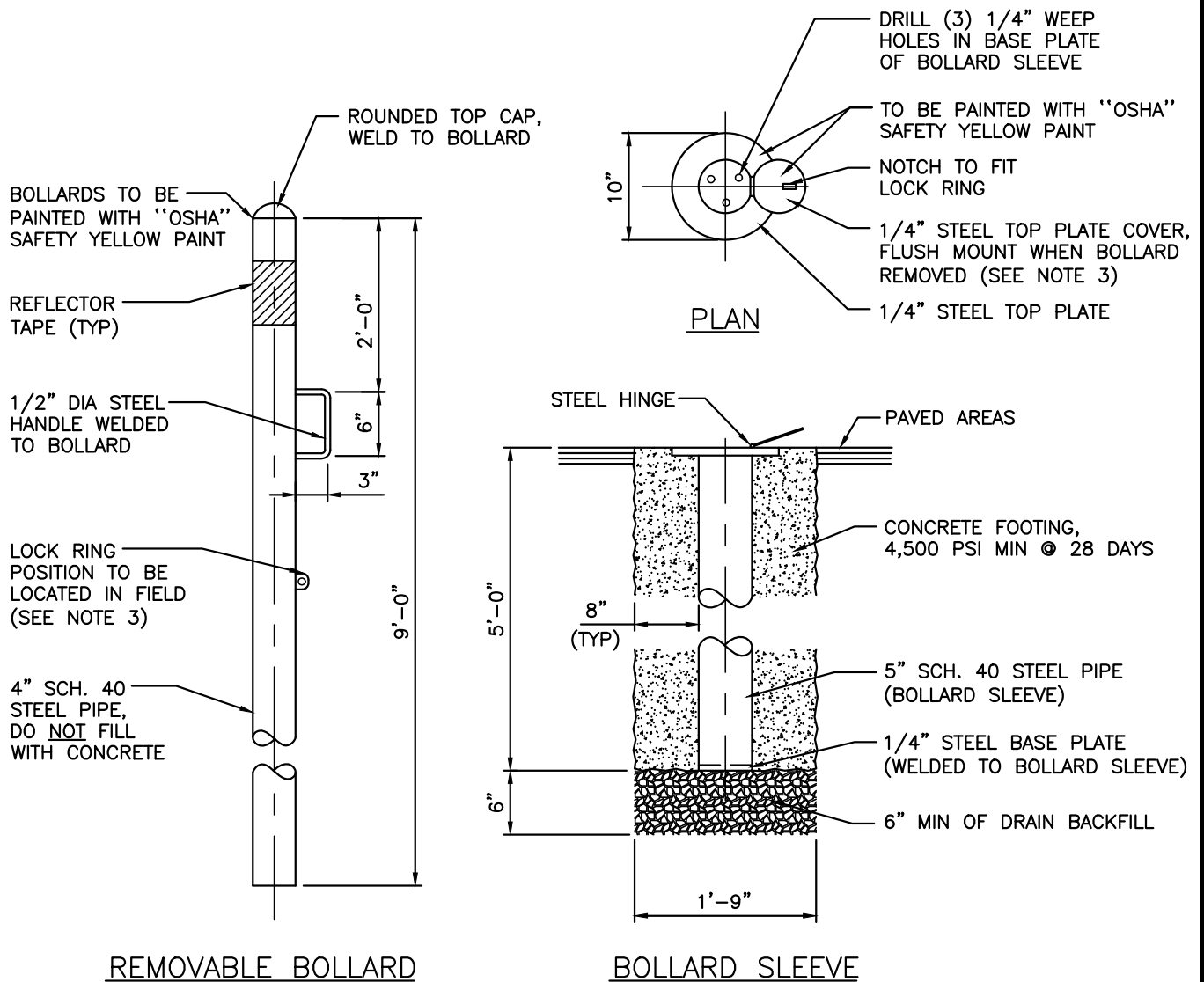
VEHICULAR PROTECTION BOLLARD

PLATE NO.

75

SHEET 1 OF 2

UNIFORM DESIGN STANDARDS FOR WATER DISTRIBUTION SYSTEMS



NOTES

1. PLACE 6" WIDE, YELLOW CLASS 4 REFLECTIVE TAPE (PER STANDARD SPECIFICATIONS, SECTION 716), 4" DOWN FROM TOP, FOR FULL DIAMETER ON ALL BOLLARDS.
2. CONTRACTOR TO ASSURE THAT BOLLARDS ARE PLACED TO ALLOW FULL ACCESS TO THE PROTECTED FACILITY.
3. INSTALL AGENCY PROVIDED LOCK AFTER INSTALLATION COMPLETED.
4. SUBMIT SHOP DRAWING OF REMOVABLE BOLLARD ASSEMBLY TO AGENCY FOR APPROVAL.

