CALAVERAS PUBLIC UTILITY DISTRICT

IMPROVEMENT STANDARDS FOR WATER SYSTEMS

AUGUST, 2016

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STANDARD DETAILS

PLANNING AND DESIGN

SECTION 1.0
DEFINITIONS AND TERMS

1.01 INTRODUCTION.

These Improvement Standards shall govern general project requirements and procedures, project design, preparation of plans and specifications, review procedures, inspection procedures, and all other work in connection with improvements and private works to be dedicated to the public and accepted by the CALAVERAS PUBLIC UTILITY DISTRICT (CPUD) for operation and maintenance.

It is recognized that it is not possible to anticipate all situations that may arise or prescribe standards applicable to every situation. Therefore, any items or situations not included in this Standard shall be resolved in accordance with the best professional engineering practice.

1.02 GENERAL.

Whenever the following terms, titles or abbreviations are used in this Standard or in any other document or instrument where this Standard governs, the intent and meaning shall be as herein defined.

1.03 DEFINITIONS.

Acceptance. The formal written acceptance by CPUD of an entire contract which has been completed in all respects in accordance with the plans and specifications and any modifications thereof previously approved.

Agreement or Water Service Facilities Agreement. The formal Agreement between CPUD and the Owner setting forth those mutual conditions, procedures and requirements in connection with improvements and private works to be dedicated to the public and accepted by CPUD for operation and maintenance.

Annexation. The inclusion of property within CPUD boundaries by proper legal procedures.

"As-Built" Plans. Original mylar plans signed and dated by the Consulting Engineer indicating that the plans have been reviewed and revised, if necessary, to accurately reflect all "As-Built" construction details.

"As-Shown", Etc. Where "as shown", "as indicated", "as detailed" or words of similar import are used, it shall be understood that reference is made to the contract drawings unless specifically stated otherwise. Where "as directed", "as permitted", "approved" or words of similar import are used, it shall be understood that the

direction, permission, requirements or acceptance of the District Engineer is intended unless stated otherwise. As used herein, "provide" shall be understood to mean "furnish and install" that is, "provide complete in place".

Calendar Day(s). Calendar day(s) shall be defined as every day shown on the calendar, Sundays and holidays included. When the time for completion in the Special Conditions is set forth in Calendar Days, each and every reference to working days in these specifications shall be deemed to mean Calendar Day(s).

Contract. The word "Contract" shall mean the contract documents and shall include the written agreement entered into by CPUD and the Contractor for the performance of work described in the Specifications and shown on the Drawings, together with the Notice Inviting Bids, the Instructions to Bidders, the Proposal, the Information Required of Bidder, the Specifications, the Drawings, all addenda issued by CPUD with respect to the foregoing prior to the opening of bids, and all change orders issued by CPUD and signed by the Contractor pertaining to the Contract after the Contract is awarded.

Construction Agreement. The term “Construction Agreement” shall mean the same as the word “Contract”.

Directed. "Directed", "designated", "permitted", "required", "accepted", and words of like import, wherever and in whatever manner used, with or without reference to the Engineer, means as directed, designated, permitted, required, and accepted by the Engineer.

Board. The Board of Directors of the Calaveras Public Utility District.

Connection Fee. The connection fee is a fee charged to connect a water service to the water system.

Consulting Engineer. Any individual, partnership, firm or corporation legally authorized to practice civil engineering in the State of California who prepares or submits improvement plans and specifications to CPUD for acceptance.

Contractor. Shall mean any individual, partnership, firm or corporation licensed in the State of California to perform the type of work involved, who has entered into a contract with any individual, partnership, firm, corporation, special district, or CPUD, as party or parties of the second part, or his or their legal representatives, for the construction of any improvement or portions of any improvement within CPUD.

County. The County of Calaveras, State of California

CPUD. The Calaveras Public Utility District.

CPUD Engineer. CPUD Engineer is also Ex-Officio CPUD Engineer of CPUD for which work will be done under this Standard acting personally or through agents or assistants duly authorized by CPUD's Engineer (Also known as District Engineer, Chief Engineer).

Cut Sheets. Cut sheets are sheets of tabulated data, indicating stationing, structures, fittings, angle points, curve data, staking offset, elevations, and offset cuts.

Developer. Any individual, partnership, firm or corporation by whom the Consulting Engineer has been retained or who, as the property owner, is making arrangements with CPUD.

Distribution Line. A public water supply line that has been or is to be constructed to distribute water to more than one service.

District, or the District. The Calaveras Public Utility District

Drawings. The words "Drawings" or "Contract Drawings" shall mean those Drawings and/or Plans accompanying the Specifications which show the location, nature, extent and form of the work, together with applicable details. “Drawings” and “Plans” may be used interchangeably.

Dwelling Unit. That individual, residential unit wherein a single family does, or could, reside.

Easements. Easements are areas along the line of all public utilities that are outside of dedicated utility easements or right-of-ways and shall be prepared on CPUD approved forms granting rights along the line of the utility to CPUD.

Electrical Engineer. "Electrical Engineer" means such persons designated to act on behalf of CPUD on electrical engineering matters related to this project.

Estimate. The Consulting Engineer estimated cost of CPUD improvement to be constructed.

Expansion Fee. Where in the opinion of CPUD it is more practical to expand existing CPUD facilities rather than construct new improvements, the Owner shall pay an "expansion fee" based on the estimated or actual cost of the required expansion of said facilities. An "expansion" fee also may be applicable where an Owner makes use of existing CPUD facilities that have been sized to include such development and in which the development has not previously participated in the cost thereof. Expansion fees are due and payable at the time service is requested.

Final Plan Acceptance. The stamp on the plans signed and dated by the District Engineer indicating that plans have been reviewed by CPUD and released for construction.

General Manager. The executive officer of CPUD, also referred to as the Manager.

Herein. "Herein", "hereinafter", and words of similar import shall refer to the contract documents.

Holiday. Those days designated as State holidays in the Government Code.

House Service. The portion of the domestic water line which links the domestic water plumbing of a house or building with the water meter.

Improvement(s), or Improvement Systems. Those utility systems, or portions of utility systems, as designated in the Agreement, to be dedicated to the public and accepted by CPUD for operation and maintenance.

Improvement District. That Improvement District formed for special benefit in accordance with the provisions of the Municipal Improvement Act of 1913, or any other manner permitted and provided under the Laws of the State of California.

Improvement Standards. See "Standard".

Inspector. The engineering or technical personnel authorized to act as agents for CPUD's Engineer in the inspection of work covered by these approved plans and specifications, limited to the particular duties entrusted to said inspector(s).

Install. "Install", wherever and in whatever manner used, shall mean the installation complete in place of any item or equipment or material.

Installation Fee. The fee to install the necessary components to the water system to provide meter service for a given property.

Manager. See "General Manager".

May. "May", wherever and in whatever manner used, is permissive.

Owner. Any individual, partnership, firm or corporation holding any interest in real property as recorded in the Official Records of the Office of the Recorder of Calaveras County.

Parcel Number. Parcel number shall mean the assessor's parcel number (APN) as assigned by the Calaveras County Assessor.

Plans. Improvement or Construction plans, including system maps, plan and profile, cross sections, detail drawings, etc., or reproductions thereof, approved or to be approved by CPUD's Engineer which show the location, character, dimensions and details for the work to be done and which constitute a supplement to the Standard Construction Specifications. "Drawings" and "Plans" may be used interchangeably.

Provide. "Provide", wherever and in whatever manner used, shall be understood to mean provide complete in place, that is, furnish and install.

Right-of-Way. All land or interest therein which by deed, conveyance, agreement, easement, dedication, usage or process of law is reserved for, or dedicated to, the use of the general public, within which CPUD shall have the right to install, reconstruct and maintain its facilities.

Service or Water Service. The publicly owned and maintained portion of the water line that links the water line from the distribution line to the meter box and includes the meter.

Shall or Will. "Shall" or "Will", whenever used to stipulate anything, means shall or will be done or be performed by the Contractor and means that the Contractor has thereby entered into a covenant with CPUD to do or perform the same.

Shown. "Shown", "indicated", "detailed", and words of like import, wherever and in whatever manner used, with or without reference to the drawings, means shown, indicated, or detailed on the drawings.

Singular. Singular words include plural and vice versa.

Soils Engineer. "Soils Engineer" means such persons designated to act on behalf of soils engineering or geologic matters related to the project.

Special Conditions. The special conditions are specific clauses setting forth conditions or requirements peculiar to the work and supplementary to the Standard Specifications.

Specifications. The word "Specifications" shall mean the CPUD District Standard Specifications, Special Conditions and all subsequent additions, deletions or revisions thereto of the Contract, together with all addenda and change orders issued with respect thereto for the work to be done and which constitute a supplement to the Plans.

Specified. "Specified", "described", or "noted", wherever and in whatever manner used, means as specified, described, or noted in the contract documents.

Standard, or Improvement Standards. As contained herein and all subsequent additions, deletions or revisions thereto.

Standard Drawings or Standard Details. The plans, drawings, etc., of structures, devices or details commonly used on CPUD work, adopted by CPUD, and made a part of this Standard and/or the Standard Specifications.

Standard Specifications. The Standard Specifications adopted by CPUD and all subsequent additions, deletions or revisions thereto. See "Specifications".

Structures. Those structures or devices designated on the standard drawings as pressure reducing stations, air relief stations, etc. Detailed drawings of structures or devices commonly used in CPUD work and mentioned in this Standard are included in the Standard Specifications. The term "structures" also includes those special buildings, pumping stations, treatment units, etc., as required and as shown on the drawings.

Subcontractor. The word "Subcontractor" shall mean any person, firm or corporation entering into an agreement with the Contractor for performance of any part of the Contractor's obligation under the contract.

Submitted. "Submitted", wherever and in whatever manner used, means submitted to the Engineer for his acceptance.

Substantial Performance. That date, as certified by the District Engineer when the construction of the project or a specified part thereof is sufficiently completed, in accordance with the contract documents, so that the project, or specified part, can be utilized for the purpose for which it is intended.

Subdivision. That certain real property for which the Owner has entered into an agreement with CPUD in connection with improvements and private works to be dedicated to the public and accepted by CPUD for operation and maintenance. As defined herein, subdivision shall include all such real property as described in said agreement, whether or not said real property is as defined as a subdivision in County's "Subdivision and Land Division Regulations", or the State Subdivision Map Act, as may be amended.

Sufficient. "Sufficient", "necessary", "proper", "acceptable", "satisfactory", "desirable", and words of like import, wherever and in whatever manner used, with or without reference to the Engineer, means sufficient, necessary, proper, acceptable, satisfactory, and desirable in the judgment of the Engineer.

Transmission Line. A public water supply line which has been or is to be constructed to transmit water to more than one distribution line and is normally twelve (12) inches or greater in diameter and to which services are not normally connected.

Work. All the improvements to be done under CPUD permit, or inspection, whether in or out of contract, in accordance with the plans, specifications, special provisions and/or permit conditions.

1.04 ORGANIZATIONS AND STANDARDS.

AASHO	American Association of State Highway Officials
AASHTO	American Association State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AGMA	American Gear Manufacturers' Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
AWPA	American Wood Products Association or American Wood Preserves' Association
AWS	American Welding Society
AWWA	American Water Works Association
CIPRI	Cast Iron Pipe Research Institute
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcement and Steel Institute
CTSS	Caltrans Standard Specification
FCC	Federal Communications Commission
IEEE	Institute of Electrical and Electronic Engineers
IFI	Industrial Fasteners Institute
IPCEA	Insulated Power Cable Engineers' Association
ISO	Insurance Services Office
NEC	National Electric Code
NFPA	National Fire Protection Association or National Forest Products Association
PCA	Portland Cement Association
PPI	Plastic Pipe Institute
PS	Product Standard

UBC	Uniform Building Code
UL	Underwriters' Laboratory
UPC	Uniform Plumbing Code
WWPA	Western Wood Products Association

1.05 OTHER ABBREVIATIONS.

AB	Aggregate Base
AC	Asphalt Concrete
acfm	actual cubic feet per minute
ACP	Asbestos Cement Pipe
amp	ampere
ARV	Air Release Valve
AWG	American Wire Gage
BFD	Back Flow Device
bhp	brake horsepower
BO	Blow Off
Btu	British thermal unit
C	centigrade or Celsius
cfm	cubic feet per minute
cfs	cubic feet per second
CMP	Corrugated Metal Pipe
CMU	Concrete Masonry Unit
CPU	Central Processing Unit
CPVC	Chlorinated PVC
cu	cubic
D/A	Digital to Analog
dB	decibel
dBa	decibel (adjusted)
DC	Double Check Valve
dc	direct current
diam	diameter
DIP	Ductile Iron Pipe
DO	Dissolved Oxygen
El	elevation
EMT	Electrical Metal Tubing
EPROM	Erasable, Programmable, Read Only Memory
F	Fahrenheit
FCA	Flange Couple Adaptor
fpm	feet per minute
fps	feet per second
ft (')	foot
ft-lbs	foot-pounds

g	gram
ga	gauge
gal	gallon
gpm	gallons per minute
GRC	Galvanized Rigid Conduit
GV	Gate Valve
hp	horsepower
HDPE	High Density Polyethylene
HPRS	High Pressure Relief Station
HPRV	High Pressure Relief Valve
Hz	Hertz
hr(s)	hour(s)
IBGV	Iron Body Gate Valve
ID	Inside Diameter
in (")	inch
in-lbs	inch-pounds
I/O	Input/Output
IPS	Iron Pipe Size
kb	kilobyte
kg	kilograms
kHz	kilohertz
kV	kilovolt
kVA	kilovoltampere
kw	kilowatt
lb	pound
lf	linear foot
LP	liquid propane
LPA	low pressure air
LS	Lump Sum
mA	milliampere
MAS	Multiple Address System
max	maximum
mb	megabyte
MCM	thousand circular mils
mg	milligrams
MG	Million Gallons
mgd	million gallons per day
mg/l	milligrams per liter
MH	Manhole
mHz	megahertz
MJA	Mechanical Joint Adaptor
MOS	Metal-Oxide Semiconductor
MOV	Metal-Oxide Varistor
mph	miles per hour

ms	millisecond
MSL	Mean Sea Level
MV	Megavolt
MW	Megawatt
N.C.	Normally Closed
N.O.	Normally Open
NPSH	Net Positive Suction Head
NPT	National Pipe Thread
NPW	Nonpotable Water
NTU	Nephelometric Turbidity Units
o.c.	on center
o/c	on center
OD	Outside Diameter
oz	ounce
PE	Polyethylene
PF	Power Factor
PLC	Programmable Logic Controller
ppm	parts per million
PROM	Programmable Read-Only Memory
PRV	Pressure Reducing Valve
PRS	Pressure Reducing Station
psf	pounds per square foot
psi	pounds per square inch
psia	pounds per square inch absolute
psig	pounds per square inch gage
PVC	Polyvinyl Chloride
RAM	Random Access Memory
RCP	Reinforced Concrete Pipe
RFI	Request for Information
rms	root-mean-square
RO	Reverse Osmosis
RPV	Reduced Pressure Valve
rpm	revolutions per minute
RTU	Remote Terminal Unit
SCADA	Supervisory Control Data Acquistion
SCR	Silicone Controlled Rectifier
SDR	Standard Dimension Ratio
sec	second(s)
S.F.	Service Factor
sq	square
sq. ft.	square foot or square feet
SRV	Surge Relief Valve
SRS	Surge Relief Station
SS	Stainless Steel

T	Ton
TDH	Total Dynamic Head
TEFC	Totally Enclosed Fan Cooled
temp	temperature
UV	Ultraviolet
V	Volt(s)
VCP	Vitrified Clay Pipe
VFD	Variable Frequency Drive
w.c.	Water Column
yd	yard
yr	year(s)
°	degree
'	feet
"	inch
#	number
%	percent
±	plus or minus

SECTION 2.00
GENERAL PROJECT REQUIREMENTS AND PROCEDURES

2.01 AGREEMENT.

The Owner shall enter into a formal Agreement with CPUD setting forth mutual conditions, procedures and requirements in connection with improvements and private works to be dedicated to the public and accepted by CPUD for operation and maintenance. The form of the Agreement shall be as provided by CPUD. No review of plans shall be made until such Agreement has been executed.

The Agreement shall become null and void with the expiration of the Tentative Map unless the bonds required under Section 4.02, Performance and Payment Bonds, have been filed with CPUD, unless the Board has previously granted an extension of time or upon acceptance of the facilities for Operation and Maintenance by the Board.

2.02 SYSTEM ADEQUACY.

The parties to said Agreement understand and agree that the complete improvement system, as designated in said Agreement and as generally described below, shall be adequate to provide service to all of the subdivision once that subdivision has been fully developed. A complete improvement system shall include, but not necessarily be limited to, the following:

Complete water system shall consist of all transmission, distribution and service lines, pressure systems, storage facilities, pumping facilities, treatment facilities, source facilities, telemetry; auxiliary power, all required lands and easements and other miscellaneous and associated appurtenances necessary to bring domestic water from the source or sources to the vicinity of all the lots as shown on the parcel map or the final subdivision map.

2.03 ANNEXATION TO THE DISTRICT.

The Owner's Consulting Engineer shall promptly and diligently act to obtain the necessary legal descriptions required for annexation to the District, final review of plans and specifications for construction, and/or prior to issuance by CPUD of a Department of Real Estate Statement, the Owner shall file a petition approved by CPUD requesting said formation or annexation. Upon receipt of said petition, the Board of CPUD will promptly initiate action to annex to the District, as may appear appropriate to said Board, including the lands within the subdivision. Said annexation to be made in accordance with the provisions permitted and provided under the laws of the State of California and as shall be determined in the sole judgment of CPUD. The Owner shall consent to and cooperate in every way with CPUD in said annexation. The purpose of

said annexation by CPUD will be to take over, maintain and operate the complete improvement system as described in the Agreement, which will be constructed entirely at the expense of the Owner and without cost to CPUD.

2.04 CONVEYANCE TO CPUD.

Upon completion of the improvements system as designated in the Agreement and its approval by the Board of CPUD, the Owner shall grant, transfer and assign all of the improvement system, including, but not limited to, all necessary easements and right-of-ways to CPUD free and clear of any encumbrances.

In consideration of the performance by the Owner and said transfer, CPUD agrees to accept said improvement systems and facilities so transferred to its, and to thereafter operate and maintain said improvements system and to provide system services to the owners of real property in the subdivision served by the improvements system in accordance with its then current rate schedule and thereafter as said schedule is amended from time to time. It is understood, however, that the cost of operation and maintenance may exceed the charges made to improvement system users on the current, appropriate rate schedule and the schedule may from time to time be changed.

2.05 IMPROVEMENT SYSTEM.

When the subdivision has been improved as contemplated in the Agreement and the improvement system turned over to CPUD and accepted for operation and maintenance, the said improvement system shall thereafter be governed in all respects as provided by the applicable laws of the State of California.

SECTION 3.00
GENERAL DISTRICT POLICIES

3.01 ENGINEERING POLICY.

The engineering policy of CPUD requires strict compliance with the Civil and Professional Engineers Act of the California Business and Professions Code. All plans, calculations, specifications, cost estimates, reports or documents shall be prepared by, or under the direction of, a registered civil engineer, and shall be signed by said engineer and stamped with engineer's seal to indicate engineer's responsibility for them, except that electrical plans, calculations, specifications, cost estimates, reports or documents shall be prepared by, or under the direction of, a registered electrical engineer and shall be signed by said engineer and stamped with engineer's seal to indicate engineer's responsibility for them.

It shall be the Consulting Engineer's responsibility to review any proposed improvement, extension and/or existing system change with CPUD, prior to engineering or design work, to determine any special requirements or whether the proposal is permissible.

3.02 SIZING POLICY.

Facilities shall be sized and installed to give the best service possible to the greatest practical service area in order to avoid future relocation and/or duplication of such facilities.

When CPUD has agreed to participate in any portion of work shown on the improvement plans, those plans shall be clearly noted: "Contractor shall submit a proposal to, and obtain a work order from CPUD prior to construction". CPUD will not pay for any work done without said work order.

3.03 ANNEXATION POLICY.

The Annexation Policy requires the consideration of service to any property in the ultimate service area and that all properties served may annex to the District. The annexation fee(s), and/or in-lieu fee(s), if any, represent the unit value of the major CPUD facilities. Properties annexed must provide their own local facilities and must pay any applicable fees prior to receipt of service. Only complete properties of legal record will be annexed.

3.04 RIGHT-OF-WAY POLICY.

The right-of-way policy requires that all public water line facilities be in easements or right-of-ways granted or dedicated therefore or for public use. In the case of public roads or public utility easements (PUE), further dedication is not necessary unless specifically required. All new easements must be granted or dedicated to CPUD as PUE's unless CPUD specifically approves otherwise (see Section 6.00).

Treatment plant sites, pumping station sites, storage tank sites and sites for similar major facilities shall be granted to CPUD in fee title and recorded in CPUD's name.

The cost of all such easements, right-of-ways, fee title sites, etc., shall be borne entirely by the owner.

3.05 CONDEMNATION POLICY.

When a public water line must pass through private property and a right-of-way cannot be obtained through negotiation with the property owner, CPUD may, under certain conditions, order condemnation of the required easement. If condemnation by CPUD is desired, the following will be required:

Submit complete construction plans, a detailed easement plan, listing of all legal owners, legal description of each parcel including total acreage and a letter to the Board explaining the situation and stating that all reasonable means to acquire the easement through normal procedures have been exhausted, that no agreement could be reached and requesting the Board to order condemnation.

If condemnation is ordered by CPUD, duplicate tracing of the easement map shall be submitted showing the entire easement, temporary working easement and affected properties and a description of easement and temporary working easement including correct and complete name and address of vested owner(s) of the property or other interests shall be furnished.

All costs of the condemnation shall be borne by the applicant. There shall be a minimum of Three Thousand Five Hundred Dollars ($3,500) deposited with CPUD prior to any action.

3.06 DEPARTMENT OF REAL ESTATE STATEMENT.

Should the Owner request CPUD to issue a statement to the California Department of Real Estate guaranteeing water service to a subdivision and should said request be prior to completion and acceptance by CPUD of the improvement system, the bonds or letters of credit required under Section 4.02 (Performance and Payment Bonds), the bonds or letters of credit required under Section 4.05 (Annexation, Lot, In-Lieu Fees), and all other fees required under Section 4.01 (Review and Inspection Fees) shall be submitted concurrently with said request.

3.07 FENCING.

CPUD requires that every effort be made to protect its facilities from theft, vandalism, unauthorized entry, etc. Exposed mechanical sites, including but not limited to storage tanks, treatment plants, pumping stations, etc., shall be enclosed in a chain link fence with or without redwood pickets and with wire extensions barbed wire and/or razor at the option of CPUD. Gates shall allow vehicular access.

All CPUD property shall be fenced along the property line and shall be signed as to its intended use and prohibiting general public access.

3.08 LIGHTING.

All mechanical areas, doorways and stairs shall be adequately lighted for night operation and maintenance with high efficiency lighting. Lighting normally will be controlled by automatic light sensors or timers with manual override switching.

3.09 SECURITY ALARM.

The protected space shall be provided with a complete intrusion alarm system. Intrusion protection shall be provided by way of door contact switches, and motion sensors. The intrusion alarm system is designed to detect unauthorized entry into protected spaces.

The intrusion alarm system may be divided into separate partitions (areas). The intrusion alarm control panel shall have a sufficient number of zone inputs so that each device shall be connected to a single zone (double doors may be grouped as a single zone).

The system shall have the capacity to provide one access code per person for the full occupancy of the protected space. Each user or user group to have an individual user code. When partitioned, each partition of the intrusion alarm system will have as a minimum the following devices:

1. Full LCD keypad
2. Door contact
3 Motion Detector

Security panel make and model shall be approved in advance by CPUD. The panel shall be non-proprietary (i.e. – available to all alarm contractors).

The panel power transformer shall be a minimum 37 VA. It shall be hardwired to a dedicated, non-switched source (i.e. no plug-in type transformers) and the electrical circuit # be clearly identified on both the electrical panel directory and on the alarm panel.

Battery backup shall be gel-cell type, minimum 7 amp/hour. Battery installation date shall be marked on the battery and panel cover.

All devices (including the panel) shall be supervised with tamper switches and end of line resistors.

A copy of the zone descriptors shall be left inside the alarm panel.

Installation includes field equipment, mounting hardware, wiring, terminations and I/O modules required to support the various alarm points and/or alarm systems, programming and setup of all field devices.

3.10 SCADA CONTROLS

Whenever a new site is incorporated into the Districts operations, or an existing site's control system is replaced or the majority of it modified, the control system shall be designed in accordance with the standards set out in this document.

Basic guidelines for control system hierarchy from local equipment control methods to the top level of operator interface are defined:

A. Operation of Facilities

The control room will use SCADA system primarily for monitoring the status of remote pump stations. All the pump control strategy shall be executed at the remote pump station. The SCADA alarm paging interface will send designated alarm messages to on call personnel 24 hours per day.

B. Control Hierarchy

Process control systems is organized in a logical control hierarchy in order to provide a standard format for monitoring/control of the overall facility. This standard approach provides operators and maintenance staff a uniform interface which improves their understanding of how to monitor/control the equipment, the control modes the equipment can attain, and how to override the controls when necessary due to failures or when required for routine maintenance.

The control system hierarchy can be viewed as a pyramid structure with three layers:

1. Field Sensors and Special Control Devices

   All control and monitoring must originate and terminate at this level. All the components specified at this level can be interfaced with the local PLC.

2. Local PLC monitoring/control

   All pumps stations local PLC will be primarily used for monitoring only. In some instances especially on bigger pump stations it may be used for control and monitoring. PLC for pump station shall have the capability to control the pump station if required with minor changes. At all well/tank sites the PLC shall control the pumps and other equipment.

   PLC's shall be furnished completely configured, programmed and tested providing the specified communication, monitoring, display, input/output, annunciation, computational and other requirements for operation of the SCADA system. Any additional components required for operation, whether specifically referenced herein or not, shall be provided.

   The PLC system shall be based on a scalable modular multi-use open architecture platform that can be efficiently applied to perform the necessary functions at each location. Each controller/telemetry unit shall be a modular hardware style PLC consisting of a CPU with adequate memory and instructions, power supply, local and remote input/output modules, communications ports, and all other components required to make the unit perform all of the functions required in this specification.

   The PLC system shall support true system open architecture allowing use of various hardware and software and full integration of other third party generic hardware/software devices. The architecture shall meet the requirements as herein defined and allow economical expansion of function and features based

on new and evolving technologies.

Systems using non-scalable and/or closed proprietary architectures shall not be acceptable.

3. SCADA Control

   Control at this level shall be based on operators using SCADA to monitor and control the remote pump stations. At least one SCADA server/node shall be located in the Districts Operation office as a central point for the generation of alarm reports, historical data archiving and retrieval, scheduled reports, and system maintenance.

See Section 25, for remote hardware & software requirements.

SECTION 4.00
FEES AND BONDS

4.01 REVIEW AND INSPECTION FEES.

The Owner will pay all costs incidental to CPUD's review of calculations, plans, specifications, cost estimates, property descriptions and right-of-ways, permits and for the complete improvement system and will pay all costs incidental to the construction inspection, permits, licenses, bonds, administration and the preparation of "As-Constructed" drawings.

The Water Service Facilities Agreement and the Plan Check Fee Deposit shall be received by CPUD prior to beginning plan checking by CPUD.

The Inspection Fee Deposit shall be received by CPUD prior to the plans being "Released for Construction".

A. Planning Review Fees.

Concurrently with the submittal of calculations, plans, specifications, cost estimates and legal property descriptions for CPUD review, the owner will advance in cash or check a sum calculated in accordance with the following fee schedule.

Planning review fees shall include both a "Concept Acceptance" and "Plan Checking" fee.

Concept Acceptance	
Parcel Maps	$300.00
2. Subdivision Maps	$450.00
Plan Checking (based on Preliminary Construction Estimate)	
Estimate	**Checking Fee**
Less than $10,000	$500
$10,000 - $100,000	$1,000 or 1.5% of estimate, whichever is greater.
Greater than $100,000	$2,000 or 2.0% of estimate, whichever is greater.

The Owner shall reimburse CPUD each month for review services rendered from the "Plan Checking" fee. CPUD will notify the Owner when the account reaches $100, at which time CPUD will determine the additional deposit required from the Owner (if any). The Owner shall have within thirty (30) days by which to make said deposit or CPUD may discontinue all review services to the Owner.

Any excess amounts shall be credited to the Owner's inspection fee account.

B. Inspection Fee.

Concurrently with the submittal of the Bonds or Letters of Credit required to guarantee completion and payment of the complete improvement system, the Owner will advance in cash or check an Inspection Fee calculated in accordance with the following:

Final Construction Estimate	**Inspection Fee**
Less than $10,000	$ 500
$10,000 - $200,000	$1,000 or 2.5% of estimate, whichever is greater.
Greater than $200,000	$8,000 or 4.0% of estimate, whichever is greater.

The Inspection Fee shall be received by CPUD prior to the plans being "Released for Construction".

In the event that inspection costs to CPUD exceed the Inspection Fee on account for the Owner, the owner shall reimburse CPUD for inspection services rendered. CPUD will notify the Owner when the account reaches $100, at which time CPUD will determine the additional deposit required from the Owner (if any). The Owner shall have within thirty (30) days by which to make said deposit or CPUD may discontinue all inspection services to the Owner.

The Inspection Fee shall apply until after the receipt of the As-Constructed drawings from the engineer, after the final inspection and after CPUD acceptance of the system by CPUD.

4.02 PERFORMANCE AND PAYMENT BONDS.

To ensure completion of and payment for the Improvement System in accordance with the approved plans and specifications, the Owner will provide and deliver to CPUD prior to receiving a "Notice to Proceed", a Performance Bond and a Payment Bond, each issued by a surety company authorized to do business in the State of California and acceptable to

CPUD. Each bond shall be in the amount of **100% of the final engineer's estimate** of the construction costs for the complete Improvement System. The Bonds will guarantee completion of and payment for the Improvement System contemplated in the Agreement in accordance with the approved plans and specifications. The Bonds will remain in full force and effect until such time as the Improvement System is accepted by CPUD.

The Owner may request, in writing, that CPUD allow the conversion of a Performance Bond to a Maintenance Bond. Conversion is at the sole discretion of the District.

4.03 SURETY.

A bond issued by a surety company authorized to do business in the State of California and acceptable to CPUD, or an Irrevocable Letter of Credit issued by a banking firm authorized to do business in the State of California and acceptable to CPUD, in the amount of 100% of the total which bonds or letters of credit will guarantee payment of said amount.

The Owner will provide said bond or letter of credit and deliver to CPUD concurrently with other bonds required under Performance and Payment Bonds, above.

4.04 ANNEXATION, LOT, IN-LIEU FEES.

The Owner agrees to pay any annexation and/or lot fees (or lot usage fees), "in-lieu" fees, and any other fees, as appropriate and as required in the Agreement.

SECTION 5.00
PROJECT REVIEW AND ACCEPTANCE

5.01 GENERAL.

The Owner will submit to CPUD all engineering calculations, plans, specifications, cost estimates and property descriptions proposed to provide a complete Improvement System within the development in accordance with these Improvement Standards, the Standard Construction Specifications of CPUD, the executed Agreement, and any other appropriate and necessary governmental authorities.

See Section 10.00, Water Systems Design.

5.02 PLANNING REVIEW FEE.

The Planning Review Fee shall be paid to CPUD prior to any project review.

5.03 PLANNING REVIEW.

The purpose of the Planning Review is to evaluate overall project general concepts, to determine approximate location and sizing of major system components, the effect of the project on adjacent improvements and areas, to estimate preliminary project costs and to establish general project feasibility. When submitting plans for Planning Review, two (2) complete sets of plans, engineering calculations, etc., shall be submitted in sufficient detail to determine general sizing and arrangement of major components and the general organization and design of the project as a whole. Generally, plans submitted will be based on the "system maps" and will become part of the Final Plans.

A print of the approved tentative subdivision or parcel map and a copy of the Calaveras County Planning Commission Conditions shall be included with each set of improvement plans submitted.

The submitted plans will be reviewed by the District Manager and the District Engineer and, if there are no required and/or recommended revisions, the plans will be submitted to the Board for "Concept Acceptance" (this is not approval for construction) and one (1) set returned to the Consulting Engineer. However, if there are required and/or recommended revisions, they will be noted on the plans, etc., and one (1) set will be returned to the Consulting Engineer for necessary revisions and resubmitted for "Concept Acceptance". The Concept Acceptance shall become void six (6) months from the date of approval unless plans have been submitted for Plan Checking.

5.04 WATER SERVICE FACILITIES AGREEMENT.

The Owner will enter into a Water Service Facilities Agreement with CPUD on all property where service is being requested. The Agreement shall state and provide for design, engineering and installation of a complete water system at the expense of the Owner; and

thereafter, the system will be dedicated to CPUD to be operated, maintained and served by CPUD.

The Agreement will provide for, but not be limited to, provisions for the Owner to prepare and submit to CPUD for review all engineering calculations, plans, specifications, cost estimates, property descriptions, pay all fees, deliver all bonds, construct and pay for all facilities, and do all other work as required to provide a complete Improvement System within the development. The Improvement System is to be constructed in compliance with these Improvement Standards, Standard Construction Specifications, together with any and all amendments thereto, and all other requirements of each and every governmental authority having any jurisdiction with development.

The agreement shall provide that at time of completion the system shall to be granted, in its entirety, free and clear of any and all encumbrances, to CPUD. Upon acceptance of the system CPUD will charge monthly fees to the users and impose or raise fees in order to operate and maintain the system.

5.05 EASEMENTS.

Grants of Easements to CPUD shall be prepared using formats provided by CPUD and obtained by the Owner for all installations on off-site private property. The Grant of Easement, properly signed and notarized, and the original right-of- way description, shall be submitted to the Board for acceptance and recording prior to Release of Construction.

5.06 GEOLOGICAL INVESTIGATION.

Due to the inherent hazards involved in excavation, trenching and pipe laying in certain formations within Calaveras County, the right is reserved to require a geological investigation and report prior to the Release of Construction. In general, locations on steep side hills, locations in areas of established instability, locations in known fault or slip zones, spring or seepage areas or areas where concentrated or unusual development exists or is planned, shall be investigated and construction controlled by the recommendations contained in the geological report.

5.07 FINAL REVIEW - RELEASE FOR CONSTRUCTION.

When submitting plans for review for construction, three (3) complete sets of prints shall be presented. All easement descriptions and right-of-way documents, fully executed and ready for recording, complete specifications, cost estimates, etc., shall also be furnished to CPUD prior to review for construction. Where the Owner cannot file the final map prior to construction, release may be granted to proceed with the work, but such a request must be made to CPUD in writing prior to the start or any construction.

The Owner's Consulting Engineer shall allow a minimum of three (3) weeks for this final review by CPUD. Plans "Released for Construction" imply that CPUD has reviewed the plans, calculations, etc., and the field area in which the work is proposed and that the plans, calculations, etc., and field conditions seem to meet the requirements of CPUD and

construction may begin. Any office or field change from plans "Released for Construction" which will affect the project, nullifies any prior approval of the plans and will require that revisions and/or new plans be submitted and reviewed prior to construction. If any field conditions are encountered during construction that necessitate significant deviation from the plans "Released for Construction", construction shall be halted until plans are revised by the Consulting Engineer, re-submitted to CPUD and again released for construction. "Release for Construction" for any portion of the work may be withdrawn at any time it is determined that any portion of the plans, calculations, etc., and/or construction work fails to meet CPUD requirements. "Release for Construction" shall become void six (6) months from date of release, unless construction of the project, as detailed on the plans, has begun.

5.08 OTHER AGENCY REVIEW.

A. State Review Procedure.

The Consulting Engineer shall provide the following State Departments with complete plans and specifications for their general review and coordination in such manner and detail as those departments may require.

1. State Water Resources Control Board, Division of Drinking Water (SWRCB-DDW).

   The Consulting Engineer shall provide the SWRCB-DDW with complete plans and specifications for review, in such manner and detail as they may request. Plans "Released for Construction" are expressly contingent upon SWRCB-DDW approval and/or issuance of any required permit or license, and CPUD may withhold final acceptance of the improvement plans until receipt of said approval and/or required permit or license.

