

Improvement Standards Standard Specifications Standard Drawings

2017 Edition



**IMPROVEMENT STANDARDS
STANDARD SPECIFICATIONS
STANDARD DRAWINGS**

REVISIONS

For the latest Individually Approved Specifications, Standard Drawings and Approved Materials List, go back to the Improvement Standards main page and select one of the links.

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Division 1 - General

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Section 1 - General Information

Purpose

The purpose of these Standards is to provide minimum standards for the design and construction of improvements that are to be dedicated to and accepted by the Placer County Water Agency for maintenance and operation.

How to use these Standards

These Standards are organized into three divisions as follows:

- Division 1, General – Includes an overview of the processes and legal requirements required for development of Agency facilities.
- Division 2, Improvement Standards – Provides design criteria and plan requirements.
- Division 3, Standard Specifications – Provides written instructions concerning project requirements and details the level of quality necessary.

These Standards also include a description of the Facilities Agreement (FA), Encroachment Permit Information, Easement Submittal Information, the Agency's Pre-Approved Materials List, and a set of Standard Drawings.

- Appendix A, Facilities Agreement (FA) – This appendix provides an overview of the development process and project plans checklist.
- Appendix B, Encroachment Permit Information
- Appendix C, Easement Submittal Information – This appendix provides an overview of the recording laws, a standard grant of easement, and an easement project checklist
- Appendix D, Pre-Approved Materials List – The list contains materials currently approved by PCWA. Non-approved materials may be submitted for review and approval by PCWA. The Agency reserves the right to approve or deny any non-approved material at their discretion.
- Appendix E, Standard Drawings – Illustrates materials, dimensions, arrangement, and configurations necessary to properly complete work on Agency facilities.

Finally, the Index can help locate references in these Standards.

Incorporation of SCADA System Standards and Guidelines

The Agency also has written SCADA System Standards and Guidelines. These are provided in a three volume document that includes Standard Applications and Guidelines, SCADA and PLC Applications Programming, and Standard Drawings. The SCADA System Standards and Guidelines are incorporated into these Standards by reference; contact the Agency for instructions to obtain this referenced document.

Use of Pre-qualified SCADA System Integrators

The Agency allows only the use of pre-qualified System Integrators for services, manufacturing, and installation of SCADA systems. Contact the Agency for a current list of pre-qualified SCADA System Integrators.

Definitions

Whenever the following terms or titles are used in these standards or in any document or instrument where these standards govern, the intent and meaning shall be as herein defined:

Acceptance - The formal action by the Agency accepting the work as being complete.

Agency - The Placer County Water Agency (PCWA) or its authorized representative.

Agency Engineer - The Agency's Director of Technical Services or his authorized representative.

Agency Inspector - The person or firm authorized by the Agency to conduct construction review or observation.

Agency's Business Office - 144 Ferguson Road, Auburn, California 95603, tel. (530) 823-4850. Open 8 a.m. – 5 p.m. weekdays.

Agency's Personnel - Employees of Placer County Water Agency.

Agency's Rules and Regulations - (See Rules & Regulations)

Applicant - Any person, firm, partnership, corporation, or combination thereof, legally and financially responsible for the work.

Applicant's Engineer - An engineer licensed to work in the State of California who has been hired by the applicant to work on a project of interest to the Agency.

AWWA - The American Water Works Association.

Backfill - The material placed after a pipeline or other buried appurtenance has been placed.

Bacteriological Testing - Testing conducted after pipeline disinfection in accordance with AWWA C651 using a certified testing laboratory.

Bedding - The material placed in the trench bottom or above a foundation prior to placement of a pipeline or appurtenance.

Calendar Days - Number of days including weekends and holidays.

Caltrans Standards - The California Department of Transportation's current version of its standard specifications and drawings.

Canal Encasement - The process of placing a section of open-channel canal into a pipe, usually to protect it from potential damage or contamination as adjacent areas are developed.

Carrier Pipe - A pipeline within a casing pipe.

Casing Pipe - A pipe sleeve outside of another pipeline, used to protect the inner (Carrier) pipe from overburden pressures, hazardous substances in the soil, or corrosion.

Cold Climate Area - Elevations 3,200 ft. and higher, as per Standard Drawing S501.

Cold Weather - A period of more than three successive days when the mean daily temperature falls below 40°F or any day when the low temperature is expected to fall or falls below freezing (32°F).

Contractor - The individual, partnership, corporation, joint venture, or other combination thereof licensed to perform the work who has entered into a contract with the Developer for construction of the improvements in accordance with Agency's approved Plans and these standards.

County - The County of Placer.

Cross Connection Control - Measures taken to ensure potable water quality in distribution and transmission systems is not harmed by connections to services and other outlets.

Customer Service - Agency personnel who answer questions and provide information and services to builders who add new connections and system improvements. Hours are 8 a.m. – 5 p.m., Monday-Friday, excepting holidays, at (530) 823-4850 inside Placer County, or (800) 464-0030 outside Placer County.

Days - Unless otherwise specified, calendar days.

Developer - The applicant or authorized representative.

Development or Improvement Standards - The most current version of the Agency's Improvement Standards.

Distribution Pipe - An Agency pipeline up to and including 18 inches in diameter that can be tapped for services anywhere along its length.

Encasement - See Canal Encasement.

ERT - A device that sends meter readings to Agency personnel at a distance. (The acronym stands for "electronic receiver/transmitter.")

Facilities - Agency-owned and-operated infrastructure intended to supply, treat, or distribute water to its customers or support the process of doing so.

Facilities Agreement - A contract between the Agency and an Applicant that provides the means for the Agency to take over ownership and operation of the Facilities constructed by the Applicant per Agency standards and with Agency approval.

Field Service - Maintenance and repair of Facilities by trained and experienced Agency personnel.

Final Backfill - Material placed above the intermediate backfill to at least six inches below final grade in an unpaved area.

Fire Flow - The flow of water required to supply fire-suppression water to any point in the Agency system.

Gravity Piping - Pipeline constructed to carry water that flows entirely under the influence of gravity.

Haunching - Material placed from the top of the bedding to the spring line of the pipe unless otherwise shown.

Improvement Standards - Document defining the minimum Agency requirements for constructing Facilities.

Initial Backfill - Material placed from the spring line of the pipe to 12 inches above the pipe crown unless otherwise shown.

Intermediate Backfill - Material placed from the top of the initial backfill to the road subgrade or to the final backfill.

Joint Harness - A mechanical means of restraining pipes at pipe joints external to the pipe structure.

Large Meter - Any meter larger than 1.0 inches in nominal diameter.

Max Day Demand - The greatest total potable water quantity required during a single day.

Outage - A period in which a portion of the Agency distribution or transmission system cannot deliver water to its customers.

Peak Day Demand - The greatest potable water flow rate required during a single day, averaged throughout that 24-hour period.

Peak Hour Demand - The greatest potable water flow rate required during a single hour, averaged throughout that hour.

Permittee - Party that holds or is applying for an Agency encroachment permit.

Plans - The drawings or reproductions thereof showing the location, character, dimensions, and details of the work to be done.

Potable Water - Water treated for human consumption.

Private Facility - Pipeline, appurtenances, and other improvements on the service side of a meter or as shown in the Standard Drawings.

Raw Water - Non-potable water conveyed primarily canals and pipes used for irrigation, power generation, or as source water to treatment plants.

Rules and Regulations (Agency) - The most current version of the Agency's "Rules, Regulations, Rates and Charges Governing the Distribution and Use of Water" (A copy of the current addition may be obtained at the Customer Service counter located at 144 Ferguson Rd. Auburn, CA.

Standards - Documents defining minimum levels of competence, workmanship, or materials written by an Agency-recognized authority.

Standard Drawings - The most current version of the Agency's Standard Drawings.

State - The State of California.

Subcontractor - An individual, partnership, corporation, joint venture, or other combination thereof who has entered into a contract with the Contractor to perform any of the work. Subcontractor also means an individual, partnership, corporation, joint venture, or other combination thereof who has entered into a contract with another subcontractor to perform any of the work.

Technical Specifications - The most current version of the Agency's Standard Specifications.

Test Pressure - The test pressure (in psi) a pipeline and its appurtenances is subjected to for Agency acceptance.

Tie-In - A connection to a pipeline in the Agency's distribution or transmission system.

Transmission Pipe - Any Agency pipeline 24 in. or larger in diameter, usually with no or very few service taps.

Treated Water - Potable water distributed throughout pressurized transmission and distribution mains.

Work - Any and all obligations, duties, and responsibilities necessary to complete the construction assigned to, or undertaken by, the Contractor pursuant to these Standards including all labor necessary to produce such construction and all materials, equipment, and supplies incorporated or to be incorporated in the construction. Also, the completed construction or parts thereof required to be provided under the Contract Documents.

Working Days - All days except Saturdays, Sundays, and Agency holidays.

Working Hours - For inspection purposes, working hours shall be 7:00 a.m. to 3:30 p.m. Monday through Friday except for Agency holidays.

Working Pressure - Maximum static pressure plus the surge pressure due to a one foot per second change in velocity pressure (maximum static pressure plus 50 psi minimum) unless otherwise specified.

Abbreviations List

AASHTO	A merican A ssociation of S tate H ighway and T ransportation O fficials
AC	Asphaltic Concrete or A lternating C urrent
ACI	A merican C oncrete I nstitute
ACI 306	A merican C oncrete I nstitute cold weather placement specifications
ACI 506	A merican C oncrete I nstitute Equipment & Crew Requirements
AG	A ir G ap
AGENCY	P lacer C ounty W ater A gency
ANSI	A merican N ational S tandards I nstitute
ANSI BI	A merican S ociety for T esting and M aterials Bi-national standard
APA	A merican P lywood A ssociation, E ngineers W ood A ssociation
AQMD	A ir Q uality M anagement D istrict
ASA	Was A merican S tandards A ssociation & changed to ANSI (See above)
ASME	A merican S ociety of M echanical E ngineers
ASTM	A merican S ociety for T esting and M aterials
ATS	A node T est S tation
AVRV	A ir/ V acuum R elease V alve
AWG	A merican W ire G auge
AWWA	A merican W ater W orks A ssociation
BOV	B low-off V alve
BPD	B ackflow P revention D evice
Cal-OSHA	C alifornia – O ccupational S afety and H ealth A dministration
CARB	C alifornia E nvironmental P rotection A gency, A ir R esources B oard
CCML	C oncrete C oated M ortar L ined
CCP	C oncrete C ylinder P ipe
CCW	C ounter C lockwise
CIP	C ast I n P lace or C ast I ron P ipe
CP-Test	C athodic P rotection
CPVC	C hlorinated P oly V inyl C hloride
CW	C lockwise
CWO	C old W eather O nly
DC	D ouble C heck valve assembly
DCDA	D ouble C heck D etector A ssembly
DDW	C alifornia D ivision of D rinking W ater
DIP	D uctile I ron P ipe

DR	Diameter Ratio
EBAA	Earl Bradley & Associates Iron Restraint MFG
ERT	Electronic Receiver/Transmitter
FA	Facilities Agreement
FRP	Fiberglass Reinforced Thermosetting Plastic
GPS	Global Positioning System
HDPE	High Density Polyethylene pipe
HWMPE	Insulation Material Designation
HZ	Hertz
IPS	Iron Pipe Size
IR drop	Free of voltage drop across the circuit
LCD	Liquid Crystal Displays
LED	Light Emitting Diode
MLS	Mortar-Lined Steel pipe
MSDS	Material Safety Data Sheets
NACE	National Association of Corrosion Engineers
NACE RP	National Association of Corrosion Engineers Reference Paper
NAD 83	North American Datum of 1983
NEMA	National Electrical Manufactures Association
NGVD 29	National Geodetic Vertical Datum, 1929
NSF	National Science Foundation
OS&Y	Outside Stem & Yolk
OSHA	Occupational Safety and Health Administration
PCC	Portland Cement and/or Concrete
PCWA	Placer County Water Agency
PE	Polyethylene
PE3408	PPI Polyethylene pipe classification, meets ASTM D3350
PPI	Plastic Pipe Institute
PSI	Pounds Per Square Inch
PVC	Polyvinyl Chloride pressure pipe
PWS	Public Water System
RP	Reduced Pressure principle device
RPDA	Reduced Pressure principle Detector Assembly
RW	Raw Water pipeline or Wire color designation (R =black insulation)
SCADA	Supervisory Control and Data Acquisition

SDR	Standard Dimension Ratio
SE	Sand Equivalent
SP-XX	Surface Preparation – (XX=specification #)
SS	Stainless Steel Pipe
SSPC	Steel Structures Painting Council
SSPC-PA1	Paint Application Specification No. 1, Shop, Field & Maintenance Painting
SWRCB	State Water Resources Control Board
THHN	Thermoplastic High Heat-resistant Nylon-coated
THWN	Thermoplastic High Water-resistant Nylon-coated
TW	Treated Water pipeline or Wire color designation (T = white insulation)
USE-2	Direct Burial Building Wire Type USE-2 (EPR_HYP) 600V
USA	Underground Service Alert
W	Welded Wire Mesh Wire Diameter (W0.05= 50 thousands Dia.)
WOG	Water, Oil and Gas
WWF	Welded Wire Fabric

Facilities Agreements (FA)

All Facilities to be accepted for ownership and maintenance by the Agency shall be installed under the provisions of an FA. All physical encroachments to Agency easements, property or facilities are prohibited except when expressly permitted by an Agency Encroachment Permit.

The Facilities Agreement is not fulfilled or completed until the Agency accepts the Facilities.

Prior to Acceptance of the Facilities the Applicant must provide to the Agency:

- All easements and fee title property.
- Two copies of the project parcel or subdivision map.
- A map or list correlating the addresses to each property for the parcels or lots in the project.
- Electronic files of asbuilts conforming to the requirements in Division 2, Section 4, Plan Sheet Requirements of these Standards.
- Adequate funds in the project account to provide a minimum deposit in the amount required by the Facilities Agreement.

Facilities Agreement (FA) Process

The Agency's map files, for research by the Applicant/Applicant's Engineer, are available at the Agency's Business Office at 144 Ferguson Road in Auburn during normal business hours. A completed Application is to be submitted to Customer Services for PCWA Project Review. Plan submittals will be reviewed by the Agency. After the plans are finalized, the Applicant/Applicant's Engineer will request a Facilities Agreement to be prepared and placed on an agenda for approval by the Board of Directors of the Placer County Water Agency. Once approved, copies of the Facilities Agreement will be signed by the Applicant/Applicant's Engineer, fees and charges will be paid, and the Facilities Agreement will then be signed by the

Agency. For further detail on the process, refer to Appendix A. Certain Facility Agreements may not require Board of Directors approval and signing.

Applicant Billing

The applicant shall be billed and shall pay all costs associated with the proposed facilities, including costs for plan review, inspection, mapping, clerical support, and engineering review.

Approved Plans

Complete plans and specifications for all proposed facilities to be accepted for ownership and maintenance by the Agency shall be submitted to the Agency for review and approval. This approval shall be evidenced by the signature of the Agency Engineer on the title sheet of the Plans prior to beginning any construction of proposed Agency facilities. No work on Agency facilities will be allowed without approval by the Agency Engineer.

Standards

All facilities to be accepted for ownership and maintenance by the Agency shall conform to the latest edition of the Agency's Standards, AWWA Standards and SWRCB. If these standards conflict, the Agency's standards shall have precedence. The applicant or the applicant's authorized representative shall be responsible for obtaining all necessary information, requirements, specifications, and standards to design and construct the proposed improvements in accordance with these requirements.

Alternatives to the SWRCB, DDW Standards

Proposals to use an alternative to a requirement of the DDW Standards must demonstrate to the DDW and the Agency that the proposed alternative will provide the same level of protection to public health and be approved in writing by the DDW prior to Agency approval of the plans and prior to implementation.

To request approval of an alternative the Applicant's engineer shall submit a letter to the Agency:

- Identifying the location where the alternative will be implemented.
- Explaining the need for the alternative.
- Describing the alternative.
- Stating that the letter is a request to the DDW for approval of an alternative to the DDW Standards.

The letter shall be stamped and signed by a California registered civil engineer.

The Agency will submit this letter to the DDW on behalf of the Applicant. Letters should not be sent directly to the DDW.

Plan Submittal

Complete Plans and specifications for all proposed improvements shall be submitted to the Agency for approval.

All initial plan submittals shall include the following:

- A completed Application for Project Review. Note: the Applicant identified on this form will be the party identified in the FA as the responsible party.
- Payment of the plan check deposit.

- Three (3) complete sets of improvement Plans prepared in accordance with these requirements.
- Tentative parcel map (if applicable).
- A supplemental service information forms.
- A completed "Project Plans Checklist". See Appendix A.

Subsequent plan submittals shall consist of two (2) sets of improvement Plans. Incomplete plan submittals shall not be processed and will be returned to the applicant.

After Agency approval of the Plans, three hard copy sets of Plans and one digital copy be provided to the Agency.

Pre-Construction Requirements

Prior to beginning construction of any facilities under an FA the following items shall be completed:

- Plans shall be approved and signed by the Agency Engineer.
- An FA shall be approved and signed by both the Applicant and the Agency.
- All necessary deposits and fees shall be paid.
- All required performance bonds shall be provided, reviewed by the Agency, and found to comply with the Agency's performance bond requirements.
- Proper insurance certificates shall be submitted, reviewed by the Agency, and found to comply with the Agency's insurance requirements.
- All required pre-construction easements shall be prepared, submitted, reviewed and approved by the Agency.
- Any special conditions in the FA that must be met prior to construction are completed.
- The Applicant provides to the Agency, AutoCAD files showing all existing and proposed property lines within the project with property lines placed by themselves on one of two layers, "EXISTING PLS", and "PROPOSED PLS".

Inspection

One or more inspectors may be assigned by the Agency Engineer to observe any and/or all the work. The inspector(s) may inspect any part of the work and/or materials and shall have full authority to accept or reject said work and/or materials. Such inspection shall not relieve the Developer and/or Contractor of the obligation to conduct comprehensive inspections of the work, to furnish acceptable materials, perform acceptable work and to provide adequate safety precautions.

The FA Applicant shall be billed and shall pay all Agency inspection costs, including costs for mapping, clerical support, and engineering review for the FA.

Easements/Rights of Way and Fee Title Property

The applicant shall provide the Agency with all necessary property and easements/rights of way for the proposed improvements.

All easements shall be prepared in the Agency's standard easement format and shall include all necessary legal descriptions and plat maps. See Appendix C for the Standard Grant of Easement form.

All easements and deeds will go through an escrow officer and be recorded by the escrow officer with a title company selected and approved by the Agency.

Construction of buildings and/or structures shall not be permitted within the Agency's easements.

The minimum easement width for pipelines shall be 20 feet. Easement widths greater than 20 feet may be required at the Agency's discretion.

Fee title to property shall be provided for all major above ground facilities and structures such as storage tanks, pumping stations, pressure reducing valve stations, water treatment facilities, or other facilities as determined by the Agency. When fee title to property is to be provided, it shall be sized sufficient that the Agency is able to adequately conduct all functions for which the property is intended and allow fencing.

Encroachment Permits

The Agency prohibits use of right of ways, easements, canals, and canal banks for planting trees, vines, or other crops, and prohibits construction of fences, pipes, bridges, crossings, or other structures.

At the Agency's sole discretion, Encroachment Permits may be issued that allow an encroachment, subject to conditions, terms and provisions included in the permit. If the permittee fails to uphold those conditions, terms and provisions the Agency may terminate the Encroachment Permit.

Applications for Encroachment Permits are handled using the Facilities Agreement procedure. An encroachment permit sample document can be found in Appendix B.

Warranties and Repairs

The Applicant shall warranty all materials and workmanship provided under a Facilities Agreement for a period of one year after the date of acceptance of the facilities. The Applicant shall be fully responsible for all direct and indirect damages and expenses to the Agency caused by such defects in materials and workmanship including defects in materials and workmanship supplied to the Applicant's Contractor by any subcontractor or manufacturer of equipment.

Existing Utility Location

For location of existing waterlines, appurtenances and other utilities, the Applicant and/or Contractor shall notify U.S.A. (Underground Service Alert) 48 hours before performing excavation. Not all utilities participate in U.S.A., and procedures for determining existing utilities vary by location. Proper utility location is the Applicant/Contractor's responsibility. The location of existing utilities on Agency documents is based on information from others and is considered approximate.

Requirement for Applicants

At the end of the project construction, the Consulting Engineer shall submit one electronic set of Record Drawings. Record Drawings are to show (any and all) PCWA Project Engineer approved changes and those changes approved by any other Authority that were made after the initial plan approval process. Copies of field records and drawing revisions will be provided to the Consultant by the Agency after completion of construction. These changes are to be clouded and shown as revisions to the plans, each revision shall be noted on the affected sheet only, and then all revisions with pages affected shall be listed on the cover sheet. The set of record drawings must be the originals showing the Engineer's original wet stamp and signature, PCWA's Project Engineer's approval block with signature and if applicable, Placer County's original approval signatures and initials on each sheet.

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Division 2 – Improvement Standards

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Section 1 - Design Criteria for Treated Water Facilities

Intent of Criteria

The intent of these criteria is to provide a treated water system that will:

- Be free of sanitary hazards.
- Protect the quality of the water delivered to users at all times.
- Protect the distribution system against backflow contamination.
- Be adequately sized to provide water treatment, transmission, storage, and distribution capacity.
- Be structurally sound and withstand, with ample safety factors, the physical stresses imposed during normal and extreme operation.
- Minimize the effects of disruptive and reasonably foreseeable events like power outages, equipment or structural failures, earthquakes, fires, floods, and sabotage.
- Protect against unauthorized entry, unauthorized use of water, and/or vandalism.
- Protect against adverse effects in areas subject to freezing weather.

Water Supply Pressure

The distribution system shall be designed to maintain an operating pressure at all service connections of not less than 50 psi or more than 120 psi. A minimum of 40 psi may be utilized on a project specific basis only at the Agency's sole discretion and only for unique project conditions, such as simplifying a pressure zone configuration. During periods of maximum day usage and coincident fire demand, service pressure shall not be less than 20 psi.

In accordance with the Uniform Plumbing Code, in areas where the static water pressure is in excess of 80 psi, a pressure regulator shall be installed on the customer's side of the service meter. The pressure regulator shall be owned and maintained by the customer.

Water Usage Rates (Not For Meter Sizing)

For design of the distribution system, apply a maximum-day demand for each typical residential dwelling unit as in the following table. Peak-hour demands shall be assumed at 160% of the of the maximum-day demand. Usage rates for other existing entities may be obtained from the Agency.

Number of Dwelling Units in Development	Maximum-Day Flow (gpm) per Dwelling Unit
1-10	5
11-20	2.5
21-35	1.5
36-60	1.0
>60	0.8

Fire Flows

Required fire flows shall be determined by the Fire Protection District having jurisdiction. Maximum velocity anywhere in the Agency's system under peak day usage plus fire flow conditions shall be 7 feet per second.

Water Treatment Plants

Provide engineering report to the Agency for review and approval for all new Water Treatment Plant work or process change modifications. The report shall be prepared by a qualified engineer registered in California and experienced in potable water treatment. The report shall contain a description of the design of the proposed treatment process and address the means of compliance with all current and proposed regulations. All new water treatment plants or modifications to existing ones shall be designed in accordance with the latest requirements of the California Division of Drinking Water and all applicable Federal Regulations.

Wells

Each new public water supply well shall:

- Be constructed in accordance with the California Department of Water Resources Bulletins 74-81 and 74-90.
- Be equipped with chlorination facilities.
- Be equipped with a sampling tap located on the discharge line between the discharge check valve and the chlorine injection point.
- Include valves as necessary to allow the well to be pumped to waste. An approved backflow device shall be provided on the discharge line prior to connection to the treated water system.
- Be provided with piping to an acceptable location for receiving water pumped to waste.
- Be equipped with a flow meter capable of determining and recording the instantaneous rate of flow and total volume pumped over time.
- Be equipped with an emergency generator having fuel storage sufficient to run the well for a set amount of time determined by the Agency and dependent on the well's importance to the system.
- Include an adequately sized building, constructed of masonry block or other Agency approved building material, enclosing the chlorination facilities, meter, well head and emergency generator.
- Include a telemetry connection to the Agency's SCADA.

Storage Facilities

Water storage facilities shall:

- Have SCADA connection, SCADA control and Alarm Systems.
- Be designed with a separate inlet and outlet located on opposite sides of the facility to minimize short-circuiting of the water flow through the storage facility.
- Be equipped with isolation valves and bypass piping to allow the storage facility to be removed from service and accessed for maintenance.
- Be designed to allow ready access into the reservoir for inspections, cleaning, and repair. Storage facilities located above ground shall be equipped with a ladder to allow access to the entry opening. The ladder and access hatch shall be lockable and include an anti-climb device to prevent use by unauthorized persons. The ladder shall also be equipped with a fall restraint system conforming to Cal-OSHA regulations.
- Be constructed of welded steel in accordance with AWWA D-100 or prestressed concrete in accordance with AWWA D-110 and ACI-350.
- Be designed to include a paved access road around the facility perimeter.
- Include a security fence around the site with a lockable gate.

- Provide tank overflow facilities to acceptable location. Overflow to be based on maximum influent supply.
- Provide for chlorine removal on the overflow prior to discharge.
- Have a Flow Meter and a Tank Hatch Alarm.

Water storage facility sizing shall be the sum of the following three components or as required by the Agency:

- Operational Storage – 25 percent of the maximum day demand for the pressure zone.
- Fire Storage – The maximum combination of fire flow and duration in the pressure zone.
- Emergency Storage – 25 percent of the maximum day demand for the pressure zone.

Pumping Stations

An engineering report shall be prepared by an engineer registered in California and competent to work on new pumping stations or modifications to existing ones. The report shall contain, at a minimum, a description of the proposed pumping facilities or modifications, hydraulic and pump design criteria, system surge analysis, an estimate of the annual operation and maintenance costs, and a description of the control logic.

Pumping stations shall:

- Be paved and fenced.
- Be designed for automatic operation.
- Be designed with enough pump redundancy to operate the station at maximum design flow with one pump out of operation.
- Be designed with multiple pumps, rather than a single pump to reduce the chance of pump station shutdown.
- Be enclosed within an adequately sized masonry block building having adequate access for operation and maintenance.
- Have a meter measuring instantaneous flow and total volume.
- Be connected to the Agency's SCADA system.
- Include building intrusion alarms.

Pressure Reducing Stations

Pressure reducing stations shall:

- Be located at locations determined by the Agency.
- Be designed with a single diaphragm-actuated and/or direct-acting pressure reducing valves of sufficient size and/or quantity to convey the full capacity of the pipeline supplying the pressure reducing station.
- Be located on property granted to the Agency or on Agency property.
- Be designed as an above-ground facility. The pressure reducing station shall be enclosed in a masonry block building or a light-duty permanent housing, per Agency decision and per Standard Drawings S213 and S214.
- Be designed with a bypass matching the size of the adjacent main.
- Include pressure readouts upstream and downstream of the pressure reducing valve, metering flow rate, and Agency's SCADA control with the Agency system.

Interconnections with Other Water Purveyors

Interconnections with other water purveyors shall:

- Be provided if required by the Agency.
- Be located per the Agency's requirement.
- Include a meter that accurately measures the rate of flow, totalizes the flow each way, and is connected with the SCADA system.
- Include a length of exposed pipeline with no fittings or flow disruptions equal to at least five pipeline diameters or manufacturer's recommendation on both sides of the meter.
- At the Agency's discretion, include adequately sized bypass piping and valves to be used in the event that the meter must be removed for maintenance.
- Include a telemetry connection to the Agency's existing telemetry system. The connection shall provide the ability to monitor real-time rate of flow and to produce reports showing total flow volume per hour, day, and month.
- Include an above-ground pedestal located adjacent to the metering facility containing the telemetry and communication equipment. A digital readout of the meter's cumulative total flow volume in thousand gallons (or other appropriate unit as agreed to by the Agency) shall be located within the pedestal.
- Be designed with adequate space to park a vehicle off-street adjacent to the metering facility.

Telemetry

Telemetry and communication equipment shall be designed in accordance with the Agency's current hardware and software design guides. Communication between remote sites and the Agency's current telemetry network shall be by radio using the Agency's designated frequency. In the event that a clear radio path is not available between the remote site and the Agency's communication system, a leased telephone line using the Agency's current circuit or fiber-optic network may be used with approval from the Agency.

Telemetry connections shall be required at the following locations:

- Water treatment plants
- Wells
- Storage tanks
- Pressure reducing stations
- Pumping stations
- Metering stations for interconnections with other water purveyors
- Other key facilities as determined by the Agency where real time and/or historical information will assist the Agency in providing water service in a safe, reliable, and efficient manner.

Corrosion Control

At a minimum, corrosion control measures shall be considered for improvements for the following facilities:

- Storage tanks
- Valves
- Pipelines

Note: All buried ductile iron pipelines, ductile iron fittings and all buried services shall be polyethylene encased per AWWA C105/A21.5-10. Additional cathodic or corrosion protection may be required by the PCWA Project Engineer on a case by case basis.

- Bore-and-Jack or microtunneling casings and carrier pipes.

Landscaping

When required by the Agency, landscaping shall be provided at Agency facilities. Landscaping design shall take into account local landscaping ordinances, utilize drought tolerant plants, and include an irrigation system that requires minimal maintenance. All commercial landscaping services must be equipped with a backflow device.

Landscaping may be required for improvements to the following facilities and may be required at other types of facilities at the Agency's discretion:

- Water treatment plants
- Storage tanks
- Pumping stations
- Pressure reducing stations
- Metering stations
- Other facilities located on Agency property

Distribution System

Pipeline Design Criteria

- Depth of cover shall be a minimum of 30 inches except in the Cold Climate Area. In the Cold Climate Area, 48 inches minimum cover is required.
- Max cover shall be 60 inches unless shown and called out on plans and approved by Agency.
- Trench width shall be per Standard Drawing S101.
- Bedding shall be compacted 90 percent maximum dry density to 12 inches above pipe, load factor 1.5.
- Soil density: 150 pounds per cubic foot.
- Bedding angle: 90 degrees.
- Live load: AASHTO H-20, 16,000 pound wheel load.
- Rigid pipe: 1.5 factor of safety versus crushing.
- Flexible pipe: deflection at joint is not allowable. All Horizontal changes in directions shall be made with fittings.
- Design conditions apply to an empty conduit with no internal pressure.
- Ductile iron pipe (DIP) shall be installed adjacent to and at least 40 feet on either side of fuel tanks, fueling stations, or individual properties using volatile material on the property.
- Pipelines having the primary function of conveying water from one geographic location to another are classified as transmission main. These pipelines are generally larger than those in the distribution system receiving the water. These pipelines generally are not integral within a water distribution pipe network and generally do not have service connections; however, exceptions may be made at the Agency's sole discretion.

Hydraulic Analysis

A hydraulic analysis of any proposed addition to the water system shall be provided to the Agency upon request. Provide to the Agency the peak-hour, peak-day, and fire flows

expected in the system improvement to the Agency. Agency staff will provide high and low pressures expected in the existing system given the maximum flows stipulated. The Hazen-Williams formula shall be used in the hydraulic analysis using the following “C” values:

Pipe Material	“C” Value
Ductile Iron Pipe	130
PVC Pipe	140
Mortar-Lined Steel Pipe	130

Pipe Material, Allowable Sizes, and Pressure Class Rating

Pipe mains for treated water shall be constructed of PVC, DIP, or mortar-lined steel pipe (MLS). Allow a minimum of 50 psi surge allowance in distribution and transmission main material selection. Pressure class shall exceed the test pressure and meet other pressure class requirements in the Standards.

PVC Pipe, AWWA C900

PVC pipe shall be allowed in 4”, 6”, 8”, and 12” sizes only. For working pressures less than 130 psi, pipe shall be DR 18. For working pressures between 130 psi and 180 psi, pipe shall be DR 14. PVC pipe is not allowed under higher working pressures. All changes in direction of PVC pipe must be made using restrained ductile iron fittings.

Ductile Iron Pipe, AWWA C151

Ductile iron pipe may be used in 4”, 6”, 8”, 12”, 18”, 20”, 24”, 30”, 36”, and 42” sizes. Ductile iron pipe shall have a pressure class rating greater than the test pressure. Ductile iron pipe deflections shall be less than 0.75 times the manufacturer’s allowed deflection. Pipe curve radii shall be greater than 1.33 times the manufacturer’s minimum radii.

Steel Cylinder Pipe, AWWA C200

Steel Cylinder Pipe may be used in sizes 30” and larger or as approved by the Agency. Applicants shall determine the pressure rating of steel cylinder pipe.

Pipeline Sizing

All pipelines shall be the largest size required to convey the following:

- Peak-hour flow using a maximum flow velocity of 5 feet per second.
- Peak-day flow plus fire flow using a maximum flow velocity of 7 feet per second.
- Storage replenishment flow using a maximum flow velocity of 5 feet per second.

The minimum transmission line diameter shall be 12 inches. The minimum distribution system pipe diameter shall be six inches. The minimum pipe size to fire hydrants shall be determined by the Fire Protection District’s flowrate requirement and the Agency’s maximum velocity requirement of 7 fps.

Joints

All new pressure piping systems shall be restrained by mechanical joint restraint or welded joints. Concrete thrust blocks shall only be used where shown on the drawings and as approved by the Agency. Concrete thrust blocks are required at connections to existing piping to protect against the movement of existing joints or fittings due to thrust forces. Where test pressure does not exceed 150 psi, concrete thrust blocks for pipe 12-inch and smaller shall be provided as shown on the Standard Drawings. All other thrust blocks shall be designed by a California registered engineer.

Restrained joints shall be rated for the greater of the pipeline's test pressure or its surge pressure. Install all restraining systems per the system manufacture recommendations. The location and minimum required development length shall be clearly identified on the Plans. All restraint systems calculations shall be stamped and signed by a California registered engineer.

Minimum restrained lengths may be determined through application of EBAA Iron's Restrained Length Calculator using soil type SM, safety factor 1.5:1, and trench type 5. Restrained length for valves shall be that of dead ends. Note: For ductile iron pipe, use the "Poly Wrapped Ductile" for pipe material choice.

Valves

Treated Water

For the distribution system, provide a sufficient number of valves such that no single shut down will result in taking more than 1,000 feet of pipeline out of service and such that no more than two fire hydrants will be taken out of service during a shut down. Within residential areas, valves shall have a maximum spacing of 500 feet and shall be located at intersections where practical and the projection of a property line in a straight run of pipe. In commercial and industrial areas, maximum valve spacing is 350 feet. All tees shall have 3 valves and all crosses shall have 4 valves, with the exception of tees for hydrants, services, and blow-offs.

Valve sizes shall conform to the pipe size unless shown otherwise on approved Plans. Valve class shall exceed the test pressure.

All 4-inch, 6-inch, and 8-inch valves shall be gate type. Valves 12 inches and larger shall be butterfly type.

All valves shall include a 17-lb. anode with their installation per Standard Drawing S112.

Fire Hydrants

Fire hydrants shall be designed at locations in accordance with the California Fire Code, and or the Fire Protection District having authority and Placer County. Hydrants shall at a minimum be spaced with a maximum interval of 500 feet in residential areas and 350 feet in industrial or commercial areas. All hydrants to be located within the cold climate area (see Standard Drawing S501) shall be dry barrel type hydrants. The local fire protection authority shall provide the hydrants make and model. Fire hydrant laterals shall be constructed of 6-inch ductile iron pipe that is fully restrained from the mainline tee to the hydrant. In addition to restrained joints, all fire hydrants shall have a thrust block at the base of the hydrant bury.

Blow-off Valves

Blow-off valves (BOV) shall be located at major low points, at the end of all dead-end pipelines without fire hydrants, and at pressure zone boundaries located at pressure reducing stations.

Wherever possible, install the BOV in the street right-of-way, three feet or more away from the curb and gutter. Ensure BOV's cannot back-siphon into the distribution system in their projected locations by providing a watertight cap on discharge piping per Standard Drawings S208, S209, S506, and S507.

The Agency will provide locations for BOV's on pipelines with existing hydrants.

For sections of line without fire hydrants, size BOV for minimum 2.5 feet per second flushing velocity. For 8-inch mains, use a minimum 4-inch BOV. For 12-inch and larger mains, use a minimum 6-inch BOV.

The 6-inch BOV shall be a standard fire hydrant.

Terminate stubs for future main extensions with a two-inch end-of-line BOV.

Water Quality Sampling Stations

The Agency will determine the need for water quality sampling stations based on the size and location of the proposed development, proximity to other sampling stations, layout of the distribution system, distance to source of treated water, and other factors. Water quality sampling stations shall be provided by the applicant at locations as determined by the Agency. Sampling stations shall be installed in accordance with Standard Drawing S215.

Air/Vacuum Release Valves

A combination air-vacuum release valve (AVRV) shall be installed at all high points and at intervals of no more than 1,000 feet along constant slopes. For pipelines 12 inches and smaller, use a 1-inch AVR. For pipelines larger than 12 inches, the Applicant shall determine the AVR size and submit supporting calculations showing the adequacy of the recommended size to prevent pipe failure. These calculations shall be stamped by a professional engineer registered in California and submitted to the Agency for approval.

Pipeline Layout and Clearances

Dead-end pipelines shall be avoided wherever possible. Distribution systems shall be designed with looping pipelines such that all points within the distribution system are connected to a minimum of two source pipelines. Exceptions to this may include cul-de-sacs, at pressure zone boundaries, and at other locations approved by the Agency.

All pipelines and other distribution facilities shall be installed within public rights-of-way or easements or on land granted to the Agency. When pipelines are installed within improved streets, the pipeline shall be located beneath pavement and have a minimum horizontal clearance of three feet between the edge of pipe and lip of gutter or edge of pavement. When pipelines are installed within an easement, they shall be centered within the easement or placed to have at least 10 feet clearance from the closest easement line. Variances from this requirement may be approved at the Agency's discretion.

All sewer/water crossing and separation requirements shall conform to the State of California Division of Drinking Water or the Agency's requirements, whichever is more stringent. All sewer/water crossings shall be designed with the crossing being as close to perpendicular as practical and with the sewer line and laterals crossing under the water line. See Standard Drawings S103 and S104 for detailed clearance requirements.

No parallel utilities or structures such as street light foundations, etc. shall be installed within 2 feet of either side of the water pipeline trench.

Design water mains to deflect no more than 75 percent of the manufacturer's maximum allowable deflection radius for the pipe type selected. For PVC mains, deflections must be accommodated by installing fittings, not by deflecting joints.

Where required, install trench cutoff walls with drains. The drains shall be a 2-inch minimum pipe and have a minimum slope of 1 percent to daylight.

Manifolds

Manifolds may be provided for three or more services with Agency approval. The minimum manifold size is 4 inches.

Special Separation Requirements

Pipelines to be installed within 40 feet of underground fuel tanks or fuel pipelines shall be constructed of ductile iron pipe with fuel-resistant gaskets.

Water Service Piping and Metering

Water service pipelines from the water main to the meter box shall be installed at the time the main is constructed.

Meter Size	Service Pipe Size
5/8 x 3/4, 3/4 and 1-inch	1-inch copper
1½, 2-inch	2-inch copper
3, 4-inch	4-inch ductile iron
6, 8-inch	8-inch ductile iron
10, 12-inch	12-inch

All service connections shall include an isolation valve at the main. Isolation valves shall be 1-inch corporation stops for 1-inch service pipes; 2-inch and larger service isolation valves shall be gate valves sized to the service pipe with 2-inch operating nuts.

All service connections shall be metered. The type of meter shall be determined by the Agency. Meters may be manual-read or radio-read.

Meter boxes shall be located at the edge of the right of way or easement and grouped at property lines not already occupied by other utilities. Meter boxes shall not be located in driveways, sidewalks or any vehicle or pedestrian traffic area. Meter boxes shall be installed on the lot it serves. Service lines to apartment or condominium projects shall be grouped in one location along a public street.

Two-inch and larger meters shall have lockable meter bypass piping as shown on the Standard Drawings.

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Section 2 - Design Criteria for Raw Water Facilities

Intent of Criteria

The intent of these criteria is to:

- Minimize operation and maintenance costs for the Agency related to debris and refuse removal from the raw water distribution system.
- Minimize potential damage claims from canal seepage, increased discharges at spill locations, and canal failure or overflow problems.
- Prevent storm water discharge into the canal system to prevent overtopping canal and prevent pollution.
- Protect the quality of water delivered to water treatment plants and to canal customers by minimizing the amount of pollutants and debris entering the canal system.
- Minimize the potential for personal injury associated with open canals.
- Reduce water loss from the raw water distribution system by reducing evaporation and see page.
- Ensure access is provided to properly maintain the system.

Canal Encasements

Canal encasement is defined as replacement of an Agency open canal with the installation of a pipeline or concrete box culvert in accordance with these requirements.

Encase canals located within 400 feet of areas proposed for residential development with parcels or lots of two acres or less, or areas proposed for industrial, commercial, municipal or institutional uses. Canal encasement shall also be required where new roads are created within 100 feet uphill of a canal. Canal realignments may also be required at the Agency's discretion.

All canal encasements, other than those being tied into at the downstream end of an existing encasement that has a safety/debris trash rack, shall include an inlet structure with a safety/debris trash rack, a trash rack box and an automatic spillway designed to overflow the design capacity of the canal above the crown of the encasement. The Developer shall grant to the Agency easement(s) that provide full legal rights to spill the required amount of water at this location at any time. The spillway shall be designed to avoid loss and/or damage to life and/or property. The Agency shall determine the need for manholes and other appurtenances.

Developers of property located on an open canal shall be required to take such action as directed by the Agency to ensure that the intent of the criteria identified above has been met.

Required Information

Design data, easements and detailed Plans and specifications for an encasement shall be submitted to and approved by the Agency prior to the start of construction. Generally, the design data, easements, and Plans and specifications shall include the following:

- Detailed plan and profile of the canal encasement and entrance and exit conditions.
- Before and after backwater curve and related calculations.
- Cross sections along the canal length to identify significant changes in the cross sections.

- Design calculations for inlet structure and automatic spill.
- Summary of anticipated peak flows and pipe sizing calculations.
- Design data on upstream and downstream canal transitions.
- Details of overflow discharge.
- Detailed location and width of all existing and proposed canal and spill easements on the Plans.
- Submit legal descriptions and plat maps of proposed easements along with an AGENCY "Grant of Easement" form for each easement. Easements shall go through an escrow officer.

Sizing

The design capacity of canal encasements shall be at least 25 percent greater than the normal peak canal flow. The minimum size pipe for encasements shall be 18 inches. Flow calculations shall be submitted to the Agency for approval.

Pipe Materials of Construction

1. The following materials may be used for encasement of canals under pressure flow conditions:
 - Mortar Lined Steel Pipe (MLS)
 - Ductile Iron Pipe (DIP)
 - Polyvinyl Chloride Pipe (PVC)
 - Fusion-welded High-Density Polyethylene (HDPE)
2. The following materials may be used for encasement of canals under non-pressure flow conditions:
 - All materials allowed for pressure flow conditions.
 - Precast or cast-in-place gasketed concrete box culvert.
 - PVC closed profile pipe
3. For design, use the Manning's "n" values per specified pipe;

Default Manning's "n" Values	
Pipe Type	Manning's "n"
PVC	0.011
HDPE	0.012
ALL OTHER	0.013

Bends

All bends exceeding 22.5 degrees shall be constructed with a manhole per Standard Drawing S307. Where multiple bends occur, provide a minimum of 10 feet of pipe between bends. Bends on pressure flow pipe shall not exceed 45 degrees and shall have a minimum of 3 pipe diameters between bends under pressure flow.

Valves

All raw waterlines shall be designed using gate valves or segmented ball valves. Raw water gate valves 14 inches and larger shall have a 4-inch minimum bypass valve. **Air Release/ Vacuum Valves** - Shall be designed by a CA. registered Engineer and approved by PCWA

on a case by case basis and AWWA C512-15 certified. **Air Release/Fill systems** - Shall be designed by a CA. registered Engineer and approved by PCWA on a case by case basis and AWWA C512-15 certified. See Div.3 Sect.1, Raw Water Valves and Pre-Approved Materials List Appendix D for additional information.

Mitigating Measures

An encasement variance may be approved at the Agency's discretion, if the developed area encroachment can be reduced by providing appropriate setbacks. The distance for the setback areas from the top of canal cut and from the toe of canal fill will be set by the Agency. These areas within the setbacks may become green belt areas; however, no trees or bushes shall be allowed within five feet of top of cut or toe of fill, or 20 feet from water's edge, whichever is greater. Paved parking areas may be placed within the setback areas if positive controls are used to divert drainage away from the canal. All other surface drainage must be directed away from canal. Fences may be necessary for developments attracting children, such as residential, educational, or commercial.

A legal entity must be formed to accept responsibility for maintenance repair and replacement of drainage facilities, fences, landscaping and other improvements within the setback area containing the canal.

Easements shall be granted to the Agency covering the entire setback areas. The Agency shall have the right to operate and maintain the canal at its discretion. The Agency shall be held harmless by the owner of the land during the life of the easement for destruction of any vegetation, structures, or other facilities. Spoils from cleanings or enlargements of the canal may be graded out on the berm and/or spilled over the outside of the berm. The Agency shall continue its use of aquatic weed control, weed and brush control, and all other normal maintenance activities.

Inverted Siphons

The minimum diameter for inverted siphons is 18 inches. Inverted siphons shall be designed with reinforced concrete inlet and outlet structures. A blow off valve shall be installed at the low point on inverted siphons. The minimum size blow off shall be 12 inches with a 12-inch gate valve. Access manholes may be required by Agency for siphons 24 inches or greater.

Road and Other Crossings

All road, pedestrian, equestrian, or other crossings of canals shall be by bridges. Culverts are not allowed. Bridges shall be designed to allow Agency personnel and equipment to pass when traveling along the canal.

After construction of footings and prior to bridge deck installation, the canal shall be improved to the current Agency requirements, guniting beneath the future bridge 10 feet upstream and downstream. The Agency shall make the improvements to the canal. The property owner shall pay these costs.

Bridges shall conform to Standard Drawing S301 and the following:

- All bridges are to be a clear span over the canal and its banks. Bridges shall be supported by abutments outside of the outer edge of the canal banks. No piers are allowed in the canal.
- Bridges shall be wood, welded steel, or welded aluminum. Other materials of construction may be proposed. Railroad flatcar bridges may be used in accordance with these specifications.

- Pedestrian bridges up to 15 feet in span shall be designed to support a live load of 100 pounds per square foot, minimum. They do not need to be engineered, but must be approved by an Agency engineer.
- Pedestrian bridges greater than 15 feet in span shall be engineered.
- All vehicle bridges, bridges with a clear width of 8 feet or more, and railroad flatcar bridges shall be engineered.
- For all bridges, drawings and product data shall be submitted to the Agency for review and approval.
- For engineered bridges, engineering calculations signed and stamped by an engineer registered in the state of California shall be submitted with drawings and product data for review and approval.
- Engineered pedestrian, equestrian, and bicycle bridges shall be designed in accordance with the *Guide Specifications for Design of Pedestrian Bridges* by the American Association of State Highways and Transportation Officials (AASHTO), latest edition.
- Vehicle bridges shall be designed in accordance with the *Standard Specifications for Highway Bridges* by the American Association of State Highways and Transportation Officials (AASHTO) and California Fire Code, latest edition. Proof of approval by acting fire district shall be submitted to Agency.
- Railroad flat cars must be inspected by an engineer registered in the State of California. The engineer shall determine whether the flatcar will meet the loading requirements for its intended use.
- The Approved Materials List (Appendix D) gives names of known bridge manufacturers and suppliers. The list is not an endorsement of these manufacturers, nor is the list exhaustive. Other manufacturers and suppliers exist.

Telemetry

Provide telemetry connections to monitor level at all spill locations, ends of canals, regulating stations, and gauging stations. Telemetry equipment shall be designed in accordance with the Agency's current SCADA Systems Standards and Guidelines.

Inlet and Outlet Structures

The inlet structure shall have a spillway designed to convey the full capacity of the raw water pipe. The spillway shall operate automatically in the event that water flow is obstructed downstream and shall also have the capability of being operated manually. The applicants shall provide a means of manually obstructing or diverting water from entering the pipe without raising the water surface level above the normal high water mark. See also Div. 3 Sect.1, Inlet & Outlet Structures.

Trash Racks

A hinged, lockable trash rack shall be installed at all raw water inlets. Install trash racks at approximately 2 to 1 horizontal to vertical or flatter and in line with the flow of water. The opening between bars shall be 4 inches clear or as determined by the Agency. See also Div. 3, Sect.1, Trash Racks.

Horizontal cross braces shall be located no farther than 6 inches from the bottom and top of the trash rack. No other cross braces will be allowed. The Agency may require fine screens such as wedge wire screens.

Repair damaged or inadequate Zinc coating.

Trash boxes shall be provided at all trash racks per standard drawing S309.

Hand Rails and Maintenance Platforms

Where designs of trash racks or other facilities create grade separations of greater than 30 inches, hand rails of aluminum or galvanized steel shall be provided. Aluminum or galvanized steel platforms may also be required for maintenance purposes.

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Section 3 - Cross Connection Control

Purpose

The purpose of the Agency's cross connection control program is to:

- Protect the public water supply against contamination through cross connections by isolating sources of contamination within a water user's premises.
- Eliminate existing connections between drinking water systems and other sources of water that are not approved as safe and potable for human consumption.
- Eliminate cross connections between drinking water and sources of contamination. Prevent future cross connections.

These regulations are adopted pursuant to the State of California Title 17 Code of Regulations, Division 1, State Department of Health Services and/or State Water Resources Control Board.

It is unlawful for any person, firm or corporation at any time to make or maintain or cause to be made or maintained, temporarily or permanently, for any period of time whatsoever, any cross connection between plumbing pipes and/or water fixtures being served with potable water by the Agency and any other source of water supply or to maintain any sanitary fixture or other appurtenances or fixtures which, by reason of their construction, may cause or allow backflow of water or other substances into the water supply system of the Agency and/or the service of water pipes or fixtures of any consumer of the Agency.

Definitions Pertaining to Cross Connection Control

Air-Gap (AG) Separation: A physical break between a supply pipe and a receiving vessel. The air-gap shall be at least double the diameter of the supply pipe measured vertically above the top rim of the vessel, in no case less than one inch.

Approved Backflow Prevention Device: Devices which have passed laboratory and field evaluation tests performed by a recognized testing organization which has demonstrated their competency to perform such tests to the State Water Resources Control Board.

Auxiliary Supply: Any water supply on or available to the premises other than the potable water supply.

AWWA Standard: An official standard developed and approved by the American Water Works Association (AWWA).

Backflow: A flow condition, caused by a differential in pressure, that causes the flow of water or other liquids, gases, mixtures or substances into the distributing pipes of a potable supply of water from any source or sources other than a potable water supply source. Back-siphoning and back pressure are causes of backflow.

Contamination: A degradation of the quality of the potable water by any foreign substance which creates a hazard to the public health, or which may impair the usefulness or quality of the water.

Cross Connection: Any unprotected actual or potential connection between a potable water system used to supply water for drinking purposes and any source or system containing unapproved water or substance that is not or cannot be approved as safe, wholesome, and potable. By-pass arrangements, jumper connections, removable sections, swivel or changeover devices, or other devices through which backflow could occur, shall be considered cross connections.

Double Check (DC) Valve Assembly: An assembly of at least two independently acting check valves including flange, full port resilient wedge shut-off valves on each side of the check valve assembly, and test cocks available for testing to check the water tightness of each check valve.

Double Check Detector Assembly (DCDA): An assembly of at least two independently acting check valves including flange, full port resilient wedge shut-off valves on each side of the check valve assembly, and test cocks available for testing to check the water tightness of each check valve. The double check assembly shall have a 3/4" X 5/8" detector meter (reading in cubic feet) installed around the valves (Standard Drawing S206).

Health Agency (State): The State Water Resources Control Board, or Placer County Department of Environmental Health with respect to a small water system.

Local Health Agency: The Placer County Environmental Health Department.

Person: The term "person" means an individual, corporation, company, association, partnership, municipality, public utility, or other public body or institution.

Premises: The term "premises" means any and all areas on a water user's property which are served or have the potential to be served by the public water system.

Public Water System: The term "public water system" means a system for the provision of piped water to the public for human consumption that has fifteen or more service connections or regularly serves an average of 25 individuals daily at least 60 days of the year.

Reclaimed Water: The term "reclaimed water" means a wastewater which, as a result of treatment, is suitable for uses other than potable use.

Reduced Pressure Principle Device: The term "reduce pressure principle backflow prevention device" means a device incorporating two or more check valve and an automatically operation differential relief valve located between the two checks, a flanged, full port resilient wedge shut-off valve on each side of the check valve assembly, and equipped with necessary test cocks for testing.

Reduced Pressure Principle Detector Assembly: The term "reduce pressure principle backflow prevention device" means a device incorporating two or more check valve and an automatically operation differential relief valve located between the two checks, a flanged, full port resilient wedge shut-off valve on each side of the check valve assembly, and equipped with necessary test cocks for testing. The reduced pressure principle backflow device shall have a 3/4" X 5/8" detector meter (reading in cubic feet) installed around the valves.

Service Connection: The point of connection of a user's piping to the water supplier's facilities.

Water Supplier: The person who owns or operates the water supply system.

Water Supply: Any water supply whose portability is regulated by a State or local health agency.

Water User: Any person obtaining water from a water supply system

Responsibility

Under the State of California Title 17 code of regulations relating to cross connection, the Agency has responsibility to prevent water from unapproved sources, or any other substances, from entering the Agency's water system. The Agency is primarily responsible for the prevention of contamination and pollution of the Agency's water system. Such responsibility begins at the point of origin of the Agencies water supply and includes treatment facilities and water mains, and the point of service (meter) to the water user's water system. The Applicant shall ensure adequate backflow and back-siphoning protection is maintained on the water

user's system directly connected to the Agency's system. Water users shall have the prime responsibility of preventing contaminants and pollutants from their water system from entering the Agency's water system as required by this policy and the California Department of Health Services and/or State Water Resources Control Board.

The Agency shall not be responsible for any loss or damage directly or indirectly resulting from or caused by any improper or negligent installation, operation, use, repair, maintenance, or interference with, any approved backflow prevention assembly, required by this policy, by any water user or any other person.

Water users shall bear all costs for the installation of pumps or renovation of existing water piping, as a result of any decreases in line pressure attributed to the upgrading of existing backflow prevention assemblies or the installation of approved backflow prevention assemblies.

The Agency shall not be held responsible for any losses or damages incurred by water users as a result of upgrading existing backflow prevention assemblies or the installation of approved backflow prevention assemblies.

Cross Connection Control Requirements General Provisions

Unprotected cross connections with the public water supply are prohibited. Whenever backflow protection is necessary, the Agency will require water users to install approved backflow prevention devices at their expense for continued service, or before a new service will be granted. Wherever backflow protection has been found necessary on a water supply line entering a water user's premises, any and all water supply lines from the Agency's mains entering such premises, buildings, or structures, shall be protected by an approved backflow prevention device. The type of device to be installed will be in accordance with the requirements of this program.

Where Protection is Required

Each service connection from the Agency's water system for supplying water to premises having an auxiliary water supply shall be protected against backflow of water from the premises into the public water system unless the auxiliary water supply is accepted as an additional potable water supply by the Agency.

Each service connection from the Agency's water system for supplying water to any premises on which any substance is handled in such fashion as may allow its entry into the water system shall be protected against backflow of the water from the premises into the public system. This shall include the handling of process waters and waters originating from the Agency's water system which have been subjected to deterioration in sanitary quality.

Backflow prevention devices shall be installed on the service connection to any premises having (a) internal cross connections that cannot be permanently corrected and controlled to the satisfaction of the Agency or state and local health department, or (b) intricate plumbing and piping arrangements or where entry to all portions of the premises is not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not cross connections exist.

Type of Protection Required

The type of protection that shall be provided to prevent backflow into the water supply shall be in accordance with Table 1. The type of protective device that may be required, listed in an increasing level of protection, includes: Reduced Pressure Principle Device (RP), and Air Gap (AG). The water user may choose a higher level of protection than required by the Agency. The minimum types of backflow protection required to protect the water supply at the user's water connection to premises with varying degrees of hazard are given in Table 1. Situations not covered in Table 1 shall be evaluated on a case-by-case basis and the appropriate backflow protection shall be determined by the Agency. The Agency reserves the right to install a more stringent device than listed if, in its judgment, the particular circumstances of that water user require a higher degree of backflow protection.

Table 1: Hazard Criteria and Appropriate Types of Backflow Protection

<u>Hazard</u>	<u>Required Level of Protection</u>
1 Auxiliary Water Supplies	
A. Auxiliary supply that is interconnected with a piping system connected to the public water system (PWS)	Air gap separation (AG)
B. Auxiliary supply that is not interconnected with a piping system connected to the PWS	Reduced pressure principle (RP)
2 Fire Protection Systems	
A. Fire protection system interconnected with a piping system connected to the PWS and an onsite auxiliary water supply for fire fighting	Air gap separation (AG)
B. Fire protection system supplied by the PWS with an interconnection to onsite storage facilities and pumps, or combined fire and industrial water	Reduced pressure principle (RP)
C. Fire protection system using chemical additives	Reduced pressure principle (RP)
3 Marina or port facilities	
A. Residential	Reduced pressure principle (RP)
B. Nonresidential	Reduced pressure principle (RP)
4 Premises with multiple service connections to the PWS	Reduced pressure principle (RP)
5 Recycled Water	
A. Recycled water supply system that is:	
i. Interconnected to a piping system	Air gap separation (AG)
ii. Not interconnected to a piping system	Reduced pressure principle (RP)

B. Recycled water supply system used only for landscape irrigation in an approved dual-plumbed use area established pursuant to sections 60313 through 60316, which is used for:	
i. Individually owned residential units	Reduced pressure principle (RP)
ii. Sites other than individually owned residential units	Reduced pressure principle (RP)
6 Gray-water (see gray-water definition in Section 14876 of the California Water Code)	
A. System that produces, or collects and distributes, gray-water, and is	
i. Interconnected to a piping system connected to the PWS	Air gap separation (AG)
ii. Not interconnected to a piping system connected to the PWS	Reduced pressure principle (RP)
7 Sewage and Hazardous or Potentially Hazardous Substances:	
A. Waste water treatment processes, handling and/or pumping equipment interconnected to a piping system connected to the PWS.	Air gap separation (AG)
B. Waste water treatment processes, handling and/or pumping equipment not interconnected to a piping system connected to the PWS.	Reduced pressure principle (RP)
C. Protection is required for a single family residence that has a sewage lift pump.	Reduced pressure principle (RP)
D. Premises handling a substance in any manner in which the substance may enter a piping system connected to the PWS.	Air gap separation (AG)
E. Recreational vehicle dump station that is not interconnected to a piping system connected to PWS.	Reduced pressure principle (RP)
F. Piped irrigation system interconnected to a piping system connected to the PWS, into which fertilizers, herbicides, or pesticides are, or intended to be, injected into the irrigation water.	Reduced pressure principle (RP)
G. Piping system conveying a fluid not from an unapproved water supply (canal water) that is:	
i. Interconnected to a piping system to the PWS.	Air gap separation (AG)
ii. Not interconnected to a piping system	Reduced pressure principle (RP)
8 Roadway right-of-way irrigation system interconnected to a piping system connected to the PWS, and there is no potential for back pressure	Pressure vacuum breaker (PVB)
9 Water storage facility not under control of PWS	Air gap separation (AG)

Backflow Prevention Devices**Approved Devices**

Only backflow prevention devices (BPD) that are listed on the most current edition of the State Department of Health Services list shall be acceptable for installation by a water user connected to the Agency's potable water system.

Installation

Backflow prevention devices shall be installed as prescribed in Title 17 of the California Code of Regulations. Location of the devices shall be no farther than 3 feet from the water user's meter. In cold climates, the device may be located immediately inside the building being served. In all cases, the device shall be located before the first branch line leading off the service line. If the device is located inside the structure, the device and the customers system shall be open for inspection at all reasonable times to authorized representatives of the Agency to determine if cross-connection hazards exist. The Agency shall have the final authority in determining the location of a backflow prevention device.

The following is a description of the installation of backflow devices (See Standard Drawings List for installation requirements).

Air-Gap (AG) Separation

An AG must be located as close as practical to the water user's connection, and all piping between the user's connection and receiving tank must be entirely visible unless otherwise approved in writing by the Agency.

Reduced Pressure (RP) Principle Backflow Prevention Assembly

An RP must be located no farther than 3 feet from the water user's meter. This type of assembly must be installed 12 inches minimum and a maximum of 36 inches above grade (measured from the outside top of the 90° transition fitting, do not use top of flange), and must have a minimum of 12 inches side and top clearance to allow access for testing and maintenance .

Double Check Valve Assembly (DC)

The approved double check valve assembly shall be located no more than 3 feet from the water user's connection and shall be installed above grade, if possible, and readily accessible for testing and maintenance (12 inches minimum side and top clearance). If a double check valve assembly is installed below grade, it must be installed in a vault with a minimum of 12 inches between the bottom of the vault and the bottom of the assembly. The top of the assembly shall be no more than 8 inches below grade, the clearance between the side of the assembly with the test cocks and the side of the vault shall be a minimum of 12 inches, and the clearance between the other side of the assembly and the side of the vault. "Y" type assemblies must be installed on their "side," with the test cocks in a vertical position so that either check valve may be removed for service without removing the assembly. Vaults without an integrated bottom must be placed on a 6-inch layer of gravel.

Testing and Maintenance

The owners of any premises on which, or on account of which, backflow prevention devices are installed, shall have the devices tested by a person with a certification for backflow prevention assembly testing from the American Water Works Association or other authority acceptable to the Agency. Test backflow prevention devices at least annually and immediately after installation, relocation, or repair. The Agency may require a more frequent testing schedule, if necessary. No device shall be placed back in service unless it is functioning as required. A report, in a form acceptable to the Agency, shall be filed with the Agency each time a device is tested, relocated, or repaired. These devices shall be serviced, overhauled, or replaced whenever they are found to be defective. All costs of testing, repair, and maintenance shall be borne by the water user.

