GOLETA WATER DISTRICT
SANTA BARBARA COUNTY
CALIFORNIA

STANDARDS & SPECIFICATIONS FOR THE CONSTRUCTION OF WATER FACILITIES

January 2023

General Manager Regulations

TITLE 4:
Water Service

These regulations implement Policy as adopted by the Goleta Water District Board of Directors through Resolution and by Ordinance in the ordinary course of Legislative Business. The policies and procedures contained in the Regulations form the entirety of the authority granted to the Officers and Staff to carry out the daily operations of the District. All previous iterations of Title 4: Water Service Regulations issued by the General Manager are rescinded and superseded by this document. General Manager Regulations are prepared and approved under the direction of the Assistant General Manager and formally accepted by the General Manager consistent with District Code Section 1.01.040.

General Manager Acceptance _____ Date 1/3/23

GOLETA WATER DISTRICT

STANDARDS & SPECIFICATIONS

TABLE OF CONTENTS

PART I

TABLE OF CONTENTS

PART I – GENERAL REQUIREMENTS

1.01 – General Requirements

1.01.01 Applicability

These Standards & Specifications apply to water system facilities that are to become an extension or modification of the Goleta Water District's (District) water supply system. The design requirements, criteria, and technical requirements set forth in Parts I, III, IV, and V apply to all modifications or extensions of the District's system. However, the procedural requirements set forth in Part II apply only to applicants who are required to improve or add to the District's water supply system as a condition of a project being undertaken.

1.01.02 Purpose

These Standards & Specifications establish standard procedures for applying for new or expanded water service, and for the design, and construction of water facilities that are to modify, repair, or extend the existing District water supply system.

1.01.03 Definitions

The terms below shall be used in these Standards & Specification as defined herein.

Acceptance – The formal written acceptance by the District of water supply system improvements that have been completed in all respects in accordance with the Plans and Specifications and any deviations approved separately in writing by the District.

Agreement – The application and agreement for construction of water facilities between the District and Applicant.

Applicant – The individual(s) or entity applying to the District for new or expanded water service connection and/or construction of water system facilities.

Backfill – The material used to refill excavated trench from top of pipe bedding to roadway subgrade.

Bedding – That material surrounding the pipe used to support and protect the pipe. The bedding extends from four inches below the bottom of the pipe to 12 inches above the top of pipe.

Board – The Board of Directors of the District.

City – The City of Goleta unless noted otherwise.

Commercial Agricultural Purposes – as used in Goleta Water District Code Section 1.04.020 (A),' means the growing of crops or raising of animals for the production of either food or fiber that is sold or donated to a tax-exempt organization for mass distribution.

Contract – For work to be performed on behalf of an Applicant, Contract shall mean the written agreement between the Applicant and its Contractor. For work to be performed under a public works contract between the District and a Contractor, the term Contract shall mean the contract between the District and the contractor.

Contract Documents – The GWD Standards & Specification for the Construction of Water Facilities, the Plans (Construction Drawings) which show the work to be constructed, and all other applicable bidding and contractual documents.

Contractor – The individual(s), partnership, corporation, joint venture, or other legal entity having a contract or agreement with an Applicant to construct permitted work. When imperative statements are directed to the Contractor in the District Specifications it is the Applicant's responsibility to ensure that those directives are carried out as set forth in the District Specification.

County – The County of Santa Barbara.

District – The Goleta Water District, its successors, and assignees.

District Code – The Goleta Water District Code.

District General Manager Regulations – The Goleta Water District Rules and Regulations set forth by the Goleta Water District General Manager including all amendments, and revisions.

District Standards & Specifications – These Standards & Specification for the Construction of Water Facilities for the Goleta Water District included in the General Manager Regulations.

Easements – A right of access and/or use over, through, on, or under the property of another.

Final Approval –Final approval shall mean either the final discretionary approval by the applicable land use agency of an application for development of a project such as a subdivision map or development plan meeting the following conditions:

1. the entire project was reviewed by the District in conjunction with the land use or its subsequent building permit application, and
2. the entire project received a Preliminary Conditions Letter or Conditional Can and Will Serve Letter from the District that is still in effect.

or, for an application for which discretionary land use approval is not required, final approval shall mean the approval (or issuance) by the applicable land use agency of a land use permit or equivalent entitlement for a project meeting the following conditions:

1. the project was reviewed by the District in conjunction with the land use or its subsequent building permit application, and
2. the project received a Preliminary Conditions Letter or Conditional Can and Will Serve Letter from the District that is still in effect.

General or District Manager – The General Manager of the Goleta Water District or his or her authorized representative.

Inspector – An inspector on staff or under contract with the Goleta Water District.

Measurable Rainfall (or Measurable Precipitation) – Any precipitation or rainfall event, or series of events, within any 48 hour period that results in cumulative precipitation greater than or equal to 0.5 inches.

Material – All pipe, valves, fittings, structures, trench backfill, pipe bedding and other items that are required to complete the work as required by the Plans and Specifications.

Plans – Construction drawings, including water plans and profiles, cross sections, detail drawings, signed and stamped by the District Engineer or his/her authorized licensed representative, which show the location, character, dimensions and details for the work to be constructed.

Project Engineer or Design Engineer – The Applicant's civil engineer, having a current valid license to practice civil engineering in the State of California.

Record Drawings – A set of the project plans marked to show revisions and/or changes as a record of the construction that was performed.

Specifications – The directions, provisions, and requirements contained herein and as supplemented by such provisions and/or technical specifications pertaining to the method and manner of performing the work or to the quantities and qualities of materials to be furnished under the permit or Contract.

State – The State of California.

Uniform Plumbing Code – The Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials as supplemented by CRC, Title 24, Part 5 (California Plumbing Code), edition in effect at time of project construction.

Work – All construction, repair, maintenance or other work to be performed under District direction, whether in or out of contract, in accordance with the Plans, Specifications, special provisions, and/or permit.

1.01.04 Abbreviations

The abbreviations below shall be defined in these Standards & Specifications as follows:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
Caltrans	California State Department of Transportation
CADD	Computer aided design and drafting
CCWSL	Conditional Can and Will Serve Letter
Code	Goleta Water District Code
CRWQCB	California Regional Water Quality Control Board
FCWSL	Final Can and Will Serve Letter
GIS	Geographic Information System
GWD	Goleta Water District
HCF	Hundred Cubic Feet
IAPMO	International Association of Plumbing and Mechanical Officials
NEMA	National Electrical Manufacturers Association
NSF	National Sanitation Foundation
PCL	Preliminary Conditions Letter
PWSD	Preliminary Water Service Determination
SSPWC	Standard Specifications for Public Works Construction (Green Book)
WSC	District Water Supply and Conservation Department

1.02 – California Environmental Quality Act (CEQA) Implementation Guidelines

The District shall implement California Environmental Quality Act (CEQA) pursuant to State CEQA Implementation Guidelines, California Code of Regulations, Title 14, Section 15022(d).

To provide consistency with the current State CEQA Guidelines, the District objectives, criteria and procedures will be applied in accordance with the California Code of Regulations, Title 14, Section 15022(a). The most current version and any future revisions to the state CEQA Guidelines (15000 et. seq.) shall be applicable to the District.

PART II

TABLE OF CONTENTS

PART II – WATER SERVICE APPLICATIONS

2.01 – Application Requirements

2.01.01 District Application

Applications for new or expanded water service are reviewed and processed in accordance with the definitions and procedures outlined in Title 5 of the District Code and these Standards & Specifications.

A. Request for Water Service

All Applicants seeking New Water Service for New Development or other uses as defined in District Code, Chapter 5.04 within the District service area must submit a completed Application to the District along with the applicable fee and requested supporting material, including project plans and cross-connection survey form. The request for water service must identify the property by street address and/or Assessor Parcel Number and must also include a complete project description, including calculations for fire system maximum demand and maximum domestic and irrigation demands in gallons per minute, along with fixture counts. .

The water service application form and cross connection survey form are available from the District upon request.

The District will determine the water service availability for, and summarize the proposed project through, the issuance of a Preliminary Water Service Determination (PWSD). The PWSD will direct the Applicant to the Santa Barbara County Planning and Development Department or the City of Goleta Planning and Environmental Service Department to inform the County or City of the availability of service.

The Applicant must return a signed copy of the PWSD to the District prior to a Preliminary Conditions Letter for water service being issued. If the Applicant is not applying to the County or City for a permit, then a PWSD is not necessary.

<u>Determination to use Recycled Water</u>

For Applicants seeking recycled water, the District will determine whether or not recycled water is available and the conditions required to be met by the Applicant to obtain recycled water service. In accordance with State law, Applicants must use recycled water for designated uses whenever it is reasonably available.

B. Application Time Frames

An application will be active for a period of one year from the date of submittal to the District and will expire at the end of that one-year time frame unless extended. A complete application may be extended for an additional time period of one year following a written request to the General Manager by the Applicant prior to the date of expiration of the application. Applications are not transferrable.

C. Preliminary Conditions Letter

If water service is available to serve the proposed project, the District will issue a Preliminary Conditions Letter (PCL) to the Applicant, which may address at least the following matters as applicable:

1. A preliminary estimate of the water allocation and New Water Supply Charge for the proposed project consistent with the procedures set forth in District Code, Chapter 5.08.
2. A determination whether plans are necessary for District Plan Check review and approval.
3. A preliminary determination of new water system improvements required to serve the proposed project.
4. Right-of-way and/or easement requirements as applicable.
5. Fire Department Conditions Letter requirements as applicable.
6. Backflow prevention device requirements as applicable.

If there are any changes made to the project after the PCL has been issued, the changes must be submitted in writing to the District by the Applicant. The changes will be reviewed to determine if the PCL must be revised. If unauthorized changes are made without District approval, the PCL may be voided by the District.

A PCL is valid for a period of one year from the date of issuance and expires at the end of that one year unless extended. A PCL may be extended by the General Manager for one or more extensions of up to one year following a written request to the General Manager that is received by the District prior to the date of expiration. A PCL is not a contract. It is issued in compliance with the current District rules and regulations related to the approval of an application for water service. A proposed project will be subject to any applicable future changes and modifications in District rules and regulations. If the project or property ownership changes, a new application and fee to process the application for water service will be required.

2.01.02 Fees

The Applicant must pay the applicable fees to the District for the new and/or expanded water supply, meter service, and for the costs and expenses incurred by the District during the Application processing, design, and construction phases of the proposed project. The timing of such payment must be consistent with the District Code and as set forth in the Preliminary Conditions Letter for the proposed project. In instances where no land use approval is required for a requested new or expanded water supply, the New Water Supply Charge may be paid as set forth in the Preliminary Conditions Letter, prior to issuance of a Final Can and Will Serve Letter.

A list of fees and charges for obtaining water service is available from the District upon request.