B. County Review Procedures.

The Consulting Engineer shall provide the following County Departments with complete plans and specifications for their general review and coordination in such manner and detail as those departments may require. "Released for Construction" shall be withheld by CPUD until these departments have signified by their signatures on the Title Sheet or by a letter to CPUD that they have reviewed and approved of the proposed improvements.

1. Director of Public Works
2. Planning Director
3. Appropriate fire protection agency (water projects)
4. County Health Department

5.09 PLAN REVISIONS.

All revisions recommended or required by CPUD will be indicated on the plans by their respective reference numbers as they appear in these standards and/or by notes written on the plans. Any revisions noted shall be made. The plans, cuts sheets, etc., shall be resubmitted for review.

5.10 COMMENCEMENT OF WORK.

No work will be permitted to proceed until all CPUD requirements have been met, including payment of all fees, acquisition of all off-site easements, permits, licenses, plans "Released for Construction" by CPUD and the posting of all required bonds.

SECTION 6.00
EASEMENTS, RIGHT-OF-WAYS AND PERMITS

6.01 EASEMENTS AND RIGHT-OF-WAYS.

Right-of-ways define and establish the rights of CPUD to construct, reconstruct and maintain facilities in the location designated by the Consulting Engineer. Grant of Easements to CPUD and a Right-of-Way Map for improvements shall be provided by the Consulting Engineer for all installations in off-site private property. No construction work will be permitted to proceed until CPUD receives and accepts all Right-of-Way easements. However, if the Final Map cannot be filed by the time construction is ready to begin, permission may be granted to proceed with the work.

A. Right-of-Way Width.

The minimum width of easements shall be twenty (20) feet for lines less than twelve (12) inches in diameter and twenty-five (25) feet for lines twelve(12) inches or greater in diameter or the width shall be three (3) times the depth of the line whichever is greater. The easement shall be centered on the water facility whenever possible.

B. Descriptions and Exhibits.

Description or exhibits for easements to be acquired shall be prepared by the Consulting Engineer, granting rights along the alignment of the improvements. The parcel number shall appear on the description or exhibit. The correct name of the grantor (individual(s), partnership or corporation) shall appear on the description or exhibit. Two (2) copies of each description or exhibit with its respective Right-of-Way Map shall be submitted with plans prior to Release for Construction.

C. Grant of Easement.

After the Consulting Engineer has submitted the descriptions or exhibits and Right-of-Way Map for checking, CPUD will prepare the Grant of Easement forms for the respective Right-of-Way. The original grant of easement form together with its description or exhibit shall be returned to the Consulting Engineer to secure the proper signature(s) and have the form notarized. The properly executed Grant of Easement shall be submitted to CPUD for acceptance by the Board and recording.

D. Right-of-Way Map.

The Right-of-Way Map shall be prepared and shall show the entire area to be covered by the easement, permit or license. A separate plat shall be prepared for each parcel and shall show all necessary survey ties, courses and distances. The Right-of-Way Map shall accompany each description of an easement, permit or license; and the original drawing shall be submitted to CPUD.

E. Easements and/or Reserves.

Easements and/or reserves may be shown on Final Maps and shall be dedicated for the purposes of constructing, reconstruction, laying and maintaining and operating the improvements and appurtenances. A copy of the recorded Final Map or other evidence shall be submitted prior to Release for Construction to substantiate the easements and/or reserves.

F. Easements for Future Extensions.

Easements shall be dedicated or granted to CPUD in all cases where future extensions of lines will be required on property being served. Such easements will be included on the parcel or subdivision map and shown on the construction plans when there is any doubt as to the ability to properly serve the ultimate service area.

6.02 PERMITS AND LICENSES.

Where permits and/or licenses, other than those issued by CPUD are required, the Consulting Engineer shall prepare and provide to CPUD all necessary permit or license requirements prior to Release for Construction.

CPUD must receive approved permits and/or licenses prior to Release for Construction. The Consulting Engineering shall prepare all reports, Right-of-Way Maps or other exhibits required to secure the permit or license. All CPUD costs shall be paid in accordance with Section 4.00, "Fees and Bonds".

A. Caltrans, Railroad and Utility Encroachment Permit.

Applications for all work within State Highways, railroad right-of-ways and utility right-of-ways shall be obtained by the Consulting Engineer and copies submitted to CPUD with the final review plans.

B. Calaveras County or City Encroachment Permits.

Applications for all work within County roads or City streets shall be obtained by the Consulting Engineer and copies submitted to CPUD with the final review plans.

6.03 FEE TITLE.

Fee title to treatment plant sites, pumping station sites, storage tank sites and sites for similar major facilities shall be granted to CPUD and recorded in CPUD's name. CPUD shall accept all sites and descriptions prior to Release for Construction and recording must be completed prior to CPUD acceptance of the improvements.

SECTION 7.00
PREPARATION OF PLANS

7.01 SIZES OF REQUIRED MAPS, PLANS, ETC.

CPUD minimum standards are as outlined below:

A. System Maps - Sheet Size, 22" x 34".
B. Improvement Plans - Sheet Size, 22" x 34".
C. Right-of-Way Maps - Sheet Size, 18" x 26" or 22" x 34"
D. Description or Exhibit - Sheet Size, 8-1/2" X 11".
E. Electronic Drawings - AutoCAD* DWG or DXF Extension.

(AutoCAD Version to be determined by CPUD)

7.02 ORIGINAL DRAWINGS.

All original drawings prepared by the Consulting Engineer shall be prepared on high quality mylar media (if requested by District).

7.03 PRINTS & REDUCTIONS.

All prints of plans shall be high quality black on white background. Half-size reduction of plans shall be to scale and all text shall be legible. Any presentation of hatching shall be in such a manner as to be capable of reading any underlying feature or text.

7.04 PLAN SETS.

The following details are to be shown on plans submitted for CPUD review. This does not in any way exempt the Consulting Engineer who is preparing plans from the responsibility of preparing neat, accurate and comprehensive plans in keeping with the standards of the profession. If the plans submitted are not prepared in accordance with these Standards, the Standard Construction Specifications, the Agreement, etc., or are not in keeping with the highest standards of the engineering profession, District Engineer may return such plans unmarked and unapproved.

A. General.

All sheets of each set of plans shall be in order and stapled together as a complete set which shall generally consist of a Title Sheet, an overall system map, System Map(s), Plan and Profile Sheet(s), Detail Sheets, etc. Each revision and its date shall be indicated on the pertinent sheet. The project name shall appear on each sheet of the plans.

1. Legible Original Drawings.

   To produce legible original drawings, half-size reproducible copies and prints, all line work must be clear, sharp and heavy. Numerals showing profile elevations shall not be bisected by station grid lines.

2. Standard Symbols and Legend.

   Standard symbols and legend shall be incorporated into all plans.

3. Signature and Stamp.

   The signature and stamp of the Consulting Engineer (responsible registered engineer, registration number, and date of expiration) shall appear on each sheet of the plans.

4. Title Blocks.

   Each sheet within the set of drawings shall have a title block showing the sheet title, number, date, scale and the Consulting Engineer's name and registration number, and/or the name of the subdivision, project or assessment district.

5. Stationing and Orientation.

   The stationing on plan and profile shall normally read from left to right. Plans shall be so arranged that the North arrow points towards the top or upper 180 degrees, insofar as practical.

6. Benchmarks.

   The benchmarks and datum shall be clearly pointed out on the plans both as to location, description and elevations. Consulting Engineer or Surveyor shall contact the County for location and elevation of the nearest official benchmark.

   The District Engineer may require that the proposed improvements be tied into the California Coordinate System if monument coordinate points are available within a reasonable distance of said improvement as determined by the District Engineer.

7. Typical Sections.

   A typical section for each type of street within the improvement setting out the structural features, shall be a part of the plans.

8. Cross Sections.

   Cross sections shall be included in the plans where determined necessary by the District Engineer. When, in limited areas, unusual topographic features or special conditions occur that would affect the work, individual cross sections may be shown on the pertinent plan sheet.

9. Special Notes.

   Special notes shall be clearly indicated. When CPUD has agreed to cooperate in any portion of work shown on Consulting Engineer's plans, these plans shall be clearly noted: "Contractor shall submit a proposal to and obtain a work order from CPUD prior to construction". CPUD will not pay for any work done without said work order.

B. Title Sheet.

On improvement plans exceeding three sheets in one set, a title sheet shall be prepared showing project title, the Owner, the Developer, the Consulting Engineer, general notes, sheet index, location map, etc.

1. Names and Signatures.

   The printed name, signature and date of the following, when applicable to the improvement project, shall appear on the title sheet

   a. Consulting Engineer
   b. Owner
   c. Director of Public Works
   d. Chief (appropriate fire protection agency)
   e. District Engineer

2. General Notes.

   The following information is to be included in the general notes:

   a. Datum information.
   b. Depth of underground utilities if known.
   c. Contractor responsible for notifying USA.
   d. Stationing along street centerline unless otherwise noted.
   e. Time of completion.
   f. Special sequence of construction.
   g. Reference to CPUD Standard Specifications.
   h. Reference to CPUD standard Details.
   i. Drafting symbol legend.
   j. Clearances shown are from construction centerline to the nearest surface of object noted.

C. System Map

The system map scale shall normally be 1 inch = 200 feet. The system map shall cover sufficient area to show adjacent, existing and proposed improvements, all properties to be served, contours with intervals not less than 20 feet, line sizing, pressure zones for water systems, water tanks with base elevation and tank height, pumping stations, treatment plants, street names, subdivision names and/or numbers, project boundaries, key layout of plan and profile sheets, permanent benchmarks, etc. Un-served areas within the project boundaries which cannot be served at a future date by simple extension of the project's system (without pumping) shall be indicated.

All horizontal angle points, crosses, tees, valves, air release, pressure reducing valves, blow offs, hydrants, and services shall have State Plane Coordinates (Zone 3) shown on the system map.

Preliminary System Maps are to be submitted as part of the Planning Review phase and must be sufficient in detail to determine general concepts, system

adequacy and potential service to adjacent properties. See Section 10.00 for specific requirements.

Final System Maps are to be submitted with the Final Review Plans and shall show all valve, ARV, PRS, HPRS and fire hydrant, etc. locations.

D. Plan and Profile Sheets.

When the project is in unimproved land, plans should be drawn from topographic base maps. When the project is in improved land, plans should be drawn from aerial photos. Appropriate, water and sewer facilities may be combined on the same original base sheets.

1. Plan.

   The scale shall normally be 1 inch = 20, 40 or 50 feet horizontal (1 inch = 20 or 40 feet required when proposed facilities are to be constructed in existing improved or built up areas) and shall show the true horizontal relationship between the proposed improvements and the existing and/or proposed field conditions, including existing or proposed utilities and other facilities in accordance with available information. Plans shall also include topographic contours, line size, pipe type, pipe class and designation, all structures and their respective numbers, lot numbers, all property lines and corners adjacent to the alignment, all necessary and required stationing, location dimensions, horizontal curve data and street names.

2. Services.

   The location of each proposed service shall be indicated on the plans by stationing or by reference to a permanent, well-defined structure. Improvements or lots shown on a plan sheet but served by a line shown on another plan sheet shall have the service shown by a small triangle and the letter "W" (water service).

3. Permanent and Working easements.

   Permanent and working easements shall be shown to scale on the plans. Easement dimensions shall be given and each easement shall be tied to both the property line and the improvement line.

4. Improvement Line.

   The proposed improvement line shall be shown on each plan sheet as a solid line. Sufficient dimensions from right-of-way centerline shall be given. If the line is to be located in an easement, sufficient dimensions to locate the line in the field shall be shown on the plans.

5. Utilities.

   Existing and proposed gas, water, sewer, power, telephone and all other utility lines above or below the ground shall be determined and shown upon the plans with accuracy as great as practicable. The location of any utility line which is within 5 feet of the improvement line, shown to an accuracy of 1.0± foot and the clearance shown upon the plans. Service lines shall be shown.

6. Obstructions.

   Trees and other objects within the working easement shall have their correct location shown on the plans, the clearance from construction centerline shown, and the diameter of tree trunks and interfering heavy tree branches noted. Removal of a tree or object or other special handling shall be noted on the plans. The Consulting Engineer shall assume full responsibility for such notes because it is assumed that the Consulting Engineer has made all necessary arrangements with the owner of the object to be handled. Tree removal within public right-of-way must be approved by the appropriate public agency.

7. Culverts.

   Culverts shall be shown on both plan and profile when crossed by the construction and shall be shown when parallel and within 20 feet of the construction line or may affect location or depth of services to individual lots. The size and type of all such culverts shall be indicated. When the culvert crosses or is perpendicular or nearly so to the construction line, the invert(s) of the culvert affecting the work shall be shown.

8. Pavement Designation.

   The existing pavement type and condition shall be indicated on each sheet. Pavement replacement type and location also shall be indicated.

9. Miscellaneous Structures.

   Driveways, curbs, sidewalks, pavement edges, buildings and all other items that could influence the work shall be shown. Only the front line and indication on the side lines of buildings need be shown.

10. Profile.

    The Profile shall show the approximate vertical relationship between underground improvement lines and the ground surface at the time of construction and the finish ground and/or paving surface. Size and location of structures shall be repeated in profile. Designate all clearances when less than twelve (12) inches. All sections of line necessarily designed with less than the required minimum cover shall be noted with the length of the section indicated and shall require special approval in each case.

    The length, size, type and strength designation shall be shown in the profile view between well defined points.

    Indicate the pipe material and class. Imported sand bedding and initial backfill is required on all non-metallic pipe. If more than one combination of pipe class, maximum limiting trench width, or bedding type is available, a practical range of such combinations shall be shown on the plans.

E. Detail Sheets.

Items of special nature such as creek crossings, etc., shall be shown in large scale upon a separate sheet of plans labeled "Detail Sheet". This Detail Sheet shall be bound immediately after the plan and profile sheets.

F. Pumping Station.

Pumping stations shall include site plans, erosion control plans, drainage plans, grading plans pump curves, detail plans, sections, electrical details, miscellaneous details, etc., sufficient to describe, layout and construct the proposed facilities. Preparation of such plans shall be closely coordinated with the District Engineer.

SECTION 8.00
CONSTRUCTION OF FACILITIES

8.01 CONSTRUCTION OF FACILITIES.

The Owner shall promptly and diligently cause the Improvements as described in the Agreement to be constructed and installed to serve all of the parcels or services of the Development in accordance with the accepted plans, specifications, real property descriptions, etc.

The Owner may construct and install portions of the Improvements from time to time contemporaneously with other Development improvements as they are installed in the Development from time to time. The Improvements shall be installed and in operating condition and offered to CPUD within two years after CPUD has accepted the plans, specifications, legal property descriptions, etc., unless an extension of time has been authorized by the Board.

All construction shall be in accordance with CPUD Standard Construction Specifications (see Sections 11.0 – 26.0)and performed by an appropriately licensed contractor for the work being performed.

8.02 CONSTRUCTION INSPECTION.

Any improvement or private works will be constructed to CPUD requirements. Where it is intended that such improvements or private works be dedicated to and accepted by the CPUD for operation and maintenance, those improvements must be inspected during construction by CPUD. Each phase of construction must be inspected and accepted prior to proceeding to subsequent phases.

Any improvements or private works constructed without inspection as provided above or constructed contrary to the orders or instructions of the District Engineer will be deemed as not complying with these requirements and will not be accepted by CPUD.

The Owner will pay all costs incidental to the construction inspection of the system as outlined in Section 4.00.

8.03 FINAL INSPECTION.

Upon completion of any Improvements that are constructed under and in conformance with these Standards and prior to requesting a final inspection, the area shall be thoroughly cleaned of all rubbish, excess material and equipment, and all portions of the work shall be left in a neat and orderly condition satisfactory to the District Engineer.

Within 14 days after receiving the request for final inspection, the District Engineer shall inspect the work. The Contractor, Consulting Engineer and Owner, will be notified in

writing as to any particular defects or deficiencies to be remedied. The Contractor shall proceed to correct any such deficiencies with thirty (30) days. At such time as the work has been completed, a second inspection shall be made by the District Engineer to determine if the previously mentioned defects have been repaired, altered and completed.
At such time as the District Engineer approves the work and the Board accepts the Improvements, the Contractor, Consulting Engineer and Owner will be notified in writing as to the date of final approval, acceptance and recording.

For assessment districts and projects where CPUD participates in the costs thereof, quantities will be measured in the presence of the District Engineer, Consulting Engineer and Contractor.

SECTION 9.00
PREPARATION OF AS-CONSTRUCTED PLANS

9.01 GENERAL.

Upon completion of the work, subsequent to the final inspection but prior to the Board's acceptance of the facilities, the Consulting Engineer will submit accurate project "As-Constructed" plans and computer media to CPUD. To the extent feasible, CPUD will cooperate in compiling necessary field data to aid in the preparation of "As- constructed" plans.

The Owner will pay all costs incurred by CPUD incidental to the preparation of the As-constructed plans.

9.02 AS-CONSTRUCTED PLANS.

"As-constructed" plans shall include all details shown on the original Plans Released for Construction, corrected and/or expanded to reflect all design or construction changes. The original drawings as corrected for As-constructed plans, noted and signed by the Consulting Engineer as "As-constructed" plans, shall be submitted to CPUD for acceptance. "As-constructed" plans will be reviewed and signed, if acceptable, by the District's Engineer.

9.03 ITEMS TO CONSIDER.

Items to be considered in the preparation of "As-constructed" plans but not necessarily limited to:

A. Line, valve and hydrant horizontal locations.
B. Mechanical and electrical details.
C. Wire and Terminal Strip Identifications.
D. Ground and road surfaces and water line vertical locations (where different from "standard").
E. Size and type of pipe used. Location of pipe size transitions.
F. Service locations and depth.
G. Mechanical modifications (treatment plant, pumping stations, etc.).
H. Backflow devices.
I. Pressure Reducing, High Pressure Relief and Air Relief Valves.
J. Survey Datum's.

SECTION 10.00
WATER SYSTEMS DESIGN

10.01 INTRODUCTION.

These design criteria shall govern the engineering design of domestic water systems which will be dedicated to the public and accepted by CPUD for maintenance and operation and those systems designed for CPUD by its consultants.

It is the intent of these criteria to provide a water system that will dependably and safely convey the required amount of high quality water at adequate pressures and with minimum maintenance and operational costs.

The Owner shall furnish, without cost to CPUD, all intrinsic and auxiliary components for maintenance and operation as necessary to provide a complete water system.

10.02 REGULATORY STANDARDS.

Pertinent requirements of the following agency standards, including all changes thereto, shall be considered and complied with, except that in the event of conflict, the stricter design criteria shall prevail.

A. United States Public Health Service (USPHS) Drinking Water Standards.
B. Environmental Public Agency (EPA) Standards.
C. The Porter-Cologne Water Quality Control Act.
D. State Water Resources Control Board, Division of Drinking Water.
E. Ordinances of the County of Calaveras.
F. Uniform Fire Code, and Local Fire Ordinances.
G. These Improvement Standards.
H. Others (as appropriate as deemed appropriate by District Engineer).

10.03 BENEFITING AREAS NOT WITHIN PROJECT BOUNDARIES.

A parcel or area which benefits and participates in a project, but is not included within the project boundaries shall have a note to this effect placed on the overall project map and on the plan and profile sheet if the parcel appears thereon. Parcels not so noted which make use of a project's facilities after the project's completion will be required to pay an "expansion fee" prior to such use.

10.04 DESIGN PROCEDURE.

A design for each project proposed to be constructed under a CPUD Agreement, or by its consultants, shall be submitted to, and accepted by, the District Engineer in accordance with Section 5.00, "Project Review and Acceptance" of these Standards. In addition to the general requirements of said section, the following requirements are applicable.

A. Preliminary Design

The preliminary Design shall be submitted in the form of a map (and associated calculations) to include the following:

1. Location of project.
2. Tributary areas outside project.
3. Adjacent areas.
4. Contours over complete map.
5. Major line layout and preliminary pipe size.
6. Residual pressures with design flows at major junctions and critical points; pressure zones.
7. Predicted design flows (peak and/or average as appropriate) at major junctions, including flows into and out of the project area.
8. Direction of flow under design conditions.
9. Zoning used to predict flows.
10. Special areas such as hospitals, schools, large office buildings, industrial, commercial areas, etc.
11. Boundaries of areas within the project which are tributary points of major flow.
12. Location and sizing of major system components, including water treatment plant and storage facilities, if included in the project.
13. Electrical and Telemetry Details.

B. Final Design.

Shall be an expansion of the "Planning Review" preliminary design in such detail as to verify all preliminary sizing of facilities and to size those facilities not included in the preliminary design. All such final design calculations shall accompany the construction plans and specifications for the review leading to Release for Construction.

10.05 CALCULATIONS.

Hydraulic Analysis of any proposed transmission or distribution system shall be done by computer using EPANET Windows version or other acceptable computer modeling system.

The Hazen-Williams formula shall be used in the hydraulic analysis of the system, using a "C" value of 140 or the value recommended by the pipe manufacturer, whichever is lower for new pipe and a "C" value of 120 for existing pipe. A Hardy-Cross hydraulic analysis of any proposed distribution system shall be supplied to CPUD.

A. Population Density

The population density for residential developments for determining the flow per unit shall be based on the following:

1. 3.5 persons per unit for developments of 100 units or less
2. 3.0 persons per unit for developments of 100 units and greater.

B. Flow Requirements.

Flow determination shall be based upon the current or proposed zoning. The minimum population density in areas of potential development shall be equivalent to that of single family zoning. The area shall be examined for trends toward population concentration and, if found, an estimate should be made of the probable extent of such concentration. This estimate shall be used as the basis for determining flow. All calculations shall assume full development, except where a stage concept has been specifically approved by CPUD.

Average per capita daily flow requirement shall be as follows:

1. Forested, Residential Developments
   (above 3,000 ft. elevation) -- 200 gallons per person per day.
2. Urban and Non-forested Residential Developments
   (below 3,000 ft. elevation) -- 250 gallons per person per day.
3. Commercial, Industrial Development -- Based on specific development plans as approved by the District Engineer.
4. Schools.

   The larger flow, as determined from one of the two following methods, shall be used:

   i. The entire school area shall be assumed a single family zoning with minimum sized lots assumed.

   ii. Flow shall be based on ultimate design student population plus administration, teaching and operating personnel.

C. Average Daily Flow (ADF).

Shall be determined for tributary service area(s) by multiplying the sum of the area(s) design population by the average per capita daily flow requirement as designated above, plus any commercial, industrial, school, etc. demand.

D. Maximum Daily Flow (MDF).

Shall be determined by multiplying the ADF by a factor of two (2).

E. Maximum Hourly Flow (MHF).

Shall be determined by multiplying the ADF by a factor of three (3).

F. Fire Flow (FF)

The fire protection district responsible for the area being developed will set the fire flow requirements. In no case shall the requirements of fire flow be less than that provided below:

1. Single Family and Duplex Residential Areas - 500 g.p.m.
2. Townhouse, Multiple Residential and similar density, two and three floor structures - 1,000 g.p.m.

3. Commercial - 2,500 g.p.m. or with interior sprinklers 1,500 g.p.m (to be approved in writing by the fire protection agency involved).
4. Industrial - to be determined.

10.06 WATER SOURCE.

Where it is necessary to develop a new source of water for the proposed Development due to existing CPUD facilities being either inadequate, unavailable, or where a CPUD approved firm supply contract cannot be obtained through another water supply agency.

Development of a new water source shall comply with the following requirements:

A. Quality.

Quality of the water shall conform to the current EPA Drinking Water Standards and all of the current requirements of the State and County Health Departments. A pollution survey of existing and potential sources of contamination shall be prepared and forwarded for review with other data submitted for Planning Review.

B. Testing.

Developer shall provide sufficient tests during significant times of the year to determine the quality of water and to determine the design parameters for required treatment processes. Such tests shall include, but not necessarily limited to, complete SWRCB-DDW chemical tests (including heavy metals), dissolved oxygen, turbidity, temperature, bacteriological (including fecal coliform), pH, etc.

C. Reliability.

Sufficient geological, hydrological and meteorological studies will be required to prove that the design flows can be maintained through the driest years of record. CPUD does not consider surrounding existing wells a firm source of reliability for water.

10.07 PUMPING STATION DESIGN.

All phases of pumping station design shall be closely coordinated with CPUD. In general, such facilities shall include all necessary components and amenities as required by CPUD to insure a complete, automated, operating facility that will lend itself to minimum maintenance and operational costs. All electrical, SCADA, PLC and Telemetry equipment must be designed to be compatible with existing equipment.

A. Pumping Units.

Pumping units shall approximately pace the expected flow pattern and shall be capable of providing the maximum design flow with the largest pumping unit out of service.

B. Access.

All weather asphalt paved access shall be provided to all major functional units.

C. Structures.

Structures shall provide protection against weather and vandalism, shall be designed to blend architecturally with the character of the Development, and afford minimum CPUD maintenance.

An "in-lieu" fee will be required where it is practical to expand existing CPUD facilities to accommodate the new development.

D. Metering, Recording and Monitoring Equipment.

Metering, recording and monitoring shall be provided at major pumping stations as determined by CPUD. All such equipment shall be compatible with existing CPUD equipment and be approved for use by CPUD.

General requirements are as follows:

1. Flow meter and recorder.
2. Alarm equipment shall be compatible and interface with existing CPUD equipment.

E. Design Flow.

Pumping stations are normally designed to pump the Maximum Daily Flow (MDF). Maximum hourly, emergency and fire demands are normally supplied from storage without pumping. Where storage facilities are not available, such facilities shall be designed for the Maximum Hourly Flow (MHF), including fire demands and standby power or pumping equipment will be required.

10.08 STORAGE FACILITIES.

Storage capacity shall be equal to the sum of the fire storage reservation, plus the allowance for system peaking, plus an allowance for emergency reserve.

The minimum size storage tank shall be 250,000 gallons.

A. Fire Storage Reservation (FSR).

Shall be the product of the appropriate fire flow and the design fire duration. The minimum design fire duration shall be four (4) hours but may be increased by the appropriate fire protection agency, where a higher figure is deemed appropriate.

B. System Peaking Storage (SPS).

Is a function of the system design and generally is approximately twenty (20) per cent of the total maximum daily flows (assuming a 24- hour pumping rate).

C. Emergency Storage (ES).

Shall provide sufficient capacity, without encroaching into the fire storage reservation or the system peaking storage, to carry the system through reasonable periods of system failure. An emergency storage increment of four (4) hour duration, based on the Maximum Daily Flow (MDF) is normally considered adequate. Isolated developments may require a larger increment and must be discussed individually with CPUD.

D. Overflow Pipes.

Must be sized to pass the maximum incoming flow rate with a design head of four (4) inches; head loss calculators must include both entrance and friction losses. Provide Air Gap with backflow protection on all overflows. Overflow must be directed to a natural watercourse in a manner that prevents scouring.

E. In-Lieu Fee.

Where it is impractical to construct required facilities at the required elevations, or, where in the opinion of CPUD, it is more practical to expand existing CPUD facilities, Developer shall pay an "In-Lieu" fee based on required storage volume and current construction cost.

10.09 TRANSMISSION LINE.

The following requirements are applicable from a source to a storage facility and where there are no services off the transmission line. Beyond the point of storage, or if storage is not available, or where services are taken off, the requirements of Distribution Lines normally apply.

A. Design Flow Rate.

Size line to pass the Maximum Daily Flow, (MDF).

B. Design Pressure.

Design pressure shall be such that the Design Flow Rate can be maintained to supply water from the source to the storage facility.

C. Main line, Valves, Blow-off Assemblies and Air Release Valves.

Main Line Valves shall be provided every 1800 lineal feet and any exceptions must be approved by CPUD.

Air release valves shall be installed at all major summits and every 1500-3000 feet and both ends of long horizontal runs of pipe.

Blow-offs shall be installed at all major low points. Whenever practical a fire hydrant shall be substituted for blow off valves.

Whenever possible, valves shall be shown as required in Section 10.10, "Distribution Lines".

All valve risers shall be 8" minimum diameter.

10.10 DISTRIBUTION LINES.

The following requirements are applicable on all water lines not classified as transmission lines.

A. Design Flow Rate.

Size lines for the higher of the following two conditions at the Design Pressures:

1. Municipal Service - Maximum Hourly Flow (MHF).

2. Fire Flow Demand (FF) plus Maximum Daily Flow, (MDF).
3. Pipe Velocities

B. Maximum and Minimum pipe velocities for design flow rate shall be per the table below:

Pipe Size	Maximum	Minimum
4"	12 fps	3.0 fps
6"	10 fps	2.5 fps
8"	10 fps	2.5 fps
10"	8 fps	2.5 fps

C. Design Pressure.

Shall be such that the Design Flow Rate can be maintained as follows:

Municipal Service Pressure (MSP).

1. Minimum - 35 psi at highest point of lot to be served.
2. Maximum - 115 psi at lowest point of lot to be served.
3. Fire Demand plus Maximum Daily Flow (MDF) at 20 psi.
   i. The distribution system shall be zoned to provide the above pressure range.

D. Minimum Size Lines.

In general, the minimum pipe size shall not be less than six inches inside diameter.

Minimum size shall be as follows:

1. Residential Areas, Single Family and Duplex - 6 inch.
2. Townhouse, Multiple Residential and similar density two and three story structures:
   i. Looped System - 6 inch.
   ii. Dead-end system - 8 inch.
3. Commercial - 8 inch.
4. Transmission and major distribution lines shall not be less in diameter than the lines they serve.

10.11 SERVICE CONNECTIONS.

A. Backflow Devices.

Backflow devices (BFD) will be required on all connections where there is potential contamination to the water system.

1. Reduced-pressure backflow prevention assemblies shall be provided on all commercial and industrial water services.

2. Depending on degree of hazard, a double check valve assembly may be required in place of a reduced-pressure backflow assembly.
3. Reduced-pressure backflow prevention assemblies shall be provided on irrigation services where served by potable water.
4. Reduced-pressure backflow prevention assemblies shall be provided on potable water services where recycled water, well water or any other water supply is served to the same property.
5. Double check valve assemblies shall be provided at all points of connections to District sources at construction sites.
6. Reduced-pressure detector assemblies shall be provided on all fire services.
7. The District shall be the final authority as to the location, installation, and type of backflow prevention device required.

B. Water Meters.

Water meters are required for each residence, dwelling, commercial and industrial unit.

1. Water meter size, to support required residential, commercial or industrial fire sprinkler systems, shall be determined by owner's retained fire sprinkler system design consultant.
2. Water meters shall be set using Ford series copper setter with a lockable angle meter stop on CPUD side and a service valve and handle on the customer side of the meter.
3. Inlet fittings shall be pack joints with solid stainless steel inserts suitable for use with iron pipe size polyethylene tubing.
4. Outlet fittings shall be suitable for use with polyvinyl chloride pipe.

C. Valves

The distribution system shall be designed with a sufficient number of valves so that no single shut down will result in shutting down a distribution line or necessitate the removal from service, of a length of pipe greater than 500 feet in school, commercial, industrial, or multiple family dwelling areas, or greater than 900 feet in other districts. In no case shall more than two fire hydrants be removed from service. The valves shall be so located that any section of main can be shut down without going to more than three (3) locations to close valves. Valves shall preferably be located at street intersections. If it is necessary to install valves between street intersections, they shall be located on the prolongation of property lines between lots.

D. Air Release Valves

Air release assemblies shall be provided at all major high points in the system and protected from traffic.

E. Pressure Reducing Stations

Pressure Reducing Stations (PRS) will be installed when appropriate and shall automatically reduce a higher inlet pressure to a steady lower downstream pressure.

F. High Pressure Relief Stations

High Pressure Relief Stations (HPRS) shall be installed to relieve excessive downstream pressure in the case of failure of the PRS. HPRS will be placed downstream of PRS and set at 25 psi above static pressure at that point. All stations shall be located outside of the traveled way and protected from traffic.

G. Blow-off Assemblies.

In general fire hydrants shall be used for blow-off (BO) assemblies. A blow-off assembly shall be installed on all permanent dead-end runs and at all major low points in the system.

Special attention shall be given to those of a temporary nature, taking into consideration the length of the dead-end run, the number of services on the line and the estimated time before extension.

Wherever possible, the blow-off shall be installed in the street right-of- way.

In no case shall the location be such that there is a possibility of a back-siphon into the distribution system.

10.12 LINE LOCATION.

All water mains shall be designed to be within the paved portion of the roadway, normally six (6) feet from the right-of-way centerline, and parallel with the centerline, or in a public easement. All locations within existing road right-of-ways shall be approved by County Director of Public Works. If it is necessary to install a water main within a private road, the easement shall be the width of the paving plus one foot each side, or 20 feet, whichever is larger.

10.13 SAMPLING STATIONS.

Sampling stations will be provided throughout the system as directed by the District Engineer.

Stations shall be located such that they are protected from traffic.

10.14 REGULATIONS RELATING TO SANITARY HAZARDS.

All construction shall conform to applicable regulations relative to safeguarding the public health, particularly the regulations relating to cross-connections as established by the California Administrative Code, Title 17.

In designing the distribution system, it is intended that ten (10) feet clear be the minimum horizontal distance between parallel water and sanitary sewer lines and that the water main be at least 12 inches higher than sewer lines.

When crossing a sanitary sewer force main, the water main shall be a minimum of 12 inches above the sewer line and encased in Class B concrete. Encasement shall extend five (5) feet on each side of the force main, or as specified or directed by the Engineer.

10.15 MAIN LAYOUT.

A. Grid

The distribution system, whenever possible, shall be in a grid form so that pressures throughout the pressure zone(s) tend to become equalized under varying rates and locations of maximum demand. Further attention will be given to avoid all "dead-ends" within the system whenever possible.

B. Dual Mains

Dual mains (one pipeline on each side of the street) shall be installed in streets which carry heavy concentrations of traffic, or the right-of-ways of which are 100 feet or more in width. State highways are in this category. In those streets classified for dual mains, the minimum size shall be six (6) inches on each side in residential areas. In commercial districts the sizes shall be not less than one eight (8)-inch and one six (6)-inch.

10.16 FIRE PROTECTION.

Fire hydrants shall dry barrel type with "two hose and one pumper" outlet types.

Fire Hydrants shall be supplied by a minimum 6" diameter riser. Normal depth of cover shall be 42" when served by a 6" or 8" main. Greater depth of cover may be required when main size is larger or when required by the topography.

A. Spacing.
   1. Single Family and Duplex Residential Developments, not to exceed 500 feet.
   2. Townhouse, Multiple Residential similar density, two or three floor structures and/or commercial areas, not to exceed 300 feet.

B. Guard Valves.

Guard valves are required for all fire hydrants; risers shall be 8" minimum.

10.17 TAPPING EXISTING LINES.

The District shall make all taps into existing lines. A note "CPUD shall make all taps." shall be placed on each plan sheet that requires such tapping.

10.18 CONNECTION TO TRANSMISSION LINES.

Services shall not connect to transmission lines greater than twelve (12) inches in diameter without the written approval of CPUD.

10.19 CREEK CROSSINGS.

Crossing details of pipe, pier, anchorage, transition couplings, etc. shall be shown upon a detail sheet of the plans in large scale.

Ductile iron pipe shall be used under the full creek width plus ten (10) feet on each side. All soft or organic material shall be replaced with select imported backfill. Special care shall be used to provide a firm base for the pipe bedding. Full concrete encasement is required.

If the pipe must cross above the creek bed, ductile iron pipe shall be used. Reinforced concrete cylindrical piers of adequate depth shall be used. Galvanized steel straps, with galvanized anchor bolts of adequate size, shall hold the pipe in cylindrical cradles formed in the pier tops. Cushion material shall be placed between the pipe, clamps, and support.

Calculations shall be submitted which clearly indicate the design of the pipe and supports regarding impact, horizontal and vertical forces, overturning, pier and anchorage reactions, etc.

CONSTRUCTION AND INSTALLATION

SECTION 11.00
PURPOSE AND INTENT

11.01 GENERAL.

It is the purpose of these Improvement Standards to provide minimum standards to be applied to improvements and private development projects to be dedicated to the public and accepted by CPUD for maintenance or operation, as well as improvements to be installed within existing rights of way and easements. These standards provide for coordinated development of required facilities to be used by and for the protection of the public. These standards shall apply to and regulate the design and preparation of plans for construction of water system facilities and related public improvements.