REMOVABLE VEHICULAR PROTECTION BOLLARD INSTALLATION

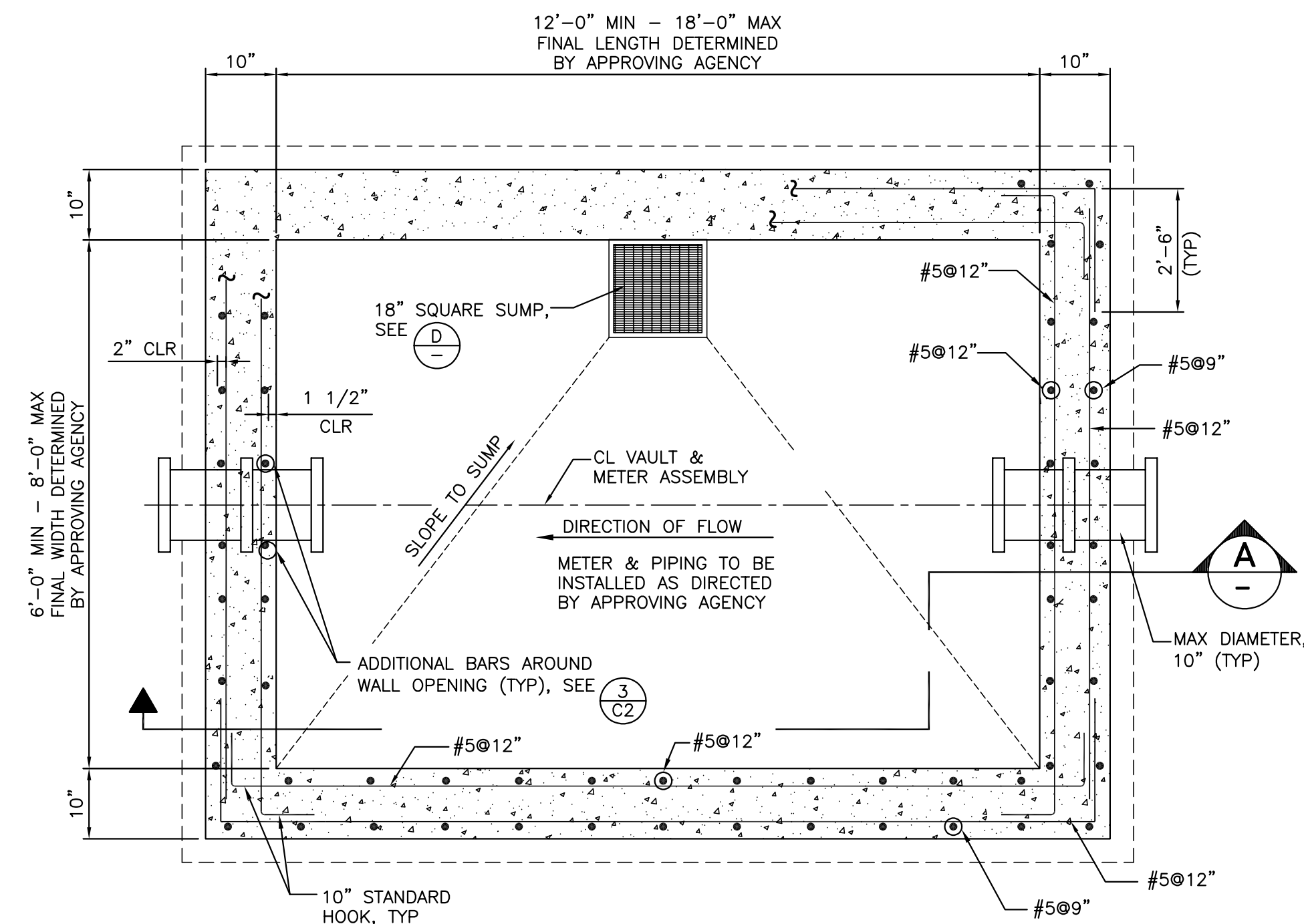
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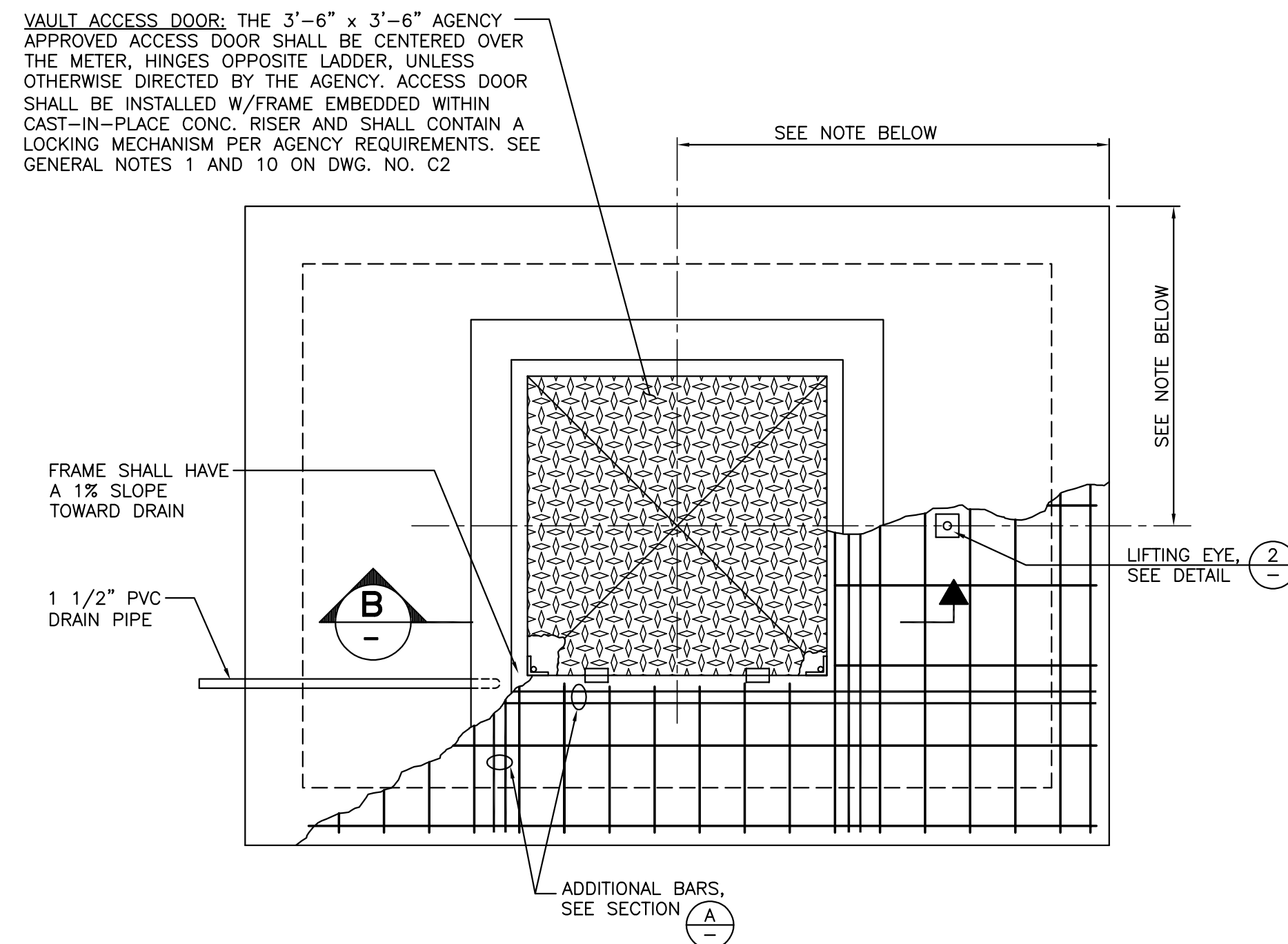
VEHICULAR PROTECTION BOLLARD