2.01.03 Conditional and Final Can and Will Serve Letter

A Conditional Can and Will Serve Letter (CCWSL) may be issued for the proposed project following completion of a Plan Check and determination of any required deposits or fees. Conditions in the PCL or CCWSL may be revised by the District prior to issuance of a Final Can and Will Serve Letter (FCWSL) if any of the following occur: 1) The District determines that there have been changes or additions to the application or proposed project; 2) There have been changes to the applicable District rules, regulations, code, standards and/or specifications; 3) Changes are required by other public agencies such as the County Department of Public Health.

A FCWSL is not a guarantee of water service. If a FCWSL has been required, one will be issued by the District upon all of the following conditions having been met:

1. The District has determined that the proposed improvement can and will be served by the District.
2. The Applicant has received all necessary County or City approvals and provided a certified copy of the final building permit.

3. The District has reviewed the relevant approved County or City Conditions of Approval, and the District has made any resulting necessary revisions to the PCL or CCWSL.
4. All financial arrangements have been met including payment of all fees, charges, and deposits, and the posting of all required securities, i.e., letters of credit of bonds, acceptable to the District.
5. All conditions required by the District for issuance of a FCWSL have been met.

2.01.04 Temporary Water Service

Temporary Water Service as defined in District Code Chapter 6.12 may be provided for the following:

- Construction interim. Examples include: dust control, job site offices, model homes, water system testing, water system repair, etc.
- Special temporary uses. Examples include: circuses, bazaars, fairs, temporary restaurants, etc.

Temporary water service may be permitted for up to a maximum period of 18 months. An approved temporary water service connection is not a guarantee of water service and may be terminated at any time and is subject to District water availability.

For temporary water service, an application for Water Service must be submitted including proposed use and expected duration of the temporary service (not to exceed 18 months). At the Applicant's cost, a backflow prevention device must be installed and inspected by the District prior to the activation of service.

Temporary service will normally be provided through a fire hydrant or 'end drain'. If the Applicant requires more than one temporary meter, a separate application is required for each service requested. If service is provided through a fire hydrant, fire department approval may be required prior to installing a temporary service connection.

After Application approval and receipt of fees and deposits, if sufficient water is available, the District will install the temporary meter and backflow device and perform necessary inspections. Once installed and tested, temporary water service will be activated, and billing will commence. The monthly bill will include monthly meter and backflow charges, along with a commodity charge as set forth in Appendix A of the District Code).

Unless a request for an extension of time to continue use of the temporary water service is submitted in writing no later than 10 business days prior to the expiration date of the service, and the District approves the extension request, the temporary service will be terminated and the meter removed on the termination date set forth in the Application. A written request for extension of time must provide an explanation and documentation justifying the extended time period.

If an Applicant with an active temporary service desires to relocate the temporary meter, an additional written request including any changes in use or duration must be submitted along with an installation administration charge. Approval of meter relocation is subject to additional review and backflow testing inspection by the District.

2.01.05 Affordable Housing Projects

The District will plan for proposed developments that include housing affordable to lower income housing as defined in Government Code section 65589.7(d)(1). District staff will assist developers of those projects through the new water service application process.

Pursuant to California Government Code Section 65589.7(c), the District will not deny or condition the final approval of an application for services to, or reduce the amount of service applied for by, a proposed development that includes housing units affordable to lower income households unless the District makes specific written findings that the denial, condition, or reduction is necessary due to the existence of one or more of the following reasons:

1. The District does not have "sufficient water supply," as defined in paragraph (2) of subdivision (a) of Government Code Section 66473.7, or is operating under a water shortage emergency as defined in Section 350 of the Water Code, or does not have sufficient water treatment or distribution capacity, to serve the needs of the proposed development, as demonstrated by a written engineering analysis and report.
2. The District does not have sufficient water treatment or distribution capacity to serve the proposed development, as demonstrated by a written engineering analysis and report on the condition of the treatment works to serve the needs of the proposed development.
3. The District is subject to a compliance order issued by the State Department of Health Services prohibiting new water connections.
4. The applicant has failed to agree to reasonable terms and conditions relating to the provision of services generally applicable to development projects seeking service from the District, including, but not limited to, the requirements of local, state, or federal laws or regulations or the payment of a fee or charge imposed under Government Code section 66013.

2.01.06 Application Processing During Prohibition of New Water Connections

When the District has temporarily ceased approving applications for new or additional potable water allocations pursuant to a resolution of the Board of Directors, District staff will accept applications solely in order to determine whether a new water allocation may be required for a project, and in order to process applications for which no new water allocation is required.

Upon request by an authorized project applicant or property owner, staff shall research potential historical credits for a property and provide such information to the applicant or property owner without requiring a specific project application and application fee. Upon request, staff will provide historic water credit to any property owner prior to accepting an application and fee. No fee will be required for an inquiry regarding historic water credits for a property

If during the course of a project specific application, staff determines that the project being applied for would require a new water allocation; staff shall deny the application and shall not proceed to process the application further. No refund of the initial application fee is permissible. The applicant shall be notified promptly of the denial of the application. Staff shall notify the applicant that he or she may submit a future application for the proposed project at such time as the Board of Directors determines that water is available for new water service allocations.

2.01.07 Allocation of Historic Water Credit or Entitlement

Where a parcel with an historic water credit or entitlement, including a New Water Service credit as defined by District Code Section 5.16.041.B, has been subdivided into multiple parcels:

1. Absent an agreement or other document that is acceptable to the District specifying the relative apportionment of credit amongst the subdivided parcels, the District shall allocate the proportional water credit amongst the subdivided parcels based upon evidence of the location and extent of the prior water use on the original parcel.

2. In the absence of any records of apportionment of credit or evidence that is acceptable to the District of the location and extent of prior water use on the original parcel, the District will

apportion the historic water credit or entitlement based upon each of the subdivided parcel's proportional size relative to the original parcel.

2.01.08 Accessory Dwelling Units and Junior Accessory Dwelling Units

The development or conversion of an existing structure to an Accessory Dwelling Unit or a Junior Accessory Dwelling Unit, both as defined in Code Section 1.04, does not constitute New Development for which New Water Service is required and is not subject to the SAFE Water Supplies Ordinance. (California Government Code section 65852.2 and District Code Title 5)

An Applicant for an Accessory Dwelling Unit that is required to be separately metered as set forth in Code Section 6.20.020 may satisfy the separate meter requirement of that provision through the installation of a private submeter.

PART III

TABLE OF CONTENTS

APPENDICES

PART III - WATER FACILITIES ENGINEERING

3.01 -- DESIGN REQUIREMENTS

3.01.01 General

The Project Engineer must design all proposed water system facilities in accordance with all applicable requirements of the GWD Standards & Specifications. In addition to the design requirements presented in this Section, of particular relevance is Part V Technical Specifications and Part VI Standard Details.

For developments on property that is 2 or more acres in size and has 10 or more occupiable units, the development must be master metered unless the Chief Engineer determines that separate metering is feasible and practical. District meters must be located at the property boundary for water service to the property. At its sole discretion, the District may waive this requirement and extend District mains, service connections and appurtenances onto the property as the District may determine is best for water service to the development. See Standards & Specifications Sections 3.01.04 paragraph J, 3.01.04 paragraph N and 3.01.04 paragraph O. The property or homeowners Association must own and maintain all water lines and appurtenances on the property.

One (1) full size printed copy and one (1) electronic pdf file of the engineered construction drawings showing the proposed water system improvements as well as other project improvements, produced by the Project Engineer, must be submitted to the DISTRICT for review and comment. After DISTRICT review, an electronic pdf copy of the plans with comments will be returned for corrections. This process will continue until all DISTRICT comments are addressed. Any variance from the requirements set forth in the GWD Standards & Specifications may result in the rejection of the Application. Any and all deviations from design requirements must be proposed by the Project Engineer in writing to the DISTRICT prior to submittal of construction drawings. Any variance from GWD Standards & Specifications not identified during DISTRICT review will remain the Applicant's obligation to remedy, including until the end of the 1-year warranty period after final completion.

3.01.02 Project Engineer

All engineering work must be performed under the direction of a registered Professional Civil Engineer with a current valid license to practice in the State of California (Project Engineer). The Project Engineer's signature, stamp, and expiration date must appear on all final plans, specifications, reports, calculations, and documents submitted to the DISTRICT. However, a licensed architect, mechanical engineer or plumber may prepare water fixture unit calculations for on-site plumbing systems. For single family residential on less than 0.5 acre, applicants may submit their own fixture unit counts.

3.01.03 Plans

A. Format

Drawings for the construction of water system improvements must be prepared in the following format:

1. Sheet size must be 22 inch by 34 inch for full size and 11 inch by 17 inch for 50% reduced size. Borders, title blocks, plan and profile views must be as shown on GWD Std. Detail 1-01.
2. The Title Sheet and/or second sheet must include a vicinity map, sheet index maps at 100 scale, GWD General Specifications, project title with tract/parcel number, legend and

abbreviations (refer to GWD Std. Detail 1-01 and 1-02), utility contacts, benchmark, basis of bearing, name, address and phone number of Project Engineer, construction notes, and a statement that any deviations from GWD Standards & Specifications shall be the responsibility of the applicant to remedy, including until the end of the 1-year warranty period after final completion, and the maximum fire demand and maximum domestic demand.

3. A North Arrow and drawing scale must be included on all drawings.
4. Drawings must include Plan views, Profile views, typical meter location details, applicable GWD Standard Details, District easements and other non-standard details. Profiles must include existing or proposed surfaces over the centerline of the waterline.
5. The Horizontal scale of the plan and profile view for full size drawings must be 1 inch = 20 feet. Other scales may be used if approved in writing by the DISTRICT prior to design and drafting of construction drawings; however, the scale must not be smaller than 1 inch = 40 feet.
6. The Vertical scale of the profile view for full size drawings must be 1 inch = 4 feet. Other scales may be used if approved in writing by the DISTRICT prior to design and drafting of construction drawings; however, the scale must not be smaller than 1 inch = 8 feet.
7. The scale to be used for details must be 1 inch = 4 feet or larger as appropriate.
8. Construction notes and note numbers must be consistent on all drawing sheets and not change from sheet to sheet.
9. Preliminary plans and draft documents must be marked “preliminary” or “draft” and include the name and registration number of the Project Engineer.
10. All new or proposed sewer, recycled water, and/or storm drain pipelines and their horizontal and vertical separations from water mains and service lines shall be clearly identified in plan view, profile view, and construction notes
11. Plans must include expiration note for review date.

B. Drafting

All drawings provided to the District must be drafted in CADD and submitted to the DISTRICT as electronic files and on paper. The electronic files must be fully functional in AutoCAD release 2020 or latest AutoCAD format. The use of “sticky backs” will not be permitted. Paper copies submitted for plan check may be ink printed on bond paper. Final copies of plans for submittal to the DISTRICT for signature and construction must be an electronic pdf file with a digital signature of the Project Engineer. Record Drawings must be submitted on ink printed Mylar and as an electronic pdf file with a digital signature of the Project Engineer. (Please refer to Section 3.03.02 Plan Submittal and Review, for plan checking procedures.)