It is not possible to anticipate all situations that arise or to prescribe standards applicable to every development. The intent of these Standards is to assist developers, engineers, and contractors toward completion of improvements that will comply with the District's requirements and be accepted by the District for maintenance and operation. The Board of Directors for the District may impose project specific requirements which may supersede the requirements and standards set forth herein. Any items or situation not included in these Improvement Standards shall be designed in accordance with accepted engineering practice, the applicable Standard Plans and Standard Specifications of the State of California Department of Transportation, and shall be subject to the approval of the District Engineer.

11.02 FIRE DISTRICT.

Water lines shall be sized to meet the fire flow requirements of the respective Fire District within the CPUD's service area boundary. It is the responsibility of the Developer to obtain written approvals by the Fire District. CPUD will not approve any Improvement Plans without said approvals.

SECTION 12.00
GENERAL REQUIREMENTS

12.01 INTENT OF PLANS AND SPECIFICATIONS.

Complete plans and specifications shall be prepared by an Engineer for all proposed water distribution system improvements. All plans and specifications for improvements to be accepted for maintenance by the CPUD shall be prepared by an Engineer of the appropriate branch of engineering covering the work submitted. All dedications and easements necessary to accommodate all improvements shall be submitted to the CPUD's District Engineer for approval and offered for dedication to CPUD.

Possession of a complete set of CPUD approved plans and a valid encroachment permit shall constitute the necessary permits for a Contractor to perform work in the City/County right of ways or easements. The District Engineer or his representative shall order the Contractor to cease work on any project when the Contractor does not have properly approved plans in his possession. Contractor shall be duly licensed by the State of California, possess the an appropriate current Business License, and shall be bonded as required to meet the requirements of the District.

The Specifications and Plans are complementary and what is called for in one shall be as binding as if called for in the other.

The Standard Specifications shall be made a part of contract documents by note or reference which shall appear in the Special Provisions and in the General Notes on the plans. The note or reference shall be as follows:

> *"The Standard Specifications are part of the contract documents of this project and all materials and construction shall be in strict conformance with said Standard Specifications or as authorized by these plans."*

12.02 CONTRACTOR AND DEVELOPER RESPONSIBILITY.

Contractor and Developer are directed to the Construction Safety Orders of the Division of Industrial Safety. Contractor and Developer shall conduct all work in accordance with these standards. Contractor and Developer shall be responsible for all damage arising from any failure to comply with such orders regardless of any action taken by the City or its authorized agents.

Contractor and Developer are directed to the regulatory provisions of the State Standard Specifications. The District will assume no costs or liability for complying with these provisions.

The Developer, the Engineer, and the Contractor shall keep themselves fully informed of and shall comply with all applicable federal and state laws in addition to all county

and municipal ordinances, resolutions, rules and regulations which in any manner affect the design, construction, or operation of the project or its appurtenances.

It shall be the responsibility of the Developer to obtain all approvals required from applicable public agencies regarding the proposed construction. Such agencies may include but are not limited to California Department of Fish & Game and the State Water Resources Control Board, Division of Drinking Water.

12.03 WORKING HOURS.

The Contractor shall restrict working hours from 7:00 a.m. to 6:00 p.m. Monday through Friday, excluding holidays, unless otherwise approved by the District Engineer. The District may restrict work hours in specific areas to protect the public. The Contractor will be given written notice of any work hour restriction.

Any work performed during a weekend day or holiday will be charged to the Contractor per the Agreement.

12.04 DISCREPANCIES IN SPECIFICATIONS AND PLANS.

Any discrepancies, errors or omissions found in the Specifications or Plans shall be promptly reported to the Engineer who will issue a correction in writing. The Engineer shall seek approval (if required) from the District Engineer prior to the Contractor taking corrective measures and, shall not take advantage of any such corrective measures regarding the same prescribed by the Engineer.

12.05 PLAN SUBMITTAL.

Three sets of improvement plans, complete and in accordance with these Improvement Standards and the Standard Specifications, shall be submitted along with any required specifications, computations, test data, and other material required by CPUD for approval. When the plans are initially submitted to CPUD, a plan check fee will be required as a deposit to initiate checking of the plans by CPUD in accordance with Section 4.01.

Should there be required alterations or revisions to the plans as submitted, one copy will be returned with the required corrections marked or indicated thereon. Plans not prepared in accordance with these Improvement Standards and the Standard Specifications or plans not prepared consistent with the standards of the profession, may be returned unmarked and unapproved.

No plans will be approved nor construction authorized until such times as all appropriate Official(s) signify approval on the plans. All changes, corrections, or additions required shall be resubmitted to CPUD for approval as prescribed. At such times when the plans meet the requirements of CPUD and the plan check and inspection fees have been paid, the plans will be signed by the District Engineer. The Engineer shall deliver not less than two complete sets of plans to the District Engineer which will be retained by the District.

Excepted from approval are any features of the plans that are contrary to or in conflict with any California State Law, City /County ordinance or resolution, generally accepted sound engineering practice, or standards of the profession; even though such errors, omissions or conflict may have been overlooked in CPUD review of the plans.

12.06 STANDARDS OR PUBLICATIONS.

Any reference made in the Specifications or Plans to any specification, standard or publication of any organization, in the absence of a specific designation to the contrary, shall be understood to refer to the latest edition of the specification, standard or publication in effect as of the date of advertising the work.

12.07 PROPRIETARY PRODUCTS.

Where references to proprietary products appear in the Specifications or Drawings, whether or not followed by the words "or equivalent", it is for the purpose of establishing an acceptable standard of quality or design. Unless a substitute is expressly prohibited, the Contractor may request approval of a substitute for any such proprietary product. Such approval will not normally be given by the Engineer prior to approval of plans or award of a Contract. A request for substitution must be in writing and must include descriptive literature, specifications, test reports or samples, as appropriate, to enable the Engineer to determine the acceptability of the product proposed for substitution. If substitution is requested as part of a shop drawing submittal, the item(s) proposed for substitution shall be clearly indicated. No substitute product shall be used on the work until written approval has been received from the Engineer. Any revisions to structures, piping, mechanical or any other work made necessary by such substitution must be approved by the Engineer; and the entire cost of these revisions shall be borne by the Contractor.

Where a particular type or model number for an item of equipment is specified in addition to a word description of the item, it shall be understood that the call out of type or model number is made solely for the convenience of the Contractor; and no guarantee is made or should be assumed as to its accuracy. In the event an item of equipment as represented by a model number differs in any respect from the word description contained in the Specifications, the word description shall govern; and the Contractor will be held to furnishing the item of equipment to meet the worded description of the Specifications.

12.08 CONSTRUCTION VIDEOS/PHOTOGRAPHS.

If required by the District Engineer, Contractor shall take and provide to CPUD videos/photographs of pre-construction job and/or site.

12.09 PUBLIC SAFETY AND CONVENIENCE.

At all times the Contractor shall conduct the work so as to assure the least possible obstruction to traffic and inconvenience to the general public and adequate protection of

persons and property in the vicinity of the work. No street shall be closed to the public without first obtaining permission of the District Engineer and proper governmental authority. Where excavation is being performed in primary streets or highways, one (1) lane in each direction shall be kept open to traffic at all times unless otherwise provided or shown. Toe boards shall be provided to retain excavated material if required by the District Engineer or the agency having jurisdiction over the street or highway. Temporary provisions shall be made by the Contractor to assure the proper functioning of all drainage facilities.

The Contractor shall provide adequate barricades, signs, warning lights, guards and flaggers as required, in the opinion of the Engineer and agency having jurisdiction, to protect the work and the safety of the public. Warning lights using flammable liquids will not be permitted. Only electrically-operated warning lights will be approved for use. Warning lights shall be on from sunset to sunrise, and barricades shall be painted to increase their visibility at night.

12.10 TEMPORARY FACILITIES AND SERVICES.

No water shall be withdrawn from fire hydrants for construction purposes until the Contractor has written approval of CPUD for such a connection.

12.11 DUST CONTROL.

The Contractor shall at all times conduct the work so as to avoid unnecessary dust. Contractor shall provide adequate equipment and water as determined by the District Engineer to be necessary for accomplishment of this objective.

12.12 CLEANUP.

The Contractor shall promptly remove from the vicinity of the completed work all rubbish, un-used materials, concrete forms, equipment and temporary structures used during construction.

SECTION 13.00
CONSTRUCTION & INSPECTION

13.01 CONSTRUCTION.

A pre-construction meeting is to be scheduled with the District inspector prior to the start of construction. A set of the signed plans and a copy of the Construction Standards are to be onsite during construction.

13.02 INSPECTION.

Any improvement which is intended for District maintenance responsibility or required as a "Condition of Approval", shall be constructed to District's requirements and inspected during construction by the District Engineer. Each phase of construction shall be inspected and approved prior to proceeding to subsequent phases.

Inspection includes field inspection during the course of construction and materials testing of those improvements over which no other public agency or utility exercises inspection responsibility.

A. The Engineer shall notify the District Engineer when the Contractor first calls for grades or staking. Any improvements constructed without inspection as provided above or any construction contrary to the orders or instructions of the District Engineer shall be deemed not in compliance with CPUD requirements and will not be accepted by the District.

B. The District will inspect the work for ultimate compliance with the specifications but will not be responsible for the conduct of the work itself or the manner in which it is performed. Requirements of State or Federal agencies shall be verified by appropriate agency representatives.

C. Any improvements installed without being inspected by the District will be automatically rejected and will be required to be re-installed in the presence of a District inspector, at the developer's expense. The Owner will pay all costs directly related to the construction inspection of the said improvements.

SECTION 14.00
PROJECT ACCEPTANCE & WARRANTY

14.01 GENERAL.

Project Acceptance consists of final inspection by the District, submission of record drawings and project costs, payment of any outstanding monies, and submission of guarantee.

14.02 PROJECT ACCEPTANCE.

General Project Acceptance consists of contractor's cleanup, final inspection by the District, submission of record drawings by the Engineer, payment of any outstanding monies by the developer, and submission of bonds by the contractor.

A. Clean Up. Upon completion of any improvements which are constructed under and in conformance with these Improvement Standards and prior to requesting a final inspection, the work area shall be thoroughly cleaned of all rubbish, excess material, and all portions of the work shall be left in a neat and orderly condition.

B. Final Inspection. Within five (5) working days after receiving a request for final inspection, the District Engineer shall inspect the work. The Contractor, Engineer, and Developer will be notified in writing as to any particular defects or deficiencies to be remedied. The Contractor shall proceed to correct all defects or deficiencies at the earliest possible date. At such time as the work has been completed, an inspection shall be made by the District Engineer to determine if all defects have been repaired, altered, and completed in accordance with these Improvement Standards.

C. "Record Drawings". One complete set of "as-built" reproducible plans, including "as-built" system map, and PDF electronic plans, as prescribed by the District Engineer, shall be submitted to the District prior to acceptance of the improvements.

D. Payment. Pay any outstanding monies due the District for Inspections.

E. Guarantee. The Contractor shall guarantee the entire work constructed by Contractor under the Agreement to be free of defects in materials and workmanship for a period of one (1) year following the date of acceptance of the work by CPUD's governing body.

   The Contractor shall agree to make, at Contractor's own expense, any repairs or replacements made necessary by defects in materials and workmanship which become evident within said guarantee period. The Contractor shall agree further to indemnify and save harmless CPUD and the Engineer and officers, agents and employees of CPUD and the Engineer against and from all claims and liability arising from damage and injury due to said defects. The Contractor shall

make all repairs and replacements promptly upon receipt of written order from the Engineer. If the Contractor fails to make the repairs and replacements promptly, CPUD may do the work and the Contractor and Contractor's surety shall be liable to CPUD for the cost of such work.

The guarantee shall be secured by a surety bond which shall be delivered by the Contractor to CPUD prior to the date on which final payment is made to the Contractor. Said bond shall be in an approved form and executed by a surety company or companies satisfactory to CPUD in the amount of ten percent (10%) of the construction price.

Said bond shall remain in force for the duration of the guarantee period. Instead of providing such a bond as prescribed above, the Contractor may, at Contractor's option, provide for the faithful performance bond furnished under the Agreement to remain in force for said amount until the expiration of said guarantee period.

SECTION 15.00
CONSTRUCTION STAKING

15.01 SCOPE.

It is the intent of this section to define the responsibilities of the Contractor regarding the use, maintenance, and replacement of construction stakes. The Developer's Engineer or Contractor shall furnish the stakes and reference points for the improvements relative to the work.

15.02 CONTROL STAKES.

Control and reference stakes for all construction work shall be conspicuously flagged. Contractor shall be responsible for the preservation and perpetuation of these points, marks, and stakes. When removal of a control point, mark, or stake is required by construction operations, Developer's Engineer shall perpetuate such control points subject to approval of District Engineer.

SECTION 16.00
MATERIALS AND WORKMANSHIP

16.01 NEW MATERIALS AND EQUIPMENT.

Unless otherwise specified, shown or permitted by the District Engineer, all materials and equipment incorporated in the work shall be new and of current manufacture. The District Engineer may request the Contractor to furnish manufacturer's certificates to this effect.

16.02 TITLE TO MATERIALS FOUND ON THE WORK.

The District reserves the right to retain title to all soils, stone, sand, gravel and other materials developed and obtained from excavations and other operations connected with the work. Unless otherwise specified in the Special Conditions, neither the Contractor nor any subcontractor shall have any right, title or interest in or to any such materials. The Contractor will be permitted to use in the work, without charge, any such materials which meet the requirements of the Specifications and Drawings.

16.03 DEFECTIVE EQUIPMENT, MATERIALS OR WORK.

Inspection of the work shall not relieve the Contractor or any of Contractor's obligations under the these specifications. Any material or equipment found defective shall be replace or repair at Contractor's own expense up to the end of the maintenance and guarantee period.

SECTION 17.00
CLEARING AND GRUBBING

17.01 GENERAL DESCRIPTION.

Clearing and grubbing shall be performed in accordance with the plans and these specifications.

Clearing and grubbing shall consist of removing all objectionable material from the right-of-way, roadways, areas through which work must be carried on, and such other areas as may be specified on the plans.

Within easements or right-of-ways, trees, shrubs, fences and all other improvements that have to be removed to permit construction shall be replaced.

17.02 PRESERVATION OF PROPERTY.

Existing improvements or facilities, adjacent property, trees, and shrubbery that are not to be removed, shall be protected from injury or damage resulting from the Contractor's operations.

When a line or an appurtenance is to be constructed on property over which CPUD has a right-of-way or an easement, the Contractor's operations shall be governed by the terms of the easement and any supplemental agreement on file at CPUD's office; and Contractor is cautioned to request such agreement from CPUD's office. Such property shall be restored to a condition equal in all respects to that prior to entry. Special attention shall be directed to the restoration of trees, shrubs, vegetation, top soil, landscaping improvements, subsurface pipes, drains and buildings.

17.03 CARE AND REMOVAL OF TREES AND SHRUBBERY.

Where construction is to be performed in the vicinity of trees and shrubbery, the work shall be carried on in a manner which will cause minimum damage. Trees and shrubbery that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations. Tunneling shall be used where required.

Roots, two inches (2") or more in diameter, that are severed in the course of excavation shall be neatly trimmed and coated with a heavy coat of an approved tree seal. Trees and shrubs which are to be removed and saved shall be preserved by wrapping roots in burlap after removal and roots shall be kept moist until replanted.

Native trees larger than six inches (6”) in diameter at the base shall not be removed unless otherwise shown on the plans or as permitted.

The removal of any trees, shrubs, fences or other improvements outside of easements or right-of-ways as deemed necessary by the Contractor shall be arranged with the property owner and replaced, if required, by the Contractor at his expense.

17.04 REMOVAL OF EXISTING FACILITIES.

Where existing structures, piping, equipment, conduit, wiring and other appurtenances are specified to be removed or are required to be removed in order to satisfactorily complete the work, such items shall be removed in an acceptable manner. Generally, when such items are removed, the area shall be left with a finished and neat appearance compatible with the surrounding areas and surfaces. The Contractor shall do all painting, sanding, grouting, sacking, resurfacing and other work as necessary to comply with the above requirements.

A. Temporary Removal. Where any part of the existing system is temporarily removed or altered in any way to facilitate the work, the Contractor shall restore such parts to their original condition, unless permanent modifications of these facilities is specifically included as part of this work.

B. Use of Salvaged Materials. Carefully remove items to be salvaged and store as directed by the District Engineer. All items removed shall be classified by CPUD as either salvage or junk. Junk becomes the property of the Contractor. Salvage shall be cleaned of all loose debris and stored at a site designated by CPUD.

17.05 REMOVAL AND DISPOSAL OF MATERIAL.

Material removed as above specified shall be disposed of by the Contractor.

The right-of-way and adjacent areas shall be left with a neat and finished appearance. All slashing and other debris shall be disposed of by the contractor. No accumulation of flammable material shall remain on or adjacent to the right-of-way. Local fire ordinances shall govern building or waste material.

SECTION 18.00
ON-SITE CONDITIONS

18.01 GENERAL DESCRIPTION.

All existing site improvements shall be protected from damage due to the contractor's activity on private property. Any damage to improvements resulting from contractor's activity shall be repaired or replaced as directed by the District Engineer.

Improvements to be placed on private property shall as shown on the plans and as directed by the District Engineer.

18.02 PROTECTION OF SURFACES.

The Contractor shall protect all paved surfaces during the course of the work. All equipment working on paved surfaces shall be equipped with street pads. Damaged surfaces shall be repaired "at Contractor's expense" to the satisfaction of the respective agencies and District Engineer.

Any paved surface damaged by the Contractor shall be temporarily repaired by placement of temporary cold mix asphalt until such time that the roadway surface can be restored in accordance with these specification.

The contractor shall repair all damaged surface to equal or better condition.

18.03 ASPHALT ROAD SURFACE RESTORATION.

Asphalt road surface restoration shall include placing asphalt concrete paving and aggregate base in accordance with the Plans and these Specifications. Asphalt concrete used for road surface restoration shall conform to Section 25.00, "Surface Restoration" of these Specifications.

18.04 TREE TRIMMING AND LANDSCAPE REMOVAL.

Tree and landscape removal shall be in accordance with Section 17.00, "Clearing & Grubbing" of these specifications.

Trees, tree branches and landscaping which obstruct the work area may be cleared as sufficiently to perform the work.
Tree limbs and landscaping to be trimmed shall be cut off at the trunk. Trimming shall consist of cutting branches at the main trunk or the main branch as directed.

The Engineer will review and approve trimming plan prior to the Contractor conducting any removal work.

SECTION 19.00
CONSTRUCTION AREA TRAFFIC CONTROL

19.01 GENERAL DESCRIPTION.

Some work will encroach upon roadways within the work area. Traffic control shall be employed to protect the safety of workers and vehicles traversing the work area. One lane of traffic shall be open at all times between 8:00 a.m. and 5:00 p.m. Monday through Friday. Two lanes of traffic shall be open 5:00 p.m. to 8:00 a.m. and at all times on weekends and holidays. No construction work will be allowed on weekends and holidays. Contractor is alerted to the fact that all roadways will be open to emergency vehicles at all times during the course of work.

Construction area signs shall be furnished, installed, maintained and removed when no longer required in accordance with the provisions in Section 12 "Construction Area Traffic Control Devices" of the State Standard Specifications.

The Contractor shall use the traffic control system found in the provisions of Section 12 of the State Standard Specifications for lane closure. The provisions in this section will not relieve the Contractor from his responsibility to provide such additional devices to take such measures as may be necessary to assure public safety. Whenever steel plates or a similar device is used to bridge a trench, the Contractor shall place "BUMP AHEAD" warning signs in accordance with these Specifications.

Flaggers, while on duty and assigned to traffic control or to give warning to the public that the highway or project area is under construction and of any dangerous conditions to be encountered as a result thereof, shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Instruction to Flagmen" of the Department of Transportation. The equipment shall be furnished and kept clean and in good repair by the Contractor at his expense.

SECTION 20.00
EXCAVATION, TRENCHING AND BACKFILLING

20.01 GENERAL DESCRIPTION.

The work of this section consists of excavating, trenching, and backfilling for the construction and installation of pipelines and related structures. It includes all clearing and grubbing, dewatering and incidental work. Facilities shall be installed in accordance with the Plans, Specifications and the provisions of any applicable encroachment permit.

20.02 OVEREXCAVATION.

If over excavation occurs, the Contractor shall be responsible for the repair of the area by backfilling with approved select material and compacting to ninety-five percent (95%) minimum density.

20.03 EXCAVATION CLASSIFICATION.

Regardless of the nature of material excavated, all excavation will be considered unclassified.

20.04 EXCAVATED MATERIALS.

Use only approved excavated material for backfill. Excess excavated material for backfill may be transported and used in areas of deficiency.

20.05 DISPOSAL OF EXCESS EXCAVATED MATERIAL.

Excess excavated material, unsuitable material, or that not required for backfill, shall be the property of the Contractor and deposited in a location and manner satisfactory to the District Engineer. Any excess material to be disposed of outside the County right of way or CPUD easements shall require written permission from the owner upon whose property the disposal is to be made before any material is deposited.

20.06 STRUCTURE EXCAVATION.

A. Excavation Dimensions. Provide a clear working space as noted on the Plans between the exterior lines of the structure and the face of the excavation or shoring.

B. Foundation Treatment. Clean all rock and other foundation surface of loose material and cut to a firm surface either level, stepped or serrated as directed. Avoid excavation below the specified grade.

C. Excavation Approval. When excavation has been completed for a structure, the Contractor shall notify the District Engineer, who will inspect the excavation. Place no concrete until the excavation is approved.

20.07 CONTROL OF WATER.

All trenches and excavation shall remain dry throughout all pipe laying operations. When water is encountered, the Contractor shall furnish, install, maintain and operate all necessary equipment to keep excavation free from water until the placing of the bedding material, laying and jointing of the pipe, pouring of concrete and placing of the initial backfill material has been completed, inspected and approved, and all danger of flotation and other damage is removed. Ground water pumped from the trench shall be disposed of in such a manner as will not cause injury to public or private property or constitute a nuisance or menace to the public.

If water is allowed to stand and the earth is softened, the earth must be completely dried or removed to firm material and the proper backfill placed before construction can proceed.

20.08 WATER USED IN CONSTRUCTION.

All water used in construction will be clean and free from harmful substances. Contractor shall not use CPUD fire hydrants at any time without CPUD approval. The water used for testing and flushing or any other construction operation that is taken from a CPUD system shall be paid for at the applicable rate by the contractor. Before drawing any water from a CPUD system, the Contractor shall make application to CPUD, seven (7) working days in advance. CPUD will furnish and install a hydrant meter to which the Contractor must connect.

20.09 DIFFERING SITE CONDITIONS AND HAZARDOUS WASTE.

A. The contractor shall promptly, and before such conditions are disturbed, notify the Owner, in writing of any:

1. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II or Class III disposal site in accordance with provisions of existing law.
2. Subsurface or latent physical conditions at the site differing from those indicated.
3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

B. The Owner shall promptly investigate the conditions and, if it finds that the conditions do materially so differ or do involve hazardous waste and cause a

decrease or increase in the Contractor's cost of or the time required for the performance of any part of the work, shall issue a change order under the procedures described herein.

In the event that a dispute arises between the Owner and the Contractor whether the conditions materially differ or involve hazardous waste or cause a decrease or increase in the Contractor's cost of or time required for performance of any part of the work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

20.10 TRENCHES AND BACKFILL GENERAL.

This work shall consist of performing all operations necessary to excavate earth and rock or other material of whatever nature, including water, regardless of character and subsurface conditions, necessary to provide trenches for pipe structures and appurtenances. This work includes placing backfill for structures and other facilities, to backfill trenches and depressions resulting from the removal of obstructions, or to remove and replace unsuitable material to construct protection dikes, to remove unstable material and slide material which has come into trenches. All such work shall be in conformance with the Plans and Specifications.

Excavate trenches to lines, grades and elevations indicated or staked in the field. Fine grade the trench bottom throughout and excavate to accommodate joints and connections so the barrel of the pipe will receive bearing pressure throughout from the trench bottom. Trenches shall be excavated to provide for the bedding hereafter specified.

Foreign material which falls into the trench prior to or during placement of the backfill shall be removed.

Where pipes are to be installed above original ground or in new embankment fills, the embankment shall first be constructed to the required height for a distance on each side of the pipeline location of not less than five feet (5'). Embankment shall have relative compaction of not less than ninety-five percent (95%) upon completion. Compaction requirements shall be met with the trench sides nearly vertical and the pipelines installed.

The location of underground utilities or other obstructions shall be determined by the Contractor sufficiently in advance of the excavation so that pipe alignment can be confirmed or re-routed.

20.11 TRENCH WIDTH.

If trench widths at the top of the pipe as shown on the Plans is exceeded by any amount for any reason, the Contractor shall provide at Contractor's own expense stronger pipe

or improved bedding conditions, as approved by the District Engineer, to meet the load requirements of the changed condition.

The trench widths shall be shown on the Plans in accordance with District and encroachment permit requirements. No caving within the roadway will be permitted. Where excavation greater than the specified widths is necessary for execution of the work, machine or hand excavation to a stabilized slope will be permitted provided one-way traffic can be maintained. Trench width is the distance face-to-face of trench walls or inside face to inside face of sheeting should solid sheeting be used.

20.12 CUTTING OF PAVEMENT.

When the trenching is in an existing paved area, the pavement shall be saw cut on neat lines parallel with and equidistant from the trench centerline. Pavement between the lines shall be broken and removed immediately ahead of the trenching operations. The width of pavement removed shall be sufficient that the trenching operation does not damage the edges of the pavement left in place and at least six inches (6") from the edge of the trench.

20.13 MAXIMUM LENGTH OF OPEN TRENCH.

At the end of each working day there shall be no open trench. At no time will an open trench exceed a maximum of two hundred fifty feet (250'). When in the streets, the trench shall be backfilled and compacted and opened to traffic as soon as possible. When in unimproved areas the trench shall be backfilled and compacted by the end of each day.

20.14 SPECIAL FOUNDATION TREATMENT.

Whenever, in the opinion of the District Engineer, the bottom of the trench is soft or rocky or otherwise unsuitable as a foundation for the pipe, the unsuitable material shall be removed to a depth such that when replaced with an approved bedding material that will provide a stable and satisfactory foundation. The resulting excavation shall be backfilled with imported, approved drain rock. Imported backfill shall be compacted to ninety percent (90%). Excavation and Special Foundation Treatment will be paid by the cubic yard as a separate bid item.

20.15 SHEETING, SHORING AND BRACING.

All sheeting, shoring and bracing shall conform to Section 21.00.

20.16 ROAD CROSSINGS.

The pipeline may be jacked through the roadbed, or the roadbed may be bored to accommodate the pipe. Prior to proceeding, the Contractor shall secure approval of jacking and boring method. Refer to required permit for method of road crossing allowed.

20.17 BEDDING AND INITIAL BACKFILL.

The Contractor shall provide bedding and initial backfill as described herein. All backfill material shall be approved before use and be free of roots, brush, debris or other objectionable material. The material used for bedding and initial backfill shall be Class I Backfill (Sand).

All pipe shall be placed on a firm, prepared bedding. Bedding shall extend at least six inches (6") below the pipe barrel. Pipe shall not bear on bells or joints.

Pipe shall bear uniformly throughout its length. This bearing shall be achieved by shaping the bedding or by lightly "bouncing" the pipe to set it into the bedding. In lieu of either of these procedures, the Contractor may place bedding material to the spring line of the pipe, compacting it by light tamping to provide haunch support. Care shall be used to fill all spaces under the haunches while not disturbing the pipe. Pipe shall not bear on bells, couplings or joints. No wedging or blocking of the pipe will be permitted.

20.18 BACKFILL MATERIAL.

A. Class 1 Backfill (Sand). Sand shall be free from clay or organic material suitable for the purpose intended and shall be of such size that 90 percent to 100 percent (90%-100%) will pass a No. 4 sieve and not more than 5 percent (5%) will pass a No. 200 sieve.

B. Class 2 Backfill (Aggregate Base). Class 2 Aggregate Base in accordance with Sections 26-1.02, 26-1.02B, and 26-1.035 of the State Standard Specifications.

C. Class 3 Backfill (Native Backfill). Material for Class 3 Backfill may consist of material from excavation free from rocks or lumps exceeding **three inches (3")** in greatest dimension, vegetable matter, and other unsatisfactory material. Backfill shall be compacted to the relative compaction shown on the plans.

D. Class 4 Backfill (Cement Slurry). Class 4 Backfill shall be cement-sand slurry comprised of aggregate, cement and water. The aggregate, cement and water shall be proportioned either by weight or by volume. Cement used shall be 190 to 210 pounds for each cubic yard of material produced. The water content shall be sufficient to produce a fluid workable mix that will flow and can be pumped without segregation of the aggregate while being placed.

   Materials shall be thoroughly machine mixed in a rotary drum mix truck and placed in the trench from a direct truck discharge unless otherwise approved.

   Mixing shall continue until cement and water are thoroughly dispersed throughout the material. All mixed slurry shall be placed within one (1) hour of the introduction of water and cement to the material.

Aggregate shall be free of organic materials and other deleterious substances and have a minimum sand equivalent of 20. Aggregate shall conform to the following grading:

Sieve Size	**Percent Passing**
1/2”	95-100%
3/8”	80-100%
#4	75-100%
#100	10-24%

Road surfacing will not be permitted until the District Engineer is satisfied that the set is sufficient to support traffic. The Contractor shall include in all items of work using slurry backfill the full cost of all labor and equipment to keep traffic from crossing any trench with slurry backfill prior to setting.

No additive shall be used without prior approval of the District Engineer as to type and amount.

Class 4 Backfill will be paid for as a separate item of work when Class 4 backfill is called for on the Plans or is placed upon direction of the District Engineer. Full compensation for Class 4 Backfill placed as a convenience to the Contractor shall be included in various Contract items of work, and no additional compensation will be allowed therefore.

All weigh master’s certificates will be given to the Inspector upon delivery.

20.19 BACKFILL MATERIAL PLACEMENT, GENERAL.

Material for Class 1, 2 and 3 Backfill shall be placed in uniform horizontal layers not exceeding one foot (1') in thickness before compaction and shall be brought up uniformly on all sides of the trench, structure or facility.

Each layer of backfill shall be compacted to a relative compaction indicated for the class of backfill.

Slurry backfill shall be placed in a uniform manner that prevents voids in, or segregation of, the backfill.

As directed, mound at the surface to allow for settlement to adjacent finish grades. Prior to final inspection and acceptance, level areas of fill to surrounding ground surface. Do not backfill until pipelines have been inspected and permission given to backfill. Place no backfill against foundation walls until concrete has thoroughly set.

A. Structure Backfill. Place backfill material in horizontal uniform layers not to exceed eight inches (8"). Bring each layer up uniformly on all sides of the

structure and thoroughly compact using pneumatic compaction or other approved methods. Moisten the backfill prior to placing to ensure maximum compaction. Puddling or water flooding for consolidation of the backfill will not be permitted.

B. Initial Backfill. Backfill trenches immediately after approval of the pipeline construction. Initial backfill shall be the material placed on the bedding and shall extend to a point twelve inches (12") above the top of the pipe. The material shall be carefully placed in uniform layers not exceeding six inches (6") in thickness and brought up evenly on both sides and compacted by tamping or shovel slicing, all done so as not to disturb or damage the pipe. Continue placing the material and fill the area under the pipe haunches. Place each layer, uniformly and compact by use of hand, pneumatic or mechanical tampers exercising care to prevent lateral displacement. Jetting will not be allowed.

C. Trench Backfill. Areas of backfill one foot (1') over the top of the pipe to the top of trench shall be backfilled with Class 3 Backfill.

Moisten backfill above one foot (1') over the top of the pipe and place in twelve inch (12") layers at ninety-five percent (95%) R.C. Compact each layer by hand, pneumatic, or mechanical compactor. Puddling or flooding of the trench for consolidation of backfill will not be permitted. Wheel rolling will be permitted after the fill exceeds two feet (2') over the top of the pipe provided adequate compaction can be obtained. Wheel rolling will not be permitted in or adjacent to roadways.

D. Roadways, Parking Areas And Road Crossings. Use Class 3 Backfill placed in uniform layers not exceeding eight inches (8") in thickness above initial backfill and thoroughly compacted with mechanical tampers under optimum moisture conditions to ninety-five percent (95%) compaction. Replace removed base course and paving with new material of equal or better quality and of the same texture and color as the adjacent roadway.

20.20 COMPACTION TESTS.

All compaction tests shall be made in conformance with the following requirements set forth in the State Standard Specifications:

TESTS	TEST METHOD NO.
Relative Compaction	Cal 216 & 231
Sand Equivalent	Cal 217
Resistance (R-value)	Cal 301
Sieve Analysis	Cal 202

20.21 PAVING.

Within State and County right-of-ways the paving and structural section shall conform to the requirements of the encroachment permit issued for the project.

20.22 CLEANUP.

Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave the area in a neat, satisfactory condition.

20.23 SURFACE TREATMENT.

The Contractor shall place surface treatment special erosion control along the pipeline the full width of the work area unless otherwise directed by the District Engineer.

This special erosion control shall not be placed until all equipment, except equipment required to cultivate the area, is through working in the area.

Soil shall be spread evenly. Loose rocks larger than 2-1/2" in maximum dimension and debris brought to the surface shall be removed and disposed of offsite.

Application. Seed and fertilizer shall be uniformly spread over the area at the rates specified in these provisions. Seed and fertilizer shall be provided by the Contractor as specified below:

Seed	**Minimum Proportion**
Ramsey Seed, Calaveras Mix Live Pure Seed	80 lbs./acre
Fertilizer	
NPH 16-20-0	240 lbs./acre

After broadcasting the recommended seed mixture and fertilizing, the soil shall be raked to form a one-half inch (1/2") soil cover over the seeds.

Contractor may hydro mulch the seed fertilizer mixture in lieu of application method noted above.

Where shown on the Plans, a geo-textile blanket shall be placed over the seeded and fertilized area in accordance with the geo-textile manufacturers' specifications. The blanket shall consist of a machine-produced mat of curled wood of eighty percent (80%), six inch (6") or longer fiber length, with consistent thickness and the fiber evenly distributed over the entire area of the blanket. Each side of the blanket shall be covered

with extra heavy duty extruded plastic mesh netting. Blankets are to be smolder resistant with no chemical additives. Geo-textile blanket shall be AMXCO HI-VELOCITY Curlex Blankets or equal.

SECTION 21.00
SHEETING, SHORING AND BRACING

21.01 GENERAL DESCRIPTION.

This section specifies requirements for sheeting, shoring and bracing of trenches greater than five feet (5') in depth. Sufficient bracing and shoring shall be installed in all excavations to ensure the safety of workers and to protect and facilitate the work.

21.02 REFERENCES.

This section references the following documents. They are a part of this section as specified and modified

REFERENCE	TITLE
CAL OSHA	State of California Construction Orders
STATE OF CAL	California State Labor Code

21.03 SUBMITTALS.

The Contractor shall make available upon request by CPUD information required by the California State Labor Code.

21.04 DESIGN REQUIREMENTS.

The Contractor shall design sheeting, shoring and bracing in accordance with Article 6 of CAL OSHA and the California State Labor Code. The standards of design referred to in the Labor Code shall be those of CAL OSHA.

The bracing and shoring shall further comply with the rules, orders and regulations of the California Division of Industrial Safety. Failure to comply with any of the above-mentioned rules, orders and regulations shall be sufficient cause for the District Engineer to immediately suspend the work. No compensation for losses incurred by the Contractor for such a suspension will be allowed.

Horizontal strutting below the barrel of a pipe and the use of pipe as support are not acceptable.

21.05 EXECUTION.

The construction of sheeting, shoring and bracing shall not disturb the state of soil adjacent to the trench and below the excavation bottom. Trench sheeting below the top of a pipe shall be left in place.

21.06 SEQUENCE.

Trench excavation shall not be started until the design for trench support has been accepted by CPUD.

SECTION 22.00
BORING AND JACKING - CONDUCTOR PIPE

22.01 GENERAL DESCRIPTION.

All conductor pipe, pipe to be conducted and fittings shall conform to the applicable portions of these Specifications. The Contractor shall bore and jack steel casing across roads in accordance with the Plans, these Specifications and per County and/or State encroachment permit requirements.

The equipment, method of operation and conductor pipe grades shall be approved by the District Engineer before proceeding with the work. All work shall be in accordance with the provisions of any applicable encroachment permits.