PLATE NO.
75
SHEET 2 OF 2

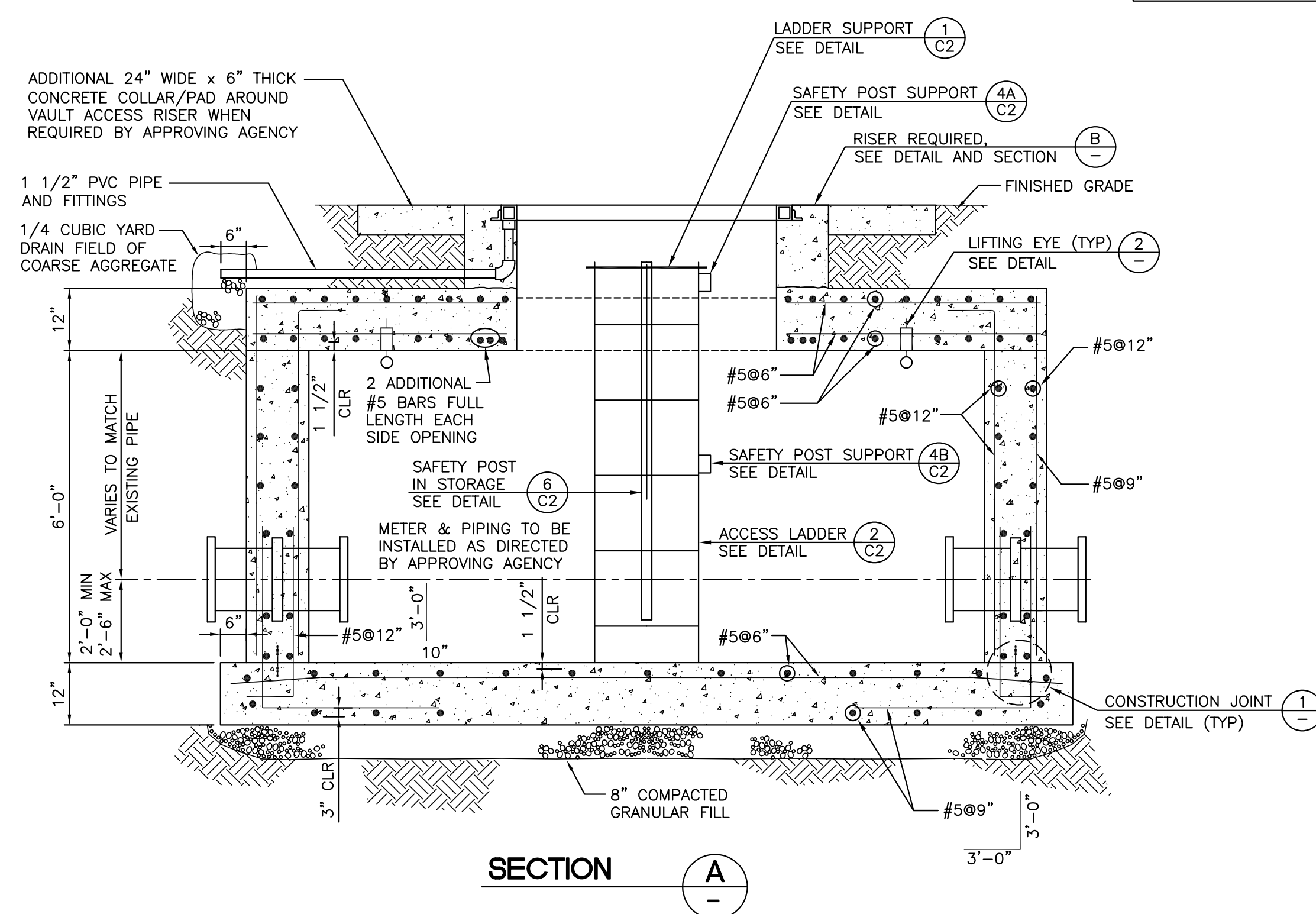
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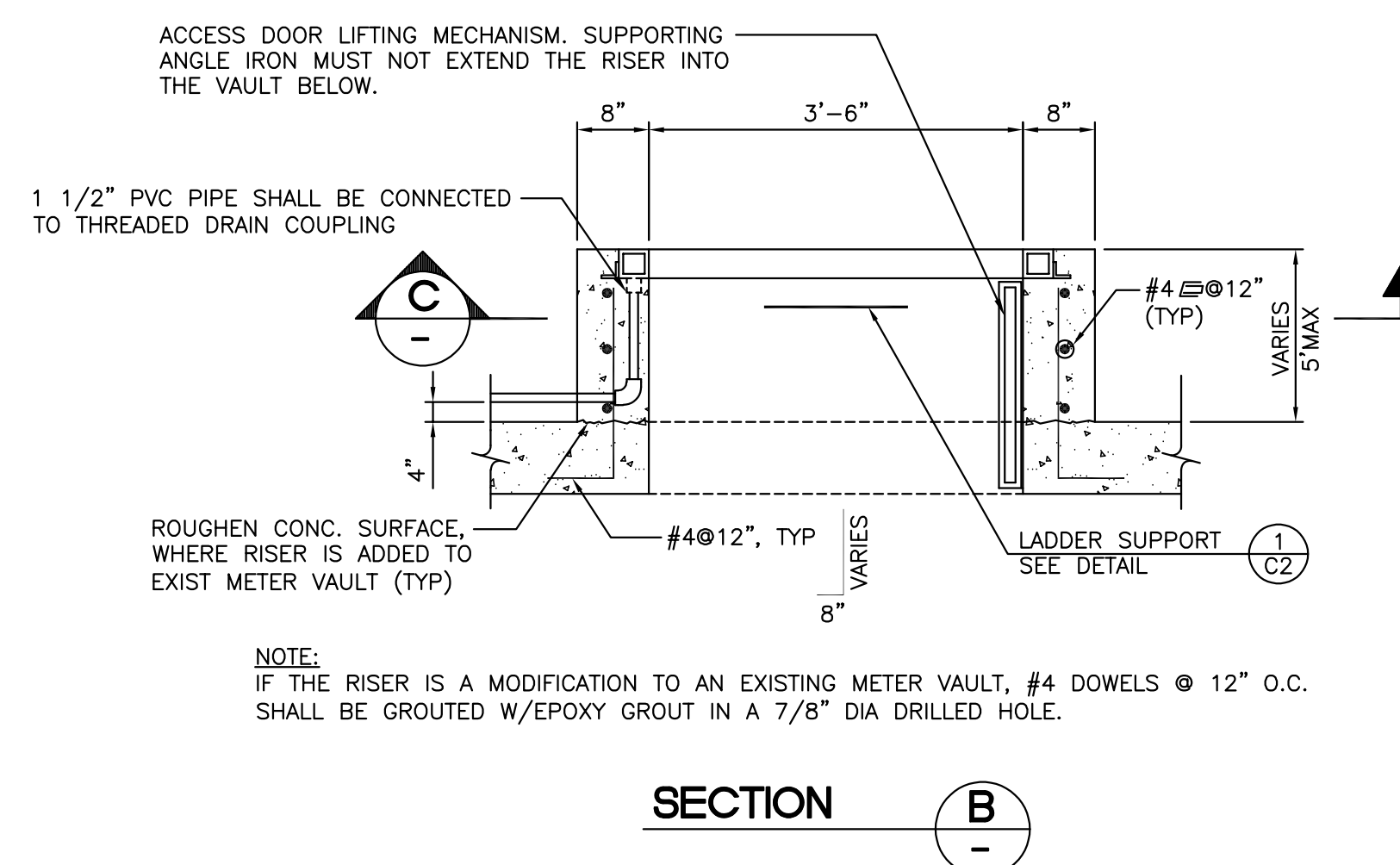
TRAFFIC-BEARING VAULT SECTIONAL/PLAN