The Agency will notify affected customers by mail when annual testing of a device is needed.

Removal

Approval must be obtained from the Agency before a backflow prevention device is removed or relocated.

Removal: The use of a device may be discontinued and the device removed from service upon presentation of sufficient evidence to the Agency to verify that a hazard no longer exists and is not likely to be created in the future;

Relocation: A device may be relocated following confirmation by the Agency that the relocation shall continue to provide the required protection and satisfy installation requirements. A retest shall be required following the relocation of the device;

Repair: A device may be removed for repair, provided the water use is either discontinued until repair is completed and the device is returned to service, or the service connection is equipped with other backflow protection approved by the Agency. A retest shall be required following the repair of the device; and

Replacement: A device may be removed and replaced provided the water use is discontinued until the replacement device is installed. All replacement devices must be approved by the Agency and must be commensurate with the degree of hazard involved.

User Supervisor

At each premise, where it is necessary in the opinion of the Agency, a user supervisor shall be designated by and at the expense of the water user. This user supervisor shall monitor the backflow prevention devices and ensure no cross connections are made. In the event of contamination or pollution of the drinking water system due to a cross connection on the premises, the Agency shall be promptly notified by the user supervisor so that appropriate measures may be taken to overcome the contamination. The water user shall inform the Agency of the user supervisor's identity annually and whenever a change in Supervisor occurs.

Administration Procedures Water System Inspection

The Agency shall review all requests for new services to determine if backflow protection is needed. Plans and specifications must be submitted to the Agency upon request for review of possible cross connection hazards as a condition of service for new service connections. If it is determined that a backflow prevention device is necessary to protect the public water system, the required device must be installed before service shall be granted.

The Agency may require an on premise inspection to evaluate cross connection hazards. The Agency shall transmit a written notice requesting an inspection appointment to each affected water user. Any water user who cannot or will not allow an on premise inspection of his piping system shall be required to install the backflow prevention device the Agency considers

necessary.

The Agency, at its discretion, may require a re-inspection for cross connection hazards of any premise to which it serves water. The Agency shall transmit a written notice requesting an inspection appointment to each affected water user. Any water user who cannot or will not allow an on premise inspection of his piping system shall be required to install the backflow prevention device the Agency considers necessary.

Customer Notification - Device Installation

The Agency will notify the water user of the inspection findings and list any corrective actions to be taken. A period of 60 days shall be given to complete all corrective actions required, including installation of backflow prevention devices. A second notice shall be sent to each water user who does not take the required corrective actions prescribed in the first notice within the 60 day period allowed. The second notice shall give the water user a one week period to take the required corrective action. If no action is taken within 60 days of the initial notification the Agency may terminate water service to the affected water user until the required corrective actions are taken.

Annual Testing and Maintenance - Customer Notification

The Agency will notify each affected water user when it is time for the annual testing of their backflow prevention device installed on the service connection. This initial written notice will give the water user 60 days to have the device tested and a test report submitted.

If a user does not have a backflow prevention device test report submitted within the first 30 days of the initial notice, the Agency will initiate additional reminders prior to service disconnection.

Within the 60 day notification timeline, the water user shall have the option of requesting the Agency to perform the annual test (in place of disconnection) at the customer expense. The water user shall be billed for this service at the current charge out rate. The billing will be included on the regular water bill.

In the event of a failed report the Agency shall notify the water user of any needed repairs. The device must be repaired and a passing test report submitted within the 30 day extension of their original test month.

Additional maintenance may be required in emergency situations. At such time the Agency will notify the affected water user of their responsibility to repair and/or replace the device and submit a passing test report.

Water Service Discontinuance General

When the Agency encounters water uses that represent a clear and immediate hazard to the potable water supply that cannot be immediately abated, the Agency shall institute the procedure for discontinuing the water service per Section 4205 of the Personnel and Administrative Manual.

Basis for Discontinuance

Conditions or water uses that create a basis for water service termination shall include, but are not limited to, the following items:

- Refusal to install a required backflow prevention device ; Refusal to test a backflow prevention device;
- Refusal to repair a faulty backflow prevention device; Refusal to replace a faulty backflow prevention device;
- Direct or indirect connection between the public water system and a sewer line;
- Unprotected direct or indirect connection between the public water system and a system or equipment containing contaminants;
- Unprotected direct or indirect connection between the public water system and an auxiliary water system; or
- A situation which presents an immediate health hazard to the public water system.

Approved Certified Backflow Prevention Assembly Testers

The Agency does not maintain a list of certified backflow testers. It is the responsibility of the tester to maintain and file the documents below with Backflow Solutions, Inc. Online, PCWA's automated tracking system.

- AWWA certification
- Calibration certificates

To monitor tests, tester integrity, and appropriate protection within the system, the Agency administers an audit program. The Agency reserves the right to reject reports from testers not consistent with our audit parameters.

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Section 4 - Plan Sheet Requirements

General

The plan sheet requirements contained in this section are applicable to improvements to be provided under the provisions of an FA.

Drawing Size and Scale

All improvement Plans shall be prepared using ARCH D (24"x36") or ANSI D (22"x34") inches in dimension. The horizontal scale shall be 1-inch = 20, 40, or 50 feet. The vertical scale shall be appropriate for the topography and the horizontal scale and approved by the Agency.

Drafting Standards

All line work must be clear and sharp with appropriate line type, line weight, shading to distinguish proposed, existing, topography, etc. Letters and numerals shall be 0.083 (1/12 inch, 6 point) inch minimum height if computer generated or 0.125 (1/8 inch, 9 point) inch if handwritten, well formed, and sharp.

Title Sheet

Each set of improvement Plans shall have a title sheet. The title sheet shall be prepared showing the following:

- The entire subdivision or project, including street names and property lines.
- A vicinity map drawn to a convenient scale.
- A north arrow and scale.
- A sheet index.
- A legend of symbols and abbreviations (use the Agency's standard symbols conforming to standard drawing S401).
- A title block.
- A signature block for Agency engineer, local fire protection district, and City/County as applicable.
- The Applicant's name, address, and phone number.
- The property owners name and address.
- A table listing the sizes, lengths, quantities, class, and material of pipe; number and sizes of water services; number and sizes of fire protection services; number of fire hydrants; and numbers and sizes of BOVs and AVRVs.
- Agency's standard note (see next page).

Placer County Water Agency Facilities

Placer County Water Agency facilities shall be constructed in accordance with the Agency's latest revised Standards. The Contractor shall provide two working days' notice to the Placer County Water Agency inspector (530-823-4885) prior to beginning work on Water Facilities and by 7:30 a.m. each day work on Water Facilities occurs. The Agency's approval of these Plans is for Water Facilities only. Undiscovered errors and omissions shall be corrected by others. Conflicts with other improvements shall be the responsibility of others.

Placer County Water Agency Map No. _____.

AGENCY Approval: _____ Date: _____

(This approval expires 24 months after the above date at the Agency's discretion)

Title Block

Each sheet within the set of drawings shall have a title block showing the sheet title, sheet number, total number of sheets, date, scale, project name, revision block, and the design Engineer's name, address, phone number, registration number, seal, and signature.

Water System Layout Sheet

The proposed treated and raw water systems shall be shown on an overall plan layout at an appropriate scale. This layout shall show pipe size, valving, hydrants, existing facilities, canal names, spill location, boundary lines and found existing monuments, property lines, lot numbers, street names, section lines and corners, existing easements with recording data, and proposed easements. This layout must be incorporated into the improvement Plans and may be shown on the title sheet if it may be produced there legibly.

Plan Details

The following shall be shown on Plans submitted for approval:

- Right-of-Ways- Right-of-way lines, the boundaries of lots fronting on the street, drainage easements, existing easements with recording data, proposed easements, planting easements, section lines and corners, land grant lines and temporary construction easements (existing and proposed), shall be shown on the Plans. All right-of-way and easement lines shall be properly dimensioned.
- The Applicant shall provide a minimum 20-foot-wide, non-exclusive recordable easement to the Agency for all water lines and meters installed outside a public right-of-way or public utility easement adjacent to a public right of way. All easements granted to the Agency shall be on Agency forms. The easement forms format, legal description and plat shall be processed through an escrow agent. Construction of buildings and/or structures shall not be permitted within the Agency's easements. The easement will be recorded by the Agency.
- Contours and Elevations - Show existing contours or supporting elevations, and the limits of grading, cuts and fills with finished elevations. Vertical control for profiles and benchmarks shall be based on the National Geodetic Vertical Datum, 1929 (NGVD 29). The horizontal control datum shall be California Zone II NAD 83 survey in feet.
- Pipelines - For water facilities, the Plans shall show stationing, size of pipes, class or pressure rating, angle of pipe bends at fitting, valves, Blow-Off Valves (BOVs), Air/Vacuum Relief Valves (AVRVs), hydrants, services, backflow prevention devices, meters, location and length of restrained pipe, and all other appurtenances. The meter

size shall be indicated if the meter proposed is larger than 5/8" x 3/4". Call outs for services shall indicate the meter will be set by the Agency

- Other Utilities - The Plans shall show all existing or proposed utilities within 20 feet of proposed or existing Agency facilities, including sewer lines and laterals, storm drain lines and laterals, gas, electric, cable and communications. The Plans shall indicate minimum horizontal and vertical clearances between Agency facilities and other utilities.
- Profiles - The Plans shall show the corresponding profile of all roadway centerlines, drainage ditches, storm drains and sanitary sewers. All profiles of proposed improvements shall show elevations, percent grade, vertical curves and other vertical alignment data. The profile of pipelines shall show size, length, material, pressure rating and all fixtures such as BOVs, AVRVs, fire hydrants and valves. Profiles shall follow the pipeline stationing for accuracy. Where sewer laterals cross water lines, show the lateral at the elevation it crosses, material type and size.
- Locations and lengths of restrained pipe shall be shown on either the plan view or the profile view.
- Landscape Irrigation - Landscape plans shall have a single table listing all irrigation circuits and the maximum flow rate of each circuit in gallons per minute.
- Design Criteria – Pressure Zone, minimum and maximum working pressure, test pressure, fire flow and max static pressure.

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Section 5 - Surveys, Topographic Mapping, and CAD Drawings

General

The requirements of this section apply to deliverables created and submitted specifically for the Agency.

Surveys and Topographic Mapping

All Surveys and Topographic Mapping submitted to PCWA shall use:

- Horizontal Datum-California Coordinate System NAD83 California State Planes, Zone II, U.S. Survey Feet
- Shall use Vertical Datum from the National Geodetic Vertical Datum of 1929 (NGVD29).
- Shall be drawn in U.S. Survey Feet
- Shall have a minimum of two (2) control points. Control points can be monuments, PK nails, 5/8 rebar or larger, something physical in the field that can be used to reestablish the survey submitted if required. The control points must be located within 200 ft. of the submitted survey and must be in clear view of each other. After the submittal of the survey, the physical location (site) and accuracy of the control points will be the responsibility of the Contracted Surveyor until the Project Engineer has signed off on the Survey/Topo in writing to the Contracted Surveyor.

CAD Drawings

All CAD Drawings created for PCWA:

- Shall be compatible with Autodesk C3D 2015 or newer.
- Shall be drawn according to the latest US National CAD standards.
- Shall use PCWA Borders. Borders are available from the Agency's web site or by contacting the Agency's Engineering Division.
- Shall be drawn at 1:1, full size in model space.
- Shall be submitted in both digital format (CD) as a drawing (dwg.) file and a pdf file, and hard copy format (plotted).
- Surveys and Mapping CAD drawings created for PCWA, shall include a point file with descriptions and coordinates in a comma separated values (CSV) file on the CD. All existing and proposed property lines within the project with property lines placed by themselves on one of two layers, "EXISTING PLS", and "PROPOSED PLS".

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Division 3 – Standard Specifications

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Section 1 - Piping and Plumbing

General

This section describes the materials and labor necessary for installation of treated and raw water pipelines, plumbing, and appurtenances. An acceptable products list is provided in Appendix D.

All buried ductile iron pipe, ductile iron fittings and all buried services shall be polyethylene encased per AWWA C105/A21.5-10 or latest version. Additional cathodic or corrosion protection may be required by the PCWA Project Engineer on a case by case basis.

Materials

Nuts and Bolts

Nuts and bolts shall be cadmium-plated or zinc-coated steel per ASTM A307 Grade A, hex or T-head, unless otherwise noted. Threads shall be coated with anti-seize lubricant. The bolt shall extend at least 3 threads through the nut when tightened to proper torque.

Joint Lubricants

Lubricants shall be as specified by the pipe manufacturer to ensure compatibility with the pipe and gasket material and shall comply with NSF 61 requirements.

Ductile Iron Pipe (DIP)

Pipe Material

DIP shall conform to AWWA C151 specifications. Joints between DIP and other types of pipe shall be made by means of the properly sized and correct type of restrained adapter. DIP shall be cement mortar-lined in accordance with AWWA C104 unless otherwise noted.

Joints

DIP joints shall be push-on-type, mechanical, or flanged joints as shown on the Plans with gaskets furnished by the manufacturer of the pipe and designed for use with the pipe being installed and complying with AWWA C111. Provide fuel-resistant gaskets within 40 feet of property using or containing volatile materials.

Assembly of pipe and joints shall follow the manufacturer's instructions. After assembly of each push-on joint, the final location of gaskets within each joint shall be checked by feeler gauge as recommended by the manufacturer.

Restrained DIP shall be installed where shown on the Drawings, or as necessary to prevent the dislocation of the completed pipeline due to pressure. Restrained DIP shall be as described below. Gaskets with integral teeth used to restrain DIP such as "Field Loc" gaskets are not allowed.

- **Push-On Joint** - Restrained push-on joint DIP shall be restrained at the joint by the use of a locking ring or some other type of mechanism designed by the pipe manufacturer as a restrained pipe joint.

Push-on joints without an integral locking system may be restrained by use of a joint harness. Joint harnesses shall be installed per manufacturer's recommendations, shall be fusion-bonded, and epoxy-coated.

- **Flanged Joint** - Unless otherwise specified, flanges shall be cast-on flanges conforming to ANSI/ AWWA A21.10/C110 or thread-on ductile iron conforming to AWWA A21.15/C115. Flanges shall be adequate for 250 psi working pressure. Bolt circle and bolt holes shall match those of ANSI B16.1, Class 125 flanges and ANSI B16.5, Class 150 flanges. Where specified, flanges shall be cast-on or threaded-on flanges conforming to ANSI B16.1, Class 250.
- **Mechanical Joint** - Mechanical joint pipe shall be restrained by use of locking rings with lugs that secure the ring to the pipe. Locking rings and lugs shall be fusion-bonded, epoxy-coated, and wrapped in polyethylene as part of the pipe.

Fittings

Fittings shall meet the design requirements of the adjacent pipe. All fittings shall be smooth and free from defects, made from ductile iron or fabricated steel, and shall be manufactured in accordance with AWWA C110, C111, C115 and C153. Steel fittings shall be fusion-bonded and epoxy-lined and coated. Special fittings may be manufactured from steel pipe in accordance with AWWA C200.

Polyvinyl Chloride (PVC) Pressure Pipe

PVC pressure pipe may be used in pipe sizes 4 to 12 inches, shall conform to current AWWA C-900 (C.I.O.D.), and have Underwriters' Laboratories, Factory Mutual and NSF approval.

Note - PVC pipe shall not be installed if:

- It has been discolored from exposure to the sun.
- The installation date is more than one year after the manufacture date printed on the pipe.
- The printed manufacture date has been altered or destroyed.

Joints

PVC pipe shall be joined by a push-on bell and-spigot configuration with a locked-in, flexible elastomeric gasket coupling or mechanical joints. All metallic parts and appurtenances shall be coated with coal tar mastic to a thickness of 16-30 mills and shall be wrapped in Polyethylene encasement in accordance with AWWA C105/A21.5.

Restrained PVC pipe shall be installed where shown on the Drawings or as necessary to prevent the dislocation of the completed pipeline due to pressure. Restrained PVC pipe shall be as described below.

- **Mechanical Harness** - Metallic mechanical harnesses shall include bolt-on, bolt tightened wedges on the spigot side of a push-on joint tied together with a sufficient number of rods to prevent joint movement with proper installation.
- **Mid-Span Gland** - Provide mid-span restraint split glands designed for use with PVC pipe where specified in the Drawings or where mid-span restraint is necessary to prevent pipe movement at unrestrained joints. Restraint split glands shall be fusion-bonded and epoxy-coated and shall depend on toothed wedges manufactured to limit point pressure on and damage to the pipe.
- **Mechanical Joint Adapter** - Where plain-end PVC pipe is mated to a mechanical joint fitting, provide a mechanical joint follower gland with the same restraint characteristics and torque limiting provisions as the mid-span ring.

Fittings

Fittings shall be cast or ductile iron fittings lined and coated per DIP fitting requirements.

Steel Pipe

Steel pipe is allowed for 12 to 60-inch diameters and shall be mortar-lined steel (MLS) pipe.

Protection of Field-Welded Steel Pipe

Contractor shall comply with AWWA C206 to protect field-welded steel pipe from thermal stresses.

Mortar-Lined Steel (MLS) Pipe

Mortar-lined and mortar-coated steel pipe shall conform to AWWA C200 and C205, subject to the following supplemental requirements. The pipe shall be of the diameter and class indicated, shall be provided complete with rubber gasket joints if they are indicated in the Contract Documents, and shall be provided with all specials and bends as required. For pipe 14 inches in diameter and larger, the nominal inside diameter after lining shall not be less than the diameter shown on the Drawings, allowing for tolerances according to AWWA C200 and C205.

Markings

The manufacturer shall legibly mark all pipes and specials in accordance with the laying schedule and marking diagram. Each pipe shall be numbered in sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation. All specials and fittings shall be marked at one end with top field centerline.

Handling and Storage

The pipe shall be handled by use of slings, padded cradles, or other devices designed and constructed to prevent damage to the pipe coating/exterior. The use of equipment that might injure the pipe coating/exterior will not be permitted. Stockpiled pipe shall be supported on sand or earth berms free of rock exceeding 3 inches in diameter. The pipe shall not be rolled and shall be secured to prevent accidental rolling. All pipe handling equipment and methods shall be acceptable to the Agency. The Contractor shall be fully liable for the cost of replacement or repair of pipe that is damaged.

Laying Lengths

Maximum pipe laying lengths shall be 40 ft. with shorter lengths provided as required on the Drawings.

Closures and Correction Pieces

Closures and correction pieces shall be provided as required so that closures may be made due to different headings in the pipe laying operation and so that correction may be made to adjust the pipe laying to conform to pipe stationing indicated.

Mortar

Materials for mortar shall conform to the requirements of AWWA C205, provided that cement for mortar coating shall be Type II and mortar lining shall be Type II. A fly ash or pozzolan shall not be used as a cement replacement. Admixtures shall contain no calcium chloride.

Steel for Cylinder and Fittings

Pipe manufactured under AWWA C200 shall have a minimum yield strength of 36,000 psi for the steel cylinder.

Specials and Fittings

Unless otherwise required by the Contract Documents, all specials and fittings shall be in accordance with AWWA C208 and AWWA M11 and coated as specified above.

Design of Pipe

The pipe shall be manufactured, tested, inspected, and marked according to applicable requirements previously stated and, except as hereinafter modified, shall conform to AWWA C200.

Joint Design

The standard field joint shall be as shown on the Drawings and the following requirements:

Ends of the bell and spigot type for rubber gasket joints shall conform to AWWA C200 and the pipe ends for 36" diameter and larger shall employ steel joint rings (Carnegie style spigot with weld-on bell ring). All joints used shall have been thoroughly tested for sealing water. Drawings of the type of pipe joints used shall be submitted as part of the shop drawings. The exposed inside and outside surface of the joints shall be protected with an epoxy coating applied at the time of manufacture.

Ends for mechanically coupled field joints shall conform to Section 4.13.1 of AWWA C200. Ends fitted with butt straps for field welded joints shall conform to AWWA C200.

Ends of the lap-welded slip type for field welded joints shall conform to Section 4.13.2 of AWWA C200 and as modified here. Unless otherwise approved by the Agency, bell ends shall be formed by an expanding press or by being moved axially over a die to stretch the steel plate beyond its elastic limit to form a round bell of suitable diameter and shape. Bells shall not be formed by rolling.

Plain ends fitted with flanges shall conform to AWWA C200 Section 4.13.7 and AWWA C207.

Restrained Joints

Restrained joints shall be field-welded joints, either single (inside or outside lap-weld) or butt-straps as indicated on the Drawings.

Lining

Lining shall be centrifugally spun in pipes and specials in conformity with AWWA C205. The lining thickness and tolerances shall be in accordance with AWWA C205.

Defective linings, as determined per AWWA C205, shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather edged joints.

Protection of Pipe Lining/Interior

For all pipe and fittings with plant-applied cement-mortar linings, the Contractor shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out of the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.

Exterior Coating

Exposed Piping

The exterior surfaces of pipe which will be exposed to atmosphere inside structures or above ground shall be cleaned and coated per Section 5, Painting and Coating.

Buried Piping

All pipe for buried service, including permanent bumped heads, shall be coated with a 3/4-inch minimum thickness of reinforced cement-mortar coating. Unless otherwise indicated, exterior surfaces of pipe or fittings passing through structure walls shall be cement-mortar coated from the center of the wall or from the wall flange to the end of the underground portion of pipe or fitting.

Contractor shall provide spiral wire or welded wire fabric reinforcement in accordance with AWWA C205. Welded wire fabric shall be securely fastened to the pipe with welded steel clips or strips.

For fittings and specials with an earth cover of less than 10 feet, the reinforced concrete coating shall be a minimum of 4 inches in thickness. Supplemental reinforcement shall be provided and shall consist of cages of reinforcing steel designed for external loads and with a minimum reinforcement steel area ratio of 0.002 in both the circumferential and longitudinal directions.

For fittings and specials with an earth cover of 10 feet or greater, the selected reinforced concrete coating shall result in a special wall thickness equal or greater than 4 inches or to that of the adjacent pipe, whichever is greater. The coating shall be reinforced as described above, and shall be either shop cast or field cast as an encasement.

The supplemental external reinforcement, with the concrete coating or encasement as described above, shall be used for all buried fittings and specials regardless of the ability of the steel cylinder to carry earth loads.

Pipe Appurtenances

Access manholes for 24" and larger pipe shall be spaced at a maximum 1,000-foot interval or as indicated on the Drawings. Install manholes during pipeline fabrication, not in the field.

Threaded outlets shall be forged steel suitable for 300-psi service.

Fusion-Welded High Density Polyethylene (HDPE) Pipe

Fusion-welded HDPE pipe supplied under this specification shall have a nominal Iron Pipe Size (IPS) outside diameter and be smooth-walled and manufactured in accordance with ASTM D3261 and PPI Designation PE3408 unless otherwise specified. The Standard Dimension Ratio (SDR), and/or the pressure rating of the pipe supplied shall be as specified by the Agency.

The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other deleterious defects, and shall be uniform in color, density, melt index and other physical properties throughout.

Fittings

Fittings shall be of HDPE manufactured in accordance with ASTM D3261.

Joining

Sections of HDPE pipe shall be joined into continuous lengths on the jobsite above ground by butt fusion method performed in accordance with the pipe manufacturer's recommendations. Socket fusion shall not be used. Extrusion welding or hot-gas welding of HDPE shall not be used.

Transitions

All transitions from HDPE pipe to another pipe material or outside diameter pipe material shall be manufactured specifically to match the outside diameters of the two pipes and shall have a pressure rating at least equal to the larger pressure rating of the two pipes. The coupling shall be welded to the HDPE pipe as above.

Pipe Packaging, Handling, and Storage

The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage.

Pipe shall be stored and stacked on clean, level ground to prevent undue scratching or gouging of the pipe in accordance with the pipe manufacturer's recommendations. The pipe shall be handled so that it is not damaged by dragging over sharp objects or cut by chokers or lifting equipment. Pipe cut or gouged in excess of 10 percent of the pipe wall thickness shall be cut out, and the cut ends fused together.

Water Service Piping

All service lines, valves, and fittings shall comply with AWWA C800.

Two-inch service piping shall have a two-inch gate valve with two-inch square operator nut accessible through a valve box at the main.

Meters three inches and larger shall have bypass piping with lockable shutoff valves around the meter.

Where required by the Agency, meters on services requiring uninterrupted water supply smaller than three inches shall have bypass piping equal in size to the service piping.

Drilling Service Taps

Service taps shall be drilled such that the entire plug and remains are extruded from the pipe. Small service taps are not permitted on pipes larger than 20 inches without written consent from the Agency.

Treated Water Service Piping Type

- **Copper and Brass Pipe** - Copper pipe shall be Type K, hard or soft, in conformance with the State of California drinking water act. All joints to saddle shall be inspected by the Agency before backfilling. Joints shall be bronze compression connections. When soldered fittings are used, the solder and fittings shall be lead-free and approved for potable water service. All 1- and 2-inch service pipes shall be one continuous pipe.

Plant & Raw Water Service Piping Types

- **Copper and Brass Pipe** - Copper pipe shall be Type K, hard or soft, in conformance with the State of California drinking water act. All joints to saddle shall be inspected by the Agency before backfilling. Joints shall be bronze compression connections. When soldered fittings are used, the solder and fittings shall be lead-free and approved for potable water service. All 1- and 2-inch service pipes shall be one continuous pipe.
- **Polyvinyl Chloride Pipe (PVC)** - Two-inch-diameter PVC pipe shall be Schedule 80, and shall conform to ASTM D1784 for rigid PVC compounds, have NSF approval, and shall conform to commercial standard 256 and ASTM D2241.

Pipe shall be manufactured to Iron Pipe Size (IPS) dimensions and shall be furnished in minimum standard lengths of 20 feet. Four-inch and larger diameter PVC shall conform to the most current AWWA C900.

All chemical feed piping three-inch and smaller shall be Schedule 80 PVC as specified in this section.

All PVC fittings shall be molded and manufactured of the same material as the adjacent pipe, suitable for either solvent-weld or screwed connections. Solvent-weld-type couplings and fittings shall be rated for pressures greater than that of adjacent pipe and shall be of a type recommended by the pipe manufacturer.

- **Polyethylene (PE)** - PE pipe shall conform to AWWA C-901, Standard designation PE 3408, SDR 9, Class 200 and shall be copper tube size.

Valves and Appurtenances

Valves shall open counterclockwise. Buried valves shall have a non-rising stem on the actuator and a 2-inch-square operating nut accessible through a valve box. Unless otherwise noted, above-ground valves shall have outside stem and yolk (OS&Y), rising stem.

Four-inch and larger valves shall be flanged. Valves installed above ground shall be lever-operated through 8 inches, handwheel-operated for larger sizes. Hand wheels shall have a minimum diameter of 18 inches and be fastened to the operating shaft with a cotter pin for easy removal.

Interior ferrous surfaces shall be factory fusion-bonded and epoxy-coated to a minimum thickness of 8 mils per AWWA C550. Exterior ferrous surfaces shall be factory-coated with a minimum thickness of 8 mils of fusion-bonded epoxy per AWWA C213.

Corrosion Control

See Section 7 - Corrosion Control for corrosion protection for pipes and appurtenances.

Waterline valves

Treated water valves 2 to 8 inches in diameter shall be gate type. Butterfly valves shall be used on larger pipe.

Raw water valves shall all be gate valves or segmented ball valves as determined by the Agency.

Gate Valves

Gate valves 2 to 8 inches in diameter shall be resilient-seated wedge type, 200 psi water, oil or gas (WOG) rated, and conform to AWWA C509.

Gate valves 1 ½ inches and smaller shall be bronze, handwheel- or lever-operated, with non-rising stem, 200 psi, WOG rated.

Butterfly Valves

All butterfly valves shall be rubber-seated, conforming to AWWA C504. Valves shall be short-body type.

Valve discs shall be an offset design to allow 360° seating and shall be constructed of alloy cast iron, ASTM A436 Type 1 (Ni-Resist). Butterfly valves shall be manually operated with a two-inch operating nut through an actuator complying with the "Gear Actuators" section below. Butterfly valves shall have the rubber seat in the body.

Where a butterfly valve is adjacent to a capped pipe, provide enough pipe between valve and cap to allow complete movement of the valve (at least three feet).

Air Vacuum Release Valves (AVRV)

AVRV's shall incorporate combination valves with bronze or stainless steel trim and shall be rated for at least the pressure rating of the adjacent pipe. As directed by the Agency provide an easily accessible isolation valve upslope of all AVRVS.

Size AVRVS per these Standards or as shown on the Plans. See Standard Drawings for box dimensions and positioning.

Submit engineering calculations for each AVRVS installed on steel pipe demonstrating the adequacy of the valve to prevent pipe failure. Unless otherwise shown, on other pipe types, provide 1 inch AVRVS on line sizes up to 12 inches; 2 inch AVRVS on line sizes 14 inches to 18 inches; and 3 inch AVRVS on line sizes 20 inches to 30 inches. For line sizes larger than 30 inches, the AVRVS size shall be determined by a professional engineer registered in California or as shown on the Plans.

Locate AVRVS at all high points of waterlines. Provide AVRVS on constant-slope pipelines on at least 1,000-foot intervals.

- **Air vent enclosures** - Above-grade air vent enclosures for AVRVS shall be composed of a minimum of 3/16-inch thick, 8-inch square tube stock with weld-on steel cap. When assembled and galvanized or coated and installed, the enclosure shall provide at least as much open area as the AVRVS outlet pipe. The assembly shall bolt onto AVRVS cover lids.

Raw water AVRVS shall be designed and manufactured for wastewater applications. See approved products list on page 154.

Ball Valves

Ball valves shall be metallic or plastic as described below with a minimum pressure rating equal to that of the adjacent pipe.

- **Metallic Ball Valves** - Ball valves 2 inches and smaller and used in steel or copper piping systems shall have a bronze body and stem and Teflon coated ball and seating.
- **Plastic Ball Valves** (Plant and Raw water only) - Plastic ball valves used in PVC piping system shall be PVC, normal impact, with Teflon seat ring. Valves two inches and smaller shall be provided with union-type end connections and stub ends designed for socket welding. Larger valves shall be flanged.

Globe Valves

Globe valves 3 inches and smaller shall have a bronze body with a replaceable composition disc. Valves shall be globe or angle pattern, as required. Larger globe valves shall be cast-iron body with yoke bonnet and bronze trim. Globe valves shall have a minimum working pressure of 200 psi.

Automatic Control Valves

Automatic control valves include pressure reducing, pressure relief, pressure sustaining, rate of flow, surge anticipation, and altitude valves. Unless otherwise approved by the Agency, all automatic control valves shall be diaphragm-actuated, pilot-controlled type and shall have globe style body, stainless steel trim, and V-port seating. The pilot system shall include pilot line wye-strainers with blow-offs, opening and closing speed controls, position indicator, and pilot system isolation cocks. Minimum pressure rating shall be 150 psi.

Pressure Reducing Valves

Pressure reducing valves 2 inches and smaller shall be bronze body with stainless steel trim, self-contained, direct-acting, high-capacity type with a built-in stainless steel strainer, have an adjustable outlet pressure setting, and be fully repairable in line.

Pressure reducing valves larger than 2 inches shall be combination reducing/sustaining type.

Pressure Relief Valves

Unless otherwise noted, submit calculations for approval by the Agency showing the valve's capacity to limit water velocity changes to less than one foot per second on valve closure.

Altitude Valves

Altitude valves shall include a single seat and a resilient disc for tight closure. If required by system hydraulics, the valve shall be the two-way flow type. For applications of altitude valves in which the differential pressure exceeds the manufacturer's cavitation chart limit, an orifice plate shall be installed downstream of the valve to dampen the cavitation per the manufacturer's recommendations.

Swing Check Valves

Swing check valves 1-1/2 inches and smaller shall be all bronze, with a regrinding-type disc and seat designed for a working pressure of 150 psi.

Swing check valves for waterlines two inches and larger shall be iron body, brass trimmed, designed for a working pressure of not less than 350 psi. They shall be of the balanced, swing gate-type with a clear opening at least equal to that of the connecting pipe and a rubber flap unless otherwise specified, and shall have an external lever and counter weight.

Valve Boxes

Valve boxes shall be provided for all underground valves and shall be precast concrete, traffic valve boxes. Lids shall be traffic-rated cast iron as noted on Plans with "WATER" cast into the surface.

- **Valve Riser Extensions** - Use 8-inch diameter PVC water pipe conforming to AWWA C900 or SDR 35.
- **Locking Valve Boxes** - Where specified, modify valve boxes as shown on Standard Drawing S107 to accept a valve box locking device. These devices shall be manufactured of stainless steel parts, shall be easily accessible and removable by hand, shall be anchored to the side of the valve box to prevent loss into the valve well, shall include a tag for written identification or note, shall lock with a common padlock, and shall block access to the valve actuator or valve stem riser. The Agency shall provide the padlock for locking valve boxes.

Raw water valves

Raw waterline valves shall be gate type, manufactured and installed as for treated water. Valves shall have a smooth inside bore on the bottom half so that sediment cannot accumulate. Air-Vacuum Release Valves (combination valve) shall be designed and manufactured for wastewater installation.

Gear Actuators

Unless otherwise noted, gear actuators shall be provided for the following:

- Butterfly valves
- Buried valves that have the operating shaft mounted horizontally

- Where specified or shown
- Where a lever or wheel operator effort would otherwise be greater than 40 foot -pounds of torque or 40 pounds of force at the rim of the wheel or lever under any operating condition

Gear actuators shall be of the traveling nut type with the output shaft perpendicular to the valve shaft. Above grade gear actuators shall have a removable hand wheel mounted on the output shaft. Unless otherwise specified, the gear actuators shall conform to AWWA C504 and shall be certified.

Actuators shall be capable of being removed from the valve without dismantling the valve or removing the valve from the line.

Threaded rod and traveling nut shall be machine-cut steel designed for smooth operation. Lever or slot mechanism shall be constructed to eliminate the possibility of slipping and jamming.

Manual input effort to the handwheel shall be a maximum of 40 foot pounds for operating the valve from full open to full close, under any operating conditions. Above grade gear actuators shall indicate valve position and have adjustable stops. Maximum handwheel size shall be 18 inches in diameter.

Tapping Sleeves/Saddles

Tapping sleeves shall be 304 stainless steel, including the flange, nuts, and bolts, and shall include a full circumferential gasket and a tapped test outlet and plug. Flanged gate valves shall be used for hot-tapping waterlines. Gate valves shall conform to gate valves in these Standards.

Tie-in Sleeves and Couplings

Complete tie-ins with restrained ductile iron mechanical joint sleeves. Mechanical joint sleeves must be at least 12 inches long. Bolting and gaskets shall conform to the requirements for the pipe to which the sleeve is attached.

Tie-ins to older pipe materials prohibit the use of sleeves. In these cases, use fusion-bonded, epoxy-coated flexible couplings manufactured for the types and sizes of pipes being connected and with the gaskets required by the manufacturer. Because these flexible couplings cannot be restrained on the pipe, restrain the pipe through other means.

Tie-in sleeves and couplings shall have a minimum pressure rating of 150 psi.

Flange Gaskets

Flanged joints shall conform to ANSI/AWWA C115/A21.15. Gaskets for up to 24" inches shall be ring type elastomer per ANSI/AWWA C111/A21.11 and shall be 1/8" thickness. Flanged gaskets shall be the high performance type satisfying the special requirements of ANSI/AWWA C111/A21.11, Appendix C, Sec.C.2 and have at least (3) bulb type rings molded into both faces of the gasket. Gaskets for 30 inches and above shall be full-faced type SBR elastomer and shall satisfy the special recommendations of ANSI/AWWA C111/A21.11, Appendix C, Sec.C.2 and have an elongated bulb molded into both faces of the gasket. Blind flange gaskets shall be cemented to the blind flange.

Hydrants

Hydrants shall be installed per Standard Drawings, as designated on the Drawings, and as specified here.

Provide a six-inch resilient seat gate valve on the lateral at the tee from main with every hydrant. All hydrant piping shall be restrained from hydrant tee to hydrant bury.

Hose nozzles shall be threaded-in, with one 4 ½-inch-diameter pumper outlet and two 2 ½-inch hose outlets having National Standard Fire Hose Coupling Screw Threads conforming to AWWA/ANSI C502 or as otherwise specified. Operation nut shall be National Standard bronze 1 ½-inch pentagon. The hydrant nozzle caps shall be securely chained to the body.

Hydrant main valve shall be a minimum 5 ¼-inch diameter, shall open CCW, with bronze-to-bronze seating. All bolts, nuts, and washers in the hydrant shall be Series 300 stainless steel.

- **Wet Barrel** - Wet-barrel hydrants shall conform to AWWA C503. The bury shall have a mechanical joint inlet for connection to the six-inch-diameter DIP hydrant lateral. Hydrants are to be furnished with drain openings plugged to the base.
- **Dry Barrel** - Dry-barrel hydrants shall conform to AWWA C502, and shall be compression type with safety flange and safety stem coupling above the ground line for repair without shutting off the water. Operating mechanism shall be automatically lubricated from a sealed, self-contained lubricating reservoir.

Service Saddles

Service saddle materials shall comply with the State of California drinking water act, and include a wide stainless steel or bronze strap and iron pipe thread with a minimum pressure rating of 150 psi. Service saddles shall be double strap bronze type. Maximum service tap and saddle size is 2 inches. Larger services require installation of tees in main.

Meter Boxes

Meter boxes shall be sized for the meter and appurtenances plus at least three inches of clearance between box wall and appurtenances. Meter boxes shall also be constructed and installed to resist incidental light vehicular traffic for the installation site, with a minimum of H10 load rating except where occasional heavy traffic such as driveways, alley and parking lots shall have a minimum of H20 load rating or as noted otherwise. All meter boxes shall be a minimum of six inches apart (outside to outside).

Angle Meter Stops

Angle Meter Stop materials shall comply with the State of California drinking water act. Inlet shall be compression or similar non-proprietary system approved by the Agency, with a meter coupling nut outlet and locking wing. For 1 ½- or 2-inch meters, provide two-inch angle meter stops with double-drilled or slotted flanges.

Meter Box Lids

All meter box lids for 2 inch and smaller meters shall be made of Polymer cement composite material (non-concrete). All meter box lids for 3 inch and larger shall be aluminum with spring assist lid, lockable, with drain.

Meter boxes are not permitted in sidewalks, driveways and/or parking areas.

Corporation Stops

Corp stop materials shall comply with the State of California drinking water act, ASTM B62, with a male iron pipe thread inlet and compression outlet for copper tubing. Corp stops shall be provided on services as large as two inches unless otherwise specified.

Pressure Gauges

Pressure gauges shall be rated for service intended, including negative pressure (vacuum gauge or compound gauge).

Unless otherwise noted, pressure gauges shall be glycerin-filled stainless steel Bourdon type with a 4½-inch-diameter black alumilite case. Maximum working pressure rating shall be 75 percent of maximum gauge pressure. Pressure range and calibrations shall be as required for site specific applications. The dial shall be engraved with the units in which the gauge is calibrated. All pressure gauges shall be equipped with shutoff and bleed cocks.

Flexible Couplings

Flexible couplings shall have a minimum pressure rating equal to the pipe class. Care shall be taken to see that smooth surfaces have been provided on the pipe so that the coupling can be properly fitted. Coupling shall be fusion-bonded epoxy-coated with stainless steel nuts and bolts unless otherwise specified. Couplings shall be the minimum length shown in the table below.

Pipe Size (in.)	Min. Coupling Length (in.)
¾ - 2 ½	5
3 - 4	8
6 – 24	12
>24	16

Expansion Joints

All piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement, without excessive forces imposed on equipment or structures. This may be accomplished with expansion loops, bellows-type expansion joints, or sliding-type expansion joints, as indicated.

Expansion joints shall be stainless steel, Monel, rubber, or other materials best suited for each individual service.

Contractor shall submit detailed calculations and manufacturer's shop drawings that guarantee satisfactory performance of all proposed expansion joints, piping layouts showing all anchors and guides, and information on materials, temperature and pressure ratings. Minimum pressure rating shall be that of the adjacent pipe class.

Locating Wire and Tape

Direct-bury insulated copper cable, 10 AWG. THHN shall be taped to the top of all pipe except 1- and 2-inch service piping at 5-ft. intervals with duct tape before backfilling. The pipe shall be clean and dry before the tape is applied. The cable shall be procured from the vendor, complete with an approved epoxy splice kit. Cable joints shall be spliced in accordance with the manufacturer's instructions to form a set of continuous electrical conductors throughout the pipe system or lacking these per Standard Drawings. Where pipe branches occur, the cable shall be branched so that cable surfaces at each valve, fire hydrant, blow-off, air/vacuum release valve, backflow prevention device, or other facility. Twelve-inch-wide, blue, waterline warning tape with the phrase, "CAUTION: WATER" printed in permanent, 4-inch-high letters shall be installed with all piping, including service lines, as shown on Standard Drawing S101.

Water Facility Markers

Markers shall be blue, flexible, dual-sided posts made of composite materials formed into a flat web protected by two ribs on the marker edge. Marker decals/printing and posts shall be resistant to vandalism, impact, ultraviolet light, and extreme temperature changes and guaranteed against fading, breakdown, and defects for at least 15 years. Water facility markers shall be installed in all unpaved areas as detailed in the Standard Drawings.

Backflow Devices

All backflow prevention assemblies shall be installed in accordance with AGENCY Improvement Standards, Division 2, Section 3, "Cross Connection Control" and as detailed in the Standard Drawings.

Inlet and Outlet Structures

All inlet and outlet structures shall be constructed of reinforced concrete. Also see Div.2, Sect. 2, Inlet & Outlet Structures.

Trash Racks

Trash racks shall be of all welded construction made from 1 ½ inch schedule 40 galvanized steel pipe. Damaged or inadequate zinc coatings shall be repaired before Agency acceptance.

Trash boxes shall be provided at all trash racks.

Execution

Installation and Testing

Quality Control

The Contractor shall use appropriate quality control procedures to ensure that all pipe and fittings shall be of the first grade and quality conforming to these Specifications. Pipe shall be stored and transported in a proper manner and kept clean after delivery to the job site. All work on pipe shall be performed in a skillful and professional manner.

Construction Staking

Contractor shall provide waterline offset staking for cut grades of centerline of pipe at a minimum of 50 ft. intervals or as directed by the Agency. Contractor to verify intervals with Agency prior to staking.

Excavation

Conduct excavation per Division 3, Section 3 - Earthwork of the Standard Specifications.

Laying Pipe

Pipe shall be placed and joined in accordance with manufacturer's and/or Agency's directions as specified. Necessary equipment including slings shall be provided for lowering and properly placing pipe sections into trench without damage.

Each section of pipe shall be thoroughly cleaned before it is lowered into the trench.

If clean pipe sections and fittings cannot be placed in the trench without getting dirt into open pipe, the Agency may require a piece of material be secured over the ends of the pipe or fitting until it has been lowered into position in the trench. After the pipe has been lowered into the trench, all foreign matter shall be completely brushed from the pipe ends before assembly.

The pipe shall be cut to provide closure pieces of correct lengths to permit the proper location of the pipe sections, or to locate valves, fittings, and appurtenant structures where specified on Plans.

The pipe and fittings shall be placed to the lines and grades specified on Plans, and centered in the trench. All pipe to be placed upgrade for grades in excess of 10 percent.

Trenches must be kept dry until pipe has been placed, joints closed and backfill completed to a depth of 1 foot above top of pipe. Crushed rock for drainage and/or bedding shall be provided as shown in the Standard Drawings.

Temporary, water-tight plugs shall be provided for closure of the open ends of the pipelines each time pipe-laying activity stops and at the end of each working day to prevent the entry of dirt and/or other contaminants.

Gravity-flow raw water piping shall have a straight alignment and uniform grade between manholes. Accept as approved by the Agency.

Bedding and Backfill Placement

Bedding and backfill in pipe trenches shall be of the type, placement and compaction as shown in the Standard Drawing S101 and as specified in Standard Specifications, Division 3, Section 3.

Connections to Existing Pipelines

System Shutdowns

When deemed necessary by the Agency, shutdowns of existing in-service pipeline and other distribution facilities shall be made by the Agency as necessary to complete pipeline connections. A shutdown shall be for as short a period as possible and shall be scheduled by the Agency. The amount of lead time necessary for shutdown and connection to existing mains varies with each job and must be planned accordingly. In no case shall a shutdown and/or connection be scheduled with less than 11 days' notice to the Agency. Make no connections to existing pipes prior to passing pressure and disinfection tests. Interference with the operation of the Agency's distribution system shall be kept at a minimum. While an existing pipeline is shut down, the connection work shall be performed without interruption, continuing after regular working hours until completed, if necessary unless otherwise directed by the Agency. In some cases, shutdowns must occur at times other than normal working hours and/or days.

In all cases, shutdowns shall be made in conformance with the requirements of the Agency, AWWA C651-14 and local, state, and federal authorities. The Agency shall operate all valves in making a shutdown, restoring pressure to the existing main, and initiating pressure to a new installation. The Contractor is required to obtain all necessary discharge permits. The Contractor shall make the necessary piping connections, furnish and install all necessary equipment required for the high velocity flushing operations. The Contractor shall provide for safe and legal disposal of water from such flushing's. The contractor shall remove all temporary flushing facilities. All costs for the permits, chlorination, and flushing shall be paid by the contractor.

The Agency shall be notified at least 11 working days prior to any connection operations. Contractor is required to submit a shutdown, testing, and discharge plan to the Agency that illustrates their means and methods of complying with this section. The plan shall be submitted at the time of notification.

General Connections

All connections to existing pipelines shall be made as shown on the Plans and per the Agency Engineer.

Where the existing main is provided with fittings for connecting to the new main, the face of the connection shall be clean and free of all foreign materials. The Contractor shall remove the plug, cap or blind flange, clean the ends, disinfect, and make the new joint.

Where the existing main is not provided with fittings for connecting to the new main, connections shall be made either by hot tap or by cutting and inserting sections of pipe and fittings, as shown on the Plans or as directed by the Agency.

Hot Tap Connections

All hot taps shall be witnessed by the Agency Inspector. After installation and prior to cutting into the existing pipe, hot tap installations shall be air tested at 50 psi for 5 minutes with no leakage.

At the successful completion of the hot tap, protect the tapping sleeve and main.

- **Steel main** - Wrap the tapping sleeve in WWF 0.5 x 0.5 W O.1 x W O.1 secured to the sleeve by stainless clamp at the throat. The entire sleeve shall then be coated in mortar to a minimum thickness of two inches, allowed to set, then backfilled.
- **DIP, PVC main** - Wrap the tapping sleeve in polyethylene encasement per AWWA C105 and the Corrosion Control section, then backfill.

Pipeline Abandonment

Boxes, vaults, and test stations associated with the pipeline must be removed to at least 24 inches below final grade, and any remaining structure shall be filled with sand compacted to at least 90 percent of maximum dry density.

Unless otherwise instructed, the Contractor shall return all valves, meters, and test stations to the Agency. The remaining material and appurtenances from main abandonment shall be disposed of by the Contractor at no additional cost to the Agency.

Removal

Pipeline removal shall not disturb other utilities. Excavate the pipeline completely before obtaining Agency approval for removal. Backfill the pipeline trench per standard trench section up to the initial backfill in the Standard Drawings.

Abandonment in place

Pipelines 12" and larger, or within 25 feet of roads, other paved surfaces, structures, or foundations, or at Agency request shall be filled with two-sack slurry in a manner to ensure no voids remain at the conclusion of the process.

Pipelines 8 inches in diameter and smaller shall be abandoned by plugging the pipe ends with at least 12 inches of concrete.

Hydrostatic Testing

Prior to pressure testing, pipelines shall be cleaned of all debris, construction materials, dirt, and any other materials not suitable for inclusion in the completed pipeline. The Contractor shall provide all labor, equipment, and materials required for filling and testing the pipelines. Cleaning shall conclude with water flushing, performed so that the velocity of flushing water is at least 2.5 feet per second in the pipeline to be tested.

Contractor shall test all pipelines either in sections or as a unit. No section of the pipeline shall be tested until all field-placed concrete, thrust blocks, and mortar have aged at least 14 days.

Backfill shall meet and pass all compaction requirements and subgrade shall be completed to the Agency's satisfaction prior to hydrostatic testing. The Agency shall be notified 48 hours prior to testing and must approve any water placement in any portion of the pipeline. The test shall be made by closing valves when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water and evacuating all air. Do not test against closed valves connected to a potable water system.

After the pipeline or section thereof has been filled, it shall be allowed to stand with a pressure of 2-20 psi for at least 24 hours to allow the concrete or mortar lining, if applicable, to absorb water and allow the escape of air from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to Agency shall be taken.

Pressure Pipelines

Hydrostatic Testing – backfill shall meet and pass all compaction requirements, all underground utilities shall be installed, and subgrade shall be completed prior to hydrostatic testing. The Inspector shall be notified forty eight (48) hours prior to testing and must approve any water placement in any portion of the pipeline. The pipeline shall be filled with water and all air evacuated.

For raw and treated water lines, the test pressure shall be 150 psi or 150 percent of static pressure, whichever is greatest. Maintain the test pressure for at least 2 hours.

The test pressure shall be measured at the lowest point of the pipeline section being tested. If other test pressures are indicated on the Drawings, the requirement that yields the greatest test pressure shall be used. The amount of water introduced into the pipeline to maintain the test pressure shall be measured volumetrically using a calibrated test reservoir. Accurate means shall be provided for measuring the quantity of water required to maintain full pressure on the line for the test period.

Leakage shall be considered as the total amount of water pumped into the pipeline during the test period. The allowable leakage is zero.

The allowable leakage for welded steel pipe shall be zero gallons.

The allowable leakage for buried piping having threaded, brazed, or welded joints (including solvent welded) shall be zero gallons.

Exposed pipe, and pipe with welded, flanged, or coupled joints shall have no leakage.

Gravity Piping

Test pressure shall be a minimum of 150psi, 150 percent of static pressure or 150 per cent of surge pressure, whichever pressure is the greatest (independent of pipe pressure rating). All allowable leakage shall be the same as for pressure pipeline (see above).

Disinfection

After successful completion of the hydrostatic test, the Contractor shall coordinate with the Agency to chlorinate all treated water main per AWWA C651-14 by completely filling the main and appurtenances with water having a 50-100 parts per million (ppm) available chlorine from sodium hypochlorite. The disinfection method shall be the continuous-feed method. The chlorinated water shall be retained in the main for at least 24 hours. At the end of the 24-hour period, the treated water in all portions of the main and appurtenances shall have a residual of not less than 25 parts per million (ppm). If the samples do not pass tests, iterate the disinfection process until a test passes.

Care shall be taken to prevent the strong chlorine solution from flowing back into the line supplying the water. A reduced pressure backflow preventer or an air gap must be used for this purpose.

After chlorination, the pipeline shall be flushed with treated water per AWWA C651-14. The water in the pipeline shall remain a minimum of 48 hours, after which the Agency shall collect bacteriological samples. These will be tested for coliform by an independent laboratory. The number and location of samples shall be determined by the Agency and shall be randomly chosen from fire hydrants and services. The improvements shall pass if all coliform tests show the most probable number (mpn) is less than 2.2. Failed tests will necessitate additional disinfection as above.

The Contractor shall make the necessary piping connections and furnish and install all necessary equipment required for the flushing operations. Velocities in the flushed pipe must be 2.5 feet per second or greater.

A reducing agent shall be applied to the water to completely neutralize the chlorine residual prior to discharge of the water. The Contractor shall provide for safe and legal disposal of water from such flushings. The Contractor shall remove all temporary flushing facilities. All costs for chlorination and flushing shall be paid by the Contractor, at no additional expense to the Agency

Continuity Testing

The Contractor shall test for the continuity of the locating wire at time of final walk-through. The Contractor shall provide all labor, equipment, and materials required for testing the continuity of the locating wire at each meter, valve, fire hydrant, blow off, and AVR. Should continuity not be present and/or observed, the Contractor shall repair, replace, and retest as necessary, entirely at Contractor's expense.

Hydrants

The pumper outlet shall face the street or traffic lane unless specified otherwise. In the event that the hydrant must be disassembled to rotate the pumper outlet so that it faces the street, new gaskets shall be applied to the hydrant when it is reassembled. When installing the concrete thrust block at the shoe, ensure the dry barrel hydrant weep/drain hole remains clear to drain.

Services

Install services per the Standard Drawings unless otherwise specified.

Meters

The Agency will install meters. See Standard Drawings for meter laying lengths and meter box configurations.

Corrosion Monitoring

See Division 3, Section 7 - Corrosion Control.

Section 2 - Concrete Work

General

In case of conflicts, these Standard Specifications shall govern over the Caltrans Standard Specifications, and the Caltrans Standard Specifications shall govern over those of the American Concrete Institute (ACI).

Hot weather is defined as any combination of high air temperature, low relative humidity and wind tending to impair the quality of fresh or hardened concrete or otherwise resulting in abnormal concrete properties. During hot weather, any or all the methods specified in ACI 305 shall be used to maintain the concrete temperature below the specified limits.

Materials

All concrete shall be designed for a 28-day compressive strength of at least 4,000 psi unless otherwise noted. The maximum slump shall be 4" per ASTM C143. Air entrainment shall be 6 percent per ASTM C138. The maximum water to cement ratio shall be 1:2 by weight. If concrete is to be placed by pumping, follow recommendations of ACI Committee 304.

All steel shall conform to Section 52 of the Caltrans Standard Specifications and these additional requirements. Bars for reinforcing shall be deformed, steel bars conforming to ASTM A615, Grade 40 minimum. Wire for tying reinforcement in place shall be 18 ga. or heavier, black annealed.

All formwork materials shall conform to requirements of Section 51 of the Caltrans Standard Specifications.

Forms for exposed concrete shall be APA-grade-stamped Class 1 plywood. Forms for foundation concrete shall be of any lumber of sufficient strength and rigidity to maintain specified tolerances. Forms shall be designed so that all exposed finish surfaces meet the appearance criteria of the project specifications.

Suppliers

Concrete suppliers shall be certified by the State of California Department of Transportation (Caltrans), and shall certify that all concrete furnished to the project conforms to these specifications and to the Caltrans Standard Specifications. In addition, the supplier shall furnish records of 7- and 28-day cure concrete cylinder tests for the proposed mix.

Related Materials

Moisture-Retaining Cover

Shall be one of the following, complying with ANSI/ASTM C171:

- Waterproof paper
- Polyethylene film
- Polyethylene-Coated Burlap

Liquid Membrane-Forming Curing Compound

Liquid type membrane forming curing compound complying with ANSI/ASTM C 309, pigmented or colored at time of application, non-toxic to potable water, and with a water retention of 0.035 pounds/square foot (0.17 kg/square meter) as determined per ASTM C-156 Standards.

Execution

The Agency shall be notified a minimum of 24 hours prior to concrete placement.

No more than one hour between loading concrete at the batch plant and placing the concrete is permissible.

The surface finish shall be as shown on the Plans, as approved by the Agency and conforms to Caltrans Standard Specifications. A one-inch chamfer shall be used on all vertical and horizontal finished edges unless otherwise shown, except slabs on grade which shall receive a 0.75-inch rounded corner on all horizontal corners.

Form Work

Forms shall be designed and constructed in accordance with the requirements of the ACI Standard Recommended Practice for Concrete Formwork, ACI-347 and Section 51 of the Caltrans Standard Specifications.

The forms shall be smooth, mortar-tight, true to the required lines and grades, and of sufficient strength to resist springing out of shape during placing. All dirt, chips, sawdust, and other foreign matter shall be completely removed before concrete is placed. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being reused. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly coated with an approved form sealer. The form sealer shall leave no film on the surface of the forms that can be absorbed by the concrete and shall be compatible with concrete paint.

Reinforcing

Minimum Reinforcing Steel Cover

The minimum concrete coverage for steel reinforcement shall be as follows:

Concrete Exposure	Min. Reinforcing Steel Cover (inches)*
Cast against and exposed to soil	3
Exposed to weather or water	2
All other applications	1 ½

*In no case less than 1 ½ times the maximum aggregate size.

Supporting Devices

Steel reinforcement shall be accurately placed and shall be supported and secured against displacement by the use of adequate supporting and spacing devices, tie wires, etc., so that it will remain in its correct location in the finished work. No supporting devices shall be used that will impede the flow of concrete.

Installation of Reinforcing Bars

Reinforcing steel shall be cleaned, fabricated, placed, tied and supported in accordance with ACI-318.1/318.1R and the Concrete Reinforcing Steel Institute's Manual of Standard Practice. Reinforcing shall not be bent or straightened in any manner that will weaken the material. Unless Plans show otherwise, allow at least 40 bar diameters overlap on splices for deformed bars.

The clear spacing between parallel bars shall not be less than 1-1/2 times the normal diameter of the maximum size aggregate and at least 1-1/2 inches except at splices, which shall be wired together.

Construction Joints

Before placing new concrete on or against set concrete, thoroughly roughen existing concrete surfaces and remove laitance, foreign matter and loose particles by sand blasting or wire brushing to the satisfaction of the Agency.

Curing and Protection

Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof.

All horizontal, screeded and floated surfaces exposed to drying winds and sunlight shall be sprayed with a curing compound at an application rate of 200sf per gallon.

Formed concrete surfaces shall be sprayed with a curing compound at an application rate of 200sf per gallon. This requirement will be waived if forms are left in place for at least 7 days.

Hot Weather Placing

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated into total amount of mixing water. Ice when introduced into the mixer shall be in such form that it will be completely melted and dispersed throughout the mix at the completion of the mixing time.

The temperature of concrete delivered at the time and location of placement shall not exceed 90°F under any conditions. The temperature of concrete delivered at the time and location of placement, except for concrete deposited in wall or column forms, shall not exceed the following temperatures under the following ambient conditions:

Relative Humidity Less Than %	Ambient Temperature Greater than °F	Maximum Concrete Temperature °F
80	90	90
70	90	90
60	90	90
50	90	85
40	90	80
30	80	75
20	75	70

- **Preparation for Placing**

Forms and reinforcing steel shall be cooled by fog spraying evaporation or covering with water-soaked burlap immediately prior to placing concrete. Forms shall be free of standing water when concrete is placed.

- **Placement**

Concrete shall be placed in shallower layers than under normal conditions if necessary to assure coverage of the previous layer while it will respond readily to vibration.

- **Protection and Curing**

Fog spray shall be used after finishing and before the specified curing is commenced to avoid surface plastic-shrinkage cracking. Forms shall be kept covered and continuously moist. Once forms are loosened and during form removal concrete surfaces shall be protected from drying and shall be kept continuously wet by fog spraying or other approved means until the specified curing is commenced.

Cleanup and Protection

Protect all concrete work against injury and defacement during subsequent construction operations, until acceptance by the Agency.

All projecting fins, bolts, wire, nails, etc. not necessary for the work shall be removed or cut back one inch inside the finished surface and patched in an inconspicuous manner. Metal form ties extending from the face of permanently exposed concrete shall be cut off at least 1 inch deep in the concrete immediately after removal of the forms. Fill holes with a 1:3 cement and sand mortar of the same color as the adjoining concrete. Mix and place the mortar as dry as possible and finish flush with the adjacent surface.

If pre-cast snap-tie fillers are used, they shall be firmly epoxied and the final surface of plugs shall be smooth with the wall surface.

All defects in concrete work shall be corrected. Chip voids to a depth of at least 1 inch, with the edges perpendicular to the surface and parallel to form markings. Voids, surface irregularities, or honeycombing shall be filled by patching or rubbing as approved by the Agency and shall be done at the Contractor's expense. Concrete surfaces so repaired shall duplicate the appearance of the un-patched work.

Testing

Concrete Compression Strength Tests

Concrete materials and operations will be tested by the Agency and inspected as work progresses. One complete test shall consist of making three (3) test cylinders in accordance with ASTM C31, storing the cylinders for 24 hours at the pour site, delivering the cylinders to the testing laboratory, testing one cylinder at 7 days of cure, one cylinder at 28 days in accordance with ASTM C39, and the third cylinder at a date determined by the Agency if the 28-day strength is below the required concrete strength. Should tests show insufficient concrete strength, Contractor shall remove and dispose of all concrete from the same mix batch off-site at no cost to the Agency. Costs of concrete replacement, subsequent retesting or re-inspection and other appurtenant items directly related to this work shall be borne by the Contractor.

The Agency shall select the testing lab to be used. The Contractor shall give the selected lab sufficient notice of construction operations and schedule to allow the lab to schedule the required tests and inspection.

Concrete Slump Tests

Each concrete pour shall be tested for slump per ASTM C143 at the beginning of the pour, at the time the sample cylinders are filled, and whenever the consistency of the concrete appears to vary.

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Section 3 - Earthwork

General

This work shall consist of performing all operations necessary to excavate earth and rock or other material, of whatever nature, including removing water, regardless of character and subsurface conditions necessary for the construction of the project facilities; placing backfill for all project facilities, including site grading, structures, transmission piping, electrical underground conduit, ditch and channel excavation, culverts, minor concrete structures, roadwork; removing and replacing unsuitable material; placing embankment material for all required project facilities; and other earthwork shown on the Plans and indicated in the Specifications including excavating and backfilling all structures, trenches and depressions resulting from the removal of obstructions, removing and replacing unsuitable material.

References

Comply with the following standards when making the following tests:

Tests	ASTM	California Test No.
Relative Compaction	D-1557-70 (or latest)	216 or 231
Sand Equivalent		217
Resistance (R-Value)		301
Sieve Analysis		302

Materials

Bedding, Haunching, and Initial Backfill

Unless otherwise specified, this material shall consist of well-graded clean sand or native material with 100 percent passing the No. 4 sieve, and less than 5 percent passing a #200 sieve. The material shall be free from vegetative matter and other deleterious substances. The backfill material shall be able to be compacted readily to form a firm and stable base. The material shall have a minimum Sand Equivalent (SE) of 30 (SE30). Any trench soil or moisture condition that prevents the bedding and haunching material from forming a firm and stable base requires the use of ¾-inch crushed rock for bedding and haunching and foundation as approved by the Agency. Proposed bedding, haunching, and initial backfill materials shall be submitted to the Agency with sieve analysis and SE test results.