Excavation for the boring operation shall be the minimum necessary to satisfactorily complete the work. Bracing and shoring shall be adequate to protect workers and any adjacent structure or roadbed. Special backfill requirements may be specified for pipe installed in the area excavated for the boring operation.

22.02 MATERIALS.

Pipe used as a conductor of another conduit under a highway, railroad or other location shall be welded steel pipe as specified herein.

Welded steel pipe shall be manufactured of ASTM. Designation A245, commercial grade steel. All joints shall be butt welded. Welded steel conductor shall have a minimum wall thickness as set forth in the standard details.

22.03 INSTALLATION OF CONDUCTOR.

The conductor shall closely follow the boring operation. The bored hole shall not be more than 0.1 foot larger in diameter than the outside diameter of the conductor. Guide rails shall be accurately set to line and grade to ensure installation of the conductor within allowable limits. Conductor diameter shall be sufficient to allow adjustment of line and grade of the conducted pipe to meet allowable tolerances and to allow sand to be placed between the conductor and the conducted pipe. Minimum conductor diameter shall be six inches (6") larger than the outside diameter of the conducted pipe joints.

22.04 PLACING PIPE IN CONDUCTOR.

The insulator skids shall be large enough to prevent any part of the joint from bearing on the conductor. Each joint of conducted pipe shall have skids centered at points approximately one-fifth (1/5) the pipe length from each end or as recommended by the skid manufacturer. Insulator skids shall be of adequate size so that sand filling of the conductor is not required.

Contractor shall use plastic casing insulators installed at locations specified for skids. Pipeline casing insulators and end seals shall be as manufactured by PSI Products, Inc., Calpico, Inc., Advance Products & Systems, Inc., or equal.

Necessary adjustments in grade shall be made by adjusting the height of the skids.

22.05 CONDUCTOR PIPE END SEALS.

Unless shown on the Plans or designated otherwise in the Special Conditions, casing end seals shall be used on both ends of the conductor pipe.

22.06 NOT USED.

22.07 TOLERANCES.

Extreme care shall be exercised by the Contractor to maintain line and grade during jacking operations. Maximum deviation from stated line and grade of conductor pipe shall be such that line and grade of the conducted pipe can be adjusted a sufficient amount within the conductor pipe to achieve the line and grade shown on the plans. This adjustment shall be made to all pipe deviating from line and grade and not merely to the sections of pipe nearest the end of the conductor.

22.08 BORING UNDER OBSTRUCTIONS.

Portions of water mains or water services which pass beneath obstructions may be placed by boring. The end of the pipe shall be capped or plugged, and the pipe pushed into the hole.

22.09 BORING AND JACKING.

Operations may be suspended because of refusal upon written approval of the Engineer. In the event boring and jacking operations are suspended, Contractor shall open cut roadway in accordance with encroachment permit provisions.

In the event boring and jacking operations are suspended, the contract price paid for conductor casing shall be reduced by contract change order.

SECTION 23.00
WATER LINES AND APPURTENANCES

23.01 GENERAL DESCRIPTION.

Water distribution lines shall be installed in accordance with these Specifications, the Special Conditions, the provisions of any applicable encroachment permit and the Plans.

23.02 SHUTDOWNS TO EXISTING SYSTEMS.

Under no circumstances shall anyone other than a certified representative of CPUD open or close any valve in a CPUD-operated water system. The District Engineer shall be given no less than seven (7) days notice before any shutdown is required. Normally, connections are made by CPUD using a wet tapping machine with no shutdown required.

In general, shutdowns shall be made at times when there will be the least interference with consumer service. Connections shall be made only after complete and satisfactory preparation for such work has been made in order that the shutdown may be of as short duration as possible. Notification to fire districts and to all consumers whose water service will be interrupted shall be made by CPUD.

23.03 NOT USED.

23.04 STEEL CONDUCTOR CASING.

As per Section 22.02 of these Specifications.

23.05 PIPE MATERIAL.

A. DUCTILE IRON PIPE. The following documents are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

REFERENCE	TITLE
AWWA C104	Cement Mortar Lining for DIP
AWWA C110	DIP Fittings for Water and Other Liquids
AWWA C111	Rubber Gasket Joints/Seals for DIP Pipe and Fittings
AWWA C150	Thickness Design of DIP
AWWA C151	DIP Casting and Molding
AWWA C153	DIP Tyton Fittings

The Contractor shall provide manufacturer's statement that the required inspections and tests have been made and found in compliance with AWWA Specifications. All pipe shall be marked in accordance with AWWA.

B. POLYVINYL CHLORIDE PIPE (PVC). The following documents are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

REFERENCE	TITLE
UNI-B-3	Installation of PVC Pressure Pipe
AWWA C-900	PVC 4”-12” Pressure Pipe for Water Distribution
AWWA C-905	PVC 14”-36” Water Transmission Pipe

The class of pipe shall be not less than Class 150.

23.06 PIPE AND FITTING INSTALLATION.

All pipe, valves, joints, fittings and appurtenances shall be installed in accordance with the manufacturer's recommendations and according to accepted water works practice. Each section of pipe and each fitting shall be thoroughly cleaned out before it is installed. All pipe, fittings, valves, etc., shall be carefully lowered into the trench by suitable tools or equipment in such a manner as to prevent any damage. Any defective, damaged or unsound pipe shall be rejected.

Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize the entrance of foreign material. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Rodent-proof plugs may be used when it is determined that watertight plugs are not practicable and when thorough cleaning will be performed by flushing or other means.

Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the risk of contamination.

The pipe shall be laid true to line, with no visible change in alignment at any joint unless curved alignment is shown on the Plans.

Whenever pipe laying is discontinued for an hour or more, the open ends of all mains and fittings shall be closed with watertight plugs or bulkheads. The plug or bulkhead shall not be removed unless or until the trench is dry. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.

Where necessary to properly locate valves and fittings, the pipe shall be neatly and squarely cut to length, using methods recommended by the manufacturer. Cutting of asbestos-cement pipe shall not be allowed.

All excavation trenching and backfill shall be in accordance with Section 20.00.

23.07 PLACING LOCATING WIRE AND IDENTIFICATION TAPE.

All runs of pipe shall have a locator wire of No. 10 AWG solid, soft drawn copper with Type UF insulation. The wire shall be stubbed up inside each valve box. The wire shall be continuous. All splices and wire placement shall be in accordance with CPUD's Standard Detail.

Identification tape shall be 2 inches wide minimum, blue in color and contain the words "water" or "water main" imprinted on the tape. The tape shall be lain on top of the initial backfill.

23.08 VALVES.

A. GATE VALVES**.** Gate valves shall be set plumb and properly fitted to the adjacent sections of main. Gate valves shall be cast iron, bronze mounted, epoxy coated, fully encapsulated with polyurethane rubber wedge, resilient seat, non-rising stem, "O" ring seals, open to the left, 200 psi cold water rated valve conforming to the requirements of AWWA Standard C509. Buried valves shall have a two inch (2") square operating nut, and all others shall be equipped with hand wheels. Gate valves shall be installed per standard details.

B. BUTTERFLY VALVES. Butterfly valves are acceptable on mains larger than twenty (20") only. Specifications shall be as referenced in the Plans.

23.09 VALVE BOXES.

Valve boxes shall have a cast iron face and a cast iron traffic lid. Covers shall be marked "WATER" and shall have a loose fit in the box. Extensions shall be as furnished by the manufacturer. Valve boxes shall be installed in accordance with Standard Details.

23.10 FIRE HYDRANTS.

Fire hydrants shall be placed by the Contractor at the locations shown on the Plans in accordance with the fire hydrant details. The Contractor is responsible for verifying the size and type of fire hydrants to ensure installation in accordance with the Plans and these Specifications. The Contractor shall supply all labor, pipe, valves, drain rock, concrete and other miscellaneous materials necessary for a complete installation adjusted for plumb and to grade.

Fire hydrant limits of work shall be from the main line tee to and including the hydrant and hydrant gate valve (and hydrant pressure reducing valve if noted on the Plans).

Fire hydrants shall stand plumb with the pumper outlet facing the street and at least eighteen inches (18") above the sidewalk or finished ground surface, whichever is higher. The hydrant shall be served by a six-inch (6") line from the main.

Fire hydrant shall be a traffic type dry barrel, with two (2) two and one-half inch (2-1/2") hose nozzles and one (1) four and one-half inches (4-1/2") steamer nozzle. The main valve opening shall be five and one-quarter inches (5-1/4").

23.11 COMBINATION AIR RELEASE VACUUM RELEASE VALVES.

AIR/VAC's shall be installed at the locations shown on the Plans. The Contractor's attention is directed to the detail sheet of the Plans.

AIR/VAC's shall be installed with a Hotbox Model 1 NY enclosure on a concrete slab.

Combination AIR/VAC shall release air from the line under pressure and allow air to enter the line under vacuum conditions. Unless otherwise shown on the Plans, AIR/VAC valves shall be two inch (2") diameter, designed for operation between 2 psi and 170 psi and shall be Bermad Model 02-ARC or an approved equal. Orifice sizes shall be not less than found in standard Bermad Model 02-ARC.

23.12 THRUST BLOCKS.

All valves, cast iron fittings and pipe directional changes shall be held in place by concrete thrust blocks. Thrust blocks shall consists of Class "B" concrete in accordance with Section 90 of the State Standard Specifications and CPUD Standard Details.

23.13 INSTALLATION OF WATER SERVICES.

Installation of water services shall utilize Ford series meter setter w/1" inlet & outlet with an adapter as shown on the standard details.

Double services shall be two (2) single service boxes placed in accordance with the Plans and these Specifications. Tees for double services shall be one inch (1") compression tees. Ninety degree (90°) angle fittings for double services shall be one inch (1") compression fittings.

Service line crossings of roads shall be in accordance with these Specifications. Trenches shall be no more than twelve inches (12") wide.

The Contractor shall terminate service lines at the locations shown on the standard details or as directed by the District Engineer. Service lines shall be placed at the correct location and depth for easy connection to services without unnecessary work by CPUD. Services located in a cut or fill area shall terminate at the top or bottom of the slope in accordance with the standard details.

23.14 METER BOXES.

The Contractor shall place service lines and new meter boxes in accordance with the detail sheet and these specifications. All services shall be placed at property lines or as directed by the Engineer. Rodent screens shall be placed under all meter boxes and wrap up to boxes allowing no openings greater that one half inch (1/2”). Rodent screens shall be poly mesh Grundnet XL-14 or approved equal.

23.15 SAMPLE SITES.

Sample sites will be constructed at locations as shown on the Plans and shall consist of all parts, piping and other miscellaneous items of work for a complete and operational site. Sampling Station will be constructed on an concrete pad, placed above grade and joined at either the back of the sidewalk or shoulder right-of-way. Station will be connected with a bronze reducing fitting and a one inch (1") polyethylene pipe lateral off of a gate valve, pressure reducing station or as specified on the Plans and shall include a locator wire. Station will be connected to the lateral with a three inch (3") PVC sleeve.

23.16 PRESSURE REDUCING STATION.

Pressure reducing station shall consist of pressure reducing valves (PRV), gate valves, pressure gauges, miscellaneous piping, vault, vault cover and miscellaneous items of work that will produce a complete and operational pressure reducing station in accordance with the Plans and these Specifications.

PRV's shall maintain a constant downstream pressure regardless of fluctuation in demand or inlet pressure. Pressure reducing valves shall be hydraulically operated, diaphragm-actuated globe valves. PRV'S shall have a single removable seat and resilient disc. No external packing glands shall be permitted and the diaphragm shall not be used as a seating surface. PRV's shall be as manufactured by Cla-Val Company, Newport Beach, California, or approved equal. Bypass line gate valves shall be iron body AWWA valves in accordance with these Specifications. PRV's shall be the size shown on the Plans. Specific location may be adjusted in the field to accommodate site conditions. PRV installation shall be equipped with upstream and downstream pressure gauges to provide visual checking or upstream and downstream pressure.

PRV body and cover shall be ductile iron, main valve trim shall be stainless steel and pilot control shall be bronze with stainless steel trim.

PRV's shall be equipped with movement indicators. Pressure gauges shall be liquid filled, have a dial face not less than three inches (3") in diameter, have a pressure range of 0-200 psi, and be accurate to 5 psi. Pressure gauges shall be connected to main piping through shut off cocks rated for 200 psi.

PRV's shall be equipped with "Flow Clean" strainers and shut-off cocks and an opening speed control. The Contractor shall provide two (2) copies of an operation and

maintenance manual for each valve type. The Contractor shall provide factory representatives to field adjust each valve and instruct CPUD's operator on adjustment and maintenance.

PRV's shall be housed in a traffic-rated vault, one piece (Brooks 400, 500, or 510 series), sufficient in size to comply with the Plans and these Specifications. Pressure reducing valve vaults shall have spring assisted hinged traffic covers, as manufactured by Brooks Products Incorporated or approved equal. Vault covers shall be equipped with flush locking devices capable of accommodating a #1 master lock.

PRV vault covers shall be at finished road grade and shall be placed to conform to the shoulder grade. Vaults outside roadways or driveways shall extend twelve inches (12") above existing ground.

23.17 HIGH PRESSURE RELIEF VALVE (HPRV).

The Contractor shall place a flanged HPRV in accordance with the Plans and these Specifications. The valve shall have flanged fittings and shall be connected to a flanged tee on the main line. HPRV shall drain to atmosphere, be Class 150 pipe, and shall have a screened outlet as shown on the Plans. HPRV shall be Cla-Val or approved equal. HPRV shall discharge into existing drainage as shown on the plans.

23.18 BLOW-OFFS.

CPUD requires fire hydrants be placed in-lieu of traditional blow-offs if possible. All pipe and fittings shall be of the same material as used in the main line.

23.19 BACKFLOW PREVENTION DEVICES (BPV).

Backflow preventer valves shall be installed where shown on the Plans or as described in the Special Conditions and shall be of the type shown on the Plans or specified in the Special Conditions or these Specifications. All valves shall conform to AWWA Standard C506. Assembly shall conform to current CPUD ordinance(s) for backflow prevention.

A. Reduced Pressure Type (BPV-RP) shall consist of two (2) independently acting internally loaded check valves together with an automatically operating pressure differential relief valve located between the check valves.

B. Double Check Type (BPV-DC) shall consist of two (2) independently acting internally loaded check valves in series.

23.20 FLEXIBLE COUPLINGS AND ADAPTERS.

A flanged coupling adapter (FCA**)** shall be used to connect plain end pipe to flanged fittings. Adapters shall be of a gasketed, sleeve type with diameter to properly fit the pipe. Body shall be cast iron per ASTM A487. Steel nuts and bolts shall be galvanized. All gaskets, nuts and bolts shall be galvanized. All gaskets, nuts and bolts shall be furnished by the manufacturer of the FCA.

23.21 MECHANICAL JOINT ADAPTERS (MJA).

Two inches (2") through thirty-six inches (36") mechanical joint fittings shall be gray or ductile iron Class 250 minimum and shall be produced in strict accordance with ANSI/AWWA C110/A21.10 and C111/A21.11 and shall conform to details and dimensions published therein.

23.22 MARKING OF PIPELINES AND APPURTENANCES.

All pipe, couplings and fittings shall be marked with the manufacturer's name, nominal inside diameter, class or pressure rating. Piping material and class shall be as specified herein and as shown on the Plans. Raw water conduit and treated water conduit in a common trench will be clearly marked for easy identification. Unless otherwise approved in writing, raw water conduit and treated water conduit in a common trench will be different colored pipe.

SECTION 24.00
PIPELINE CLEANING, FLUSHING AND TESTING

24.01 PROJECT CLEAN-UP.

During the progress of the work the Contractor shall keep the entire job site in a clean and orderly condition. Spillage resulting from hauling operations along or across existing streets or roads shall be removed immediately by the Contractor. Contractor shall govern his operations and methods at all times to minimize dust problems within the area of the work or along adjacent properties. Water or dust palliative shall be applied as required to provide adequate control of dust.

24.02 NOT USED.

24.03 WATER LINES AND MAINS PRESSURE TEST.

After completion of the installation, the Contractor shall test all piping to the pressure specified below. The Contractor shall furnish all material, equipment and labor for such testing. The District may furnish a test gauge at its option. The system shall be tested in sections as directed by the Engineer. Each section tested shall successfully meet the requirements herein specified. The water services shall be considered as part of the main for test purposes. Contractor shall notify District seven (7) days in advance of **ALL** tests. All tests shall be witnessed by the District Inspector.

Thrust blocks shall have been in place for at least thirty-six (36) hours if high-early-strength cement was used or at least seven (7) days if standard cement was utilized.

Each section of the pipe to be tested shall be slowly filled with water, and all air shall be expelled from the pipe. The release of the air can be accomplished by opening hydrants and service line cocks at the high points of the system and fire hydrants or blow-offs at all dead ends. The valve controlling the admission of water into the section of pipe to be tested should be opened wide before shutting the hydrants or blow-offs. After the system has been filled with water and all air expelled, all the valves controlling the section to be tested shall be closed; and the line shall remain in this condition for a period of not less than twenty-four (24) hours.

The pipe shall then be refilled, if necessary, and subjected to a pressure of not less than one hundred-fifty (150) pounds per square inch, or the service pressure plus fifty (50) pounds, whichever is greater, for a period of two (2) hours.

Test pressure shall be maintained as constant as possible throughout the period of test. Measurement of the amount of additional water pumped in during test provides a

measurement of the amount of leakage, if any. In setting up a section of line for test, an ARV should be provided. Air trapped in the line during testing will affect test results.

The leakage allowable shall be determined by the formula:

$$L = \frac{N\ D\ (P)^{1/2}}{7400}$$

"L" is the allowable leakage, in gallons per hour;
"N" is the number of joints in the length of pipeline tested;
"D" is the nominal diameter of the pipe in inches; and
"P" is the average test pressure during the test in pounds per square inch, gauge (psig).

Leakage values determined by the above formula are shown in the table below.

Leakage Allowable (Gallons per 1,000 ft. [50 Joints]/Hr.)

Pipe Size	Test Pressure (PSI)		
(Inches)	150	200	250
4	0.33	0.38	0.43
6	0.50	0.57	0.64
8	0.66	0.76	0.85
10	0.83	0.96	1.07
12	0.99	1.15	1.28

When pipe has been damaged and repair is required, all damaged material shall be replaced in kind. The damaged section of the pipe shall be cut out and replaced. Dresser type couplings will be required to join the pipe ends.

All leaks that are found shall be immediately corrected and the system again subjected to the same test for a period of one (1) hour. Even if the leakage is less than the allowable, all observed leaks shall be repaired.

The Contractor shall take all necessary precautions to prevent any joints from drawing while the pipe lines and their appurtenances are being tested and shall, at Contractor's own expense, repair any damage to the pipes and their appurtenances or to any other structures, resulting from or caused by these tests.

24.04 DISINFECTING AND FLUSHING OF WATER LINES.

After all other work has been completed and prior to placing line in service, Contractor shall completely disinfect all water lines, valves, fittings, etc., in accordance with AWWA Standard C651.

Contractor shall flush the main lines prior to disinfecting and flushing velocity shall be not less than two and one-half feet (2.5') per second. Contractor shall be responsible to ensure that flushing sites can adequately contain the quantities of water flushed from the pipes without damage to nearby improvements and/or terrain. Flushing is no substitute for preventative measures taken before and during pipe laying to prevent contaminating material from entering mains.

Residual contamination shall be disinfected with a solution containing a residual chlorine concentration of twenty-five (25) parts per million, and the solution shall remain in the system for a minimum of twenty-four (24) hours.

Basic disinfecting procedure consists of:

1. Preventing contaminating materials from entering the water main during storage construction or repair.
2. Removing, by flushing or other means, those materials that may have entered the water main.
3. Chlorinating any residual contamination that may remain and flushing the chlorinated water from the main.
4. Protecting the existing distribution system from backflow due to hydrostatic pressure test and disinfecting procedures.
5. Determining the bacteriological quality by laboratory test after disinfecting.
6. Final connection of the approved new water main to the active distribution system.

Preventive and corrective measures during construction. Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is essential that the procedures of AWWA C651 be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorinating. Also, any connection of new water main to the active distribution system prior to receipt of satisfactory bacteriological samples may constitute a cross-connection. Therefore, the new main must be isolated until bacteriological tests described in the AWWA C651 standard are satisfactorily completed.

Disinfecting may be accomplished by use of Calcium Hypochlorite tablets. This method may be used only if the pipes and appurtenances are kept clean and dry during construction. During construction, Calcium Hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at five hundred feet (500') intervals. The quantity of granules shall be as shown in Table 1. This method may be used only if the pipes and appurtenances are kept clean and dry during construction.

During construction, five gram (5-g) Calcium Hypochlorite tablets shall be placed in each section of pipe. Also, one (1) such tablet shall be placed in each hydrant, hydrant branch and other appurtenance. The number of five gram (5-g) tablets required for each pipe section shall be $0.0012d^2L$ rounded to the next higher integer, where "d" is the inside pipe diameter in inches, and "L" is the length of the pipe section in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. The tablets shall be attached by a food-grade adhesive. There shall be no adhesive on the tablet except on the broadside attached to the surface of the pipe. Attach all tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

Inside Diameter of pipe (inches)	Number of 5-g Calcium Hypochlorite Tablets (per 20 feet of main)
4	1
6	1
8	2
10	3
12	4
16	7

When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than one foot per second (1 ft/s). Precautions shall be taken to ensure that air pockets are eliminated. This water shall remain in the pipe for at least twenty-four (24) hours. This water should be at background CL^2 residuals of 1.5 ppm or less. If the water temperature is less than forty-one degrees Fahrenheit (41° F), the water shall remain in the pipe for at least forty-eight (48) hours.

As an optional procedure the Contractor may submit a disinfecting plan to the Engineer for review and approval using Chlorine Gas or Sodium Hydrochloride Solution (12.5%) injection as an alternative to tablets.

On completion of disinfecting, the mains and appurtenances shall be thoroughly flushed until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system.

The wasted chlorinated water shall cause no damage to the environment. A neutralizing chemical shall be applied to the water to neutralize thoroughly the chlorine residual remaining in the water. Where necessary, Federal, State and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

24.05 BACTERIOLOGICAL TESTS.

After final flushing and before the new water main is connected to the distribution system, two (2) consecutive sets of acceptable samples, taken at least twenty-four (24) hours apart, shall be collected from the new main. At least one (1) set of samples shall be collected from every 1,200 feet of the new water main, plus one (1) set from the end of the line and at least one (1) set from each branch. All samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater and shall show the absence of coliform organisms. A standard heterotrophic plate count may be required at the option of CPUD.

If trench water has entered the new main during construction or if, in the opinion of CPUD, excessive quantities of dirt or debris have entered the new main, bacteriological samples shall be taken at intervals of approximately two hundred (200) feet and shall be identified by location. Samples shall be taken of water that has stood in the new main for at least sixteen (16) hours after final flushing has been completed.

Samples of bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate.

24.06 RE-DISINFECTING.

If the initial disinfecting fails to produce satisfactory bacteriological results, the new main may be re-flushed and shall be re-sampled. If check samples also fail to produce acceptable results, the main shall be re-chlorinated by the continuous-feed or slug method of chlorinating until satisfactory results are obtained.

24.07 HEALTH DEPARTMENT TESTS.

Disinfecting of the mains is supervised by CPUD.

After the final flushing and before the water main is placed in service, a sample or samples shall be collected by the Engineer and tested for bacteriological quality and shall show the absence of coliform organisms.

If the initial disinfecting fails to produce satisfactory samples, disinfecting shall be repeated until satisfactory samples have been obtained. The tablet method cannot be used in these subsequent disinfections.

SECTION 25.00
SCADA HARDWARE & SOFTWARE

25.01 REMOTE STATION HARDWARE AND SOFTWARE

PLC system for the SCADA system shall be based on an existing data concentrator PLC at District office and a PLC at each remote pump stations. Data concentrator PLC is an Allen Bradley SLC 5/05 PLC with Ethernet processor. The primary functions of data concentrator PLC is poll the remote sites over radio network or CDMA network and collect data from each site. This data typically includes station flow, run time and run counts for all the pumps, power and generator status, alarms etc. Communication failure with remote PLC shall create an alarm for SCADA. Data concentrator PLC shall also synchronize PLC clocks at the remote pump stations.

25.02 PLC PANELS

PLC Panels shall be NEMA 4X, fiber glass enclosures. Enclosures shall be provided with swing out panels to allow mounting the local operator interface units (OIT) inside the enclosure. PLC panels shall have individual circuit breakers for each device in the panel.`

PLC panels shall also be provided with uninterruptible power supplies (UPS) to back up the PLC and telemetry hardware for at least 4 hour of power loss.

25.03 PLC HARDWARE REQUIREMENTS

PLC at remote sites shall be from Allen Bradley Micrologix family with adequate memory and instruction sets required to make the unit perform all of the functions required by this specification. It is required that the same model PLC device be used throughout the SCADA system providing a complete solution with one common technology. This is to insure complete system continuity, compatibility between like devices, enhancing overall system efficiency by the reduced need to learn, maintain, support and carry spare parts for multiple technologies.

All control signals, status signals, alarm and process variable data shall be transmitted and received between the central location and the remote sites via the radio network or CDMA network as required by the District Engineer.

The master and remote PLCs shall be capable of stand-alone control to maintain programmed logic. Remote pump stations PLC's shall be provided with 120 VAC discrete input modules and relay output modules. Analog input and output modules shall be provided with 4-20 mA range. Actual I/O count will vary from pump station to pump station.

25.04 PLC COMMUNICATION OPTIONS

The PLC's shall be supplied with minimum two (2) RS-232 communication ports. The

Vacuum clean interior building(s) areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until completion.

Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on newly painted surfaces.

Ports shall support DF1 and MODBUS protocol as minimum.

25.05 PLC SOFTWARE

PLC's shall be programmed with Allen Bradley RSLogix 500 software.

25.06 LOCAL OPERATOR INTERFACE UNIT (OIT)

Each remote station shall have local operator interface unit (OIT's). These units shall be Allen Bradley Panelview 300 or higher. The OIT's shall display current alarms, alarm history, station flow, pump run times and pump run counts. OIT's shall allow full control of pumps and other auxiliary equipments, entering various process set points, pump status, run times and run counts etc. OIT's shall have assignable PIN's and being capable of assigning various levels of authority.

25.07 TELEMETRY

Data concentrator PLC at the District office shall communicate with remote site over radio or CDMA network.

Radio network for the District is formed using MDS TRANSNET radios. The MDS TRANSNET utilizes FHSS (Frequency Hopping Spread Spectrum) in the ISM Band of 902 – 928 MHz to provide reliable long range data transportation at up to 115.2 kbps. The TRANSNET provides transparent data communications for nearly all SCADA/Telemetry protocols.

CDMA network use Verizon as it courier.

25.08 SCADA SOFTWARE

The SCADA Software shall be Client/Server based HMI/SCADA solution that provides process visualization, data acquisition and supervisory control over the operational processes.

The SCADA system is based on PCs running current version of Microsoft© Windows as the operating system. Any remote workstations will also run Windows as the operating system, and client functions will be provided by means of software at the District's office using an Ethernet Local Area Network (LAN).

The architecture of SCADA software shall includes redundant head-end servers to ensure that failure one server will not impact operations and continue to provide real time data, historical data and alarms. The redundant servers will collect data from data concentrator PLC over Ethernet network.

Any new station added to the Districts system shall be added to the SCADA system. The following additions shall be provided for each new station:

- Graphical display screen indicating status of pump stations. Typical information displayed shall be pump status, pump run times and counts, other instrumentation values, power and generator status, process set points etc. Running pump status shall be shown in red color and stopped pump status shall be shown in green color. Open valves shall be shown in red color and close valves shall be shown in green color.
- SCADA shall be configured to display real time trends of various parameters. Typical data shall include tank levels, system pressures, chlorine analyzers etc. A minimum of four variables may be trended in the Trend window at a time. All the real time data shall also be achieved for producing historical trends. The operator shall be able to scroll backwards and forwards in time for the complete period of data storage without entering dates and times, etc. Data for historical trends shall be stored for minimum 6 months.
- SCADA shall display process and systems alarms read from data concentrator PLC. Each of these alarms shall be prioritized in the SCADA as per their importance. Alarm screen shall have soft button for operator to acknowledge alarms. Active, Inactive, Acknowledge and Unacknowledged alarms shall be identified with different colors. Following is a typical list of alarms:

  a. Starter Panel Power Failed
  b. Generator Failed
  c. Pump Run Failure
  d. Pump failed to Stop
  e. Pump over temperature
  f. Pump seal failure
  g. Pump overload tripped
  h. Pump station communication failed
  i. Discharge pressure low
  j. Chlorine level low/high
  k. Main power loss
  l. tank high/low level
  m. Generator Failed
  n. ATS position

- SCADA system shall display telemetry status for every pump station. Any communication failures shall display be displayed on the telemetry screen and shall create alarm in SCADA. SCADA will display and archive the up time and down time of each site for at least 3 years.
- SCADA system shall have the capability to log important pump station data in ODBC compliant database such as MS SQL Server. SCADA system shall provide reports of pump station data as per the requirements of operators.

25.09 SCADA MODIFICATIONS

The system integrator shall create new SCADA screens for the new pump stations. Screens shall be similar in nature to the existing screens. Graphic screen shall implement graphical display of all set point, instrument readings, and equipment status and control states. Update any automatically generated reports or trends affected by the addition of the new Pumping Station to the SCADA system. This also includes any update to the SCADA software.

The Systems Integrator shall provide the RTU and associated components.

SECTION 26
SURFACE RESTORATION

26.01 GENERAL DESCRIPTION.

The Contractor shall furnish and place aggregate base material, asphaltic concrete material and necessary incidentals for restoration of paved and non paved surfaces as required by the District Engineer.

26.02 MATERIALS.

The materials shall conform to the applicable provisions of the State Specifications.

26.03 TEMPORARY PAVING.

Temporary paving shall be placed at locations indicated on the Plans or directed by the Engineer. Temporary paving may be asphalt plant-mix cutback unless otherwise directed by the District Engineer.

Thickness of temporary paving shall be one and one-half inches (1-1/2") unless otherwise specified on the Plans. Temporary paving shall be maintained at the same level as the existing pavement until the permanent surfacing is placed.

26.04 RECONSTRUCTION.

All curbs, gutters, sidewalks, driveways, road shoulders, pavement, and similar items damaged by contractor's activity shall be replaced of the same kind of material and to not less than the original dimensions, subject to minimum requirements specified herein, or on the Plans. All work shall match the appearance of the existing improvements as closely as practicable.

A. COUNTY MAINTAINED ROADS AND STREETS. The trench area shall be kept level with the adjacent street or shoulder and continuously maintained to prevent a traffic hazard with temporary paving until the permanent pavement is placed. Repaving of trench areas in bituminous pavement shall consist of not less than four inches (4") of aggregate base and two inches (2") of asphalt concrete, with a single seal coat.

B. PRIVATE ROADS. On private roads, the trench compaction shall meet the same requirements as that for public roads and streets.

   Where asphaltic concrete surfacing exists, the surface restoration in the trench area shall be a minimum of four inches (4") aggregate base, one inch (1") asphalt concrete and a single seal coat.

Where existing surface is tarred or sealed, the surface restoration in the trench area shall consist of four inches (4") of aggregate base and a double seal coat.

Where gravel, stone or crushed rock surfacing exists, surface restoration in the trench area shall consist of a minimum of four inches (4") aggregate base. The remaining gravel or stone roadway shall be reshaped to preconstruction cross section and given an application of a minimum of two inches (2") of three-quarter inch (3/4") maximum size gravel or crushed rock compacted into place.

The surface restoration of private roadways under any circumstance shall be no less than existed in the preconstruction condition.

C. SHOULDERS. Surface restoration of trenches located in a shoulder or within six feet (6') of the traveled way shall consist of a structural section equal to the original, or as set forth on the Plans, but with a minimum of four inches (4") of aggregate base compacted to a relative compaction of ninety-five percent (95%).

D. CONCRETE. Repairs to concrete curbs, gutters, sidewalks, driveways, etc., shall be made by removing and replacing the entire portions between joints or scores, and not merely by refinishing the damaged part, except that curb and gutter may be replaced between saw cuts of a width to be determined by the Engineer. Replacement shall be in accordance with the applicable requirements.

E. NATURAL EARTH. In areas of natural earth, the top two feet (2') of trench backfill shall be placed and compacted to a density of not less than ninety percent (90%). The surface of the trench shall be left slightly higher and graded to blend into the adjacent ground.

In areas of natural earth used for agriculture or horticulture, the final backfill depth of twelve inches (12"), unless otherwise specified in the Special Conditions, shall be made with the original top soil which has been excavated and stockpiled separately for this purpose. No compaction shall be required for the upper twelve inches (12") and the surface shall be left slightly higher and graded to blend into the adjacent ground.

26.05 AGGREGATE BASE.

"Class 2 Aggregate Base" shall conform to Sections 26-1.01 through 26-1.06, "Aggregate Base" of the State Standard Specifications.

Asbestos content in Aggregate Base shall not exceed 0.01 percent.

After the trench backfill has been placed and compacted as specified, aggregate base material shall be added sufficient to obtain a depth after compaction equal to the

required depth. The aggregate base materials and placement shall meet the requirements of these Specifications, for three-quarter inch (3/4") maximum grading. The relative compaction of the base material shall be not less than ninety-five percent (95%).

26.06 ASPHALT CONCRETE.

Asphalt concrete shall conform to the provisions in Section 39, "Asphalt Concrete," of the State Standard Specifications and shall be 1/2" or 3/4" maximum, medium grade, Type B aggregate as directed by the District Engineer.

The trench shall be filled and compacted in layers not to exceed two inches (2") with asphalt concrete until the pavement has been brought to the final grade and cross section of the street.

Immediately prior to placing the pavement, the top two inches (2") of material, or more where greater depth of paving is indicated, shall be removed and the surface re-compacted to a minimum relative compaction of ninety-five percent (95%).

Any base or underlying material that is soft or spongy shall be removed and replaced with aggregate base material and compacted in layers not exceeding six inches (6") in depth to a minimum relative compaction of ninety-five percent (95%).

Edges of trenches which are broken or damaged shall be removed and neatly trimmed back to stable and undisturbed base and surface materials.

The edges of the existing pavement shall be given a tack coat of asphalt emulsion. Asphalt binder shall be AR 8000 in accordance with Section 92 of the State Standard Specifications.

26.07 SURFACE SEAL COAT.

Seal coat treatment shall be applied to trench surfaces as required by the District Engineer.

A. SINGLE SEAL. All bituminous pavement replacement and sealed shoulders shall receive a seal coat for the full width of the trench or pavement replacement plus a minimum of twenty-four inches (24") on each side, with a fine seal coat using high viscosity type asphalt emulsion in accordance with the State Specifications. The screenings and method and rate of spreading shall conform to the State Specifications Section 37. After the screenings are set in the bituminous binder, but not earlier than the following day, any loose screenings are to be redistributed over the surface. After four (4) calendar days, any excess screenings shall be removed in such a manner that the screenings set in the binder will not be displaced.

B. DOUBLE SEAL. Those areas indicated on the Plans shall receive a double seal coat treatment. The first seal coat of the double seal shall be the coarse seal coat specified in the State Specifications. The final seal shall be as outlined herein for single seal.

SECTION 27.00
CLEAN-UP

27.01 GENERAL DESCRIPTION.

Maintain premises, public and private properties free from accumulations of waste and debris caused by work on this project at the end of each day and, at completion, leave project clean and ready for occupancy.

27.02 HAZARDS CONTROL.

Store volatile wastes in covered metal containers and remove from premises daily.

Prevent accumulation of wastes which create hazardous conditions.

Provide adequate ventilation during use of volatile or noxious substances.

27.03 CLEANING AND DISPOSAL.

Conducting cleaning and disposal operations will comply with laws and safety orders of governing authorities including anti-pollution laws.

Do not burn or bury rubbish and waste materials on project site.

Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

27.04 CLEANING MATERIALS.

Use only cleaning materials recommended by manufacturer of surface to be cleaned.

Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

27.05 DURING CONSTRUCTION.

Prevent dust nuisance attributable to this work; provide site dust suppression as needed throughout project.

At reasonable intervals during progress of the work, legally dispose of waste materials, debris and rubbish off the site.