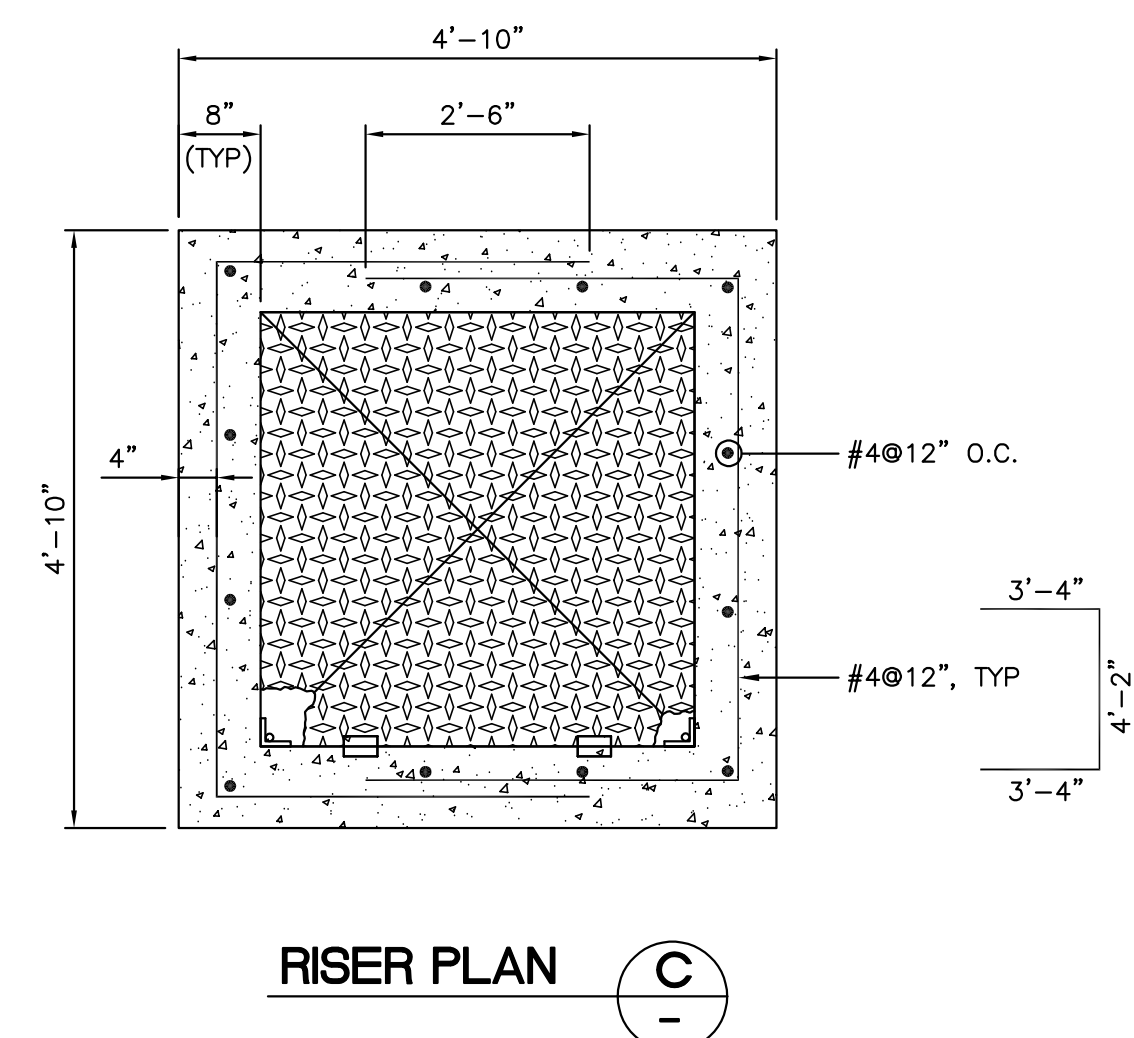
TOP PLAN



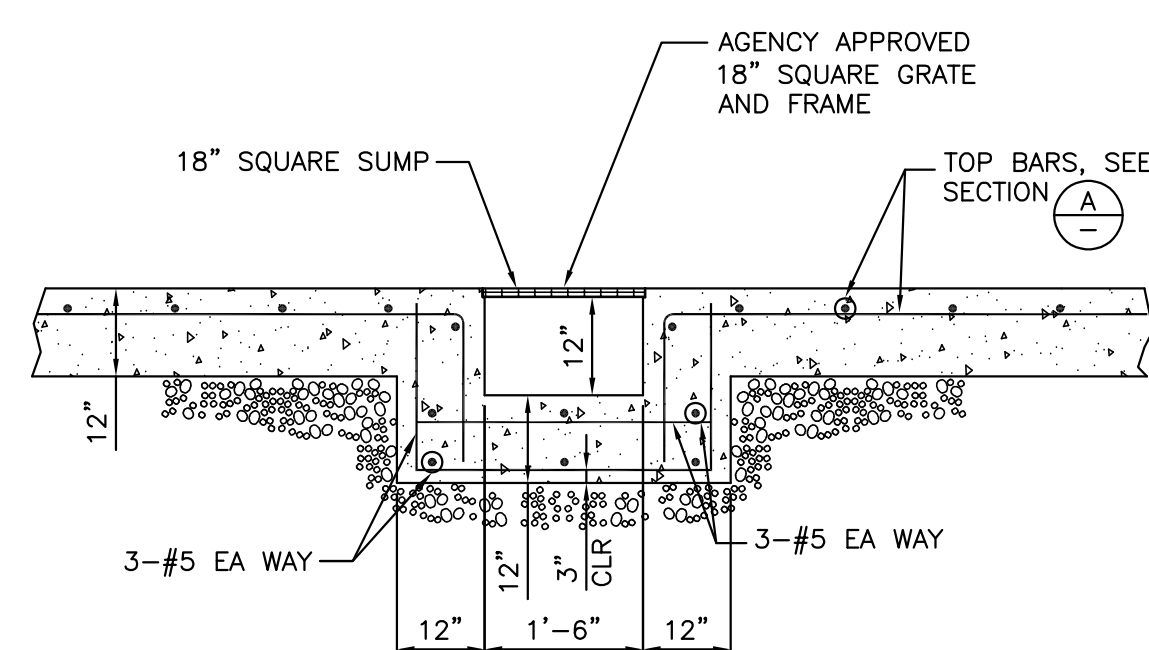
SECTION



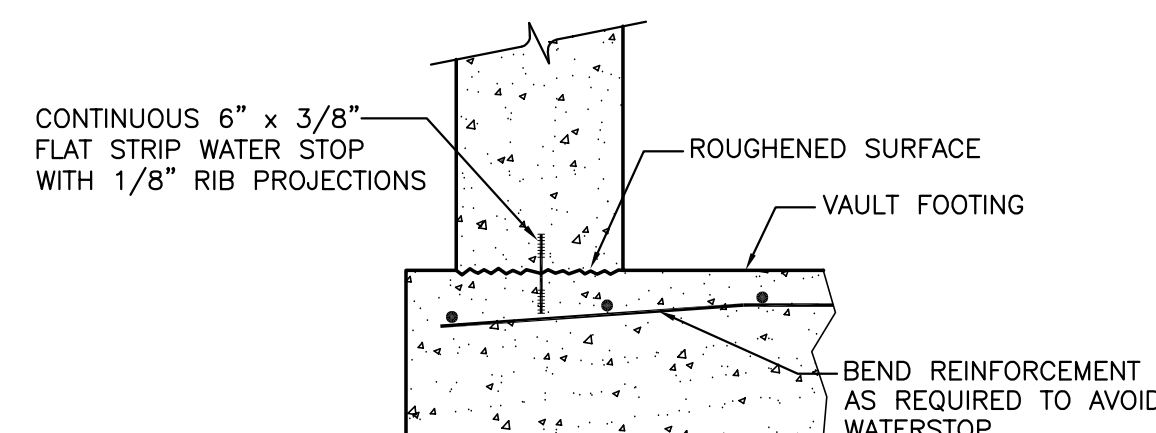
SECTION



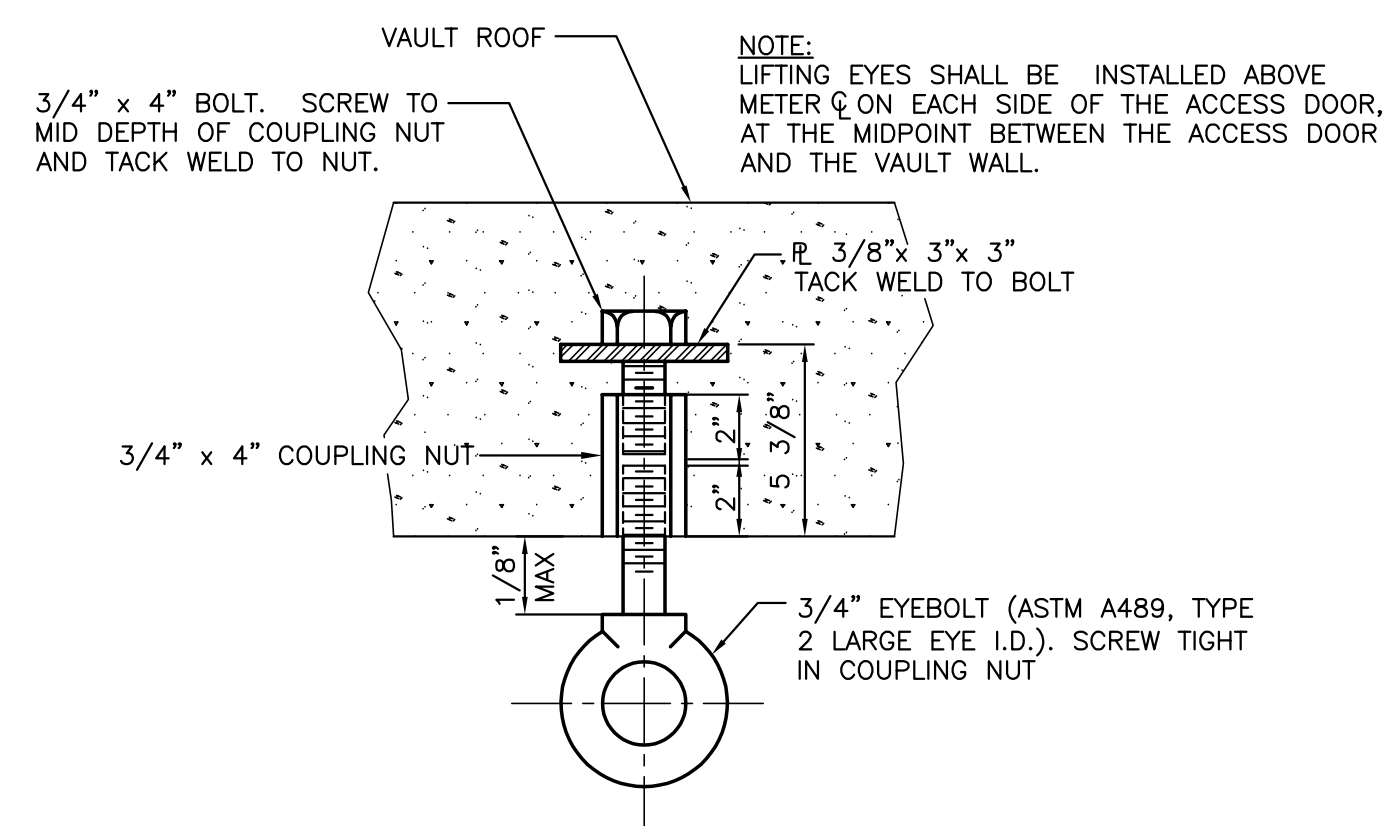
RISER PLAN



DRAIN SUMP SECTION



CONSTRUCTION JOINT DETAIL



LIFTING EYE DETAIL

GENERAL NOTES

METER VAULT DESIGN BASED ON AASHTO "LRFD BRIDGE DESIGN SPECIFICATIONS", 9TH EDITION, 2020.

1. MATERIALS SHALL BE IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS:

GRANULAR FILL	TYPE II PER UNIFORM STANDARD SPECIFICATIONS, SUBSECTION 704.03.04.
CEMENT	ASTM C150, TYPE V.
FINE AGGREGATE	CLEAN NATURAL SAND PER ASTM C33.
COARSE AGGREGATE	CRUSHED STONE OR WASHED GRAVEL, GRADING SIZE NO. 67, PER ASTM C33.
CONCRETE	MAXIMUM WATER TO CEMENT RATIO = 0.4
SOIL WEIGHT	130 pcf MAXIMUM
SOIL PRESSURE	60 pcf MAXIMUM (AT REST) 2,000 psf MINIMUM (AT FOOTING)
F _c	4,500 PSI (TYP)