Intermediate Backfill

Intermediate backfill can only be used with prior written approval from the Agency. The intermediate backfill material shall have a minimum SE of 30 with 100 percent passing a 1.5-inch sieve and well graded with less than 5 percent passing a #200 sieve. Any request to use intermediate backfill must be submitted with a sieve analyses and SE test results for review and approval.

Sand Slurry Backfill

Sand slurry backfill shall have the following mix (by percent volume): 23 percent sand, 73 percent water, and 4 percent entrapped air. Sand shall be as described for bedding, haunching, and backfilling, except that the SE shall be at least 95 (SE95). Sand Slurry Backfill can only be used in a free-draining trench with prior written approval from the Agency.

Two-Sack Sand Cement Slurry Backfill

Low-strength concrete slurry backfill shall be a sand aggregate Portland Cement concrete of Type I or Type II Portland Cement per cubic yard of concrete sand and sufficient water added to provide a fluid, workable mix that will flow and can be pumped without separation of materials while being placed. Unless otherwise noted the maximum slump shall be 6 inches, maximum compressive strength 1000 psi and the minimum compressive strength 600 psi.

Four-Sack Sand Cement Slurry Backfill

4-sack concrete slurry shall consist of Type I or Type II Portland Cement added per cubic yard of concrete sand and sufficient water to provide a slump of not more than 4 inches. Unless otherwise noted, the maximum compressive strength shall be 1,800 psi and the minimum compressive strength shall be 1,400 psi.

Embankment Construction Material

Embankment shall be constructed of excavated or imported material that is free from organic matter, roots, debris, rocks larger than 3 inches in the greatest dimension, and shall not have more than 14 percent of the material larger than 1-1/2 inches, and shall have these properties:

- Maximum Plasticity Index: 15
- Maximum Percent Passing the No. 200 Sieve: 50
- Maximum liquid limit: 50

Filter Fabric

Wherever filter fabric is specified, provide geotextile fabric meeting the minimum requirements shown in the following table:

Minimum Properties	Test Method	Values
Mechanical		
Unit Weight (oz./yd ²)	ASTM D-5199	12
Thickness (mils)	ASTM D-1777	110
Grab Tensile Strength (lbs.)	ASTM D-4632	300
Grab Elongation (%)	ASTM D-4632	50
Puncture Strength (lbs.)	ASTM D-4833	175
Burst Strength (psi)	ASTM D-3786	580
Hydraulic		
Permeability (cm/s)	ASTM D-4991	0.1
AOS (vs. Std. Sieve)	ASTM D-4751	100

Trench Plugs

Trench Plug (cutoff collar) shall be two-sack sand-cement slurry or material from excavation or imported material consisting of earth with particle sizes consisting of silts, clayey sands, or clays, and free from frozen material debris, vegetation, cinders, ashes and other organic materials. The nominal maximum particle size diameter for cutoff shall be 0.75 -inch and smaller, with 100 percent passing a 3/4-inch sieve, a minimum of 20 percent passing a #200 sieve, and a minimum plasticity index of 20, per ASTM D4318.

The Trench Plug shall be 4 feet long, shall key 18 inches into the trench walls and bottom, and shall extend 18 inches above the pipe crown. Trench Plugs shall be installed at crossings of streams, ditches, or canals or other sources of groundwater, or as requested by the Agency, and shall include drains.

Execution

Trench Excavation

Trench excavation shall include the removal of all materials or obstructions of any nature (except as otherwise specified), the installation and removal of all sheeting and bracing, and the control of water necessary to construct the work as shown. Unless otherwise indicated on the Drawings or permitted by the Agency, excavation shall be open cut. Trenching machines may be used except where their use will result in damage to existing facilities or where hand trenching is required to prevent damage to trees, tree roots, or other utilities.

All paving shall be saw cut or ground to a neat line. All loose, lifted, or cracked paving shall be removed to sound material and to a neat line as directed by the Agency.

Trench Width

Minimum trench width at the top of the pipe is detailed in the Standard Drawings. If for any reason, the trench is more than 8 inches greater than the minimum width, the Contractor shall provide, at his own expense, stronger pipe or corrected bedding conditions as approved by the Agency to meet the load requirements of the changed conditions at the Contractor's expense. Trenches shall meet OSHA requirements.

Foundation Bedding Treatment

Whenever the bottom of the trench cannot support a 300 lb/sf load, or in the opinion of the Agency, is otherwise unsuitable as a foundation for the pipe, the unsuitable material shall be removed to a depth such that when replaced with compacted ¾-inch crushed rock, it shall provide a stable and satisfactory foundation at the original trench grade as approved by the Agency.

Three-quarter-inch crushed rock shall be used only with approval of the Agency and the road controlling agency. Use of ¾-inch crushed rock must be reviewed for migration of fines. Filter fabric shall be provided around all ¾-inch crushed rock.

Whenever the trench bottom is in rocky material, the trench shall be over-excavated to 12 inches below the bottom of the bells, couplings, or joints of pipe and backfilled with bedding material.

Control of Water

Contractor shall control ground- and surface water to ensure the trench bottom has no standing water during backfill and compaction operations.

Trench Bedding, Haunching, and Backfill

Pipe shall be bedded and backfilled uniformly throughout its length. The specified bedding shall be compacted to a minimum 6-inch thickness below bells, couplings, and joints before placing the pipe. The bedding shall be compacted and leveled to give a uniform surface for laying the pipe.

Pipe shall not bear on bells, couplings, or joints. The trench shall be excavated at these locations as necessary. No permanent wedging and/or blocking of pipe shall be permitted. Care shall be taken not to compact the material beneath the bells, couplings, or joints until the pipe is in its final position.

Haunching shall be forced under the pipe and made firm and stable before any material is placed above the springline of the pipe. Backfill shall be compacted as specified with no damage to the pipe or appurtenances.

Intermediate backfill may be used with prior written approval of the Agency.

Slurry backfill may be used in place of bedding, haunching, and/or backfill as shown on the Plans or as approved by the Agency. Slurry backfills shall be delivered to the job site in a transit mix truck and deposited in the trench immediately after delivery. Slurry backfills can be covered with backfill as soon as surface water is absorbed and the slurry is firm and stable. Compaction of backfill or road section materials shall not begin until slurry backfills have set and provide a firm, stable base for the method of compaction used. Provisions shall be made by the Contractor to prevent the pipe from floating and to install a plastic bond breaker isolating the pipe from contact with the slurry.

Trench Compaction

The initial backfill shall be placed immediately after the pipe joints have been completed and inspected. The initial backfill shall be carefully placed without disturbing and/or damaging the pipe and/or joints, and shall be brought up evenly on both sides of the pipe. The initial backfill shall be manually compacted to a relative compaction of 90 percent using care to not damage the pipe or joints. "Manually compacted" does not exclude careful use of hand-controlled, power-operated equipment such as air tampers, vibrating tampers, or other hand controlled tools. Compaction by jetting will not be allowed unless approved in writing by the Agency.

At completion of compaction beneath the pipe haunches, backfill can continue in eight-inch maximum depth loose lifts compacted by means that provide specified compaction without damaging the pipe or joints.

The backfill material shall be moisture-conditioned to within 2 percent of optimum.

Lift thickness can be increased with prior written approval of the Agency and the road controlling agency.

The Agency and the road controlling agency shall determine the location and depth of all compaction tests. If a test fails, the area 15 feet on either side of the test shall be re-worked and re-tested to the satisfaction of the Agency and/or road-controlling agency until passing tests are achieved. An additional test will be performed 50 feet on either side of the initial failing test. The entire area between adjacent failing tests shall be re-worked and re-tested until passing tests are achieved.

Embankment Construction

Placement and compaction of embankment material shall be in conformance with Caltrans Standard Specifications Sections 19-6.01 and 19-6.02. The material shall be moisture conditioned to within 2 percent of optimum.

Section 4 - Clearing, Grubbing, and Stripping

General

This section describes the work included in clearing, grubbing, stripping, and otherwise preparing the project site for construction operations.

Clearing

Remove and dispose of shrubs, brush, limbs, and other vegetative growth. Remove all evidence of their presence from the surface, including sticks and branches greater than 2 inches in diameter or thickness. Remove and dispose of trash piles, rubbish, and fencing. Protect trees, shrubs, vegetative growth, and fencing not designated for removal.

Grubbing

Remove and dispose of wood or root matter below the ground surface remaining after clearing, including stumps, trunks, roots, or root systems greater than 2 inches in diameter or thickness, to a depth of 12 inches.

Stripping

Remove and dispose of all organic sod, topsoil, ash, grass and grass roots, and other structurally unsound material remaining after clearing and grubbing from the areas designated to be stripped.

Trees and Shrubbery

It is possible that existing trees, shrubbery, and other vegetative material are not shown on the Plans. Inspect the site to determine the nature, location, size, and extent of vegetative material to be removed or preserved, as specified herein. Preserve trees that are specifically designated for preservation on the Plans, conducting only hand tool work within their driplines.

Preservation of Trees, Shrubs and other Plant Material

The following areas shall be fenced with four-foot-tall, brightly colored synthetic mesh fencing:

- Wetland preservation easements within 50 feet of proposed construction activities
- All trees to remain within 50 feet of the construction area as follows:
- Outside the dripline of trees 6 inches diameter at breast height (dbh)
- Outside the dripline of trees 10 inches dbh aggregate for multiple-trunk trees
- Around any special protection areas defined in project environmental review documents
- As the Agency directs

A 1' x 2' sign shall be attached to fencing stating, "This tree to be saved," or "Protection area – keep out."

No development or on-site storage of equipment or materials will be permitted until the temporary fencing measures above are implemented.

All fencing shall be maintained throughout the construction project.

Execution

Clearing and Grubbing Limits

All excavation areas associated with new pipelines, structures, slabs, and special areas shown on Plans shall be cleared and grubbed.

Disposal of Clearing and Grubbing Debris

Do not burn combustible materials. Remove all cleared and grubbed material from the work site and dispose of in accordance with all local laws, codes, and ordinances.

Areas to be Stripped

All excavation areas associated with new pipelines, structures, slabs, and special areas shown on Plans shall be stripped.

Disposal of Stripping's

Remove all stripped material and legally dispose offsite.

Section 5 - Painting and Coating

General

This section includes materials and application of painting and coating systems for submerged metal, exposed metal, buried metal, and metal in contact with concrete.

Submittals

Submit manufacturer's data sheets detailing coating and surface preparation work including the following:

- Coating manufacturer's technical data on product and recommended use. Include the brand name and series number of all coatings to be used.
- Coating manufacturer's surface preparation criteria, including recommended surface profile range after abrasive blasting.
- Coating manufacturer's application instructions, equipment recommendation, temperature and humidity limitations, pot life and induction requirements, drying and curing times, and recoat cycle times. Recoat times and final cure shall be listed at 35° F., 45° F., 55° F., 65° F. and 75° F. substrate temperatures. Provide manufacturer's maximum and minimum material and substrate temperatures for proper application.
- Contractor's written program for over spray prevention.
- Coating manufacturer's Material Safety Data Sheets (MSDS) for all Product to be used on the project, including solvents, additives, cleaners and thinners.
- Abrasive supplier's certification that the abrasive blast material to be provided complies with the State of California Environmental Protection Agency, Air Resources Board (CARB) and local Air Quality Management District (AQMD) requirements for dry outdoor blasting as project requires.
- Abrasive blast cleaning and application equipment list and complete procedures for its use.
- Contractor's safety program to be employed on this project complying with the current requirements of Cal/OSHA, OSHA and these Standards.

Qualifications

The coating applicator shall hold a valid State of California Contractor's Class C-33 Painting and Decorating Contractors license for performing abrasive blast cleaning and coating work. The Contractor's coating applicator shall have a minimum of five (5) years practical experience and successful history in the application of similar products on like projects. The Contractor shall substantiate this requirement by furnishing and receiving Agency approval of a written list of references that includes a list of projects with verifiable coating inspection reports prior to beginning work.

The Contractor's coating applicator shall:

- Provide a supervisor at the work site during cleaning and coating operations.
- Provide skilled personnel qualified to perform the required work in a manner comparable with the best standards of practice and safety.
- Maintain continuity of personnel and coordinate transfer of personnel with the Agency.

Materials

General

All materials of a specified system including primer, touch-up, intermediate, and finish coats shall be provided by the same manufacturer. Thinners, cleaners and other additives shall be as recommended in writing by the coating manufacturer for the specified system. Materials handling and application shall conform at a minimum with manufacturers' requirements.

Coating materials including additives to be used in interior potable water contact surfaces must appear in the current ANSI/NSF Standard 61 "Listing of Certified Drinking Water System Components- Health Effects", as published by NSF International (NSF). They shall conform to regulations and applicable requirements of local, State and federal air quality and health regulatory agencies.

All coatings used on this project shall be asbestos free, lead free, cadmium free, and chromate free.

Coating products shall conform to local AQMD rules and regulations.

Painting and Coating Systems

Deliver paints to the jobsite in the original, unopened containers.

The following index lists the various painting and coating systems by service and generic type:

PAINT COATING SYSTEM INDEX		
System No.	Title	Generic Coating
Submerged Metal Coating Systems		
1	Submerged Metal, Non-Potable, Normal Service	Coal Tar
		Coal Tar Epoxy
2	Submerged Metal, Non-Potable, Severe Service	Polyamidoamine Epoxy
		Polyamine Epoxy
6	Submerged Metal, Potable, Normal Service	Urethane or Epoxy
Exposed Metal Coating Systems		
12	Exposed metal, Atmospheric Weather, Corrosive Environment	Polyamidoamine Epoxy
13	Steel Storage Tank, Interior Potable Water	High-Solids Epoxy
14	Steel Storage Tank, Exterior	Polyurethane
18	Exposed Metal, Galvanized	Synthetic Resin Primer
Buried Metal Coating Systems		
21	Buried Metal	Coal Tar
		Coal Tar Epoxy
Systems for Metal in Contact with Concrete		
22	Aluminum in Contact with Concrete	Bituminous Paint

System No.1 - Submerged Metal Coating Systems – Non-Potable Water – Normal Service

Coal Tar

Service Conditions:

For use with metal structures that cannot be dried properly. Material is soft, single component and approved for use with potable water.

Surface Preparation:

SSPC SP-3

Prime Coat:

8 dry mils

Coal Tar Epoxy

Service Conditions:

For use on metal structures or pipes where adequate drying time is available or for application at temperatures above 90 degrees Fahrenheit with reduced drying time. Material has superior abrasion resistance, longer drying time.

Surface Preparation:

SSPC SP-10

Prime Coat:

8 mils

Finish Coat:

8 mils

System No. 2 - Metal Submerged in Non-Potable Water - Severe Service

Polyamidoamine (high solids) Epoxy

Service Conditions:

For use on metal submerged in non-potable water exposed to abrasion or chemical attack

Surface Preparation:

SSPC SP10 (anchor pattern of 1.5-2.0 mils)

Prime Coat:

Shop-or Field-applied, two-component polyamidoamine epoxy applied at 4.0 to 6.0 dry mils.

Intermediate Coat (as necessary):

Field-applied two-component polyamidoamine epoxy applied at 4.0 to 6.0 dry mils.

Stripe Coat (as necessary):

Field-applied, two-component polyamidoamine epoxy applied at 1.0 to 2.0 dry mils to all welds and sharp edges per SSPC-PA1, 6.6 Striping, 7.4.6 Application Method (Brush).

Finish Coat:

Field-applied, two-component polyamidoamine epoxy applied at 4.0 to 6.0 dry mils.

Polyamine (100 percent solids) epoxy

Service Conditions:

For use on metal submerged in non-potable water exposed to abrasion or chemical attack

Surface preparation:

SSPC SP10 (anchor pattern of 3.0-4.0 mils)

Stripe Coat:

Field-applied, two-component polyamidoamine epoxy applied at 8.0 to 12.0 dry mils to all welds and sharp edges per SSPC-PA1, 6.6 Striping, 7.4.6 Application Method (Brush), followed immediately by finish coat "wet on wet."

Finish Coat:

Field-applied, two-component polyamine epoxy applied pinhole-free at 30.0 to 40.0 dry mils in one or two coats.

System No. 6 -- Submerged Metal - Potable Water - Normal Service.

Urethane or Epoxy

Service Conditions:

For use on structures, piping, or equipment immersed in potable water.

Surface Preparation:

SSPC-SP10

Prime Coat:

Shop or field-applied urethane applied at 2.5 to 3.5 dry mils.

Intermediate Coat:

Field-applied, two-component epoxy applied at 4.0 to 6.0 dry mils.

Stripe Coat:

Field-applied, two-component epoxy applied at 1.0 to 2.0 dry mils to all welds and sharp edges per SSPC-PA 1, 6.6 Striping, 7.4.6 Application Method (Brush).

Finish:

Field-applied, two-component epoxy applied at 4.0 to 6.0 dry mils.

System No. 12 - Exposed Metal - Atmospheric Weathering - Corrosive Environment

Semi-Gloss polyamidoamine epoxy (min. 43% solids)

Service Conditions:

For use with metal structures or pipes subjected to water condensation and chemical fumes, such as hydrogen sulfide, or atmospheric weathering.

Surface Preparation:

Previously painted Steel; SSPC SP-12 (scarify any remaining coating with 80-100 grit sandpaper.)

Galvanized components: SSPC SP-7

Bare Steel: SSPC SP-3

Spot Prime:

Field-apply, two-component epoxy at 4.0 to 6.0 dry mils to all bare steel, overlapping adjacent coating by 2 to 4 inches.

Prime Coat:

Field-applied, two-component epoxy applied at 4.0 to 6.0 dry mils.

Finish Coat:

Field-applied, semi-gloss polyurethane applied at 2.0 to 3.0 dry mils.

System No. 13 - Steel Storage Tank - Interior Potable Water

High-solids epoxy

Service Conditions:

For use on interior of steel storage tanks for potable water use.

Surface Preparation:

SSPC-SP-10

Shop or Field Prime Coat:

4.0 dry mils.

Finish Coat:

Field-apply each coat to a minimum of 6.0 dry mils. Total coat shall be at least 10.0 dry mils.

System No. 14 - Steel Storage Tank - Exterior

Polyurethane

Service Conditions:

For use on exterior surfaces of steel storage tanks. Material weathers well and resists graffiti.

Surface preparation:

SSPC SP-6.

Shop or Field Prime Coat:

2.5-3.5 dry mils

Finish Coat:

Apply each coat of acrylic aliphatic polyurethane to 3.0-5.0 dry mils. Total coat shall be 5.5-8.5 dry mils.

System No. 18 - Exposed Metal - Galvanized

Synthetic resin primer (phosphoric acid or vinyl butyral acid).

Service Conditions:

Surfaces shall be galvanized surfaces before applying topcoat.

Surface Preparation:

SSPC SP-1 followed by SSPC SP-7 (surface profile of 1.5 - 2.0 mils for interior surfaces, 1.0 - 1.5 mils for exterior surfaces)

Prime Coat:

4.0-6.0 dry mils.

System No. 21 -- Buried Metal

Coal tar or coal-tar epoxy (68 percent solids min.)

Service Conditions:

Buried metal, including valves, flanges, bolts, nuts, structural steel, fittings and metal piping in vaults.

Surface Preparation:

SSPC SP-6.

Prime Coat:

15 mils.

Topcoat:

15 mils.

System No. 22 – Aluminum in Contact with Concrete

Bituminous paint (68 percent solids min., coal tar pitch-based)

Service Conditions:

Aluminum grating, stairs, or structural members in contact with concrete.

Surface Preparation:

SSPC SP-1.

Prime Coat:

Synthetic resin wash primer (phosphoric acid or vinyl butyral acid)

Finish Coats:

Two coats of 12 dry mils.

Execution

Surface Preparation

Do not blast or prepare more surface area than can be coated in 1 day. Remove all sharp edges, burns, and weld spatter. Do not blast PVC, CPVC, or FRP piping or equipment. Do not blast epoxy-or enamel-coated pipe that has already been factory-coated.

Surface preparation shall conform to these SSPC (Steel Structure Painting Council, Surface Preparation Specifications, ANSI A159.1) specifications:

Description	SSPC Specification
Solvent Cleaning	SP1
Hand Tool Cleaning	SP2
Power Tool Cleaning	SP3
White Metal Blast Cleaning	SP5
Commercial Blast Cleaning	SP6
Brush-Off Blast Cleaning	SP7
Pickling	SP8
Near-White Blast Cleaning	SP10
Power Tool Cleaning to Bare Metal	SP11
Shop, Field, and Maintenance Painting	PA1

Wherever the words “solvent cleaning,” “hand tool cleaning,” “wire brushing,” or “blast cleaning” or similar words are used in these Specifications or in paint manufacturer's specifications, they shall be understood to refer to the applicable SSPC specifications listed above.

Paint Mixing

Prepare multiple-component coatings using all of the contents of the container for each component as packaged by the paint manufacturer. Do not use partial batches. Do not use multiple-component coatings that have been mixed beyond their pot life. Provide small quantity kits for touchup painting and for painting other small areas. Mix only the components specified and furnished by the paint manufacturer. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

Surfaces Not to Be Coated

Do not paint these surfaces unless otherwise noted and protect during the painting of adjacent areas:

- Concrete
- Mortar-coated pipe and fittings
- Stainless steel
- Metal letters
- Copper tubing
- Red brass piping
- PVC piping except where such piping occurs in rooms where the walls are painted or required for color coding
- Electrical fixtures except for factory coatings
- Nameplates
- Grease fittings
- Submerged brass and copper
- Buried pipe
- Aluminum handrails and grating

Protection of surfaces not to be painted

Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process. Mask openings in motors to prevent paint and other materials from entering the motors.

Field Touch-Up of Shop-Applied Prime Coats

Surfaces that are shop-primed shall receive a field touchup of the same primer used in the original prime coat.

Field Touch-Up of Galvanized Coatings

Surfaces that are shop-primed with inorganic zinc primers shall receive a field touchup of organic zinc primer to cover all scratches or abraded areas. Organic zinc coating system shall have a minimum volume solids content of 32 percent and a minimum zinc content of 15 pounds per gallon. Coating shall be of the converted epoxy or epoxy phenolic type. Organic zinc primer shall be manufactured by the prime coat and finish coat manufacturer.

Damaged areas of coating with a surface area not exceeding one square foot each shall be repaired in accordance with ASTM A780. The cold-applied zinc dust coating shall be applied in accordance with the manufacturer's printed instructions. Two coats shall be applied, to produce a total dry film thickness of 4 to 6 mils. Surface preparation shall consist of power tool cleaning to remove all corrosion, foreign materials, and defective zinc coating, and to expose bare substrate.

If items are damaged with total surface areas that exceed one square foot or 10 percent of the surface area of the item, whichever area is less, the damaged areas shall be re-galvanized with the hot-dip process.

Dry Film Thickness Testing

Measure coating thickness specified for ferrous surfaces with a magnetic-type dry-film thickness gauge. Test the finish coat (except zinc primer and galvanizing) for holidays and discontinuities with an electrical holiday detector, low-voltage, wet-sponge type. Check each coat for the correct dry-film thickness. Do not measure within eight hours after application of the coating.

If the item has an improper finish color or insufficient film thickness, clean and topcoat the surface with the specified paint material to obtain the specified color and coverage. Hand- or power-sand visible areas of chipped, peeled, or abraded paint, feathering the edges, then prime and finish coat. Work shall be free of runs, bridges, shiners, laps, or other imperfections.

Section 6 - Boring, Jacking, and Tunneling

General

Minimum casing inside diameter (I.D.) is 24 inches. Casings must be designed by a professional engineer registered in California.

Bores and tunnels made beneath roadways or railroads are not only subject to these Standards, but also the standards and approval of the road authority or the owner of the road or railroad.

Materials

Casings

Allowable casings shall be steel or high-density polyethylene (HDPE). Alternate casings may be permitted by the Agency if they meet or exceed steel pipe strength specifications and pose no health or safety hazards. Lap-weld steel pipe shall not be used for boring. Size casings to permit installation and removal of the carrier pipe. Parallel casing installations shall have a minimum of 1-1/2 diameters clearance between casing walls. The clearance between casings, when crossing freeways, shall be 2 diameters minimum.

When practical, install casing in bore before open-cut installation of carrier pipe. If it is not possible to install bores at the start of construction, leave 100 feet of carrier pipe at the bore pit side, and 300 feet at the receiving pit side for construction after completion of the bore.

Casing(s) placed within conventional highway rights-of-way shall extend 5 feet from the back of the curb on one side to 5 feet in the back of the curb on the opposite side, or to the right-of-way if the road line is less than 5 feet. Where Portland cement concrete (PCC) gutter exists, the casing shall extend at least 5 feet beyond the back of the gutter. In rural areas, the distance from the edge of the pavement to each end of the bore shall be 10 feet or 5 feet beyond the outside toe of the slope.

In any one bore, maximum variation between maximum and minimum outside diameter shall not exceed 1/4 inch for casings 24 to 48 inches O.D., and 0.50 inches for larger casings.

Steel Pipe

Use straight-seam or spiral weld steel casing with a minimum yield strength of 35,000 psi before cold forming. Casing shall have no coating or wrapping. Machine-clean pre-wrapped casing before delivery. Maximum weld height over plate thickness shall be 3/16 inch (0.185 inch).

The Contractor is responsible for using a casing of sufficient strength to install it without damage or failure. Casing buckled by jacking force shall be removed and replaced at no cost to the Agency.

Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.

Outside Diameter (O.D.) Tolerances

The O.D. shall not vary by more than one percent.

Wall Thickness Tolerances

The wall thickness in any location on the casing shall not vary from the required thickness by more than +17.5 to -10 percent of wall thickness.

Wall Thickness Minimums

Minimum wall thickness for steel pipe casing shall be as shown on Standard Drawing S404.

Lead Joints

A heavy-wall lead joint may be required for adverse ground conditions. If a heavy-wall lead joint is required, it should be 10 feet long but must be at least 1 diameter long, and shall have a minimum wall thickness of 1.5 times the wall thickness of the casing being used.

Lengths and Ends

Unless otherwise approved by the Agency, the casing shall be square cut by mechanical methods. Torches held by machinery shall be considered to meet this requirement. This does not apply to field cutting. Casing lengths shall be at least as long as the auger length.

Straightness

Casing shall be measured by the cord method with either string or wire stretched taut to take out all visible sag. Maximum cord measured along the casing shall be equal to true length times 0.02 percent. This is to be measured on actual lengths before loading for delivery to the job site.

Steel Casing Insulators

Lined steel casing insulators with plastic runners or skids shall be used to support and insulate the carrier pipe within the casing while preventing carrier pipe flotation. The size, type, spacing, installation, and manufacturer of these insulators shall be per the manufacturer's recommendations and these Specifications. If a discrepancy exists between the two, these Specifications shall override.

Band/Shell

The band, shell, or body of the insulator shall be constructed of 14 gauge T-304 stainless steel, or shall be hot-rolled, pickled, minimum 14-gauge steel with a coating of rust-inhibiting enamel or hot-fused PVC.

Connecting Flanges

The connecting flanges shall be of the same material as the shell and shall be ribbed or gusseted for rigidity.

Bolts/Studs

All bolts, studs and nuts shall be 5/16 inch diameter minimum and shall be stainless steel only.

Insulating Liner

The insulator shall have a PVC insulating liner with a minimum thickness of 0.090 inch and with 85 to 90 durometer.

Skids/Runners

The insulator shall have high-density plastic skids. The skids shall have a high resistance to abrasion and a low coefficient of friction. The skids may be supported by a riser welded to the shell. The skids shall be either bolted or have a stud-welded connection to the shell or riser. Glued connections are not acceptable.

Wing Cutters/Bands/Flairs

Wing cutters, if used, shall cut a maximum of 1 inch larger than the casing measured on the outside diameter. Any voids occurring from the use of wing cutters shall be grouted.

HDPE Pipe

Install HDPE casing where requested by the Agency and where the carrier pipe is also HDPE.

Center Spacers

Do not use center spacers for HDPE pipe installed in HDPE casing.

Diameter of Hole

Bored installations shall have a bored hole diameter essentially the same as the outside diameter of the casing pipe to be installed.

HDPE Casing Pipe Length

Lengths of casing pipe shall be as long as practical for site conditions. Joints between sections shall be completely fused in accordance with the manufacturer's recommendations.

Carrier Pipe

HDPE, DIP, and PVC pipe may be used for carrier pipe. All carrier pipe joints shall be restrained using a method approved by the Agency. HDPE Carrier Pipe may only be used with HDPE Casing Pipe.

Execution

Jacking and Receiving Pits

All boring, jacking, and receiving pits shall be:

- Located at least 10 feet from edge of pavement on conventional highways in rural areas
- Located 5 feet behind concrete curb or asphalt concrete (AC) dike on conventional highways in urban areas
- Located 5 feet outside toe of slope in embankment areas
- Located at least 20 feet from center line of main line Railroad
- Adequately fenced or barricaded behind type "K" barrier
- Adequately shored in accordance with Cal/OSHA or OSHA requirements

All pits left overnight shall be protected with a 6-foot-high fence in panel sections securely fastened together with reflectors secured to the side of the fence that faces the traffic. Partially buried posts with fencing attached to form a continuous fence, with reflectors secured to the side of the fence that faces the traffic may also be used. This fencing is not intended to be vehicle-proof.

Casing construction shall not interfere with, interrupt or endanger surface and activity above, and shall minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition at no cost to the Agency.

Grouting

Grouting shall be necessary only if there is reason to believe that voids exceeding 1 inch over the outside diameter of casing or liner plate are present.

From Inside Casing

For safety reasons, inside grouting can be used on casings 30 inches or larger.

Place fittings to fill expected cavities. When grouting, monitor the road or railroad surface over the casing and the casing being installed so that the road, railroad surface, casing or other structures nearby are not altered or damaged. Grouting pressure shall be the minimum pressure to feed the grout, but in no case shall it be more than 4 psi measured at the grouting fitting.

Alignment Tolerances

The centerline of the casing shall not vary in line or grade from the desired alignment by more than one percent or 1 foot per 100 feet of casing.

Rotary Drilling

The face must be mechanically cut (not cut with fluid pressure). If ground conditions warrant, a bentonite mix may be used to lubricate the cutter. The mix must be supplied to the face from a controlled tank. (Under no circumstances shall the fluid line be hooked directly to the water system or the water truck while drilling). Provide a controlled tank capable of mixing and agitating the fluid and regulating volume and pressure. Use the fluid mix only for lubrication and to bring back cuttings, not to cut the face.

Casing Installation

Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.

Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wet boring.

Auger the hole and jack the casing through the soil simultaneously.

Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.

Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.

As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed and the alignment and grade checked at minimum intervals of 60 feet.

Any casing pipe damaged in jacking operations shall be repaired, if approved by the Agency, or removed and replaced at Contractor's expense.

The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing shall be left in place, cut off or removed, as designated by the Agency.

Casing Fill

The annular space between the carrier and casing pipes is not to be filled.

End Caps

Seal the ends of the casing with sandbags and at least 12 inches of low-strength concrete per Standard Drawing S404.

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Section 7 - Corrosion Control

General

Corrosion control systems shall be designed by a registered corrosion engineer or a National Association of Corrosion Agencies (NACE)-certified Cathodic Protection Specialist or Senior Corrosion Technologist.

The minimum design life of the cathodic protection system will be 30 years. The cathodic protection system will require an annual survey and adjustment to ensure the long-term satisfactory operating performance of the system.

Provide a corrosion analysis for all transmission pipelines.

Materials

Magnesium Anodes for Buried Metallic Valves

Magnesium anodes shall be of high potential alloy with composition as indicated below. Each anode shall be cast with a steel core protruding from one end. The core shall be of sufficient length to permit attachment of a lead wire, the attachment procedure shall be approved by the Inspector.

Element	Chemical Composition by Weight
Aluminum	5.0 – 7.0% max.
Manganese	0.15% min.
Zinc	2.0 – 4.0% max.
Silicon	0.30% max.
Copper	0.1% max.
Nickel	0.003% max.
Iron	0.003% max.
Other	0.30% max.
Magnesium	Balance

Magnesium anodes for valves shall have a net weight of 17 pounds. Two 9-pound anodes may be substituted for one 17-pound anode.

The anode core strap shall be galvanized steel, with one end recessed to provide access to the rod for connection of the lead wire.

Each anode lead wire shall be 10 feet long, consisting of black No. 12 AWG, Type TW or HMWPE insulation. Connect the lead wire to the core with silver brazing to the rod for a mechanically secure connection

The soldered connection and core shall be sealed entirely with electrical potting compound.

Test Stations

Space test stations in intervals 800 to 1,000 feet along the pipeline to provide adequate test points for checking the performance of the system and to allow for future system adjustment. Additional test stations may be required at the starting point and the ending point for each new pipeline.

Ground level test stations shall include a cast-iron lid unless otherwise shown on the Plans. The cover shall be manufactured with "CP-TEST" markings for easy identification. Terminal boxes shall be locking type, constructed of high-impact molded Lexan plastic. The test box shall be provided with sufficient hardware and terminals for each cable as shown on the drawings. All test station hardware, including nuts, bolts and shorting straps shall be nickel-plated brass. Terminal Boxes for the anode test stations shall be supplied with 6 amp, 0.01 ohm shunts.

Post mounted test stations shall be weather tight with cast aluminum body. The size and number of terminals will vary according to the number of cables. Use appropriately sized terminal boxes at each location. All test station hardware, including nuts, bolts and shorting straps shall be nickel-plated brass. Mount test stations on 4-inch diameter rigid galvanized schedule 40 steel posts.

Impressed Current System for Tanks

Rectifier

The rectifier unit shall include:

- Transformer
- Selenium or silicon rectifying elements
- Circuit breaker(s)
- Lighting, surge, and overload protection
- Provision for air-cooling operation
- Voltmeter(s) and ammeter(s)
- Weatherproof cabinet in accordance with NEMA 3R requirements
- Provision to vary current output from 0% to 100% of rated capacity.
- Provision for mounting, grounding, and locking
- Provisions for 110-120 volt, 60 HZ, single phase A.C. power
- D.C. output capacity in volts and amperes in accordance with Design (Section B)
- Number of circuits or separate rectifiers in accordance with design (Section B)

Automatic Controller

Automatic controller shall adjust current output to compensate for changes in water level, temperature of water, water chemistry, and cathodic polarization, and shall include the following provisions:

- Utilize long-life reference electrode(s) mounted in tank
- Monitor the tank-to-water potential, free of IR drop
- Automatically adjust the tank-to-water potential, free of IR drop, to a preset value
- Operate within 25 mV of preset value
- Automatically limit current to preset value
- Utilize potential meters to display tank-to water potential, free of IR drop

Long Life Reference Electrodes

Reference electrode shall consist of a copper-copper sulfate electrode manufactured to remain stable (± 25 mV) for a minimum of 10 years. The reference electrode-to-lead wire connection shall be encapsulated to prevent water migration.

Anode Suspension System

Handhole assemblies used for the installation of vertical anode suspension systems from the roof of the tank shall consist of a 6-inch-diameter steel cover, rubber gasket, and a steel bar and bolt assembly.

Icing Tanks

The anode suspension system for icing tanks shall consist of a minimum 5/16-inch polyester cord secured to steel anchors welded to the side wall of the tank bowl or to the exterior of the dry access column of spheroidal type tanks and the side wall of wet risers 30 inches in diameter or larger. All cord-to-cord connections shall be tied and taped.

Non-Icing Tanks

The anode suspension system for non-icing tanks shall be either the same system as above, or a system allowing for vertical suspension from the roof of the tank. The anode lead wire shall be a minimum No. 10 HMWPE or USE-2 (EPR-HYP) and will be used to secure the lead wire to a porcelain insulator bracket bolted or welded to the interior of the tank roof.

Anode Materials

The anode materials shall consist of one of the following:

- Minimum 0.06-inch diameter platinized niobium with 25 micro inches of platinum.
- Minimum 0.062-inch diameter titanium with a precious metal oxide coating.
- One-inch diameter x 9-inch high silicon cast iron.

All anode-to-header cable connections shall be sealed to prevent water migration.

Pressure Entrance Fitting

For icing tanks, the pressure entrance fitting shall accommodate anode and reference electrode lead wires through the side wall of the bowl or riser of the tank.

The pressure entrance fitting shall consist of a maximum 1.5-inch coupling rated at 3000 psi. The fitting shall be manufactured to prevent leakage or water migration through the insulated lead wires.

Wiring

All wiring within the tank shall be insulated to prevent copper conductor-to-water contact.

All wiring on the exterior of the tank shall be insulated and run in rigid conduit.

Hardware

All hardware used in conjunction with the system shall be protected against corrosion.

A.C. Power

A.C. power to the rectifier shall be furnished and installed according to the Plans and specifications.

Execution

Cathodic Protection for Valves

All buried valves shall be installed with magnesium anodes as described in these Standards.

Thermite Welds

Remove any existing coating on the valve by making a 3 inch square window in the coating. File or wire brush the exposed metal surface to produce a bright metal finish, equivalent to SSPC SP-10.

Cartridges and sleeves for welding the anode lead wires to the valve shall have a minimum weight of 15 grams. Weld metal shall be as recommended by the manufacturer for the type of pipe to which the wire is to be welded.

Thermite weld caps shall be high density polyethylene plastic, 20 mils (minimum) thick. Design shall incorporate a mastic-filled dome and a tunnel portion to contain the lead wire from the thermite weld connection.

Silver brazing alloy shall have a minimum silver content of 15 percent as per ASTM E 56. Melting range shall be 1,185°F to 1,300°F.

Installation of Magnesium Anodes on Valves

Install the magnesium anodes as shown on the Plans or as shown in Standard Drawing S112. Anodes shall be installed in the trench horizontally or vertically in native soil, after excavation to proper depth, as shown. Spacing between anodes shall be five feet (minimum) if multiple anodes are installed at a single location. Prior to placing anodes in the trench or hole, paper or plastic bags shall be removed, but the cloth bag shall remain around the anode. Care shall be exercised during installation to prevent damage to the cloth bag and loss of backfill material. After placing anodes in the trench, native soil, free of rocks and other foreign objects shall be placed around the anode to a minimum cover of one foot above the anode. Remainder of the trench shall then be backfilled with native soil. During installation, anodes shall not be supported or handled by use of attached wires.

Backfill around each anode and compact to the relative compaction specified to one foot above the anode.

Bury anode lead wires a minimum of 24 inches below finished grade. Coil wires in slack loops to compensate for settlement near the anode and near the lead-wire connection to the pipe. Any damage to the insulation on the anode lead wire shall be wrapped with 2 layers of Scotch No. 23 high-voltage tape and 2 layers of Scotch No. 88 vinyl-electrical tape, or equal.

After backfill is level with the top of the anode, pour 15 gallons of water into the anode to completely saturate the backfill.

Cathodic Protection of Pipelines

Ductile Iron Pipelines

Comply with the recommended practice of NACE RP 0169, Control of Corrosion on Underground or Submerged Metallic Piping Systems.

Polyethylene Encasement for Ductile Iron Pipe

When required by the Agency or where soil conditions necessitate, all buried ductile iron pipe shall be coated in 16 to 30 mils of coal tar mastic and wrapped in polyethylene in accordance with AWWA C105/A21.5, Polyethylene Encasement of Ductile Iron Piping for Water and Other Liquids. The polyethylene sheets used for encasement of the ductile iron pipe and fittings shall be minimum 8 mils thick.

Bonding of Ductile Iron Pipe Joints

All buried, non-insulating joints of ductile iron pipelines shall be bonded with HMWPE-insulated, stranded, copper cables, for electrical continuity. The joint bond cables shall be sized as shown on the Plans, or a minimum of No. 12 AWG.

Isolation from Existing Pipelines and Above-Grade Structures

Insulate the buried portion of pipeline from other metallic pipelines, reinforced concrete structures, and above-grade buildings or structures with insulating flanges and/or couplings.

Anodes

Protect ductile iron pipelines with anodes where required by soil conditions and where required by the Agency.

Galvanic anodes may be installed in groups of as many as 10 anodes connected to the pipe through Anode Test Stations (ATS). The number and size of anodes shall be determined by the pipeline diameter and length, and by the soil characteristics.

Mortar Coated Steel

Where cathodic protection is necessary, comply with NACE RP 0169 and RP0100.

Bonding of Pipe Joints

All buried, non-insulating, non-welded, joints of mortar coated steel pipelines shall be bonded with HMWPE insulated, stranded, copper cables, for electrical continuity. The joint bond cables shall be sized as shown on the Plans.

Isolation from Existing Pipelines and Above-Grade Structures

Insulating flanges and/or couplings should be installed to electrically isolate the buried portion of pipeline from existing metallic pipelines, reinforced concrete structures, above-grade buildings or structures, and dissimilar metal pipelines.

Cathodic Protection of Interior of Steel Water Storage Tanks

Provide automatically controlled impressed current cathodic protection for the interior surfaces of each tank following the recommended practice of NACE RP0388.

The criterion for protection shall be based on a tank-to-water potential, IR drop free, within a range of -0.850 volts to -1.100 volts related to a copper-copper sulfate reference electrode. This criterion shall be maintained by an automatically controlled rectifier and an anode system.

In addition, base system capacity and performance on the following:

- Total surface area of the tank (Total surface area includes high water level in bowl and wet risers in elevated tanks 30 feet in diameter or larger.)
- Type of coating and condition of coating (Total bare surface area to be protected will be a minimum of 25 percent of total surface area.)
- Minimum current density of 0.5 milliamp/ft² of bare surface area.
- Chemical analysis of water, including resistivity expressed in ohm-cm.
- Susceptibility of tank to icing.
- Minimum anode system life of 20 years.
- Selection, dimensions, and layout of system components.

Impressed Current Systems

Workmanship and Installation

Impressed-current systems shall be installed by personnel who are specifically trained and qualified in the installation of cathodic protection systems. All work shall be in accordance with the following requirements:

- Components of the cathodic protection system shall be installed in the manner and at the locations as shown on the design drawings prepared by the corrosion engineer.
- Pressure entrance fitting shall be installed in accordance with AWWA D100, Section 3.13.
- Welding, cutting, and coating shall be in accordance with AWWA Standards D100, D102 and D103.
- Materials and equipment shall be inspected prior to installation. Any defective component shall be repaired or replaced.
- Electrical work shall be in accordance with the National Electrical Code.
- Lead wires shall be installed to prevent damage from abrasion.
- Electrical connections within the tank shall be sealed to prevent water migration.
- The rectifier shall be mounted and at convenient height (eye level) above grade for monitoring and service purposes.
- All improvements required to bring A.C. power to the rectifier shall be provided.
- Work provided by the cathodic protection contractor shall be completed in a clean and safe manner.

Energizing System

After the system is installed and the tank is filled, the Contractor shall provide startup service including energizing, testing, and adjusting the system for optimum performance. This startup service shall be in coordination with the Agency. In addition to the startup service, "as-built" drawings and three copies of an Owners Operation and Maintenance Manual shall be submitted to the Agency.

All testing shall be conducted with a calibrated, portable, copper-copper sulfate reference electrode and a portable, high-impedance voltmeter. Measure a minimum of five locations. A corrosion engineer shall review and evaluate all test data in accordance with NACE standards.

Section 8 - Erosion Control

General

The work under this article consists of furnishing all labor, equipment, materials, and performing all operations required to install erosion protection on the areas disturbed during the construction operation.

Comply with the Placer County Storm water Management Manual, Chapter IX, to determine project requirements for sheet, gully, and channel erosion control.

Materials

Materials shall conform to the provisions in Section 20-2 of Caltrans Standard Specifications. The materials shall include fertilizer, soil, seed, straw, and other materials as approved by the Agency. Seed used shall be of a variety native to the area as recommended by the Soil Conservation Service.

Straw wattles shall be constructed with biodegrading mesh. Plastic mesh will not be allowed.

Execution

Preparation

Preparation shall include all work required to get the areas ready to receive the erosion control materials, including spreading straw over the area after fertilizing and seeding.

Topsoil shall be spread uniformly and shall be cultivated, if necessary, to a sufficient depth to break up any compaction resulting from the spreading operations.

Fertilizing and Seeding

Unless otherwise specified, fertilizing and seeding shall conform to the following requirements. Fertilizers and seed shall be uniformly spread over the area and shall be done in accordance with Sections 20-3.OA and 20-3.OA and 20-3.OB of Caltrans Standard Specifications or as approved by the Agency.

Applying Straw

Straw shall be uniformly spread over all areas receiving erosion control materials. Straw shall be placed after all other erosion control materials are properly placed. Straw shall be dispensed onto the areas using a power driven dispenser.

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Section 9 - Guniting

General

Work under this section includes furnishing, preparation, mixing, and placing of gunite as specified herein. Gunite shall be applied by the dry-mix process.

Shotcrete will not be allowed as a substitute for gunite.

References

The standards referenced below will be utilized in this application:

- ASTM C33, Specification for Concrete Aggregates
- ASTM C150, Specification for Portland Cement
- ASTM 494, Specification for Chemical Admixtures for Concrete

Materials

Cement

Cement shall be clean, fresh, Type II Portland cement and shall conform to ASTM C150. Type III (High Early Strength) cement is also acceptable when authorized by the Agency.

Water

Water shall be clean and free from deleterious amounts of silt, oil, acids, alkali, salts, organic substances and shall contain no chlorides, calculated as Cl, in excess of 1000 ppm, or sulfates in excess of 1000 ppm. Water pressure shall be at least 15 psi above the air pressure at the nozzle.

Sand

Sand shall be washed, clean, sound and free of deleterious coatings, clay balls, wood, or other extraneous material and, at the time of batching, shall conform to ASTM C33, C88, and C131. Sand shall be furnished in the primary sizes specified in ASTM C33. Sand shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine. Gradation shall be adjusted for best performance as approved by the Agency. Sand shall have a moisture content between 3-6 percent.

Accelerator

No admixtures shall be added to the gunite mix except a liquid or powdered set accelerator. The accelerator shall meet the requirements of ASTM Designation C494, Type C, except for the restrictions on the time of initial set, and the percent of minimum compressive strength of control specimens over 7 days of age. The proposed set accelerator shall be tested for compatibility with the gunite mix and submitted for Agency approval. The maximum initial set time shall be 3 minutes, and the maximum final set time shall be 12 minutes. Use of calcium chloride will not be permitted.

Fibers

Polypropylene fibers shall be used when specified at a rate of 1.5 lbs. per cubic yard.

Wire Reinforcement

Reinforce gunite with 6x6 10 gage welded wire fabric.

Execution

Proportioning and Mixing

Use a minimum of 7 sacks and a maximum of 8 sacks of cement per cubic yard of gunite. The basic proportions of the gunite shall consist of 1 part cement to 4 parts sand by weight. Contractor shall submit the proposed mix design, including admixtures, to the Agency for approval before beginning placement. Batch weight of the sand shall be on a saturated, surface-dry basis. Mix proportions shall be such that core-drilled, nominal three-inch-diameter cylindrical specimens of the gunite will pass a minimum unconfined compressive strength test of 4,000 psi at 28 days.

Use the dry-mix process for guniting. Thoroughly and uniformly mix the material in a dry state in an approved mixer for at least 90 seconds for 1 cubic yard of gunite, with an additional 30 seconds for each additional cubic yard of gunite. The mixture shall be uniform and shall be continuously supplied to the delivery equipment to assure uninterrupted operation. Dispose of mixes allowed to stand for more than one hour. Dispose of off-site.

The equipment proposed for use shall be capable of mixing and delivering a high-quality, well-mixed gunite mixture with reliability. Provide sufficient quantity of compressed air at proper pressure to maintain a clean airflow adequate for sufficient nozzle velocity and for operation of a blow pipe for clearing away rebound. Maintain communication between the mixer operator and the delivery equipment operator at all times.

Preparation of Foundation

The foundation for areas to receive gunite shall be evenly graded before the mortar is applied and no point on the graded slope shall be above the slope of the plane shown on the Plans or directed by the Agency.

The areas shall be thoroughly compacted, with sufficient moisture to provide a firm foundation and to prevent absorption of water from the mortar, but shall contain no free surface water.

Existing facilities to receive gunite shall be trimmed to create smooth transitions and flows, cleaned and cleared of all vegetative growth, rocks, sediment and all other objectionable material to one foot beyond the limits of the gunite application. When shown on the Plans, joints, side forms and shooting strips shall be provided for backing or paneling. Ground or gauging wires shall be used where necessary to establish thicknesses, surface planes and finish lines.

Placement of Gunite

All gunite layers shall be built up to their specified thicknesses in passes so that no sloughing of freshly placed material occurs. Place each layer in one continuous operation except where there is evidence of sagging, excess moisture, or other defects. Cut out defective areas and replace them with fresh satisfactory gunite. Final gunite thickness for each area will be specified by the Agency.

Thickness

Where repairing an existing gunite slab, match the existing thickness or 3" whichever is greater.

New work shall be placed a minimum of 6 inches thick or as shown on Drawings.

Reinforcement

Secure wire fabric to remain embedded at half the thickness of the final gunite slab during preparation and application. Overlap adjacent sheets of fabric by at least six inches in both directions. Loose mill scale, oil, or rust on the fabric will not be permitted.

Equipment and Crews

Foremen, machine operators, and nozzleman employed in guniting operations shall be experienced on comparable projects and meeting the requirements of ACI 506. Generally, foremen must have 2 years of applicable experience and machine operators and nozzleman must have 6 months of applicable experience. Nozzleman who demonstrate adequate skill at gunite application may be approved by the Agency even if they do not have 6 months of experience. All equipment used for the guniting operations must be approved by the Agency. All batching equipment must be capable of performing accurate measurement to produce a uniform material. Weighing and flow meter devices shall be maintained within +/- one percent of the correct weight, volume, or flow rate throughout the range of use. Submit documentation of equipment testing and accuracy and receive Agency approval before guniting begins.

The gunite batching and mixing equipment as well as equipment required to deliver material to the nozzle shall be approved by the Agency.

Any personnel or equipment not approved for this type of guniting work according to the above requirements, shall immediately be removed by Contractor upon written notification by the Agency.

Batching and Mixing Temperatures

At the time of batching and mixing, the temperature of the mixture, prior to adding water, shall be above 38°F. The water temperature shall be adjusted by cooling, heating, or adding ice to obtain a gunite temperature of at least 45°F as discharged and less than 80° F as discharged. Temperature of the gunite as discharged, shall always fall between 45°F and 80°F.

Operation of Pneumatic Equipment

The nozzleman shall have complete and safe freedom of movement. A nozzleman's helper equipped with an air blow pipe shall attend the nozzleman in order to keep the work area free from rebound.

The nozzle shall be kept 2.5 to 3.5 feet from the application surface so that the material shall impinge as nearly as possible at right angles to the surface, except at interior corners. Loose sand or rebound shall be removed prior to placing a succeeding layer of gunite.

Rebound shall be kept to a minimum. Do not reuse rebound material.

Nozzle velocity shall be 275 to 500 feet per second for 3/4 to 1 inch nozzles, and 425 to 500 feet per second for 1.25-inch nozzles.

Work Stoppages

Placement shall be interrupted in case of sagging, excessive moisture, rebound pockets, or other defects. Before placement may be resumed, the bonding surface shall be processed in compliance with one of the following:

- Alternate 1 - Before initial set, all defective gunite shall be cut out, and all laitance shall be removed by carefully performed light brooming.

- Alternate 2 - After final set, loose rebound shall be brushed off, rebound pockets and other defective gunite shall be cut out, and all laitance shall be removed by dry sandblasting or high-pressure water jetting.

Construction Joints

Construction joints caused by work stoppages shall have tapered edges forming an angle of 30 degrees or less with the flat surface of the joint. In no case will square shoulders be allowed.

Clean-up and Disposal

Cleanup and disposal of waste gunite is the responsibility of the Contractor.

Repairs to Gunite

The surface of previously placed gunite shall be thoroughly sounded with a hammer to determine the location of any rebound pockets, lack of bond, or other subsurface defects. All such areas, sags or other defects shall be cut out and replaced with suitable gunite. All gunite which, in the opinion of the Agency, fails to comply with the provisions of this Section shall be chipped out and replaced with acceptable gunite by the Contractor at the Contractor's expense. Replacement wire fabric shall overlap existing wire a minimum of 1 square. If the wire fabric is left in place, it shall not be damaged.

Quality Control

Testing, Control, and Inspection

Sampling and quality control shall be the responsibility of Contractor. The Agency may carry out compression and other tests on the samples taken. The Agency will inspect, from time to time, all aspects of the work and may carry out tests on the gunite in place and on the batch weights, grading and moisture content of the aggregates. Contractor shall be required to remove gunite in those locations where representative test specimens fail to comply with these Specifications.

Fabrication of Test Panels

Test panels shall be used to demonstrate the strength of the gunite mix and the qualification of the nozzleman. Construct test panels at Agency request.

A test panel measuring 2 feet by 2 feet minimum or as directed by the Agency shall be constructed by application of gunite to a smooth wood or steel surface using the same equipment, air quantity and pressure, water content, materials and angles of material approach as will be employed for the Work. The test panels shall be fabricated by the nozzleman who will be employed for the Work. Application shall be not less than 3.5 inches in thickness. One test panel must be shot prior to the start of work, and must be clearly marked with a number and date.

The test panels shall be protected against being disturbed for a period of 6 hours or as directed by the Agency, after which the panels may be tested by the Agency.

Section 10 - Rip Rap & Sacked Concrete

General

Provide riprap and sacked concrete materials as specified below.

Materials - Rip Rap

Unless otherwise specified on the Plans, rip rap shall be quarry run 4-inch to 8-inch angular rock, with no rocks larger than 12 inches in any dimension and less than two percent by weight passing a 4 inch sieve.

Flat or elongated shapes will not be accepted unless the thickness of the individual pieces is at least one-third of the length. Stone shall be sound, durable, hard, resistant to abrasion, and free from laminations, weak cleavage planes, and the undesirable effects of weathering. The stone shall not disintegrate from the action of air, water, or the conditions to be met in handling and placing.

All material shall be clean and free from deleterious impurities, including alkali, earth, clay, refuse, and adherent coatings.

Execution - Rip Rap

Testing

The material, if in question, may be subject to the following tests and requirements:

Tests	Test Method	Requirements
Apparent Specific Gravity	ASTM C 127	2.20 Min.
Absorption	Calif. #206	4.2% Max.
Durability	Calif. #229	52 Min.

Materials - Sacked Concrete

Sacks for gunite foundation, headwalls, and slope or bank protection shall be 10 oz. burlap measuring 19 ½ "by 36" inside the seams when laid flat. Paper sacks will not be accepted. Concrete shall conform to Division 3 Section 2 of these Specifications. Sacks shall be filled with approximately ½ cubic foot of loosely placed concrete. Sacks shall be filled so as to leave room for folding the top of the sacks.

Execution - Sacked Concrete

Sacks shall be placed so they are horizontal or sloping towards the bank. Sacks sloping away from the bank will not be accepted.

When required by the Agency, drive one #3 reinforcing bar through each sack, and into sacks above and below. Minimum length of bars shall be 18 inches. Minimum embedment of bars shall be 3 inches. Do not leave ends of bar exposed. Do not drive bar into dirt or into joint between sacks.

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Section 11 - Cold Weather/Climate Application

General

Cold weather is defined as a period when the mean daily temperature falls below 40°F for three successive days or the daily low temperature is expected to fall or falls below 32°F.

Work during cold weather at any location shall be in accordance with the methods and materials indicated in this Section.

All work performed at an elevation of 3,200 ft. or above shall conform to Cold-Climate Area materials, equipment, and execution (See Standard Drawings 500 series for a map of the cold-climate application zone and the applicable Standard Drawings).

In the Cold Climate Application Area, all pipelines and appurtenances for water shall be placed at least 48 inches below grade or as shown on Standard Drawings. Pipelines and appurtenances installed at depths of less than 48 inches below grade shall be installed with other acceptable means of freeze protection. Acceptable means include installation of rigid polystyrene insulation board with a minimum R value of 10 to three feet on either side of buried appurtenances in the ground, wrapping appurtenances in insulation blankets (specified below), heat tracing, or installation of vaults or boxes designed to prevent surface air from circulating against the appurtenances.

Materials

Concrete

Provide air entrainment of 6 to 7 ½ percent for ¾ -inch maximum size aggregate mix, or 6 to 7 percent for 1 ½ -inch maximum size aggregate mix.

Insulation Blankets

Insulation blankets shall conform to ASTM 1094 and shall have a minimum R rating of 10 when dry and 5 when wet. Install blankets in vaults against appurtenances carrying or containing water. Install the blankets to wrap entirely around appurtenances or to drape to the floor of vaults without gaps.

LED / LCD Readouts

Provide light-emitting diode (LED) readouts on instruments in cold-climate application zone work whenever possible. Where LED displays are not available, house liquid crystal displays (LCDs) in enclosures capable of maintaining the air temperature at least 50°F.

Execution

Trenching

When the ground has frozen, maintain separate material piles to ensure frozen material is not used as backfill. No frozen material shall be used as backfill.

If frozen material is used to provide loose fill over trench, after the material has been thawed for at least 30 days, return, level, and fill the cover.

Concrete Placement in Cold Weather

Protect concrete work from physical damage or reduced strength caused by frost, freezing actions, or low temperatures in compliance with ACI 306 and as below.

Water and aggregates may be preheated for cold-weather placement, but their temperature shall not exceed 150°F. All methods and equipment for heating water and aggregate shall conform to the requirements of ACI 306. Concrete mixture at the point of placement shall have a temperature of at least 50°F, and not more than 80°F.

Construction

No concrete shall contain frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or subgrade containing frozen materials. Placement shall be delayed until the ground has fully thawed. When temperatures are expected to fall below 32°F the night before concrete is placed, all reinforcing steel, forms, and the ground shall be preheated for a minimum of 12 hours at a minimum temperature of 50°F.

Curing

When temperatures are expected to fall below 32°F at any time before the concrete has reached a strength of 1,000 psi, the concrete must be adequately protected against frost damage by heating blankets, straw, or insulation materials for a minimum of seven days. The concrete temperature shall at no time fall below 40°F based on recording temperature monitors placed at a maximum of 50 feet on centers, each way, and around the circumference of the floor, wall, roof slab, and wall footing. The Contractor shall provide heat as required to keep the concrete temperature as specified throughout the entire curing period of seven days.

When combustion-type heaters are used to maintain concrete temperatures within an enclosure, the exhaust gases shall be vented from the heater to the outside atmosphere so that the concrete is not exposed to the products of combustion.

Section 12 - Industrial Ornamental Fencing

General

Work Included

The work under this section consists of furnishing all labor, materials and appurtenances necessary for installation of the industrial ornamental steel fence system (Project specific see specifications).

System Description

The manufacturer shall supply a total industrial ornamental steel fence system. The ornamental steel fence system shall include all components (i.e., pickets, rails, posts, gates and hardware) required.

References

ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

ASTM D523 - Test Method for Specular Glass.

ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

ASTM D2244 - Test Method for Calculations of Color Differences from Instrumentally Measured Color Coordinates.

ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

Submittal

The manufacturer's submittal package shall be provided to the Agency for approval prior to ordering the fencing.

Product Handling and Storage

Coordinate with Agency Inspectors before the delivery of product at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

Materials

Steel material for fence framework (i.e. tubular pickets, rails and posts), shall be galvanized prior to forming in accordance with the requirements of ASTM A653/A653M, with minimum yield strength of 50,000 psi (344 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft² (276 g/m²), Coating Designation G-90.

The manufactured galvanized framework shall be subjected to a thermal coating process which includes, as a minimum, a pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a zinc-rich thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The finish color shall be approved by the Agency.

The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.

Material for fence pickets shall be 1" square x 14 Ga. tubing. The cross-sectional shape of the rails shall at a minimum have an outside cross-section dimension of 1.75" square and a minimum thickness of 14 Ga. Picket holes in the rail shall be spaced 4.715" O.C., Picket retaining rods shall be 0.125" diameter galvanized steel. Posts shall be a minimum of 2-1/2" square x 12 Ga. (See Table-2).

Fabrication

Pickets, rails and posts shall be precut to specified lengths. Rails shall be pre-punched to accept pickets. Pickets shall be predrilled to accept retaining rods.

Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that predrilled picket holes align with the internal upper raceway of the rails. Retaining rods shall be inserted into each rail so that they pass through the predrilled holes in each picket.

Completed sections (i.e., panels) shall be capable of supporting a 600 lb. load applied at mid span without permanent deformation. Panels shall be biasable to a 25% change in grade.

Swing gates shall be fabricated using the same manufacture, panel material and gate ends having the same outside cross-section dimensions as the rail. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined either by welding or by the same retaining rod process used for panel assembly.

Proposals to substitute fence systems that use welded connections of pickets to rails will be considered by the Agency on a case by case basis. At a minimum, substitute fence systems shall meet all the requirements of this section with the exception of paragraph "Fabrication" 1 and 2. Substitute fence systems that require field welding will not be considered.

Execution

Preparation

The new installation shall be laid out by the contractor in accordance with the construction plans.

Installation

Fence posts shall be set in accordance with the spacing shown in Table 2, plus or minus 1/2", depending on the nominal span specified. Gateposts shall be spaced according to the gate openings specified in the construction plans.

When cutting the rails immediately seal exposed surfaces by Removing all metal shavings from cut area. Applying zinc-rich primer to thoroughly cover cut edge and drilled hole, allowing curing time. Applying 2 coats of custom finish spray paint matching fence color.