27.06 FINAL CLEANING.

Remove grease, dust, dirt, stains, labels, fingerprints and any other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces as designated for shine finish. Vacuum clean interior spaces, including inside cabinets.

Repair, patch and touch-up marred surfaces to specified finish to match adjacent surfaces.

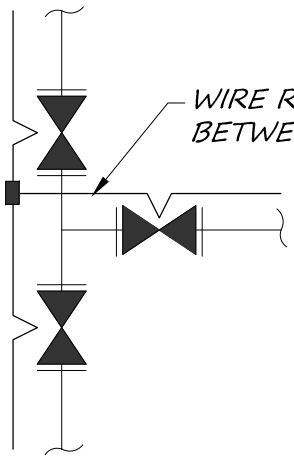
Broom clean paved surfaces; rake clean other surfaces of grounds.

Replace heat pump air filters if units were operated during construction. Clean ducts, blowers and coils if units were operated without filters during construction.

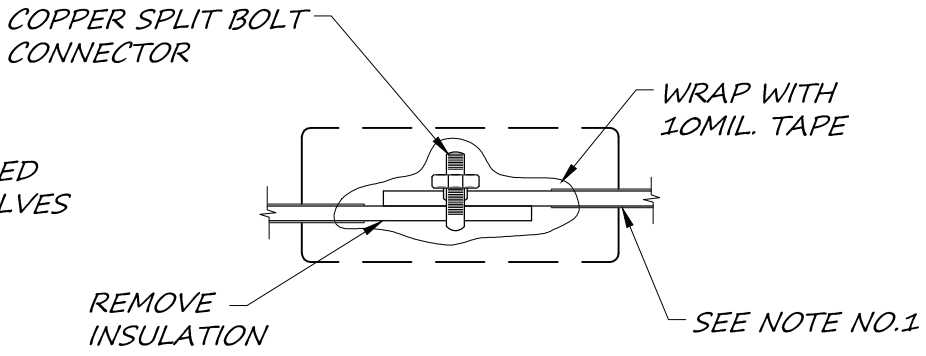
STANDARD DETAILS

NOTES:

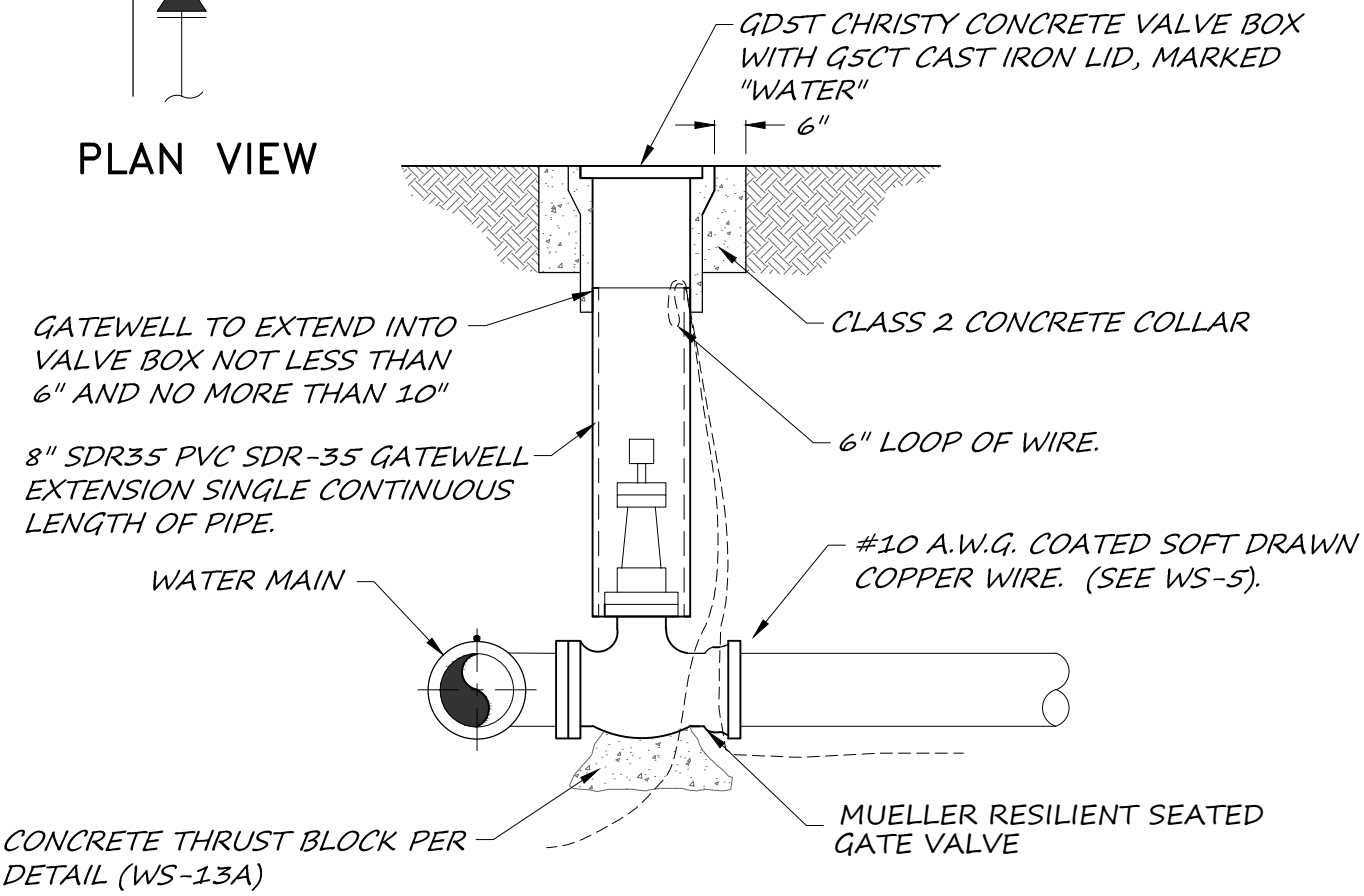
1. WIRE TO BE CONTINUOUS BETWEEN VALVE BOXES. A CONTINUITY TEST SHALL BE PERFORMED BY CONTRACTOR PRIOR TO FINAL ACCEPTANCE BY DISTRICT.
2. ALL FITTINGS TO BE WRAPPED w/MINIMUM 6 MIL. POLYETHYLENE FILM.



PLAN VIEW



SPLICE DETAIL



PROFILE VALVE INSTALLATION

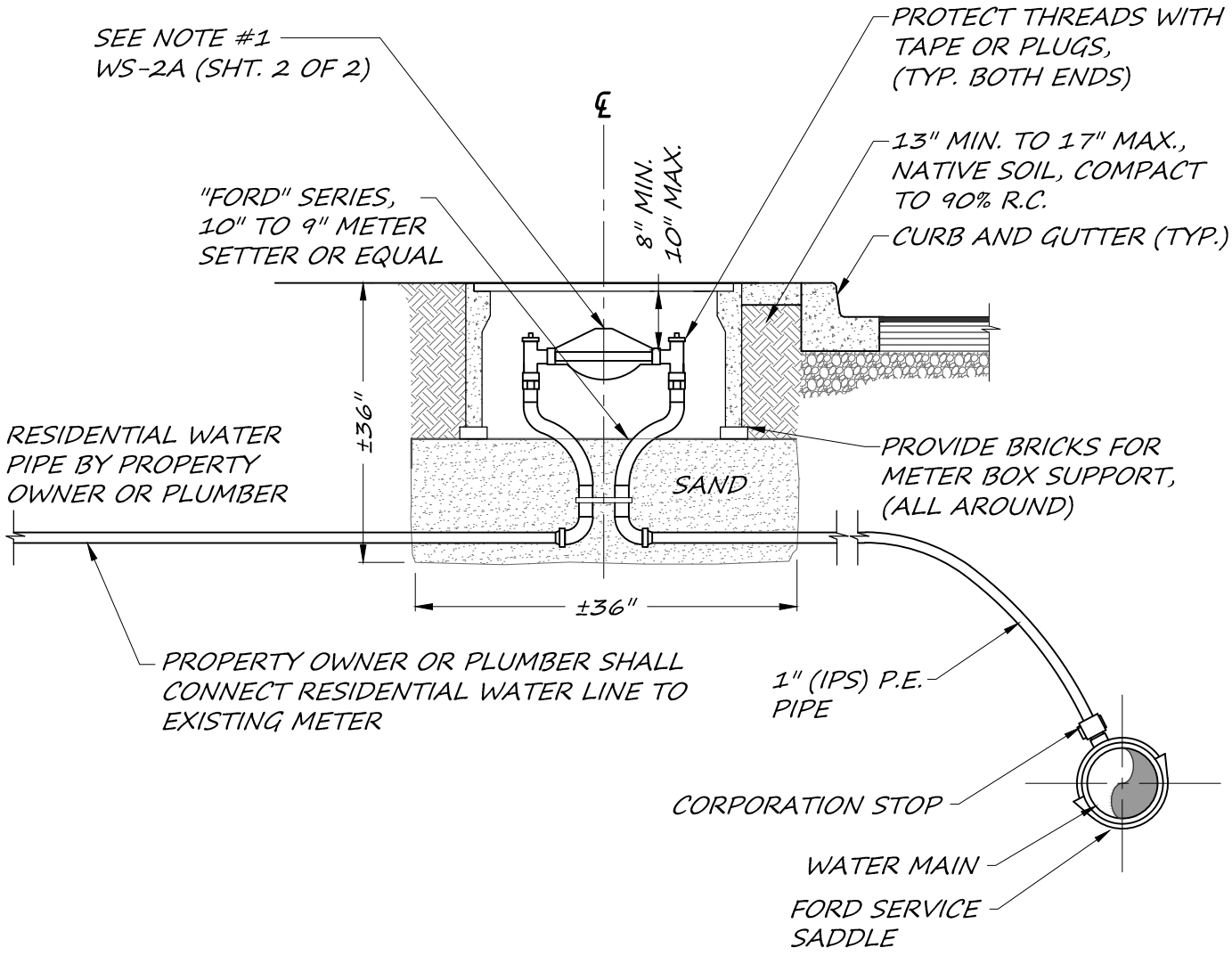
NOTES:

ITEM #	ITEM DESCRIPTION
1.	SOLID No. 10. COPPER WIRE INSULATED WITH HIGH MOLECULAR WEIGHT POLYETHYLENE (HMWPE) - BLUE COLOR ONLY. (FOR DIRECT BURIAL USE ONLY).

VALVE AND LOCATING WIRE INSTALLATION

DRAWN BY:	SCALE:	DRAWING NO.:
DMV	N.T.S.	WS-1
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:



FOR NOTES SEE SHEET WS-2A, (SHEET 2 OF 2)

STANDARD RESIDENTIAL METER

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-2A**	
REV No.:	DATE:	BY:	SHEET 1 of 2

CALAVERAS PUBLIC UTILITY DISTRICT

NOTES:

1. CPUD FORCES WILL FURNISH AND INSTALL WATER METER AFTER PLUMBING PERMIT HAS BEEN ISSUED, RESIDENCE HAS PASSED FINAL BUILDING INSPECTION, AND METER FEES HAVE BEEN PAID. WATER METER MUST BE INSTALLED BEFORE FINAL OCCUPANCY IS GRANTED.

2. 6 MI. POLYETHYLENE WRAP WITH 10 MIL. TAPER SHALL BE REQUIRED.

3. METER BOX SHALL BE "CHRISTY" B09 WITH CONCRETE COVER w/CI READER DOOR."CHRISTY" B09G LID. EQUIVALENT BOXES, LIDS, AND SLABS MAY BE USED, SUBJECT TO DISTRICT APPROVAL.

4. FOR TRAFFIC OR ALLEY INSTALLATIONS, UTILITY BOX SHALL BE CHRISTY B1324 BOX H20 LOADING WITH B1324061GH STEEL CHECKER PLATE COVER WITH READING LID, 5"x 8".

5. PIPING FROM MAIN TO METER SHALL BE 1" IPS POLYETHYLENE STAINLESS STEEL INSERTS REQUIRED ON ALL P.E. TUBING FITTINGS.

6. ALL PIPE CONNECTIONS SHALL BE COMPRESSION TYPE: "MUELLER" C-110; FORD "PACK JOINT"; OR EQUAL.

7. SERVICE METER AND PIPE MUST NOT BE INSTALLED IN DRIVEWAY.

8. VARIANCES TO METER LOCATION SHALL BE APPROVED BY DISTRICT ENGINEER.

9. BEDDING AND BACKFILL REQUIRED ALONG SERVICE LINE PER STANDARD DETAIL, WS-5.

10. FOR METER BOXES AT PROPERTY LINE, SEE DETAIL WS-2B.

11. LOCATOR WIRE REQUIRED, SEE DETAIL WS-1.

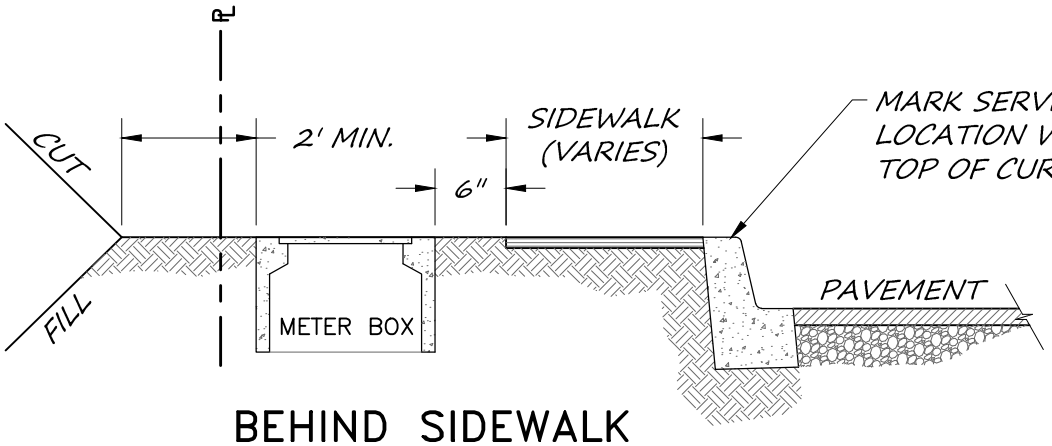
12. THIS DETAIL APPLIES TO EXISTING RESIDENCES ONLY FOR NEW CONSTRUCTION SEE DETAIL WS-2D FOR FIRE SPRINKLER CONNECTIONS.

13. FOR MULTIPLE SERVICES SEE DETAIL WS-2D.

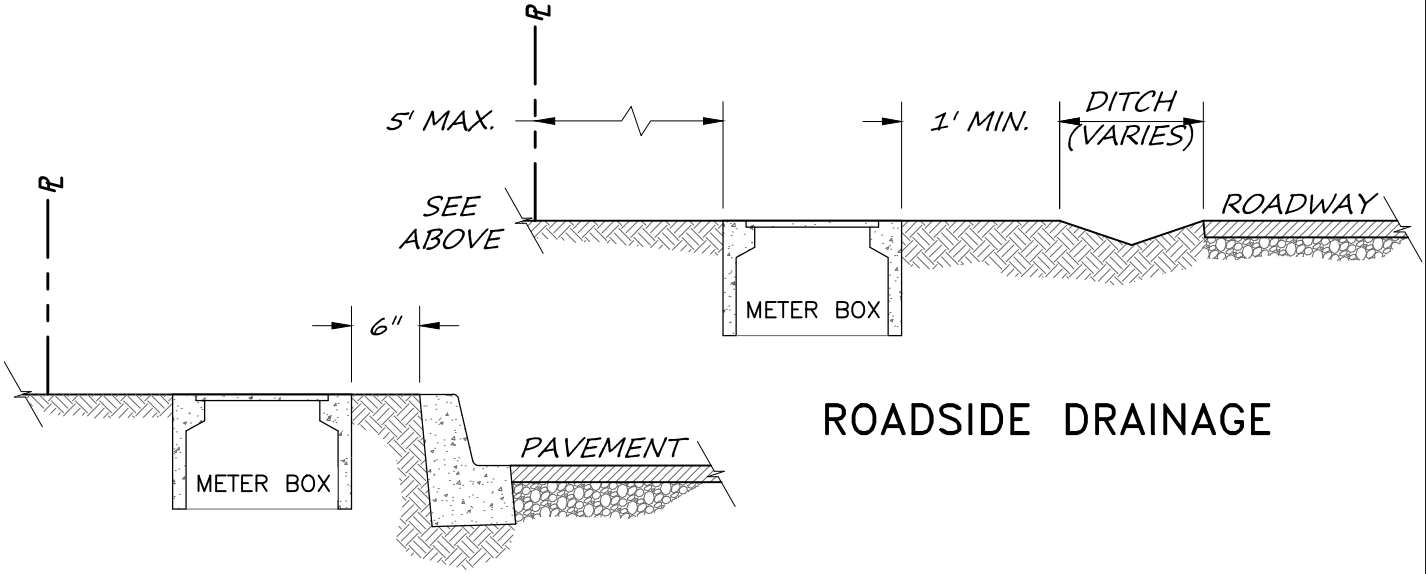
STANDARD RESIDENTIAL SERVICE CONNECTION

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-2A**	
REV No.:	DATE:	BY:	SHEET 2 of 2

CALAVERAS PUBLIC UTILITY DISTRICT

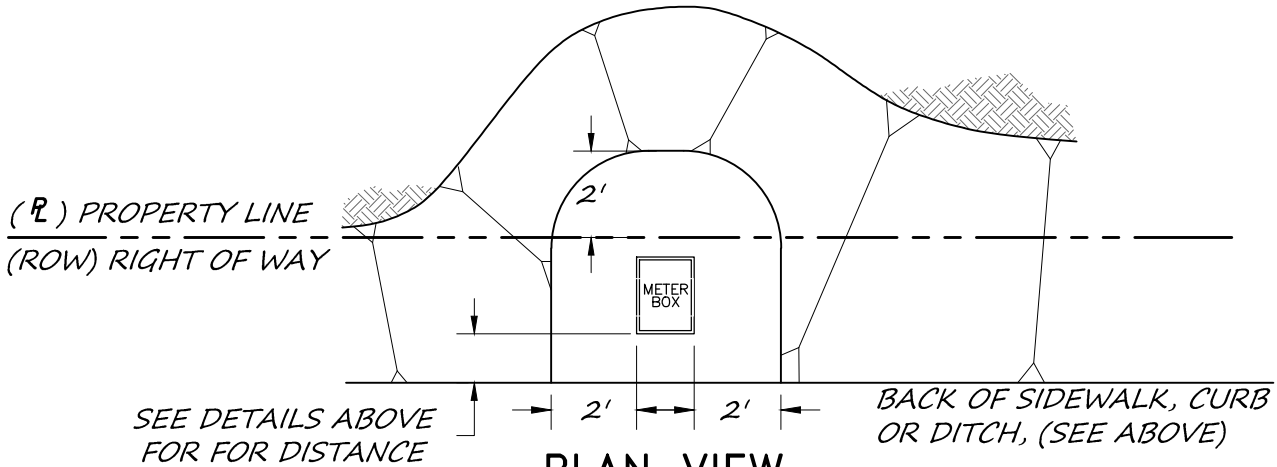


BEHIND SIDEWALK



ROADSIDE DRAINAGE

NO SIDEWALK



PLAN VIEW

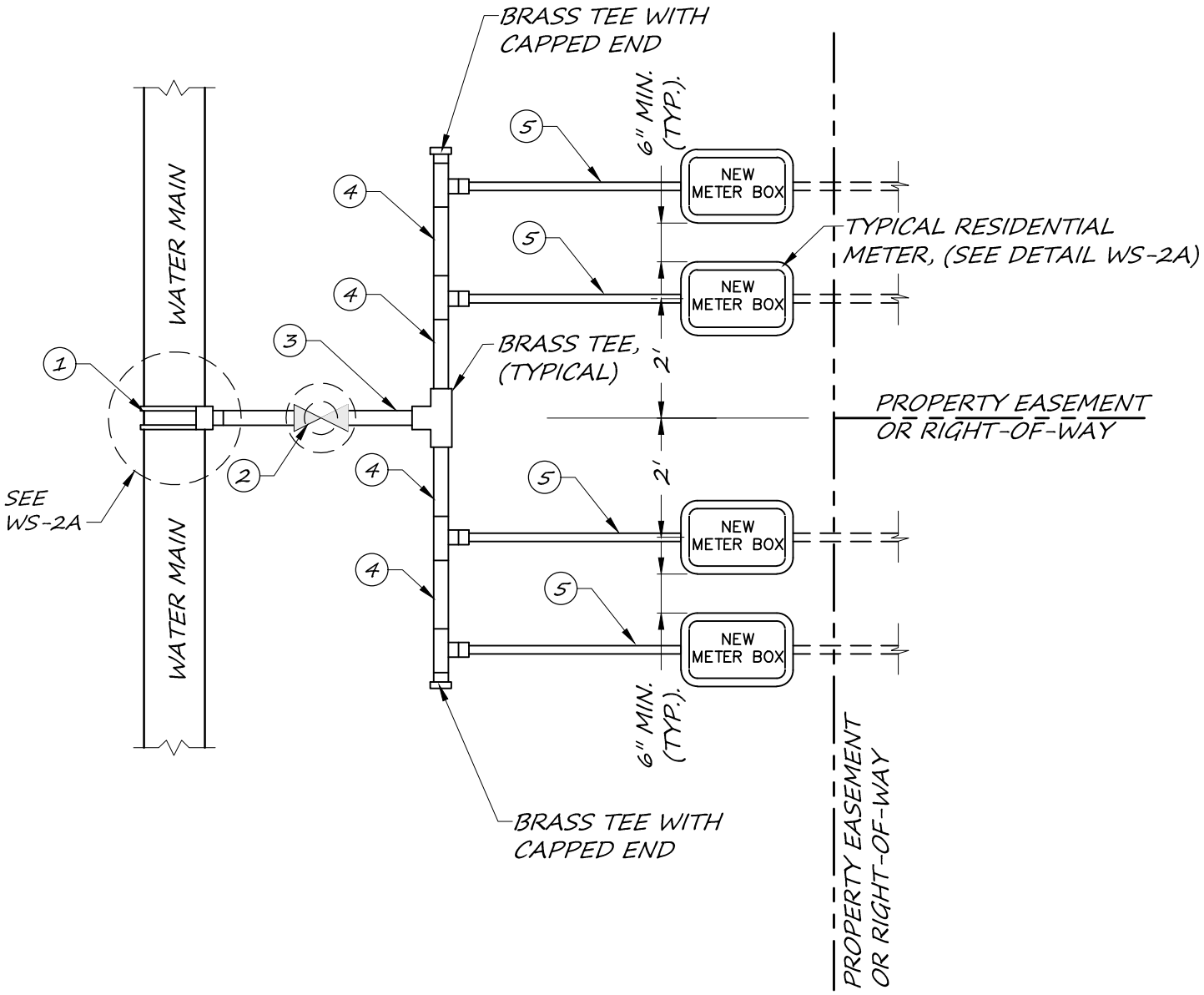
NOTES:

1. ALL METER BOXES ARE TO BE PLACED LENGTHWISE AS SHOWN.
2. FOR SERVICE AND METER INSTALLATION, SEE DETAIL WS-2A.
3. CUSTOMER RESPONSIBLE FOR INSTALLATION OF P.R.V. AND/OR BACKFLOW DEVICE, (IF REQUIRED).

WATER METER BOX PLACEMENT

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	WS-2B	CALAVERAS PUBLIC UTILITY DISTRICT

REV No.:	DATE:	BY:



NOTE:
FOR RESIDENTIAL METER w/FIRE SPRINKLER, SEE (WS-2D)

NUMBERED NOTES:

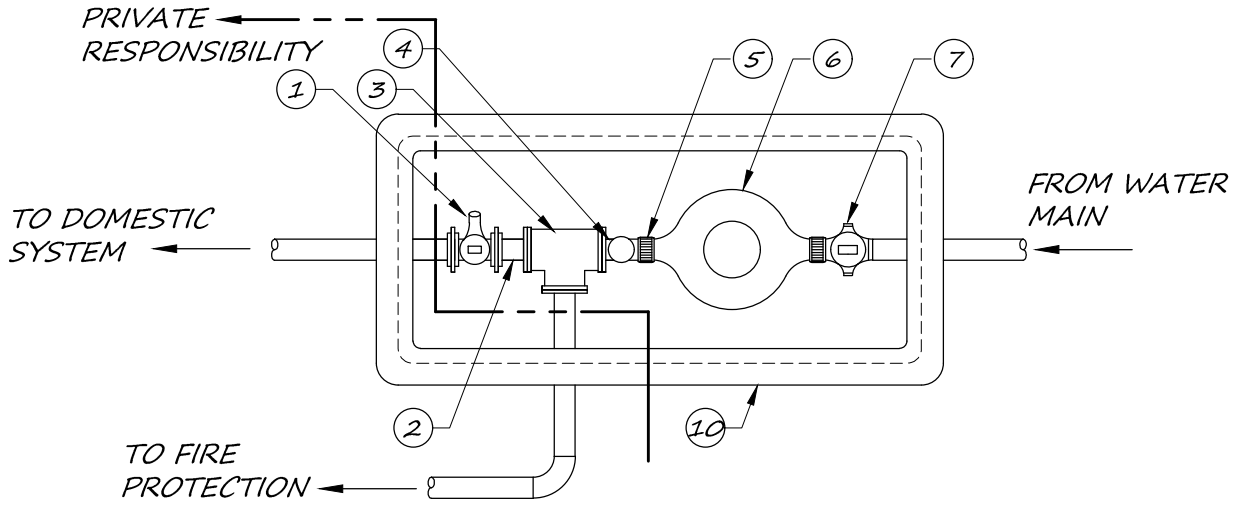
ITEM No.	ITEM DESCRIPTION
1	SERVICE SADDLE - FORD FS300
2	FORD CURB STOP IN VALVE BOX,
3	2" IPS POLYETHELENE
4	2"Ø BRASS NIPPLE
5	1"Ø BRASS NIPPLE

SERVICE TAP
MULTI WATER METER MANIFOLD

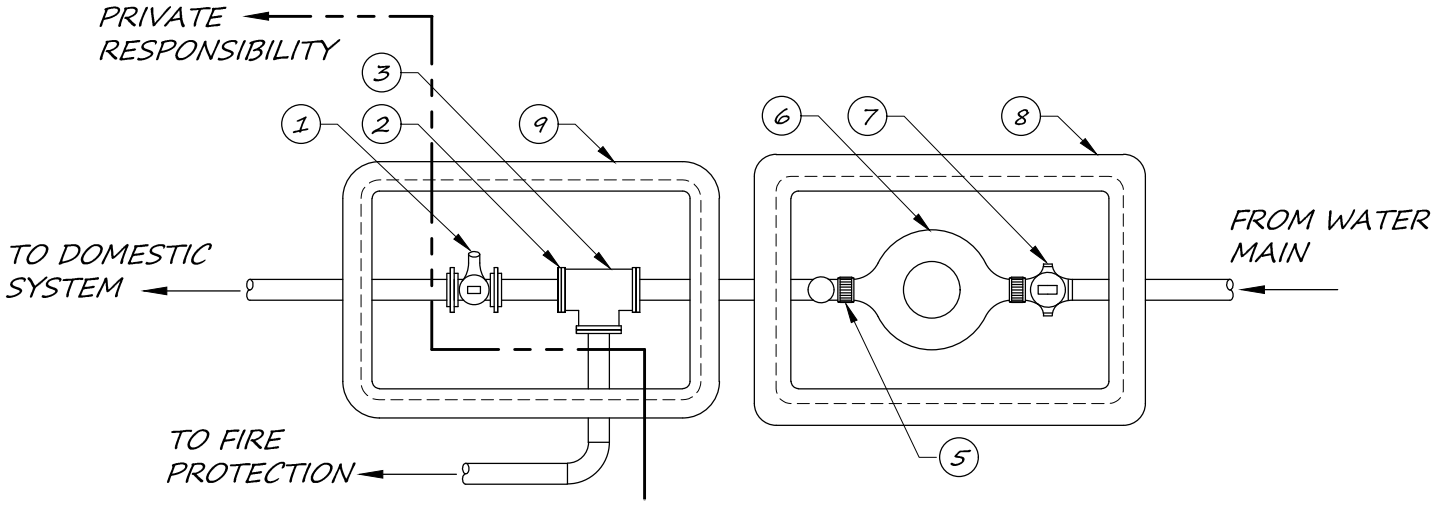
DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: JULY 2016	**WS-2C**	

REV No.:	DATE:	BY:

CALAVERAS PUBLIC UTILITY DISTRICT



1" FIRE AND 1" DOMESTIC SERVICE, (SINGLE BOX)



1" FIRE AND 1" DOMESTIC SERVICE, (DUAL BOX)

(DISTRICT APPROVAL REQUIRED)

NUMBERED NOTES:

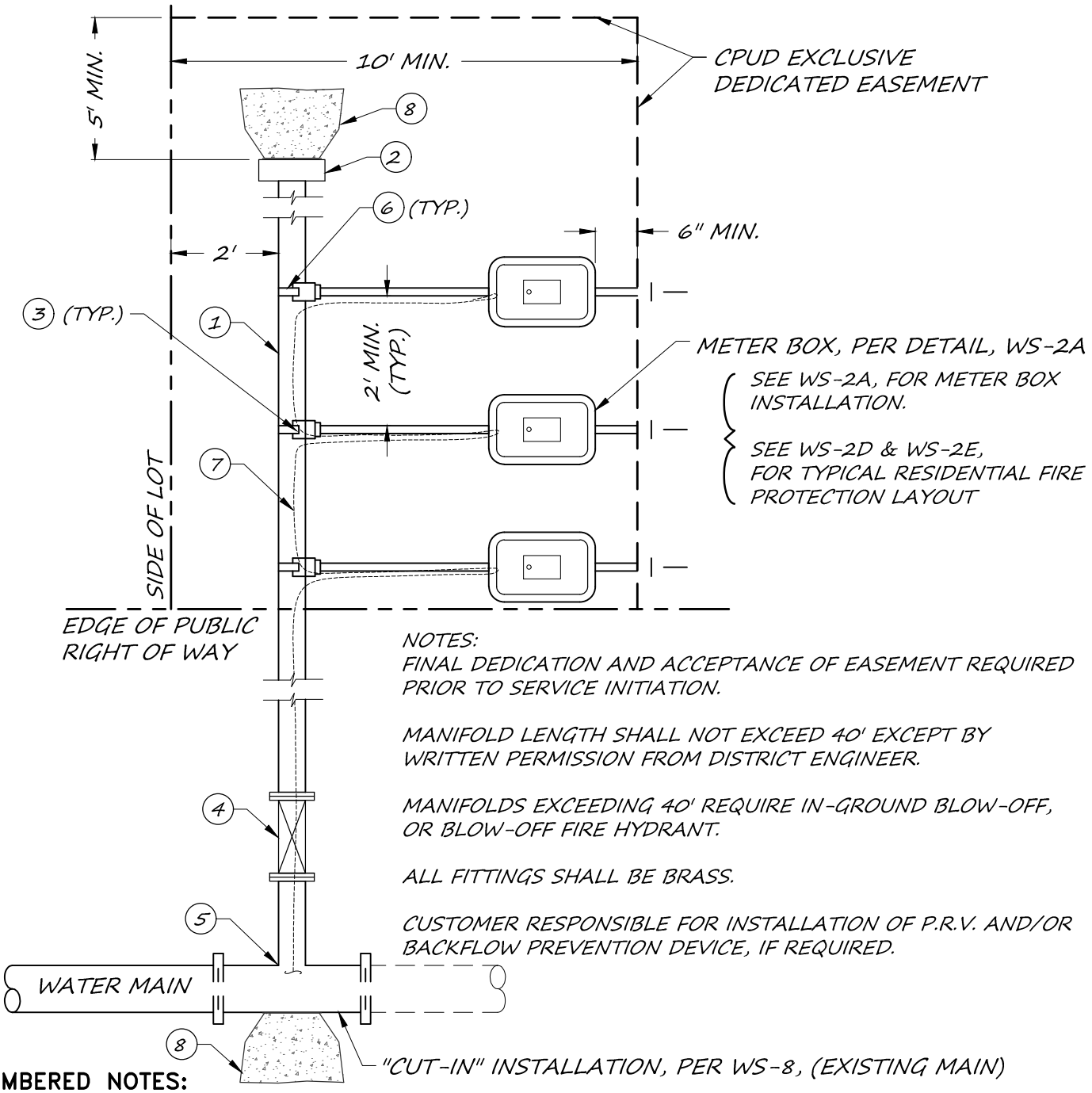
ITEM No.	ITEM DESCRIPTION
1	CURB STOP WITH LOCK WING
2	BRASS NIPPLE
3	BRASS TEE
4	BRASS NIPPLE
5	METER COUPLING
6	WATER METER, w/SETTER (WS-2A)
7	ANGLE METER STOP WITH LOCK WINGS
8	METER BOX, "CHRISTY" B09, w/CONC. CI READER LID
9	METER BOX, "CHRISTY" B9, w/CONC. LID, (NO READER)
10	METER BOX, "CHRISTY" N36, w/CONC. CI READER LID

DOMESTIC FIRE SERVICE DETAIL

DRAWN BY:	SCALE:	DRAWING NO.:
DMV	N.T.S.	WS-2D
APPROVED: GSG	DATE: JULY 2016	

REV No.:	DATE:	BY:

CALAVERAS PUBLIC UTILITY DISTRICT



NOTES:
FINAL DEDICATION AND ACCEPTANCE OF EASEMENT REQUIRED PRIOR TO SERVICE INITIATION.

MANIFOLD LENGTH SHALL NOT EXCEED 40' EXCEPT BY WRITTEN PERMISSION FROM DISTRICT ENGINEER.

MANIFOLDS EXCEEDING 40' REQUIRE IN-GROUND BLOW-OFF, OR BLOW-OFF FIRE HYDRANT.

ALL FITTINGS SHALL BE BRASS.

CUSTOMER RESPONSIBLE FOR INSTALLATION OF P.R.V. AND/OR BACKFLOW PREVENTION DEVICE, IF REQUIRED.