WATER PRESSURE	<u>NO</u> GROUNDWATER PRESENT
REINFORCING STEEL	ASTM 615 GRADE 60.
CURING COMPOUND	CURING COMPOUNDS SHALL BE WHITE PIGMENTED, RESIN-BASED, CONFORM TO ASTM C309 - LIQUID MEMBRANE FORMING COMPONENTS FOR CURING CONCRETE, AND COMPLIANT WITH LOCAL VOC REQUIREMENTS. SEE AGENCY FOR APPROVED COMPOUNDS.

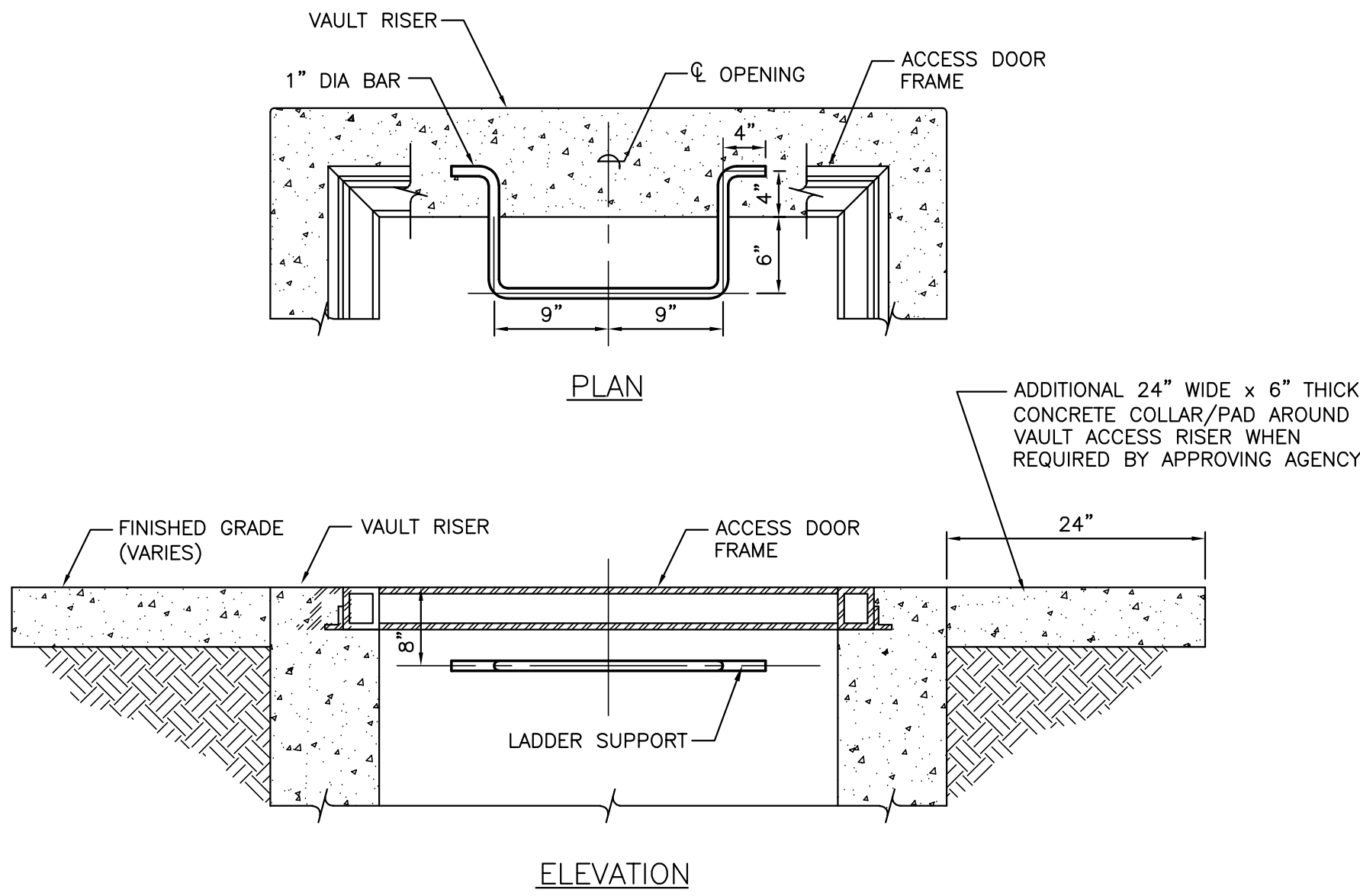
ACCESS DOORS:	
TRAFFIC BEARING VAULTS	AGENCY APPROVED (GALVANIZED STEEL)
ACCESS LADDER STEEL	HOT DIP GALVANIZED AFTER FABRICATION, PER ASTM A123, A153, & A385.
PLATE AND BARS	ASTM A36 STEEL
PVC PIPE AND FITTINGS	ASTM D1785 & D2466
WALL SPOOLS	AGENCY APPROVED
WATERSTOP	EXTRUDED ELASTOMERIC POLYVINYL CHLORIDE WATERSTOP; CONTINUOUS 6" x 3/8" FLAT STRIP WITH 1/8" RIB PROJECTIONS.
MISCELLANEOUS METALS FOR LADDER SUPPORTS, LIFTING EYES, ETC:	
STEEL PLATES AND BARS	ASTM A36 STEEL
BOLTS	ASTM A307
HOT-DIP GALVANIZED AFTER FABRICATION PER ASTM A123, A153, & A385.	