C. Existing Utilities

The drawings must show the precise location, depth, size, and pipe material for all existing underground utilities, storm drains, sewers, structures, and other facilities. The Applicant is required to precisely locate underground utilities by potholing and surveying unless this requirement is explicitly waived in writing by the DISTRICT. Even if the DISTRICT waives the requirement for potholing and surveying, the Applicant will be solely liable for any resulting required design modifications or relocations, whether required by the District, or another governmental entity with jurisdiction.

D. Easements

All District and utility easements must be shown on plans. The following shall not be allowed within District easements: erected structures; trees planted; plants with deep roots; and/or other conflicting structures and vegetation as deemed by the District.

E. Plan Reduction

All drawings must be clearly readable at full size, 22" x 34" and reduced size of 11" x 17". To maintain plan readability, text height must not be less than one-tenth (0.10) of an inch on full size drawings.

F. Applicability of Goleta Water DISTRICT Water Specifications

The Goleta Water DISTRICT Specifications **DO NOT** follow the Standard Specifications for Public Works Construction (Greenbook). The Greenbook must **NOT** be used or referenced on the construction drawings.

Notes of the Water General Specifications, presented in Standard Detail 1-04 must be printed on the construction drawings. When reclaimed/recycled water system facilities are to be constructed, applicable notes, also presented in Standard Detail 1-04, must also be printed on the construction drawings.

3.01.04 Design Criteria for Potable Water Lines

A. Estimated Water Demand

Estimated average daily flow demand for potable water service must be calculated as follows if more specific data are not available:

Type of use	Size category	Approximate demand
Residential	Single family	500 gal/day/sfr
	Multi Family	350 gal/day/unit
Commercial	Light Heavy	2000 gal/acres/day 3000 gal/acres/day
Irrigation (non potable)	Turf irrigation	1.6 gpm/100 sq.-ft of irrigation surface
Agriculture	Varies	To be determined by District on a case by case basis
School, hospital or institutional	Varies	To be determined by District on a case by case basis

A peaking factor must be used to determine the following demands:

Peak Factor				
Maximum Day Demand	=	2.0	X	Avg. Day Demand
Peak Hour Demand	=	3.0	X	Avg. Day Demand

Values here are given as a guide and should only be used when other more specific data are not available.

Fire flow rates must be as required by the Santa Barbara County Fire Department.

B. Sizing of Pipes

Proposed water line pipe diameters must be sized to supply the maximum day water demand plus required fire flow or peak hour demand, whichever is greater, while maintaining a pipeline velocity no greater than 8.5 feet per second. The Project Engineer must submit to the DISTRICT hydraulic calculations demonstrating the adequacy of the selected pipe size. Peak flows, fire flows, pressures, velocities, and hydraulic gradient must be presented. The DISTRICT will review the Project Engineer's proposed pipe size and make a final determination of size to be installed.

Minimum pipe diameter for water lines must be 8 inches unless otherwise approved by the DISTRICT. The DISTRICT will not approve any main size less than 6 inches diameter and will only consider approval of 6-inch diameter pipe for dead end runs of 300 ft or less that have no fire hydrants and no potential for future extension or looping.

Headloss for pipes less than or equal to 12 inches diameter must be less than 10 feet per 1000 feet of pipe. For pipes greater than 12 inches diameter, headloss must be less than 3 feet per 1000 feet of pipe. The Hazen-Williams flow coefficient for new PVC pipe must be C=140 and for new steel or ductile iron pipe must be C=130.

C. Thrust Restraint

Thrust restraint must be provided to prevent movement of pipe or appurtenances in response to thrust forces. Thrust restraint must be used whenever pipelines:

- Change direction (e.g. tees, horizontal bends, vertical bends, and crosses)
- Change size (e.g. reducers)
- Terminate (e.g. dead end)
- Connect to valve or hydrant at which thrust develops when opened or closed.
- Are subject to conditions in which thrust forces might occur and cause movement of pipeline or appurtenances.

Where required, thrust restraint must be provided in the form of welded joints for steel pipe and retainer glands and joint restraints for PVC and ductile iron pipe. Concrete thrust blocks may also be used for PVC and ductile iron pipe. Restrained pipe lengths for PVC and ductile iron pipe must be in accordance with the table below for pipe sizes 12-inches or less. Calculations must be submitted whenever retainer glands and joint restraints are used for pipe larger than 12-inches in diameter, or when non-standard thrust blocks are used. Calculations must identify the lengths of pipe to be restrained in all directions at each fitting.

Restrained Pipe Length (ft) in All Directions from Fitting

Pipe Dia. (in)	Tee Run/Branch	45 V-Bend U/L	90 Bend	45 Bend	22.5 Bend	11.25 Bend	Dead End
4	20/5	30/10	30	15	10	5	65
6	20/15	40/10	40	20	10	5	90
8	20/45	50/10	55	25	15	10	120
10	20/65	60/15	65	25	15	10	140
12	20/90	70/15	75	30	15	10	165

When used, thrust block must be sized as shown in Std. Detail 3-09 for pipes up to 14 inches in diameter, unless a report prepared by a California licensed geotechnical engineer is submitted stating that the soils at the project site have a higher allowable soil bearing capacity for horizontal restraint than 1,000 pounds per square foot (psf). In such case, thrust blocks may be designed using the allowable soil bearing pressure determined by the geotechnical engineer.

The thrust blocks in Std. Detail 3-09 are sized for a water system pressure of 250 psi. In cases where the DISTRICT's maximum working pressure (normal system pressure) plus a surge allowance may be higher than 250 psi, thrust blocks must be designed for the maximum working pressure plus surge allowance. Surge pressures must be determined using current AWWA Manuals of Practice for water supply.

For pipe sizes greater than 14 inches in diameter, thrust blocks must be designed using site specific soil bearing capacities as determined by a geotechnical engineer and 250 psi water pressure or maximum working pressure plus surge allowance, whichever is greater. The following thrusts must be used in calculating restraint requirements for thrust blocks**.**

Thrust at Fittings in Lbs. per 100 psi of Water Pressure

Pipe Dia. (in)	90° Elbow	45° Elbow	22.5° Elbow	11.25 Elbow	Valves, Tees, Crosses, and Dead Ends
4	2,200	1,200	600	300	1,600
6	4,800	2,600	1,400	700	3,400
8	8,600	4,700	2,400	1,200	6,100
10	13,400	7,300	3,700	1,900	9,500
12	19,200	10,400	5,300	2,700	13,600
14	26,200	14,200	7,300	3,700	18,500

D. Service Pressure and Connections

Service Pressure- Water system facilities must be designed to have an average working pressure between 50 psi and 80 psi working water pressure at all meters. The maximum working pressure must not exceed 120 psi. Additionally, service pressure must not drop below 20 psi for flow conditions in mains equal to maximum day demand plus fire flow. Pressure regulator valves must be supplied and installed on the customer's side of the meter as required in accordance with the current Uniform Plumbing Code.

Service Connections- The Project Engineer will submit water demand requirements, i.e. flow rate, for service connections. Submittal of water demand requirements must include building fixture counts, irrigation system requirements and other appropriate data necessary to determine meter size and service connection size. The DISTRICT will make the final determination of service connection and meter sizes. At a minimum, new and replacement copper service lines should be sized such that the maximum demand or required fire flow plus 5 gpm, whichever is greater, maintains a pipeline velocity no greater than 8 feet per second. New and replacement service lines must be no smaller than 1 inch in diameter.

E. Fire Protection

Location and number of fire hydrants shall be as required by Santa Barbara County Fire Department and by the DISTRICT Chief Engineer. Fire flow requirements will be determined by the Santa Barbara County Fire Department. A letter from the Santa Barbara County Fire Department setting forth the required fire flows and hydrant

locations for the project must be submitted to the DISTRICT. Fire hydrants must 1) conform to AWWA Std C503, 2) be a type approved by the Santa Barbara County Fire Department and 3) be made by a manufacturer approved by the DISTRICT.

Fire hydrants must be located a minimum of five feet clear of above and below ground obstructions such as vaults, utilities, and driveways, and ten feet clear of trees, bushes and buildings. Fire hydrants must not be located behind curb returns or within five feet of the beginning or end of a curb return along a street. See GWD Standard Detail 4-01 and 4-02.

F. Looping System

To the extent possible, all water system piping to be connected to DISTRICT water supply system must be connected in two or more locations to the existing system. Dead end mains must be avoided whenever possible. Looping will allow greater flexibility for maintenance and repair and provide better fire flow in system hydrants. Rights of Way and/or easements must be provided for water system improvements as necessary to accommodate a looped system.

G. Isolation Valves

Gate valves and/or butterfly valves must be provided at various locations sufficient to allow for isolation of pipe segments and pipe appurtenances. Tee intersections of pipeline must have a minimum of two pipes valved at the intersection fitting. Cross intersections of pipeline must have a minimum of three pipes valved at the intersection fitting. In-line valves must be spaced at a maximum distance of 1000 feet. In general, resilient seat gate valves must be used on waterlines less than or equal to 12 inches in diameter, and butterfly valves must be used on waterlines greater than 12 inches in diameter. When used with PVC pipe greater than 12 inches in diameter, butterfly valves must be flanged and equipped with flanged-by-mechanical joint adapters. Final valve location, types, and sizes must be approved by the DISTRICT.

H. Combination Air Valves and Blow-off Assemblies

Combination Air Valve assemblies are required at all high points in water mains and along pipeline runs of more than 2000 feet. Only combination air valves (air release and air/vacuum) must be used in the DISTRICT water supply system. Combination air valves must be sized in accordance with Standard Detail 2-10. For waterlines 18 inches in diameter and larger, combination air valves must be sized by a registered engineer and calculations must be submitted to the DISTRICT for review. Combined 2-inch combination air valve and end drain per Standard Detail 2-10 are required at all dead end high points of waterlines.

Blow off assemblies must be provided at all significant low points in the water supply system. Where practical, the DISTRICT may require that a fire hydrant be used in place of a blow off assembly. Blow off assemblies must be sized using the following criteria:

- The size of the pipe to the blow off valve must be sufficient to drain the main in less than four hours.
- The blow off assembly must be sized to create a minimum velocity of ten feet per second in the main. This will allow for sediments to be removed.

Combination air valve and blow off assemblies must be located a minimum of five feet clear of above and below ground obstructions such as vaults, utilities, curb returns, street lights, street signs and driveways and ten feet clear of trees and bushes.

I. End Drains

End drains must be provided at the end of all dead end waterlines. A fire hydrant may be used in place of an end drain upon written approval by the DISTRICT. Wherever a dead end waterline ends in a high point, a combined 2-inch combination air valve and end drain per Standard Detail 2-10 must be installed to serve the dual purpose of end drain and combination air valve.

End drains must be located a minimum of five feet clear of above and below ground obstructions such as vaults, utilities, and driveways, and ten feet clear of trees and bushes.