NUMBERED NOTES:

ITEM No.	ITEM DESCRIPTION
1	4" C-900 PVC MANIFOLD
2	END CAP
3	SERVICE SADDLE, PER WS-2A
4	MJ x FLG GATE VALVE IN VALVE BOX
5	TEE, CONNECTION TO MAIN
6	SERVICE CONNECTION
7	TRACER WIRE
8	THRUST BLOCK, PER WS-13B

MULTIPLE SERVICE METERS
ALLOWABLE NUMBER OF METERS TO BE DETERMINED BY HYDRAULIC CALCULATIONS

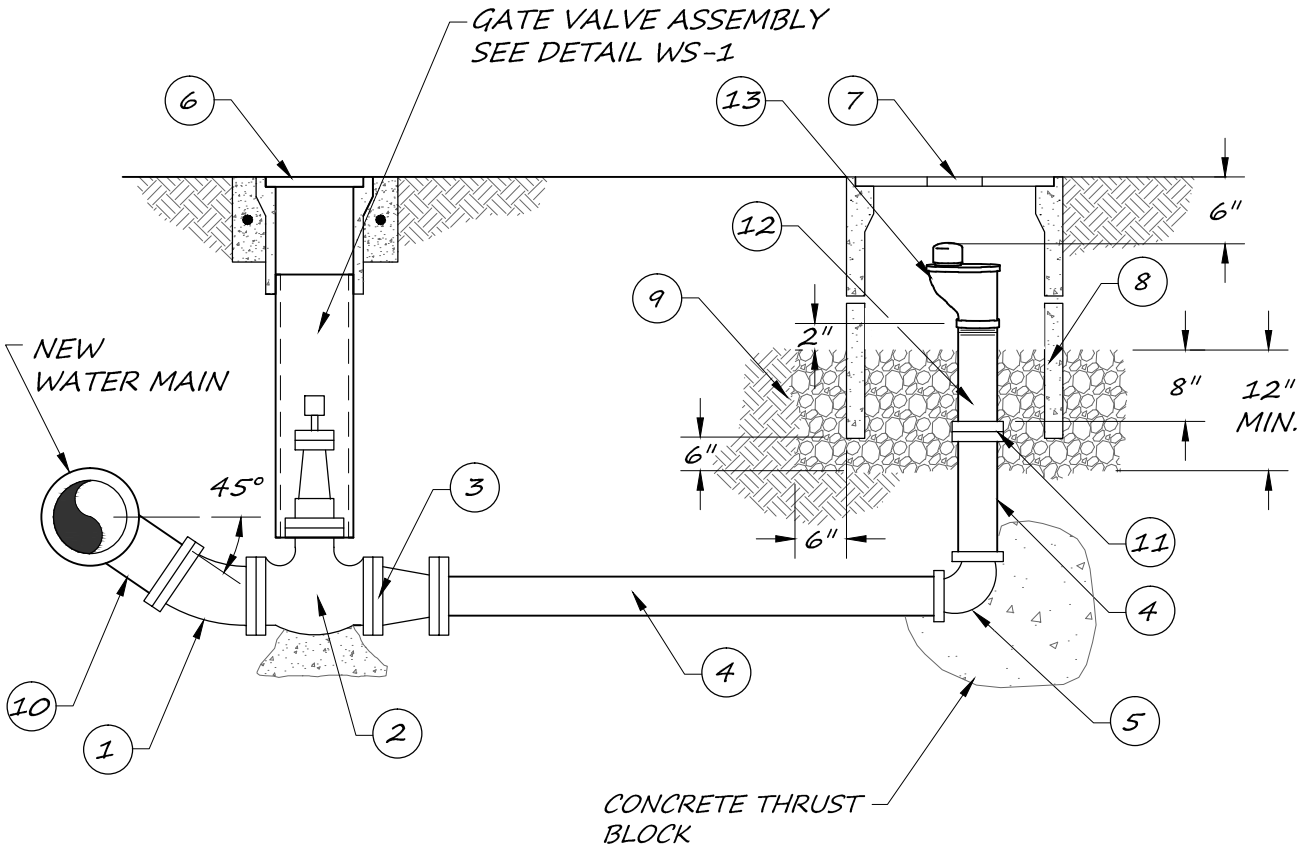
MULTIPLE METER SERVICE LINE

DRAWN BY:	SCALE:	DRAWING NO.:
DMV	N.T.S.	WS-2E
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:

NOTES:

1. IN-LINE BLOW-OFF IS REQUIRED AT LOW POINTS.
2. THE TOP OF THE BOX SHALL BE FLUSH WITH PAVEMENT WHEN LOCATED IN TRAFFIC AREAS.
3. ALL BURIED NUTS AND BOLTS SHALL BE TYPE 316 STAINLESS STEEL.
4. LOCATOR WIRE PER DETAIL WS-1.
5. ALL FITTINGS WRAPPED IN 6 MIL. POLYETHYLENE



NOTES:

1. SEE NUMBERED NOTES ON SHEET WS-3 (SHT. 2 OF 2)
2. FIRE HYDRANT MAY BE USED IN LIEU OF BLOWOFF, (PER DETAIL WS-6A)

IN-LINE BLOW-OFF ASSEMBLY

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-3**	
REV No.:	DATE:	BY:	SHEET 1 of 2

CALAVERAS PUBLIC UTILITY DISTRICT

NUMBERED NOTES:

1. 45° BEND (DIP)
2. "MUELLER" RESILIENT SEATED, GATE VALVE - MATCH MAIN SIZE
3. REDUCER
4. 2" (DIP)
5. 2" (DIP) 90° BEND, "FIELD LOK" GASKETS
6. TRAFFIC VALVE BOX PER WS-1
7. TRAFFIC BOX, CHRISTY NO. B1730 BOX (H-20 LOADING) WITH STEEL CHECKER PLATE COVER
8. VALVE BOX EXTENSION, CHRISTY (AS REQUIRED)
9. 3/4" DRAIN ROCK
10. MJ x MJ, TEE
11. COMPANION FLANGE w/ THREADED IP OUTLET
12. 2" BRASS NIPPLE, MIN OF 8" IN LENGTH
13. 2" BLOW-OFF/FLUSHING HYDRANT, TRUFLO MODEL TF500 MANUFACTURED BY KUPFERLE FOUNDRY CO.

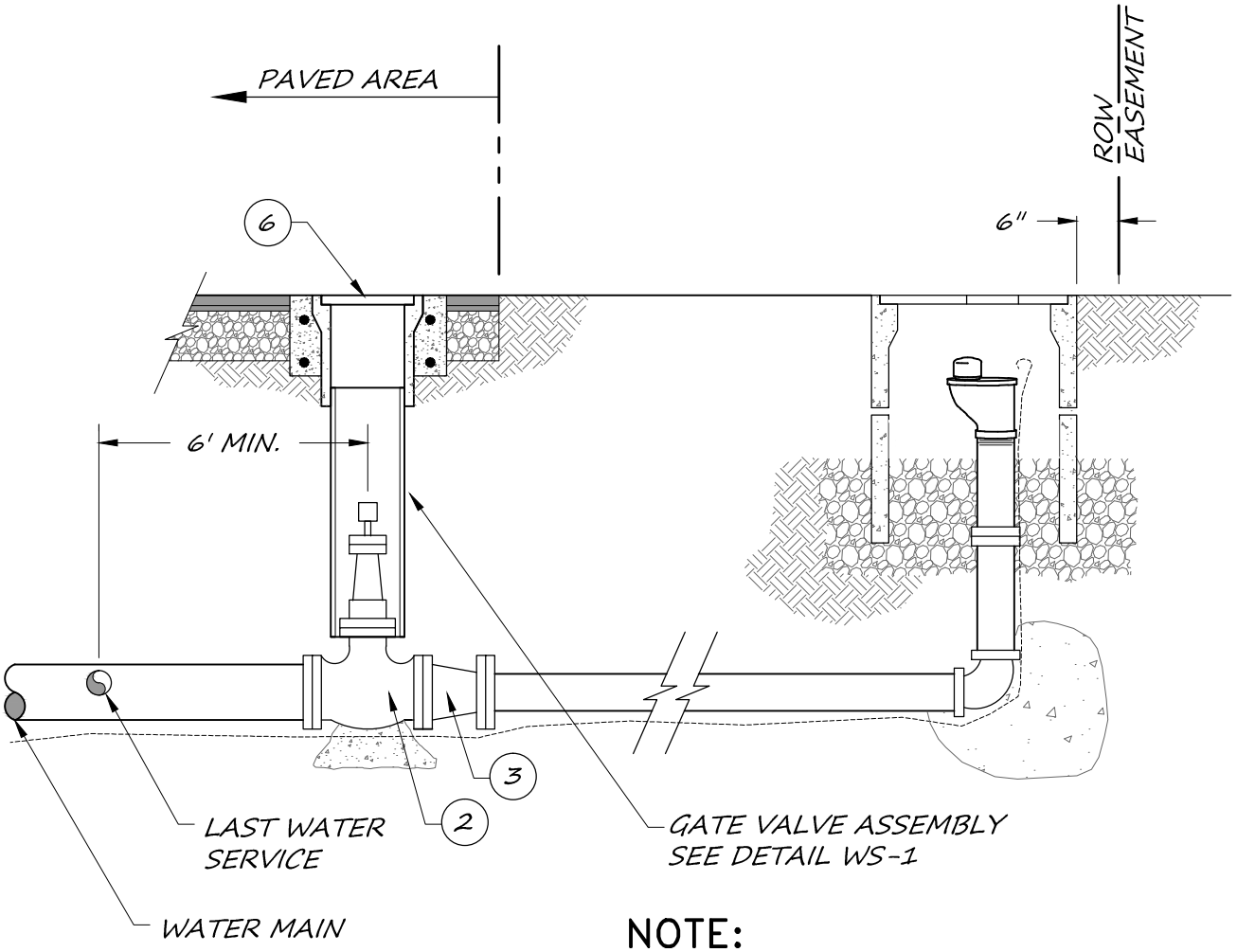
IN-LINE BLOW-OFF ASSEMBLY

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-3**	
REV No.:	DATE:	BY:	SHEET 2 of 2

CALAVERAS PUBLIC UTILITY DISTRICT

NOTES:

1. THE TOP OF THE BLOWOFF BOX SHALL BE FLUSH WITH PAVEMENT WHEN LOCATED IN TRAFFIC AREAS.
2. ALL BURIED NUTS AND BOLTS SHALL BE TYPE 316 STAINLESS STEEL.
3. GATE VALVE SIZE SHALL MATCH WATER MAIN SIZE.



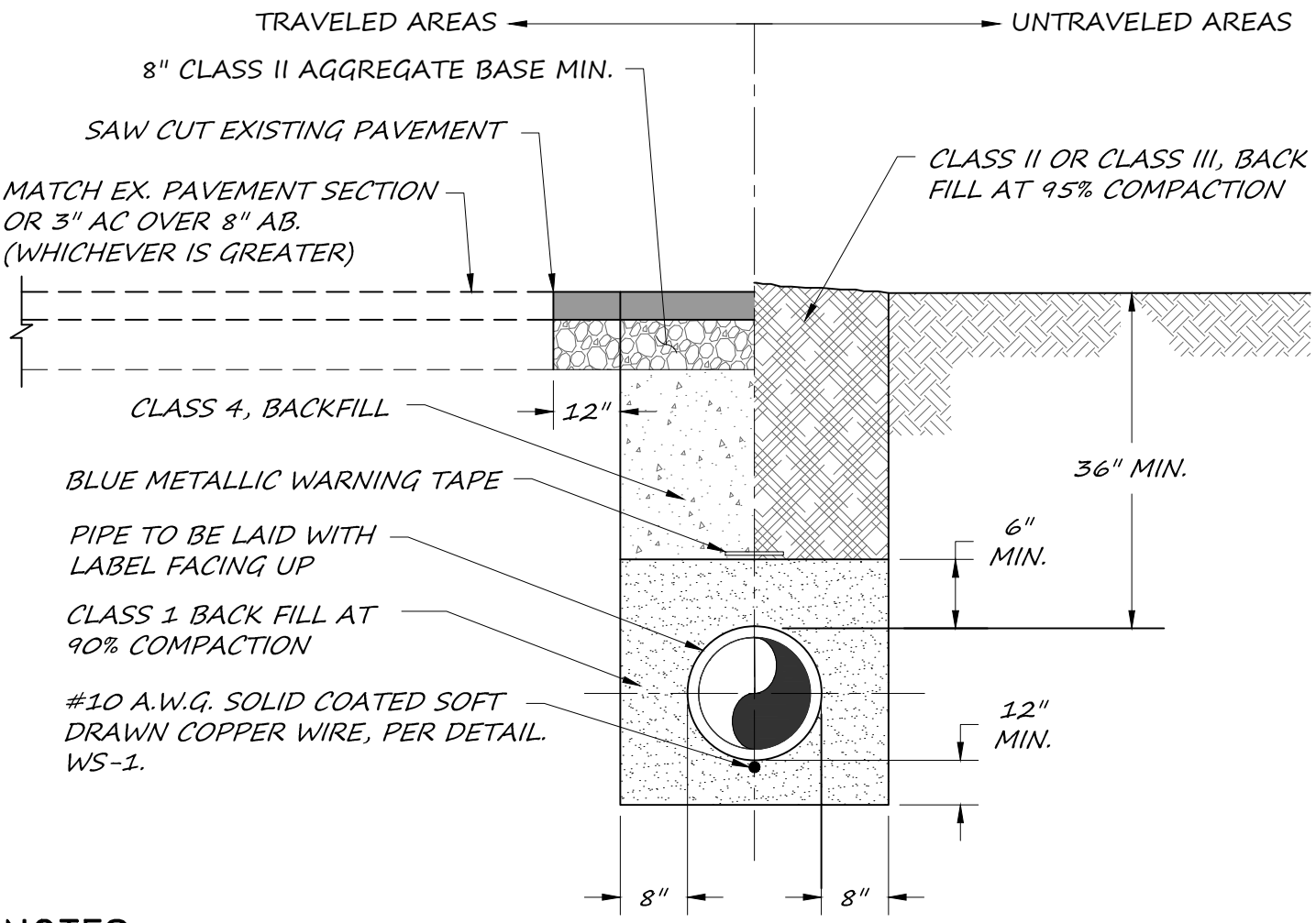
NOTE:

SEE DETAIL WS-3 FOR BLOW-OFF DETAIL

DEAD END BLOW-OFF ASSEMBLY

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-4
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:



NOTES:

1. PIPE BEDDING SHALL COMPLY WITH DISTRICT IMPROVEMENT STANDARDS.
2. MINE TAILINGS ARE UN-ACCEPTABLE FOR ANY TRENCH BACKFILLING.
3. PIPE COVER 40" OR GREATER MUST BE PRE-APPROVED BY DISTRICT ENGINEER.
4. BLUE LOCATOR TAPE AT TOP OF PIPE BEDDING AND BACKFILL TO BE MARKED: "CAUTION - WATER LINE BURIED BELOW".
5. STRUCTURAL SECTION ELEMENTS MAY BE INCREASED WHERE REQUIRED BY THE DISTRICT ENGINEER DUE TO SOIL CONDITIONS AND/OR TRAFFIC CONSIDERATIONS. THE REPLACEMENT STRUCTURAL SECTION SHALL EQUAL THE EXISTING SECTION AS A MINIMUM REQUIREMENT IN GENERAL.

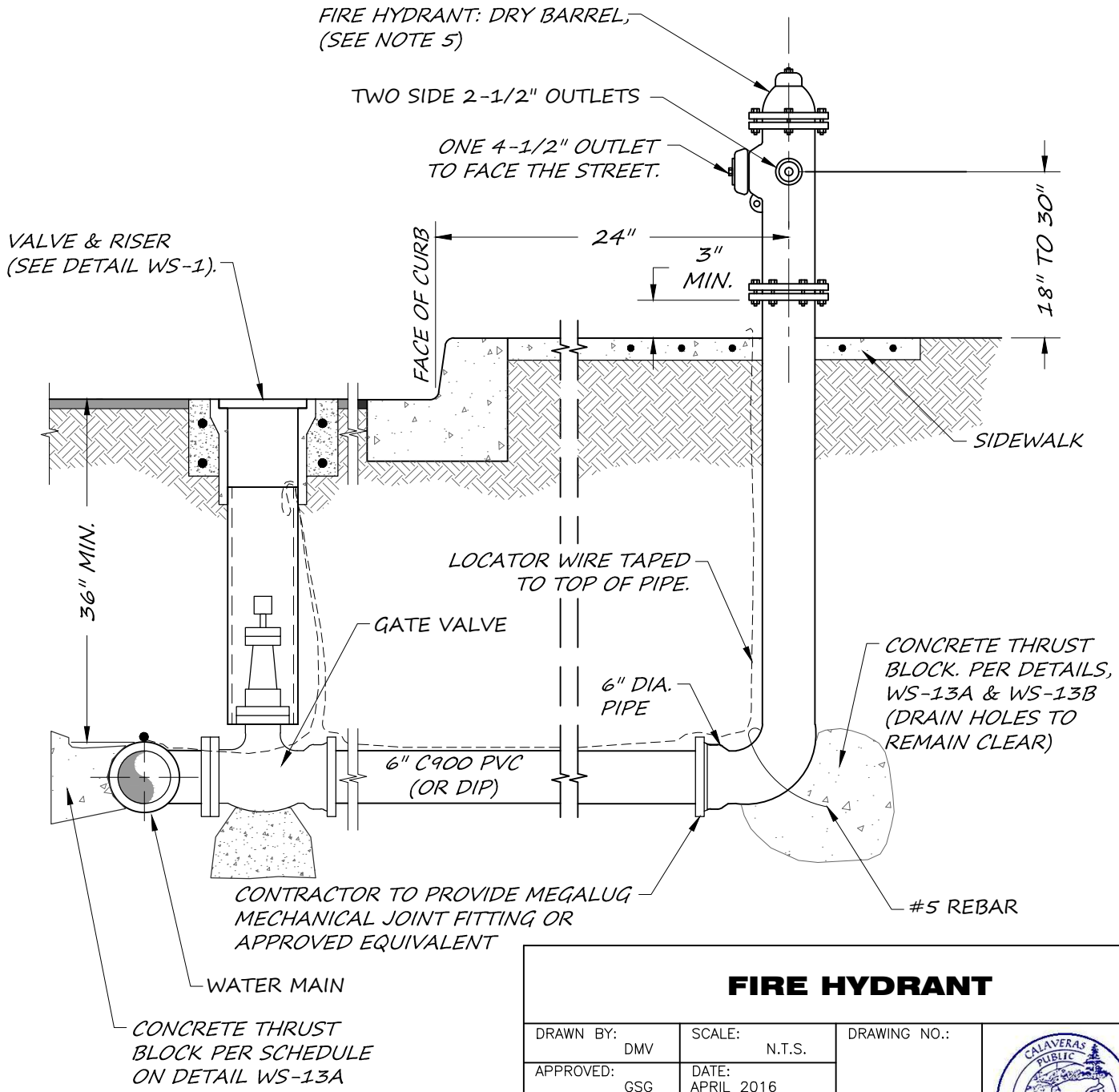
PIPE TRENCH BEDDING AND BACK FILL

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-5
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:

NOTES:

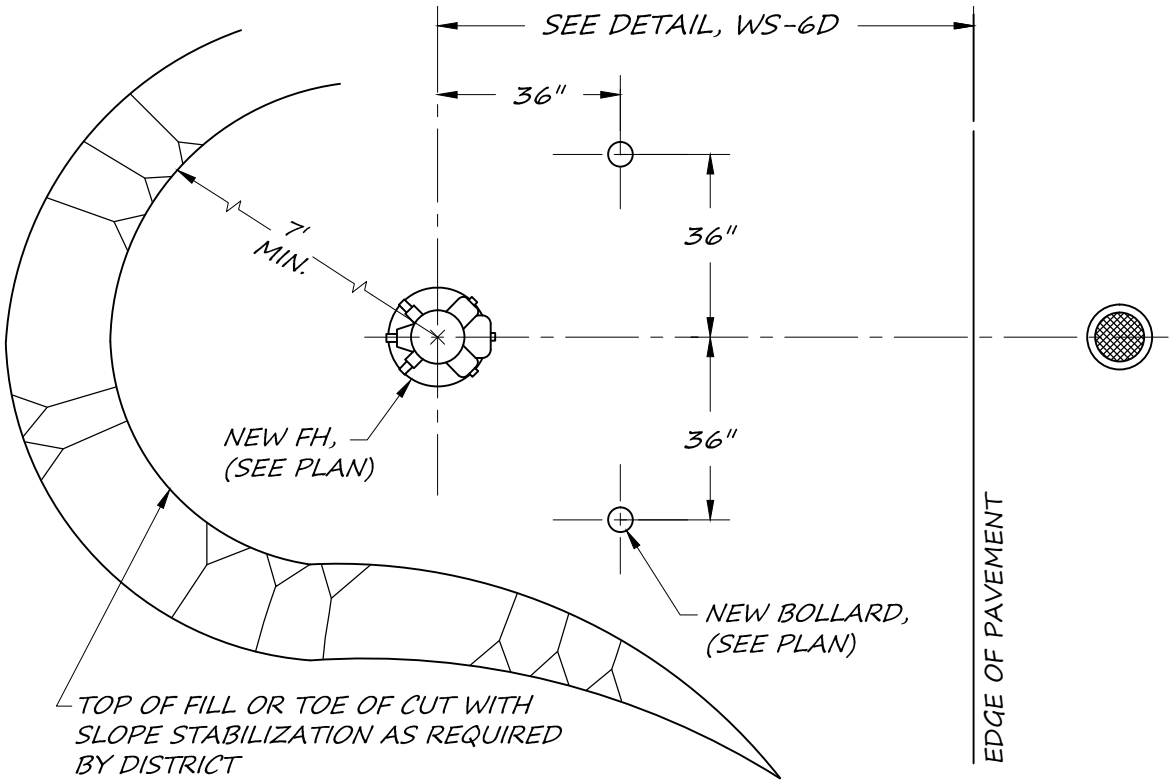
1. CONTRACTOR TO SET FIRE HYDRANT TO CORRECT GRADE.
2. FIRE HYDRANTS MUST BE COVERED (BAGGED) UNTIL AVAILABLE FOR USE.
3. LOCATING WIRE AFTER VALVE BOX IS NOT REQUIRED IF HYDRANT LATERAL IS PERPENDICULAR TO THE MAIN AND LESS THAN 40' LONG.
4. DRY BARREL - MUELLER, SUPER CENTURION - SAFETY YELLOW
5. BLUE REFLECTOR SHALL BE PLACED IN THE CENTER OF THE DRIVING LANE ADJACENT TO THE HYDRANT FOR LOCATION PURPOSES.
6. PAINT VALVE BOX LID, "WHITE"



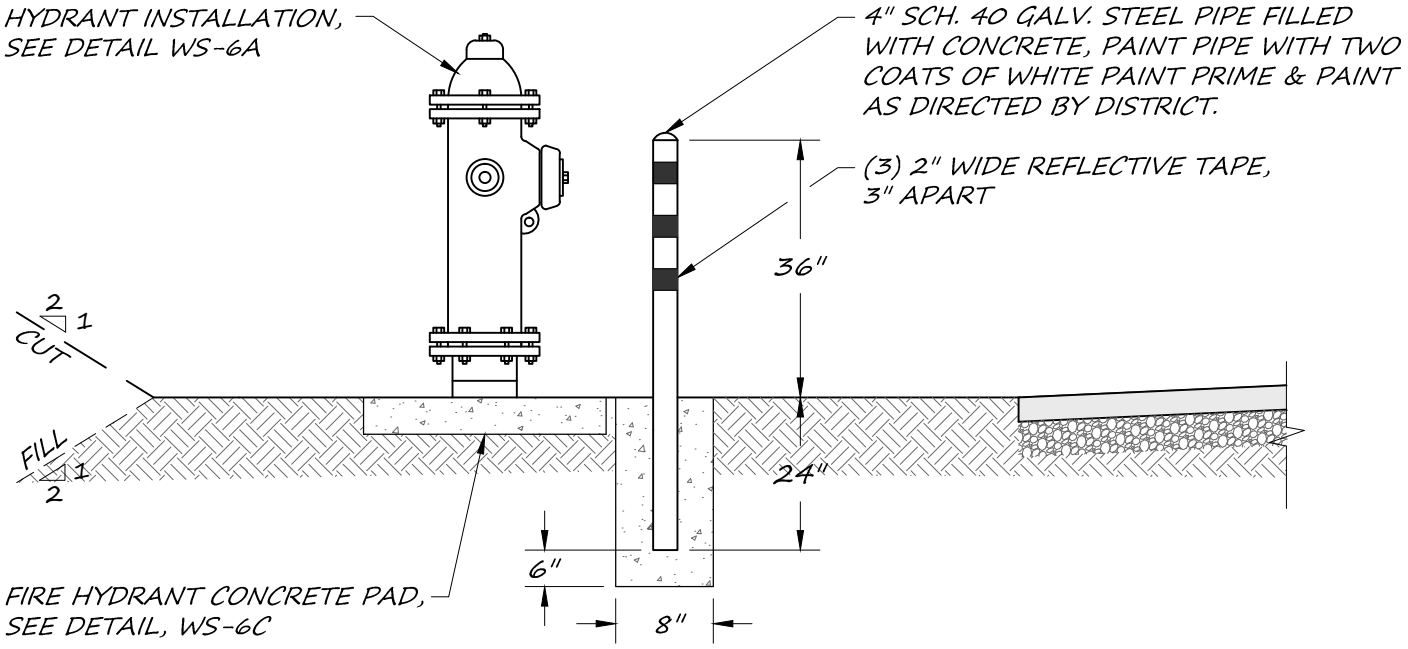
FIRE HYDRANT

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-6A
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:



PLAN VIEW



ELEVATION VIEW

NOTES:

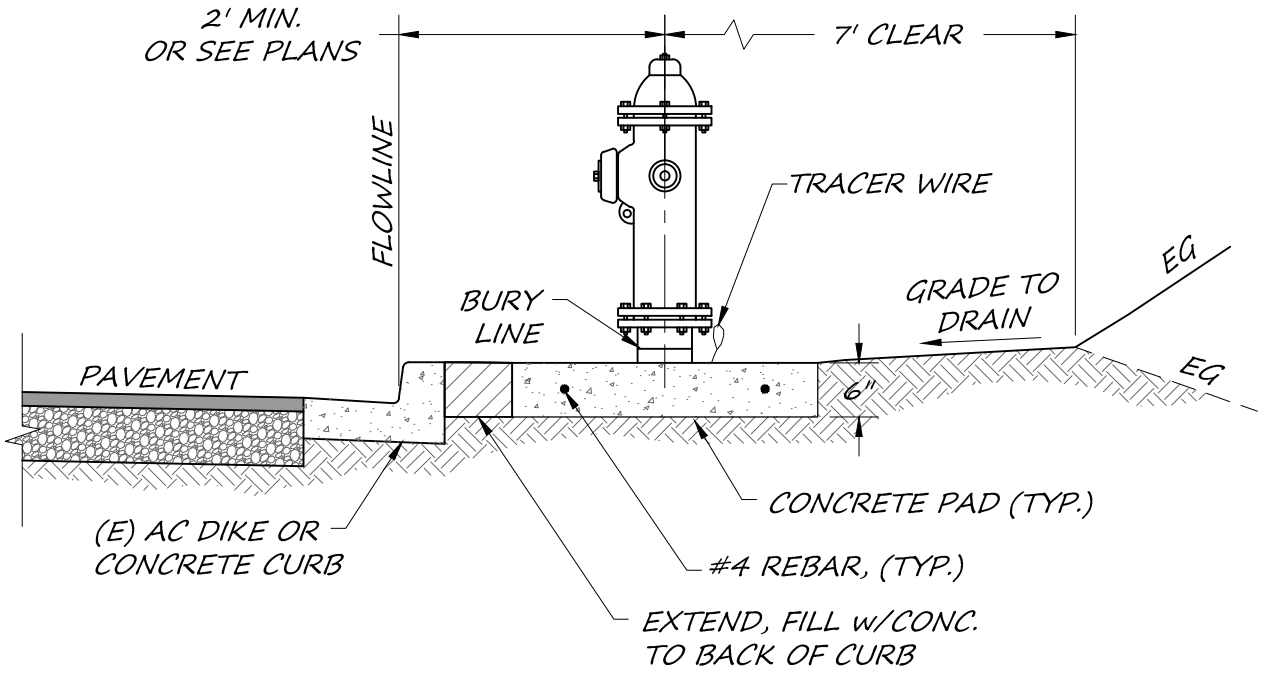
1. TWO BOLLARDS ARE REQUIRED UNLESS OTHERWISE APPROVED BY DISTRICT ENGINEER.
2. HYDRANT PAD SHALL BE CONSTRUCTED TO DRAIN AND HAVE A MINIMUM 95% RELATIVE COMPACTION.
3. FIRE HYDRANT PAD SHALL HAVE PROPER DRAINAGE AWAY FROM HYDRANT.

FIRE HYDRANT BOLLARDS

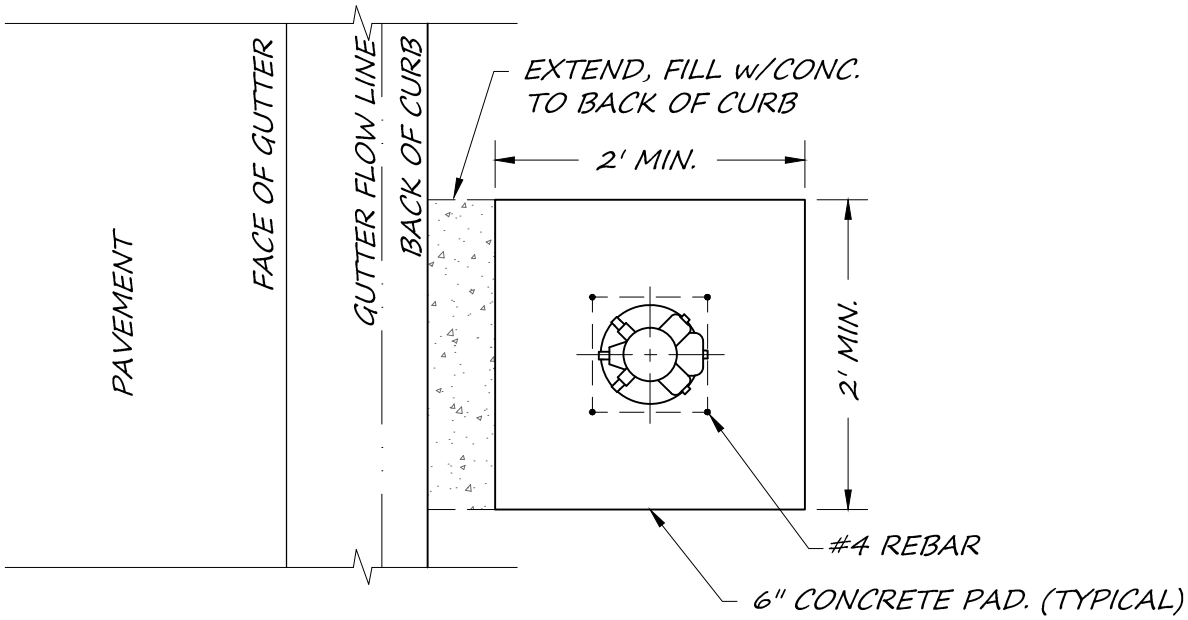
DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	WS-6B	

REV No.:	DATE:	BY:

CALAVERAS PUBLIC UTILITY DISTRICT



AT VERTICAL CURB AND GUTTER, (NO SIDEWALK)



CONCRETE PAD PLAN VIEW

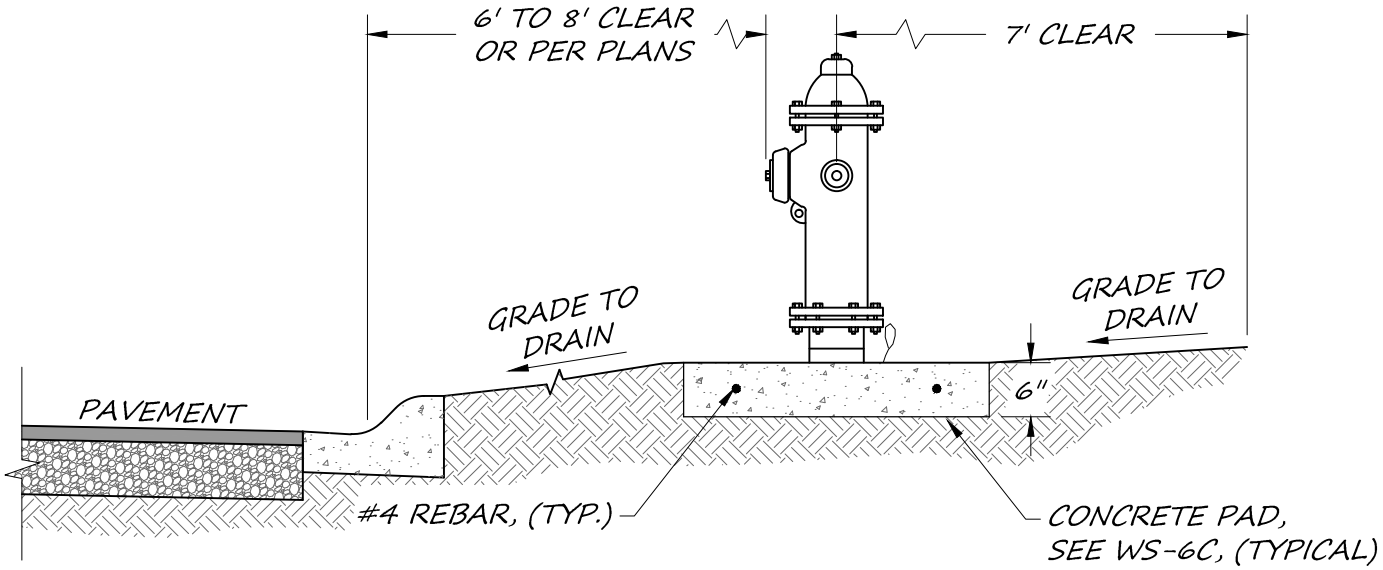
NOTES:

1. ALL VALVE BOXES SET IN THE AC OR CONCRETE TO BE SET TO FINISHED GRADE MINUS 1/8" (in.).
2. FOR TYPICAL FIRE HYDRANT INSTALLATION, SEE DETAIL WS-6A.
3. ALL SLOPES GREATER THAN 2:1, IN ANY INSTANCE MUST HAVE THE DISTRICT ENGINEER'S APPROVAL PRIOR TO INSTALLATION.

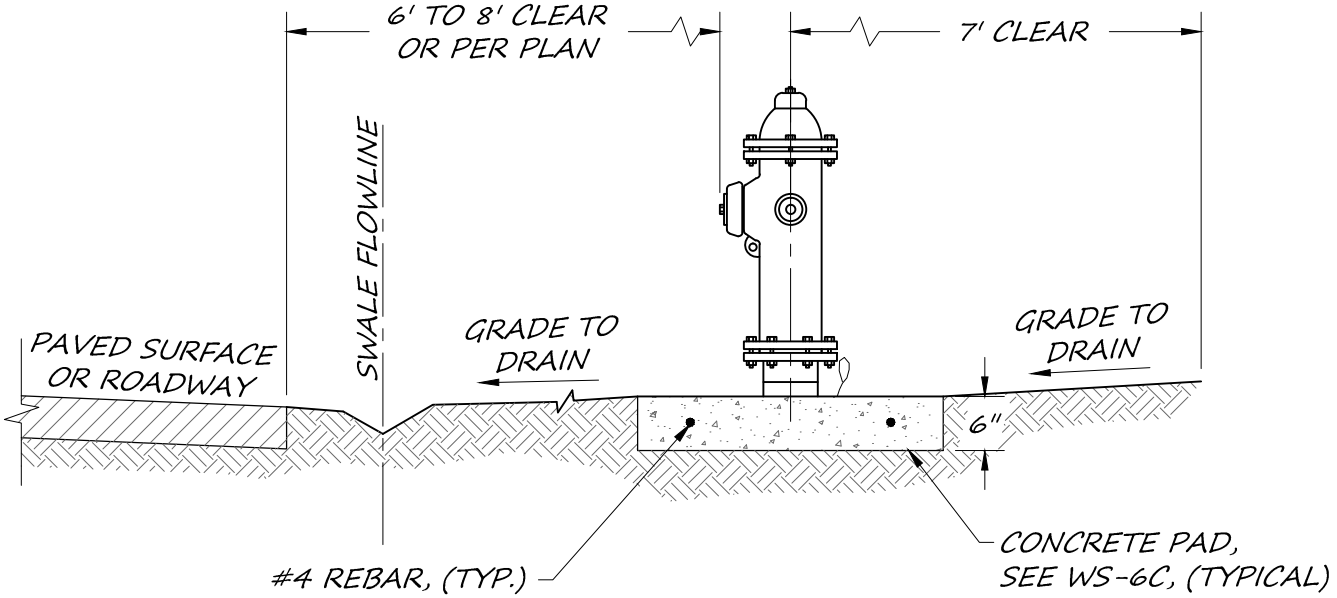
TYPICAL FIRE HYDRANT LOCATIONS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:
APPROVED: GSG	DATE: APRIL 2016	**WS-6C**

REV No.:	DATE:	BY:



AT ROLLED CURB AND GUTTER (NO SIDEWALK)



WITHOUT CURB AND GUTTER

NOTES:

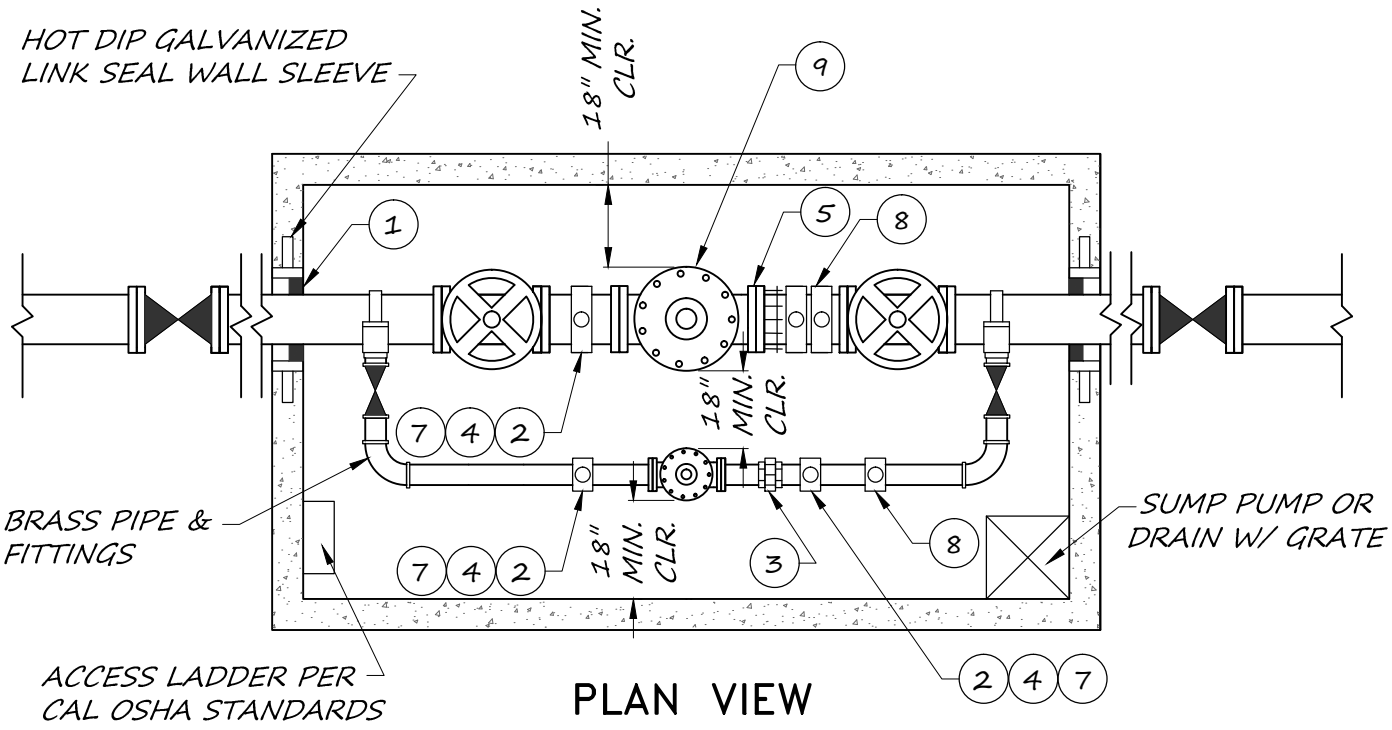
1. ALL VALVE BOXES SET IN THE AC OR CONCRETE TO BE SET TO FINISHED GRADE MINUS 1/4" (in.).
2. FOR TYPICAL FIRE HYDRANT INSTALLATION, SEE DETAIL WS-6A.
3. ALL SLOPES GREATER THAN 2:1, IN ANY INSTANCE MUST HAVE THE DISTRICT ENGINEER'S APPROVAL PRIOR TO INSTALLATION.