2. USING MATERIALS ACCEPTABLE TO THE APPROVING AGENCY, A TENTATIVE CONCRETE MIX SHALL BE DESIGNED, TESTED, AND SUBMITTED TO THE APPROVING AGENCY FOR APPROVAL. THE MIX SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 4500 PSI. CONCRETE SHALL BE BATCHED BY A READY-MIXED CONCRETE SUPPLIER ACCEPTABLE TO THE APPROVING AGENCY AND SHALL CONFORM TO ASTM C94. THE SLUMP OF THE CONCRETE DELIVERED SHALL NOT EXCEED 4".

3. ALL CAST-IN-PLACE CONCRETE SHALL BE ACCURATELY FORMED AND PROPERLY PLACED AND FINISHED AS SHOWN ON THE DRAWINGS. FORM WORK SHALL CONFORM TO ACI 347 INCLUDING RECOMMENDATIONS FOR CONSTRUCTION TOLERANCES AND MINIMUM ELAPSED TIME BEFORE FORM REMOVAL. CONCRETE SHALL BE PROTECTED FROM MOISTURE LOSS FOR 7 DAYS. CONCRETE MAY BE CURED BY APPLICATION OF AGENCY APPROVED MEMBRANE CURING COMPOUND.

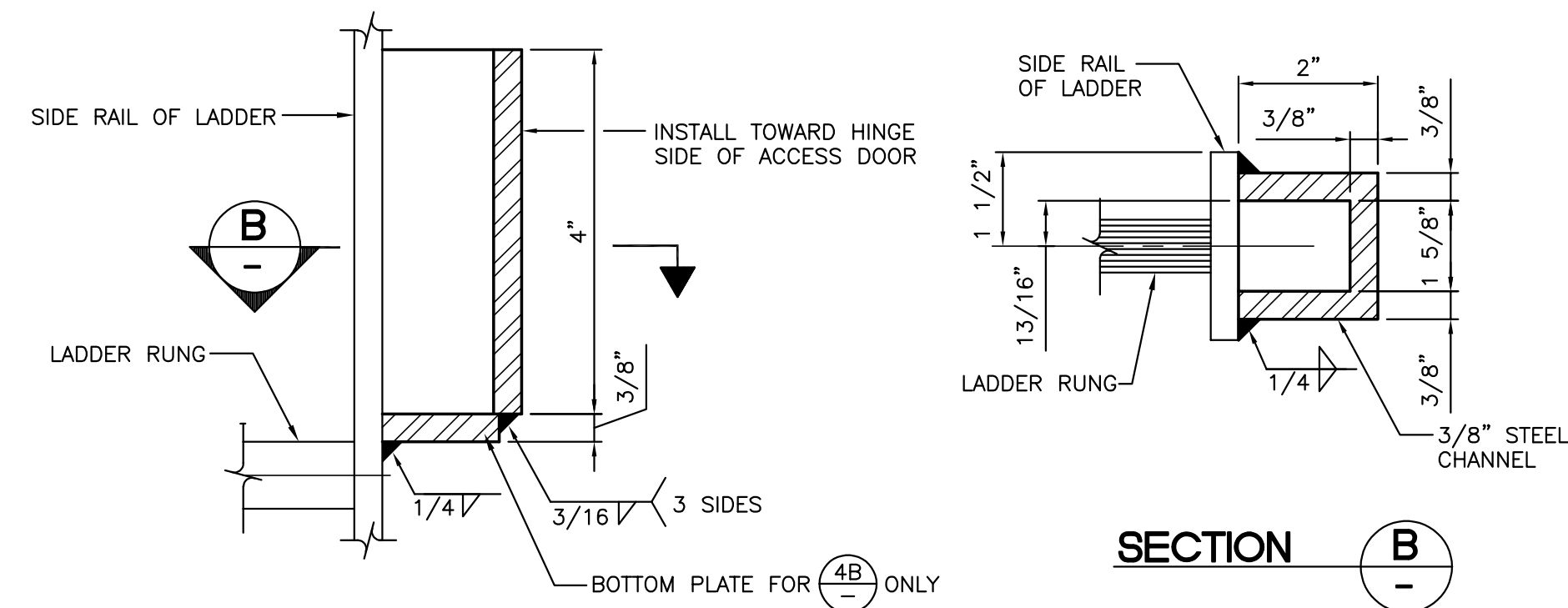
4. REINFORCING STEEL SHALL BE ACCURATELY FORMED AND SHALL BE FREE FROM LOOSE RUST, SCALE, AND CONTAMINANTS WHICH REDUCE BOND. UNLESS OTHERWISE SHOWN ON THE DRAWINGS, DETAILS OF REINFORCEMENT SHALL CONFORM TO AASHTO "LRFD BRIDGE DESIGN SPECIFICATIONS", 9TH EDITION, 2020. REINFORCING STEEL SHALL BE ACCURATELY POSITIONED ON AGENCY APPROVED SUPPORTS OR SPACERS, AND SHALL BE SECURED IN PLACE WITH WIRE TIES.