J. Meters

The DISTRICT will supply and install all service meters, except for fire meter assemblies, which the CONTRACTOR must install. Meters must be no larger than the service line. Refer to the DISTRICT Approved Materials List for approved materials and manufacturers.

All plans involving residential meter installation must include a typical meter location detail.

Meters must be located as follows:

- Case 1 - Landscaped Parkway Between Curb and Sidewalk. Meter boxes must be located directly behind the curb (6 inches from back of curb).

- Case 2 - Sidewalk Directly Behind Curb with Sufficient Right-of-Way Width. Meter boxes must be located directly behind the sidewalk if the right-of-way extends a minimum of four feet behind the sidewalk.

- Case 3 - Sidewalk Directly Behind Curb and Right-of-Way Ends Near Back of Sidewalk. Meter boxes must be located directly behind the curb (in the sidewalk).

Meters must be located a minimum of five feet clear of above and below ground obstructions such as vaults, utilities, curb returns, street lights, street signs and driveways, and ten feet clear of trees and bushes.

Unless waived by the DISTRICT in writing, developments on property that is 2 or more acres in size and has 10 or more occupiable units, must be master metered at the property boundary for water service to the property. Master meters must be located within the public right-of-way or an easement granted to the DISTRICT. Backflow prevention devices must be installed and located as close as possible and downstream of the master meters. In the City of Goleta, backflow prevention devices must be installed within 12 inches of the public right-of-way. All occupiable units on the property must be sub-metered by the property owner.

Meters for single family residences with sprinklers systems must use the higher of the two flow rates: peak domestic demand, or peak fire system demand plus 5 gpm.

K. Cross Connection Control

Water facilities must be designed in accordance with good cross connection control practices, and in accordance with the requirements of the GWD Code, Title 6, Chapter 6.16, and the State of California Code of Regulations Title 17 and/or Title 22. All connections to the public water supply must also conform to the requirements of Section 3.02 Cross Connection Control of these Standards &Specifications.

Installations of backflow devices must conform to the guidelines set forth by GWD Standards & Specifications and Standard Details, and the State of California Department of Public Health and the California Plumbing Code, current edition. If there is a conflict between any of the guidelines, the more stringent guideline prevail.

In the City of Goleta, backflow prevention devices must be installed within 12 inches of the public right-of-way.

L. Minimum and Maximum Pipe Cover

Potable Waterlines – All potable waterlines 12 inches or smaller in diameter (ID), must have a minimum cover of 36 inches from finish surface grade to top of pipe. Potable waterlines greater than 12 inches and less than or equal to 24 inches diameter (ID) must have a minimum cover of 42 inches from finish surface grade to top of pipe. For waterlines over 24 inches in diameter (ID), the Project Engineer must submit design recommendations and calculations for the proposed depth of the pipeline to be reviewed and accepted by the DISTRICT. Maximum cover must not exceed 120 inches.

Recycled/Reclaimed Waterlines – All recycled/reclaimed waterlines, must have a minimum cover of 60 inches from finish surface grade to top of pipe or 12 inches from bottom of potable water mains to top of the reclaimed waterline, whichever is greater and as approved by the DISTRICT and County Environmental Health Services Division. Maximum cover must not exceed 120 inches.

M. Pipe Materials

For waterlines 6 inches to 12 inches in diameter, ductile iron or PVC pressure pipe must be used. Ductile iron pipe must be manufactured in accordance with AWWA C150 and for a minimum of 150 psi rated working pressure plus a surge allowance of 100 psi and a safety factor of 2.0 upon the combination of working pressure and surge allowance i.e. (150psi working pressure + 100psi surge allowance) x 2 safety factor provides a minimum total design pressure considered of 500 psi. PVC pressure pipe must be manufactured in accordance with AWWA C900. PVC Pipe must be pressure rated as class 200 (DR14).

Designer must consider the effects of dead load of soil, live loads (traffic), and surge pressures. PVC pipes must be provided with bell and spigot push-on joints with integral gaskets. All fire hydrant runouts must be AWWA C900, Class 200 (DR 14) PVC.

Steel pipelines greater than 12 inches in diameter must be cement mortar lined and coal tar enamel tape wrapped per AWWA Standards C203 and C205. Steel pipe must also be used when the designer determines PVC is not feasible for the particular application or if required by the DISTRICT. Steel pipe must be joined by welded lap joint (slip) or welded butt strap for under ground applications and flanged joints for above ground applications.

Other pipe materials may be used if approved by the DISTRICT. Other pipe materials are identified in Part V, Technical Specifications.

All metallic pipe must be designed with cathodic protection as required by the DISTRICT. Applicant must obtain DISTRICT direction prior to design.

N. Water Main Location

Whenever possible, water mains must be located under roads within the paved area and in conformance with State of California Department of Public Health requirements for sewer- water separation. Mains to be located within County or City road right-of-way must be located 7 feet from the easterly or southerly curb face unless otherwise approved by the DISTRICT. The DISTRICT will make the final determination of the location of all mains.

DISTRICT water mains on private property must be located under paved roadways having a minimum traveled roadway width of 32 feet and must be a minimum of 7 feet from the face of the southerly or easterly curb face or edge of pavement. The Project Engineer must obtain written approval for main location in private road rights-of-way, from the DISTRICT prior to preparation of construction drawings. Water lines and appurtenances may be located in easements on private property if acceptable to the DISTRICT and the location has been approved by the DISTRICT; however, no service connections will be allowed in easements along side or back yard mains.

Water mains must also be located to maintain separation from other underground pipes (sewer and recycled water) as required by the State Department of Public Health and separation from other underground and aboveground utilities and bioswales or other stormwater impoundments. See GWD Standard Detail 2-01.

O. Easements (Waterlines on Private Property)

A 20-foot wide easement must be granted to the DISTRICT for all waterlines on private property with less than 4 feet of cover from finished grade. For waterlines with more than 4 feet of cover, 2 feet of width must be added to the 20-foot easement for each additional one foot of cover greater than 4 feet. Waterlines must be located 5 feet from an easement line, property line, or any other right-of-way line, or 1 foot for every foot of depth whichever is greater, except where required by the DISTRICT to allow for future extension, looping or access. If the water line easement is to be combined with other utility easements, the total width of easement must not be less than 25 feet. Easements must also extend to include and lie a minimum of 5 feet on each side of service connections, meters, hydrants and other appurtenances.

Easements must be provided to the DISTRICT without cost to the DISTRICT before the DISTRICT will sign the construction drawings. Prior to activation, easements must be recorded with the County of Santa Barbara. Easements must grant to the DISTRICT the right to install, operate and maintain water pipeline, valving, pumps, tanks, hydrants, electrical controls, instrumentation and appurtenances. The right of access, ingress and egress must also be granted to the DISTRICT with the easement. The easement must also state that the grantor of the easement and its heirs or assignees must not install or allow to be installed structures, trees, plants with deep roots, fencing, invasive landscaping, or other things which might interfere or hinder the DISTRICT's installation, operation, or maintenance of facilities in the easement, or interfere or hinder the DISTRICT's access or other rights to the easement. The easement must also state that the grantor of the easement, its heirs and assignees must be responsible for the cost of damage, repair, relocation, maintenance, and/or replacement of landscaping, paving, utilities and any other surface or subsurface features placed in the easement by the grantor of the easement, its heirs, assignee or other parties due to the DISTRICT exercising its rights within the easement.

P. Connections to Existing Asbestos Cement Pipe Waterlines

When possible, connections to existing asbestos cement pipe (ACP) waterlines should be avoided. Where a connection to an existing ACP waterline is necessary, the connection must be designed to avoid the need to cut the ACP during construction of the connection. The connection must be designed to remove intact full pipe sections without the need to cut the ACP.

Q. Existing Facilities

The Project Engineer must contact Underground Service Alert (USA) and all utility owners with facilities within the proposed construction area, conduct a field survey of existing facilities in the proposed construction area, review all available records of existing utilities in the project area, and pothole to determine location and depth of existing utilities. The information obtained on existing utilities in the proposed construction area must be shown on the plans.

3.01.05 Horizontal and Vertical Control

A. Datum

Horizontal datum for all topographic maps, construction drawings, and record drawings must be based on the North American Datum of 1983 (NAD83) and the Project Engineer must identify the basis of control and the epoch. Vertical datum and benchmark elevation must be based upon the North American Vertical Datum of 1988 (NAVD 88).

Benchmarks, basis of bearing, and control points must be clearly identified on the construction drawings.

B. Horizontal Control

Horizontal Locations of proposed water system improvements must be measured and referenced to the line of stationing along the centerline of the road wherever possible or as approved by the DISTRICT. Stations must be located at 100 foot increments and labeled every 100 feet. Stations for water system improvements must be determined as measured perpendicular or radially from the line of stationing.

Construction drawings must show horizontal dimensions and distances for all property lines, easements, rights-of-way, existing above and underground improvements, trees, landscaping and proposed new improvements. Ties to existing facilities, boundaries, coordinates, bearings and distances must be used to show exact locations of proposed water system improvements.

C. Vertical Control

Construction drawings must specifically define the vertical location of proposed water system improvements. Elevations or depths must be used to show the exact vertical location unless otherwise permitted by the DISTRICT.

Profile view must be used to show the existing surface elevation over the proposed improvements, the proposed finish surface elevation over the proposed improvements and elevation of the proposed improvements.

The top and bottom of proposed pipes must be shown in profile with connections of fire hydrants, blow-offs, air and vacuum valves, other valving and improvements.

3.01.06 Design Criteria for Other Potable Water System Improvements

A. Storage Tanks

Storage tanks must be designed in accordance with AWWA standards. Prior to design of the tank, the Project Engineer must submit the proposed location, positioning (above or below ground) and tank material for review and acceptance by the DISTRICT. The total capacity of a proposed tank must include, at a minimum, the following:

Operational Storage Component	25 percent of Maximum Day Demand
Emergency Storage Component	1 Day Volume of Maximum Day Demand
Fire Storage Component	As required by the Fire Department.

B. Pumping Stations

DISTRICT pumping stations must be designed with 2 or more pumps and must be capable of pumping the maximum day demand plus fire flow for the area being served with one pump out of service.

For private pump stations, the DISTRICT may require all private pumping equipment, valves, and electrical equipment to be located within an enclosed building structure. The Project Engineer must review the preliminary design with GWD and receive GWD approval for all aspects of the pumping station including secondary emergency power to operate the pumping station.

Pumping stations with service lines 4-inches and larger must use VFDs or soft starters or motorized ball valves to avoid creating pressure transients. Privately owned pump stations must use flow control valves downstream of meters to prevent water main flow velocities that exceed the DISTRICT standard of 8.5 feet per second.

3.01.07 Design Criteria for Recycled (Reclaimed) Water Lines

The design criteria for recycled water facilities are separated into two categories: public improvements and on-site facilities. Public improvements or off-site recycled water facilities typically consist of those recycled water facilities which are, or will be owned, operated, and maintained by the DISTRICT. Typically, these are facilities on the upstream side of the meter. On-site recycled water facilities typically consist of facilities that will be owned, operated, and maintained by the customer and are downstream of the meter (Please refer to section 3.02.08).