TYPICAL FIRE HYDRANT LOCATIONS, (Cont.)

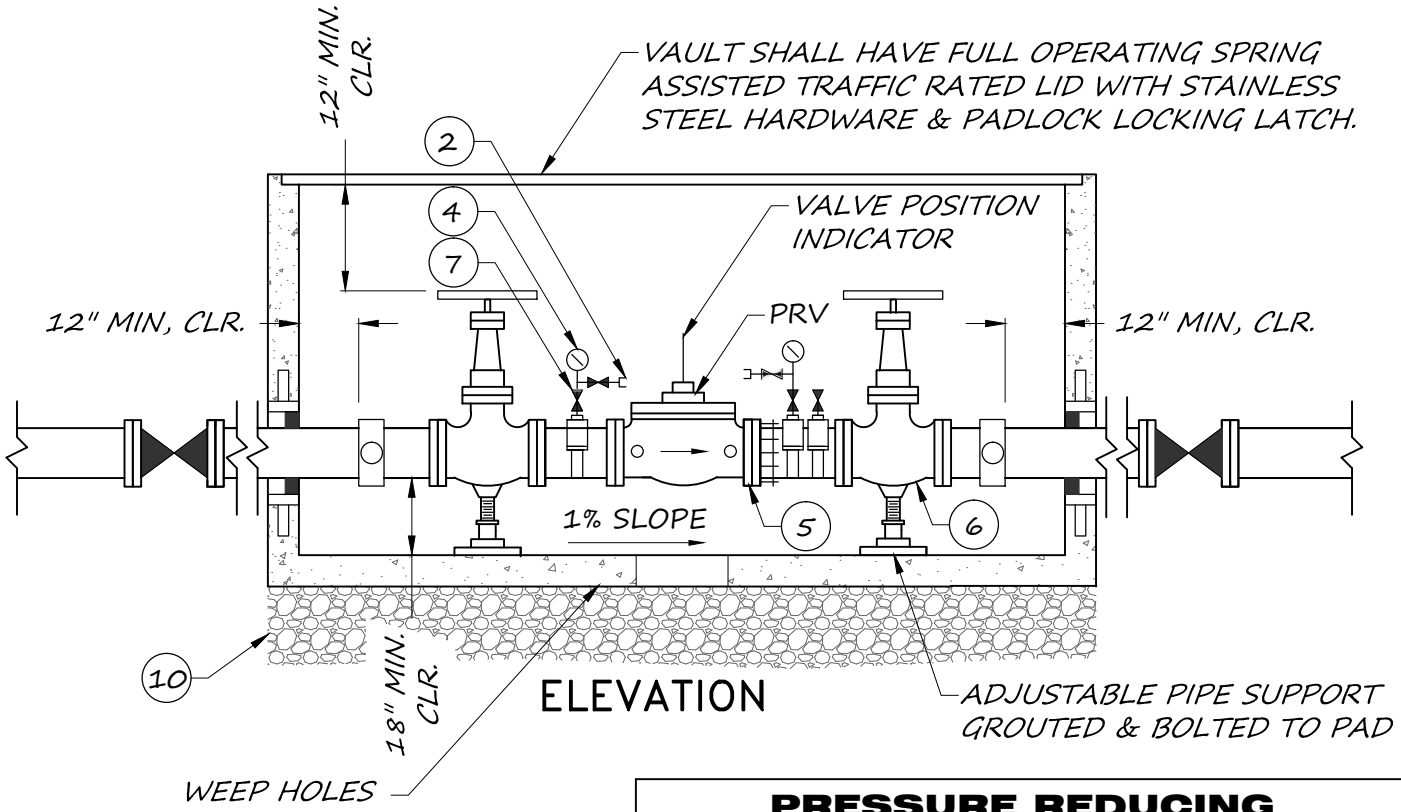
DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-6D
APPROVED: GSG	DATE:	

REV No.:	DATE:	BY:

CALAVERAS PUBLIC UTILITY DISTRICT



PLAN VIEW



ELEVATION

NOTE:

SEE NUMBERED NOTES ON SHEET WS-7 (SHT. 2 OF 2)

PRESSURE REDUCING STATION LAYOUT

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-7
APPROVED: GSG	DATE: APRIL 2016	SHEET 1 of 2

REV No.:	DATE:	BY:

CALAVERAS PUBLIC UTILITY DISTRICT

NOTES:

1. THIS DETAIL IS INTENDED TO ILLUSTRATE A TYPICAL LAYOUT OF REQUIRED EQUIPMENT & CLEARANCES AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES. DIFFERENT PIPE SIZES WILL REQUIRE DIFFERENT LAYOUTS. PRV STATION DESIGN IS SUBJECT TO DISTRICT APPROVAL.
2. PIT SUMP SHALL DRAIN TO DAYLIGHT THROUGH A 4" DIA. DRAIN PIPE OR HAVE SOME OTHER POSITIVE MEANS OF DRAINAGE SUCH AS A SUMP PUMP OR EDUCATOR.
3. INLINE VALVES SHALL BE LOCATED WITHIN 20' OF THE PRV STATION.
4. ALL EXPOSED PIPE & FITTINGS SHALL BE COATED WITH 8 MIL. EPOXY PAINT.
5. VALVE SUPPORTS SHALL BE PLACED AS DIRECTED.
6. PRECAST CONCRETE VAULT SHALL BE APPROVED BY DISTRICT ENGINEER.
7. ALL STATIONARY PRESSURE GAUGES TO HAVE AN END LINE BLEED VALVE

NUMBERED NOTES:

(1) WALL PENETRATION SEAL - THUNDER LINE LINK SEAL OR EQUAL.

(2) 1/2" HOSE BIB

(3) UNION

(4) PRESSURE INDICATOR

(5) FLANGE COUPLING ADAPTER

(6) HAND WHEEL OPERATED FLANGED MUELLER RESILIENT SEATED GATE VALVE

(7) BALL VALVE

(8) 2" SADDLE WITH GATE VALVE

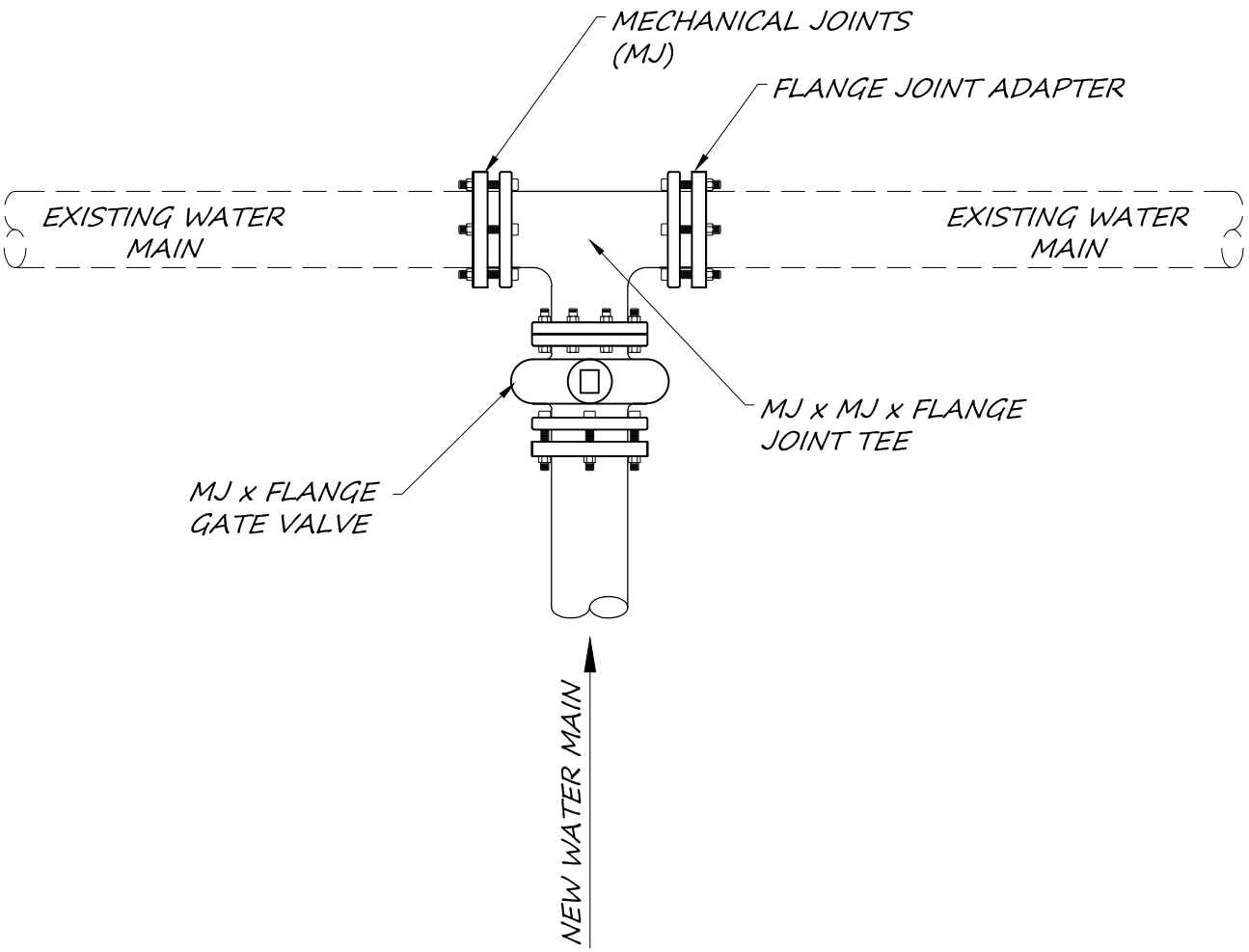
(9) PRESSURE REDUCING VALVE (PRV), CLA-VAL OR EQUIVALENT.

(10) 18" DRAIN ROCK

PRESSURE REDUCING STATION LAYOUT

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-7**	
REV No.:	DATE:	BY:	SHEET 2 of 2

CALAVERAS PUBLIC UTILITY DISTRICT



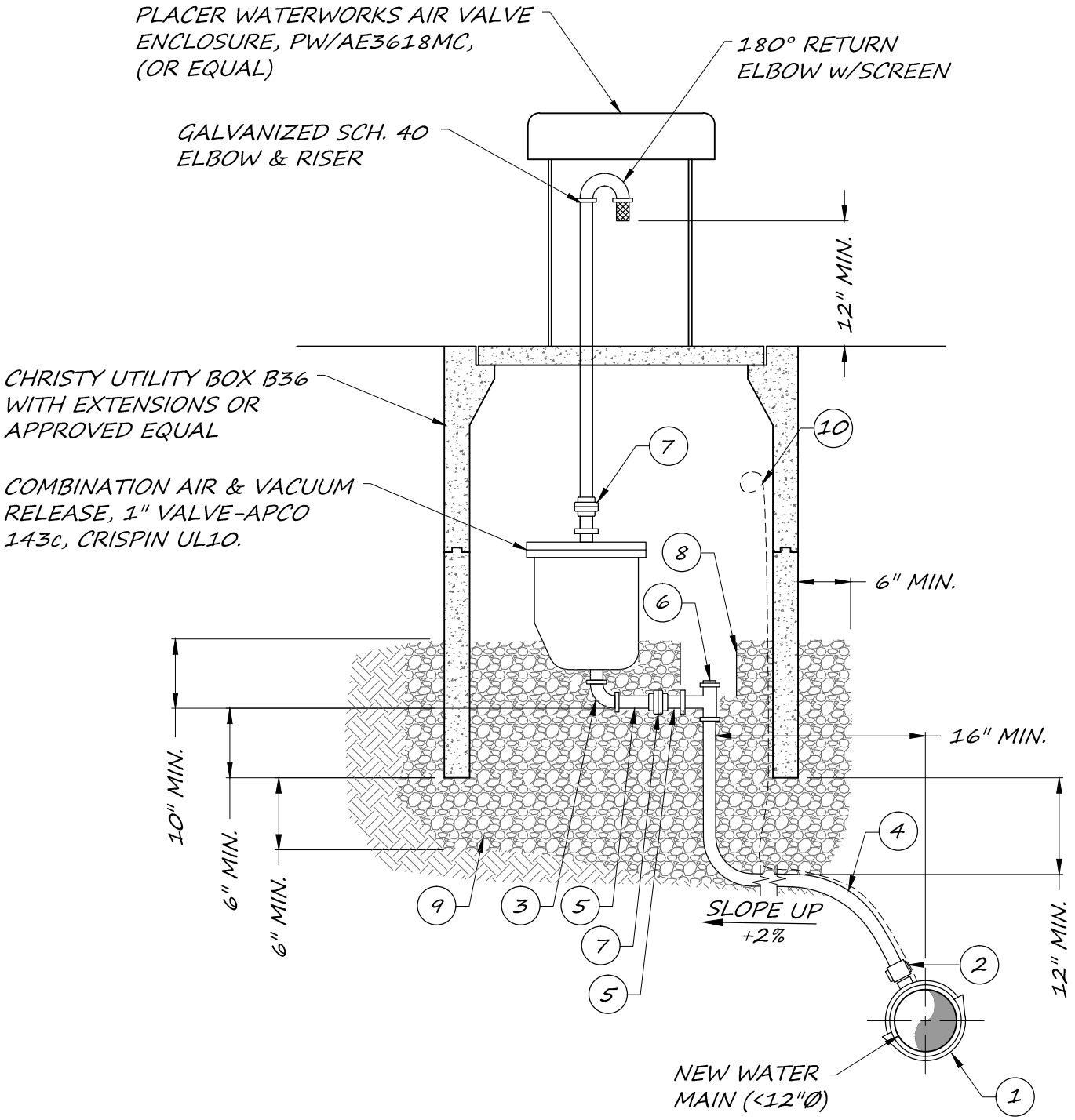
NOTE:

ALL INSTALLATIONS REQUIRE A SHUT DOWN AND DEWATERING OF THE EXISTING WATER MAIN

WATER MAIN, "CUT-IN" INSTALLATIONS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-8**	

REV No.:	DATE:	BY:



NOTE:

SEE NUMBERED NOTES ON SHEET WS-9 (SHT. 2 OF 2)

1" OR 2" COMBINATION AIR & VACUUM RELEASE VALVE

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-9**	
REV No.:	DATE:	BY:	SHEET 1 of 2

NOTES:

1. UNLESS OTHERWISE CALLED OUT SADDLES, BALL VALVES, ETC. SHALL COMPLY WITH CPUD STANDARD SPECIFICATIONS. MATCH ALL PIPE AND APPURTENANCE SIZES TO COMBINATION AIR & VACUUM RELEASE VALVE SIZES.
2. COMBINATION AIR & VACUUM RELEASE VALVE MUST BE PLACED IN THE BOX SO THAT IT MAY BE REMOVED WITHOUT REMOVING BOX.
3. PLACE VENT AT BACK OF SIDEWALK OR OUTSIDE TRAVELED WAY PER WS-6D OR AS DIRECTED BY DISTRICT ENGINEER.
4. VENT SIZE SHALL MATCH COMBINATION AIR & VACUUM RELEASE INLET SIZE.
5. LOCATE COMBINATION AIR & VACUUM RELEASE VALVE AT INTERMEDIATE HIGH POINTS AND AS CALLED FOR ON PLANS.
6. MAINTAIN MINIMUM 2% CONTINUOUS UPWARD SLOPE FROM CORP STOP TO AIR VALVE.
7. PROVIDE BOLLARDS PER WS-6B IF NO SIDEWALK.
8. GRAVEL TO BE 3/8" CLEAN RIVER RUN PEA GRAVEL, CLASS II AB, OR APPROVED EQUAL.
9. TOP OF BASE AND BOX SHALL BE A MINIMUM OF 2" ABOVE FINISHED GRADE OR LEVEL WITH SIDEWALK / PAVEMENT GRADE.

NUMBERED NOTES:

(1.) "FORD", SERVICE SADDLE

(2.) CORPORATION STOP

(3.) 90° BRASS ELBOW

(4.) (IPS) POLYETHYLENE

(5.) BRASS NIPPLE

(6.) "FORD", ANGLE METER STOP

(7.) UNION.

(8.) 6" PVC SLEEVE

(9.) GRAVEL

(10.) LOCATOR WIRE, PER DETAIL WS-1

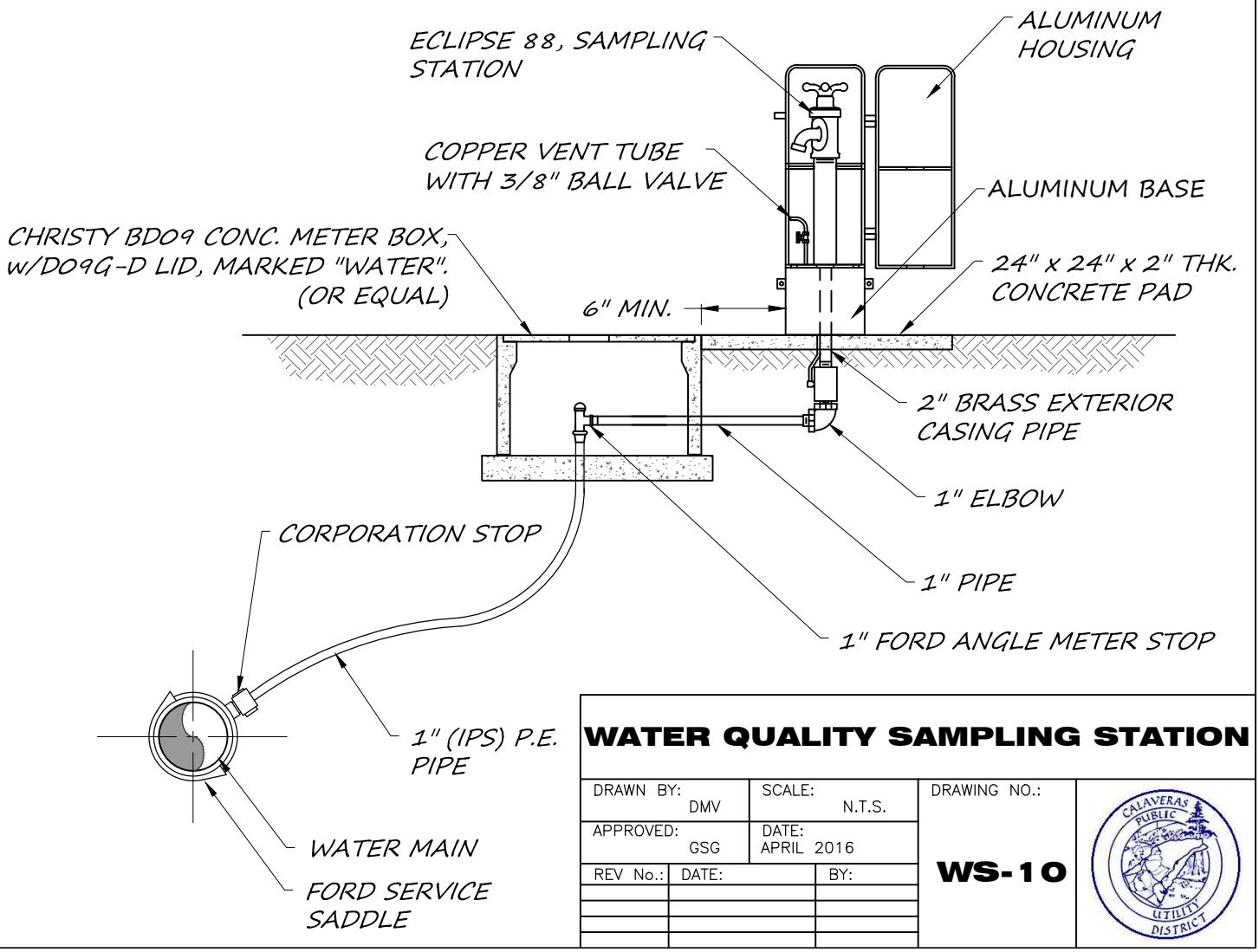
1" OR 2" COMBINATION AIR & VACUUM RELEASE VALVE

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-9**	
REV No.:	DATE:	BY:	SHEET 2 of 2

CALAVERAS PUBLIC UTILITY DISTRICT

NOTES:

1. SAMPLING STATION SHALL BE LOCATED AT PROPERTY LINE AS DIRECTED BY THE DISTRICT ENGINEER.
2. SAMPLING STATIONS SHALL BE FITTED WITH A 3/4" FIP INLET, AND A 3/4" HOSE NOZZLE.
3. ALL STATIONS SHALL BE ENCLOSED IN A LOCKABLE, NON-REMOVABLE, ALUMINUM-CAST HOUSING.
4. WHEN OPENED, THE STATION SHALL NOT REQUIRE A KEY FOR OPERATION, AND THE WATER SHALL FLOW IN AN ALL BRASS WATERWAY.
5. ALL WORKING PARTS SHALL BE OF BRASS AND BE REMOVABLE FROM ABOVE GROUND WITH NO DIGGING. EXTERIOR PIPING SHALL BE BRASS.
6. A COPPER VENT TUBE ENABLING EACH STATION TO BE PUMPED FREE OF STANDING WATER TO PREVENT FREEZING AND TO MINIMIZE BACTERIA GROWTH SHALL BE PROVIDED.
7. SAMPLING STATION SHALL BE ECLIPSE NO. 88 SAMPLING STATION MANUFACTURED BY KUPFERLE FOUNDRY, ST. LOUIS, MO 63102.
8. INSTALL LOCATOR WIRE PER DETAIL WS-1.



WATER QUALITY SAMPLING STATION

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-10
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:

NOTES:

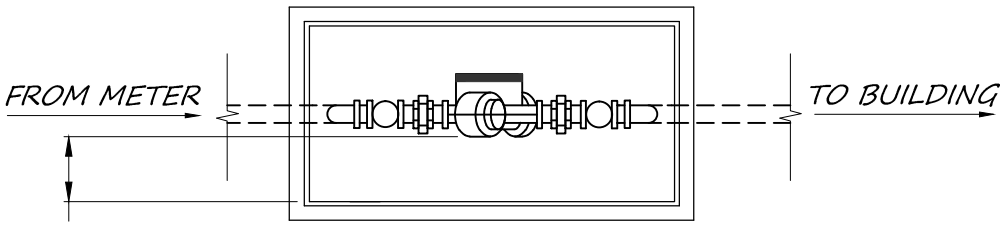
1. ALL PROPERTY HAVING A SECOND SOURCE OF WATER, SUCH AS A WELL OR RAW IRRIGATION WATER, SHALL HAVE AN APPROVED BACKFLOW PREVENTION ASSEMBLY INSTALLED ON THE PROPERTY SIDE OF AND ADJACENT TO THE WATER METER. ALTERNATE PLACEMENT MAY BE ALLOWED SUBJECT TO DISTRICT ENGINEER APPROVAL. CONNECTIONS OF ANY SORT INTENDED TO BYPASS THE PROTECTIVE ASSEMBLY ARE PROHIBITED.

2. BACKFLOW PREVENTION ASSEMBLY SHALL NOT BE INSTALLED BELOW GRADE.

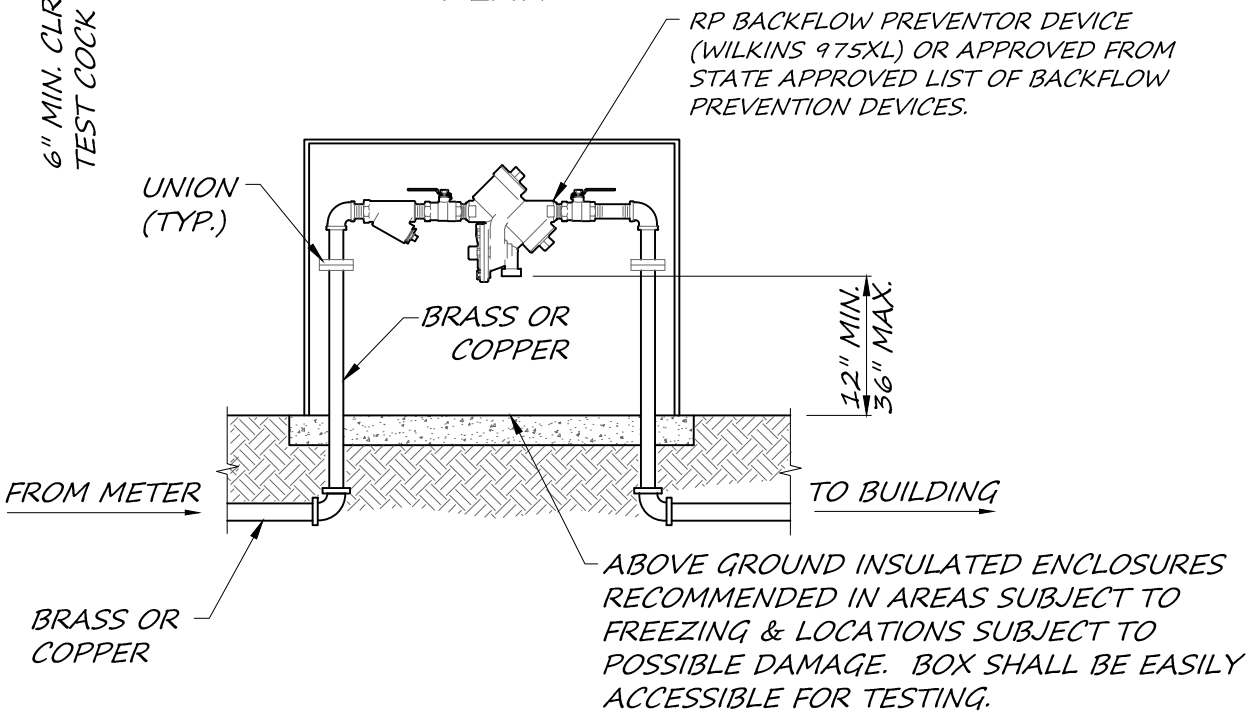
3. ALL BACKFLOW PREVENTION DEVICES SHALL CONFORM TO THE LATEST REVISED CALIFORNIA DEPARTMENT OF PUBLIC HEALTH APPROVED LIST FOR CROSS-CONNECTION.

4. THE CUSTOMER SHALL OWN AND MAINTAIN THE BACKFLOW PREVENTION ASSEMBLY AND PAY ALL COSTS TO INSPECT & TEST THE INSTALLATION.

5. INSTALL LOCATOR WIRE PER DETAIL WS-1.



PLAN



ELEVATION

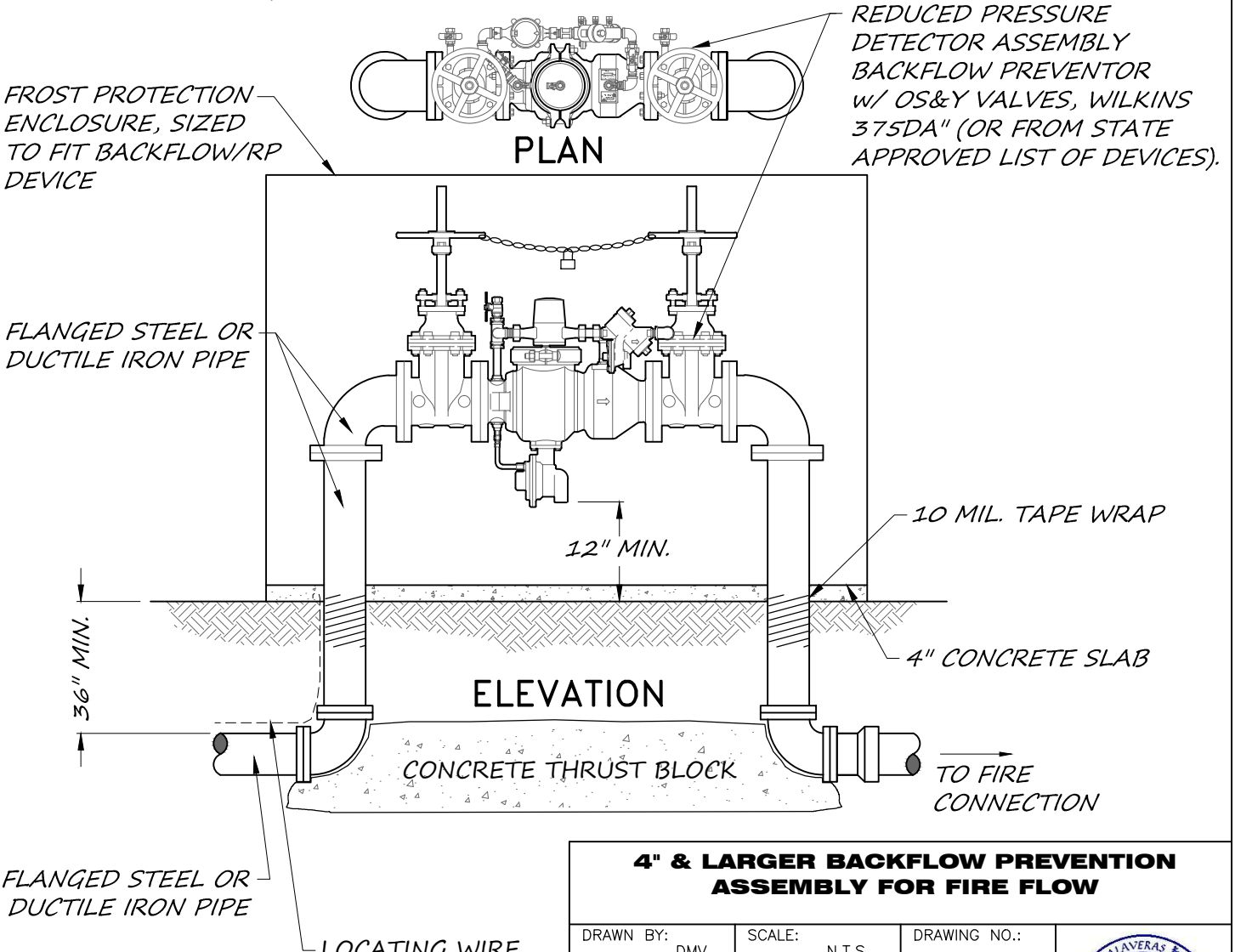
RESIDENTIAL REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-11
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:

NOTES:

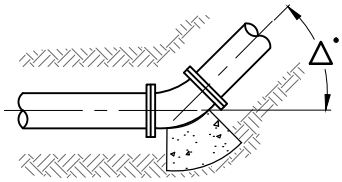
1. ALL MECHANICAL BACKFLOW PREVENTION DEVICES SHALL CONFORM TO THE LATEST REVISED CALIFORNIA DEPARTMENT OF PUBLIC HEALTH APPROVED LIST FOR CROSS CONNECTION.
2. THE TYPE OF DEVICE (REDUCED PRESSURE PRINCIPAL ASSEMBLY OR DOUBLE CHECK/DETECTOR ASSEMBLY) SHALL BE DETERMINED BY THE DISTRICT.
3. REDUCE PRESSURE BACKFLOW ASSEMBLIES SHALL BE REQUIRED ON ALL FIRE SERVICE CONNECTIONS.
4. NO TEES OR OTHER CONNECTIONS ARE ALLOWED ON THE ASSEMBLY.
5. INSTALL BACKFLOW PREVENTION DEVICE AS CLOSE AS PRACTICAL TO THE MAIN.
6. THE CUSTOMER SHALL OWN & MAINTAIN THE BACKFLOW DEVICE AND ALL PIPING FROM MAIN
7. CUSTOMER SHALL PAY ALL DISTRICT COSTS FOR INSPECTION AND TESTING.
8. GATE VALVE REQUIRED AT MAIN PER DETAIL WS-1.



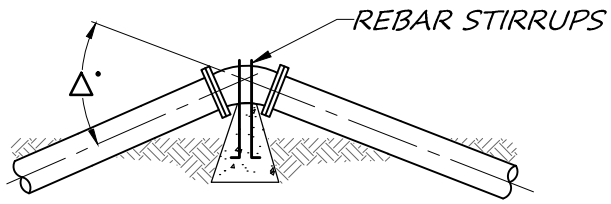
4" & LARGER BACKFLOW PREVENTION ASSEMBLY FOR FIRE FLOW

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-12
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:

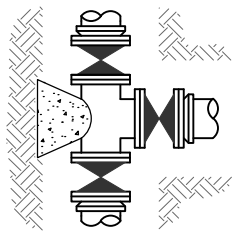
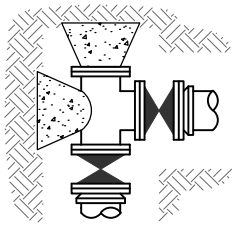
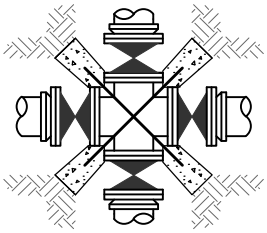
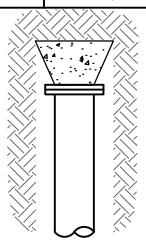
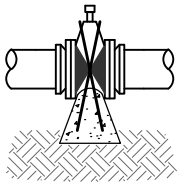


PLAN



ELEVATION

NOMINAL PIPE DIA. (IN.)	HORIZONTAL THRUST BLOCK BEARING AREA (SQ. FT.)				VERTICAL THRUST BLOCK VOLUME OF CONCRETE (CU. YD.)			
	Δ° =11 1/4°	Δ° =22 1/2°	Δ° =45°	Δ° =90°	Δ° =11 1/4°	Δ° =22 1/2°	Δ° =45°	Δ° =90°
4"	1.0	1.0	1.0	2.0	0.5	0.5	1.0	1.0
6"	2.0	2.0	3.0	4.0	0.5	0.5	1.0	2.0
8"	2.0	2.0	4.0	7.0	0.5	1.0	2.0	3.5
10"	3.0	3.0	6.0	12.0	1.0	1.5	3.0	5.5
12"	5.0	5.0	9.0	16.0	1.3	2.2	4.3	7.9

NOMINAL PIPE DIA. (IN.)					
	TEE	TEE w/BLDG. FLG.	CROSS	DEAD END	IN LINE VALVE
4"	2.0	2.0	2.0	2.0	1.3
6"	3.0	3.0	4.0	3.0	2.8
8"	5.0	5.0	7.0	5.0	5.0
10"	8.0	8.0	12.0	8.0	7.8
12"	12.0	12.0	16.0	12.0	11.3

EACH HORIZONTAL THRUST BLOCK BEARING AREA (SQ. FT.)