Table- 1 Coating Performance Requirements

QUALITY CHARACTERISTICS	ASTM TEST METHOD	PERFORMANCE REQUIREMENTS
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife Test)
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 3500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters)
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822, D2244, D523 (60°Method)	Weathering resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table- 2 Construction Dimension Requirements

STRAIGHT PICKET TABLE						
SPAN	8' NOMINAL RAIL					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301) or Industrial Universal Boulevard (BB302) (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)	
Post Setting ± 1/2" O.C.	96"	96-1/2"	96"	96-1/2"	97-1/2"	98"
SPAN	6' NOMINAL RAIL					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Universal Boulevard (BB302) (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)	
Post Setting ± 1/2" O.C.	71-1/2"	72"	71-1/2"	72"	73"	73-1/2"

CURVED PICKET TABLE						
SPAN	8' NOMINAL RAIL					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301) or Industrial Universal Boulevard (BB302) (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)	
Post Setting ± 1/2" O.C.	94-1/2"	95"	94-1/2"	95"	96"	96-1/2"
SPAN	6' NOMINAL RAIL					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Universal Boulevard (BB302) (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)	
Post Setting ± 1/2" O.C.	75"	75-1/2"	75"	75-1/2"	76-1/2"	77"

APPENDICES

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Appendix A - Facilities Agreement (FA)

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Facilities Agreement Process

Prior to Beginning

The Agency's map files are available for the Applicant/Applicant's Engineers research at the Agency's Business Office at 144 Ferguson Road in Auburn during normal business hours. PCWA's Standard Specifications are available online at www.pcwa.net. Design Criteria, symbols, standard drawings, and specifications are provided there.

Facilities Application and Design Phase

Applicant/Applicant's Engineer shall submit to the Agency's Engineering Division the following for review and preparation of the Facilities Agreement:

- Completed Application for PCWA Project Review signed by local Fire District and Applicant.
- Completed Supplemental Service Information Forms for each unique meter size and demand signed the Applicant
- Three sets of improvements plans for the proposed work.
- Approved tentative map or preliminary final/parcel map.
- Current application fee and minimum project deposit. Please contact the Agency's Engineering Division by phone at (530) 823-4886 or email at engineering@pcwa.net for current fee schedule.

Engineering will assign a Facilities Agreement number. The Facilities Agreement number will be the letters "FA" followed by the next sequential number from the previous Facilities Agreement.

The first plan submittal is reviewed by multiple Agency departments and the applicants should allow up to eight weeks for the review. NOTE: In fairness to all project proponents submittals are reviewed on a first-in-first-reviewed basis. Schedule accordingly.

Applicant's Engineer is notified their reviewed plans are ready for pick up at the Engineering counter in the Agency's Business Center located at 144 Ferguson Road, Auburn.

Applicant/Applicant's Engineer submits successive plan submittals (2 plan sets per submittal) until notified by the Agency that all comments have been addressed to the satisfaction of the Agency's Engineer.

After the Applicant/Applicant's Engineer have been notified that all comments have been addressed to the satisfaction of the Agency's Engineer, the Agency's Engineer will sign the reproducible cover sheet in order for the Applicant/Applicant's Engineer to

continue processing the plans through other entities. Applicant/Applicant's Engineer shall provide Agency with 3 sets of final approved plans.

Facilities Agreement

The Applicant/Applicant's Engineer notifies the Agency that they wish the Facilities Agreement (FA) to be prepared. The Agency will then prepare the FA for internal Agency review. Once the FA has passed internal Agency review it will be sent to the Applicant for their review and signature. The Applicant must sign and return the FA within 30 days or it will expire. When the FA is signed by the Applicant and returned, it will be placed on the next available Board agenda for the Board of Directors of the Placer County Water Agency to consider approval and execution. Regular Board meetings are typically held the first and third Thursday of each month. Please allow four weeks minimum advance notice for your FA to be drafted, internally reviewed, and sent to the applicant. It is recommended that the construction plans be complete and approved prior to drafting the FA, but it is not mandatory. Certain FAs may not require Board of Directors approval and signing if the following conditions are met:

- A. FA does not include a commitment of water service; and
- B. FA does not include an Agency obligation greater than \$30,000; and
- C. FA does not include special conditions that warrant approval by the Board of Directors.

The applicant has 90 days from the date of Board execution to pay the additional Inspection/Engineering deposit listed in Section 1 of FA or it will become void. Should the approval become void and the Applicant wishes to resubmit for re-approval, the Applicant notifies the Agency of the reason for not executing the Agreement and states when the Applicant wishes the Agreement to go back to the Board for another 90 day approval and execution. The FA will be process as described above with the original FA number with a revision designation appended to the number FA. Payment of meter set fees and the Water Connection Charges can be made any time after the agreement has been executed and but must be paid prior to acceptance of the facilities and requesting meters.

Prior To Start Of Construction

Improvements plans shall be approved and signed by the Agency.

The Facilities Agreement shall be executed and returned to the Agency with the payment of the Inspection fees.

The Applicant or the Applicant's contractor shall furnish the Agency with a certificate(s) of insurance and additional insured endorsement (ISO CG 2010) as satisfactory proof

that the Applicant or the Applicant's contractor carries the insurance required by the Agreement and shall be approved by the Agency's Risk Manager.

Any pre-construction easements or property transfers required under the Agreement have been provided to and accepted for recording by the Agency prior to any construction of water facilities within the easement or transfer area.

The performance bond and payment bond, if required under the Agreement, shall be submitted in the amount of 100% of the cost of the water facilities to be installed and shall be approved by the Agency's Risk Manager.

If the installation of the Facilities is not commenced within one (1) year after the date of execution of the Facilities Agreement and completed and accepted by the Agency within twelve (12) months after that commencement date, the Agency shall have the right to terminate the Agreement at any time thereafter. Upon such termination by the Agency, the Agency shall refund the meter installation deposit, water connection charge (WCC), and any portion of the deposit made for engineering review and inspection costs that has not been used by the Agency prior to the date of such termination.

Construction Phase

All construction of facilities shall conform to Agency approved standards. For Projects that involve construction of typical Agency facilities the following milestones must be met:

Prior to any water facilities construction, a preconstruction meeting shall be scheduled and held with PCWA Inspection staff. This meeting will be used to review the project, any recent plan revisions, Contractor's insurance requirements, preconstruction easements, construction staking and general project construction parameters.

The Contractor shall provide the Agency with a 48 hour notification prior to start of construction of the Facilities. Contractor shall notify the Inspection Section prior to 7:30 a.m. each day on which work will be performed on Facilities or facilities that affect the water system. The Inspection Section may be reached at (530) 823-4885.

The Contractor shall construct the Facilities in accordance with the PCWA approved plans and the PCWA Standards.

After the Facilities have been installed and inspected, the system shall be pressure tested, tested for continuity, chlorinated, flushed, tested and passed for bacteriological contaminants.

If the new system requires a connection to an existing PCWA system, a request for an outage notification must be processed. The outage notification requires a minimum of eleven (11) working days. However, outages, which require connection to crucial Agency facilities, may require much more notification time and advanced scheduling as determined by the Agency.

After a tie in has been completed, a final bacteriological test shall be performed.

Final paving, adjusting valve boxes to grade and presetting meters may take place after passing the bacteriological retest.

A final walk through and as-built mapping of the Facilities will be conducted with PCWA inspectors, contractor, and other interested parties.

A deficiency list will be prepared.

Contractor shall repair or replace items on the deficiency list.

A final inspection will be made to assure the deficiency list items have been completed.

Project Closeout

Prior to the Agency's formal acceptance of the Facilities and providing water service to the project the Applicant is required to provide the following:

- Easements or property transfers not provided prior to construction, for all water facilities.
- The addresses for each lot, marked on a record map, or on a list indicating the address for each lot or parcel in the project.
- Provide a maintenance guarantee bond in the amount of 50% of the cost of the Facilities that were installed.
- Completion of all "Deficiency List Items" to the satisfaction of the Agency.
- Payment to the Agency for any monies owed plus a minimum deposit of five hundred dollars, as stated in the Facilities Agreement, for the one year maintenance warranty inspection costs.
- Completion of any special condition in the Facilities Agreement.

To ensure compliance with the above requirements the following will be done:

- Agency staff will map actual construction.
- Agency inspectors will review the map and verify its accuracy.
- Agency inspectors will create a deficiency list.
- Agency inspectors will confirm completion of the deficiency list.
- Agency inspectors will confirm the number of services and types installed.
- Agency property specialist will review and determine the adequacy of the maps or easements provided by the Applicant.
- Agency engineer will receive a list or map indicating the street address for each parcel served by the project.
- Agency engineer will confirm the maintenance bond has been received in the correct amount and approved by Risk Manager.
- Agency engineer will confirm that deposit balance is equal to or greater than the amount stated in the specific Facilities Agreement.
- Agency engineer will confirm the paid number of services agrees with the number installed.
- Agency engineer will prepare a letter accepting the Facilities.
- Agency inspector will review and validate letter.
- Agency inspector will prepare letters notifying other jurisdictions of the acceptance of the Facilities.

Setting of Meters

When the Facilities to be accepted by the Agency as identified in the Facilities Agreement are formally accepted, service orders for only those water meters that have been requested by the Applicant are released to the Agency's Field Services Department for installation. Timing of meter installations is predicated upon existing work load conditions and could take up to six weeks.

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Project Plans Checklist

- ☐ Complete PCWA Project Review Application.
 - ☐ Include Fire Department approval, specifying hydrant and private fire service flow rate requirements as applicable.
 - ☐ Include Applicant's Signature.
- ☐ Complete PCWA Supplemental Information for Residential Services (if applicable).
 - ☐ Provide summary of lot sizes. A spreadsheet will be provided to help.
 - ☐ Include Applicant's Signature.
- ☐ Complete PCWA Supplemental Information for Non-Residential Services (commercial or landscape services, if applicable).
 - ☐ Complete one application per unique meter size/expected demand combination for 5/8", 3/4", and 1" meters. Prepare one application for each 1 1/2" and larger meter.
 - ☐ Include Applicant's Signature.
- ☐ Refer to the Standard Specifications (including revisions) in preparing your project plans, and be sure to:
 - ☐ Include Owner's and Engineer's name and contact information (full address and telephone number) on the Title Sheet; this information must match that which is shown on the PCWA Project Application.
 - ☐ Include an Engineer's stamp, or name and license number on all submittals.
 - ☐ Include the PCWA "Water Facilities" note in the plan set (refer to the PCWA Improvement Standards, Division 2, Section 4. D). PCWA will provide the PCWA Map No. during the plan check process.
 - ☐ Include an approval signature block for the PCWA Engineer.
 - ☐ Include reference to a benchmark, used for the survey control, which is referenced to National Geodetic Vertical Datum 1929. Assumed datum is not acceptable.
 - ☐ Show symbols legend and use the Agency's Standard symbols in the plans, See PCWA standard drawing S401.

- ☐ Include an overall plan layout for the treated and raw water facilities, as applicable, in the plan set.
- ☐ Include a plan and profile of PCWA's existing and proposed facilities related to the project. Include labels for pipe size, type, length, class, and restraint lengths.
- ☐ Show and label proposed minimum 20 foot wide PCWA easements (non-exclusive) where water lines are installed outside the public right of way or PUEs/MPEs adjacent to public right of way.
- ☐ Show and label existing easements with recorded information.
- ☐ Ensure velocity of water during a fire flow event is no more than 7 feet per second in mains (fire hydrant laterals excluded).
- ☐ Provide connection detail for tie-ins to existing PCWA facilities that identifies and describes the required fittings, valves, couplers.
- ☐ Ensure separations between PCWA facilities and other utilities are as described on Standard Drawing – S103, S104 and S105.
- ☐ Show PCWA standard drawing S101, Pipe Trench Bedding and Backfill Detail. All other PCWA drawings shall be incorporated by reference only.
- ☐ Show utility representative contacts with phone numbers for all utilities local to the project.

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Appendix B - Encroachment Permit Information

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Encroachment Permit Sample Document

Recording Request By

Placer County Water Agency
No fee required, pursuant to Gov't
Code § 27383.

And When Recorded Mail To

Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604

T. ____ N., R. ____ E., Sec. ____ 1/4

A.P.N: ____ - ____ - ____ - ____

Project: _____

PCWA Map No.: ____ - ____ - ____

Permit No: EP20 ____ - ____

Encroachment Permit

To: (Name of Entity Receiving Permit) (Date)

Subject to all terms, conditions and restrictions written below or printed as general or special provisions on any part of this form.

Permission Is Hereby Granted To

(Description of activities allowed by permit)

This permit is to be strictly construed and no work other than that specifically mentioned above is authorized hereby. Performance of the work shall be deemed to be acceptance by the Permittee of all terms and conditions of this permit, attached and incorporated herein.

All work authorized by this permit must be completed by _____.

Approved:

Deputy Director of Technical Services

Date

(Signature must be acknowledged by a Notary Public)

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Appendix C - Easement Submittal Information

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Summary of California Recording Laws

1. Any instrument, paper, or notice submitted for recording must be authorized or required by law to be recorded, meet the requirements of statute, and contain original signatures except as otherwise provided by law, or be originally certified by a government agency.
2. Any document submitted must indicate the title or titles of the document(s) contained therein. Titles should appear on the first page, directly below the space reserved for the Recorder.
3. Recording fees for documents which contain only 8 ½" by 11" pages will not change. However, for any document which contains a sheet or sheets which do not measure 8 ½" by 11", an additional fee of \$3.00 for every page of that document will apply.**
4. Any document submitted for recording shall have at least a ½" margin on each vertical side. In addition, the top 2 ½" of the first page shall be reserved for recording information with the left hand 3 ½" used by the public to show the name of the person requesting recording and the name and address to which the document is to be returned following recording. The right hand portion of the space is for use by the recorder only.
5. If a document modified, releases, or cancels provisions of a previously recorded document, it must contain the recorder's identification number of the prior document.

**** (PCWA REQUIRES 8 ½" BY 11" AND 12 FONT TIMES NEW ROMAN)**

Guidelines for Preparation of New Forms

In addition to compliance with the requirements outlined above, any form developed for recording should also follow these general guidelines.

- 8 ½" by 11" single-sided sheet of white paper, preferably 16 lb. or heavier.
- If multiple notary acknowledgements are used, they should be on separate 8 ½" by 11" sheets, and not stapled or taped to the document on half sheets.
- Exhibits should appear on separate pages, be properly marked, and be referred to in the body of the main document. Exhibits, including plats, must have the ½ inch vertical margin.
- All information required by the statute which provides for the creation of the document must be there. In addition, all recording requirements must be met.

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RECORDING REQUEST BY

Placer County Water Agency
No fee required, pursuant to Gov't
Code § 27383.

AND WHEN RECORDED MAIL TO

Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604

This space for recorder's use only

For internal use only:

T. ___ N., R. ___ E. SEC. ___, ___ 1/4

A.P. No:

Project:

Map No.:

project type: treated/raw

Grant of Easement**FOR VALUABLE CONSIDERATION,****NAME OF INDIVIDUAL, CORP., ETC. (as it appears on Grant Deed)**

(hereinafter called "GRANTOR") hereby grants to the Placer County Water Agency, a public body, (hereinafter called "AGENCY") a non-exclusive permanent easement in, on, over, under, and across that certain real property in the County of Placer, State of California, described in Exhibit "A" attached hereto and incorporated herein by reference, and depicted on Exhibit "B", the map attached hereto showing the boundaries of the easement. In the event of any conflict between the description of the easement in Exhibit "A" and its depiction on Exhibit "B", the description in Exhibit "A" controls.

The easement granted herein is a right-of-way to construct, reconstruct, maintain, repair, replace and operate any size water pipeline or pipelines, conduits, lined or unlined canals, open ditches and above and below ground appurtenant facilities, including but not limited to metering devices, gate valves, electrical/electronic equipment and devices for controlling electrolysis, necessary to convey and/or meter water. GRANTOR further grants to the AGENCY:

- (a) The right to grade the easement area for the full width thereof.
- (b) The right of ingress and egress over and across GRANTOR'S remaining lands as described in that certain document, recorded on _____ in Book _____ at page _____ (or) document number _____, Official Records of Placer County, by means of roads and lanes thereon, if such there be, otherwise by such route or routes as shall cause the least practical damage and inconvenience to GRANTOR; provided further, that if any portion of Grantor's land is or shall be subdivided and dedicated roads or

highways on such portion shall extend to the easement area, this right of ingress and egress on GRANTOR'S remaining land shall be confined to such dedicated roads and highways;

- (c) The right from time to time to trim and to cut down and clear away any and all trees, stumps, brush and landscaping now or hereafter in the easement area and to trim and cut down and clear away portions of any trees extending onto or over the easement area which may interfere with the exercise of the AGENCY'S rights hereunder; provided, however, that all trees which the AGENCY is hereby authorized to cut and remove, if valuable for timber or wood, shall continue to be the property of GRANTOR, but all tops, lops, brush, stumps, and refuse wood shall be burned, chipped, or removed at the discretion of the AGENCY;
- (d) The right to install, maintain, and use gates in all fences which cross the easement area and the right to install Agency locks on existing or future gates installed within the easement area;
- (e) The right to mark the location of pipelines and other underground facilities in the easement area by suitable markers set in the ground; and
- (f) The right to line, seal, patch, or replace pipelines, canals, ditches, conduits and other facilities, installed in the easement area.

ENCROACHMENT BY GRANTOR

Subject to all of the rights and easements granted to AGENCY herein, GRANTOR reserves the right to use the easement area; provided, that GRANTOR shall not erect or construct any building or other structure in the easement area or cut and/or fill over any AGENCY pipeline, or appurtenant facilities in the easement area or drill or operate any well, or drill any holes for fence posts or other structures, or construct any reservoir or other obstruction in the easement area, or diminish or substantially add to the ground cover over the easement area, or otherwise use the easement area in any way that interferes with AGENCY's full enjoyment and use thereof. If issued an encroachment permit by the AGENCY, GRANTOR may construct fences within or crossing the easement, provided that GRANTOR shall provide a gate or gates of sufficient width to allow ingress and egress to the easement by the AGENCY for personnel, trucks and equipment and a means for AGENCY to install its own lock on any such gates.

ASSIGNMENT

The provisions hereof shall inure to the benefit of and bind the successors and assigns of the respective parties hereto, and all covenants shall apply to and run with the land.

Name _____

Date

Name _____

Date

(Signature(s) must be acknowledged by a Notary Public)

(Document must be Accepted by the Agency and may be submitted to escrow)

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Right of Way questions (easements, encroachment over Agency facilities, etc.) should be directed to:

Primary Contact (Thursday and Friday): Richard Gomer (530) 823-4078

Secondary Contact: Sandie Hewston (530) 823-4414 or shewston@pcwa.net

Right-of-Way Requirements Checklist

- ☐ Subdivision or Parcel Map.
 - ☐ Provide a Tentative, Final or Final Recorded Map showing acceptance of P.U.E.'s/M.P.E.'s
 - ☐ All streets, roads, lanes, and alleys with water facilities dedicated as P.U.E.'s
 - ☐ P.U.E.'s or M.P.E.'s dedicated adjacent to all streets, roads, lanes, and alleys
 - ☐ Dedication of P.U.E.'s is for all utility purposes and appurtenants
 - ☐ If water facilities are located within M.P.E.'s, dedication language specifically allows for use of M.P.E.'s for all utility purposes and appurtenants
 - ☐ P.U.E.'s/M.P.E.'s width clearly defined on each page of map and labeled P.U.E or M.P.E.
 - ☐ Acceptance language specifically accepts P.U.E.s and M.P.E.'s for the benefit of utility agencies and/or the public and are accepted immediately upon recordation and unconditionally
- ☐ Grants of Easement for Water Facilities not installed within P.U.E.'s or M.P.E.'s:
 - ☐ Use PCWA approved coversheet (contact Right of Way Technician for current version)
 - ☐ Most recent vesting deed(s) showing current property ownership
 - ☐ Easement for Off-Site Water Facilities (property not under common ownership) accepted and recorded by PCWA prior to approval of Improvement Plans (All other requirements below apply.)
 - ☐ Provide a current (within 6 months) Preliminary Title Report for property to be encumbered

- ☐ For Corporations, LLC's, Partnerships, Trusts, or other "non-individual" parcel ownership, provide proof of authority to encumber property (see Signing Authority checklist)
- ☐ If Preliminary Title Report indicates a lien on the property, provide consent to the Grant(s) from all lien-holders
- ☐ If there is an active lease on the property, provide consent to the Grant(s) from all lessees and a copy of the lease showing lessee names
- ☐ Legal and Plat contain the following:
 - ☐ Basis of Bearing, scale and north arrow
 - ☐ Point of commencement and point of beginning shown and are retraceable
 - ☐ Legal description gives reference to entire parcel
 - ☐ Marked Exhibit 'A' and Exhibit 'B'
 - ☐ Total area contained in grant(s) given on legal and plat in square feet
 - ☐ Plat shows APN(s) and record number of vesting deed
 - ☐ Township, Range and Quarter Section on legal and plat
 - ☐ County and State on legal and plat
 - ☐ States 'Fee Title' or 'Easement' on legal and plat
 - ☐ Stamp and dated signature of surveyor on Exhibit 'A' and 'B'
 - ☐ License is current
 - ☐ Date shown on Exhibit(s) is prior to date document signed by Grantor(s)
- ☐ Coversheet contains the following:
 - ☐ Assessor's Parcel Number(s)
 - ☐ Name of Grantor(s) is the same as the most current vesting deed(s)
 - ☐ Grantor and Grantee named on first page of coversheet
 - ☐ Coversheet states 'Fee Title' or 'Easement'
 - ☐ Signatory name and Title (if applicable) is typed or legibly printed on signature page
 - ☐ Trust, LLC, or Corporation name (and appropriate subsidiary(s) are typed above signatory line

- ☐ Recorder's Block is unchanged from PCWA coversheet template
- ☐ All text is 10 point or larger
- ☐ Notary Acknowledgement is complete and consistent with requirements for State where acknowledgement is performed (preferred is the use of the California All-Purpose Acknowledgement).

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Signing Authority Checklist

☐ CORPORATIONS

- ☐ A certificate copy of a resolution of the Board of Directors authorizing the contemplated transaction and designating which corporate officers, by name and title, shall have the power to execute on behalf of the corporation, or
- ☐ A copy of the Articles of Incorporation or Bylaws showing which officers have the authority to encumber assets of the corporation

- Sample language

“the above-named officer(s) have full power and authority to do all things deemed necessary or desirable to conduct business of the corporation, in accordance with the following provisions: ...

The acquisition, disposition, mortgage, pledge, encumbrance, hypothecation, or exchange of any assets of the corporation...”

☐ CALIFORNIA LIMITED PARTNERSHIP

- ☐ A full copy of the partnership agreement and any amendments
- ☐ Satisfactory evidence of the consent of a majority in interest of the limited partners to the contemplated transactions, or
- ☐ Language in the partnership agreement specifically giving authority to named partners to encumber assets of the partnership

- Sample language

“the above-named partner(s) have full power and authority to do all things deemed necessary or desirable to conduct business of the partnership, in accordance with the following provisions: ...

The acquisition, disposition, mortgage, pledge, encumbrance, hypothecation, or exchange of any assets of the partnership...”

☐ FOREIGN LIMITED PARTNERSHIP

- ☐ Escrow will be required and documentation determined by the Title Company

☐ GENERAL PARTNERSHIP

- ☐ A full copy of the partnership agreement and any amendments
- ☐ Satisfactory evidence of the consent of a majority in interest of the limited partners to the contemplated transactions, or
- ☐ Language in the partnership agreement specifically giving authority to named partners to encumber assets of the partnership

☐ LIMITED LIABILITY COMPANY

- ☐ A copy of its operating agreement and any amendments thereto;
- ☐ If the limited liability company properly operates through officers appointed or elected pursuant to the terms of a written operating agreement, grants must be executed by at least two duly elected or appointed officers, as follows: the chairman of the board, the president or any vice president, and any secretary, assistant secretary, the chief financial officer or any assistant treasurer;
- ☐ If the limited liability company properly operates through a manager or managers identified in the articles of organization and/or duly elected pursuant to the terms of a written operating agreement, grants must be executed by at least two such managers or by one manager if the limited liability company properly operates with the existence of only one manager

☐ TRUST

- ☐ A certification pursuant to Section 18100.5 of the California Probate Code in a form satisfactory to the Company;
- ☐ Copies of those excerpts from the original trust documents and amendments thereto which designate the trustee and confer upon the trustee the power to encumber real property

☐ INDIVIDUAL

- ☐ All individuals having current vested interest to the property to be encumbered, as shown on vesting deeds

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Appendix D - Pre-Approved Materials

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Pre-Approved Materials List	Notes (CWO=COLD WEATHER ONLY):		
	1. All materials shall conform to the Agency's Standard Specifications.		
	2. Alternates will not be considered for items noted as "No Equal".		
	3. All proposed alternate items are subject to Agency review and approval.		
	4. Other than main piping and fittings, "No Plastic" will be allowed.		
	5. All materials as defined by the State of California drinking water act.		
	6. For 24" DIA. and larger pipe and materials, submit for PCWA approval.		
Item	Manufacturer	Model or Part Number	Spec. Div. Sect. or Notes
Access Covers			
Hatch, Spring Assisted	Halliday Products	Submittal Required	
	Bilco	Submittal Required	
Air Vacuum Release Valve Appurtenances (See Valves - AVR)			
Air Vent Riser	Placer Water Works		
AVRV Below Grade Box	Christy		
	Jensen		
Air Vent Riser (See Air Vacuum Release Valve Appurtenances)			
Backflow Prevention Devices (See State of CA list of approved devices)			
Bridge Manufacturers/Suppliers			
Prefabricated	Hallsten Corporation - Sacramento, CA	Submittal Required	
	Interstate Sales - Auburn, CA	Submittal Required	
Railspan Railroad Flat Cars		Submittal Required	
Boring, Jacking, and Tunneling Materials			
Casing Insulator	Cascade Waterworks Mfg.	Series CCS Stainless Steel	Runners Polyethylene
	Calpico, Inc.	Series M-X-SS	Runners HDPE
Boxes and Vaults			
1" Meter "Box"	Christy by Oldcastle	B16 Reinforced concrete box, for traffic & non-traffic rated locations.	O.D. 16" x 25" I.D. 11-3/4" x 22-1/4"
1" Meter Box "Lid" (non-traffic rated)	Christy "Fibrelyte" by Oldcastle	FL16P Fibrelyte	Must include AMR hole, max ID 1-27/32" thru 2"
1" Meter Box "Lid" (traffic rated)	Armorcast Products (20K = AASHTO H20)	Polymer Concrete Lid 20K-A6000489T	Must include AMR hole, max ID 1-27/32" thru 2"
"AMR Plug"	Ford	Plastic Plug for ERT Hole # PTP-3-25	Plastic Plug w/nut min-max ID 1-27/32" thru 2", min-max lid thickness 1/8" thru 3-1/4"
("Boxes and Vaults" Continued)			

Item	Manufacturer	Model or Part Number	Spec. Div. Sect. or Notes
Boxes and Vaults			
1-1/2" to 2" Meter "Box"	Christy by Oldcastle	N40	
1-1/2" to 2" Meter Box "Lid"	Placer Water Works	PW/B40-S	2 piece lid, steel diamond plate
Valve "Box and Lid"	Christy by Oldcastle	G5	Black-Traffic Rated
	Jensen	G5	Black-Traffic Rated
Cathodic Protection			
Anode Lead Wire	Corpro	#10 HMWPE or USE-2 (EPR-HYP)	Div. 3, Sec. 7, Page 96
Cartridge/Sleeve for Thermite Welding	ThermOweld	Submittal Required	
Flange Gasket Isolation Kit	Calpico	Type "E"	
Magnesium Anode	AEGION	Corpro	Ref. Std. Dwg. S112
Weld Cap	Royston Handy Cap	Handy-Cap	Use Roybond 747 Primer
	MESA	Thermite Weld Cap	Mastic Cover
	AEGION	Calpico T-Cap	
Concrete, Gunite, Rip Rap, and Masonry			
Grout			
Gunite Set Accelerator	Sika Chemical Corp.	Sigunit Powder	Gunite/shotcrete set accelerator
Keyed Masonry Retaining Wall	Keystone		
Non Shrink Grout			Ref. Std. Dwg. S405
Rip-Rap			Div. 3, Sec. 10, Page 110
Copper Tubing & Joints			
<i>Joints</i>	Mueller	Series 110	Compression
	Jones Water Distribution Products	Series E-2600	
	Ford	Pack Joint	
Service Piping		Type K (Copper)	Note 5, Pg. 154
Enclosures for PRV			
	Placer Water Works	BE6D-Solid Submittal Required	Insulated Custom Size
(Continued)			

Item	Manufacturer	Model or Part Number	Spec. Div. Sect. or Notes
Dielectric Insulated Union for Sample Stations or as required by PCWA.			
304 Stainless/Low Lead Approved Brass	Hart Industrial Unions	Insulated Series 3000, 1/8" through 5" dia.	NSF Approved EDPM O-ring
Facility Marker Post or Flexibility Marker			
	Carsonite	Ref. Std. Dwg. S102	
Filter Fabric			
		Div. 3, Sec. 3, Page 75	
Fittings, Couplings, Restraint, and Hardware			
Grooved Coupling	Victaulic	FireLock	
Flange Coupling Adapter	Smith Blair	920 (PE/DIP to PE/PVC) 911 (PE/DIP to FLG/DIP)	
	ROMAC	FCA / DIP RFCA / PVC	2" - 24" 2" - 12"
Flexible Coupling Expansion Joint	EBBA Iron	FLEX-TEND	2" - 24"
Mechanical Joint Restraint for "Ductile Iron" (100% Domestic Only - "No Import Parts" or Restraint Glands)	Ford Meter Box Co.	Series 1400-D-SZ	Wedge Action MJ Retainer Gland
	EBAA Iron Inc.	Series 1100	3" - 54"
	ROMAC	Romagrip	3" - 48"
	Star Pipe Products	Stargrip Series 3000	3" - 36"
	Sigma Corp.	ONE-LOK Series D-SLDE	3" - 48"
	US Pipe	TR Flex	Note: Gripper Rings are not allowed
Mechanical Joint Restraint for "PVC" (100% Domestic Only - "No Import Parts" or Restraint Glands)	EBAA Iron	2000PV Megalug	3" - 12"
	Star Pipe Products	PVC Stargrip Series 4000	4" - 12"
	Sigma Corp.	ONE-LOK Series D-SLCE	3" - 12"
	EBAA Iron	Tru-Dual 1500TD	4" - 12"
	ROMAC	Series 611 Restrainer	4" -12"
	Star Pipe Products	Series 1100C	Ductile Iron "Only"
	US Pipe	TR Flex	Ductile Iron
Mechanical Joint Restraint for joining "DIP, PVC & HDPE" (100% Domestic Only - "No Import Parts" or Restraint Glands)	EBAA Iron Inc.	Mega-Coupling Series 3800	DIP 4"-48" Steel 4"-12" HDPE 4"-12" C900 4"-12" C905 14"-48"
Note: For pipe sizes greater than 12" dia., lay drawings shall be provided. These drawings shall include all pipe, fittings and /or restraints intended to be installed.			
("Fittings, Couplings, Restraint, and Hardware" Continued)			

Item	Manufacturer	Model or Part Number	Location of Spec. Div/Sec. or Notes
Fittings, Couplings, Restraint, and Hardware (Continued)			
Tapping Sleeve (Hot Tap Only)	Muller	Stainless Steel H-304 Tapping Sleeve	4"-24" Main with 4"-8" Flanged Outlet
	Romac	STS420	6"-48" Main with 3"-8" Flanged Outlet
	U.S. Pipe	Stainless Steel H-304 Tapping Sleeve	4"-24" Main with 4"-8" Flanged Outlet
Note: For pipe sizes greater than 12" dia., lay drawings shall be provided. These drawings shall include all pipe, fittings and /or restraints intended to be installed.			
Fire Service			
Hydrants	CLOW	Model 960	6" Inlet
2" Residential Fire Service RPDA	CA Approved	With 5/8" low flow bypass system, and Badger "0" designation meter	Ref. Std. Dwg. S218
3" and Larger Commercial DCDA	CA Approved		Ref. Std. Dwg. S207
3" and Larger Commercial RPDA	CA Approved		Ref. Std. Dwg. S207 w/dual water source
Gaskets, Flange			
Non-Isolating	U. S. Pipe	Ring Flange-Tyte Gaskets (drop-in)	
Isolation	Calpico Inc.	Type F Ring Gasket Kit (drop-in)	Option #2 - 1/8" Neoprene-faced Phenolic
Locating Wire & Splice Kit			
Wire			Div. 3, Sec. 1, Page 62
Wire Splice Kit			Div. 3, Sec. 1, Page 62
Manholes & Related Materials			
Precast	Christy		
	Jensen		
	Teichert		
Rim and Cover			Reference Std. Dwg. S307 & S308
Water Stop for Manhole	Ram Neck		
Meter/Water Services			
Meter Box and Lid	(See Boxes and Vaults)		
Service Saddles	(See Service Saddles)		
Paints			
	Devoe		
	Tnemec		
Pipe			
Brass	No Specific Mfg.	Must comply with, Note # 5, Page 154	
("Pipe" Continued)			

Item	Manufacturer	Model or Part Number	Location of Spec. Div/Sec. or Notes
Pipe (Continued)			
Ductile Iron	American	Per AWWA C-151	Div. 2, Sec. 1, Page 21
	Electrosteel USA	Per AWWA C-151	Div. 2, Sec. 1, Page 21
	McWane Ductile	Per AWWA C-151	Div. 2, Sec. 1, Page 21
	U.S. Pipe	Per AWWA C-151	Div. 2, Sec. 1, Page 21
HDPE	ISCO	Per AWWA C-901-08 / C-906-15	Div. 3, Sec. 1, Page 54 Div. 3, Sec. 6, Pg. 88, 90
	JM Eagle		
PVC	JM Eagle	Per AWWA C-900	Div. 2, Sec. 1, Page 22 Div. 2, Sec.2, Page 28
	Diamond Plastic Corp.		
Note: For pipe sizes greater than 12" dia., lay drawings shall be provided. These drawings shall include all pipe, fittings and /or restraints intended to be installed.			
Pipe Supports			
	Anvil International	Submittal Required	
Pressure Gauges			
	Ashcroft	4" Dia., Glycerin filled	200 psi Min. Rating to match test pressure.
Pressure Transmitter			
	Instrumentation Northwest	Seametrics Smart Sensor	Submittal Required
Joint Sealant Between Concrete & Concrete or Gunite			
	Polymeric Systems Inc.	PSI-270	Polyurethane Joint Sealant
	International Chem-Crete Inc.	Chem-Crete CCC270	Polyurethane Joint Sealant
Service Saddles			
Service Saddle for Ductile	Mueller	BR2B Service Saddle	(3/4" thru 2" tap sizes)
	Smith-Blair	313 Service Saddle	(3/4" thru 2" tap sizes)
	Jones	J-979	(3/4" thru 2" tap sizes)
Service Saddle for PVC	Smith-Blair	397 Service Saddle	(3/4" thru 2" tap sizes)
	Smith-Blair	397 Service Saddle	(3/4" thru 2" tap sizes)
	Jones	J-969	(3/4" thru 2-1/2" tap sizes)
	Romac	Style 202BS	(1/2" thru 2" tap sizes)
Service Saddle for AC	Smith-Blair	372 Service Saddle	(1/2" thru 2" tap sizes)
	Romac	Style 202BS	(1/2" thru 2" tap sizes)
Stops, Corp, Angle, Etc.			
Angle Meter	Mueller	Series 300 Ball Valve	
	Jones	E-1525 or E-1525F	
	Ford	kv43-XXXW-NL	
("Stops, Corps, Angle, etc. Continued)			

Item	Manufacturer	Model or Part Number	Spec. Div. Sect. or Notes
Stops, Corp, Angle, Etc. (continued)			
Corp (Insulating Only)	Mueller	Series 300 Ball Corporation Valve	
	Ford	Ball Corp Valve w/ service insulator	
	Jones	E-1993	
Tapping Saddles (See Fittings & Couplings)			
Valves			
Actuator for Butterfly Valve	Pratt	MDT	Travelling nut type
Air/Vacuum Release Combination Air Valve	Dezuric	APCO Valve Series 140C	Submittal Required
	Crispin	Series "C"	Submittal Required
Air/Vacuum Release (Raw Water)	Crispin	UX Series	Submittal Required
	A.R.I.	D-026	Submittal Required
Altitude	Cla-Val	Model 210-01 and 210-02	01 = 1 way flow 02 = 2 way flow
Ball Valve "Brass" (Treated Water)	Flow Tek	NSF 61 CA Compliant	Must comply with Note # 5, Page 154
Butterfly	Pratt	2FII, MKII, HP-250 & Groundhog	
	Clow	Series 4500	
	M & H	AWWA Butterfly Valves	
	Mueller	Lineseal III, Lineseal XP	
Check (Externally weighted swing)	Mueller	Swing Type Lever and Weight Check Valve	
	American AVK Company	Series 41 Swing Check Valve	
Gate	American AVK Company	Series 25 Resilient Wedge Gate Valve	Per AWWA C-515-15
	Clow	Gate Valve	
	American Flow Control	Series 2500	
	Mueller	A-2360 (2"- 3") A-2361 (4"- 8")	
Pressure Reducing	Cla-Val	Model 990	≥2"
	Cla-Val	Model 92-01	≥2" combination pressure reducing and sustaining valve
	Watts	LF25AUB-Z#	≤2"
Pressure Relief	Cla-Val	Model 50-01	
Solenoid	Automatic Switch Co.	Model 8210	
("Valves" Continued)			

Item	Manufacturer	Model or Part Number	Spec. Div. Sect. or Notes
Wall Penetration Seals			
	GPT	Link Seal	Per Specification
	Sigma	Omni-Sleeve	Per Specification
Water Quality Sampling Station			
	Kupferle	Main Guard #66	Per Specification
End of List			

Appendix E - Standard Drawings

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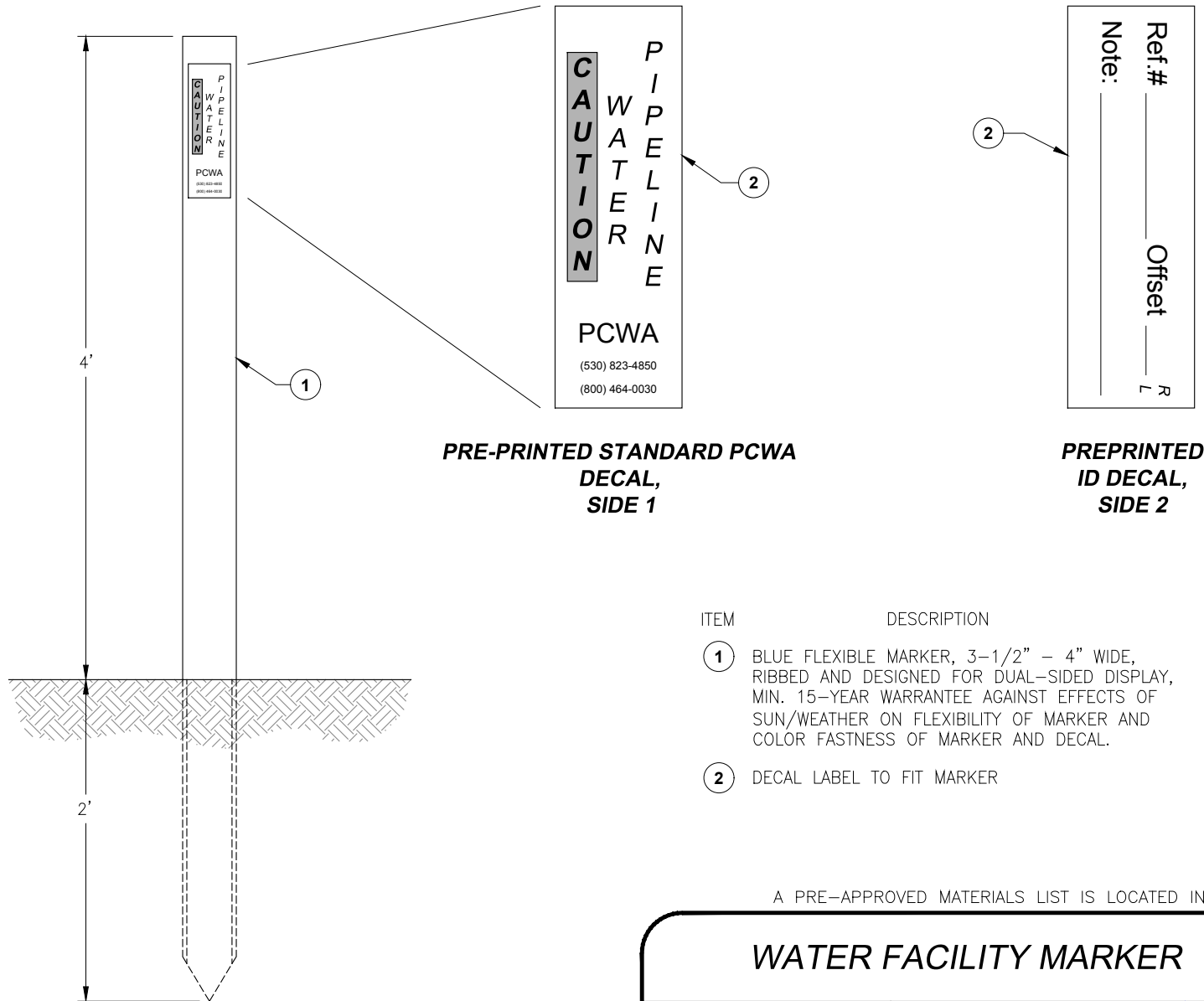
Standard Drawings List

Dwg. No.	Title
100's	
S101	Pipe Trench Bedding and Backfill
S102	Water Facility Marker
S103	Parallel Pipes Separation and Backfill
S104	Crossing Pipes Separation and Cover
S105	Water Service Minimum Separation
S106	Valve and Well Installation
S107	Locking Valve Box
S108	Valve Cluster
S109	Locating Wire
S110	Valve Operating Nut Extension
S111	Thrust Block Details (For 150 PSI Test Pressure)
S112	Magnesium Anode Installation Detail
S113	Standard CCML Cut-In
200's	
S201	Standard Meter Connection 1" and Smaller Meters
S202	Standard Service Connection 1-1/2" and 2" Meters
S203	Commercial Service with Bypass for 1-1/2" and 2" Meters
S204	Standard Service Connection 3" - 4" Meter
S205	Meter Protection Wall
S206	2-1/2" and Smaller Commercial RP Backflow Prevention Device
S207	Backflow Prevention Device 3" and Larger
S208	2" Blow-off Assembly
S209	4" Blow-off Assembly
S210	Fire Hydrant 6" Blow-Off Assembly (Wet Barrel)
S211	Air Vacuum Release Valve 1" - 2" (AVRV) Treated Water
S212	Pressure Relief Valve Assembly
S213	Pressure Reducing Station Plan View (see Section View S214)
S214	Pressure Reducing Station Section A-A
S215	Water Quality Sample Station
S216	2-1/2" and Smaller "Residential" RP Backflow Prevention Device
S217	1" PRS Bypass with Sample Port
S218	2" Residential Fire Service with 2-1/2" Approved RPDA

Dwg. No.	Title
300's	
S301	Bridge Installation Over Canal
S302	Waterline Crossing Under Canal
S303	Waterline Crossing Over Canal
S304	Sewer Crossing Under Canal
S305	Customer Irrigation Water Receiving Tank
S306	Customer Irrigation Water - Hard Piped Service
S307	Standard Open Channel Flow Manhole
S308	Manhole Frame and Cover
S309	Trash Rack Box
S310	Minimum Setbacks for Fences Parallel to Canals
S311	Air Vacuum Release Valve 1"-2" (AVRV) Raw Water
400's	
S401	Water Symbols Legend
S402	Guard Post Detail
S403	Approved Methods for Filling Water Tanker Trucks
S404	Pipe Casing and Carrier Pipe Supports
S405	Wall Penetration
S406	Industrial Ornamental Fence
S407	Standard Fence Detail
S408	Standard Fence Gate Anti-Swing Details
500's	
S501	Cold Climate Vicinity Map
S502	Cold Climate Meter Connection 1" and Smaller
S503	Cold Climate Service 1-1/2" - 2" Meter
S504	Cold Climate Service 3" Meter & Larger
S505	Fire Hydrant Assembly (Dry Barrel)
S506	Cold Climate 2" Blow-Off
S507	Cold Climate 4" Blow-Off
S508	Cold Climate 1" - 2" Air & Vacuum Release Valve
S509	Cold Climate Backflow RP Device, 2-1/2" and Smaller

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REVISION DATE
09-09-15



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

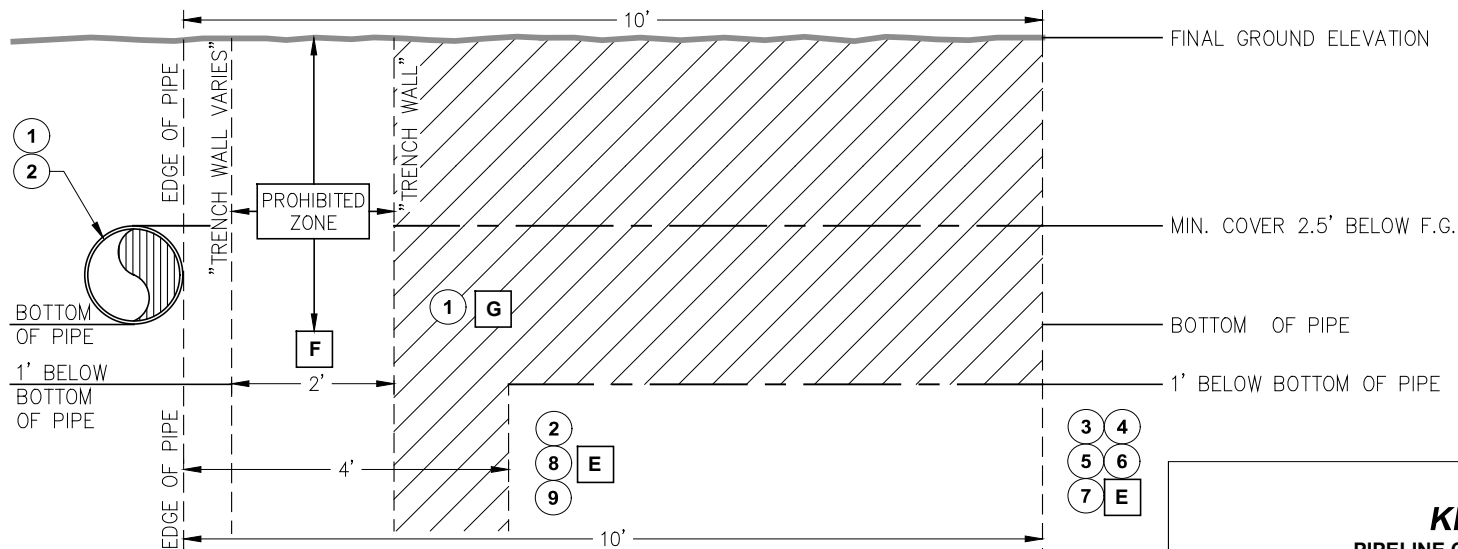
WATER FACILITY MARKER

DRAWING NO.
S102



APPROVED: 
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



KEY
PIPELINE CARRYING:

1	POTABLE WATER
2	SUPPLY (RAW WATER FOR TREATMENT)
3	SEWAGE (UNTREATED)
4	SEWAGE (PRIMARY AND SECONDARY TREATED)
5	DISINFECTED SECONDARY 2.2 RECYCLED WATER *
6	DISINFECTED SECONDARY 23 RECYCLED WATER *
7	HAZARDOUS FLUIDS
8	DISINFECTED TERTIARY RECYCLED
9	STORM DRAINAGE

(* AS DEFINED BY TITLE 22)

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

NOTES:

ADDITIONAL PROHIBITED ZONES:

- A** NO WATER MAIN SHALL BE INSTALLED WITHIN 100 FT. OF THE NEAREST EDGE, OF ANY SANITARY LANDFILLS, WASTEWATER DISPOSAL POND, HAZARDOUS WASTE DISPOSAL SITE OR WITHIN 25 FT. OF THE NEAREST EDGE OF ANY CESSPOOL, SEPTIC TANK, SEWAGE LEACH FIELD, SEWAGE PIT, UNDERGROUND HAZARDOUS MATERIAL STORAGE TANK, OR GROUNDWATER RECHARGE PROJECT SITE. ALL OTHER PIPELINES ALLOWED BEYOND 10 FT.
- B** THE MINIMUM SEPARATION DISTANCES SET FORTH ON THIS DRAWING SHALL BE MEASURED FROM THE NEAREST OUTSIDE EDGE OF EACH PIPE BARREL.
- C** 1 FT. VERTICAL SEPARATION IS REQUIRED ONLY WHEN THE HORIZONTAL DISTANCE BETWEEN A WATER MAIN AND PIPELINE IS LESS THAN 10 FT.
- D** SEE ALSO S101 FOR MINIMUM TRENCH SEPARATION REQUIREMENTS FOR PARALLEL PIPELINES.
- E** IN ADDITION TO THESE REQUIREMENTS SEE APPLICABLE JURISDICTIONAL ENTITIES FOR THEIR REQUIREMENTS REGARDING ALL OTHER PIPELINES.
- F** 2 FT. MINIMUM SEPARATION FROM TRENCH WALL TO TRENCH WALL. DRY UTILITIES MAY BE APPROVED IN THIS AREA ON AN EXCEPTION BASIS BY PCWA ENGINEER.
- G** DRY UTILITIES SHALL BE APPROVED BY UTILITY COMPANY AND LOCAL JURISDICTIONAL AGENCY. POTABLE WATER REQUIRES APPROVAL BY PCWA ON A CASE BY CASE BASIS.

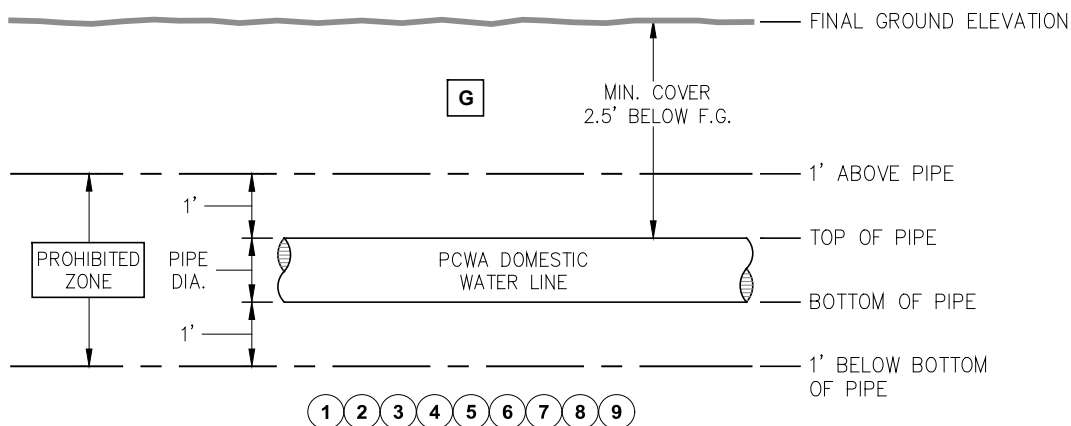
**PARALLEL PIPES
SEPARATION AND BACKFILL**

DRAWING NO.
S103



APPROVED: *R. Brent Smith* **D**
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
10-04-16



ALLOWED	KEY PIPELINE CARRYING:
1	POTABLE WATER
2	SUPPLY (RAW WATER FOR TREATMENT)
3	SEWAGE (UNTREATED)
4	SEWAGE (PRIMARY AND SECONDARY TREATED)
5	DISINFECTED SECONDARY 2.2 RECYCLED WATER *
6	DISINFECTED SECONDARY 23 RECYCLED WATER *
7	HAZARDOUS FLUIDS
8	DISINFECTED TERTIARY RECYCLED
9	STORM DRAINAGE

(* AS DEFINED BY TITLE 22)

NOTES:

- A** ALL PIPES SHALL CROSS AT MINIMUM ANGLE OF 45° HORIZONTAL (PERPENDICULAR CROSSINGS PREFERRED).
- B** ALL NEW PIPES SHALL HAVE NO JOINTS WITHIN 8' HORIZONTAL OF THE CROSSING.
- C** WITH AGENCY AND STATE WATER RESOURCES CONTROL BOARD, DIVISION OF DRINKING WATER APPROVAL, EXEMPTIONS FROM THESE SEPARATIONS MAY BE ALLOWED ON A CASE BY CASE BASIS.
- D** MINIMUM COVER OVER ALL AGENCY PIPES SHALL BE 2.5 FEET.
- E** SEE APPLICABLE JURISDICTIONAL ENTITIES FOR THEIR REQUIREMENTS REGARDING ALL OTHER PIPELINES.
- F** NO PIPES ALLOWED IN "PROHIBITED ZONES".
- G** DRY UTILITIES SHALL BE APPROVED BY UTILITY COMPANY AND LOCAL JURISDICTIONAL AGENCY. POTABLE WATER REQUIRES APPROVAL BY PCWA ON A CASE BY CASE BASIS.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

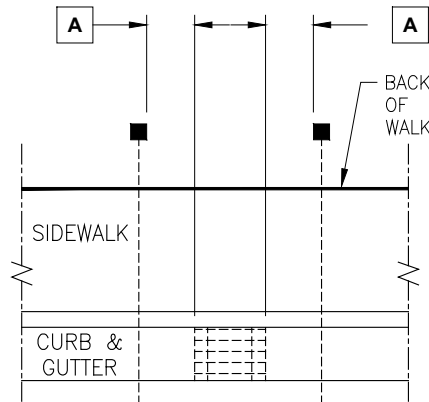
CROSSING PIPES SEPARATION AND COVER

DRAWING NO.
S104

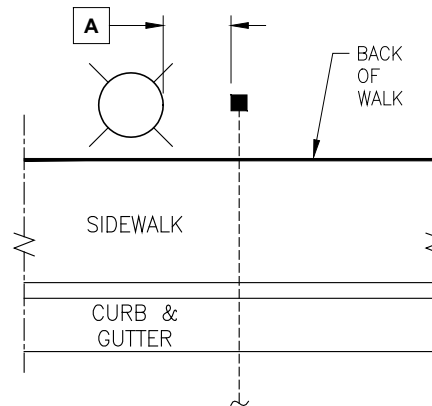


APPROVED: *R. Brent Smith* **D**
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

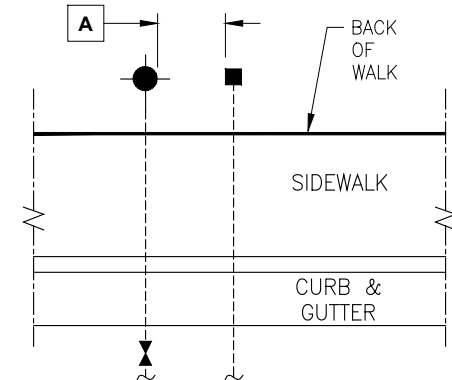
REVISION DATE
10-04-16



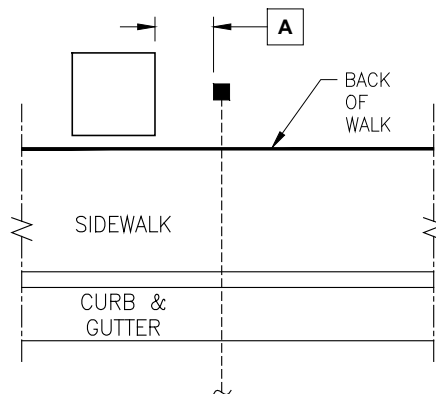
DROP INLET



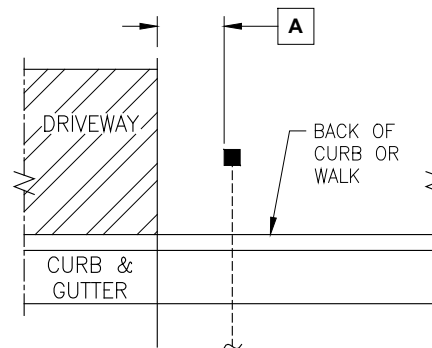
LIGHT POLE FOUNDATION



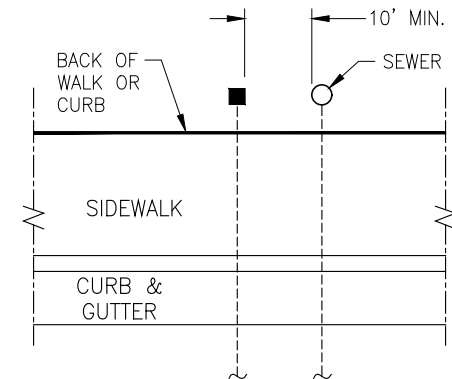
FIRE HYDRANT



UTILITY PAD



DRIVEWAY



SEWER

A ALL WATER SERVICE LATERALS SHALL BE A MINIMUM OF 2' FROM ALL UNDERGROUND, ABOVEGROUND STRUCTURES AND DRIVEWAYS.

B METERS SHALL NOT BE ALLOWED IN DRIVEWAYS OR SIDEWALKS.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

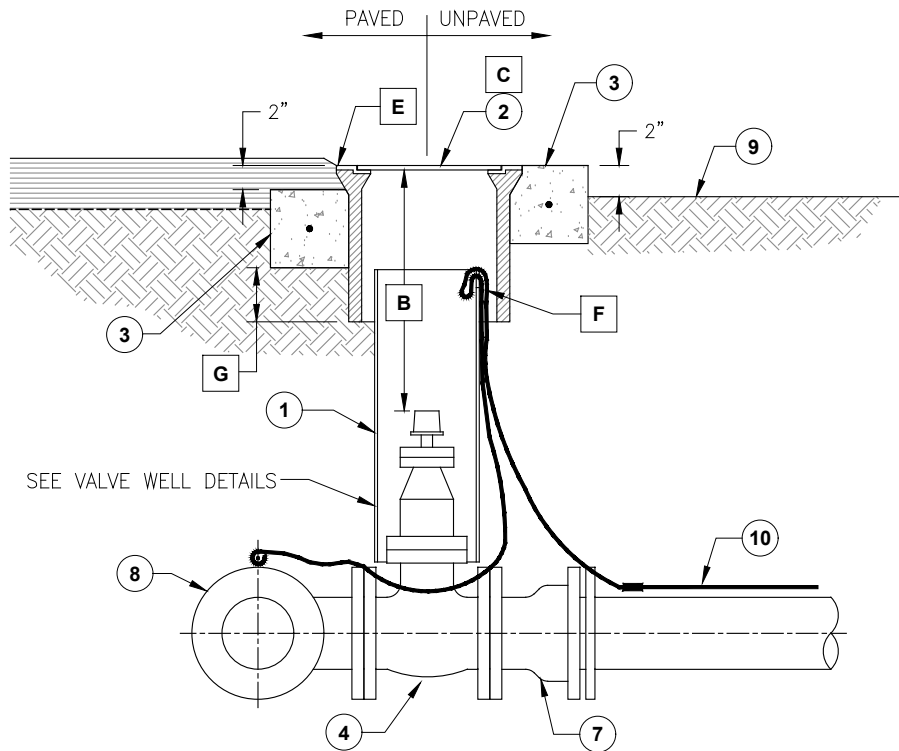
WATER SERVICE MINIMUM SEPARATION

DRAWING NO.
S105



APPROVED:  **(D)**
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
10-04-16

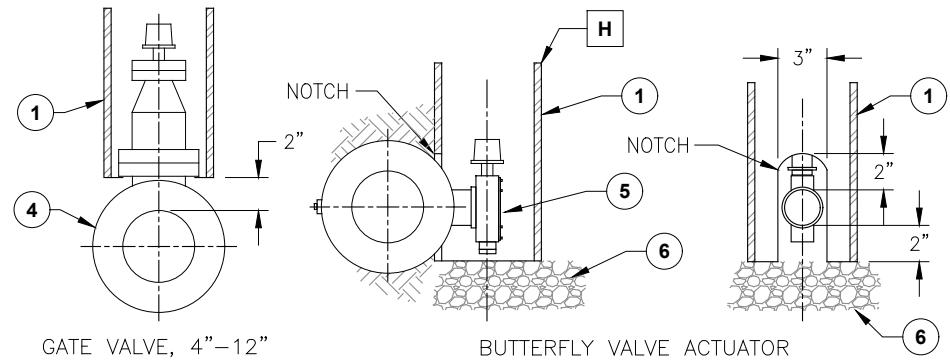


VALVE INSTALLATION

ALL VALVES $\geq 4"$ TO BE FLANGED

ITEM: DESCRIPTION

- 1 8" SDR 35 PVC VALVE WELL EXTENSION (ONE CONTINUOUS LENGTH OF PIPE)
- 2 CONCRETE VALVE BOX WITH CAST IRON TRAFFIC LID
- 3 6"x6" CONCRETE PAD W/#4 REBAR
- 4 GATE VALVE
- 5 ACTUATOR
- 6 1 CUBIC FOOT CRUSHED ROCK
- 7 MJxFLG ADAPTER
- 8 TEE
- 9 FINISHED GRADE
- 10 LOCATING WIRE PER S109



VALVE WELL DETAILS

NOTES:

- A SHOWN AS FLANGED GATE VALVE. 2" THD GATE VALVE AND BUTTERFLY VALVE APPLICATION ARE SIMILAR.
- B IF VALVE NUT IS MORE THAN 30" BELOW FINISHED GRADE, INSTALL AN OPERATING EXTENSION, PER S110.
- C FOR LOCKING LIDS, SEE S107.
- D PROVIDE MAG. ANODE PER S112.
- E SET VALVE BOX AT OR 1/4" BELOW PAVEMENT.
- F NOTCH EXTENSION TO PLACE WIRE.
- G 6" MIN. OVERLAP BETWEEN G5 AND VALVE WELL EXTENSION.
- H CENTER VALVE WELL EXTENSION OVER VALVE NUT.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

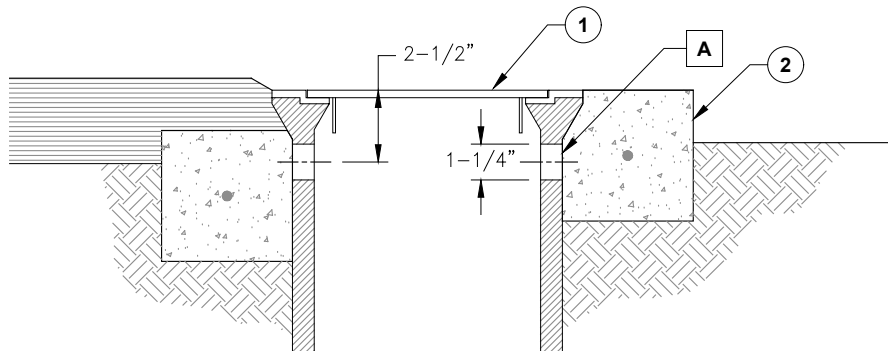
VALVE AND WELL INSTALLATION

DRAWING NO.
S106



APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

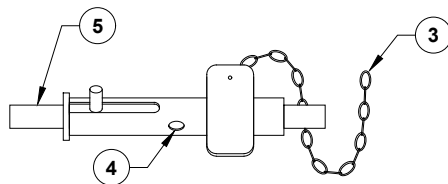
REVISION DATE
01-31-17



ITEM	DESCRIPTION
1	VALVE BOX AND LID PER S106
2	CONCRETE COLLAR W/#4 REBAR PER S106
3	12" LONG RETAINER CHAIN SECURED TO INSIDE OF VALVE WELL
4	PADLOCK HASP HOLE
5	SLIDING BAR, RB 1"

NOTES:

- A** CUT (2) 1-1/4" ϕ HOLES IN VALVE BOX 180 DEGREES APART. SEAL OFF HOLES WHEN CASTING CONCRETE COLLARS.
- B** SEE S106 FOR VALVE BOX INSTALLATION REQUIREMENTS.