Recycled water systems must be completely separate from the potable water and sanitary sewer systems in accordance with State Department of Public Health and DISTRICT regulations and requirements. No connections between these systems will be permitted. Refer to GWD Std. Detail 2-01 for separation requirements.

Recycled water lines must be sized and designed using the same criteria as potable water mains except as follows:

All recycled PVC pipelines must be purple color, Pantone #522, and embossed or integrally stamped/marked continuously on two sides with the words “CAUTION: RECYCLED WATER – DO NOT DRINK” and identified in accordance with AWWA Guidelines in the Distribution of Non-Potable Water. If purple color pipe is not available, purple identification warning tape or purple polyethylene wrap may be upon written approval by the DISTRICT.

When approved, purple identification warning tape must be installed longitudinally over the center of the pipe directly on the pipe. The warning tape must be installed continuous for the entire length of the pipe and must be fastened to each section of pipe at 5-ft intervals. Warning tape must be attached to the sections of pipe before laying into the trench. Warning tape must have flaps sufficient for continuous coverage.

All recycled water system appurtenances constructed above finished ground surface must be factory coated with purple color industrial grade epoxy paint.

Warning signs stating, “CAUTION – RECYCLED WATER – DO NOT DRINK” must be installed at all locations of above ground recycled water facilities. Letters on the signs must be white or black, a minimum of ½ inch in height and printed on a purple (Pantone #522) background.

The minimum pipe size for recycled water mains must be 4 inches in diameter.

Construction plans for recycled water facilities must contain the DISTRICT Water General Specifications as listed in Std. Detail 1-3.

3.01.08 Design Criteria for On-site Recycled (Reclaimed) Water Facilities

A. General

This section sets for requirements for the design of end user on-site distribution facilities. Cross-connection control is needed to prevent any components of recycled water distribution system from mistakenly being connected to the potable water system. Therefore, the location, depth, mode of identification, and types of appurtenances such as sprinkler control boxes and quick couplers, must be analyzed carefully in order to avoid cross-connections and ensure the appropriate use of recycled water.

All potential uses of recycled water, including uses for landscape irrigation systems, construction purposes, recreational impoundment systems, or flushing toilets and urinals in non-residential buildings will be reviewed by the DISTRICT and the California State Water Resource Control Board Department of Drinking Water

All on-site recycled water piping must be installed in accordance with these specifications and the following: the DISTRICT’s “Waste Discharge Requirements and Master Reclamation Permit” (Permit No.97-06) issued by California Regional Water Quality Control Board (RWQCB), GWD Code Title 7 “Reclaimed Water Systems Rules & Regulations”, the Uniform Plumbing Code (UPC), American Water Works Association (AWWA) “Guidelines for Distribution of Nonpotable Water” , AWWA “Guidelines for the On-site Retrofit of Facilities Using Disinfected Tertiary Recycled Water”, and all other local governing codes, rules, and regulations.

California Code of Regulations, Title 22, and RWQCB requirements apply to all recycled water facilities in the DISTRICT as applicable.

B. Pressure

Pressures may vary significantly throughout the recycled water distribution system based on topography and proximity to recycled water booster pumping stations. Pressures also vary throughout the day due to changes in scheduled recycled water deliveries. On a case by case basis, the DISTRICT will provide applicants with typical system pressures for their project site.

C. Surge Protection

All pumping systems must have proper surge protection facilities to prevent the loss of recycled water though broken piping due to water hammer and pressure surges.

D. Prohibitions and Limitations

Design and construction of on-site reclaimed water facilities must comply with the following requirements:

1. Recycled water systems must be completely separate from and independent of potable water and sewer systems and must comply with State Department of Public Health separation requirements. Refer to Std. Detail 1-4.
2. Hose bibs on recycled water facilities are forbidden.
3. Drinking fountains must be protected from the direct spray of recycled water either by proper placement of the drinking fountain within the design area or the use of a stainless steel cover approved for this purpose. Refer to California Code of Regulations, Title 22, and RWQCB requirements.
4. Conditions that directly or indirectly cause overspray or runoff outside of the approved recycled water use area are prohibited.
5. Potable and recycled water pipelines are not to be installed in the same trench.
6. Recycled water must not be used for any purpose other than the approved uses as set forth herein.
7. The system must be designed to irrigate the design area within the allowable time periods as approved by the DISTRICT.

E. Control of Runoff

The DISTRICT encourages new and innovative methods of irrigation, which meet the requirements herein. The use of drip or subsurface irrigation may prove effective in the reduction of total water consumption and control of unnecessary runoff and overspray by containment of the recycled water to the design area.

In accordance with GWD Code, Title 7 for control of runoff and overspray within areas where recycled water is applied, the design of irrigation systems must comply with the following requirements:

1. On-site recycled water facilities must be designed to meet the peak moisture demand of all plant materials used within the design area.
2. On-site recycled water facilities must be designed to prevent discharge onto areas not under control of the customer. Part circle sprinklers may be used adjacent to roadways and property lines to confine the discharge from sprinklers to the design area.
3. The design of the on-site recycled water irrigation facilities must provide for watering during the periods of minimal public use of the design area. This is typically between the hours of 6 P.M. and 6 A.M., however, the exact irrigation time window may be as allowed by the DISTRICT. Consideration must be given to allow a maximum dry out time before the design area will be used by the public.
4. Unless otherwise approved by the DISTRICT, The total time required to water the entire irrigated landscape area must not exceed nine hours in any 24-hour period. Irrigation systems must be designed to operate within this time requirement.
5. Recycled water must be applied at a rate that does not exceed the infiltration rate of the soil. Where varying soil types are present, the design of the recycled water facilities must be compatible with the lowest infiltration rate present. Copies of the developer's soils test reports must be made available to the DISTRICT upon request.

F. Minimum Depth to Top of Piping

For on-site recycled water piping, the minimum depth from finished grade to top of pipe (minimum cover) must be as follows:

1. Constant pressure lines 3-inches and larger: 24” min. cover.
2. Constant pressure lines 2-1/2 inches and smaller: 18” min. cover.
3. Intermittent pressure lines: 12” min cover.

Where piping is under paved areas, the minimum cover depth listed above must be measured from below the subgrade of the road.

G. Information on Plans

1. Meter Data – The following information must be provided and shown at each recycled meter location.

   a. Meter size (inches); meter address and civil station number.
   b. Peak flow rate through the meter (gpm).
   c. Design pressure (static) at the meter (psi).
   d. Total area served through irrigation meter in square feet or acres.
   e. An estimate of the yearly water requirement through the meter (acre-feet).

2. Drinking Fountains – Exterior drinking fountains must be shown and called out on the recycled water system plans. If no exterior drinking fountains are present in the design area, it must be specifically stated on the plans that none exist. The potable water line supplying the drinking fountain must be clearly labeled on the plans and must have warning tape installed as described later in this section.

3. Irrigation Equipment Legend – For irrigation systems, a legend showing the pertinent data for the materials used in the system must be recorded on the plans. The legend must include a pipe schedule listing pipe sizes and materials of construction, a listing of valve types including quick-coupling valves, and the following information for each type of sprinkler head:

   a. Manufacturer and model number.
   b. Sprinkler radius (feet).
   c. Operating pressure (psi).
   d. Flow rate (gpm).
   e. Sprinkler pattern.

H. Controllers

Controllers of recycled water must be color-coded to differentiate the recycled water system from the potable water system. Controllers must automatically open and close the user’s on-site distribution valves and controllers must be capable of delivering water from five to 60 minutes per each start time. The DISTRICT reserves the right to have complete access to the controller clocks, for reasons of monitoring and controlling system failures.

Controllers must be labeled inside and outside, and include a warning that the system utilizes recycled water. The labels must also alert the system’s maintenance personnel of any important constraints on the operation of the system.

I. Controller Charts

Controller charts must be reviewed and approved by the DISTRICT. The controller charts must be placed in the controllers before commencing service. Failure to provide controller charts may result in termination of recycled water service.

Controller charts must meet the conditions as set forth below:

1. Provide one controller chart for each automatic controller showing the area covered by the controller. The chart must be the maximum size the controller door will allow.
2. The chart must be a reduced drawing of the actual system. The line weights and lettering on the original controller chart drawing must be drawn to provide a clearly legible reduced chart.
3. The chart must be a blackline print with a different color used to show the area of coverage for each station.
4. When completed and approved, controller charts must be sealed in a durable waterproof plastic cover.

J. Pipe Identification

All new buried distribution piping in the user's on-site water distribution system, including service lines, valve and other appurtenances, must be colored purple (Pantone #522) and embossed or integrally stamped/marked continuously on two sides with the words "CAUTION: RECYCLED WATER – DO NOT DRINK" and identified in accordance with AWWA Guidelines for the Distribution of Non-Potable Water. The markings must also include nominal pipe size, pressure rating in pounds per square inch at 73 degrees, and ASTM designation.

Standard PVC pipe may be used for intermittent pressure lines, downstream of a control valve that will not be subject to constant pressure as long as it is apparent, due to line size and location that the lines are part of a recycled water irrigation system.

Standard PVC pipe completely wrapped with purple warning tape, as specified below, may be accepted as an alternative to stenciled purple colored PVC pipe only on a project-by-project basis with prior written approval from the DISTRICT Engineer. The color of the tape must be in accordance with AWWA Guidelines for the Distribution of Non-Potable Water. Plastic warning tape must be prepared with black or white printing on purple field having the words, "CAUTION: RECYCLED WATER – DO NOT DRINK." The overall tape width must be a minimum of 3 inches.

When approved, purple identification warning tape must be installed longitudinally over the center of the pipe directly on the pipe. The warning tape must be installed continuous for the entire length of the pipe and must be fastened to each section of pipe at 5 ft intervals. Warning tape must be attached to the sections of pipe before laying into the trench. Warning tape must have flaps sufficient for continuous coverage. All risers between the main line and control valves must be installed with warning tape.

K. Quick-Coupling Valves

Quick-coupling valves used in recycled water systems must be constructed of brass with a purple colored rubber or vinyl cover, and must have a 1-inch inlet. The cover must have a warning with the following information:

1. "NON-POTABLE" or "RECYCLED WATER".
2. "DO NOT DRINK" in English and Spanish.

3. The international “DO NOT DRINK” warning symbol such as a glass of water with a slash through it.

The warning must be permanently stamped or molded into the cover. Locking covers may be required.

Quick-coupling valves for potable water use within a recycled water area must be 3/4-inch inlet size and must have a cover made of brass, metal, or yellow rubber or vinyl. Quick-coupling valves intended for recycled water use are not to be used on potable water systems.

L. Sprinklers

All sprinklers used in on-site recycled water systems must have an exposed surface colored purple to associate them with recycled water use. The exposed surface may be colored purple through the use of: (1) dyed plastic or rubber, or (2) weatherproof paint. If paint is used, it must be periodically inspected and repainted if significantly the color is no longer easily visible.