NOTE:

SEE NOTES ON SHEET WS-13 (SHT. 2 OF 2)

THRUST BLOCK DETAILS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:
APPROVED: GSG	DATE: APRIL 2016	**WS-13**
REV No.:	DATE:	BY:
		SHEET 1 of 2

CALAVERAS PUBLIC UTILITY DISTRICT

NOTES:

1. THRUST BLOCK AREAS & VOLUMES GIVEN ARE FOR A TEST PRESSURE OF 150 psi AND A SOIL BEARING PRESSURE OF 2000 lb/sf. INSTALLATIONS USING HIGHER PRESSURES OR LOWER SOIL BEARING PRESSURES WILL REQUIRE ADJUSTMENT OF THRUST BLOCK SIZE; SUBJECT TO APPROVAL BY DISTRICT ENGINEER. CONTRACTOR SHALL CONFIRM SOIL CONDITIONS.

2. THRUST BLOCKS TO BE CONSTRUCTED OF CLASS "B" CONCRETE & SHALL BE POURED AGAINST UNDISTURBED SOIL.

3. WRAP ALL FITTINGS, NUTS, & BOLTS WITH 6 MIL. POLYETHYLENE FILM.

4. JOINTS, FACE OF PLUGS AND NUTS & BOLTS TO BE KEPT CLEAR OF CONCRETE AND MUST BE ABLE TO OPERATE WITHOUT DISTURBING THRUST BLOCK.

5. VERTICAL BENDS SHALL USE RESTRAINED JOINTS AND A FULL LENGTH OF PIPE ON EACH SIDE OF FITTING.

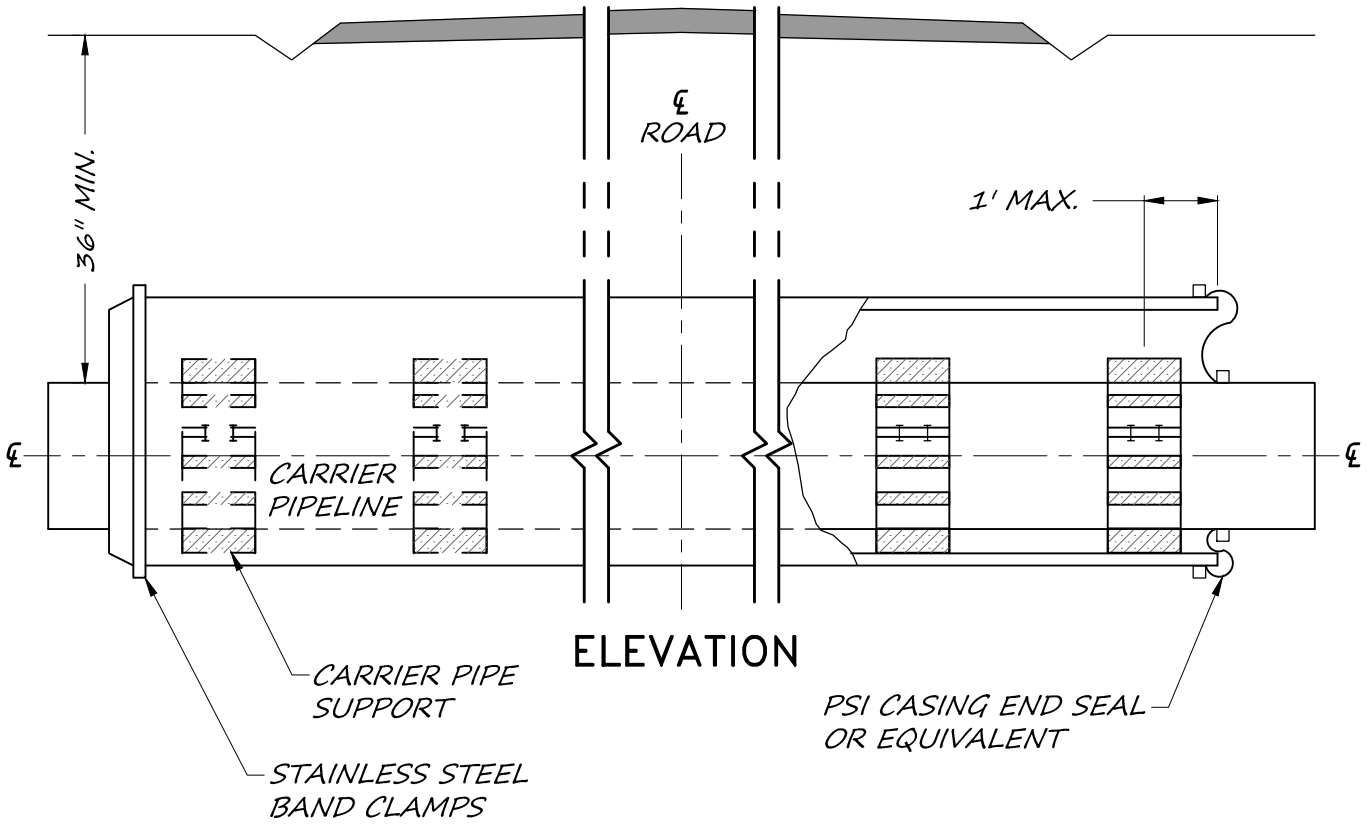
6. #4 REBAR SHALL BE PLACED AS SHOWN WITH 12" MINIMUM EMBEDMENT. REBAR STIRRUPS TO BE SHAPED WITH 90° BEND AT EACH END AND COATED WITH TWO COATS OF KOPPERS 505 OR EQUAL, 15 MILS EACH COAT. PLACE 14 GA. GALV. PLATE BETWEEN REBAR AND PIPE.

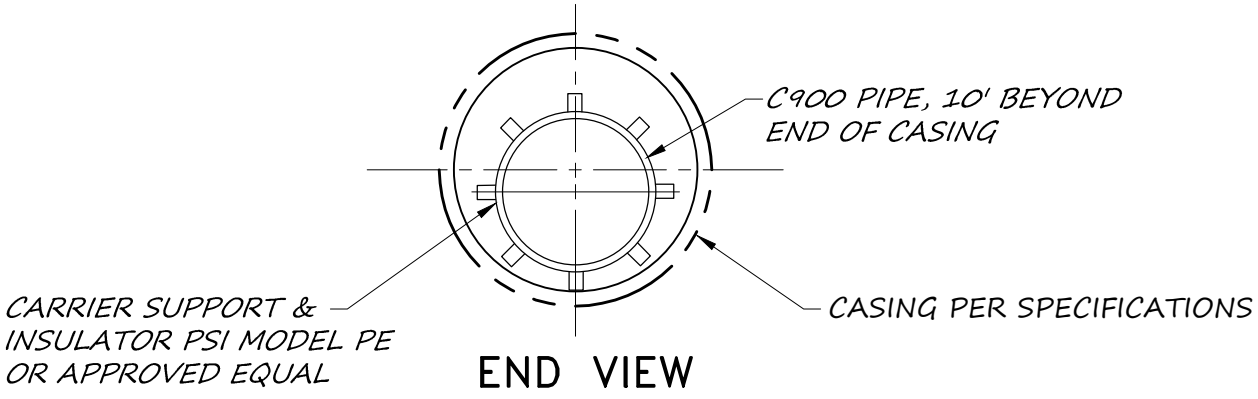
7. THRUST BLOCKS FOR REDUCERS SHALL HAVE A MINIMUM BEARING AREA OF 10 S.F..

THRUST BLOCK DETAILS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-13**	
REV No.:	DATE:	BY:	SHEET 2 of 2

CALAVERAS PUBLIC UTILITY DISTRICT





NOTE:

SEE NOTES ON SHEET WS-14 (SHT. 2 OF 2)

CASING & CARRIER PIPE

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-14**	
REV No.:	DATE:	BY:	SHEET 1 of 2
1	6/30/14	MSO	

CALAVERAS PUBLIC UTILITY DISTRICT

NOTES:

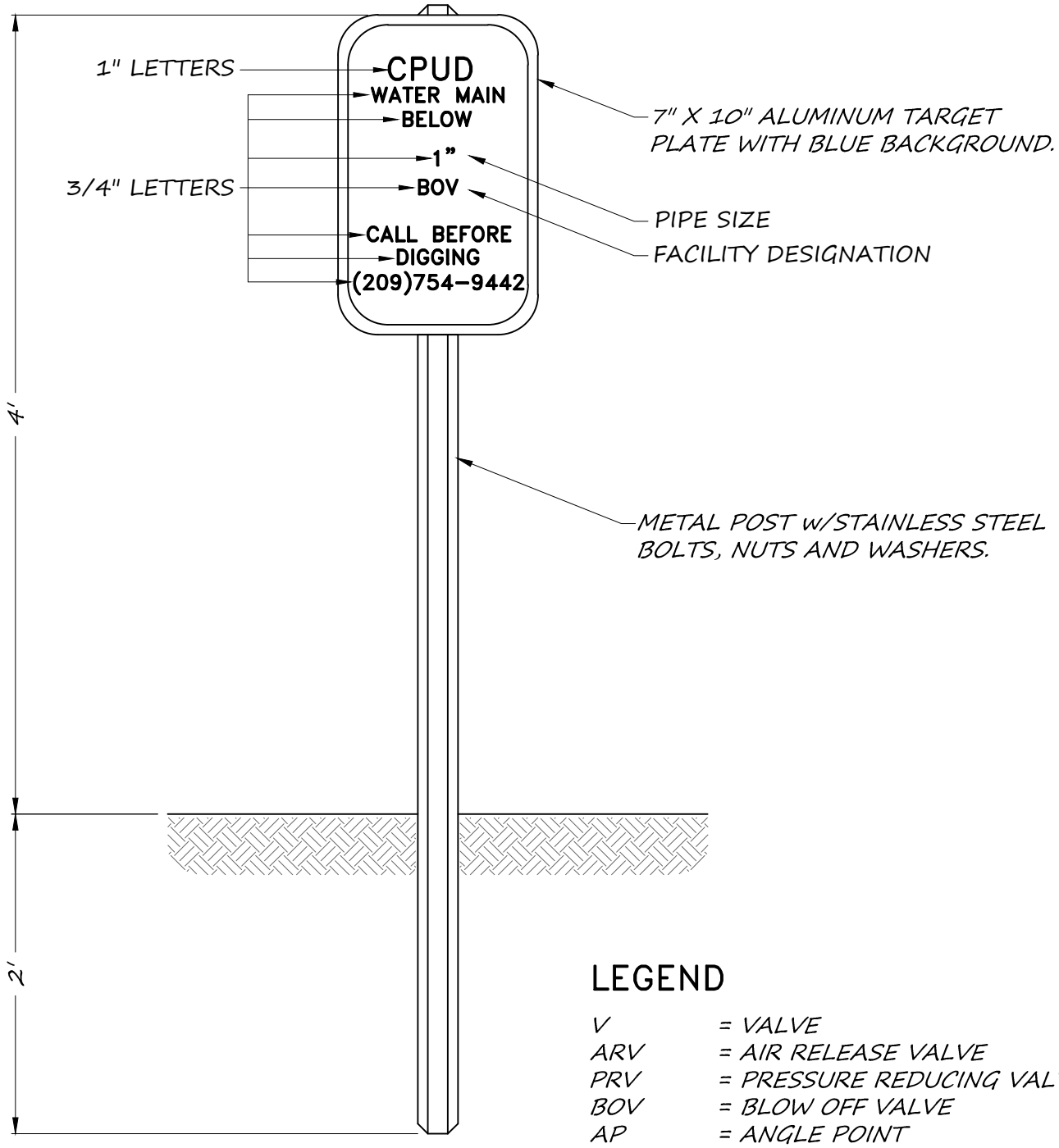
1. SKIDS OF CARRIER PIPE SUPPORTS SHALL BE GREASED BEFORE INSTALLATION.
2. SPACING OF CARRIER PIPE SUPPORTS SHALL BE PER MANUFACTURES RECOMMENDATION OR 9', WHICHEVER IS LESS.
3. CARRIER PIPE SHALL BE TESTED BEFORE SEALING ENDS.
4. BELLS OF CARRIER PIPE SHALL NOT REST ON CASING PIPE
5. VALVES SHALL BE LOCATED ON EACH SIDE OF CASING AS DIRECTED BY THE DISTRICT.

MINIMUM WALL THICKNESS		
CASING DIAMETER	**UP TO 150' LENGTH**	**OVER 150' LENGTH**
6 INCH TO 28 INCH	1/4 INCH	1/4 INCH
30 INCH TO 38 INCH	3/8 INCH	1/2 INCH
40 INCH TO 60 INCH	1/2 INCH	3/4 INCH
62 INCH TO 72 INCH	3/4 INCH	3/4 INCH

CASING & CARRIER PIPE

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	**WS-14**	
REV No.: 1	DATE:	BY:	SHEET 2 of 2

CALAVERAS PUBLIC UTILITY DISTRICT



LEGEND

V	= VALVE
ARV	= AIR RELEASE VALVE
PRV	= PRESSURE REDUCING VALVE
BOV	= BLOW OFF VALVE
AP	= ANGLE POINT

NOTES:

1. LOCATION OF MARKER SHALL BE APPROVED BY DISTRICT ENGINEER BEFORE PLACEMENT.
2. TARGET PLATE & POST SHALL CONFORM TO SECTION 82 OF CALIFORNIA STANDARD SPECIFICATIONS.
3. ALL NUMBERS AND LETTERS SHALL BE STENCILED IN WHITE.

WATER FACILITY MARKER

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.: WS-15
APPROVED: GSG	DATE: APRIL 2016	

REV No.:	DATE:	BY:

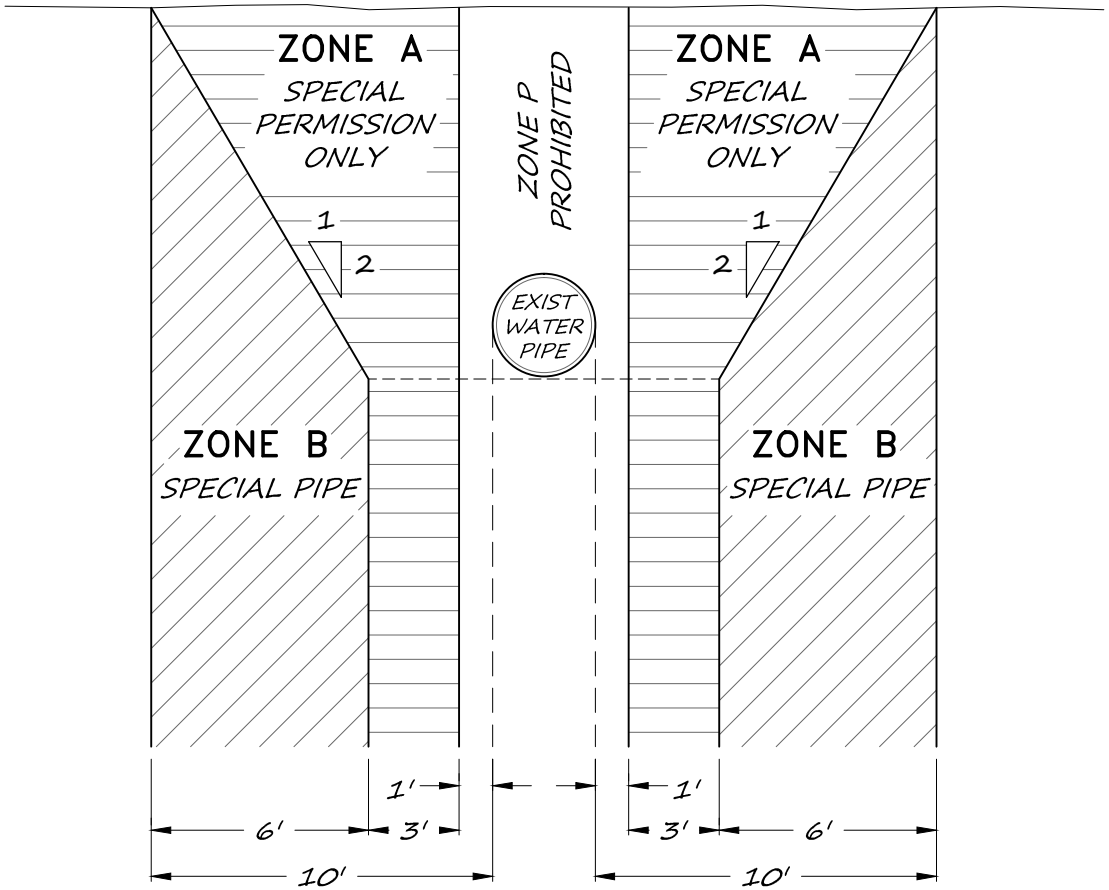
CALAVERAS PUBLIC UTILITY DISTRICT

SPECIAL CONSTRUCTION REQUIREMENTS

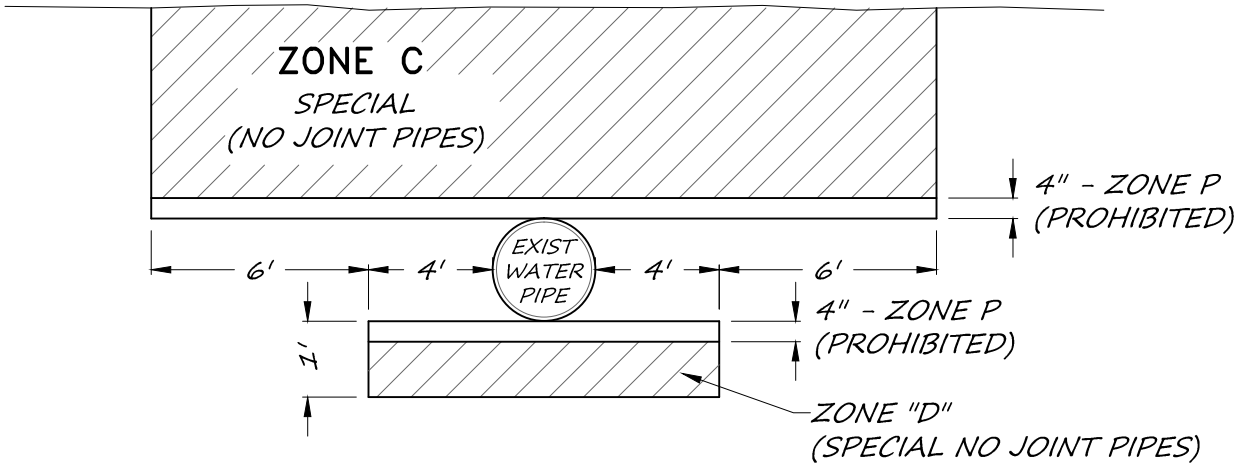
(TO BE USED ONLY WHERE REQUIRED SEPARATION CANNOT BE OBTAINED)

CASE 1 - NEW SEWER BEING INSTALLED

ZONES A,B,C, AND D INDICATE RESTRICTED AREAS.
ZONES P INDICATE PROHIBITED AREAS



PARALLEL CONSTRUCTION



PERPENDICULAR CONSTRUCTION

WATER SEPARATION STANDARDS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	WS-16A	

REV No.:	DATE:	BY:

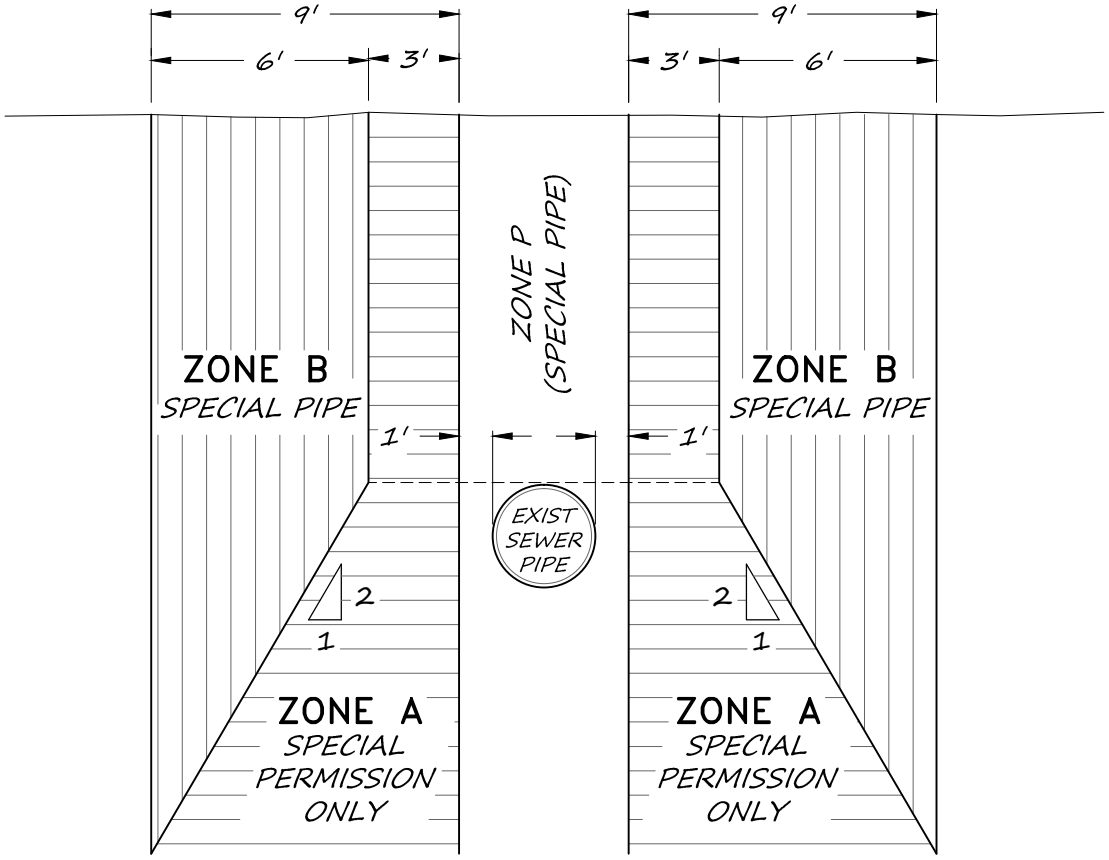
CALAVERAS PUBLIC UTILITY DISTRICT

SPECIAL CONSTRUCTION REQUIREMENTS

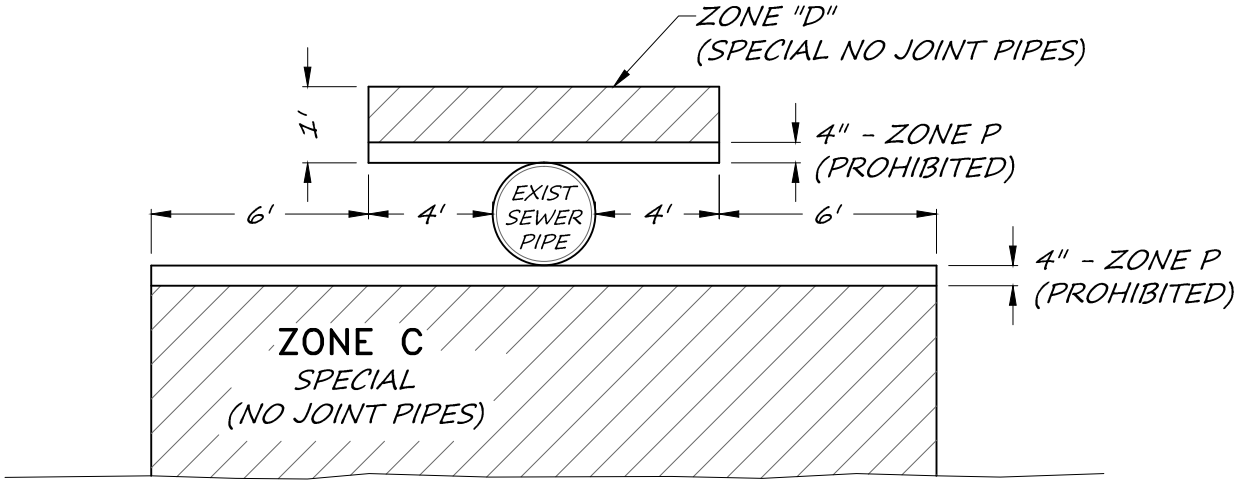
(TO BE USED ONLY WHERE REQUIRED SEPARATION CANNOT BE OBTAINED)

CASE 2 - NEW WATER LINE BEING INSTALLED

ZONES A,B,C, AND D INDICATE RESTRICTED AREAS.
ZONES P INDICATE PROHIBITED AREAS



PARALLEL CONSTRUCTION



PERPENDICULAR CONSTRUCTION

WATER SEPARATION STANDARDS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	
APPROVED: GSG	DATE: APRIL 2016	WS-16B	

REV No.:	DATE:	BY:

"A" BASIC STANDARDS:

NEW "CALIFORNIA WATERWORKS STANDARDS" SETS FORTH THE MINIMUM SEPARATION REQUIREMENT FOR THE WATER MAINS WITH SANITARY AND STORM SEWER LINES. THESE STANDARDS, CONTAINED IN SECTION 64630, TITLE 22, CALIFORNIA ADMINISTRATIVE CODE, SPECIFY:

1. PARALLEL CONSTRUCTION: THE HORIZONTAL DISTANCE BETWEEN PRESSURE WATER MAINS AND SEWER LINES SHALL BE AT LEAST 10 FEET.
2. PERPENDICULAR CONSTRUCTION (CROSSING): PRESSURE WATER MAINS SHALL BE AT LEAST ONE FOOT ABOVE SANITARY SEWER LINES WHERE THESE LINES MUST CROSS.
3. SEPARATION DISTANCES SPECIFIED ABOVE SHALL BE MEASURED FROM THE NEAREST EDGES OF THE FACILITIES.
4. WATER MAINS AND SEWER LINES MUST NOT BE INSTALLED IN THE SAME TRENCH.
5. WATER MAINS AND SEWERS OF 24 INCHES DIAMETER OR GREATER MAY CREATE SPECIAL HAZARDS BECAUSE OF THE LARGE VOLUMES OF FLOW. INSTALLATIONS OF WATER MAINS AND SEWER LINES OF 24 INCHES OR GREATER MUST BE REVIEWED AND APPROVED BY THE HEALTH AGENCY AND CITY ENGINEER PRIOR TO CONSTRUCTION.
6. WHEREVER THE WORD "SEWER" IS USED IN CONNECTION WITH ANY REQUIREMENTS A SHOWN ON DRAWINGS WS-16A, WS-16B AND WS-16C THE WORD SHALL APPLY TO SANITARY OR STORM SEWER INSTALLATIONS.

"B" EXCEPTION TO BASIC SEPARATION STANDARDS:

LOCAL CONDITIONS, SUCH AS AVAILABLE SPACE, LIMITED SLOPE, EXISTING STRUCTURES, ETC., MAY CREATE A SITUATION WHERE THERE IS NO ALTERNATIVE BUT TO INSTALL WATER MAINS OR SEWER LINES AT A DISTANCE LESS THAT THAT REQUIRED BY THE SEPARATION STANDARDS. IN SUCH CASES, ALTERNATIVE CONSTRUCTION CRITERIA AS SPECIFIED IN SECTION C SHALL BE FOLLOWED, SUBJECT TO THE SPECIAL PROVISIONS IN SECTION D.:

"C" ALTERNATE CRITERIA FOR CONSTRUCTION:

THE CONSTRUCTION CRITERIA FOR SEWER LINES OR WATER MAINS WHERE THE BASIC SEPARATION STANDARDS CANNOT BE ATTAINED ARE SHOWN ON DRAWINGS WS-16A AND WS-16B. THERE ARE TWO SITUATIONS ENCOUNTERED:

CASE 1 - NEW SEWER LINE - NEW OR EXISTING WATER MAIN

CASE 2 - NEW WATER MAIN - EXISTING SEWER LINE.

FOR CASE 1 - THE ALTERNATIVE CONSTRUCTION CRITERIA APPLY TO THE SEWER LINE.

FOR CASE 2 - THE ALTERNATIVE CONSTRUCTION CRITERIA APPLY TO EITHER OR BOTH WATER MAIN AND SEWER LINE.

THE CONSTRUCTION CRITERIA APPLY TO THE HOUSE LATERALS THAT CROSS ABOVE A PRESSURE WATER MAIN BUT NOT TO THOSE HOUSE LATERALS THAT CROSS BELOW A PRESSURE WATER MAIN.

WATER SEPARATION STANDARDS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	CALAVERAS PUBLIC UTILITY DISTRICT
APPROVED: GSG	DATE: APRIL 2016	WS-16C	

REV No.:	DATE:	BY:

CASE 1:

NEW SEWER BEING INSTALLED (DRAWING WS-16A)

ZONE SPECIAL CONSTRUCTION REQUIRED FOR SEWER.

A) SEWER LINES PARALLEL TO WATER MAINS SHALL NOT BE PERMITTED IN THIS ZONE WITHOUT APPROVAL FROM THE RESPONSIBLE HEALTH AGENCY AND WATER SUPPLIER.

B) A SEWER LINE PLACED PARALLEL TO A WATER LINE SHALL BE CONSTRUCTED OF THE FOLLOWING:

1. EXTRA STRENGTH VITRIFIED CLAY PIPE WITH COMPRESSION JOINTS.
2. PLASTIC SEWER LINES WITH RUBBER RING JOINTS (PER ASTM D3034) OR EQUIVALENT.
3. CAST OR DUCTILE IRON PIPE WITH COMPRESSION JOINTS.

C) A SEWER LINE CROSSING A WATER MAIN SHALL BE CONSTRUCTED OF THE FOLLOWING:

1. DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING AND MECHANICAL JOINTS.
2. A CONTINUOUS SECTION OF CLASS 200 (DR 14 C900) PLASTIC PIPE OR EQUIVALENT, CENTERED OVER THE PIPE BEING CROSSED.
3. ANY SEWER PIPE WITHIN A CONTINUOUS SLEEVE.

D) A SEWER LINE CROSSING A WATER MAIN SHALL BE CONSTRUCTED OF THE FOLLOWING:

1. A CONTINUOUS SECTION OF DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING.
2. A CONTINUOUS SECTION OF CLASS 200 (DR 14 C900)PLASTIC PIPE OR EQUIVALENT, CENTERED ON THE PIPE BEING CROSSED.
3. ANY SEWER PIPE WITHIN A CONTINUOUS SLEEVE.

WATER SEPARATION STANDARDS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:
APPROVED: GSG	DATE: APRIL 2016	**WS-16D**

REV No.:	DATE:	BY:

CALAVERAS PUBLIC UTILITY DISTRICT

CASE 2:

NEW WATER MAINS BEING INSTALLED (DRAWING WS-16B)

ZONE SPECIAL CONSTRUCTION REQUIRED FOR SEWER.

A) NO WATER MAINS PARALLEL TO SEWERS SHALL BE CONSTRUCTED WITHOUT APPROVAL FROM THE HEALTH AGENCY..

B) IF THE SEWER PARALLELING THE WATER MAIN DOES NOT MEET THE CASE 1, ZONE B, REQUIREMENTS, THE WATER MAIN SHALL BE CONSTRUCTED OF:

1. CEMENT LINED DUCTILE IRON PIPE WITH HOLT DIP BITUMINOUS COATING.
2. DIPPED AND WRAPPED ONE-FOURTH-INCH-THICK WELDED STEEL PIPE.
3. CLASS 200 PRESSURE RATED PLASTIC WATER PIPE (DR 14 PER AWWA C900) OR EQUIVALENT
4. REINFORCED CONCRETE PRESSURE PIPE, STEEL CYLINDER TYPE, PER AWWA (C300-74 OR C301-79 OR C303-70)..

C) IF THE SEWER CROSSING THE WATER MAIN DOES NOT MEET THE CASE 1, ZONE C, REQUIREMENTS, THE WATER MAIN SHALL HAVE NO JOINTS IN ZONE C AND BE CONSTRUCTED OF::

1. CEMENT LINED DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING.
2. CLASS 200 PRESSURE RATED PLASTIC WATER PIPE, (DR 14 PER AWWA C900) OR EQUIVALENT.
3. REINFORCED CONCRETE PRESSURE PIPE, STEEL CYLINDER TYPE, PER AWWA (C300-74 OR C301-79 OR C303-70). REQUIRES SPECIFIC DESIGN APPROVAL OF PIPE AND FITTING PRIOR TO POSSIBLE USE.

D) IF THE SEWER CROSSING THE WATER MAIN DOES NOT MEET THE REQUIREMENTS FOR ZONE D, CASE 1, THE WATER MAIN SHALL HAVE NO JOINTS WITHIN FOUR FEET FROM EITHER SIDE OF THE SEWER AND SHALL BE CONSTRUCTED OF:

1. A CEMENT LINED DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING.
2. CLASS 200 PRESSURE RATED PLASTIC WATER PIPE (DR 14 C900) OR EQUIVALENT.
3. REINFORCED CONCRETE PRESSURE PIPE, STEEL CYLINDER TYPE, PER AWWA (C300-74 OR C301-79 OR C303-70). REQUIRES SPECIFIC DESIGN APPROVAL OF PIPE AND FITTING PRIOR TO POSSIBLE USE.

WATER SEPARATION STANDARDS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:
APPROVED: GSG	DATE: APRIL 2016	**WS-16E**

REV No.:	DATE:	BY:

CALAVERAS PUBLIC UTILITY DISTRICT

"D" SPECIAL PROVISIONS:

1. THE BASIC SEPARATION STANDARDS ARE APPLICABLE UNDER NORMAL CONDITIONS FOR SEWAGE COLLECTION LINES AND WATER DISTRIBUTION MAINS, MORE STRINGENT REQUIREMENTS MAY BE NECESSARY IF CONDITIONS, SUCH AS HIGH GROUND WATER EXIST.

2. SEWER LINES SHALL NOT BE INSTALLED WITHIN 25 FEET HORIZONTALLY OF A LOW HEAD (5 PSI OR LESS PRESSURED) WATER MAIN.

3. NEW WATER MAINS AND SEWER SHALL BE PRESSURE TESTED WHERE THE CONDUITS ARE LOCATED TEN FEET APART OR LESS.

4. IN THE INSTALLATION OF WATER MAINS OR SEWER LINES, MEASURES SHOULD BE TAKEN TO PREVENT OR MINIMIZE DISTURBANCES OF THE EXISTING LINE..

5. SPECIAL CONSIDERATION SHALL BE GIVEN TO THE SELECTION OF PIPE MATERIALS IF CORROSIVE CONDITIONS ARE LIKELY TO EXIST.

6. SEWER FORCE MAINS.

   A. SEWER FORCE MAINS SHALL NOT BE INSTALLED WITHIN TEN FEET (HORIZONTALLY) OF A WATER MAIN.

   B. WHEN A SEWER FORCE MAIN MUST CROSS A WATER LINE, THE FORCE MAIN SHOULD BE AS CLOSE TO PERPENDICULAR AS PRACTICAL. THE SEWER FORCE SHOULD BE AT LEAST ONE FOOT BELOW THE WATER LINE.

   C. WHEN A SEWER FORCE MAIN CROSSES UNDER AN EXISTING WATER MAIN, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN TEN FEET (HORIZONTALLY) OF THE WATER MAIN SHALL BE ENCLOSED IN A CONTINUOUS SLEEVE.

   D. WHEN A NEW WATER MAIN CROSSES OVER AN EXISTING SEWER FORCE MAIN, THE WATER MAIN SHALL BE CONSTRUCTED OF PIPE MATERIALS WITH A MINIMUM RATED WORKING PRESSURE OF 200 PSI OR EQUIVALENT PRESSURE RATING.

WATER SEPARATION STANDARDS

DRAWN BY: DMV	SCALE: N.T.S.	DRAWING NO.:	CALAVERAS PUBLIC UTILITY DISTRICT
APPROVED: GSG	DATE: APRIL 2016	WS-16F	

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