VALVE WELL LOCKING BAR

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

LOCKING VALVE BOX

DRAWING NO.
S107



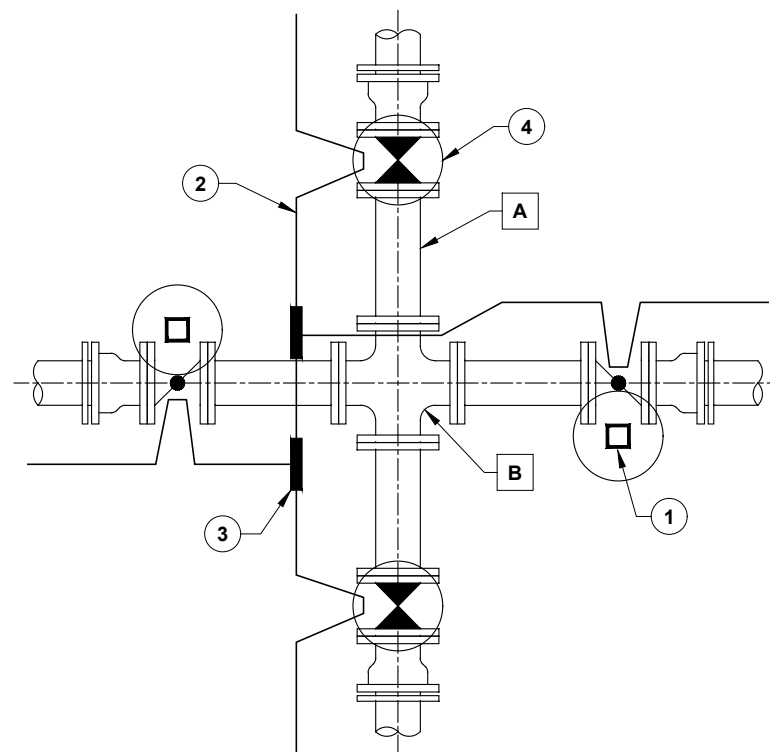
APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

ITEM	DESCRIPTION
①	BUTTERFLY VALVE OPERATING NUT LOCATION IN VALVE WELL EXTENSION PER S106, TYP.
②	TRACING WIRE
③	SPLICE PER S109, TYP.
④	GATE VALVE, VALVE BOX, VALVE WELL EXTENSION PER S106, TYP.

NOTES:

- A** PROVIDE 12" LONG FLGxFLG SPOOL BETWEEN VALVE AND TEE/CROSS ON ALL BRANCHES IF A BFV IS USED ON ANY BRANCH.
- B** SHOWN FOR CROSS INSTALLATION, SIMILAR FOR TEE INSTALLATION.



**VALVE CLUSTERING ON
TEES AND CROSSES**

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

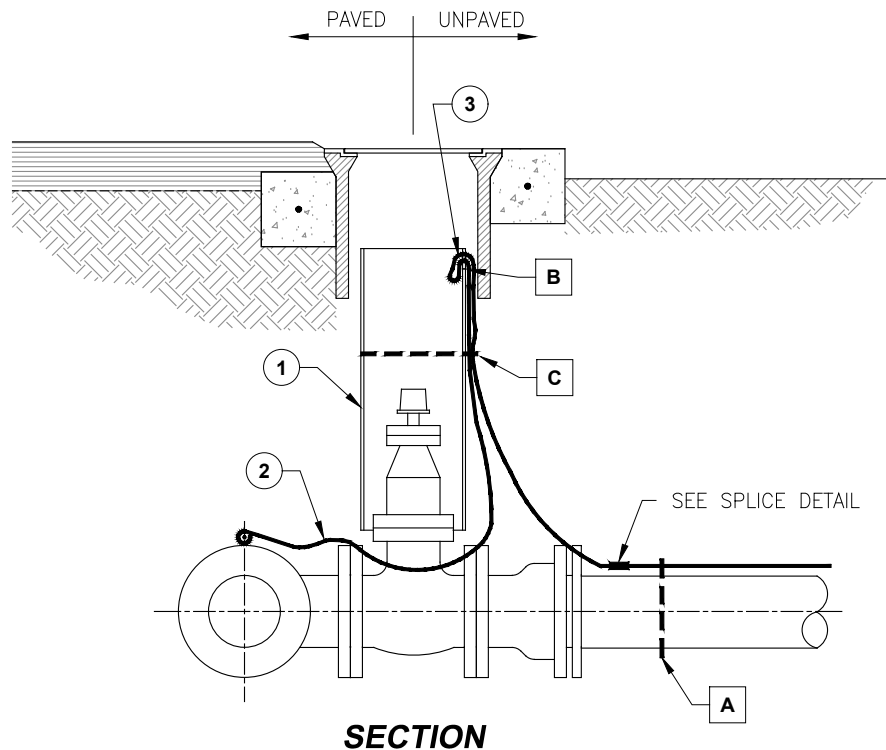
VALVE CLUSTER

DRAWING NO.
S108

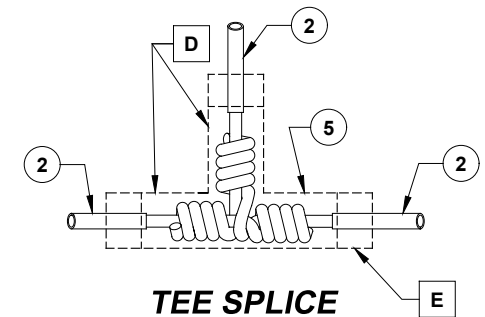


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R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

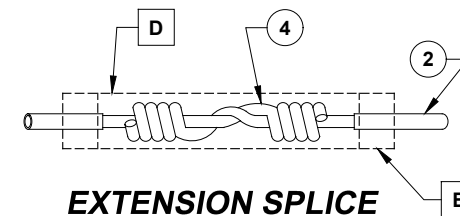
REVISION DATE
01-31-17



SECTION



TEE SPLICE



EXTENSION SPLICE

NOTES:

- A** LOCATING WIRE TO BE TAPED AT 5 FT. O.C. ON TOP OF PIPE.
- B** NOTCH VALVE BOX EXTENSION TO PLACE WIRE.
- C** TAPE TRACER WIRE TO VALVE WELL EXTENSION, MAX. 2' INTERVALS.
- D** SEAL WITH WATERPROOF UNDERGROUND HEAT SHRINK SPLICE KIT.
- E** 1-1/2" OVERLAP MIN. BETWEEN INSULATED WIRE AND WATERPROOF HEAT SHRINK WRAP.
- F** EXTENSION SPLICE - 4 RAPS PER WIRE - PER SIDE
TEE SPLICE - (TWO WIRE) 4 RAPS PER WIRE - PER SIDE
(THREE WIRE) 4 RAPS PER WIRE - PER SIDE
(SEE DETAILS ABOVE)

ITEM	DESCRIPTION
1	VALVE BOX AND WELL EXTENSION PER S106
2	SOLID, INSULATED #10 T.H.H.N. A.W.G. COPPER WIRE, SOFT DRAWN
3	6" LOOP OF WIRE INSIDE VALVE WELL
4	EXTENSION SPLICE - STRIP WIRE, 8 COMPLETE RAPS/4 EACH SIDE
5	TEE SPLICE STRIPPED - SEE NOTE F

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

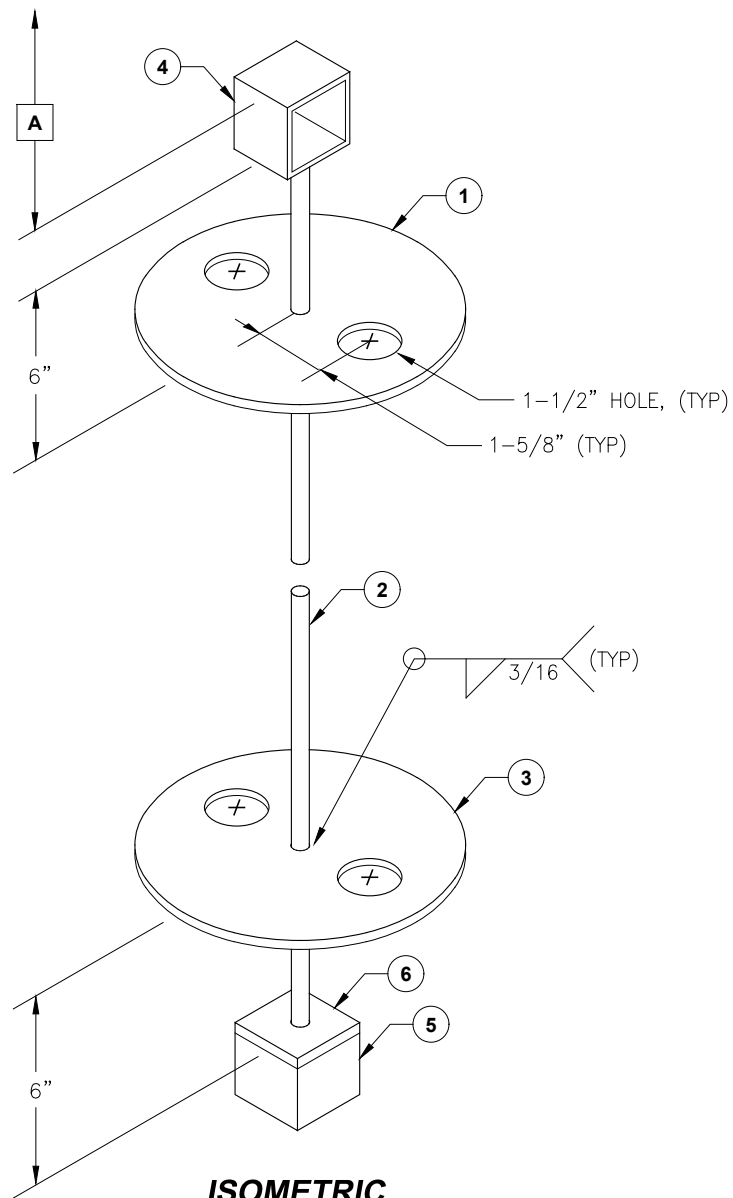
LOCATING WIRE

DRAWING NO.
S109



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



ITEM	DESCRIPTION
1	PL 1/4"x7-1/2" O.D.
2	1" STEEL BAR STOCK
3	PL 1/4"x6-1/2" O.D.
4	TS 3/16"x2"x2"
5	TS 3/16"x2-1/2"x2-1/2"
6	PL 1/4"x2-1/2"x2-1/2"

NOTES:

A DEPTH OF TOP OF FABRICATED EXTENSION

VALVE BOX INSTALLATION	DEPTH FROM LIP OF VALVE BOX
NON-LOCKING	12" TO 18"
LOCKING	2-1/2" TO 6-1/2"

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

VALVE OPERATING NUT EXTENSION

DRAWING NO.

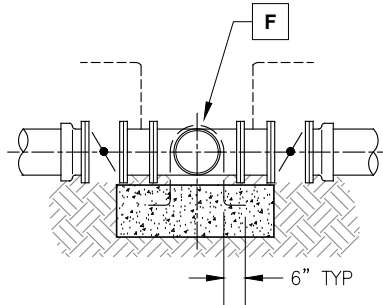
S110

REVISION DATE

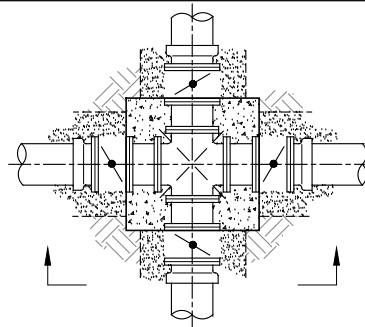
01-31-17



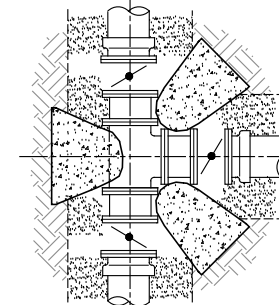
APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES



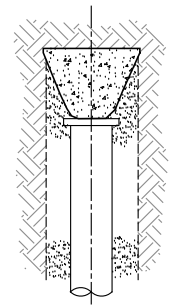
CROSS ELEVATION



CROSS PLAN



TEE

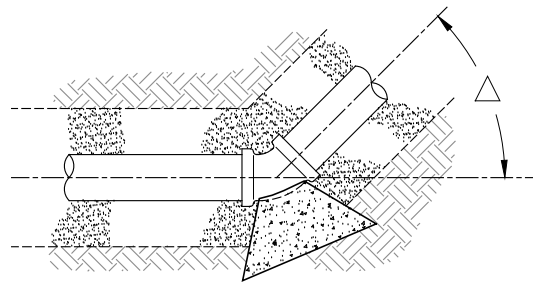


END OF LINE

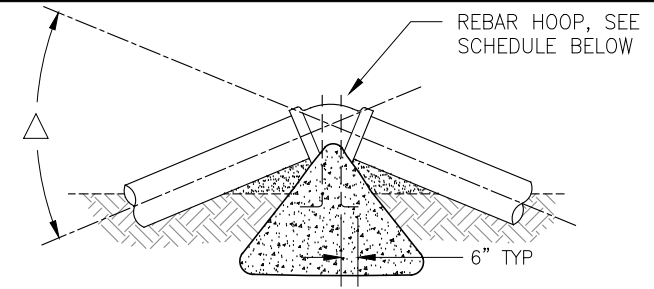
NOTES:

- A** THRUST BLOCKS ARE ALLOWED ONLY WHEN CONNECTING TO EXISTING FACILITIES OR WHERE SHOWN ELSEWHERE.
- B** TEST PRESSURE = 150 PSI, SOIL BEARING PRESSURE = 2000 LBS/S.F., ADJUST SOIL BEARING PRESSURE AS NECESSARY, WITH APPROVAL FROM THE AGENCY ENGINEER.
- C** THRUST BLOCKS TO BE CONSTRUCTED OF CLASS 'B' CONCRETE.
- D** THRUST BLOCKS TO BE PLACED AGAINST UNDISTURBED SOIL.
- E** JOINTS, FACE OF PLUGS, NUTS AND BOLTS TO BE KEPT CLEAR OF CONCRETE AND MUST BE OPERABLE WITHOUT DISTURBING THRUST BLOCK.
- F** REBAR TO BE BENT 90° AT ENDS. REBAR NOT ENCASED IN CONCRETE SHALL BE EPOXY COATED OR COATED WITH TWO COATS OF KOPPERS 505, TNEC 46-450, OR EQUAL, 15 MILS EACH COAT.
- G** THRUST BLOCKS SHALL BE PLACED AS SHOWN ON DRAWINGS; OTHER LOCATIONS MUST BE APPROVED BY AGENCY.

PIPE DIA. (in)	HORIZONTAL THRUST BLOCK BEARING AREA (S.F.)		
4 & 6	2.8	2.8	2.8
8	4.9	4.9	4.9
12	11.4	11.4	11.0



PLAN - HORIZONTAL THRUST BLOCK
NO SCALE



ELEV. - VERTICAL THRUST BLOCK
NO SCALE

PIPE DIA. (in)	HORIZONTAL THRUST BLOCK BEARING AREA (S.F.)				VERTICAL THRUST BLOCK VOL. OF CONCRETE (C.Y.)			
	$\Delta = 11 \ 1/4^\circ$	$\Delta = 22 \ 1/2^\circ$	$\Delta = 45^\circ$	$\Delta = 90^\circ$	$\Delta = 11 \ 1/4^\circ$	$\Delta = 22 \ 1/2^\circ$	$\Delta = 45^\circ$	$\Delta = 90^\circ$
4 & 6	1.0	1.1	2.2	4.0	0.3	0.5	1.1	2.0
8	1.0	1.9	3.7	6.9	0.5	0.9	1.8	3.4
12	2.2	4.4	8.7	16.1	1.1	2.2	4.3	7.9

REBAR SIZES		
PIPE SIZE	Δ	REBAR
4, 6 & 8	0-90°	#5
12	0-22 1/2°	#5
4-12	45°	#7
4-12	90°	#8

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

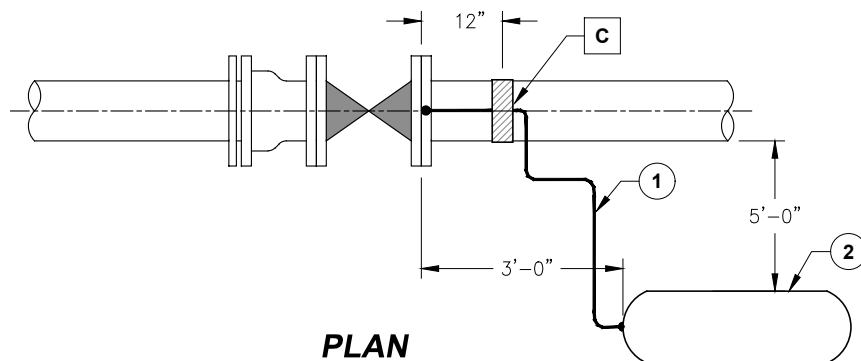
THRUST BLOCK DETAILS
(FOR 150 PSI TEST PRESSURE)

DRAWING NO.
S111

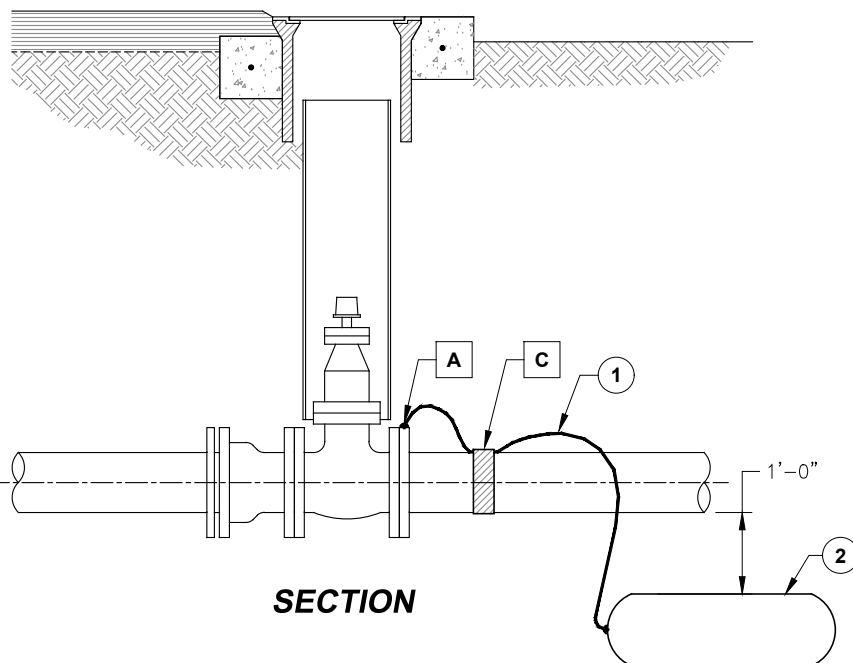


APPROVED:  **(D)**
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



PLAN



SECTION

ITEM	DESCRIPTION
①	#12 AWG COPPER WIRE WITH HMW/PE INSULATION (TYP.) 10' LONG.
②	17# MAGNESIUM ANODE

NOTES:

- A** THERMITE WELD WIRE CONNECTION TO FLANGE OF VALVE BODY. COVER WITH PREFABRICATED WELD CAP. REPAIR COATING AROUND WELD AS NECESSARY.
- B** SEE S106 FOR VALVE BOX DETAILS.
- C** TAPE WIRE TO TOP OF PIPE W/ 2" WIDE TAPE. 2 FULL WRAPS MIN.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

**MAGNESIUM ANODE
INSTALLATION DETAIL**

DRAWING NO.
S112



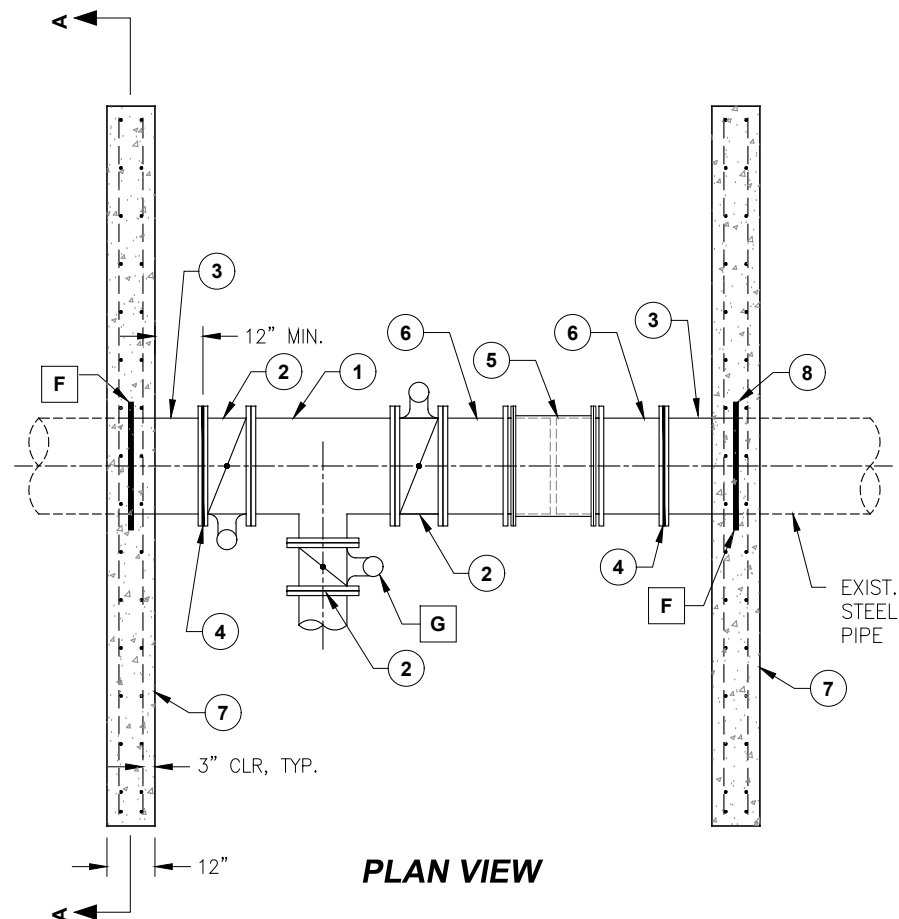
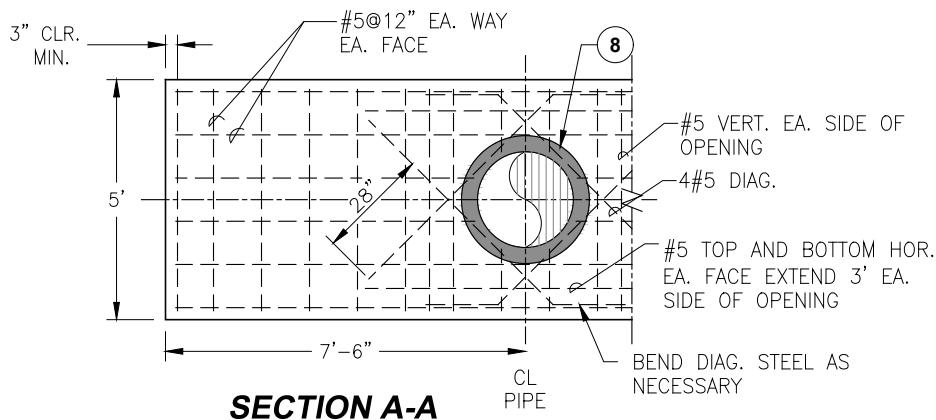
APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-017

ITEM	DESCRIPTION
1	24"xOUTLET SIZE DIP TEE (FLGxFLG)
2	BUTTERFLY VALVE (FLG)
3	24" STEEL TRANSITION PIECE (PExFLG)
4	INSULATING FLANGE AND TEST STATION
5	24" RESTRAINED COUPLING
6	24" DIP ADAPTER (FLGxPE) W/ MJ JOINT RESTRAINT
7	CONC. THRUST WALL
8	4"x0.5" STEEL THRUST COLLAR WELDED TO BUTT STRAP

NOTES:

- A** ALL CCML PIPE CUT-INS SHALL BE DESIGNED BY A CA REGISTERED ENGINEER.
- B** THIS DETAIL IS SHOWN FOR A 24-INCH MAIN. REVISE DIMENSIONS FOR OTHER PIPE SIZES ACCORDINGLY.
- C** MIN. LAP LENGTH OF REBAR = 18"
- D** REBAR SHALL BE GRADE 40 UNLESS OTHERWISE NOTED
- E** BACKFILL SHALL BE COMPACTED TO 95% MAX. DRY DENSITY.
- F** MAKE CONNECTION TO EXISTING PIPE WITH STEEL BUTT STRAPS. REMOVE COATING AND EXPOSE STEEL CYLINDER. CONFIRM CYLINDER THICKNESS AND WELD BUTT STRAP TO CYLINDER ACCORDINGLY. FILL INTERIOR JOINT RECESS WITH CEMENT GROUT AFTER INSTALLATION OF STEEL TRANSITION FITTING.
- G** VALVE OPERATOR LOCATION, (TYP).



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

STANDARD CCML CUT-IN

DRAWING NO.
S113



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

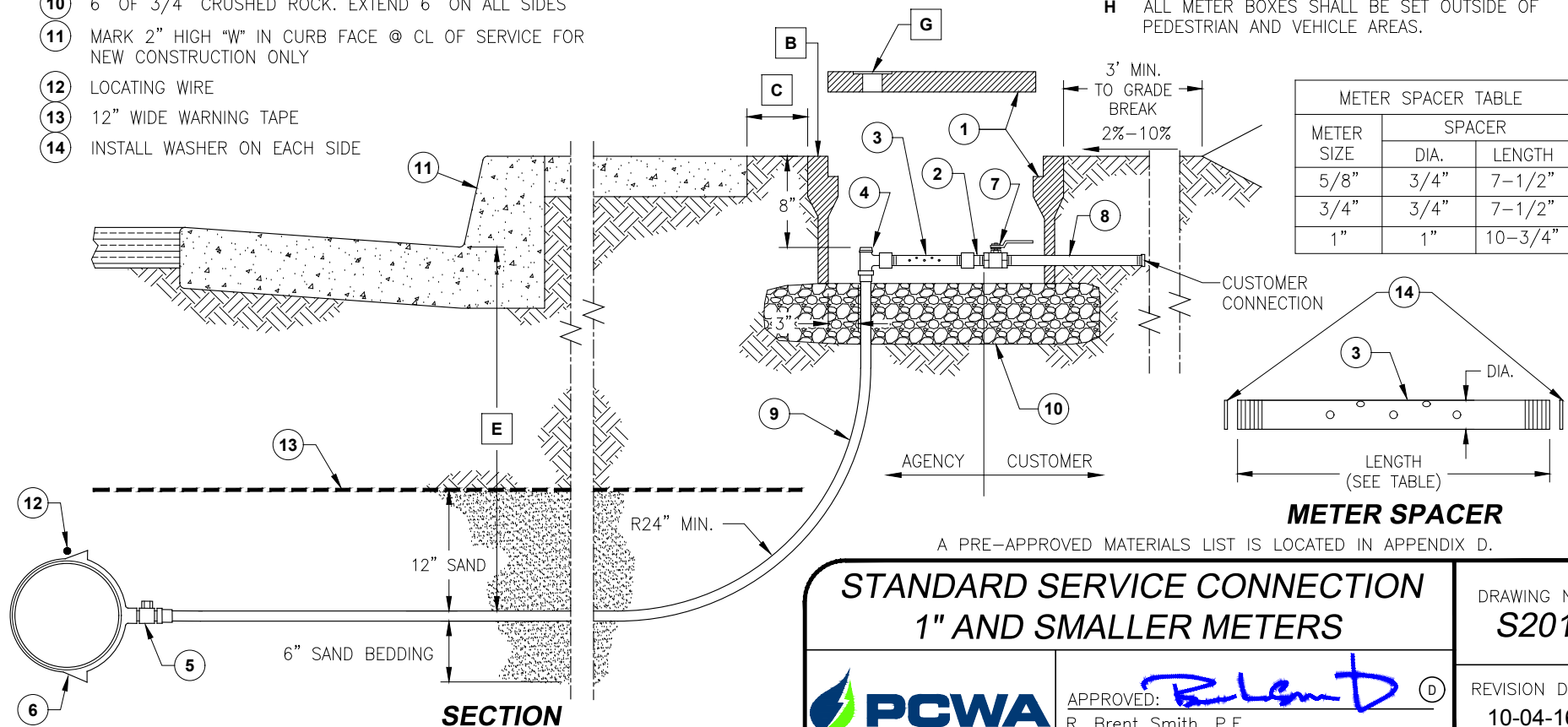
ITEM

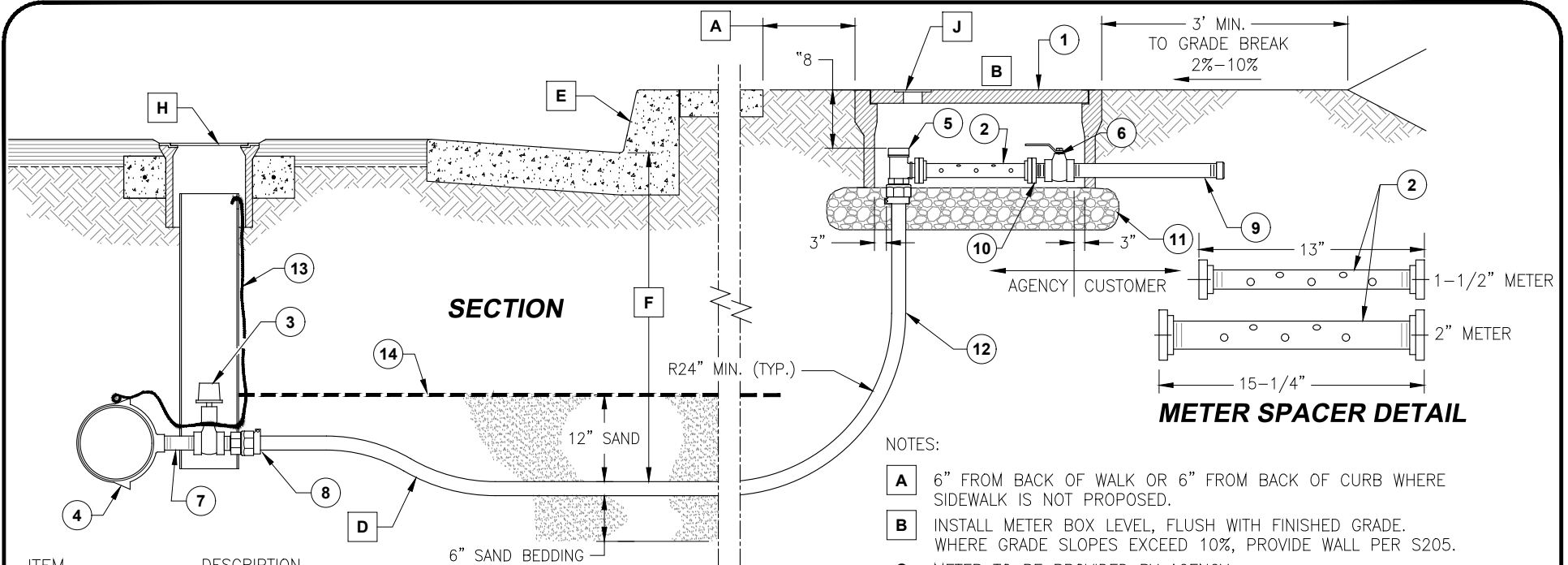
DESCRIPTION

NOTES:

- 1 METER BOX SHALL HAVE A MIN. OF 9" x 19-1/4" INSIDE DIMENSIONS. LID SHALL HAVE A HOLE AS SHOWN TO RECEIVE AN ERT.
- 2 3" LONG FIPxMIP BRASS STRAIGHT METER COUPLING (PIPE SIZE PER SPACER DIA. IN METER SPACER TABLE).
- 3 METER SPACER SCH 80 PVC NPT PIPE NIPPLE WITH 5 EA. X 1/4" DIA. HOLES THROUGH BOTH SIDES (PIPE SIZE PER SPACER DIA. IN METER SPACER TABLE).
- 4 1" COMPxMIP ANGLE METER STOP (FIP SIZE PER SPACER DIA. IN METER SPACER TABLE).
- 5 1" COMP. CORPORATION STOP (INSTALL HORIZONTAL ON THE WATER MAIN WITH OPERATING NUT STRAIGHT UP).
- 6 1" BRONZE SADDLE
- 7 BRASS BALL VALVE PER PCWA SPECS. (PIPE SIZE PER SPACER DIA. IN METER SPACER TABLE).
- 8 24" NPT BRASS SERVICE TAIL AND CAP (PIPE SIZE PER SPACER DIA. IN METER SPACER TABLE).
- 9 1" TYPE "K" COPPER
- 10 6" OF 3/4" CRUSHED ROCK. EXTEND 6" ON ALL SIDES
- 11 MARK 2" HIGH "W" IN CURB FACE @ CL OF SERVICE FOR NEW CONSTRUCTION ONLY
- 12 LOCATING WIRE
- 13 12" WIDE WARNING TAPE
- 14 INSTALL WASHER ON EACH SIDE

- A METER TO BE PROVIDED BY AGENCY.
- B INSTALL METER BOX LEVEL, FLUSH WITH FINISHED GRADE. WHERE GRADE SLOPES EXCEED 10%, PROVIDE WALL PER S205.
- C 6" FROM BACK OF WALK OR 6" FROM BACK OF CURB WHERE SIDEWALK IS NOT PROPOSED.
- D FOR COLD CLIMATE REQUIREMENTS SEE S502
- E 30" MIN. COVER EXCEPT 24" MIN. COVER AT FLOW LINE OF GUTTER OR EP WITHOUT GUTTER.
- F METER BOXES AND LIDS SHALL BE MADE OF "FIBRELYTE", A POLYMER CONCRETE MATERIAL.
- G ERT HOLE SHALL BE 1 15/16" DIA. WITH A 2 1/2" x 3/16" RECESS AS SHOWN.
- H ALL METER BOXES SHALL BE SET OUTSIDE OF PEDESTRIAN AND VEHICLE AREAS.





ITEM	DESCRIPTION
1	METER BOX SHALL HAVE A MIN. OF 17"x36" INTERIOR DIMENSIONS.
2	METER SPACER (SEE METER SPACER DETAIL) SCH 80 PVC NPT PIPENIPPLE WITH 5 EA. X 1/4" DIA. HOLES THROUGH BOTH SIDES, WITH METER FLANGExFIP ADAPTER EACH SIDE (SIZE PER METER)
3	2" NPT GATE VALVE W/2" SQ. OPERATING NUT
4	2" BRONZE SADDLE
5	2"x2" COMPxMETER FLANGE ANGLE METER STOP, PROVIDE 2"x1-1/2" FLG x FLG ADAPTER FOR 1-1/2" METER
6	NPT BRASS BALL VALVE (SIZE PER METER)
7	2"x6" NPT BRASS NIPPLE
8	2" MIPxCOMP COUPLING
9	24" NPT BRASS SERVICE TAIL AND CAP (SIZE PER METER)
10	METER FLANGExMIP ADAPTER (SIZE PER METER)
11	6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES
12	2" TYPE "K" COPPER OR BRASS
13	LOCATING WIRE
14	12" WIDE WARNING TAPE

NOTES:

- A** 6" FROM BACK OF WALK OR 6" FROM BACK OF CURB WHERE SIDEWALK IS NOT PROPOSED.
- B** INSTALL METER BOX LEVEL, FLUSH WITH FINISHED GRADE. WHERE GRADE SLOPES EXCEED 10%, PROVIDE WALL PER S205.
- C** METER TO BE PROVIDED BY AGENCY.
- D** ADJUST DEPTH AS NECESSARY FOR 24" RADIUS INTO BOX.
- E** MARK 2" HIGH "W" IN CURB FACE @ CENTERLINE OF SERVICE.
- F** 30" MIN. COVER EXCEPT 24" MIN. COVER AT FLOW LINE OF GUTTER OR EP WITHOUT GUTTER.
- G** BYPASS REQUIRED ON ALL COMMERCIAL SERVICES, SEE STD DWG S203.
- H** VALVE BOX AND WELL INSTALLATION, SEE S106
- I** ALL METER BOX AND LIDS FOR 1-1/2" AND 2 INCH METERS SHALL BE MADE OF "FIBRELYTE", A POLYMER CONCRETE MATERIAL.
- J** ERT HOLE SHALL BE 1-15/16" DIA. WITH 2-1/2" x 3/16" RECESS.
- K** ALL METER BOXES SHALL BE SET OUTSIDE OF PEDESTRIAN OR VEHICLE AREAS.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

STANDARD SERVICE CONNECTION 1-1/2" AND 2" METERS



APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

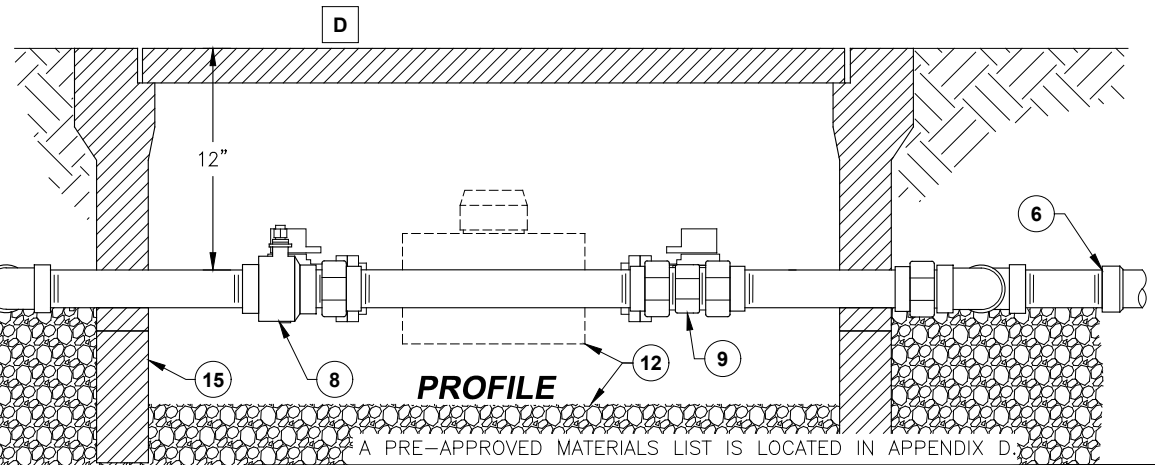
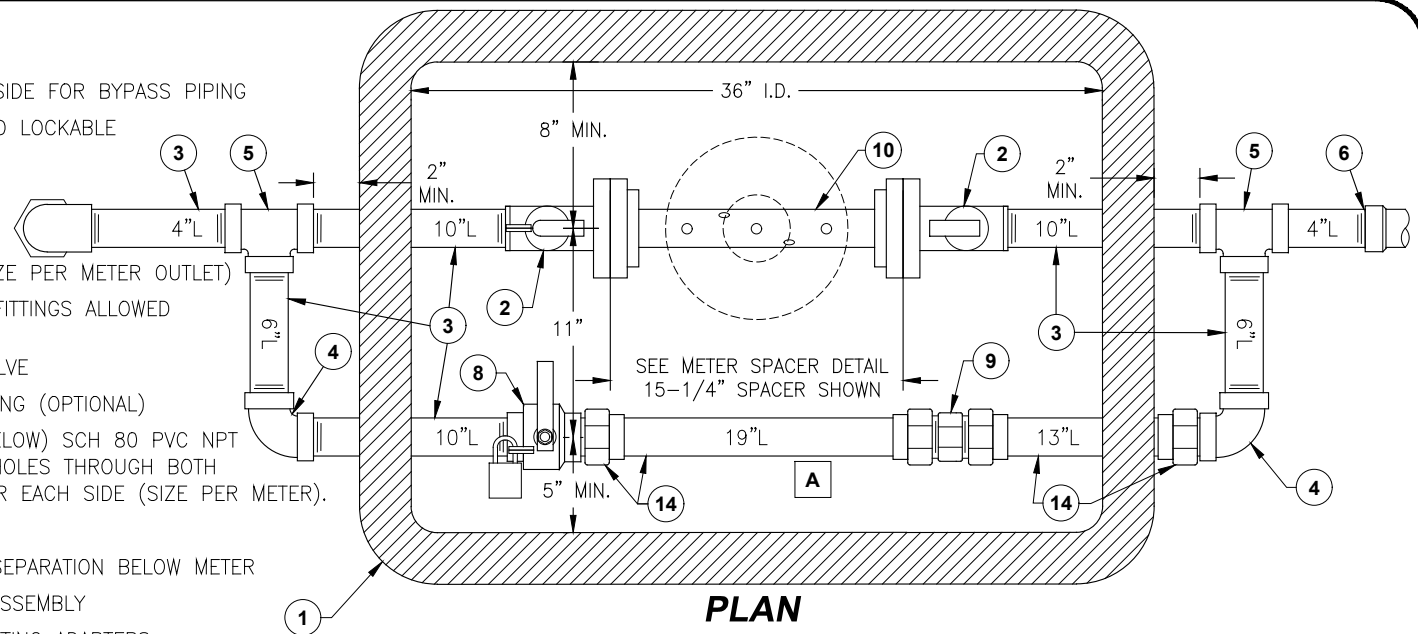
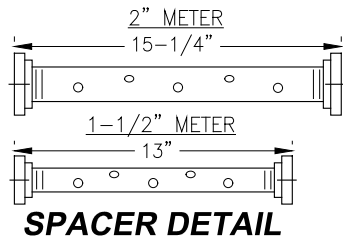
DRAWING NO.
S202

REVISION DATE
09-09-16

- | ITEM | DESCRIPTION |
|------|--|
| 1 | CHRISTY B40 METER BOX, SLOT EACH SIDE FOR BYPASS PIPING |
| 2 | NPT CURB STOP (SIZE PER METER) PAD LOCKABLE |
| 3 | 2" NPT BRASS PIPING TYPICAL |
| 4 | 2" 90° NPT BRASS FITTINGS |
| 5 | 2" x 2" x 2" NPT BRASS TEE |
| 6 | NPT BRASS SERVICE TAIL, NPT CAP (SIZE PER METER OUTLET) |
| 7 | 2" TYPE "K" COPPER FROM MAIN, NO FITTINGS ALLOWED BETWEEN CORP STOP AND #11 FITTING. |
| 8 | 2" NPT BRASS PAD LOCKABLE BALL VALVE |
| 9 | 2" TYPE-K COPPER COMPRESSION FITTING (OPTIONAL) |
| 10 | METER SPACER (SEE SPACER DETAIL BELOW) SCH 80 PVC NPT PIPE NIPPLE WITH 5 EA. X 1/4" DIA. HOLES THROUGH BOTH SIDES, WITH METER FLANGExFIP ADAPTER EACH SIDE (SIZE PER METER). |
| 11 | 2" x 90° COMP x FIP BRASS FITTING |
| 12 | 6" OF 3/4" CRUSHED ROCK, 6" MIN. SEPARATION BELOW METER |
| 13 | ALIGN AND CENTER METER BOX OVER ASSEMBLY |
| 14 | TYPE-K COPPER AND COMPRESSION FITTING ADAPTERS |
| 15 | B40 METER BOX EXTENSION (8" DEEP MIN.) |

NOTES:

- | | |
|---|--|
| A | BYPASS REQUIRED FOR ALL COMMERCIAL SERVICES |
| B | SEE S202 FOR ADDITIONAL SERVICE REQUIREMENTS AT THE MAIN |
| C | PIPE LENGTHS ARE APPROXIMATE AND VARY PER MFG. |
| D | UTILITY STEEL DIAMOND PLATE LID, PLACER WATERWORKS PW/B40-S (2 PIECE) OR APPROVED EQUAL. |



COMMERCIAL SERVICE WITH BYPASS FOR 1-1/2" AND 2" METERS

DRAWING NO.
S203



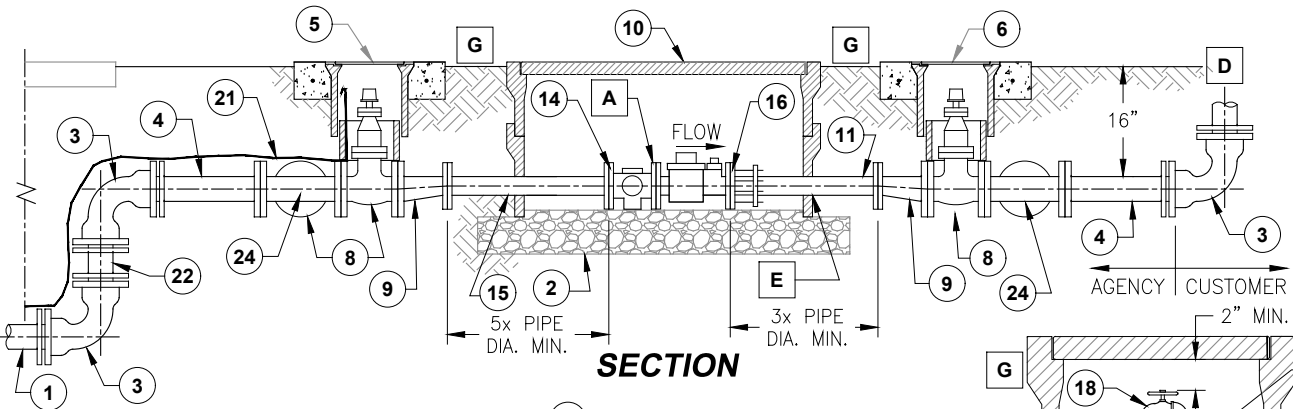
APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-01-17

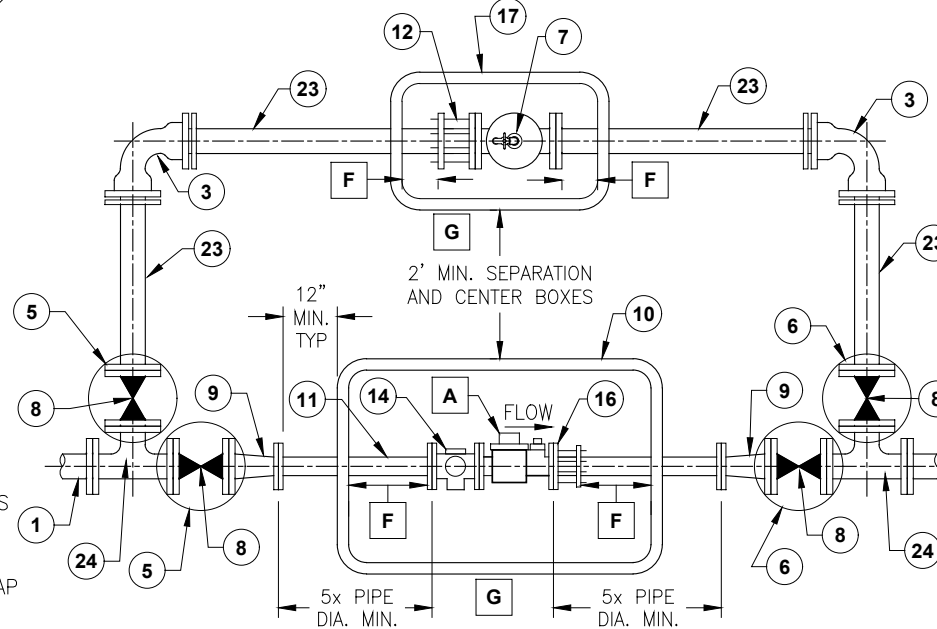
ITEM

DESCRIPTION

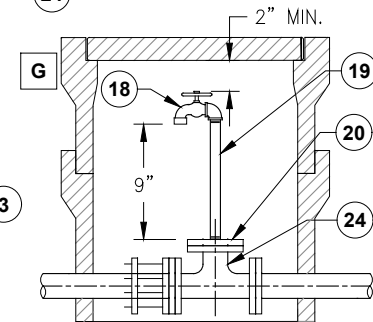
- 1 4" DIP FROM MAIN
- 2 6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES
- 3 4" MJ 90° ELBOW
- 4 4"x18" FLGxPE SPOOL
- 5 LOCKING VALVE BOX PER S107
- 6 NON-LOCKING VALVE BOX SEE S106
- 7 SAMPLING TAP, SEE DETAIL A
- 8 4" FLG GATE VALVE
- 9 4"x3" FLG ECC. REDUCER (FOR 3" METER)
- 10 PROVIDE MIN. 30-1/4"x48-1/4" INSIDE DIMENSIONS PRECAST CONC. VAULT W/ALUMINUM, SPRING-ASSIST, LOCKABLE LID WITH DRAIN.
- 11 FLG SPOOL (SIZE PER METER)
- 12 4" RESTRAINED FLANGED COUPLING ADAPTER
- 13 N/A
- 14 BRONZE PLATE STRAINER (SIZE PER METER)
- 15 FLG SPOOL (SIZE PER METER)
- 16 RESTRAINED FLANGED COUPLING ADAPTER (SIZE PER METER)
- 17 17-1/4"x 29-1/4" MIN. INSIDE DIMENSIONS PRECAST CONC. VAULT W/ALUMINUM, LOCKABLE LID WITH DRAIN.
- 18 3/4" BRASS OR BRONZE HOSE BIB AND CAP
- 19 3/4" NPT BRASS PIPING
- 20 4" COMPANION FLG WITH 3/4" NPT OUTLET
- 21 LOCATING WIRE PER S109
- 22 4" PE SPOOL
- 23 METER BYPASS
- 24 4" FLG TEE



SECTION



PLAN



DETAIL A

NOTES:

- A AGENCY TO SUPPLY AND INSTALL METER AND STRAINER.
- B RESTRAIN ALL JOINTS.
- C 3" METER CONFIGURATION SHOWN.
- D TO BACKFLOW DEVICE
- E NOTCH BOX FOR PIPE AS NECESSARY, TYP.
- F EQUAL DISTANCE.
- G WHEN LOCATED IN LANDSCAPE, INSTALL CONCRETE COLLARS PER DETAIL S211.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

STANDARD SERVICE CONNECTION

3" - 4" METERS

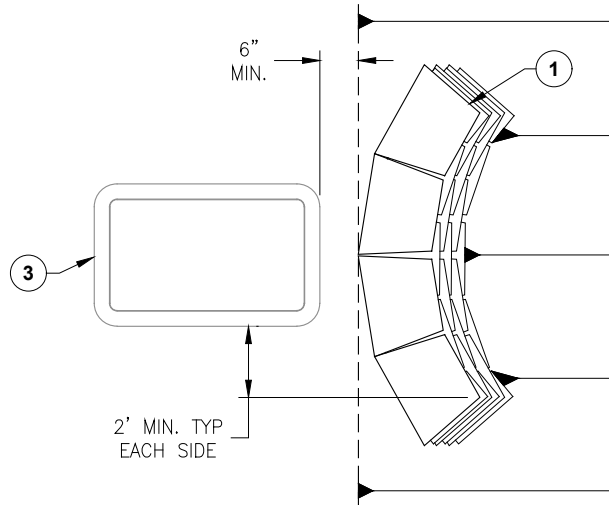


APPROVED: *R. Brent Smith*
 R. Brent Smith, P.E.
 DIRECTOR OF TECHNICAL SERVICES

DRAWING NO.
S204

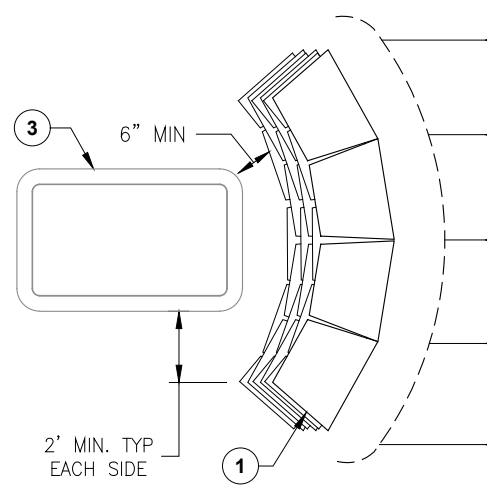
REVISION DATE
01-01-17

BOX ABOVE EXISTING GRADE



PLAN

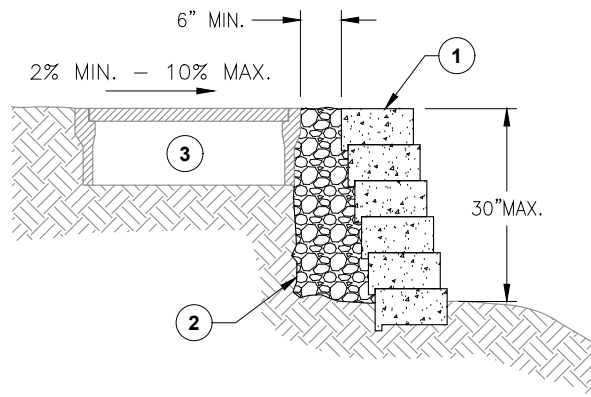
BOX BELOW EXISTING GRADE



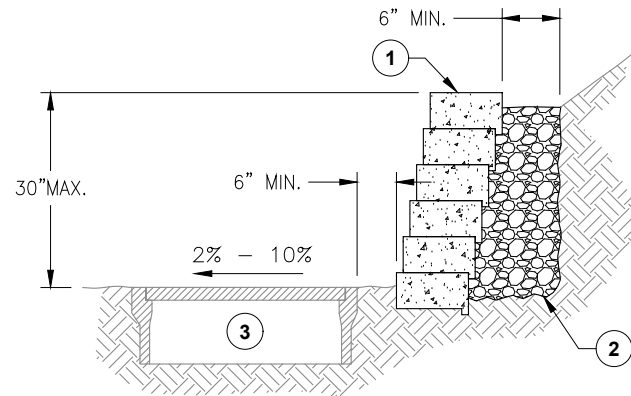
ITEM	DESCRIPTION
①	KEYED MASONRY BLOCK RETAINING WALL
②	3/4" CRUSHED ROCK
③	METER BOX AND LID

NOTES:

- A** BLOCK WALL CONSTRUCTION PER LATEST ADDITION OF UBC AND/OR THE BLOCK MANUFACTURER'S SPECS.
- B** SEE S201 FOR METER BOX INSTALLATION.