Where possible, the exposed surface must have the following warnings molded or hot-stamped upon it: (1) “DO NOT DRINK” in English and Spanish, and (2) the international “DO NOT DRINK” warning symbol. Sprinklers unable to meet these specifications must be identified with purple bilingual recycled water warning tags.

M. Public Access

All on-site recycled water facilities must have restricted public access so that the general public cannot draw water from the system. Facilities, such as washdown hydrants (typically found at tennis courts), blowoff hydrants, blowoffs on strainers, and other such facilities, must not be accessible to the public. The DISTRICT must approve the method of restricting public access in advance. Potential methods of restricting access include:

1. Housing recycled water facilities in an approved lockable container colored purple.
2. Using a sign reading “CAUTION: RECYCLED WATER – DO NOT DRINK” in. a size approved by the DISTRICT.
3. The use of valves that operate by means of a recessed key slot or by means of pentagonal heads (such as those typically found on fire hydrants).
4. Other means of restricting public access may be approved by the DISTRICT.

N. Warning Labels

The DISTRICT may require warning labels to be installed on designated facilities including but not limited to controller panels, valve boxes, control boxes, quick-couplers, and drip irrigation lines. The labels will identify that the system contains recycled water that is unsafe to drink.

O. Valve Boxes and Tags

All gate valves, manual control valves, electric control valves, and pressure relief valves for on-site recycled water systems must be installed below grade in purple valve boxes. Electrical and manual control valve boxes must have a warning label permanently molded into or affixed onto the lid. Warning labels must be constructed of a purple weatherproof material with the warning permanently stamped or molded into the label. The warning must contain the following information:

1. "NON-POTABLE" or "RECYCLED WATER".
2. "DO NOT DRINK" in English and Spanish.
3. The international "DO NOT DRINK" warning symbol such as a glass of water with a slash through it.

All control valves must be tagged with identification tags. Tags must be weatherproof plastic, 3" x 4", purple in color with the words "CAUTION: RECYCLED WATER – DO NO DRINK" imprinted on one side, and "AVISA – AGUA IMPURA – NO TOMAR" on the other side. Imprinting must be permanent and black in color.

One tag must be attached to each valve as follows:

1. Attach to valve stem directly or with plastic tie wrap or
2. Attach to solenoid wire directly or with plastic tie wrap or
3. Attach to valve cover with existing valve cover bolt.

P. Strainers and Pressure Reducing Valves

1. Strainers - Sprinkler irrigation systems must have a Y or basket strainer located downstream of the meter. The strainer must have a 30-mesh or finer screen. Strainers that have automatic backwash features will not normally be allowed unless it can be demonstrated to the DISTRICT that the backwash water will not cause runoff and is disposed of in a manner approved by the DISTRICT. The strainer drain valve must operate with a recessed key slot.
2. Pressure Reducing Valves - A pressure reducing valve (PRV) must be installed downstream of the strainer for each system using recycled water, unless otherwise directed by the DISTRICT.
3. Strainer and PRV Boxes - All strainers and PRV's must be installed below grade in rectangular boxes of sufficient size to allow easy repair or replacement of the units.

Q. Reclaimed Water Piping

1. General

All on-site recycled water piping must be manufactured and installed in accordance with the Uniform Plumbing Code, Chapters 6, 14, and Appendix J, and all other local governing codes, rules, and regulations. All piping must be continuously and permanently marked with the manufacturer's name or trademark, nominal size, and schedule or class indicating the pressure rating. All PVC potable water piping installed within the same project limits as the on-site recycled water piping must have blue tape identifying it as a potable water line and stating "CAUTION: WATER LINE BURIED BELOW".

2. Pipe and Fitting Requirements

   a. All on-site constant pressure pipe, fittings, and appurtenances must be installed below grade.
   b. Constant pressure lines from ¾ inches to 2 inches in diameter must be PVC Schedule 40 or 80 with solvent welded joints.
   c. Constant pressure lines 2 inches and larger must be PVC Class 160 (SDR 14) or Class 315 with solvent weld or rubber-ring joints.
   d. Intermittent pressure lines must be PVC schedule 40, 80, or Class 200 with solvent weld joints.

e. Tubing for drip irrigation systems must be polyethylene conforming to ASTM D 1248, Type II, Class C, or approved equals.
f. Copper pipe and fittings may only be used with DISTRICT approval. Copper must be Type K conforming to ANSI H-26.1 and ASTM B 88.
g. Wrought copper and copper alloy solder joint pressure-fittings must conform to ANSI B.16.22.

3.02 -- CROSS CONNECTION CONTROL

3.02.01 General

Cross connection is defined as any actual or potential unprotected connection or structural arrangement between the DISTRICT's and a customer's potable water system or any other source through which it is possible to introduce into any part of the potable system any used water, industrial fluid, gas, or substance other than the intended potable water with which the system is supplied.

Cross connection can be either indirect or direct. A direct cross connection is an arrangement where by the DISTRICT's potable water supply system is physically connected to an unsafe system in which backflow occurs. An indirect cross connection is an arrangement where no pipe connection exists but non-potable water or other fluids seep, leak, or indirectly flow into the DISTRICT's water supply system.

Backflow is the actual flowing of foreign fluids or gases into the DISTRICT's potable water supply system. Backflow is the main concern of cross connection control and it is the aim of the DISTRICT's cross connection control policies to eliminate all potential backflow. Backflow is typically caused by one of the following two situations: (1) when a greater pressure exists on the private side of the connection than on the DISTRICT's side. This will change the direction of flow and backflow due to "back pressure" will result; or (2) when the water supply system drops into negative pressure, the fluids in the private system are sucked or "back siphoned" into the potable system. This may occur when demands on the DISTRICT's distribution system are very high such as when fire flows are required.

Indirect cross connection can occur if conduits carrying non-potable water or hazardous fluids are buried in the vicinity of potable conduits.

3.02.02 Authority, References

The DISTRICT cross connection control policies and requirements shall govern for all properties served by the DISTRICT. The installation, testing, maintenance, and repair of backflow prevention devices is the responsibility of the property owner. The DISTRICT Cross Connection Control Specialist is the enforcement officer for the DISTRICT and all policy compliance matters will be handled through his/her office. Additionally, all backflow device installations must meet the requirements of the State of California Department of Public Health and the County of Santa Barbara Environmental Health Services Division.

Water facilities must be designed with good cross connection control practices in accordance with the requirements of the DISTRICT's Code, Title 6 Chapter 6.16 and State of California Code of Regulations, Title 17 and/or Title 22.

Installations of backflow devices must conform to the guidelines set forth by the GWD Standards & Specifications, the State Department of Public Health, the Foundation for Cross Connection-Control and Hydraulic Research, University of Southern California, Los Angeles, and the Uniform Plumbing Code, current edition. If there is a conflict between any of the guidelines, the more stringent guideline must apply.

3.02.03 Required Backflow Prevention

No water service connection to any premises shall be installed or maintained by the DISTRICT unless the water supply is protected as required by State laws and regulations and DISTRICT specifications. Service of water to any premises shall be discontinued by the DISTRICT if a back-flow prevention assembly required by the DISTRICT is not installed, tested and maintained, or if it is found that a backflow prevention assembly has been removed, bypassed, made nonfunctional or if an unprotected cross-connection exists on the premises. Service will not be restored until such conditions or defects are corrected.

Upon reasonable notice, the customer's system shall be open for inspection at all reasonable times to authorized representatives of the DISTRICT to determine whether cross-connections or other structural or sanitary hazards, including violations of these regulations, exist. When such a condition becomes known, the DISTRICT may, if in the DISTRICT's opinion a hazard to public health exists, deny or immediately discontinue service to the premises by providing for a physical break in the service line until the customer has corrected the condition(s) in conformance with State law and DISTRICT Code and standards relating to plumbing and water supplies and the regulations adopted pursuant thereto.

An approved backflow prevention assembly shall also be installed on each service line to a customer's water system at or near the property line or immediately inside the building being served; but, in all cases, in an easily accessible location before the first branch line leading off the service line wherever the following conditions exist:

1. Any premises having an auxiliary water supply which is not or may not be of safe bacteriological or chemical quality and which is not acceptable as an additional source by the State Department of Health Services.

2. Any premises on which any industrial fluids or any other objectionable substance is handled in such a fashion as to create an actual or potential hazard to the public water system. This shall include the handling of process waters and waters originating from the utility system which have been subject to deterioration in quality.

3. Any premises having (1) internal cross-connection that cannot be permanently corrected or controlled, or (2) intricate plumbing and piping arrangements or where entry to all proportions of the premises is not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not dangerous cross-connections exist.

4. Any premises having a separate irrigation system(s).

3.02.04 List of Facilities

Facilities or sites where backflow prevention assemblies will usually be required are without limitation:

1. Auxiliary Water Systems.
2. Wells.
3. Storage Tanks.
4. Creek/Pond.
5. Gray Water

6. Recycled Water.
7. Chemical Injection.
8. Booster Pump.
9. Irrigation Submerged Spray Heads.
10. Drip Irrigation System.
11. Injectors.
12. Aspirators.
13. Swimming Pool.
14. Spa/Jacuzzi.
15. Fountain.
16. Re-circulating Pump.
17. Submerged Inlet.
18. Septic System.
19. Sewage Ejector.
20. Sump and Lift Station.
21. RV Flushing Facility.
22. Dialysis Equipment.
23. Water Softener or Reverse Osmosis System.
24. Solar Hot Water System.
25. Livestock.
26. Elevation of Plumbing System.
27. Buildings—Hotels, Apartment Houses, Public and Private Buildings, or any other structures having unprotected cross-connections.
28. Car Wash Facilities.
29. Chemical Plants—Manufacturing, Processing, Compounding or Treatment.
30. Chemically Contaminated Water Systems.
31. Civil Works.
32. Film Laboratories.
33. Fire Sprinkler Systems.
34. Hospitals, Medical Buildings, Sanitariums, Morgues, Mortuaries, Autopsy Facilities, Nursing and Convalescent Homes and Clinics.
35. Irrigation Systems—Premises Having Separate Systems (i.e. Parks, Playgrounds, Cemeteries, Golf Courses, Schools, Estates, Ranches, etc.).
36. Laundries and Dye Works.
37. Metal Manufacturing, Cleaning, Processing and Fabricating Plants.
38. Multi-storied Buildings.
39. Multiple Services—Interconnected.
40. Oil and Gas Production, Storage or Transmission Properties.
41. Paper and Paper Products Plants.
42. Photo Processing or Printing Equipment
43. Plating Plants.
44. Power Plants.
45. Radioactive Materials or Substances—Plants or Facilities Handling.
46. Restricted, Classified or other Closed Facilities.
47. Rubber Plants—Natural or Synthetic.
48. Sand and Gravel Plants.
49. Schools and Colleges.
50. Sewage and Storm Drain Facilities, Reclaimed Water Plants
51. Solar Heating Systems—Direct Auxiliary.
52. Temporary Service.
53. Waterfront Facilities and Industries, Marinas.
54. Any other facility required by State law, local ordinances, or the DISTRICT

3.02.05 Approved Devices

All backflow prevention devices must be lead-free and as approved by the State Department of Public Health and the Foundation for Cross Connection-Control and Hydraulic Research, University of Southern California, Los Angeles. The type of backflow prevention device must be commensurate with the degree of potential or actual hazard that exists on the customer's premises. The DISTRICT must determine the degree of hazard.