5. EMBEDMENTS SHALL BE ACCURATELY POSITIONED IN FORMS AND SECURELY ANCHORED. THE ACCESS DOOR AND FRAME SHALL BE INSTALLED AT PLAN GRADE FOR TRAFFIC BEARING VAULTS, AND 6" ABOVE PLAN GRADE IN A CAST-IN-PLACE RISER FOR NON TRAFFIC BEARING VAULTS.
6. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION OF THE VAULT WITH THE APPROVING AGENCY. UNLESS OTHERWISE DIRECTED, THE CONTRACTOR SHALL FURNISH AND INSTALL METER, VALVES, PIPING AND APPURTENANCES.
7. THE CONTRACTOR SHALL INSTALL ALL VAULTS ON 8" GRANULAR FILL, COMPACTED TO 95% OF MAXIMUM DENSITY PER ASTM D1557. THE CONTRACTOR SHALL NOT BACKFILL THE METER VAULT UNTIL THE APPROVING AGENCY HAS INSPECTED AND APPROVED THE METER VAULT. NATIVE MATERIAL MAY BE USED AS BACKFILL, UNLESS FOUND UNACCEPTABLE BY THE APPROVING AGENCY. BACKFILL SHALL BE PLACED IN 12" LIFTS AND COMPACTED BY MECHANICAL MEANS TO 90% OF MAXIMUM DENSITY PER ASTM D1557. IN TRAFFICWAYS, COMPACTED GRANULAR FILL SHALL BE PLACED 16" BELOW PAVEMENT AND COMPACTED TO 95% OF MAXIMUM DENSITY PER ASTM D1557.
8. THE DESIGN OF THE METER VAULT IS APPLICABLE FOR BURIAL DEPTHS TO 5'-0". FOR DEPTHS GREATER THAN 5'-0", THE METER VAULT MUST BE MODIFIED BY A NEVADA LICENSED CIVIL ENGINEER FOR AGENCY APPROVAL.
9. BACKFILL ABOVE TOP OF COVER SLAB SHALL NOT BE LESS THAN 18" MINIMUM (TYP).
10. TRAFFIC BEARING VAULTS SHALL BE LOCATED WHERE THEY ARE NOT SUBJECT TO CONTINUOUS TRAFFIC LOADING. TRAFFIC BEARING VAULTS MAY BE LOCATED IN TRAFFIC LANES, BUT THE VAULT LIDS ARE TO BE LOCATED OUT OF THE WHEEL PATH.
11. THE DESIGN OF THE METER VAULT IS BASED ON THE PARAMETERS LISTED WITHIN NOTE 1 ABOVE. WHEN SITE CONDITIONS DO NOT MEET THE ABOVE REQUIRED CRITERIA, THE METER VAULT MUST BE MODIFIED BY A NEVADA LICENSED CIVIL ENGINEER FOR AGENCY APPROVAL.
12. THE VAULT CONSTRUCTION SHALL COMPLY WITH AASHTO "LRFD BRIDGE DESIGN SPECIFICATIONS", 9TH EDITION, 2020 AND ALL OTHER APPLICABLE CODES AND REGULATIONS.
13. SPECIAL INSPECTIONS ARE REQUIRED FOR CONCRETE, REINFORCING STEEL, EXCAVATION AND BACKFILL WHEN REQUIRED BY APPROVING AGENCY.
14. METER AND PIPING ASSEMBLY TO BE INSTALLED PER APPROVING AGENCY.