SECTION



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

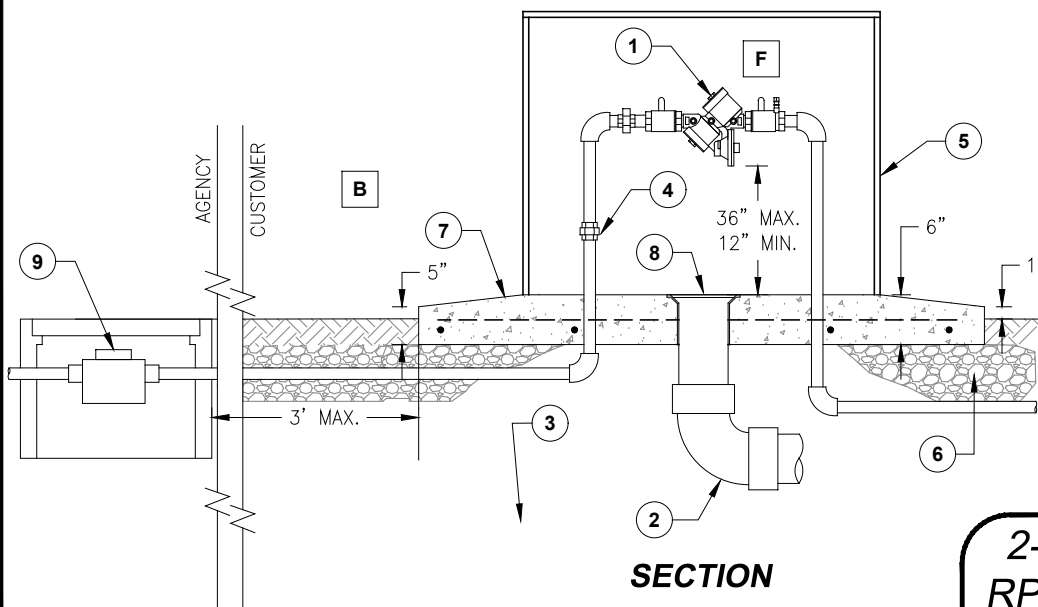
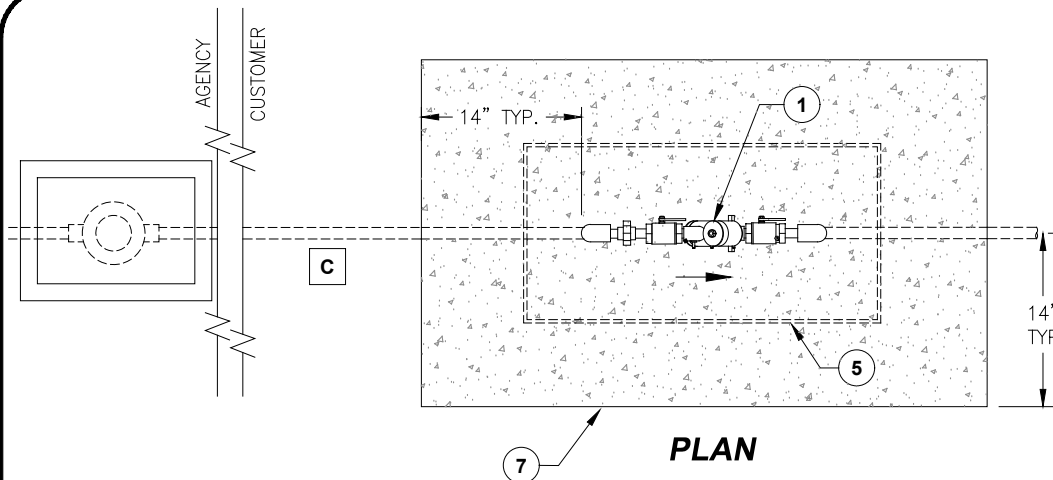
METER PROTECTION WALL

DRAWING NO.
S205



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



- | ITEM | DESCRIPTION |
|------|---|
| 1 | RP BACKFLOW PREVENTION ASSEMBLY INSTALLED PER MANUFACTURER RECOMMENDATIONS. |
| 2 | PVC DRAIN REQUIRED WHEN VALVES ARE ENCLOSED. SIZE DRAINS PER TABLE BELOW. RUN DRAINS TO STORM DRAIN OR DAYLIGHT TO DRAINAGE DITCH. |
| 3 | TYPE "K" COPPER, NTP BRASS OR BRONZE FROM METER. |
| 4 | BRASS OR BRONZE UNION SIZED PER INLET PIPING. |
| 5 | HEATED METAL ABOVEGROUND ENCLOSURE RECOMMENDED IN AREAS SUBJECT TO FREEZING OR AS NECESSARY TO PROTECT VALVE ASSEMBLY. ALL RP BACKFLOW PREVENTION DEVICES SHALL BE PROTECTED BY LOCKING INSULATING BAGS AT A MINIMUM. ENCLOSURE SHALL MAINTAIN VALVE AND APPURTENANCES AT 45°F MIN. |
| 6 | 6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES. |
| 7 | 6" CONC. PAD W/#4 REBAR 12" OC EW AND BROOM FINISH. |
| 8 | SLOTTED DRAIN INLET. |
| 9 | COMMERCIAL/AGRICULTURE METER |

DRAIN SIZE TABLE	
REDUCED-PRESSURE (RP) DEVICE SIZE	MIN. DRAIN SIZE
3/4" THROUGH 1-1/4"	4"
1-1/2" THROUGH 2"	6"
2-1/2"	8"
OTHER BACKFLOW PREVENTION DEVICES	MIN. DRAIN SIZE
3/4" THROUGH 2-1/2"	3"

NOTES:

- A** ALL PIPE AND APPURTENANCES DOWNSTREAM OF METER BOX BELONG TO CUSTOMER.
- B** NO CONNECTIONS WILL BE ALLOWED BETWEEN THE METER AND THE RP BACKFLOW PREVENTION DEVICE.
- C** CONNECT TO SERVICE TAIL FROM METER.
- D** FOR MULTIPLE RP BACKFLOW DEVICES, MINIMUM SEPARATION OF 4 FT.
- E** FOR ADDITIONAL REQUIREMENTS, SEE "PCWA STANDARDS" VOLUME 1, DISTRIBUTION AND CONVEYANCE, DIV. 2-IMPROVEMENT STANDARDS, SECT. 3-CROSS CONNECTION CONTROL, RP BACKFLOW PREVENTION DEVICES.
- F** PROVIDE 12" CLEARANCE FROM ANY PART OF DEVICE

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

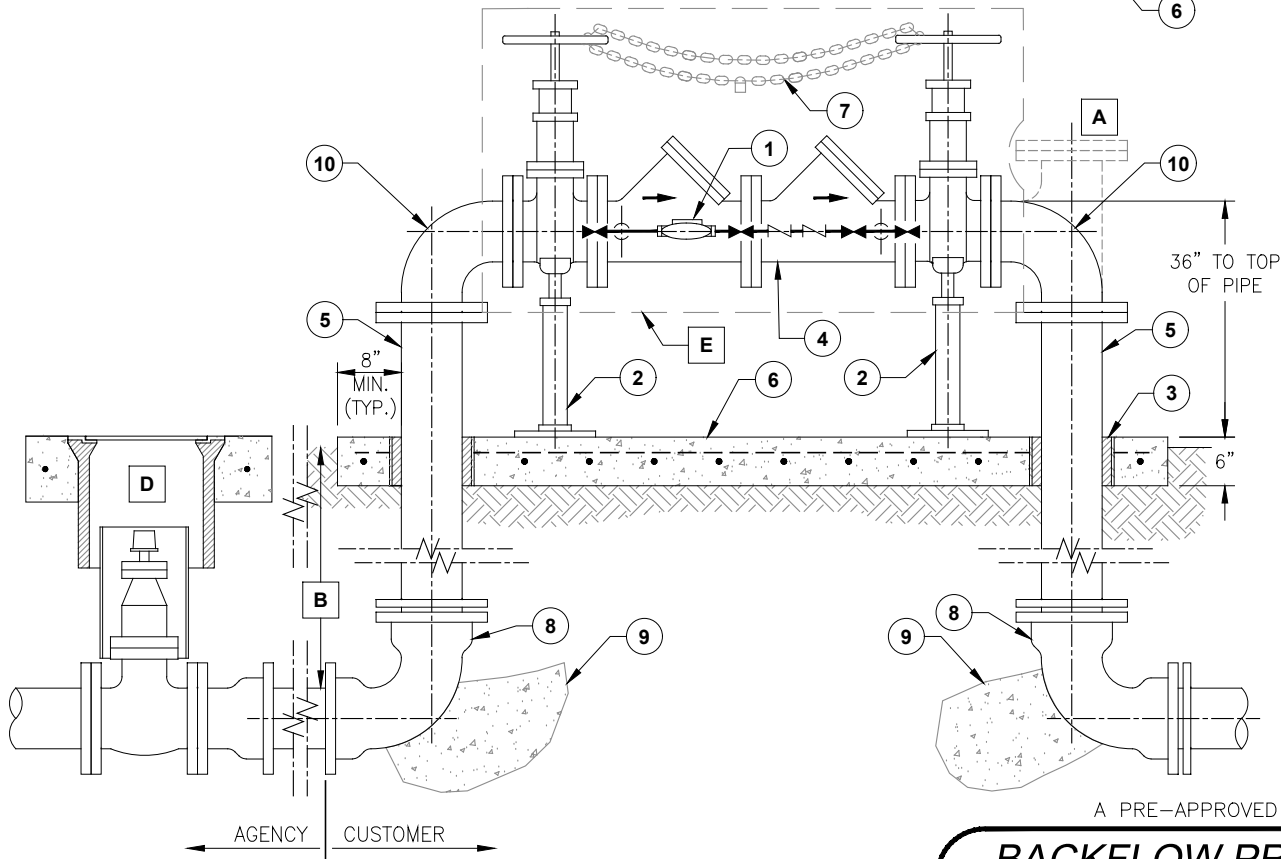
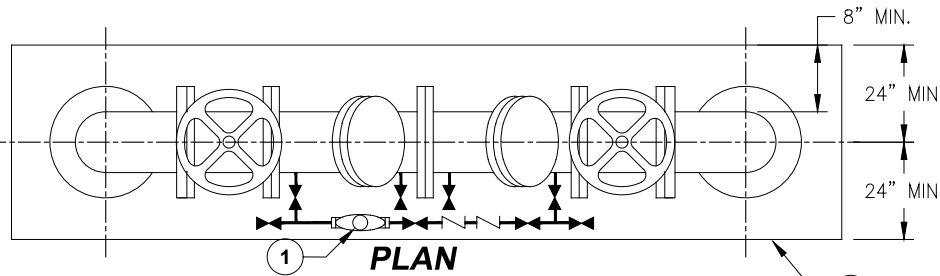
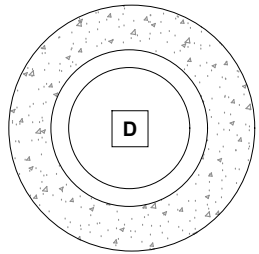
2-1/2" AND SMALLER COMMERCIAL RP BACKFLOW PREVENTION DEVICE

DRAWING NO.
S206



APPROVED:  (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-01-17



- | ITEM | DESCRIPTION |
|------|---|
| 1 | BADGER 3/4"x5/8" BYPASS METER WITH "0" DESIGNATION (REQUIRED FOR FIRE SERVICE ONLY!), MAINTAINED BY PCWA. |
| 2 | ADJUSTABLE PIPE SADDLE SUPPORTS W/BASE PLATE. |
| 3 | STEEL PIPE SLEEVE WITH JOINT SEALANT OR PACKING MATERIAL (TYP) |
| 4 | BACKFLOW PREVENTION ASSEMBLY INSTALLED PER MANUFACTURER'S RECOMENDATIONS. |
| 5 | 6"-16" DIP (SIZE PER DEVICE) |
| 6 | CONC. PAD W/#4 REBAR @12" OC EW AND BROOM FINISH. |
| 7 | 5/0 SS WELDED CHAIN AND LOCK |
| 8 | MJ 90° ELBOW (TYP.) |
| 9 | CONCRETE THRUST BLOCK AREA PER S111 |
| 10 | FLG x FLG 90° ELBOW |

NOTES:

- A** TEE MAY BE INSTALLED FOR PIPING TO FIRE DEPT. CONNECTIONS AS NEEDED
- B** 30" MINIMUM COVER
- C** ALL JOINTS SHALL BE RESTRAINED
- D** ISOLATION VALVE AND G5 BOX REQUIRED, SEE STANDARD DRAWING S106 FOR SPECS. LOCATION TO BE APPROVED BY AGENCY ENGINEER.
- E** HEATED METAL ABOVEGROUND ENCLOSURE RECOMMENDED IN AREAS SUBJECT TO FREEZING OR AS NECESSARY TO PROTECT VALVE ASSEMBLY. ALL RP BACKFLOW PREVENTION DEVICES SHALL BE PROTECTED BY LOCKING INSULATING BAGS AT A MINIMUM. ENCLOSURE SHALL MAINTAIN VALVE AND APPURTENANCES AT 45°F MIN.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

SECTION

BACKFLOW PREVENTION DEVICE 3" AND LARGER

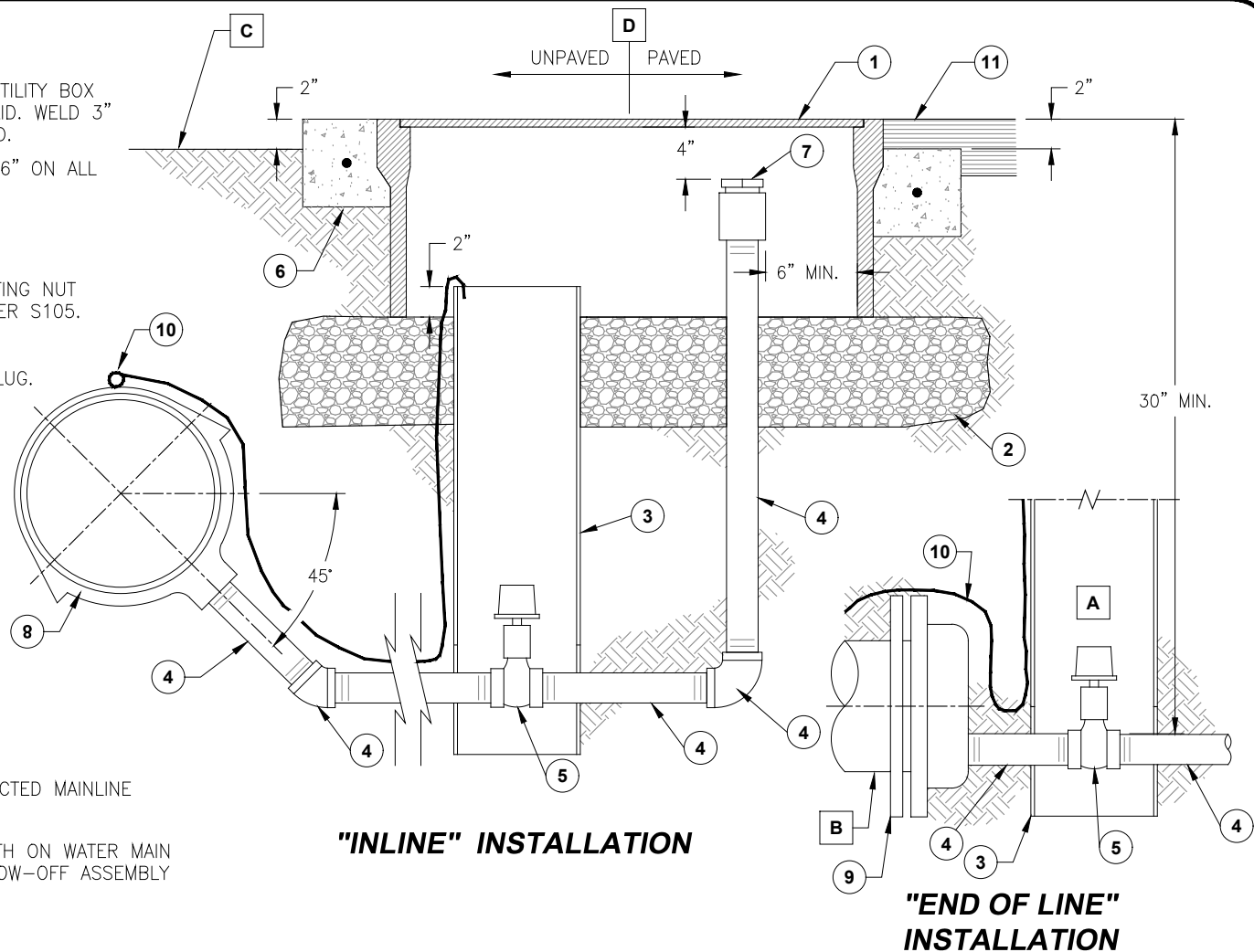
DRAWING NO.
S207



APPROVED:  **D**
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
10-04-16

- | ITEM | DESCRIPTION |
|------|--|
| 1 | 17-1/4"x 30-1/4" INTERIOR DIMS OF UTILITY BOX W/STEEL CHECKER PLATE, BOLT-DOWN LID. WELD 3" HIGH LETTERS "B.O." ON SURFACE OF LID. |
| 2 | 6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES. |
| 3 | PER S106 (OMIT VALVE BOX) |
| 4 | 2" NPT BRASS NIPPLES AND ELBOWS. |
| 5 | 2" NPT GATE VALVE WITH 2" SQ. OPERATING NUT AND NOTCHED VALVE WELL EXTENSION PER S105. |
| 6 | 6"x6" CONCRETE COLLAR W/#4 REBAR. |
| 7 | 2" NPT BRASS COUPLING WITH BRASS PLUG. |
| 8 | 2" BRONZE SADDLE. |
| 9 | RESTRAINED CAP WITH 2" NPT PORT. |
| 10 | LOCATING WIRE PER S109. |
| 11 | AC PAVEMENT. |



NOTES:

- A** PLACE END OF LINE BLOW-OFF AT EXPECTED MAINLINE EXTENSIONS.
- B** PROVIDE 8' MIN. RESTRAINED PIPE LENGTH ON WATER MAIN EACH SIDE OF TEE. RESTRAIN ENTIRE BLOW-OFF ASSEMBLY
- C** FINISHED GRADE
- D** BLOW-OFF UTILITY BOXES SHALL BE INSTALLED OUT OF ROAD AT BACK OF CURB/WALK OR ROAD SHOULDER WHEN POSSIBLE.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

2" BLOW-OFF ASSEMBLY

DRAWING NO.
S208



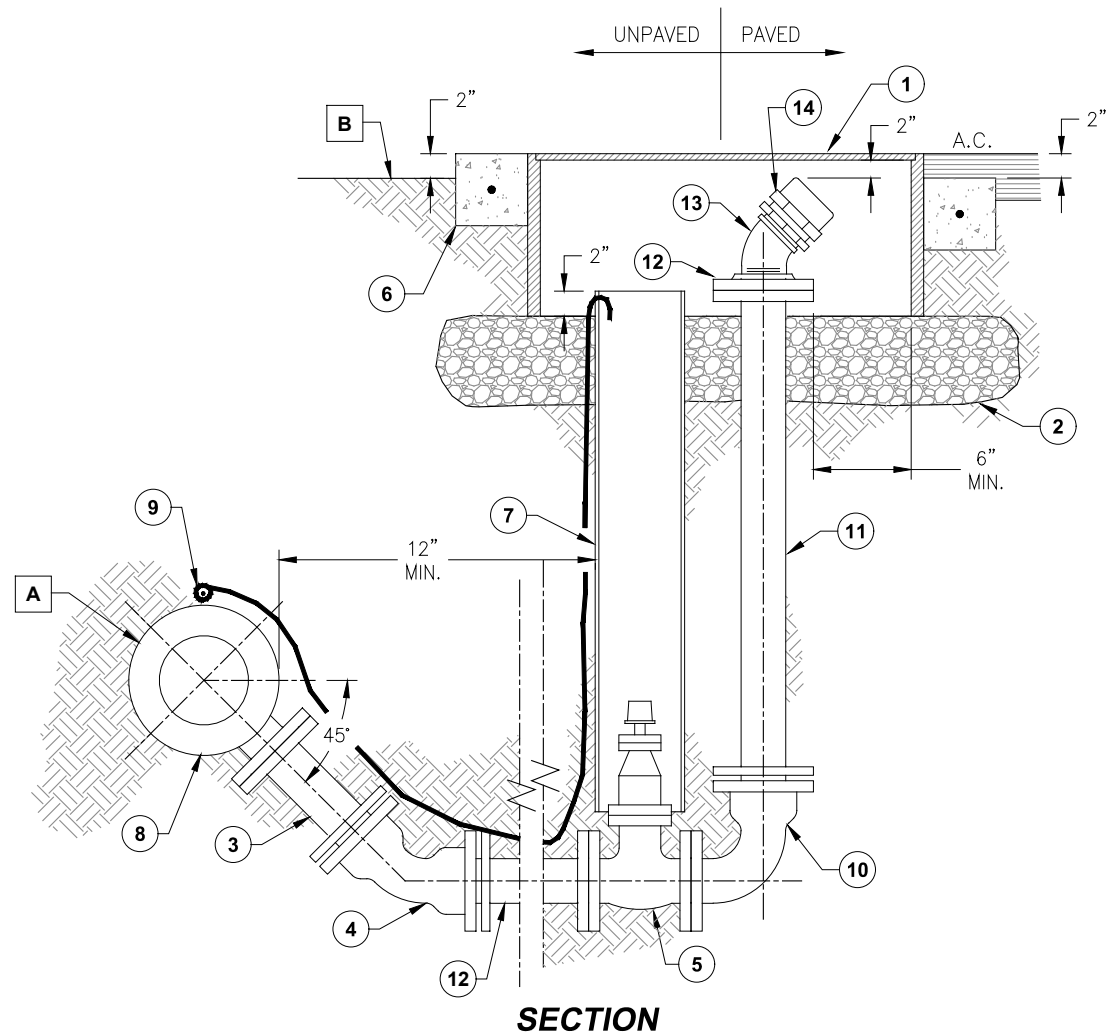
APPROVED: *R. Brent Smith* **D**
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
03-13-15

ITEM	DESCRIPTION
①	17-1/4"x 30-1/4" INTERIOR DIMS OF UTILITY BOX W/STEEL CHECKER PLATE, BOLT-DOWN LID. WELD 3" HIGH LETTERS "B.O." ON SURFACE OF LID.
②	6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES.
③	4" FLGxPE DIP SPOOL.
④	4" MJxMJ DIP 45° ELBOW.
⑤	4" FLG GATE VALVE W/2" SQ. OPERATING NUT.
⑥	6"x6" CONCRETE COLLAR W/#4 REBAR.
⑦	VALVE WELL PER S106, OMIT VALVE BOX.
⑧	MAINx4" FLG DIP TEE.
⑨	LOCATING WIRE PER S109.
⑩	4" FLGxMJ DIP 90° ELBOW.
⑪	4" PEXFLG DIP SPOOL.
⑫	4" FLGxNPT DIP COMPANION FLANGE.
⑬	4" NPT BRASS 45° STREET ELBOW.
⑭	4" NPTx4-1/2" NST HEX ADAPTER W/4-1/2" NST BRASS CAP.

NOTES:

- A** PROVIDE 8' MIN. RESTRAINED PIPE LENGTH ON WATER MAIN EACH SIDE OF TEE. RESTRAIN ENTIRE BLOW-OFF ASSEMBLY.
- B** FINISHED GRADE.



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

4" BLOW-OFF ASSEMBLY

DRAWING NO.
S209



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

4 6" CONCRETE SPLASH PAD
 5 6" FLGxMJ ADAPTER
 6 CONCRETE THRUST BLOCK W/4.0 S.F. BEARING AREA
 7 BREAKOFF SPOOL
 8 12" WIDE WARNING TAPE
 9 6" MJ HYDRANT BURY ELL
 10 6" PEXPE DIP SPOOL
 11 6" FLG GATE VALVE
 12 LOCATING WIRE PER S109
 13 WATER MAIN
 14 VALVE WELL AND BOX PER S106

AS REQUIRED

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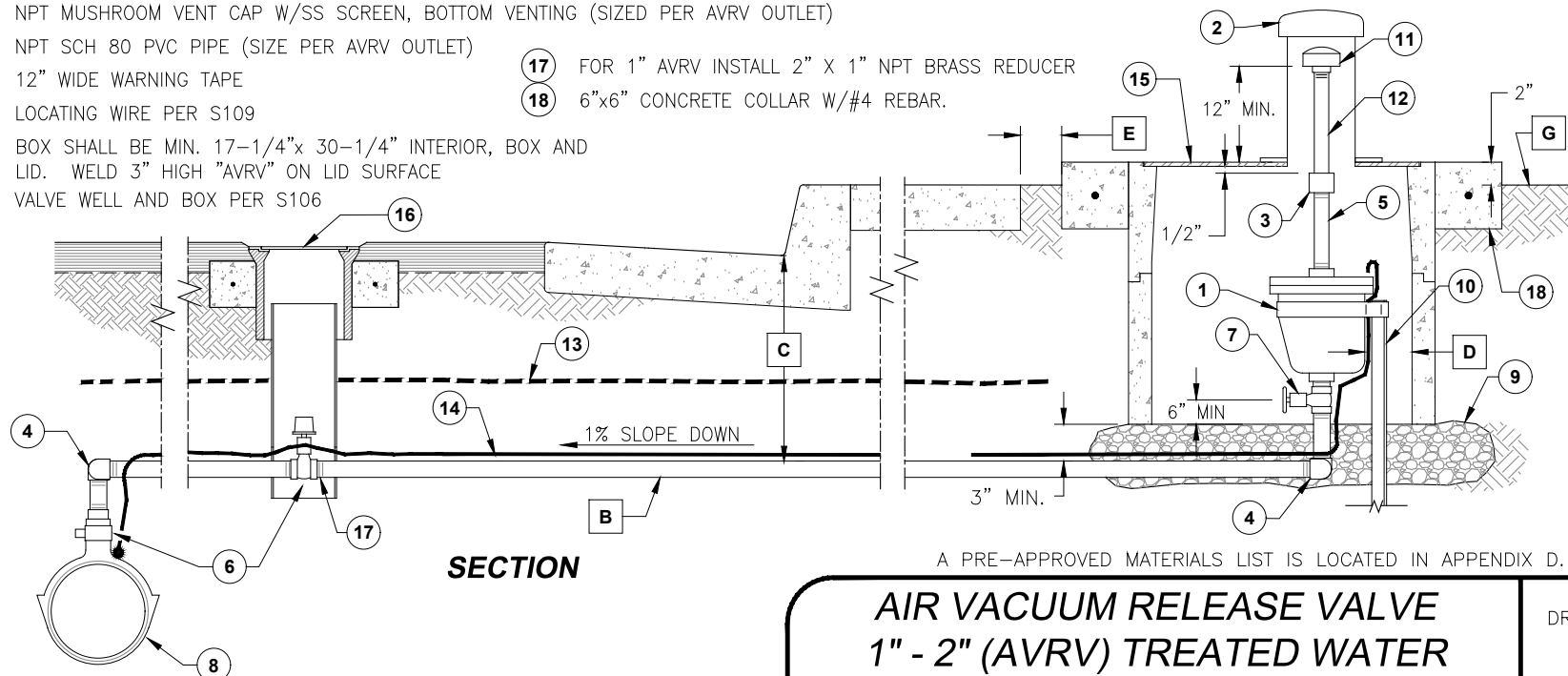
Technical drawing of a square foundation with a circular pile cap. The drawing shows a square foundation with a dashed line indicating a 3' width. A circular pile cap is centered within the square. A pile is shown passing through the cap. Dimensions include a 20" pile diameter, a 3' foundation width, and a 1'-6" pile cap diameter. Callouts 4 and 2 point to specific features.

REVISION DATE
01-31-17

ITEM	DESCRIPTION
1	COMBINATION AVR. SEE TECHNICAL SPECIFICATIONS FOR SIZING.
2	AIR VENT ENCLOSURE
3	NPT PVC COUPLING
4	SWING JOINT (2-90° FITTINGS)
5	BRASS NIPPLE SIZE PER AVR OUTLET
6	PROVIDE BRASS CORPORATION STOP VALVE TO MATCH AVR INLET. ADD A 2" NPT BRASS GATE VALVE AND VALVE BOX FOR 2" AVR INLET.
7	BALL VALVE WITH WHEEL, ACCESSIBLE WITHIN BOX.
8	SERVICE SADDLE W/BUSHING AS NECESSARY. SEE SPECIFICATIONS FOR SADDLE MATERIALS
9	6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES
10	1-5/8"x1-5/8" GALV. STEEL CHANNEL (UNISTRUT OR EQUAL) ON NARROW SIDE OF VALVE BODY. DRIVE MIN. 18" INTO SOIL BELOW CRUSHED ROCK. SECURE TO VALVE BODY W/1" MIN. WIDTH SS STRAP
11	NPT MUSHROOM VENT CAP W/SS SCREEN, BOTTOM VENTING (SIZED PER AVR OUTLET)
12	NPT SCH 80 PVC PIPE (SIZE PER AVR OUTLET)
13	12" WIDE WARNING TAPE
14	LOCATING WIRE PER S109
15	BOX SHALL BE MIN. 17-1/4"x 30-1/4" INTERIOR, BOX AND LID. WELD 3" HIGH "AVRV" ON LID SURFACE
16	VALVE WELL AND BOX PER S106
17	FOR 1" AVRV INSTALL 2" X 1" NPT BRASS REDUCER
18	6"x6" CONCRETE COLLAR W/#4 REBAR.

NOTES:

- A** WHERE POSSIBLE, PLACE AVR'S WITHIN 10 FEET OF PROPERTY CORNERS.
- B** ALL PIPES AND FITTINGS TO BE BRASS OR BRONZE UNLESS OTHERWISE SHOWN.
- C** 30" MIN. COVER EXCEPT 24" MIN. COVER AT FLOW LINE OF GUTTER OR EP WITHOUT GUTTER.
- D** PLACE AVRV IN BOX SO IT MAY BE REMOVED WITHOUT REMOVING THE BOX.
- E** 6" FROM BACK OF WALK OR 6" FROM BACK OF CURB WHERE SIDEWALK IS NOT PROPOSED.
- F** ALL HORIZONTAL PIPE SHALL SLOPE DOWN TOWARD MAIN AT 1% SLOPE MIN.
- G** FINISHED GRADE.



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

AIR VACUUM RELEASE VALVE 1" - 2" (AVRV) TREATED WATER



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

DRAWING NO.
S211

REVISION DATE
01-01-17

ITEM DESCRIPTION

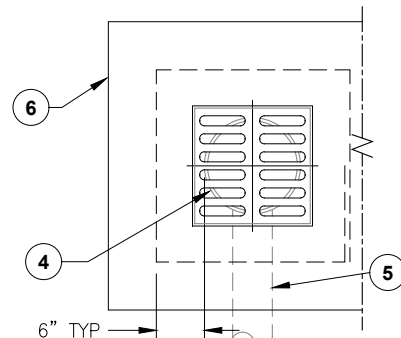
- ① FLG PRESSURE RELIEF VALVE (PRESSURE CLASS 400) SIZED PER TABLE AT RIGHT, W/MICROSWITCH ON/OFF INDICATOR
- ② FLG GATE VALVE W/HANDWHEEL SIZE PER PRESSURE RELIEF VALVE
- ③ D.I.P. FLG TEE, PRV STATION PIPE SIZE x PRESSURE RELIEF VALVE SIZE
- ④ 12" PVC DRAIN BASIN W/4" OUTLETS, HINGED, SLOTTED GRATE (PLUG ONE BRANCH AS NECESSARY).
- ⑤ 4" SDR-35 PVC DRAIN, SLOPE TO DRAIN TO STORM DRAIN OR DITCH
- ⑥ 36"x36"x6" THICK CONCRETE PAD W/#4 REBAR 12" OC EW
- ⑦ DOWNSTREAM LEG OF PRV STATION SEE S213
- ⑧ 6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES
- ⑨ STEEL PIPE SLEEVE WITH SEALANT OR JOINT PACKING

NOTES:

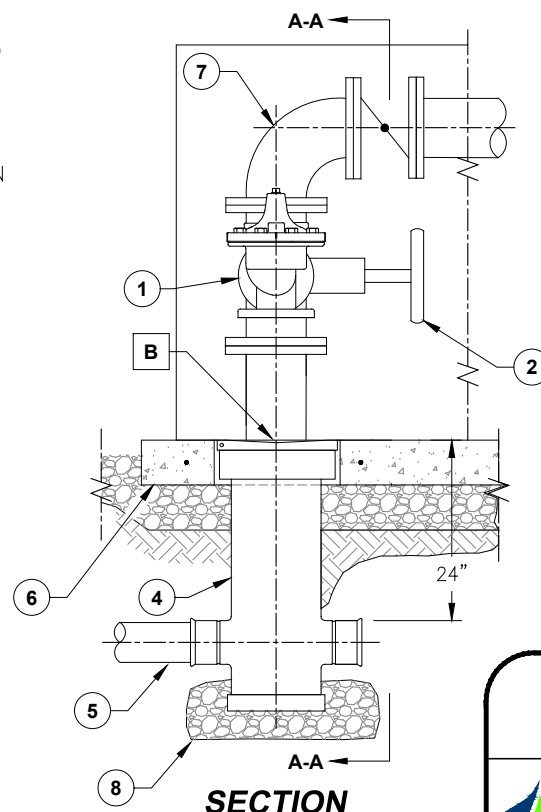
A THIS CONFIGURATION CAN BE APPLIED TO ANY ABOVE GROUND PIPING WITH THE AGENCY'S APPROVAL.

B CENTER DRAIN UNDER PRESSURE RELIEF VALVE

C SEE S213 SAFE-T-COVER



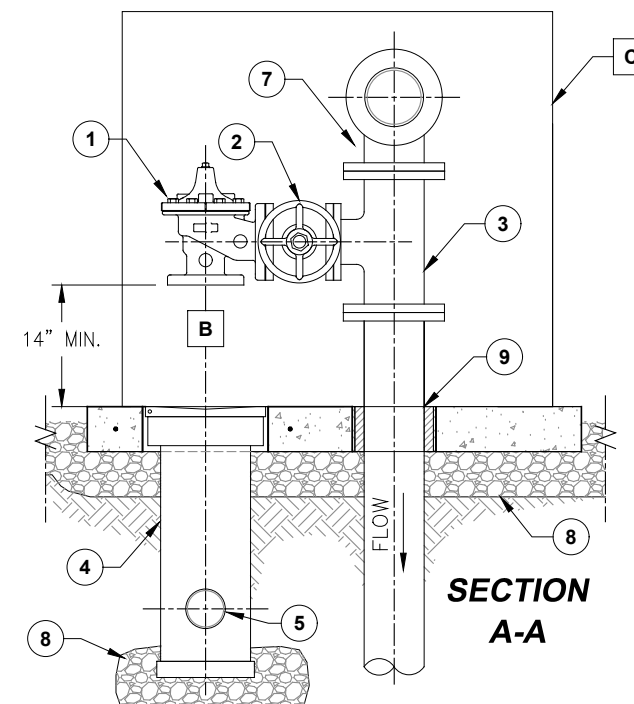
DRAIN PLAN



SECTION A-A

P. REDUCING VALVE SIZE (IN.)	P. RELIEF VALVE SIZE (IN.)
6	2
8	3
12	4

PRESSURE RELIEF VALVE SIZING TABLE



SECTION A-A

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

PRESSURE RELIEF VALVE ASSEMBLY

DRAWING NO.
S212

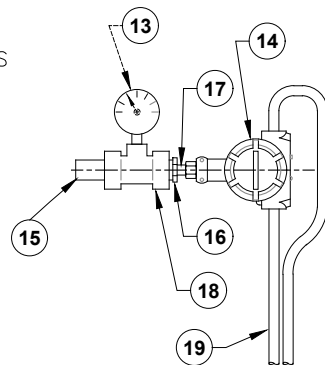


APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

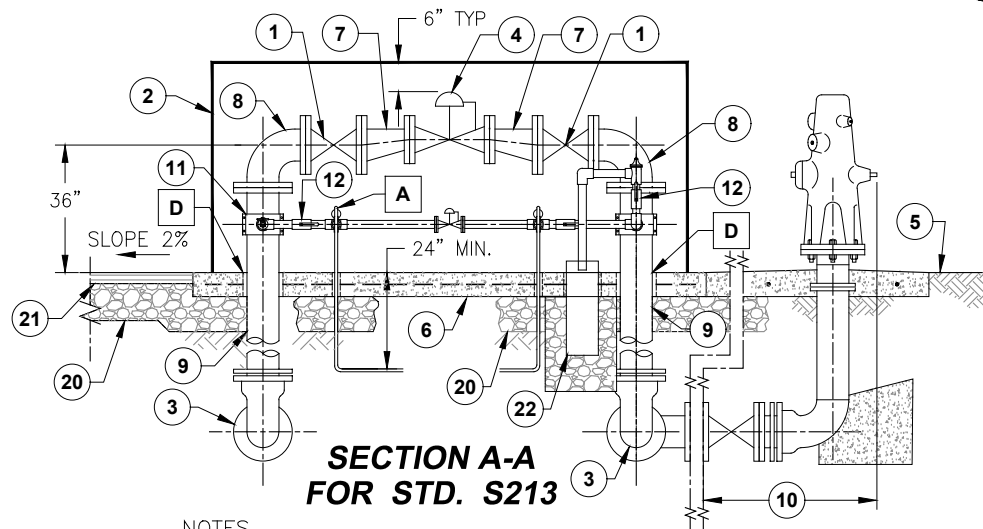
REVISION DATE
01-31-17

REVISION DATE
09-09-15

ITEM	DESCRIPTION
1	LEVER-OPERATED FLG ISOLATION VALVE W/LOCKING HANDLE
2	PLACER WATER WORKS BE6D-SOLID 66"W X 96"L X 60"H OR EQUAL IN DESERT SAND COLOR, SIZED FOR VALVE CONFIGURATION
3	MJ ELBOW
4	FLG METERING PRESSURE REDUCING VALVE
5	FINISHED GRADE
6	6" CONC. SLAB W/4x4-W1.4xW1.4 WELDED WIRE MESH AT MID DEPTH
7	FLG ECC. REDUCER, STRAIGHT SIDE UP
8	FLG 90° ELBOW
9	FLGxPE DIP SPOOL
10	FIRE HYDRANT ASSEMBLY, SEE S210
11	2" BRONZE SADDLE, 2 EA., 6" MIN. OFFSET FROM FLG
12	2" NPT BRASS BALL VALVE, 3 EA.
13	1/2" NPT PRESSURE GAUGE
14	GAUGE PRESSURE TRANSMITTER W/L.C.D. READOUT (L.E.D. IN COLD CLIMATE AREA), 1/2" NPT CONNECTIONS
15	1" NPT BRASS CLOSE NIPPLE
16	1"x1/2" NPT BRASS BUSHING
17	1/2" NPT BRASS CLOSE NIPPLE
18	1"x1/2" NPT BRASS TEE
19	1/2" PVC-COATED STEEL CONDUITS
20	6" CLASS 2 AGG. BASE
21	2" ASPHALT CONCRETE
22	6"Ø X 24"L DIP WITH 18" X 24"D ROCK DRAINAGE WELL



**PRESSURE GAUGING
ASSEMBLY**



NOTES

- A** PRESSURE GAUGING ASSEMBLY, SEE S213 (PLAN VIEW)
- B** RESTRAIN ALL JOINTS, BY FLANGE OR NPT ABOVE-GROUND CONNECTIONS.
- C** ALL BOLTS AND NUTS SHALL BE STAINLESS STEEL.
- D** STEEL PIPE SLEEVE WITH SEALANT AND PIPE JOINT PACKING PER S405.
- E** CONCRETE SLAB TO EXTEND 4" BEYOND ENCLOSURE ON ALL SIDES. A.C. SHALL MATCH FINISHED GRADE OF CONC. SLAB.
- F** ENCLOSURE TO BE CONTINUOUSLY SEALED ON THE INSIDE WHERE IT MEETS THE CONC. SLAB WITH 25-YEAR SILICONE SEALANT EXCEPT AT DOOR LOCATIONS.
- G** ENCLOSURE SHALL BE ANCHORED TO CONC. SLAB USING MFG. SUPPLIED HARDWARE AND FOLLOWING MFG. INSTRUCTIONS.
- H** IF SITE REQUIRES A BUILDING OVER VALVE STRUCTURES, BUILDING SHALL BE DESIGNED PER SITE AND SHALL INCLUDE A 36" WIDE DOOR AND A GLASS BLOCK WINDOW OR SKYLIGHT.
- I** SEE S213 FOR PRESSURE REDUCING STATION PLAN VIEW

SPECIAL NOTE:

THIS DRAWING S214 AND S213 ARE INTENDED TO ILLUSTRATE THE REQUIRED COMPONENTS. THE ACTUAL PRESSURE REDUCING STATION SHALL BE DESIGNED AND STAMPED BY A LICENSED ENGINEER IN THE STATE OF CALIFORNIA. ENGINEER SHALL EVALUATE THE LAYOUT FOR SPECIFIC PROJECT SITE AND CONDITIONS.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

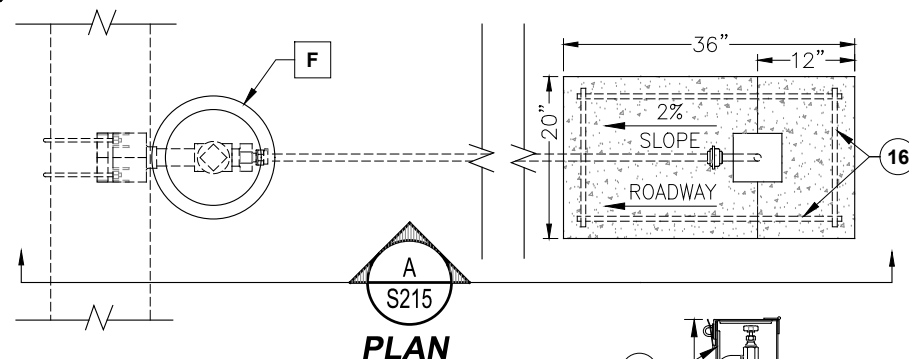
**PRESSURE REDUCING STATION
SECTION A-A**

DRAWING NO.
S214



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

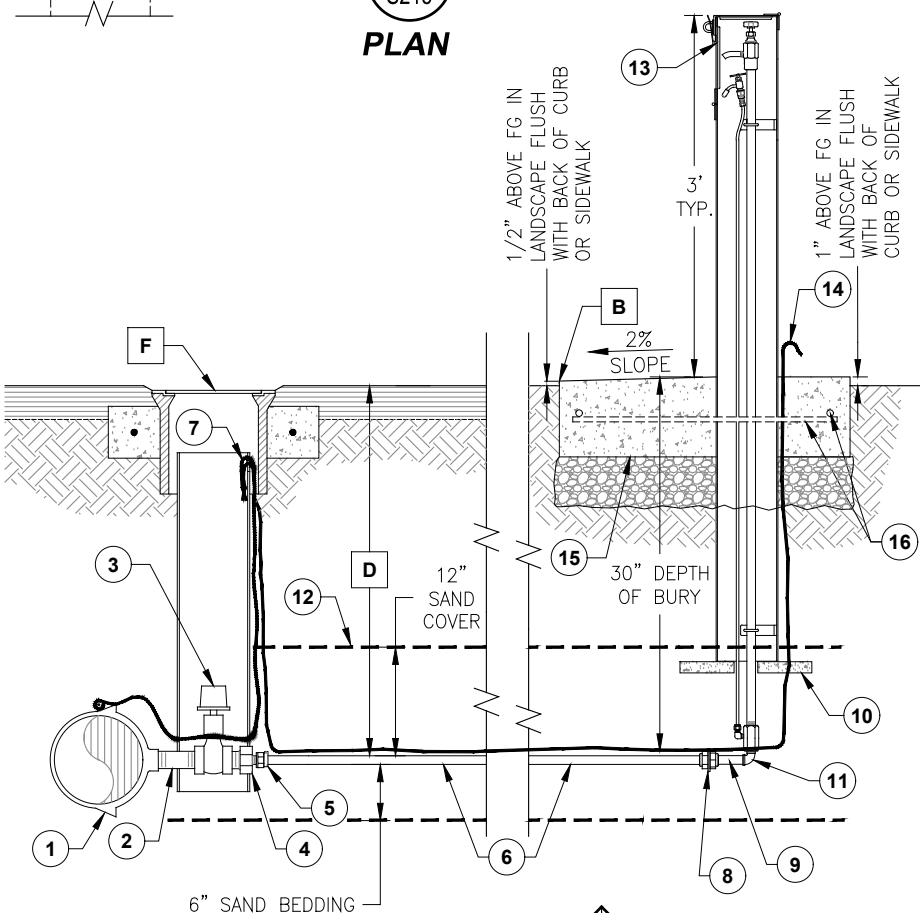
REVISION DATE
09-09-15



ITEM	DESCRIPTION
1	2" BRONZE SADDLE
2	2"x6" NPT BRASS NIPPLE
3	2" NPT GATE VALVE W/2" SQ. OPERATING NUT
4	2"x1" NPT REDUCER
5	1" MIPxCOMP COUPLING
6	1" TYPE "K" COPPER OR BRASS
7	LOCATING WIRE, MIN. 6" FOLDED OVER VALVE RISER
8	1"x 3/4" STAINLESS STEEL TO BRASS DIELECTRIC UNION
9	3/4" STAINLESS STEEL NIPPLE
10	6"x6"x2"THICK CONCRETE BRICK (2 EA.)
11	3/4" 90° STAINLESS STEEL STREET ELL FITTING
12	12" WIDE WARNING TAPE
13	MAINGUARD #66 SAMPLE STATION ALL STAINLESS STEEL PLUMBING WITH LOCKABLE ALUMINUM ENCLOSURE AND 30" DEPTH OF BURY (48" DEPTH OF BURY FOR COLD CLIMATE)
14	LEAVE 4" OF LOCATING WIRE ABOVE GRADE AND BEHIND STATION
15	8"THICK CONCRETE SLAB OVER 4" CRUSHED ROCK
16	2 EA. #4 BARS BOTH WAYS AS SHOWN

NOTES:

- A** 6" FROM BACK OF WALK OR 6" FROM BACK OF CURB WHERE SIDEWALK IS NOT PROPOSED.
- B** INSTALL FRONT EDGE OF SAMPLE STATION LEVEL, FLUSH WITH BACK OF CURB OR WALK. WHERE GRADE SLOPES EXCEED 10%, PROVIDE WALL PER S205.
- C** MAINGURAD #66 SAMPLE STATION FROM KUPFERLE FOUNDRY CO. MFG. OR APPROVED EQUAL.
- D** 30" MIN. COVER EXCEPT 24" MIN. COVER AT FLOW LINE OF GUTTER OR EP WITHOUT GUTTER. 48" OF COVER REQUIRED FOR COLD CLIMATE INSTALLATIONS.
- E** 3/4" RADIUS CONCRETE EDGES TYPICAL.
- F** G5 BOX AND WELL INSTALLATION, SEE S106
- G** ALL SAMPLE STATIONS SHALL BE SET OUTSIDE OF PEDESTRIAN OR VEHICLE AREAS.
A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.



SAMPLE STATION SECTION



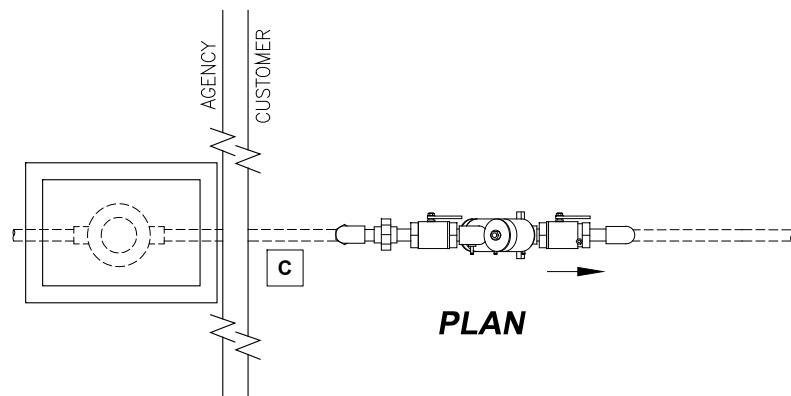
WATER QUALITY SAMPLE STATION

DRAWING NO.
S215

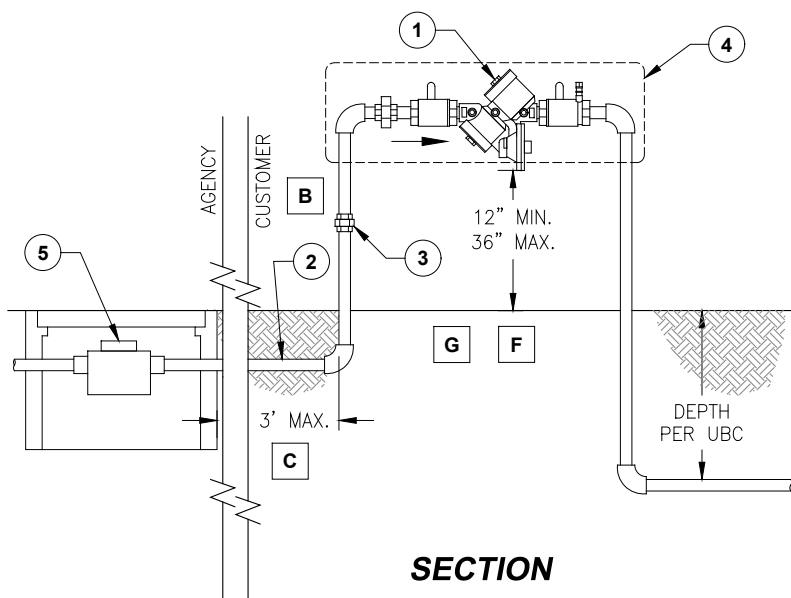


APPROVED: *R. Brent Smith* **D**
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
09-09-15



PLAN



SECTION

ITEM	DESCRIPTION
1	RP BACKFLOW PREVENTION ASSEMBLY INSTALLED PER MANUFACTURER RECOMMENDATIONS
2	TYPE "M" NPT COPPER, BRASS OR BRONZE FROM METER
3	BRASS OR BRONZE UNION SIZED PER INLET PIPING
4	ALL RP BACKFLOW PREVENTION DEVICES SHALL BE PROTECTED BY A LOCKABLE INSULATED BAG MINIMUM TO PROTECT VALVE ASSEMBLY. INSULATED BAG SHALL MAINTAIN VALVE AND APPURTENANCES AT 45°F MIN.
5	RESIDENTIAL METER

NOTES:

- A** ALL PIPE AND APPURTENANCES DOWNSTREAM OF METER BOX BELONG TO CUSTOMER.
- B** NO CONNECTIONS WILL BE ALLOWED BETWEEN THE METER AND THE RP BACKFLOW PREVENTION DEVICE.
- C** CONNECT TO SERVICE TAIL FROM METER.
- D** FOR MULTIPLE RP BACKFLOW DEVICES, MAINTAIN A MINIMUM SEPARATION OF 4 FT.
- E** FOR ADDITIONAL REQUIREMENTS, SEE "PCWA STANDARDS" VOL. 1-DISTRIBUTION AND CONVEYANCE, DIV. 2-IMPROVEMENT STANDARDS, SECT. 3-CROSS CONNECTION CONTROL, RP BACKFLOW PREVENTION DEVICES.
- F** PVC DRAIN REQUIRED WHEN RESIDENTIAL VALVES ARE INSIDE BUILDING OR STRUCTURE. FOR SIZE OF DRAIN SEE TABLE ON S206. RUN DRAINS TO STORM DRAIN SYSTEM OR DAYLIGHT TO DRAINAGE DITCH, SLOPE TO DRAIN.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

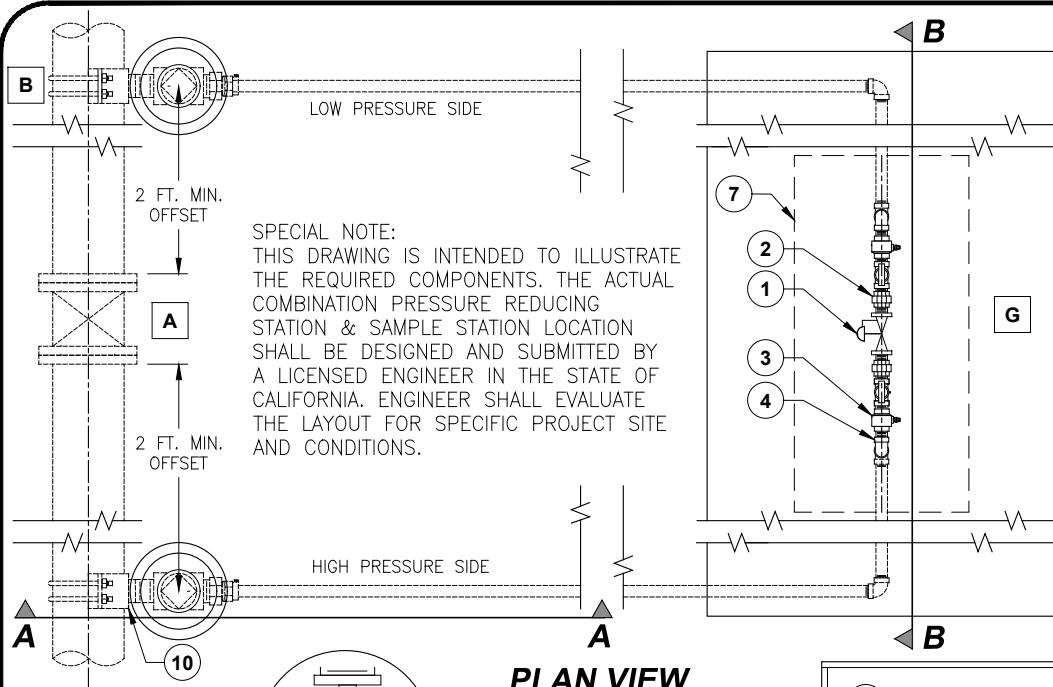
2-1/2" AND SMALLER "RESIDENTIAL" RP BACKFLOW PREVENTION DEVICE

DRAWING NO.
S216



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
09-09-15

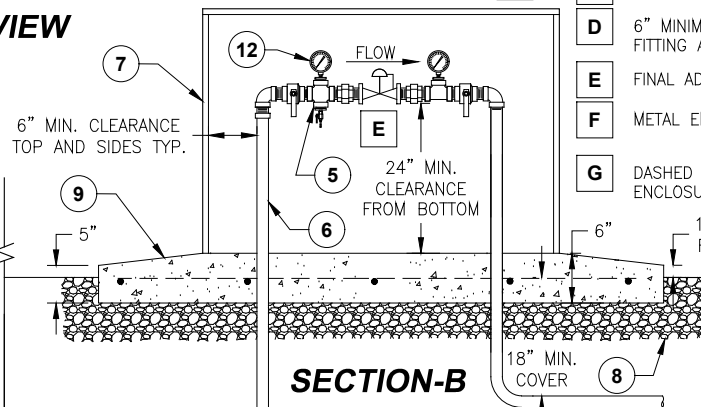
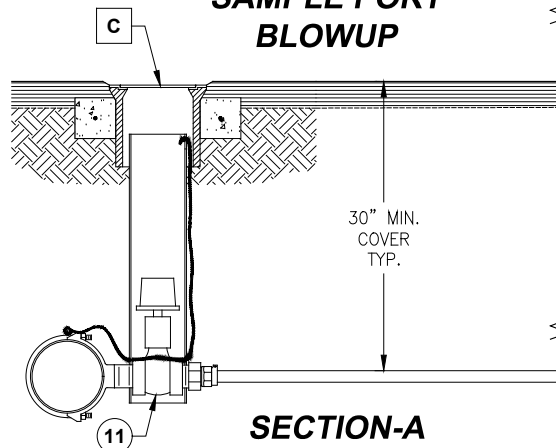
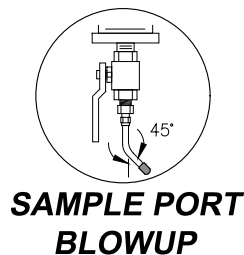


SPECIAL NOTE:
THIS DRAWING IS INTENDED TO ILLUSTRATE THE REQUIRED COMPONENTS. THE ACTUAL COMBINATION PRESSURE REDUCING STATION & SAMPLE STATION LOCATION SHALL BE DESIGNED AND SUBMITTED BY A LICENSED ENGINEER IN THE STATE OF CALIFORNIA. ENGINEER SHALL EVALUATE THE LAYOUT FOR SPECIFIC PROJECT SITE AND CONDITIONS.

ITEM	DESCRIPTION
1	1" NPT BRONZE RATE OF FLOW & PRESSURE SUSTAINING VALVE CLA-VAL #40-25.
2	2 EA. X 1" NPT BRASS UNION
3	2 EA. X 1" NPT BRASS BALL VALVE
4	1" BRASS NPT 90° FITTINGS
5	1" BRASS CROSS, 1" BRASS TEE, 1" X 1/2" REDUCER, 1/2" SS NIPPLE, 1/2" Ø SS BALL VALVE, 1/2" NPT X 3/8" COMP FITTING, 3/8" Ø X 4" SS TUBING BENT 45° FROM VERTICAL (SEE SAMPLE PORT BLOWUP BELOW) AND 3/8" Ø GRAB TAB CAP. LOCATION OF SAMPLE PORT INSTALLATION SHALL BE THE UPSTREAM HIGH PRESSURE SIDE.
6	1" Ø NPT BRASS PIPE TYPICAL FOR ABOVE GROUND
7	METAL ENCLOSURE BY PLACER WATERWORKS, SUBMIT FOR APPROVAL OR AN APPROVED EQUAL.
8	6" THICK MIN. 3/4" MINUS CRUSHED ROCK EXTENDING 6" ON ALL SIDES
9	6" CONCRETE PAD W/ #4 REBAR 12" O.C. EW AND BROOM FINISH.
10	2 EA. X 2" BRONZE SERVICE SADDLE, HOT TAPPED. SCHEDULE 10 DAYS IN ADVANCE WITH CUSTOMER SERVICE AND PCWA REPRESENTATIVE.
11	2" NPT GATE VALVE W/ 2" SQ. OPERATING NUT, 2"x1" REDUCER, 1" COMP FITTING
12	2 EA. X 2.5" ASHCROFT DURALIFE GAUGES, 200 PSI, ASME GRADE 1A OR APPROVED EQUAL

NOTES:

- A** PRESSURE ZONE VALVE(S) NORMALLY CLOSED.
- B** IN SERVICE SADDLE INSTALLATION SHALL BE HOT-TAPPED ONLY.
- C** VALVE BOX AND WELL INSTALLATION SEE S106.
- D** 6" MINIMUM RADIUS FOR 1" TYPE "K" COPPER, NO FITTINGS BETWEEN 1" COMP FITTING AND EDGE OF ROAD OR PAVEMENT.
- E** FINAL ADJUSTMENTS FOR PRESSURE/FLOW CONTROL PER PCWA.
- F** METAL ENCLOSURE ANCHORED TO CONCRETE PAD W/ PAD-LOCKABLE LOCK.
- G** DASHED LINES REPRESENT OUTLINES OF THE PROPOSED CONCRETE PAD AND ENCLOSURE.



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

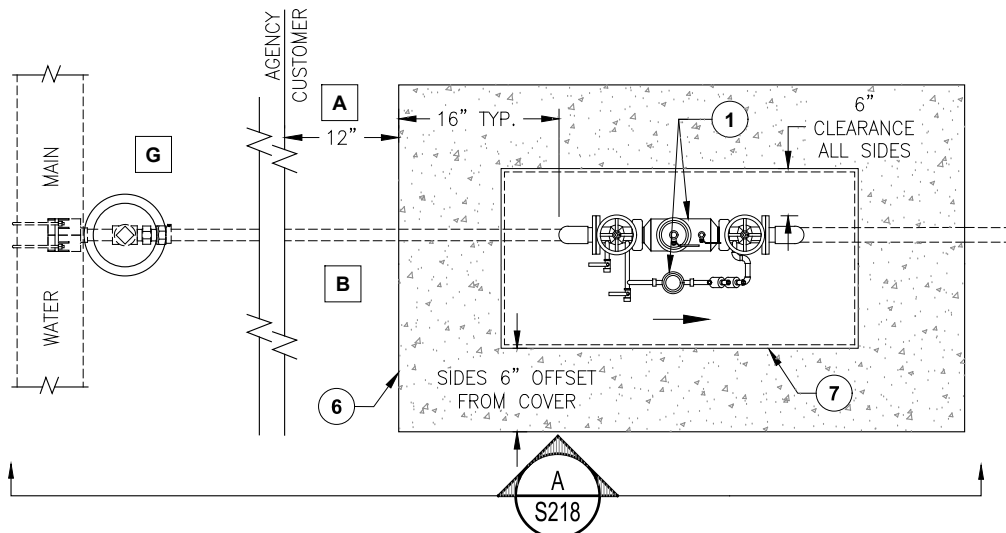
1" PRS BYPASS WITH SAMPLE PORT

DRAWING NO.
S217



APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-01-17



PLAN VIEW

- | ITEM | DESCRIPTION |
|------|---|
| 1 | CA. APPROVED 2-1/2" REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA) FIRE SERVICE ASSEMBLY SHALL INCLUDE OS&Y GATE VALVES AND A 5/8" LOW FLOW BYPASS SYSTEM AND SHALL INCLUDE A BADGER METER (CFM WITH "O" DESIGNATION). INSTALL PER MANUFACTURER RECOMMENDATIONS. |
| 2 | SERVICE PIPING 2" BRASS, BRONZE OR TYPE "K" COPPER. |
| 3 | 1 EA. 2-1/2" x 2" BRASS 90° REDUCING ELBOW. |
| 4 | 10 GA. TRACING WIRE PER PCWA STANDARDS. |
| 5 | 6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES. |
| 6 | 6" CONC. PAD W/#4 REBAR 12" OC EACH WAY WITH A BROOM FINISH. |
| 7 | HEATED METAL ABOVE GROUND ENCLOSURE RECOMMENDED IN AREAS SUBJECT TO FREEZING OR AS NECESSARY TO PROTECT VALVE ASSEMBLY. ALL RPDA FIRE SERVICE DEVICES SHALL BE PROTECTED BY A LOCKING INSULATING BAG OR LOCKABLE ENCLOSURE. ENCLOSURE SHALL MAINTAIN VALVE AND APPURTENANCES AT 45°F MIN. |

NOTES:

- | | |
|---|--|
| A | RPDA PAD SHALL BE LOCATED 12" FROM BACK OF SIDEWALK. IF SIDEWALK DOES NOT EXIST, PAD LOCATION SHALL BE APPROVED BY PCWA ENGINEER. |
| B | NO ADDITIONAL CONNECTIONS WILL BE ALLOWED UPSTREAM OF THE RPDA. |
| C | CONNECT TO 2"Ø SERVICE TAIL FROM WATER MAIN. |
| D | FOR ADDITIONAL REQUIREMENTS, SEE "PCWA STANDARDS" VOLUME 1, DISTRIBUTION AND CONVEYANCE, DIV. 2-IMPROVEMENT STANDARDS, SECT. 3-CROSS CONNECTION CONTROL, RP BACKFLOW PREVENTION DEVICES. |
| E | ALL PIPING AND FITTINGS BETWEEN ITEM 3 THROUGH RPDA SHALL BE BRASS. |
| F | 30 INCHES OF COVER MINIMUM. |
| G | FOR 2" SERVICE DETAIL, SEE PCWA STANDARD DRAWING S202. |
| H | THE INSTALLATION OF THE RPDA IS FOR FIRE SERVICE ONLY AND WILL REQUIRE A SEPARATE DOMESTIC METER. |

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

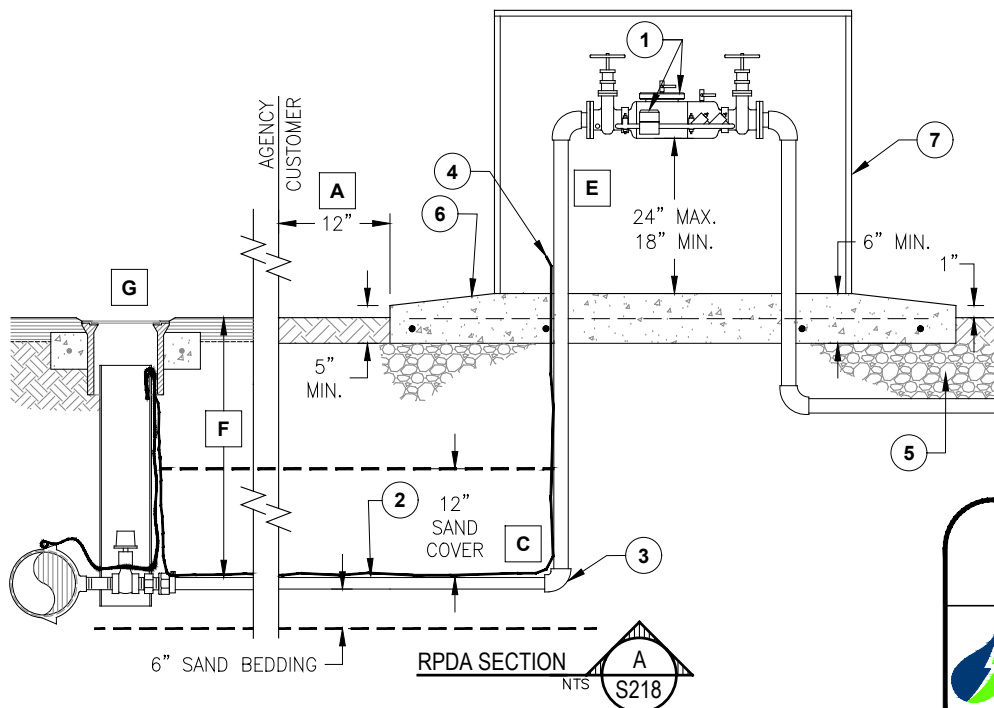
**2" RESIDENTIAL FIRE SERVICE
WITH 2-1/2" APPROVED RPDA**

DRAWING NO.
S218



APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

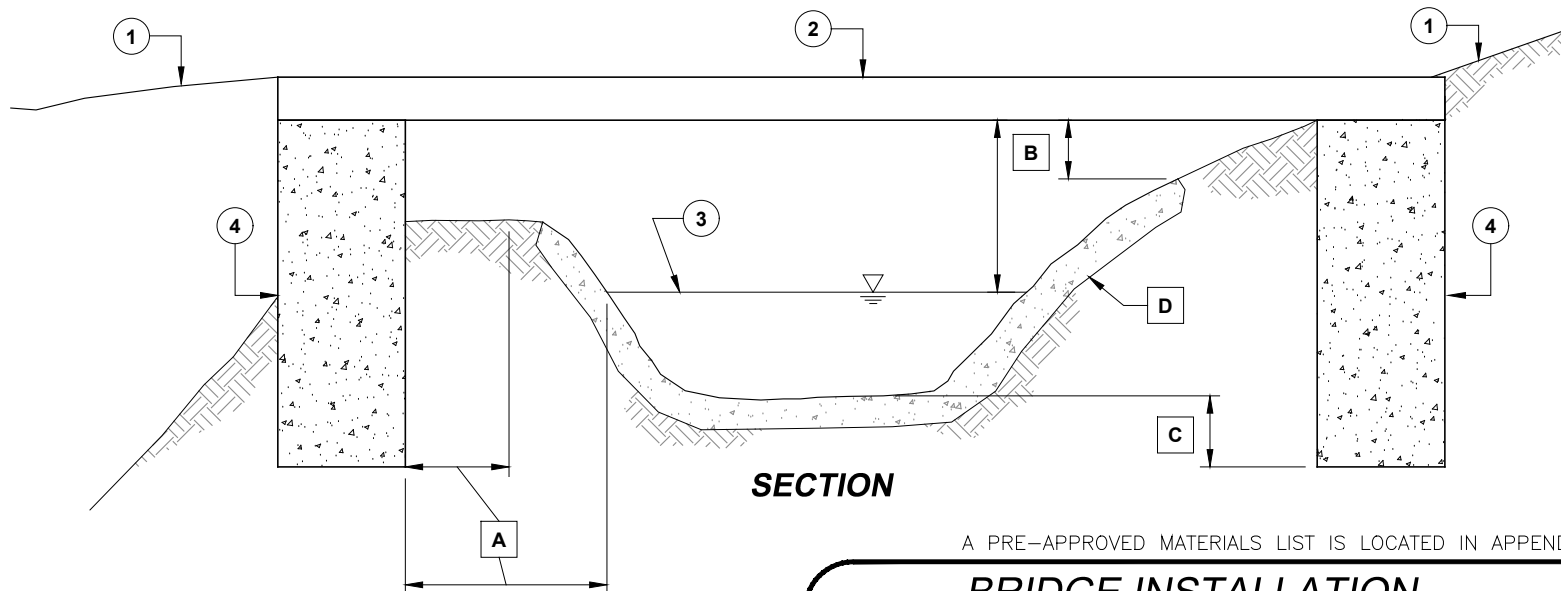
REVISION DATE
01-01-17



ITEM	DESCRIPTION
①	APPROACH RAMP BY PERMITTEE. ROADSIDE DRAINAGE SHALL BE CARRIED ACROSS CANAL IN A SAFE MANNER AND DISPOSED OF SAFELY.
②	BRIDGE BY PERMITTEE
③	HIGH WATER LEVEL AS DETERMINED BY PCWA
④	CONCRETE FOOTINGS BY PERMITTEE

NOTES:

- A** TWO FEET MIN. FROM TOP OF BANK, OR 3 FEET MIN. FROM EDGE OF WATER AT HIGH WATER LEVEL, WHICHEVER IS GREATER.
- B** BRIDGE SHALL HAVE A CLEAR DISTANCE OF 2 FEET MINIMUM ABOVE HIGH WATER LEVEL OR 1 FOOT MIN. ABOVE TOP OF BANK, WHICHEVER IS GREATER.
- C** FOOTING SHALL EXTEND 1 FOOT MIN. BELOW CANAL INVERT.
- D** THE CANAL SHALL BE RECONSTRUCTED TO THE AGENCY'S CURRENT STANDARD FOR THE PARTICULAR CANAL AFTER INSTALLATION OF THE FOOTINGS AND BEFORE PLACEMENT OF THE BRIDGE. THIS RECONSTRUCTION WORK WILL BE PERFORMED BY THE AGENCY AT THE PERMITTEE'S EXPENSE.
- E** SPECIFICATION REFERENCE DIV. 2, SECT. 2, PAR 1, ROAD & OTHER CROSSINGS
- F** BRIDGE LOAD RATING SHALL BE DESIGNED TO MEET REQUIREMENTS OF THE CALIFORNIA FIRE CODE (LATEST ADDITION). PROOF OF APPROVAL BY ACTING FIRE DISTRICT SHALL BE SUBMITTED TO THE AGENCY.