A. In the case of any premises where there is an auxiliary water supply which is not subject to any of the following rules, the public water system shall be protected by an approved air-gap separation or an approved reduced pressure principle backflow prevention assembly.

B. In the case of any premises where there is water or substance that would be objectionable, but not hazardous to health, if introduced into the public water system, the public water system shall be protected by an approved double check valve assembly.

C. In the case of any premises where there is any material dangerous to health which is handled in such a fashion as to create an actual or potential hazard to the public water system, the public water system shall be protected by an approved air-gap separation or an approved reduced pressure principle backflow prevention assembly. Examples where these conditions will exist include sewage treatment plants, sewage pumping stations, chemical manufacturing plants, hospitals, dental and medical offices, mortuaries and plating plants.

D. In the case of any premises where there are "uncontrolled" cross-connections, either actual or potential, the public water system shall be protected by an approved air-gap separation or an approved reduced pressure principle backflow prevention assembly at the service connection.

E. In the case of any premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete in-plant cross-connection survey, the public water system shall be protected against backflow from the premises by either an approved air-gap separation or an approved reduced pressure principle backflow prevention assembly on each service to the premises.

3.02.06 Location

The location of backflow prevention devices must be as close as practical to the customer's side of the meter. Within the City of Goleta limits, backflow prevention devices must be installed within 12 inches of the public right of way. Prior to installation, the Applicant must submit under separate cover the proposed backflow prevention device location for DISTRICT review and approval.

3.02.07 Testing and Maintenance

Backflow prevention devices must be tested after they are installed, relocated or repaired and not placed in service unless they are functioning as required. Backflow prevention devices must be tested annually, or more frequently if determined to be necessary by DISTRICT, by a certified tester. It is the responsibility of the property owner to have said devices tested. The DISTRICT will send out a reminder of this requirement annually. The owner of the device shall, upon completion of testing, submit required forms completed by the tester to the DISTRICT. The property owner must immediately repair any failure of the device. Failure to test or repair any identified problem may result in service shutoff.

It is the responsibility of the customer at any premises where backflow prevention assemblies are installed to maintain the assemblies in full operating condition at all times and to have certified inspections and operational tests made at least once per year. In those instances where the DISTRICT deems the hazard to be great enough, he/she may require certified inspections at

more frequent intervals. These inspections and tests shall be at the expense of the customer and shall be performed by an approved tester or testing laboratory.

Assemblies shall be repaired, overhauled or replaced at the expense of the customer-user whenever said assemblies are found to be defective. Records of such tests, repairs and overhaul shall be kept by the customer and a copy shall be sent to the DISTRICT. If the DISTRICT has reason to question the accuracy of the tests or certification, the Responsible Official may require the customer to retest the backflow prevention assemblies.

3.02.08 Pipe Separation

Underground conduit is used to carry many types of fluids and gases to various destinations. Since potable water is one of these fluids typically transported in an underground conduit attention must be given to the possibility of indirect cross connection. Because of this possibility the State Department of Public Health has established guidelines for pipe separations. The typical separation between a sewer and a potable water line must be as illustrated on GWD Standard Detail 2-01.

3.02.09 Cross Connection Control for Recycled (Reclaimed) Water Systems

Recycled water systems must be completely separate from the potable water system. No connections between these systems will be allowed. Dual water systems must have the prior approval of the DISTRICT, the California State Water Resources Control Board Division of Drinking Water, RWQCB, and other jurisdictional agencies.

Cross connection control must be in accordance with GWD Code, Title 7 “Reclaimed Water System Rules and Regulations,” Section 7.08.05 “Backflow Prevention Devices,” and Title 17 of the California Code of Regulations. Backflow protection devices may be required of the recycled water user’s potable water service.

Backflow prevention devices are not required for on-site recycled water systems. However, in order to maintain the water quality in the recycled water distribution system, a backflow prevention device may be required at a specific meter where on-site exposures could impact the quality of the recycled water supply.

If potable water is required to temporarily serve the recycled water system, an approved air gap must be provided to protect the potable water system and the connection must be protected in the same manner as a permanent connection. Exceptions may be necessary under special circumstances, but in any case, they will not be allowed unless approved by the DISTRICT, California State Water Resources Control Board Division of Drinking Water, RWQCB, and other jurisdictional agencies.

3.03 -- PROJECT REVIEW

3.03.01 General

All proposed water facility improvements and extensions to the DISTRICTs water supply system will be reviewed by the DISTRICT staff. Plans for such improvements and extensions must besubmitted to the DISTRICT for review in accordance with this section.

3.03.02 Plan Submittal and Review

A. General

Applicant must submit to the DISTRICT one (1) full size printed copy and one (1) electronic pdf file of the engineered construction drawings showing proposed water system improvements and

engineering calculations for review. The DISTRICT will not, however, begin its review of the plans until the applicant has paid the Plan Review Deposit (see Section 2.03.03). After the DISTRICT has reviewed the drawings and engineering calculations, the DISTRICT will return one electronic PDF file copy to the Applicant with comments, changes, corrections, and conditions of completion of the plans for construction. This process will continue until the DISTRICT is satisfied that the DISTRICT's comments and requested changes and corrections have been appropriately addressed. Once all conditions and requirements of the DISTRICT are met and once the DISTRICT is satisfied that the DISTRICT's comments, changes, and corrections have been appropriately addressed, the Applicant must submit to the DISTRICT one set of 22 inch x 34 inch construction drawings, an electronic pdf file with a digital signature of the Project Engineer, and AutoCAD files, Version 2020 or more current on CD of the completed construction drawings. All drawings, calculations and other documents submitted by the Project Engineer for plan check, construction or record to the DISTRICT must be signed and stamped by the Project Engineer. The DISTRICT General Manager or authorized representative will then sign the drawings.

The review and signing of the completed construction drawings by the DISTRICT is only a review of the design concept and general compliance with the DISTRICT's Standards & Specifications. The Project Engineer is responsible for the design and accuracy of the construction drawings. Any errors, omissions, conflicts, ambiguities, or discrepancies in the completed signed plans do not relieve the Applicant and/or its Contractor(s) of the responsibility to construct all water system improvements in accordance with the DISTRICT's code, rules, regulations, Standards & Specifications. Please refer to Part V, Technical Specifications.

If the application for water service includes service from recycled (reclaimed) water lines and/or installation of recycled water system improvements, the plans must also be reviewed and approved by the California State Water Resource Control Board DDW Santa Barbara County Public Health Department (SBCPHD) and the California Regional Water Quality Control Board. The final plans (22 inch x 34 inch, printed ink on Mylar) must then also be signed and stamped by SBCPHD.

B. Recycled/Reclaimed Water Facilities

Completed construction drawings for all **ON-SITE** recycled/reclaimed water systems improvements and retrofit projects must be submitted to the DISTRICT for cross connection plan check review and acceptance prior to the commencement of construction. Three sets of plans and specifications (only the portion for the recycled water system) must be submitted to the DISTRICT. If there are potable water, sewer, or unapproved (well water) systems within the design area, one set of comprehensive cross-connection plans must be provided showing sewer and the pressurized pipelines for each of the above.

As part of the cross-connection review, the DISTRICT will send one copy of the plans and specifications to the California State Water Resource Control Board DDW, Santa Barbara County Public Health Department and the RWQCB for cross-connection review and comment. The Santa Barbara County Public Health Department may require topographic plans. The DISTRICT will review the plans and will return one set with all comments to the applicant. After comments have been incorporated into the plans and specifications, a set of original plans must be submitted to the DISTRICT for review. The DISTRICT will provide the cross-connection signature blocks for The Santa Barbara County Public Health Department and the DISTRICT.

After the originals have been signed, one (1) set of printed ink on mylar must be submitted to the DISTRICT for signature. The DISTRICT will return the signed originals to the owner/applicant. A duplicate set of signed mylar drawings and three sets of blueprint must be submitted to the DISTRICT for inspection of the construction.

Minor changes to the system must be reviewed by the DISTRICT's Inspector. If major proposed changes are needed differing from the signed plans, the owner/applicant, or customer must make a formal written submittal to the DISTRICT for cross-connection review and acceptance.

3.03.03 Plan Review Deposit

The Applicant will be required to pay the DISTRICT for plan review services. A deposit must be paid in advance of services, as determined by the DISTRICT. The charges will be billed based on staff time and materials in accordance with Goleta Water DISTRICT code, rules and regulations.

3.03.04 Inspection Deposit

The Applicant will be required to pay the DISTRICT for inspection services during construction of water system improvements. A deposit must be paid in advance of services, as determined by the DISTRICT. The charges will be billed based on staff time and materials in accordance with Goleta Water DISTRICT code, rules and regulations.

3.03.05 Engineer's Cost Estimate

A construction cost estimate for potable water and recycled/reclaimed water improvements will be required once the construction drawings have been completed. The cost estimate must be prepared by the Project Engineer as stipulated in Section 3.01.02, Qualifications. The cost estimate will serve as a guide for the DISTRICT in determining the amount of surety for "Performance of the Work", for "Labor and Materials", for warranty and the amount for the inspection deposit.

3.03.06 Construction Surety

Surety in the form of a Letter of Credit (LOC) issued by a financial institution acceptable to the DISTRICT, with offices in and operating along the south coast of Santa Barbara County, State of California; or a cash deposit to the DISTRICT, or bonds, acceptable to the DISTRICT must be submitted by the Applicant guaranteeing successful completion of the work and payment to and by the Contractor for labor and materials employed in the work. For the first $25,000.00 of estimated construction cost, the surety must be a LOC or a cash deposit with the DISTRICT in lieu of the LOC. Surety for amounts over $25,000 may be in the form of a LOC or cash deposit or bonds acceptable to the DISTRICT.

Surety in the form of LOCs or cash deposit with the DISTRICT must be in the amount of 100% of the DISTRICT's construction cost estimate of the water system improvements to be constructed AND dedicated to the DISTRICT.

If bonds are used for surety for the amounts over $25,000.00, then a Performance Bond AND a Labor and Materials Bond must be provided by the applicant and each bond must be for 100 percent of the estimated construction cost over the first $25,000.00 as determined by the DISTRICT. Surety companies issuing bonds or other surety must have an A.M. Best rating of A- : VII or better. Sample bond forms and a sample Letter of Credit acceptable to the DISTRICT are set forth in Part IV Appendices.

The surety must protect the DISTRICT against any and all costs to install, repair or maintain the water system improvements during construction and for a period of one year from the date of acceptance of the improvements by the DISTRICT. The labor and materials surety must pay for any and all labor and materials claims.