LADDER SUPPORT DETAIL

1

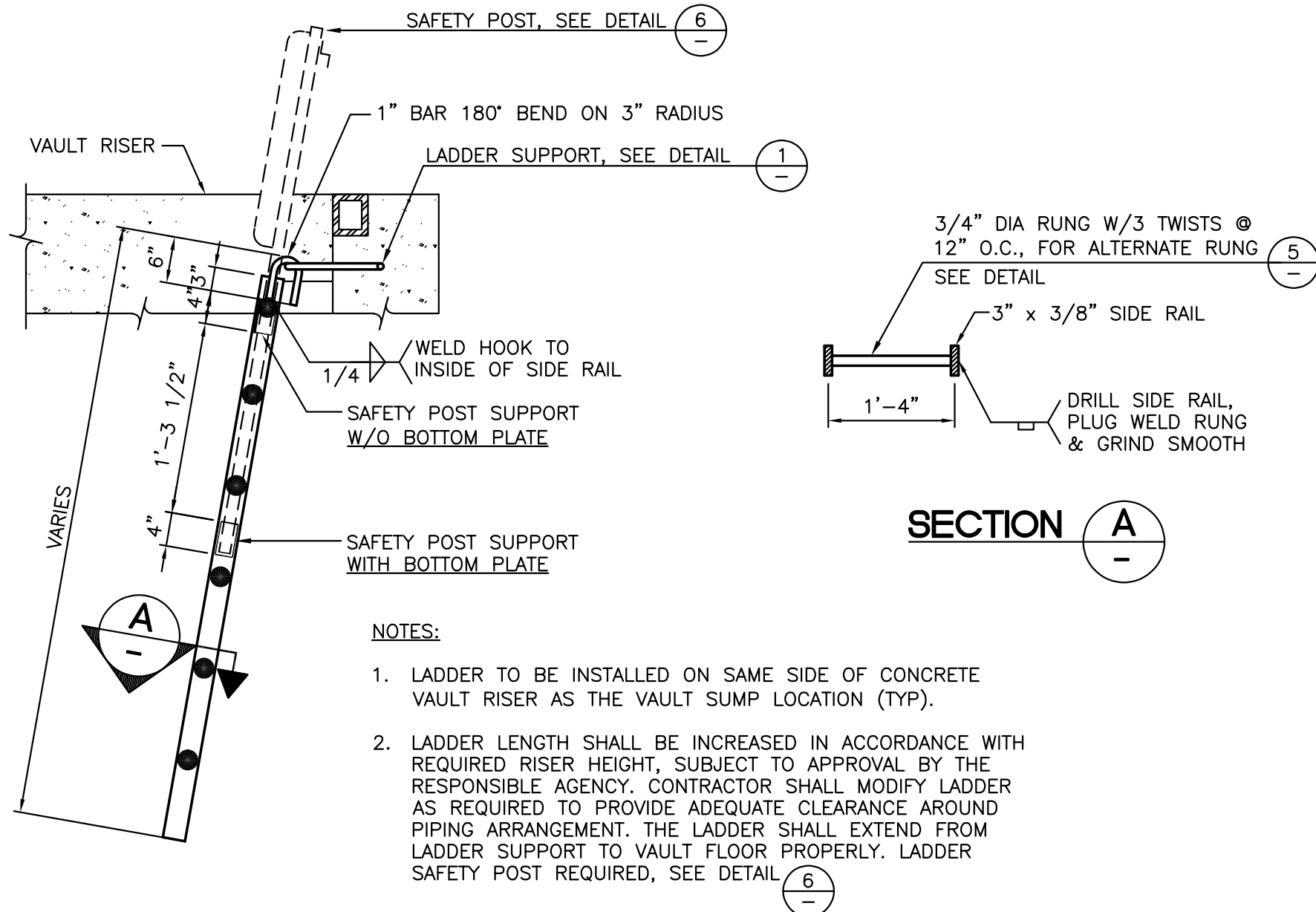


LADDER DETAIL

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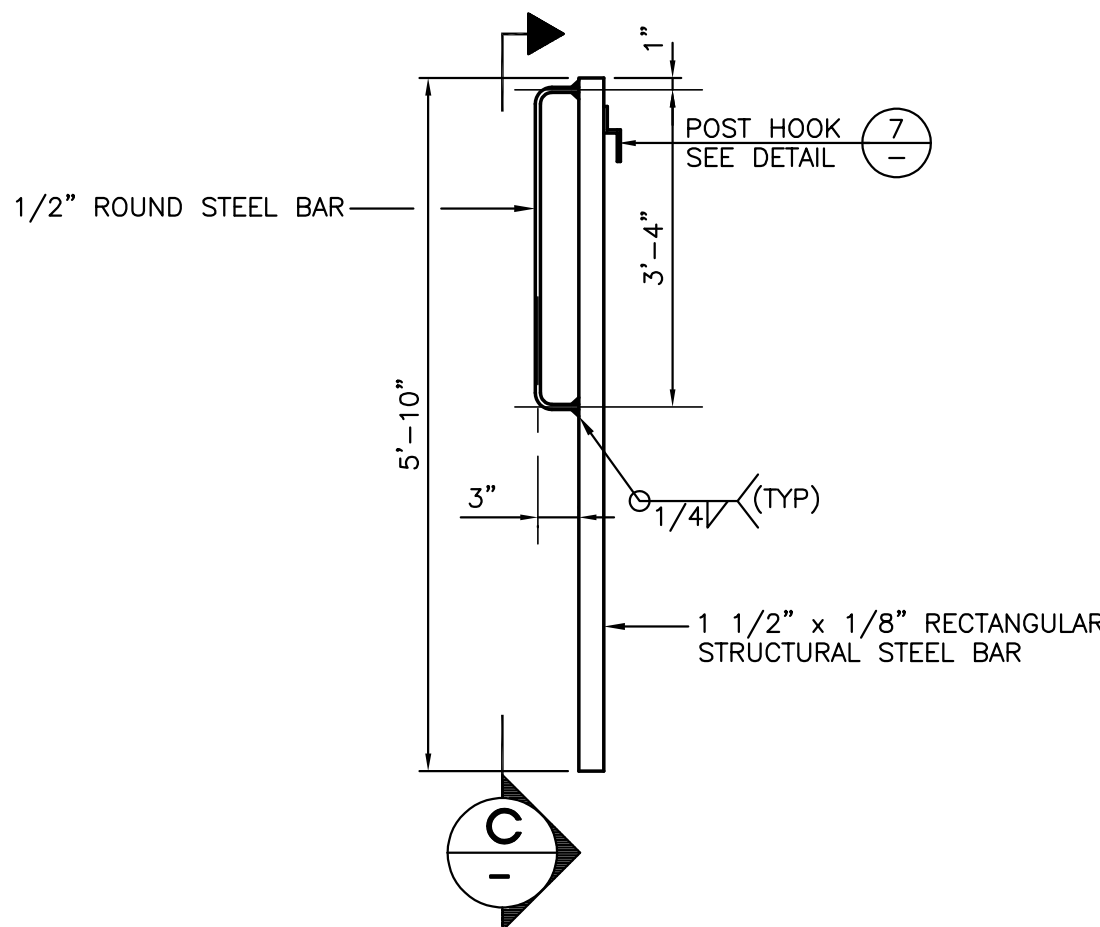
ALTERNATE RUNG WITH GROOVES DETAIL

5

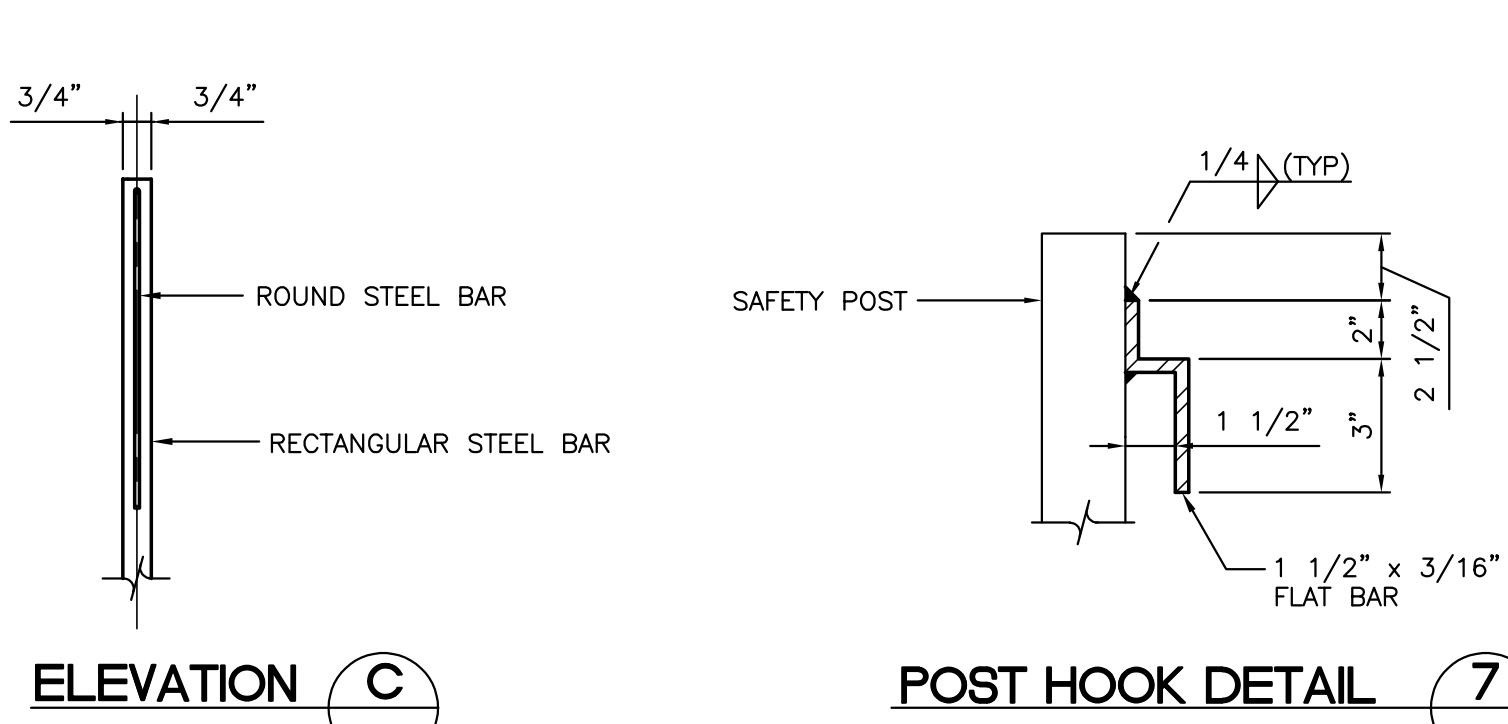


WALL OPENING REINFORCEMENT DETAIL

3



SAFETY POST DETAIL



POST HOOK DETAIL

7

SAFETY POST SUPPORT DETAIL

4A 4B

UNIFORM DESIGN AND
CONSTRUCTION STANDARDS
FOR POTABLE WATER
DISTRIBUTION SYSTEMS

SECTION 6

AGENCY
ADDENDA

CONTINUE TO THE NEXT PAGE

CITY OF BOULDER CITY

ADDENDA

CONTINUE TO THE NEXT PAGE

Addenda for the City of Boulder City may be obtained as follows:

CITY OF BOULDER CITY
401 California Avenue * Boulder City, Nevada 89005

(702) 293-9200

OR

www.bcnv.org

CONTINUE TO THE NEXT PAGE

CITY OF HENDERSON

ADDENDA

CONTINUE TO THE NEXT PAGE

Addenda for the City of Henderson may be obtained as follows:

CITY OF HENDERSON
240 Water Street * Henderson, Nevada 89015

(702) 267-3670

OR

www.cityofhenderson.com

CONTINUE TO THE NEXT PAGE

CITY OF NORTH LAS VEGAS

ADDENDA

CONTINUE TO THE NEXT PAGE

Addenda for the City of North Las Vegas may be obtained as follows:

CITY OF NORTH LAS VEGAS
2250 Las Vegas Boulevard North * North Las Vegas, Nevada 89030

(702) 633-1275

OR

www.cityofnorthlasvegas.com

CONTINUE TO THE NEXT PAGE

**LAS VEGAS VALLEY
WATER DISTRICT
AND
DISTRICT MANAGED
SYSTEMS**

ADDENDA

CONTINUE TO THE NEXT PAGE

**LAS VEGAS VALLEY WATER DISTRICT
AND DISTRICT MANAGED SYSTEMS ADDENDA**

SECTION 6

Addenda for the Las Vegas Valley Water District and District Managed Systems (Big Bend, Blue Diamond, Coyote Springs, Eldorado Valley, Jean, Kyle Canyon, and Searchlight) may be obtained as follows:

LAS VEGAS VALLEY WATER DISTRICT
PLANNING AND ENGINEERING SERVICES DIVISION
1001 South Valley View Boulevard * Las Vegas, Nevada 89153

(702) 822-8518

OR

www.lvwwd.com