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

BRIDGE INSTALLATION OVER CANAL

DRAWING NO.
S301



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

ITEM	DESCRIPTION
1	RESTRAINED DUCTILE IRON PIPE. SIZE CASING PER TABLE.

- ② CARRIER PIPE
③ HIGH WATER LEVEL AS DETERMINED BY PCWA

- A** SEAL BOTH ENDS OF CASING PIPE PER S404.
- B** THE CANAL CROSS SECTION MUST BE RECONSTRUCTED TO ITS ORIGINAL SHAPE AFTER THE CROSSING IS INSTALLED. BACKFILL MATERIAL MUST BE SIMILAR TO THE EXCAVATED MATERIAL AND BE COMPACTED TO 95% MINIMUM RELATIVE DENSITY. THE CANAL SHALL BE GUNITE LINED 20' ON EITHER SIDE OF THE PIPELINE. GUNITE SHALL EXTEND TO THE TOP OF THE BERM.
- C** THE AGENCY MAY REQUIRE THE CASING PIPE TO EXTEND BEYOND THE PRESENT CANAL CROSS SECTION IF IT IS ANTICIPATED THAT THE CANAL WILL BE ENLARGED.
- D** CARRIER PIPE ANGLE NOT REQUIRED WHERE TERRAIN ADJACENT TO CANAL IS FLAT.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

WATERLINE CROSSING UNDER CANAL



APPROVED: 
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

ITEM

DESCRIPTION

- ① RESTRAINED DUCTILE IRON PIPE. SIZE CASING PER TABLE.

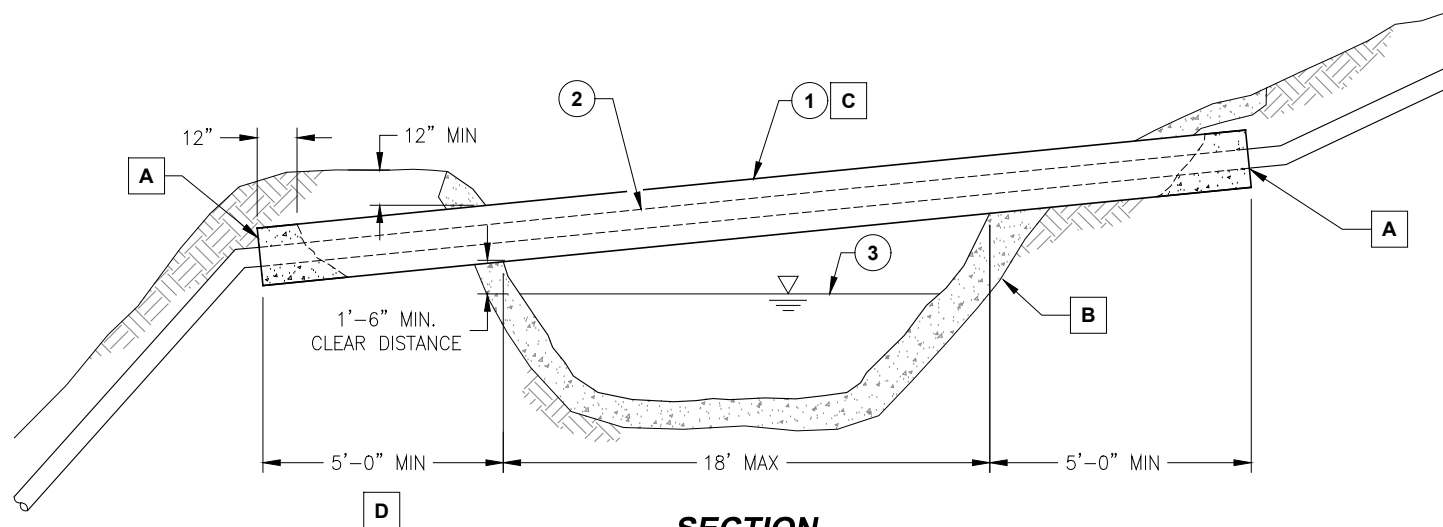
MIN. CASING SIZES	
NOM. CARRIER SIZE	MIN. NOM. CASING SIZE
≤4"	6"
6"	8"
8"	10"
12"	14"
>12"	SPECIAL DESIGN

- ② CARRIER PIPE

- ③ HIGH WATER LEVEL AS DETERMINED BY PCWA

NOTES:

- A** SEAL BOTH ENDS OF CASING PIPE PER S404.
- B** THE CANAL CROSS SECTION MUST BE RECONSTRUCTED TO ITS ORIGINAL SHAPE AFTER THE CROSSING IS INSTALLED. BACKFILL MATERIAL MUST BE SIMILAR TO THE EXCAVATED MATERIAL AND BE COMPACTED TO 95% MINIMUM RELATIVE DENSITY. THE CANAL SHALL BE GUNITE LINED 20' ON EITHER SIDE OF THE PIPELINE. GUNITE SHALL EXTEND TO THE TOP OF THE BERM.
- C** THE AGENCY MAY REQUIRE THE CASING PIPE TO EXTEND BEYOND THE PRESENT CANAL CROSS SECTION IF IT IS ANTICIPATED THAT THE CANAL WILL BE ENLARGED.
- D** MUST BE LONGER THAN EQUIPMENT TRAVEL WAY ON BERM.



SECTION

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

WATERLINE CROSSING OVER CANAL

DRAWING NO.

S303



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE

01-31-17

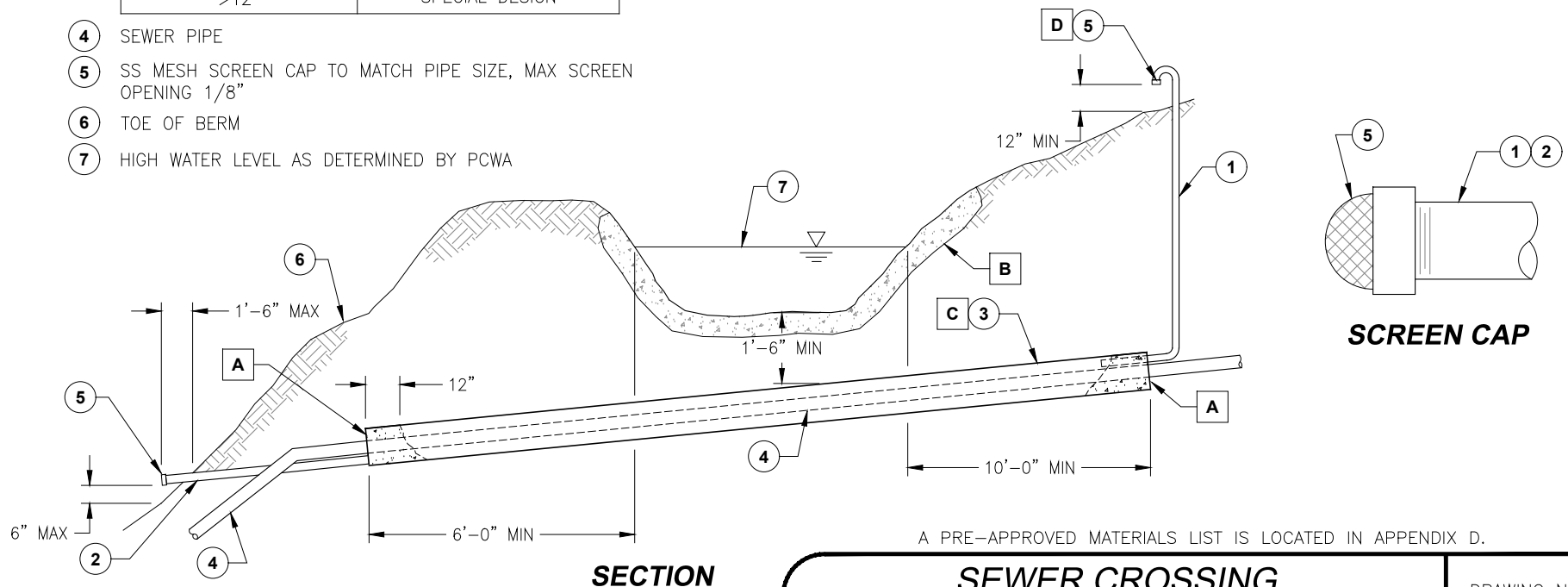
ITEM	DESCRIPTION
①	1" GALVANIZED STEEL VENT PIPE W/180° RETURN ELBOW AND SCREENED CAP
②	1-1/2" GALVANIZED STEEL OR SCH 80 PVC DRAIN PIPE AND SCREEN CAP
③	RESTRAINED DUCTILE IRON PIPE. SIZE CASING PER TABLE

MIN. CASING SIZES	
NOM. CARRIER SIZE	MIN. NOM. CASING SIZE
≤4"	6"
6"	8"
8"	10"
12"	14"
>12"	SPECIAL DESIGN

- 4 SEWER PIPE
- 5 SS MESH SCREEN CAP TO MATCH PIPE SIZE, MAX SCREEN OPENING 1/8"
- 6 TOE OF BERM
- 7 HIGH WATER LEVEL AS DETERMINED BY PCWA

NOTES:

- A** SEAL BOTH ENDS OF CASING PIPE PER S404.
- B** THE CANAL CROSS SECTION MUST BE RECONSTRUCTED TO ITS ORIGINAL SHAPE AFTER THE CROSSING IS INSTALLED. BACKFILL MATERIAL MUST BE SIMILAR TO THE EXCAVATED MATERIAL AND BE COMPACTED TO 95% MAXIMUM DRY DENSITY. THE CANAL SHALL BE GUNITE LINED 20' ON EITHER SIDE OF THE PIPELINE. GUNITE SHALL EXTEND TO THE TOP OF THE BERM. GUNITE PER DIV. 3, SEC. 9.
- C** THE AGENCY MAY REQUIRE THE CASING PIPE TO EXTEND BEYOND THE PRESENT CANAL CROSS SECTION IF IT IS ANTICIPATED THAT THE CANAL WILL BE ENLARGED.
- D** ADD CARSONITE MARKER POST 4 FT. ABOVE GRADE, LABEL SEWER CROSSINGS.



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

SEWER CROSSING UNDER CANAL

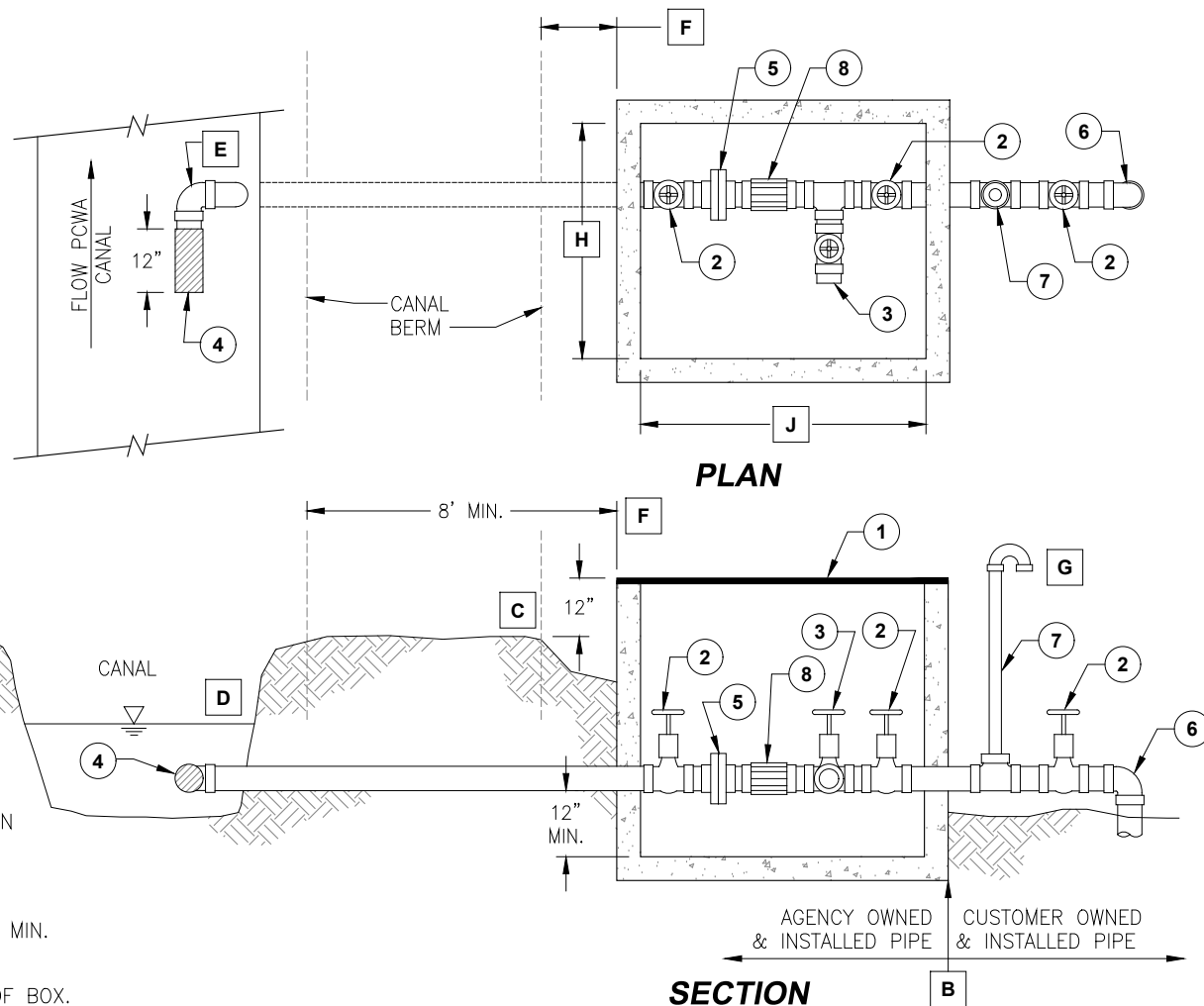
DRAWING NO.
S304



APPROVED: 
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

ITEM	DESCRIPTION
1	GALV. STEEL CHECKER PLATE OR GRATING TANK LID SHALL BE CAPABLE OF SUPPORTING A POINT LOAD OF 200 LBS. (MIN.)
2	OUTLET SHUT OFF VALVE, MATCH SIZE OF TANK OUTLET PIPE.
3	FLUSHING OUTLET, MATCH SIZE OF TANK OUTLET PIPE
4	THD RAW WATER SCREEN SIZED FOR 1/2" LOSS AT MAX. FLOW, MAX. SCREEN OPENING OF 1/2".
5	FLANGE FITTING FOR ORIFICE PLATE.
6	OUTLET
7	VENT, MATCH INLET PIPE OR 2" DIAMETER MAXIMUM.
8	COMPRESSION COUPLING



NOTES:

- A** STABILITY OF BERM MUST NOT BE ENDANGERED DUE TO BOX OR INLET PIPE INSTALLATION.
- B** BOX AND LID TO BE INSTALLED BY CUSTOMER. MATERIAL FOR CONSTRUCTION OF TANK MAY BE CHOSEN BY CUSTOMER. TANK SHALL BE WATER TIGHT AND MUST SUPPORT A 200 LB. LOAD.
- C** TOP OF TANK SHALL BE 12" ABOVE TOP OF CANAL BANK, OR AS DETERMINED BY AGENCY REPRESENTATIVE.
- D** WATER SURFACE ELEVATION IS DEPENDENT ON INSTALLATION LOCATION.
- E** INSTALL 90° EL TO ALLOW SCREEN TO BE ROTATED 90°.
- F** SET BOX 2' MIN. FROM OUTSIDE EDGE OF BERM AND 8' MIN. FROM INSIDE EDGE OF BERM, WHICHEVER IS GREATER.
- G** VENT OUTLET TO BE FLUSH WITH OR HIGHER THAN TOP OF BOX.
- H** 36" OR 8X INLET PIPE DIAMETER, WHICHEVER IS GREATER, MINIMUM.
- J** 48" OR 10X INLET PIPE DIAMETER, WHICHEVER IS GREATER, MINIMUM.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

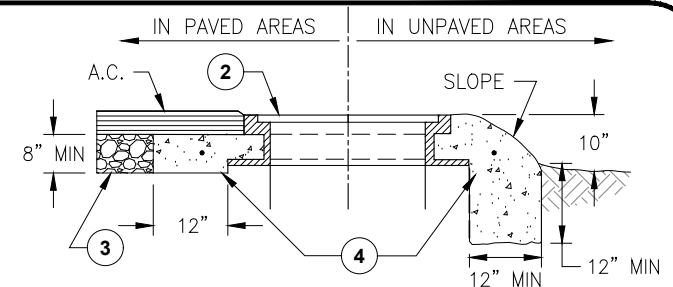
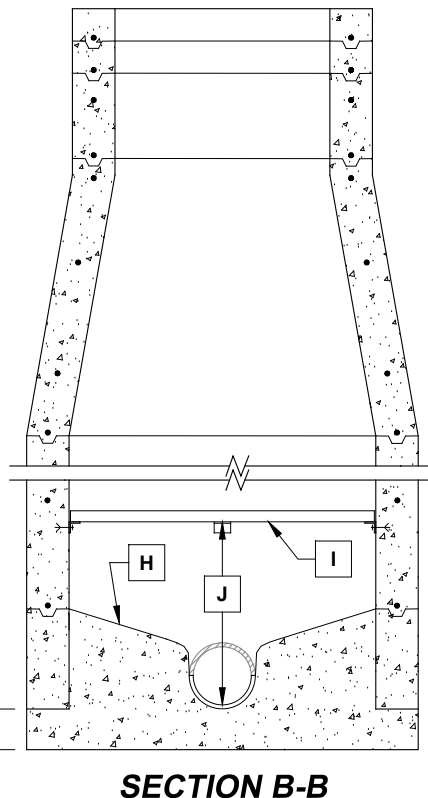
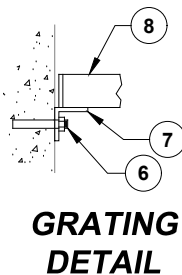
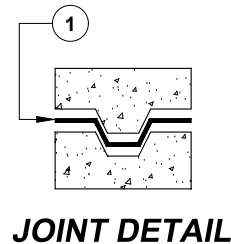
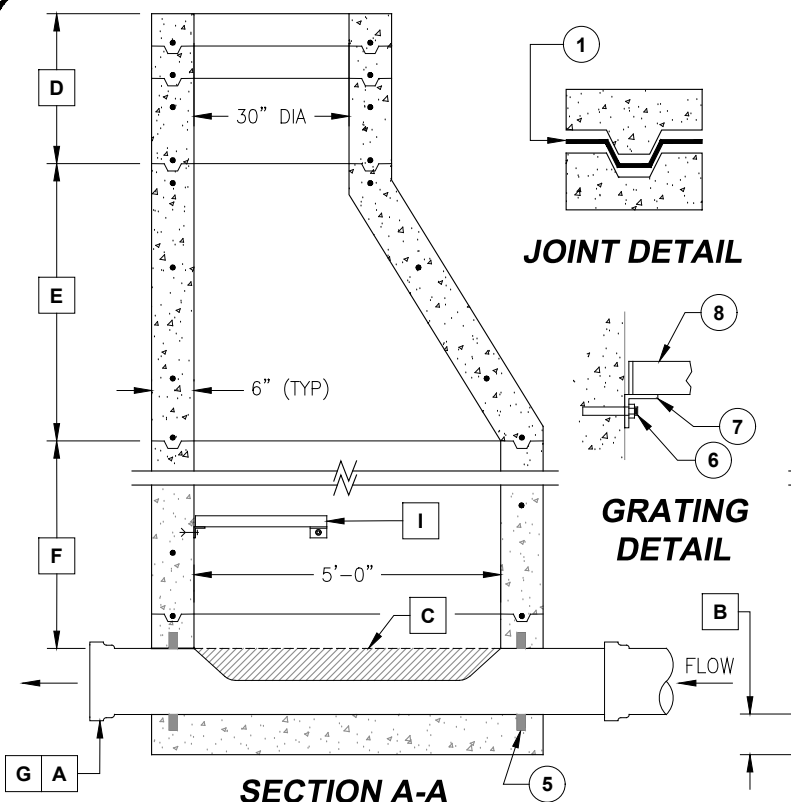
CUSTOMER IRRIGATION WATER - HARD PIPED SERVICE

DRAWING NO.
S306

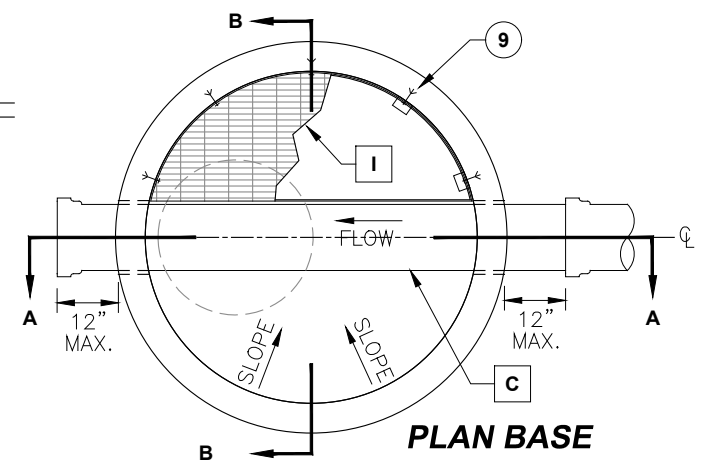


APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



**STANDARD MANHOLE
FRAME & COVER**



ITEM	DESCRIPTION
1	ASPHALT RUBBER STRIP OR EQUAL AT OUTSIDE HALF OF JOINTS, GROUT SEAL INSIDE HALF OF JOINTS.
2	MANHOLE LID PER S307 SET 1/2" BELOW FINISHED GRADE IN PAVED AREAS ABOVE EL. 2,000'
3	CLASS 2 AGGREGATE BASE
4	CAST IN PLACE CONCRETE W/ #4 REBAR CONT.
5	WATER STOP
6	1/2" SS ANCHOR BOLT
7	L2x2x1/4x0'-3" GALV. STEEL BRACKET
8	BANDED GALV. STEEL GRATING
9	GRATING BRACKET (TYP. OF 5 MIN.)

NOTES:

A	CAST PIPE W/WATER STOP INTO MANHOLE BASE.
B	8", 12" FOR DEPTHS GREATER THAN 15'.
C	CUT AWAY EXISTING PIPE TO SPRINGLINE.
D	3" TO 12" MAX. GRADE RING.
E	25", 27" OR 36" ECCENTRIC CONE.

F	12" TO 48" RISER SECTION.
G	PIPE TO 36"Ø MAX. W/OUT ENGINEERED DRAWING.
H	SLOPE SHELF 1" IN 12".
I	PROVIDE PLATFORM CAPABLE OF SUPPORTING 300 LBS. WHEN REQUIRED BY THE AGENCY.
J	HEIGHT OF PLATFORM TO BE SPECIFIED BY THE AGENCY

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

**STANDARD OPEN CHANNEL
FLOW MANHOLE**



APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

DRAWING NO.
S307

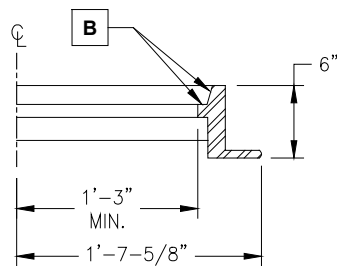
REVISION DATE
01-31-17

ITEM	DESCRIPTION
1	RAISED BLOCK TREAD FOR ASPHALT TRAFFIC AREAS, DIAMOND TREAD FOR WALK OR PEDESTRIAN AREAS
2	1" BOLT TABS (TYP.)
3	CONCEALED SIDE PRY/PICK HOLE 1-1/2" ±1/4"

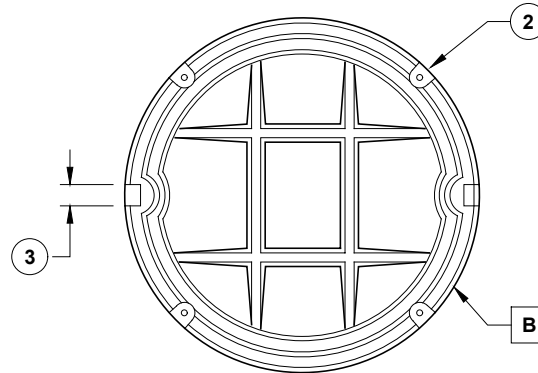
NOTES:

A MIN. 2" LETTERS SHALL BE CAST INTO COVER, WELDED BY FOUNDRY OR GROUND IN PLACE BY MFG.

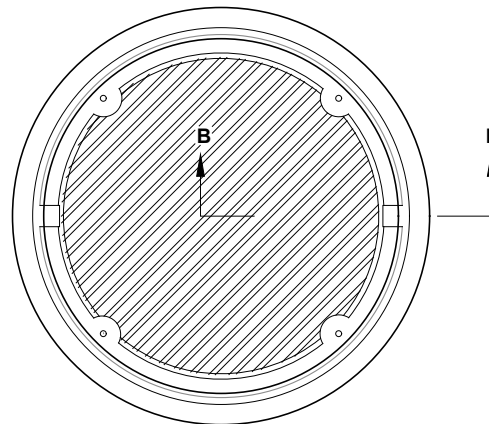
B MACHINED SURFACE



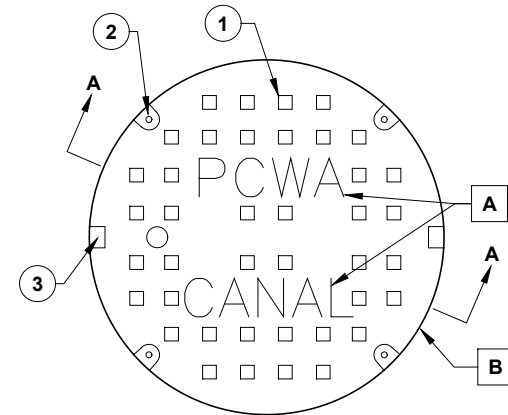
SECTION B-B



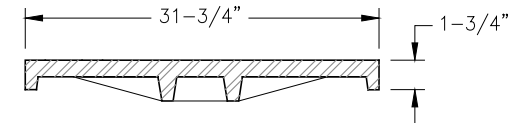
COVER-BOTTOM VIEW



RING PLAN



COVER-TOP VIEW



SECTION A-A

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

MANHOLE FRAME AND COVER

DRAWING NO.
S308



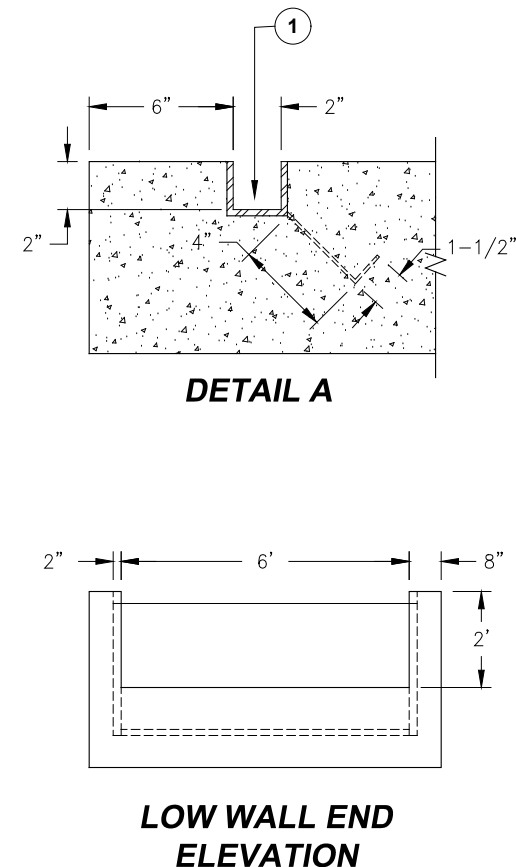
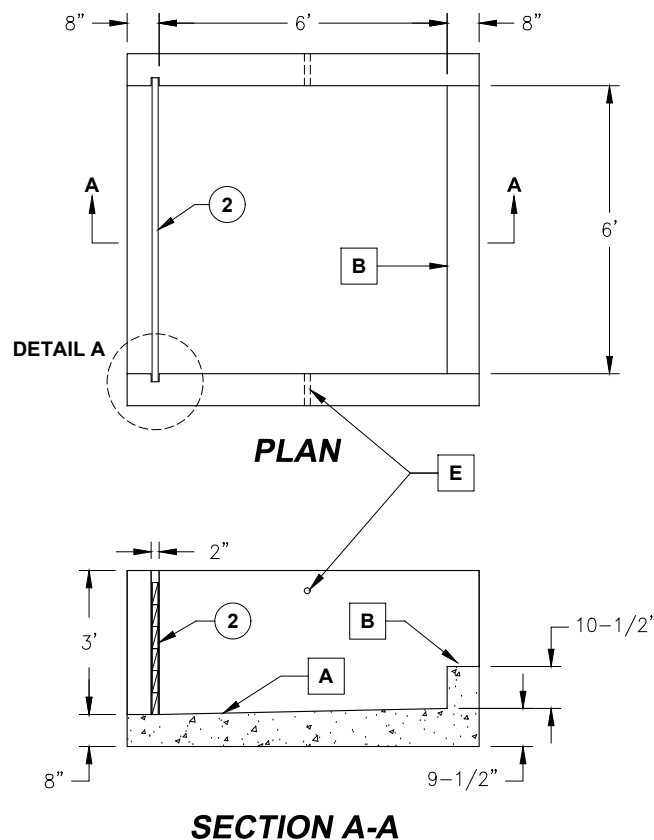
APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

ITEM	DESCRIPTION
①	2" x 2" x 1/8" GALVANIZED STEEL CHANNEL WITH 1-1/2" WIDE STEEL ANCHORS AT 12" CENTERS (MIN.)
②	2" x 6" REDWOOD PLANKS.

NOTES:

- A** SLOPE BOTTOM TOWARD REDWOOD PLANKS, 1/4" PER FT.
- B** ORIENT TRASH BOX SO LOW WALL FACES TRASH RACK AND PLANKED SIDE CAN BE ACCESSED BY SMALL LOADER.
- C** PROVIDE #4 REBAR AT 12" CENTERS EVERYWHERE.
- D** 3/4" CHAMFER SHALL BE USED ON ALL EXPOSED CONCRETE EDGES.
- E** IF PRECAST ADD 1" DIA. X 2 EA. PICK HOLES FOR LIFTING. ONE EACH SIDE 4" BELOW TOP OF BOX.



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

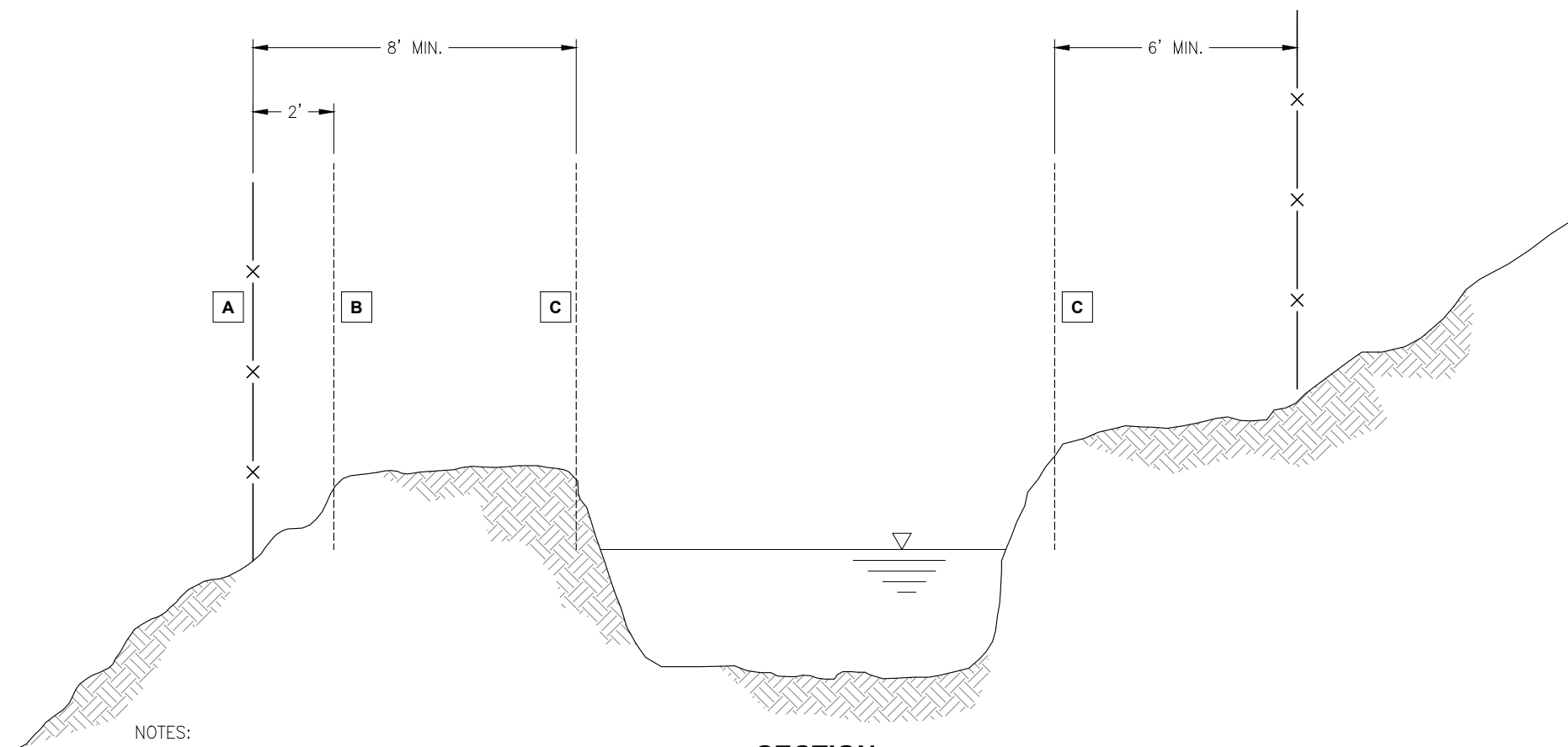
TRASH RACK BOX

DRAWING NO.
S309



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



NOTES:

- A** FENCE SHALL BE A MINIMUM OF 8 FEET FROM THE INSIDE TOP OF BANK OR 2 FEET FROM THE OUTSIDE TOP OF BANK – WHICHEVER PLACES FENCE FURTHEST FROM CANAL.
- B** OUTSIDE TOP OF CANAL BANK.
- C** INSIDE TOP OF CANAL BANK.

SECTION

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

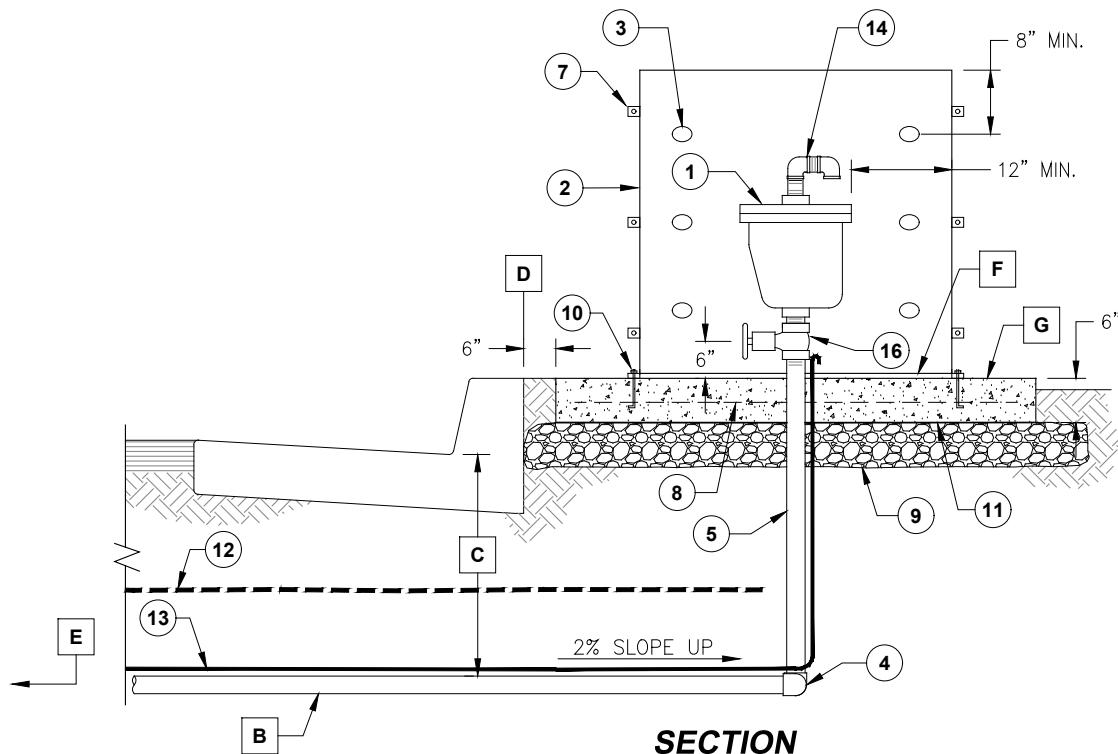
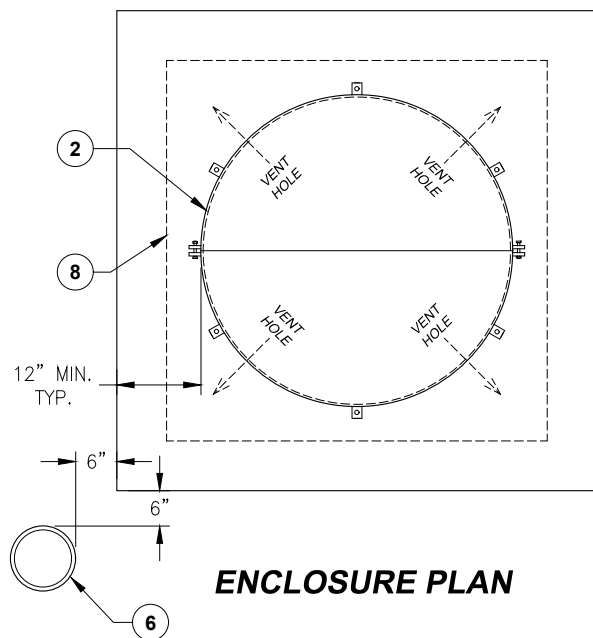
MINIMUM SETBACKS FOR FENCES PARALLEL TO CANALS

DRAWING NO.
S310



APPROVED: *R. Brent Smith* ^(D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



ITEM	DESCRIPTION
1	COMBINATION AVR. SEE TECHNICAL SPECIFICATIONS FOR SIZING.
2	STEEL AIR VENT ENCLOSURE
3	2"Ø VENT HOLES, 3 PER COLUMN, 4 COLUMNS, EQUALLY SPACED BOTH WAYS 90° APART.
4	SWING JOINT (2-90° FITTINGS)
5	BRASS NIPPLE SIZE PER AVR INLET
6	GUARD POST, TYP. OF 4 PER DETAIL S402
7	TAB & BOLT TO HOLD 2 HALVES TOGETHER, TYP. OF 6 EA.
8	#4 REBAR
9	6" OF 3/4" CRUSHED ROCK. EXTEND 6" ON ALL SIDES
10	1/2" X 6 EA. ANCHOR BOLTS, THROUGH TAB ON ENCLOSURE BASE
11	6" CONCRETE PAD
12	12" WIDE WARNING TAPE
13	LOCATING WIRE PER S109
14	GALV. STEEL PIPE VENT PER AVR OUTLET

NOTES:

- A** WHERE POSSIBLE, PLACE AVR'S WITHIN 10 FEET OF PROPERTY CORNERS.
- B** ALL PIPES AND FITTINGS TO BE BRASS OR BRONZE UNLESS OTHERWISE SHOWN.
- C** 30" MIN. COVER EXCEPT 24" MIN. COVER AT FLOW LINE OF GUTTER OR EP WITHOUT GUTTER.

- D** 6" FROM BACK OF WALK OR 6" FROM BACK OF CURB WHERE SIDEWALK IS NOT PROPOSED.
- E** SADDLE, CORP STOP, GATE VALVE AND VALVE BOX PER DETAIL S211.
- F** PROVIDE 1/2" AIRGAP FOR DRAINAGE.
- G** PROVIDE 2% SLOPE AWAY FROM ENCLOSURE.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

**AIR VACUUM RELEASE VALVE
1" - 2" (AVRV) RAW WATER**

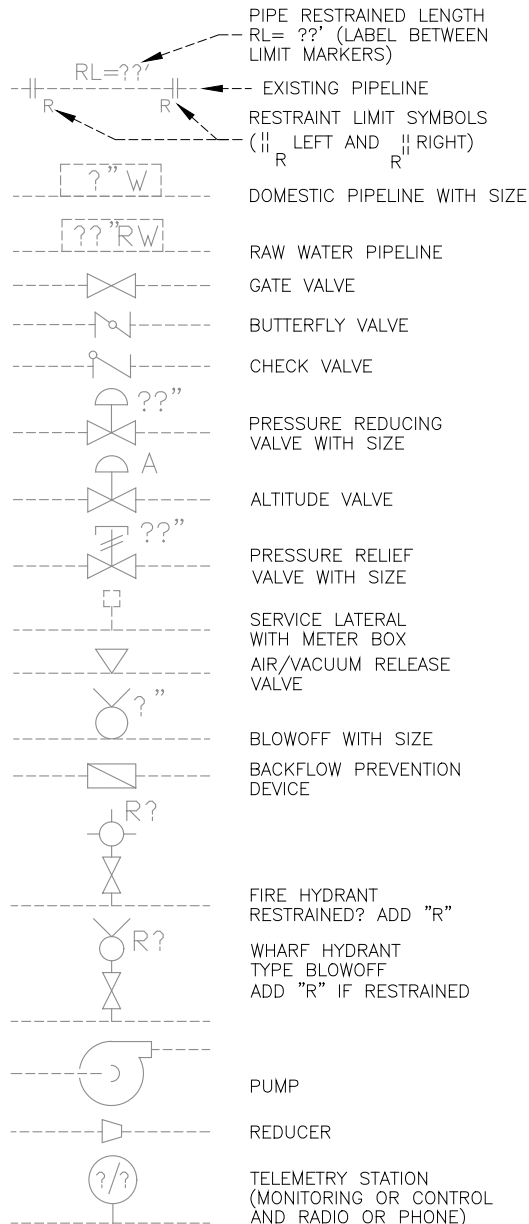
DRAWING NO.
S311



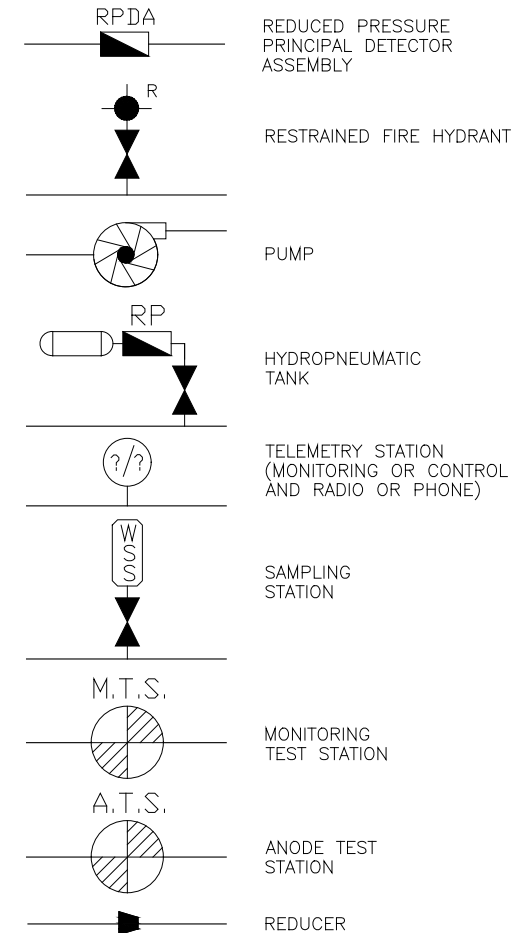
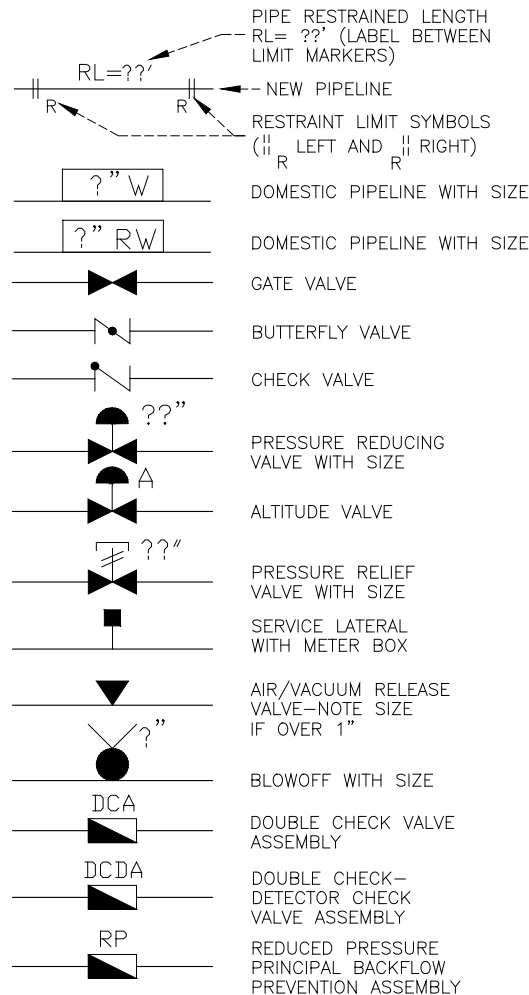
APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

EXISTING



PROPOSED



NOTES

1. THESE SYMBOLS SHALL BE USED ON ALL PLANS TO BE APPROVED BY P.C.W.A.
2. VALVE SIZE IS SAME AS LINE SIZE UNLESS OTHERWISE NOTED.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

WATER SYMBOLS LEGEND



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

DRAWING NO.
S401

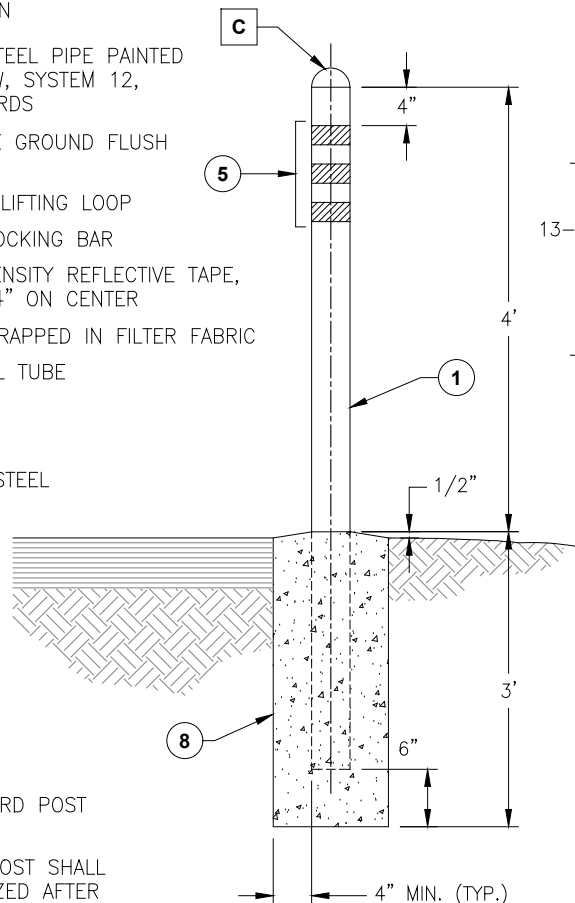
REVISION DATE
01-31-17

ITEM	DESCRIPTION
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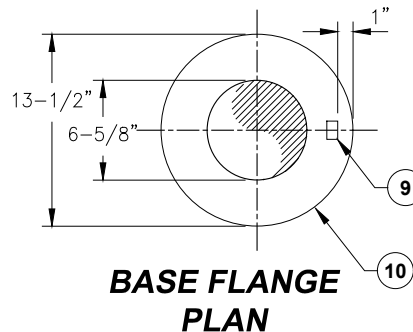
- | | |
|----|---|
| 1 | 6" GALV. SCH. 40 STEEL PIPE PAINTED OSHA SAFETY YELLOW, SYSTEM 12, PER AGENCY STANDARDS |
| 2 | WELDED STEEL PLATE GROUND FLUSH AND SMOOTH |
| 3 | 1/2" ROUND STOCK LIFTING LOOP |
| 4 | FB 3/8"x1"x1'-1" LOCKING BAR |
| 5 | 3 BANDS OF HI-INTENSITY REFLECTIVE TAPE, 2" SILVER, SPACED 4" ON CENTER |
| 6 | 3/4" DRAIN ROCK WRAPPED IN FILTER FABRIC |
| 7 | 7" I.D. x 1/4" STEEL TUBE |
| 8 | CLASS A CONCRETE |
| 9 | 1"x1-1/2" SLOT |
| 10 | PL 3/8"x13-1/2"Ø STEEL |

NOTES:

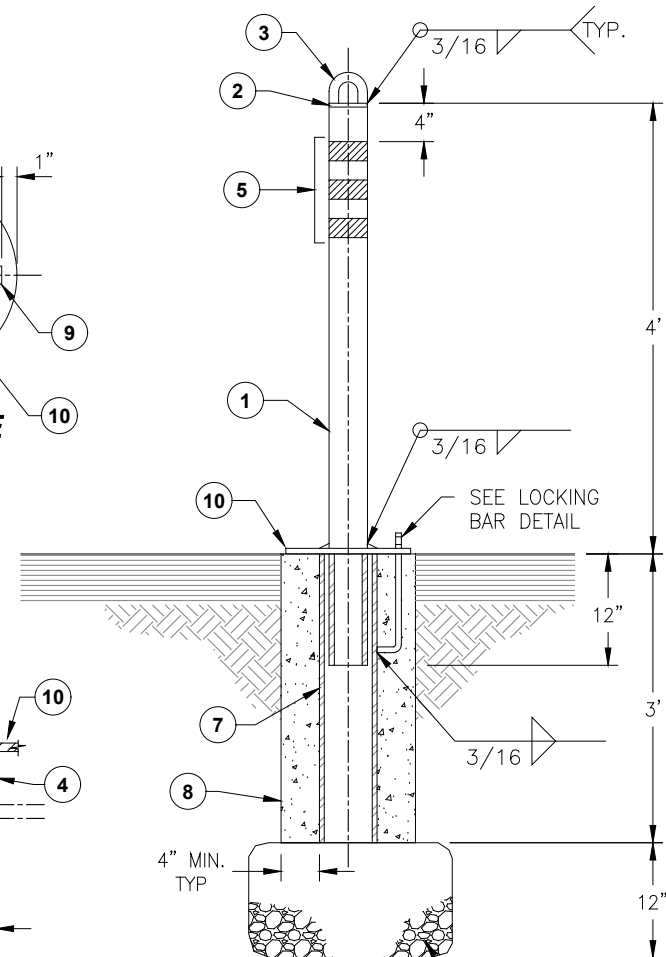
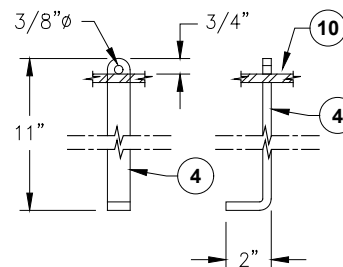
- A** FILL PERMANENT GUARD POST PIPE WITH CONCRETE
- B** REMOVABLE GUARD POST SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
- C** SMOOTH FINISH MORTAR DOME.
- D** DEBUR ALL SHARP EDGES BEFORE PAINTING



PERMANENT



LOCKING BAR DETAIL



REMOVABLE

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

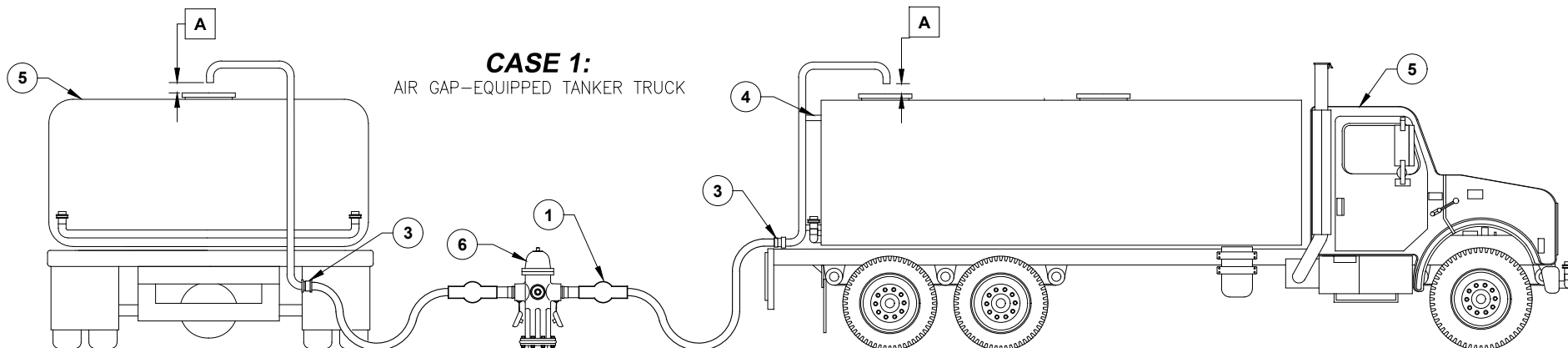
GUARD POST DETAIL

DRAWING NO.
S402

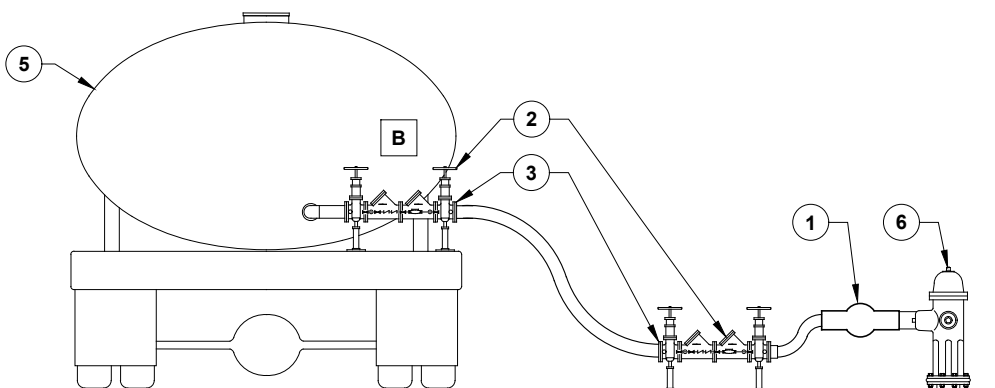


APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



CASE 1:
AIR GAP-EQUIPPED TANKER TRUCK



CASE 2:
REDUCED-PRESSURE BACKFLOW
PREVENTION DEVICE USED

ITEM	DESCRIPTION
1	HYDRANT METER PROCURED FROM AGENCY
2	TRUCK-MOUNTED OR TEMPORARY, REDUCED PRESSURE BACKFLOW PREVENTION DEVICE
3	HOSE CONNECTION
4	PIPE ATTACHED TO WATER TRUCK
5	WATER TRUCK
6	AGENCY APPROVED SOURCE OF WATER

NOTES:

- A** AIR GAP (AT LEAST 2X PIPE DIAMETER FROM FLOOD RIM OF TANK AND >12").
- B** REDUCED-PRESSURE BACKFLOW PREVENTION DEVICE MUST BE TESTED AND CERTIFIED ACCURATE. SUBMIT CERTIFICATE TO AGENCY PRIOR TO USE.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

APPROVED METHODS FOR FILLING WATER TANKER TRUCKS



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

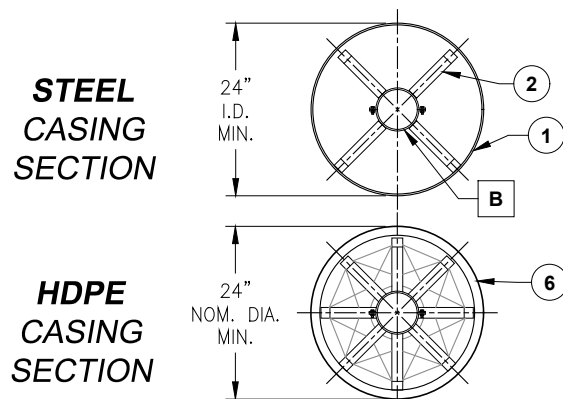
DRAWING NO.
S403

REVISION DATE
01-31-17

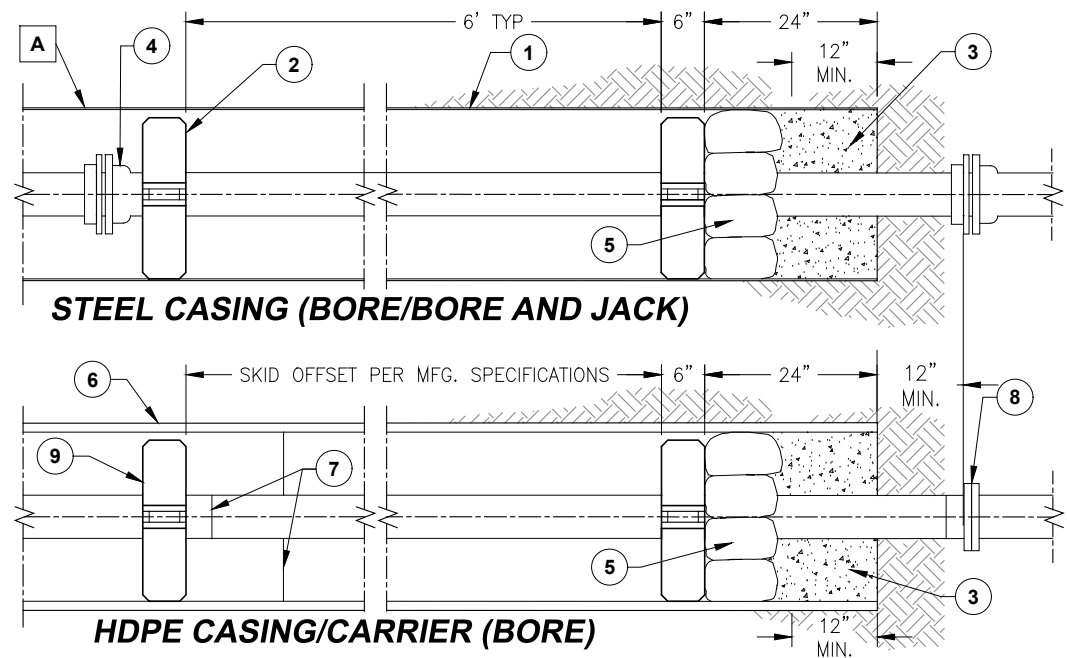
ITEM	DESCRIPTION
1	WELDED STEEL PIPE CASING, 24" MIN. INSIDE DIA., MIN. WALL THICKNESS PER TABLE BELOW, MIN. YIELD STRENGTH 36,000 PSI BEFORE COLD FORMING.
2	POLYURETHANE SKIDS DESIGNED TO ELECTRICALLY ISOLATE CARRIER PIPE FROM CASING AND TO PREVENT CARRIER PIPE FLOTATION. ADDITIONAL SKIDS MAY BE NECESSARY TO SUPPORT CARRIER PIPE (STEEL CASING ONLY)
3	12" MIN. LOW-STRENGTH CONCRETE OR SAND CEMENT SLURRY PLUG AT EACH END OF CASING
4	CARRIER PIPE RESTRAINED THROUGHOUT CASING LENGTH. ENSURE METALLIC CARRIER PIPE JOINT RESTRAINT SYSTEM DOES NOT CONTACT CASING
5	SANDBAGS TO FORM INSIDE OF CONCRETE END PLUG, WHEN SPACE ALLOWS.
6	HDPE CASING SHALL HAVE AN SDR OF 17 OR LESS
7	ALL JOINTS IN HDPE CASING AND HDPE CARRIER PIPE SHALL BE FUSION WELDED
8	CONNECT TO ENDS OF HDPE CARRIER PIPE WITH RESTRAINED MJ OR FLANGE ADAPTER W/SPLIT BACKUP RING
9	POLYURETHANE SKIDS DESIGNED TO PREVENT CARRIER PIPE FLOTATION. ADDITIONAL SKIDS MAY BE NECESSARY TO SUPPORT CARRIER PIPE

NOTES

- A** IF METALLIC CASING PIPE IS USED, PROVIDE AN ENGINEERED CATHODIC PROTECTION SYSTEM TO PROTECT CASING.
- B** MAX 6" DIA. CARRIER PIPE WITHOUT ENGINEERED DESIGN.
- C** PROVIDE BENTONITE SLURRY ON SITE DURING CARRIER INSTALLATION FOR USE AS LUBRICANT.
- D** PROVIDE WEAK-LINK OR BREAKAWAY DEVICE CALIBRATED TO PIPE MANUFACTURER'S RECOMMENDED ALLOWABLE TENSILE LOADS FOR PULLING OPERATIONS.
- E** ALLOW 24-HR. RELAXATION PERIOD BEFORE HDPE CARRIER IS CONNECTED AT ENDS OF CROSSING.



MIN. STEEL CASING WALL THICKNESS			
PIPE SIZE	CASING LENGTH (FT.)		
24" I.D.	<100	100-200	>200
	1/4"	5/16"	3/8"



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

PIPE CASING AND CARRIER PIPE SUPPORTS

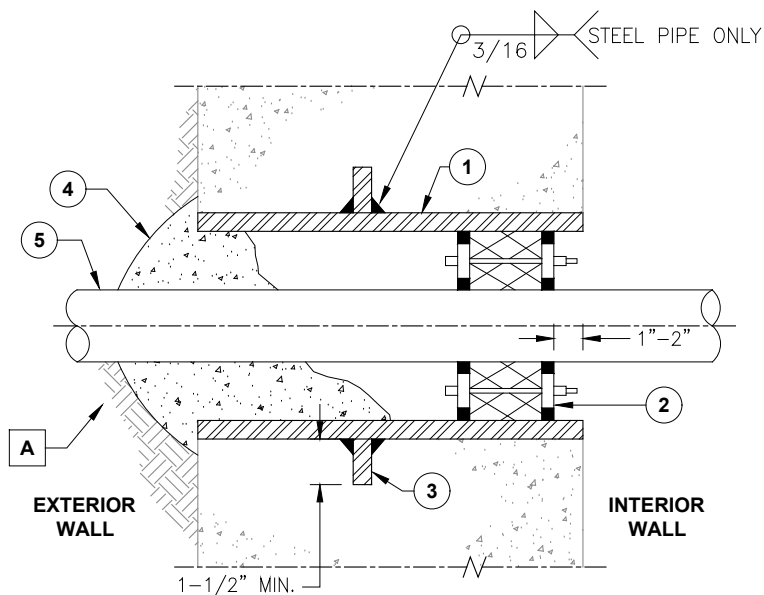
DRAWING NO.
S404



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

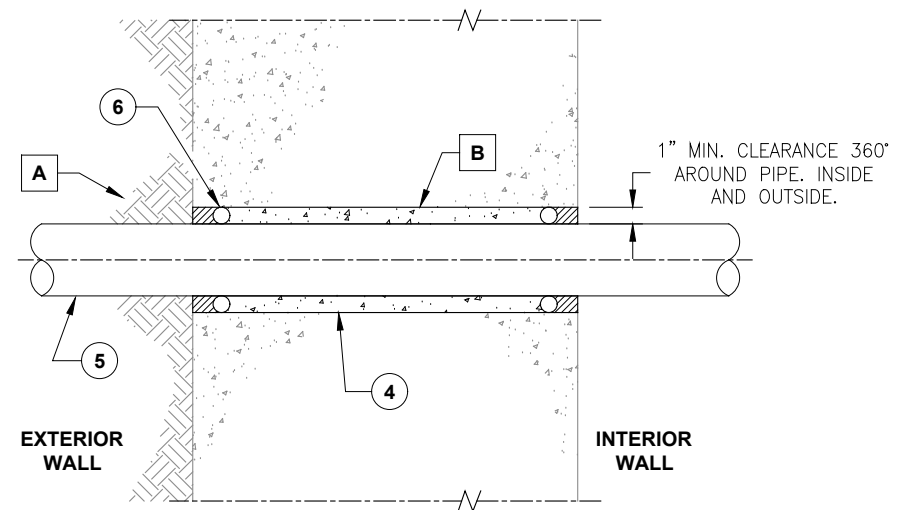
ITEM	DESCRIPTION
1	STEEL PIPE SLEEVE, 1/4" THICK MIN., GALVANIZED AFTER FABRICATION
2	ADJUSTABLE LINKED RUBBER SEAL WITH STAINLESS STEEL METALLIC PARTS ON INSIDE FACE OF VAULT OR WALL
3	STEEL WEEP RING, PIPE O.D. PLUS 3" MIN. X 1/4" TH.
4	NON-SHRINK GROUT
5	PIPELINE OR CONDUIT
6	MASTIC SEALANT W/FOAM OR MINERAL WOOL BACKER ROD



NEW WALL INSTALLATION

NOTES:

- A** THIS DETAIL IS APPLICABLE ONLY IN STABLE SOIL CONDITIONS. PROVIDE AN ENGINEERED DESIGN FOR OTHER CONDITIONS.
- B** CORE-DRILL THE WALL PENETRATION.



EXISTING WALL INSTALLATION

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

WALL PENETRATION

DRAWING NO.
S405



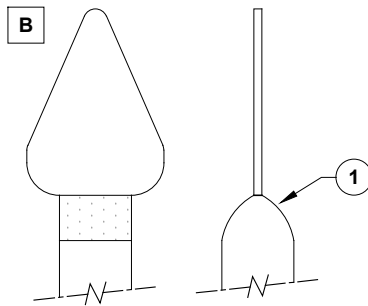
APPROVED: *R. Brent Smith* (D)
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DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
03-13-15

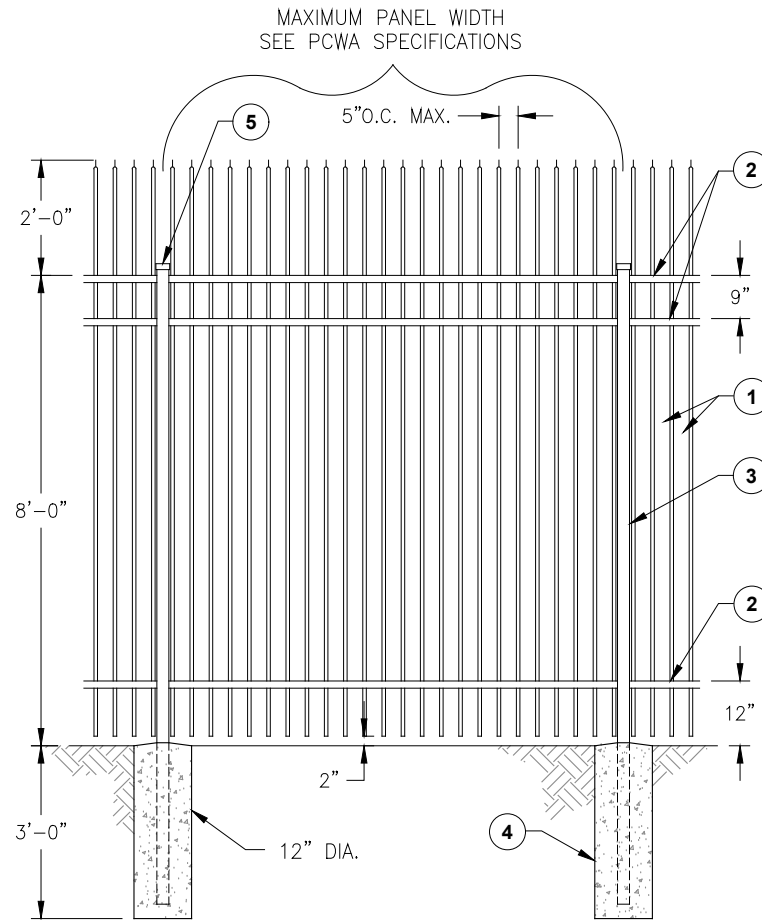
ITEM	DESCRIPTION
1	1"x14 GA. SQUARE TUBE PICKET (TYP)
2	1-3/4"x1-3/4"x14 GA. CHANNEL RAIL (TYP)
3	2-1/2"x12 GA. SQUARE TUBE POST (TYP)
4	CONCRETE FOOTING (SEE PCWA CONCRETE SPEC)
5	2-1/2"x2-1/2" STEEL CAP (TYP)

NOTE:

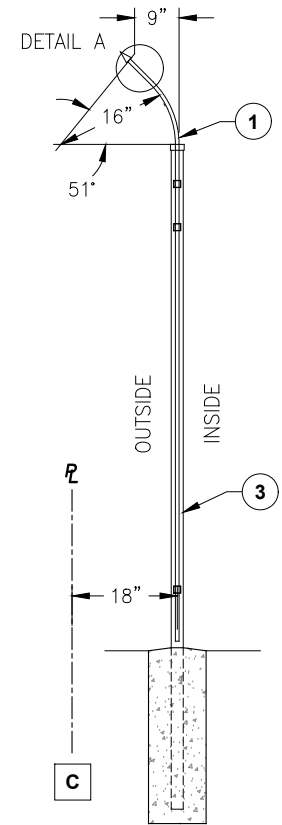
- A** ALL STEEL SHALL RECEIVE POWDER COATING AFTER FABRICATION. COLOR: BLACK
- B** END OF PICKET TO FORM POINT. NO CRACKING AROUND FORMED POINT EDGES WILL BE ACCEPTABLE.
- C** PLACE FENCE 18" INSIDE PROPERTY LINE.
- D** PICKETS CAN BE WELDED TO RAILS OR ATTACHED BY OTHER MFG. PROCEDURE WITH PRIOR PCWA APPROVAL. RAILS SHALL BE BOLTED TO THE POSTS.
- E** COMPLETED SECTIONS (PANELS) SHALL BE CAPABLE OF SUPPORTING A 600 LB. LOAD APPLIED AT MIDSPAN WITHOUT PERMANENT DEFORMATION. PANELS SHALL BE BIASABLE TO A 25% CHANGE IN GRADE.



DETAIL A



ELEVATION



SECTION

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

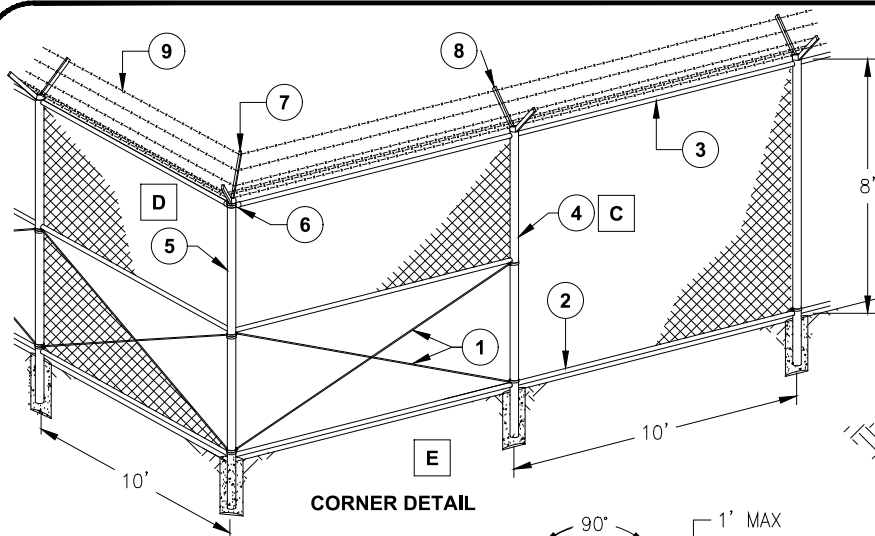
INDUSTRIAL ORNAMENTAL FENCE

DRAWING NO.
S406

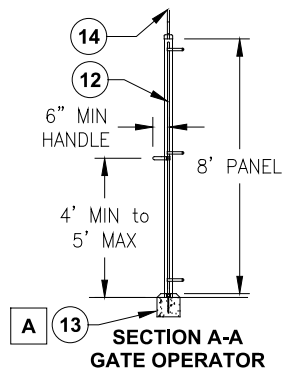


APPROVED: *R. Brent Smith* (D)
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DIRECTOR OF TECHNICAL SERVICES

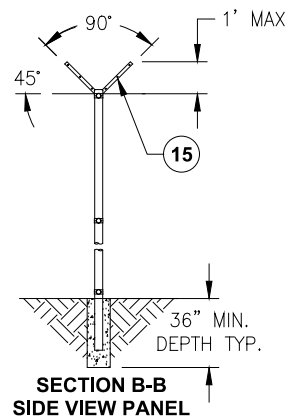
REVISION DATE
01-31-17



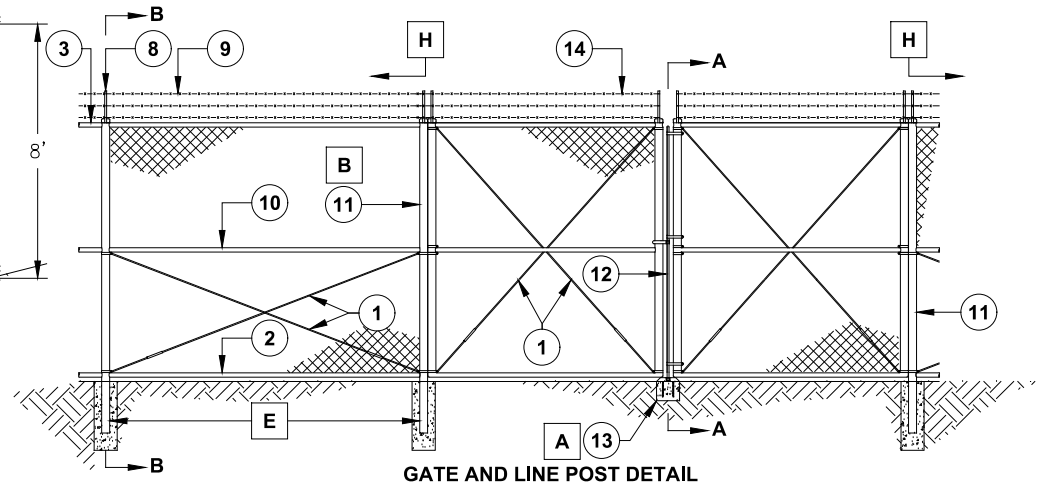
CORNER DETAIL



**SECTION A-A
GATE OPERATOR**



**SECTION B-B
SIDE VIEW PANEL**



GATE AND LINE POST DETAIL

NOTES:

- A** SEE S408 FOR ADDITIONAL FENCE APPURTENANCES
- B** GATE POST SIZE SHALL BE MIN. 6" I.D. FOR GATE WIDTHS OF 6' TO 12'
- C** LINE POST SIZE SHALL BE MIN. 2-1/2" I.D.
- D** END, LATCH AND CORNER POST SIZE SHALL BE MIN. 3" I.D.
- E** PROVIDE BRACE AND TRUSS ROD PANEL EVERY 100 FT. MIN., AT CORNERS AND PANELS ADJACENT TO GATES
- F** HORIZONTAL BRACE, BOTTOM RAIL, MIDDLE RAIL AND TOP RAIL SIZE SHALL BE 1-5/8" DIA. MIN.
- G** GATE KEEPERS ARE REQUIRED FOR ALL SWING GATES (SEE S408).
- H** TRANSITION FROM VERTICAL ARMS TO VICTORY ARMS AT THE GATE POST WHEN THE GATE WILL OPEN 90° OR LESS. CONTINUE VERTICAL ARMS ON THE PANEL ADJACENT TO THE GATE IF THE GATE WILL OPEN OVER 90°, FOR SLIDE OPERATING GATES, MAINTAIN VERTICAL ARMS TO THE NEXT POST PAST THE LENGTH OF THE OPEN GATE.
- I** DISTANCE FROM BOTTOM RAIL TO FINISHED GRADE MUST BE NO GREATER THAN 1". GRADING MAY BE REQUIRED ALONG THE PROPOSED FENCE ALIGNMENT TO MAINTAIN THE 1 INCH MAXIMUM DISTANCE.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

ITEM	DESCRIPTION
1	TRUSS RODS (ADJUSTABLE)
2	BOTTOM RAIL (TYP)
3	TOP RAIL
4	LINE POST
5	CORNER POST
6	RAIL END (TYP)
7	MALLEABLE IRON VICTORY ARMS REQUIRED FOR CORNERS
8	STANDARD VICTORY ARMS
9	BARBED WIRE (TYP)

ITEM	DESCRIPTION
10	MIDDLE RAIL
11	GATE POST
12	1"Ø GATE DROP ROD ASSEMBLY
13	GATE ANTI-SWING FOOTING (SEE GATE ANTI-SWING DETAIL S408)
14	3 STRAND BARBED WIRE, VERTICAL ON GATES (TYP ALL GATES)
15	VICTORY ARMS 3 STRAND BARBED WIRE FOR INSIDE RUN AND OUTSIDE RUN (TYPICAL ALL PANELS EXCEPT GATES)

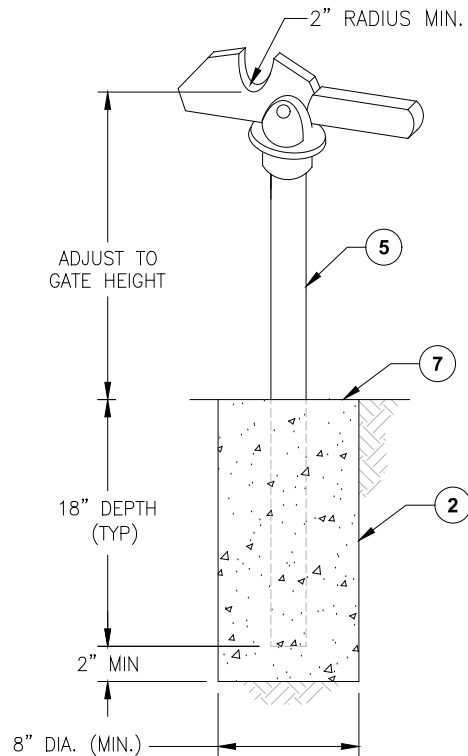
STANDARD FENCE DETAIL



APPROVED: *R. Brent Smith* **D**
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

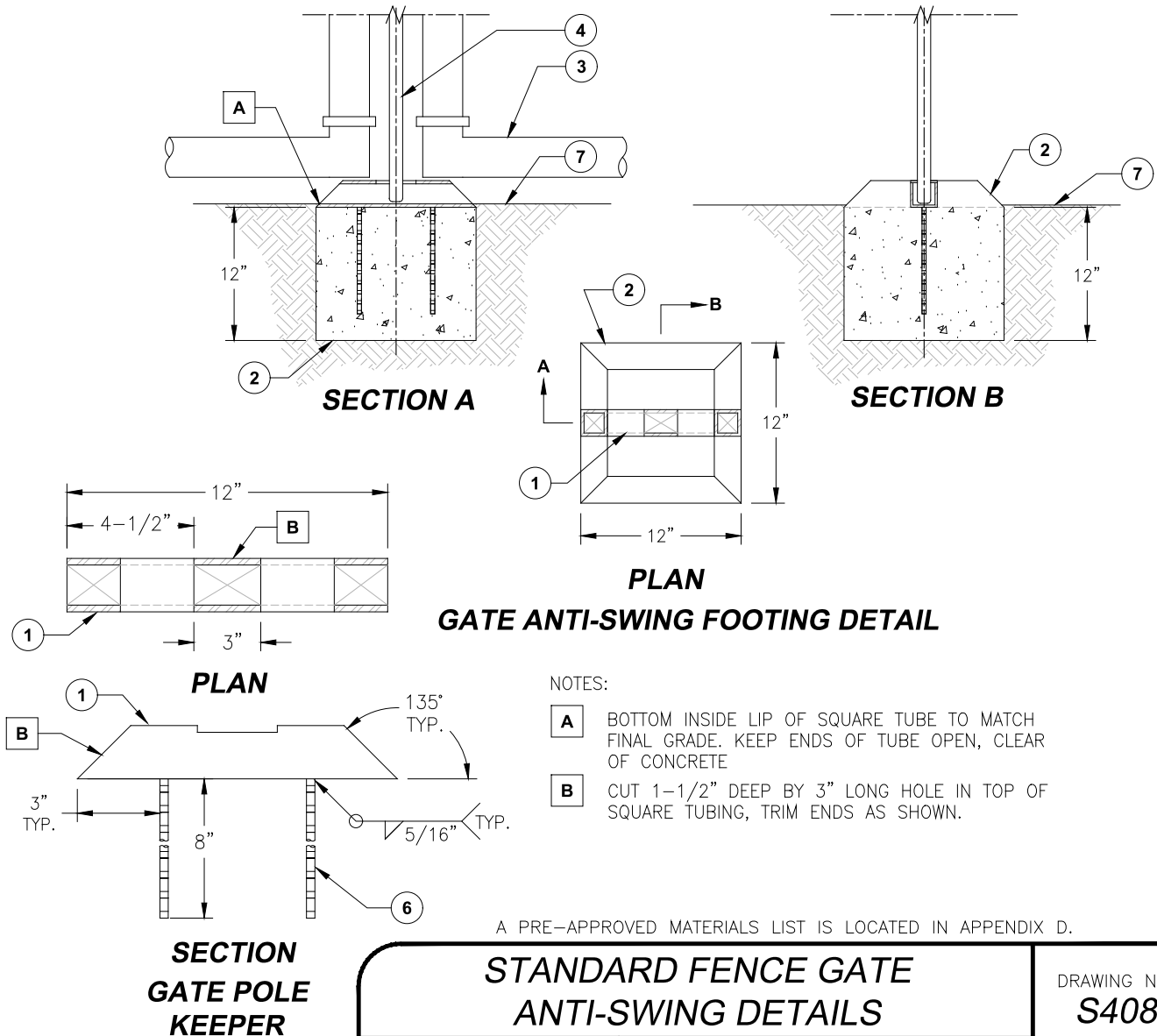
DRAWING NO.
S407

REVISION DATE
01-31-17



GATE KEEPER

ITEM	DESCRIPTION
①	2"x2"x0.25"x12'-0" LONG SQUARE TUBE. HOT DIP GALV. AFTER FABRICATION
②	CONC. FOOTING
③	FENCE GATE 2"Ø GATE RAIL
④	1"Ø FENCE GATE DROP ROD ASSEMBLY
⑤	GALV. STEEL GATE KEEPER
⑥	#5 REBAR, TYP.
⑦	FINISHED GRADE



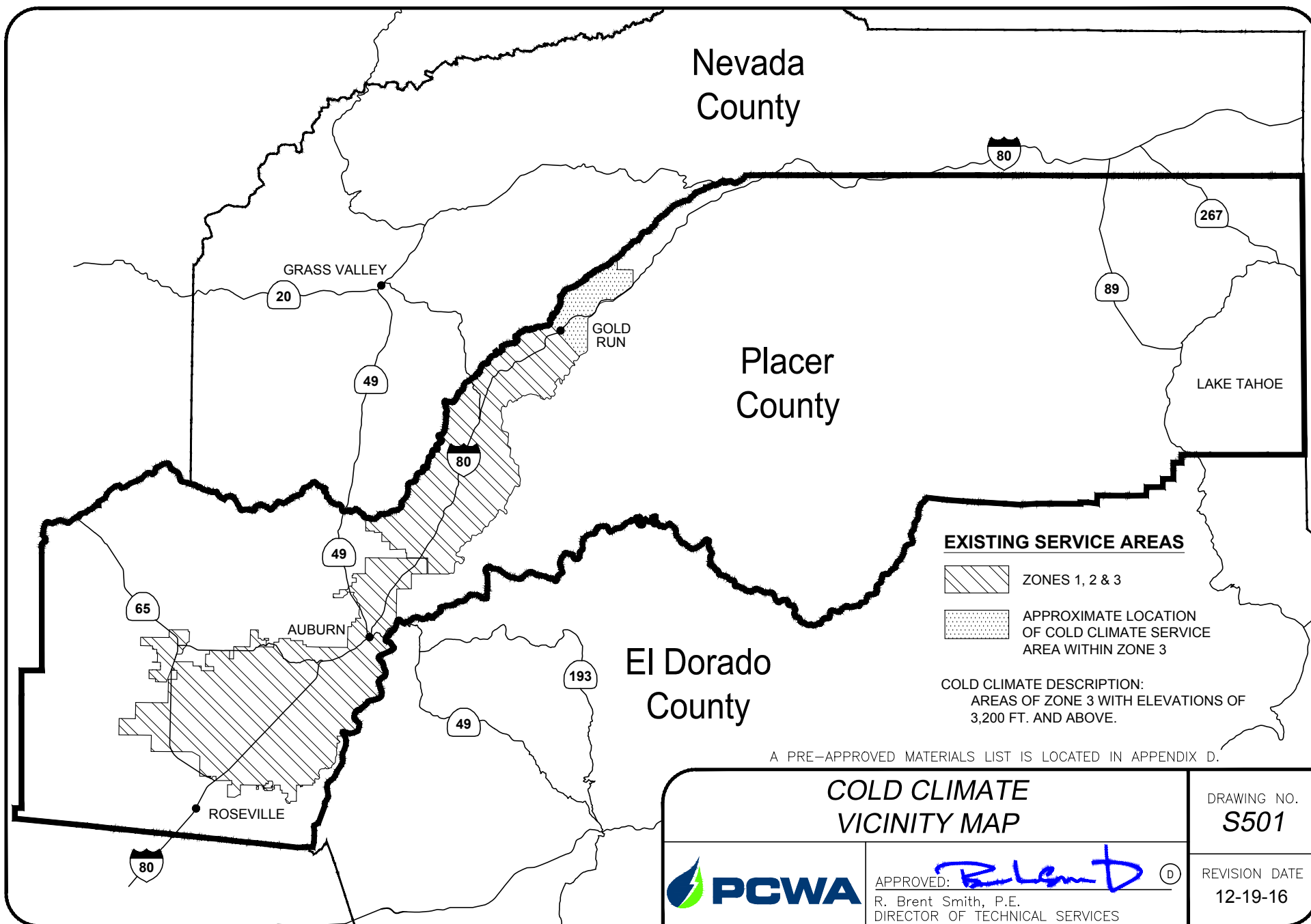
STANDARD FENCE GATE ANTI-SWING DETAILS

DRAWING NO.
S408

REVISION DATE
01-31-17



APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES



Nevada
County

Placer
County

El Dorado
County

GRASS VALLEY

20

49

GOLD
RUN

80

49

AUBURN

193

49

65

ROSEVILLE

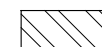
80

LAKE TAHOE

267

89

EXISTING SERVICE AREAS



ZONES 1, 2 & 3



APPROXIMATE LOCATION
OF COLD CLIMATE SERVICE
AREA WITHIN ZONE 3

COLD CLIMATE DESCRIPTION:
AREAS OF ZONE 3 WITH ELEVATIONS OF
3,200 FT. AND ABOVE.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

**COLD CLIMATE
VICINITY MAP**

DRAWING NO.

S501

REVISION DATE

12-19-16



APPROVED:  D
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

Note:

The standard drawing S502 for "Cold Climate" locations is currently under revision. Call PCWA Engineering Dept. for the latest approved updated standard drawing. 12-19-2016 JLP

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

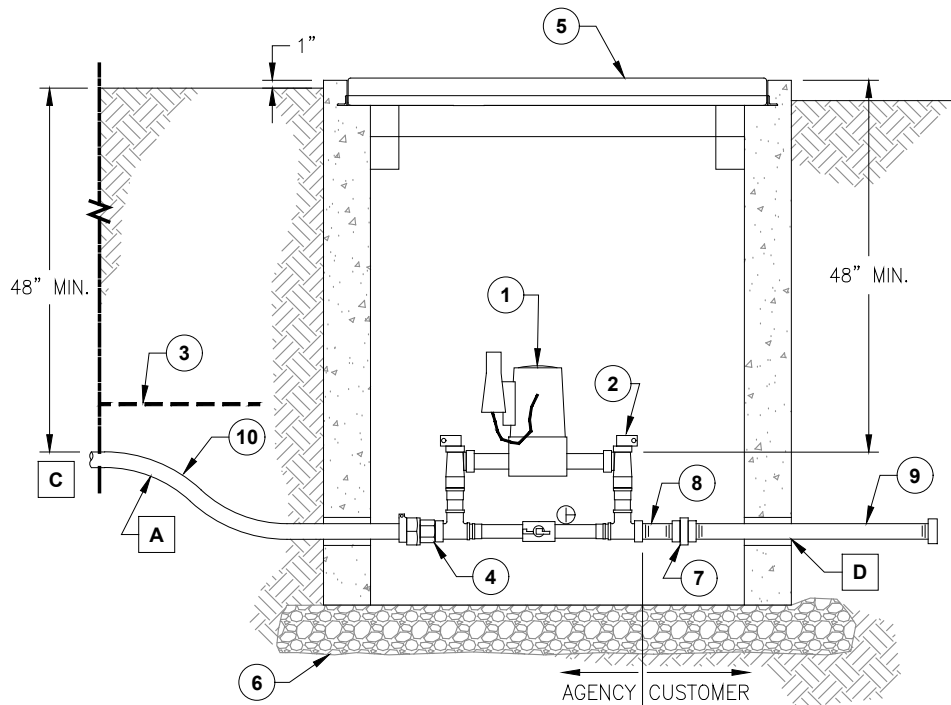
**COLD CLIMATE METER
CONNECTION 1" AND SMALLER**

DRAWING NO.
S502

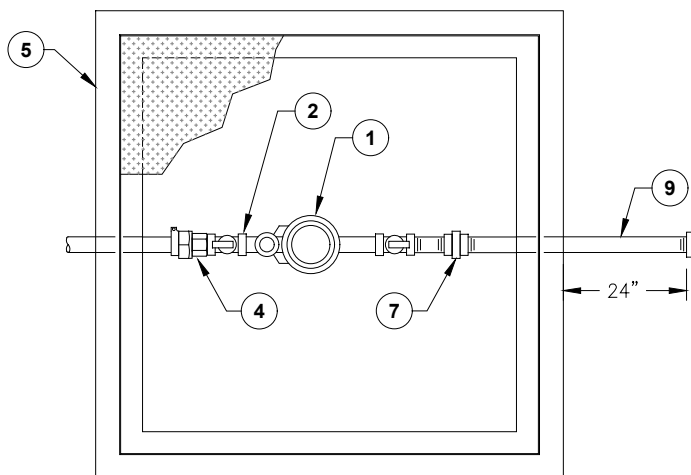


APPROVED:  (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
XX-XX-2017



SECTION



PLAN

ITEM	DESCRIPTION
1	METER AND ERT (INSTALLED BY AGENCY)
2	METER YOKE W/DUAL LOCKING ANGLE BALL VALVES AND LOCKING BYPASS SHUTOFF, SIZE PER METER
3	12" WIDE WARNING TAPE
4	2" NPTxCOMP. ADAPTER
5	PRECAST CONC. METER VAULT W/ALUMINUM, SPRING-ASSIST, LOCKABLE LID WITH DRAIN. PROVIDE MIN. 48"x48" LID OPEN AREA.
6	6" OF 3/4" CRUSHED ROCK. EXTEND 6" ON ALL SIDES
7	NPT BRASS UNION (SIZE PER METER)
8	NPT BRASS NIPPLE (SIZE PER METER)
9	NPT BRASS OR BRONZE NIPPLE WITH BRASS CAP (SIZE PER METER)
10	TYPE "K" COPPER PIPE

NOTES:

- A** R=24" MIN., TYP.
- B** DRAPE VAULT PIPING AND METER IN INSULATING BLANKETS.
- C** CONSTRUCT SERVICE SADDLE, VALVE, AND VALVE BOX PER S202.
- D** WALL PENETRATION PER S405.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

**COLD CLIMATE SERVICE
1-1/2" TO 2" METER**

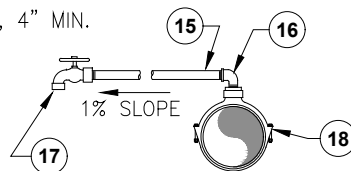
DRAWING NO.
S503



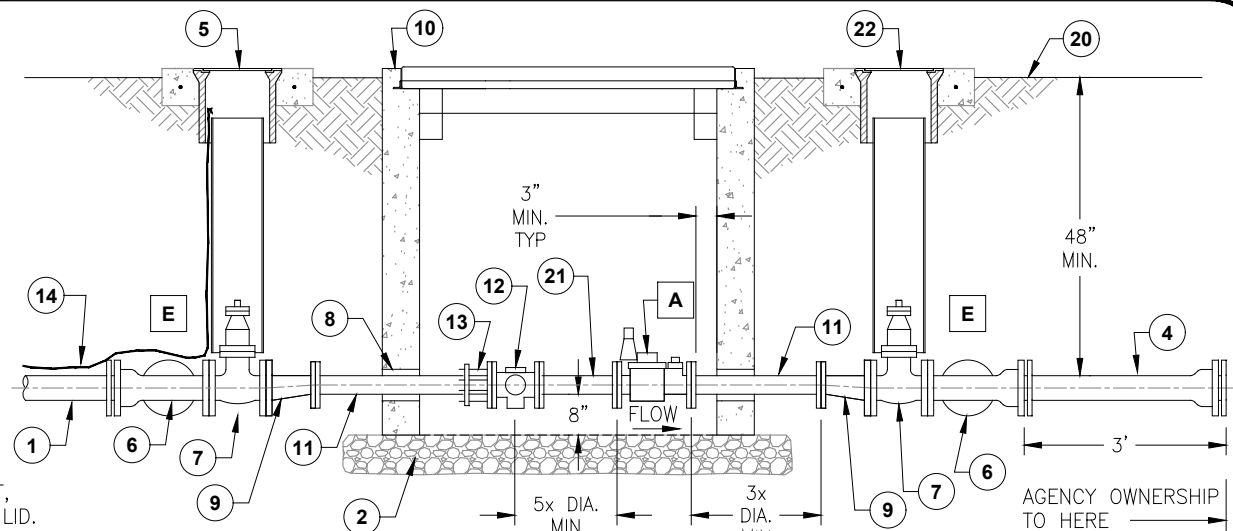
APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

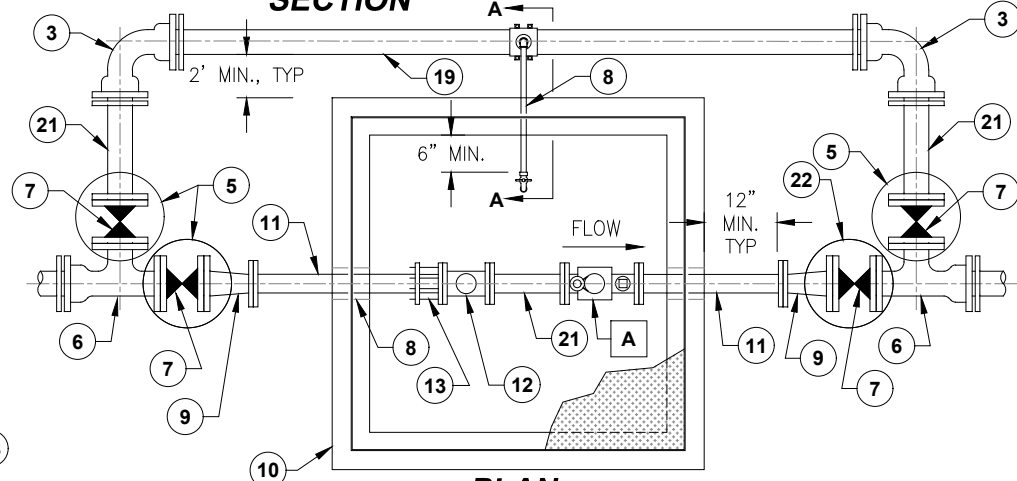
- | ITEM | DESCRIPTION |
|------|---|
| 1 | RESTRAINED DIP SIZED PER HEAD LOSS REQUIREMENTS |
| 2 | 6" OF 3/4" CRUSHED ROCK. EXTEND 6" ON ALL SIDES |
| 3 | MJ 90° ELBOW |
| 4 | PE DIP |
| 5 | LOCKING-LID VALVE BOX PER S106 |
| 6 | MJxFLGxFLG TEE |
| 7 | FLG GATE VALVE |
| 8 | SLEEVED PENETRATION PER S405, TYP. |
| 9 | FLG ECC. REDUCER FLAT SIDE UP (3" METER INSTALLATION) |
| 10 | PRECAST CONC. VAULT W/ALUMINUM, SPRING-ASSIST, LOCKABLE LID WITH DRAIN. PROVIDE MIN. 48"x48" LID. |
| 11 | FLG SPOOL (MATCH METER SIZE) |
| 12 | BRONZE PLATE STRAINER (MATCH METER SIZE) |
| 13 | RESTRAINED FLANGED COUPLING ADAPTER 2 EA. REQUIRED FOR 4" METER AND ABOVE (MATCH METER SIZE) |
| 14 | LOCATING WIRE PER S109 |
| 15 | 3/4" NPT BRASS PIPING |
| 16 | 3/4" NPT BRASS STREET ELBOW |
| 17 | 3/4" BRASS OR BRONZE HOSE BIB AND CAP |
| 18 | 3/4" BRONZE SADDLE |
| 19 | METER BYPASS. MATCH SERVICE SIZE, 4" MIN. |
| 20 | FINISHED GRADE |
| 21 | FLGxPE SPOOL |
| 22 | NON-LOCKING LID |



SECTION A-A



SECTION



PLAN

NOTES:

- | | |
|----------|--|
| A | AGENCY TO SUPPLY METER AND ERT. |
| B | RESTRAIN ALL MJ JOINTS. |
| C | 3" METER CONFIGURATION SHOWN. 4" AND LARGER METERS REQUIRE SEPARATE VAULTS FOR STRAINER AND METER. |
| D | DRAPE VAULT PIPING AND APPURTENANCES IN INSULATING BLANKETS. |
| E | VALVE BOX NOT SHOWN FOR CLARITY. |

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

**COLD CLIMATE SERVICE
3" METER AND LARGER**

DRAWING NO.
S504



APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

SECTION

HYDRANT BURY

48" MIN

12"

13

12

10

9

8

11

15

14

1

6" FLGxMJ ADAPTER

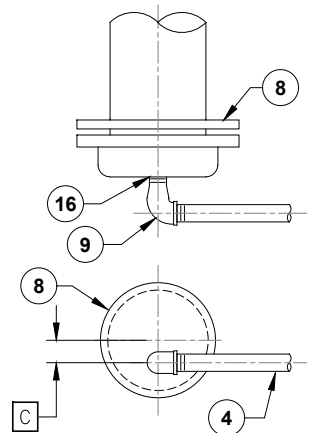
-
- The plan view diagram shows a square fire-rated safe with a total width of 3' and a total height of 3'. The interior features a dashed rectangular outline with a width of 1'-6" and a height of 3'. Inside this dashed area is a circular dial with a crosshair, a rectangular handle, and two circular components. A dimension line indicates a 12" TYP distance between the dial and the bottom-left circular component. Three numbered circles (6, 3, 16) are positioned below the safe, with arrows pointing to the bottom-left circular component, the dial, and the bottom-right corner of the safe, respectively.

REVISION DATE
01-31-17

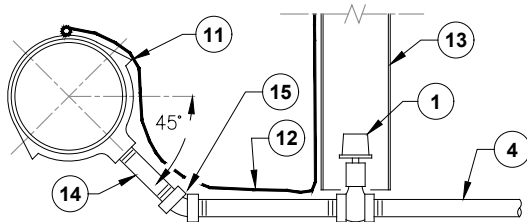
- | ITEM | DESCRIPTION |
|------|---|
| 1 | 2" NPT GATE VALVE W/2" SQ. OPERATING NUT |
| 2 | 2" NPT BRASS TEE |
| 3 | 2" NPT BRASS CAP |
| 4 | LATERAL MAY BE THD TYPE M COPPER, BRONZE, OR BRASS |
| 5 | 6" OF 3/4" CRUSHED ROCK. EXTEND 6" ON ALL SIDES |
| 6 | FINISHED GRADE |
| 7 | H2O-RATED PRECAST 42"x20" UTILITY BOX W/ALUMINUM, H2O-RATED, SPRING ASSIST, LOCKABLE LID WITH DRAIN |
| 8 | RESTRAINED DIP BLIND FLANGE W/2-1/2" NPT OUTLET. |
| 9 | 2" NPT BRASS STREET ELBOW |
| 10 | 6" CONCRETE COLLAR W/#4 REBAR |
| 11 | BRONZE SERVICE SADDLE |
| 12 | LOCATING WIRE PER S109 |
| 13 | NOTCHED VALVE WELL EXTENSION PER S105 (8" SDR 35 PVC VALVE WELL EXTENSION, ONE CONTINUOUS LENGTH OF PIPE. |
| 14 | 2" NPT BRASS NIPPLE |
| 15 | 2" NPT BRASS 45° ELBOW |
| 16 | NYLON BUSHING |
| 17 | 1 CUBIC FT. 3/4" CRUSHED ROCK IN FILTER FABRIC |
| 18 | BACK OF SIDEWALK OR CURB |

NOTES:

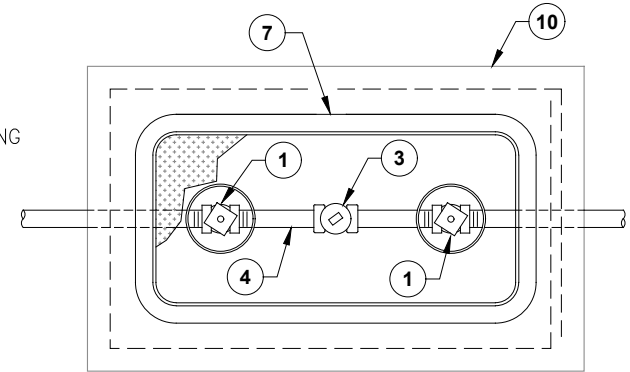
- A** ALL PIPE TO BE 2" BRASS UNLESS OTHERWISE SHOWN.
- B** DRAPE EXPOSED PIPING AND APPURTENANCES IN INSULATING BLANKETS.
- C** MINIMUM DIMENSION TO BE 1/4 OF THE MAIN PIPE DIAMETER



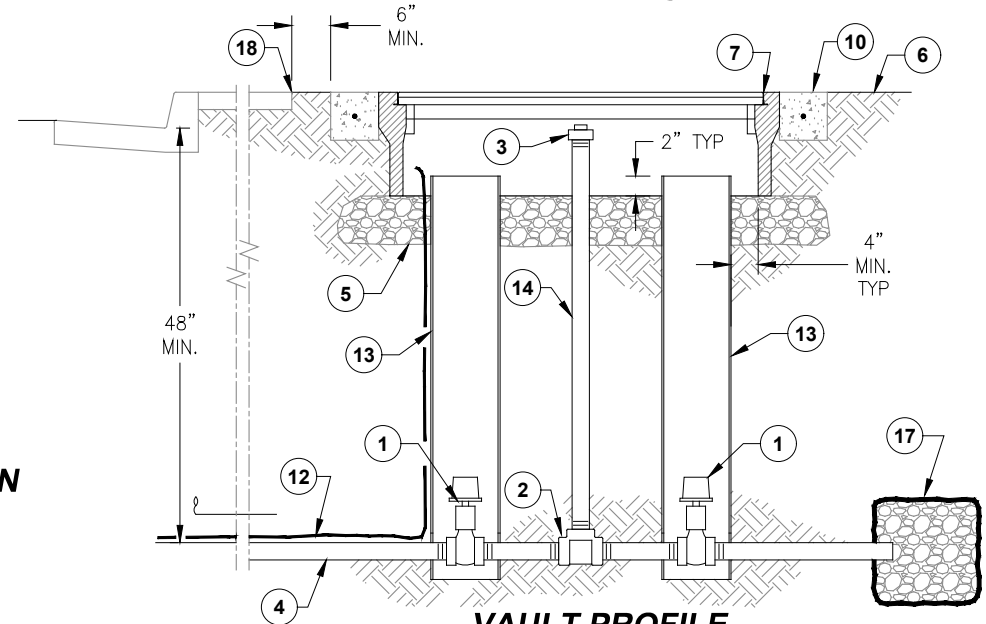
END OF MAIN TIE-IN



MID-LINE MAIN TIE-IN



PLAN VAULT



VAULT PROFILE

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

**COLD CLIMATE
2" BLOW-OFF**

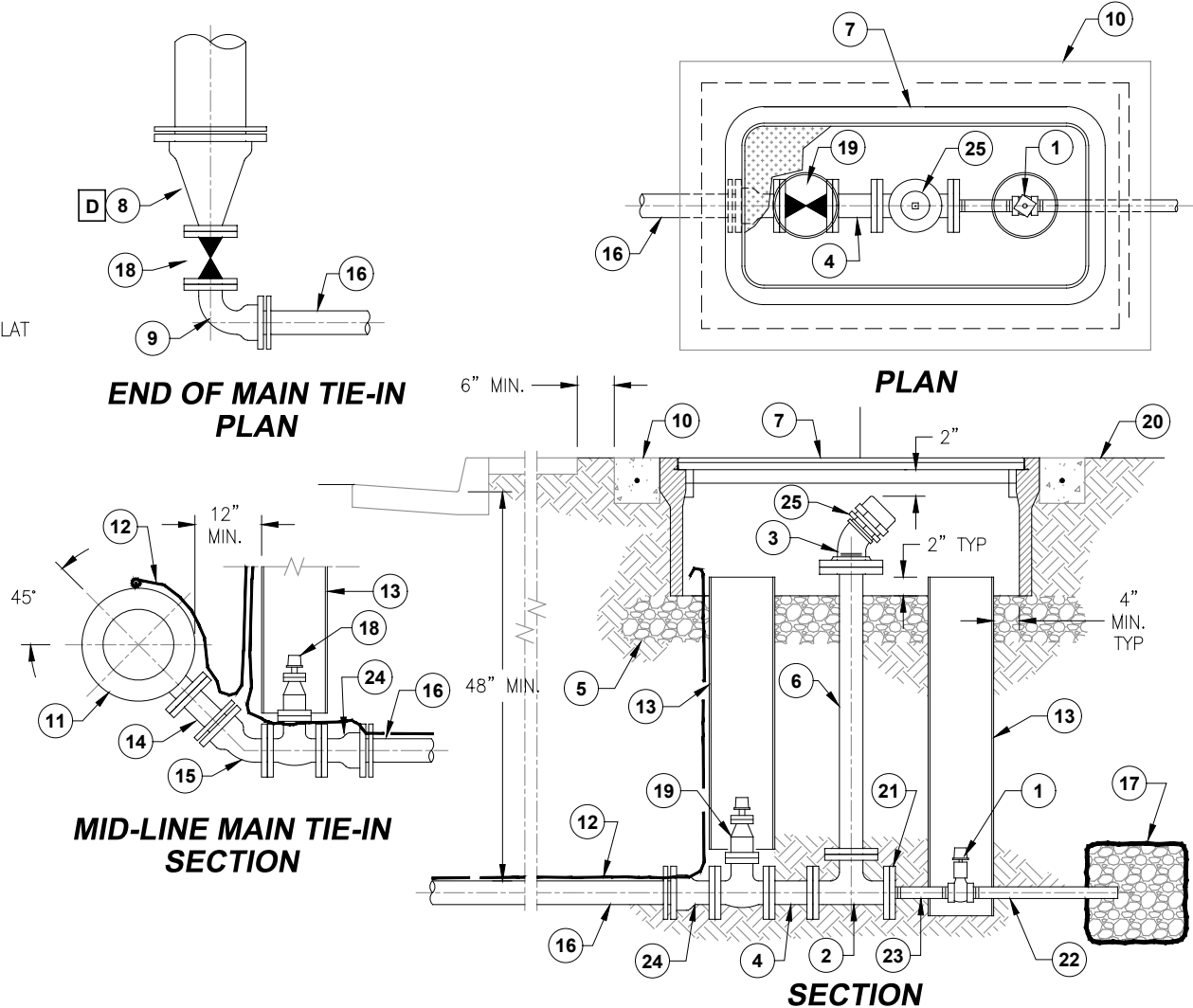
DRAWING NO.
S506



APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

ITEM	DESCRIPTION
1	2" THD GATE VALVE W/2" SQ. OPERATING NUT
2	4" FLG TEE
3	4" NPT BRASS 45° STREET ELBOW
4	4"x8" FLG DIP SPOOL
5	6" OF 3/4" CRUSHED ROCK EXTENDING 6" ON ALL SIDES
6	4" FLGxFLG DIP SPOOL
7	PRECAST 42"x20" UTILITY BOX W/ALUMINUM, SPRING ASSIST, LOCKABLE LID WITH DRAIN
8	MAINx4" MJxFLG ECCENTRIC REDUCER ROTATED FLAT SIDE DOWN
9	4" FLGxMJ 90° ELBOW
10	6" CONCRETE COLLAR W/#4 REBAR
11	MAINx4" FLG TEE
12	LOCATING WIRE PER S109
13	VALVE WELL EXTENSION PER S106
14	FLG DIP SPOOL
15	4" FLG 45° ELBOW
16	4" PE DIP
17	1 CUBIC FT. 3/4" CR. ROCK IN FILTER FABRIC
18	4" FLG GATE VALVE PER S106
19	4" FLG GATE VALVE
20	FINISHED GRADE
21	4" COMPANION FLG W/2-1/2" NPT PORT FITTED W/2" NPT INSULATING BUSHING
22	2"x24" NPT BRASS NIPPLE
23	2"x8" NPT BRASS NIPPLE
24	4" MJxFLG ADAPTER
25	4" NPTx4-1/2" NST HEX ADAPTER W/4-1/2" NST BRASS CAP



A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

COLD CLIMATE 4" BLOW-OFF

DRAWING NO.
S507

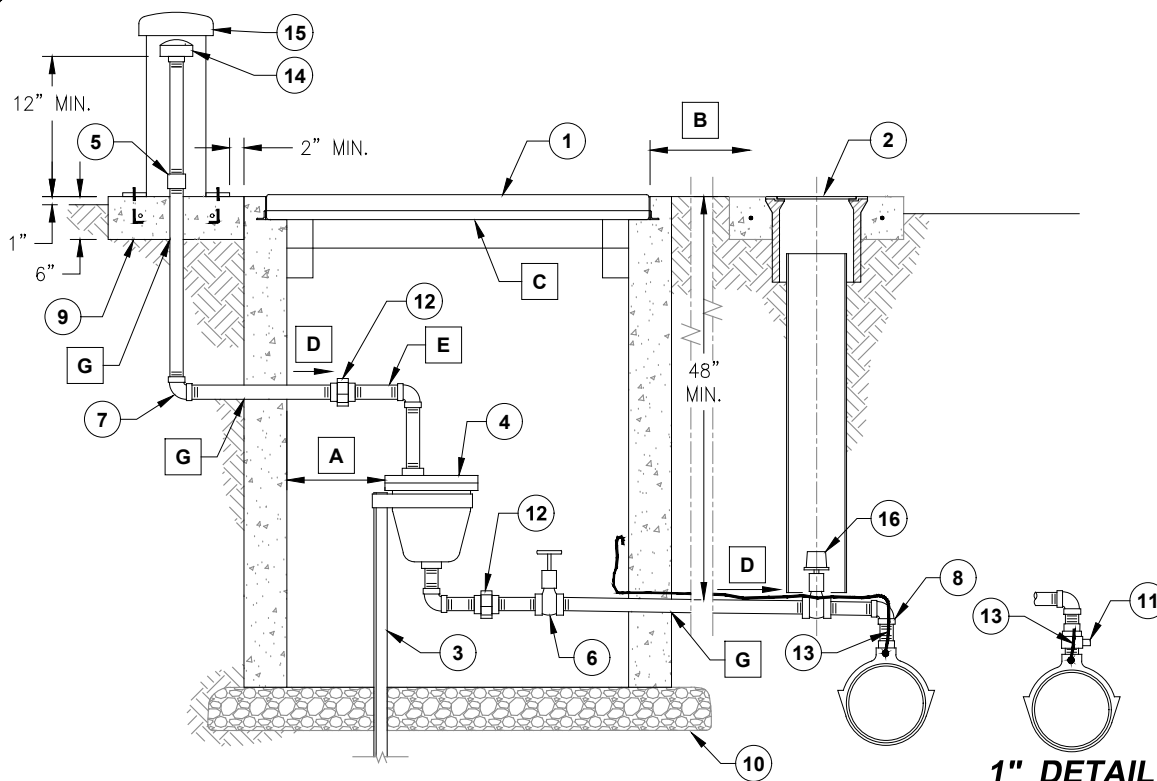


APPROVED: *R. Brent Smith*
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17

NOTES:

- A** ALL PIPE TO BE 4" DIP UNLESS OTHERWISE SHOWN.
- B** DRAPE EXPOSED PIPING AND APPURTENANCES IN INSULATING BLANKETS.
- C** 4" BLOWOFF VAULTS SHALL BE PLACED BEHIND THE BACK OF SIDEWALK (OR EDGE OF PAVEMENT IF NO SIDEWALK IS PLANNED).
- D** ORIENT REDUCER FLAT SIDE DOWN.



SECTION

1" DETAIL

ITEM	DESCRIPTION
1	H20-RATED PRECAST CONC. VAULT W/ ALUMINUM, H20-RATED, SPRING-ASSIST, LOCKABLE LID WITH DRAIN. PROVIDE MIN. 48"x48" LID OPEN AREA. INSTALL SO THAT LID DOESN'T INTERFERE W/AVRV RISER COVER.
2	VALVE BOX AND WELL EXTENSION PER S106
3	1-5/8"x1-5/8" GALV. STEEL CHANNEL (UNISTRUT OR EQUAL) ON NARROW SIDE OF VALVE BODY. DRIVE MIN. 18" INTO SOIL BELOW CRUSHED ROCK. SECURE TO VALVE BODY W/1" MIN. WIDTH SS STRAP
4	COMBINATION AIR & VACUUM RELEASE VALVE (AVRV)
5	PVC NPT COUPLING
6	NPT BRASS GATE VALVE W/HAND WHEEL EXPOSED WITHIN BOX.
7	ALL FITTINGS AND PIPE FROM TOP OF AVRV SHALL BE BRASS, SIZED PER VALVE OUTLET UNLESS OTHERWISE NOTED.
8	ALL FITTINGS AND PIPE FROM MAIN TO AVRV SHALL BE BRASS OR COPPER, SIZED PER AVRV INLET, AND SLOPED TO MAIN. INSTALL SWING JOINTS AS NECESSARY.
9	18"x18" (MIN.) CONC. PAD W/#4 REBAR HOOP, HOOK ANCHOR BOLTS UNDER REBAR.
10	3/4" CRUSHED ROCK, 6 INCHES DEEP. EXTEND 6" OUTSIDE OF BOX ON ALL SIDES
11	1" NPT BRASS CURB STOP ON SADDLE
12	NPT BRASS UNION
13	LOCATING WIRE PER S109
14	NPT MUSHROOM VENT CAP W/SS SCREEN, BOTTOM VENTING (SIZED PER AVRV OUTLET)
15	AVRV RISER COVER
16	PROVIDE BRASS CORPORATION STOP VALVE TO MATCH AVRV INLET. ADD A 2" NPT BRASS GATE VALVE AND VALVE BOX FOR 2" AVRV INLET.

NOTES:

- A** VALVE MUST CLEAR SIDES OF BOX BY AT LEAST 1" WHEN ROTATED FOR REMOVAL.
- B** AIR & VACUUM RELEASE VAULT SHALL BE SET 8' FROM EDGE OF PAVEMENT, BACK OF CURB, BACK OF SIDEWALK, OR AS DETERMINED BY AGENCY OR ENGINEER.
- C** PERMANENTLY ADHERE 2" OF CLOSED-CELL, NON-ABSORBENT RIGID FOAM INSULATION TO UNDERSIDE OF LID (NOT SHOWN FOR CLARITY).
- D** ALL HORIZONTAL PIPE SHALL SLOPE DOWN TOWARD MAIN AT 1% SLOPE MIN.
- E** DRAPE INSULATING BLANKET OVER ALL EXPOSED PIPING AND APPURTENANCES IN VAULT.
- F** 2" AVRV SHOWN. SEE 1" DETAIL FOR 1" AVRV.
- G** FOR PIPE PENETRATIONS SEE S405

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

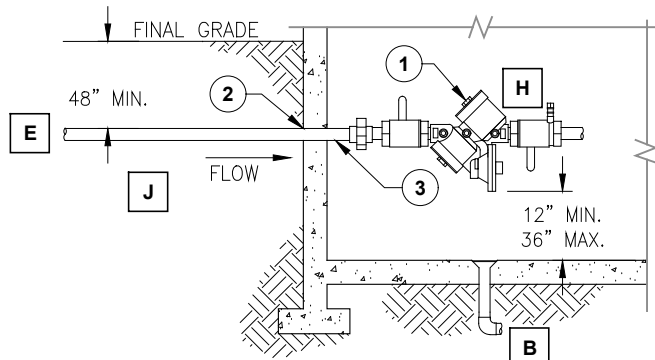
COLD CLIMATE 1" - 2" AIR & VACUUM RELEASE VALVE

DRAWING NO.
S508

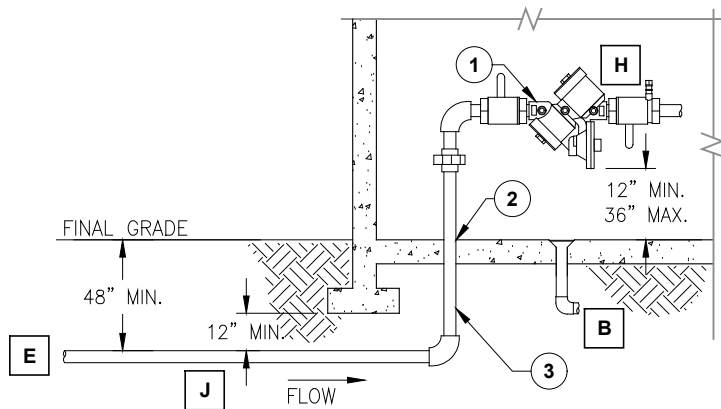


APPROVED: *R. Brent Smith* (D)
R. Brent Smith, P.E.
DIRECTOR OF TECHNICAL SERVICES

REVISION DATE
01-31-17



ELEVATION - FREEZE PROTECTED STRUCTURE



ELEVATION - FREEZE PROTECTED BUILDING

ITEM DESCRIPTION

- ① INSTALL REDUCING PRESSURE DEVICE (aka:RP) BACKFLOW PREVENTION DEVICE PER MANUFACTURER'S RECOMMENDATIONS.
- ② PENETRATIONS PER S405
- ③ PIPE MATERIAL FROM PCWA METER TO RP BACKFLOW PREVENTION DEVICE SHALL BE TYPE "M" NPT COPPER, BRASS OR BRONZE, FITTINGS SHALL BE BRASS OR BRONZE.

NOTES

- A ALL PIPE AND APPURTENANCES DOWNSTREAM OF METER BOX ARE THE RESPONSIBILITY OF THE CUSTOMER.
- B DRAIN REQUIRED PER CHAPTER 8 OF THE 2007 UNIFORM PLUMBING CODE.
- C THIS DETAIL IS APPLICABLE TO 1" AND SMALLER COLD CLIMATE RP BACKFLOW PREVENTION DEVICES LOCATED WITHIN FREEZE PROTECTED BUILDINGS OR STRUCTURES.
- D ADD ADDITIONAL RP BACKFLOW PREVENTION DEVICES FOR ADDITIONAL CONNECTIONS TO SERVICE TAIL FROM PCWA METER.
- E METER TAIL BETWEEN STRUCTURE OR BUILDING AND PCWA METER.
- F PROVIDE 12" MIN. – 36" MAX. ABOVE GRADE. PROVIDE 12 INCHES OF CLEARANCE ON ALL SIDES FROM ANY PART OF THE RP BACKFLOW DEVICE.
- G FOR MULTIPLE RP BACKFLOW PREVENTION DEVICES, A MINIMUM SEPARATION OF 18 INCHES IS REQUIRED.
- H TYPE OF BACKFLOW PREVENTION DEVICE REQUIRED, REDUCED PRESSURE PRINCIPLE, LEAD FREE.
- I THE AGENCY REQUIRES ACCESS TO RP BACKFLOW DEVICE. SEE PCWA SPECS., DIV. 2, SECT. 3.
- J NO CONNECTIONS WILL BE ALLOWED BETWEEN THE METER AND THE RP BACKFLOW PREVENTION DEVICE.
- K FOR ADDITIONAL REQUIREMENTS, SEE "PCWA IMPROVEMENT STANDARDS", VOLUME 1 DISTRIBUTIONS AND CONVEYANCE, DIV. 2 IMPROVEMENT STANDARDS SECTION 3, CROSS CONNECTION CONTROL, RP BACKFLOW PREVENTION DEVICES.

A PRE-APPROVED MATERIALS LIST IS LOCATED IN APPENDIX D.

**COLD CLIMATE BACKFLOW
RP DEVICE, 2-1/2" AND SMALLER**

DRAWING NO.
S509



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REVISION DATE
09-20-15

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