If an LOC or cash deposit is provided by the applicant as surety, then the District will release one half (50%) of the LOC or cash deposit upon dedication of water system improvements by the

applicant and acceptance of those water system improvements by the DISTRICT. The remaining LOC or cash surety (50%) will then be retained for a period of one year after the date of acceptance

If a bond was provided by the applicant for surety, then upon dedication of and acceptance of the water system improvements by the DISTRICT, up to 50 percent of the performance surety will be released. The remaining performance surety will be retained for a period of one year after the date of acceptance. The applicant must submit to the DISTRICT waivers of lien, release of liens and/or affidavits of payments made to all suppliers of labor and materials used to construct the water system improvements prior to acceptance of the improvements by the DISTRICT. The DISTRICT will release the labor and materials surety 90 days after acceptance of the improvements.

3.03.07 Required Permits and Easements

A copy of all required planning documents and permits including, but not limited to, Final Map, Grading Permit, County or City Land Use Clearance, Road Encroachment Permit, Building Permit, California Fish & Game Permit, U.S. Army Corp. Permit, and USA Number must be submitted to the DISTRICT two working days prior to the beginning of construction. A copy of the dedication documents providing all required easements and right-of-way for the proposed water system improvements installation must be submitted to the DISTRICT a minimum of two working days prior to issuance of a Can & Will Serve letter.

3.03.08 Signature of Plans

Once all requirements listed above have been met to the DISTRICT's satisfaction, final construction drawings will be signed by the DISTRICT Manager, its authorized representative or the DISTRICT's Chief Engineer. Signing of plans by the DISTRICT does not release the Project Owner or Contractor from its obligation to conform to DISTRICT Standards & Specifications. The DISTRICT only acknowledges that the drawings have been reviewed for conformance to DISTRICT Standards & Specifications.

3.03.09 Notice to Proceed

Upon completion of plan check and signing of the plans, The DISTRICT will send the applicant and the applicant's engineer a notice to proceed for the construction phase of work.

Prior to commencing construction the applicant's engineer must coordinate and schedule a pre-construction meeting. The DISTRICT's Inspector must be given a minimum of 48 hours notice prior to start of construction.

3.03.10 Pre-Construction Meeting

The applicant's engineer must coordinate and schedule a pre-construction meeting. The meeting must include the applicant, the applicant's engineer, the DISTRICT's backflow and cross connection control specialist, the DISTRICT's project representative, a representative of the DISTRICT's Operations Department, the contractor, and other consultants and representatives from other agencies and public utilities as may be appropriate. The DISTRICT's project representative must provide an agenda and conduct the meeting. Minutes will be taken and distributed to all attendees.

PART III

APPENDIX A

MINOR PROJECTS
SITE & INSTALLATION PLANS

GOLETA WATER DISTRICT
MINOR PROJECTS – SITE & INSTALLATION PLAN

A. QUALIFICATIONS OF A MINOR PROJECT

A minor project is defined as a project that meets the following **two** criteria:

1. The project is limited to the installation of no more than two new meters, or no more than one new meter and one new fire hydrant or fire line which can be performed per GWD Standard Specifications & Details. It shall NOT include any new water distribution mains and accompanied valving nor other water system improvements requiring the design by a registered civil engineer.

2. The extent of work in the roadway is no greater than that indicated in the table below for the applicable County or City designated street section.

Street Section and Extent of Work

ARTERIAL & MAJOR STREETS	INDUSTRIAL, FRONTAGE & RURAL STREETS	RESIDENTIAL STREETS
No more than one travel lane impacted by proposed installation.	No more than half the paved roadway impacted by proposed installation.	All projects that meet Criteria No. 1 are OK.

If a project fits the "Minor Project" definition then the plan preparation requirements can be limited to a simplified "Site & Installation Plan" that may be prepared by the Applicant, their contractor, or their engineer.

If a project does not fit the definition then civil engineer signed and stamped construction drawings are required.

B. APPLICANT RESPONSIBILITY AND INDEMNIFICATION OF DISTRICT

If the Applicants project meets the criteria above and qualifies as a Minor Project, and the Applicant chooses to prepare a simplified "Site and Installation Plan", the Applicant shall assume full responsibility for the engineering and construction of their project and shall execute the attached Indemnification document.

C. PLAN REQUIREMENTS FOR "SITE AND INSTALLATION PLAN"

The following minimum information must be shown on the "Site and Installation Plan" (see sample):

1. Street and Property Information: street centerline, right-of-way line, property lines, dimensions, street name, street address, assessor parcel numbers, and dimension to nearest cross street.

2. Utility Information: sewer, gas, and waterline locations, sizes and pipe materials; record drawing information for GWD waterline, and dimensions.

3. Topography: surface features such as curb and gutter or edge of pavement, driveways, sidewalk, trees, manholes, valve cans, power/telephone poles, fire hydrants, street lights, mail boxes, meter boxes, etc.

4. Proposed Improvements: proposed water service(s), fire hydrant, and/or fireline with locations and sizes shown and dimensioned, and GWD Std. Details referenced.

5. Miscellaneous: plan drawn at a scale of 1"=10', north arrow, title block information.

GOLETA WATER DISTIRCT

Minor Project
Indemnification Statement

This Indemnification Statement shall be included with "Site and Installation Plan" prepared for project qualifying as "Minor Project" within the Goleta Water District.

The Applicant agrees to indemnify and hold harmless the Goleta Water District, its directors, officers, agents and employees from any and all claims, demands, damages, losses, costs, expenses or liability due to the Applicant's errors, omissions, or negligent acts in the preparation of "Site and Installation Plan" and construction of water facilities as shown on said plan.

GWD Job Number

Applicant Name

Address

Print Name

Signature

Title

Date

PLAN PREPARED & SUBMITTED BY:

SIGNATURE: _____

PRINT NAME: _____ DATE: _____

GOLETA WATER DISTRICT

REVIEWED

BY: _____

DATE: _____ FIELD CHECK DATE: _____

SITE AND INSTALLATION PLAN

SCALE:

HOR. _____

VER. _____

SHEET _____

OF SHEET(S)

PROJECT NO.

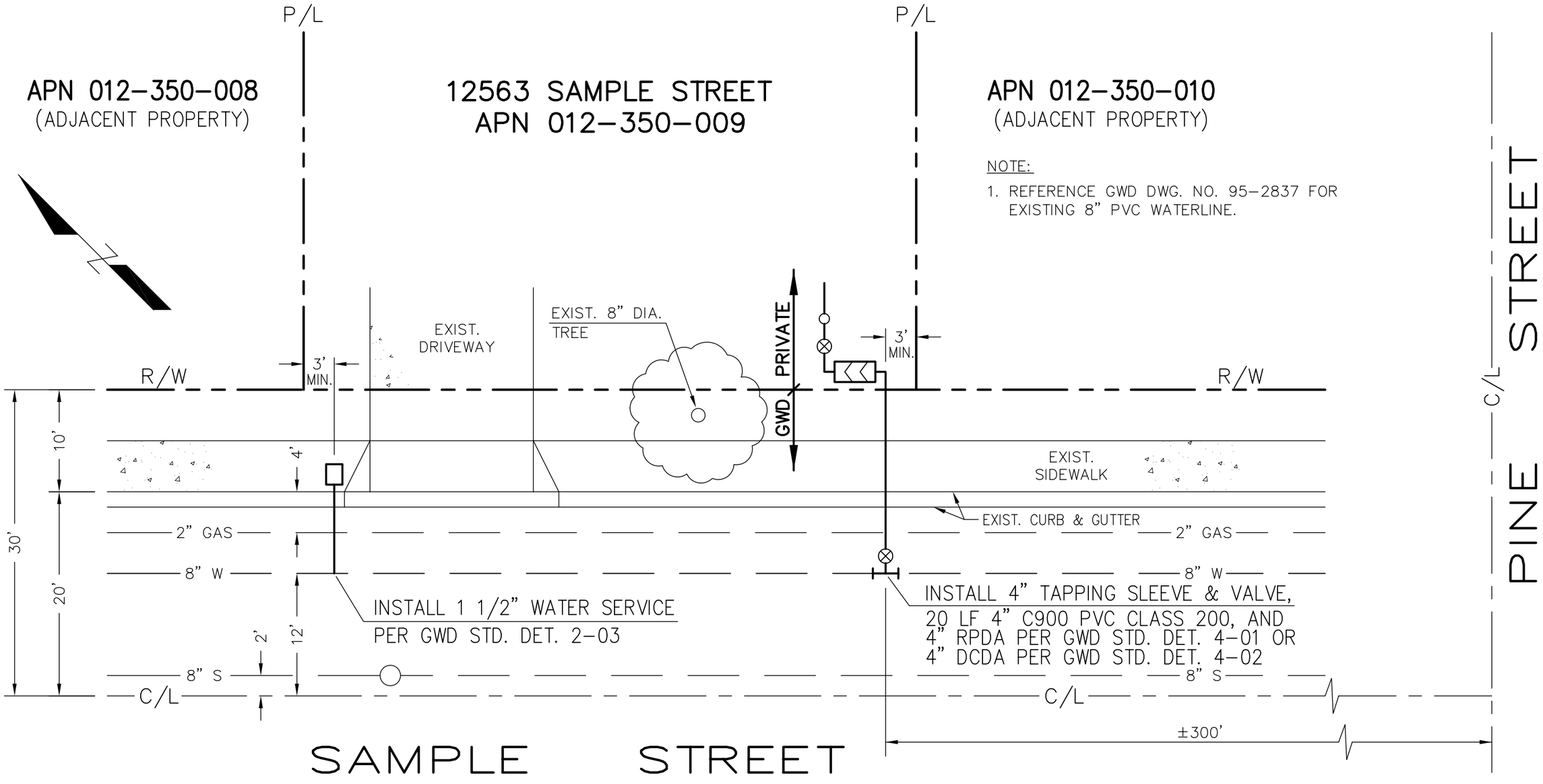
APN 012-350-008
(ADJACENT PROPERTY)

12563 SAMPLE STREET
APN 012-350-009

APN 012-350-010
(ADJACENT PROPERTY)

NOTE:

1. REFERENCE GWD DWG. NO. 95-2837 FOR EXISTING 8" PVC WATERLINE.



PLAN PREPARED & SUBMITTED BY: SIGNATURE: _____ PRINT NAME: _____ DATE: _____	**GOLETA WATER DISTRICT** REVIEWED BY: _____ DATE: _____ FIELD CHECK DATE: _____	**SITE AND INSTALLATION PLAN** 1 1/2" WATER SERVICE AND 4" FIRELINE 12563 SAMPLE STREET	SCALE: HOR. 1"=10' VER. NA	SHEET 1 OF 1 SHEET(S) PROJECT NO. 01-0200

PART IV

TABLE OF CONTENTS

PART IV - WATER FACILITIES CONSTRUCTION

4.01 -- CONSTRUCTION

4.01.01 General

A contractor who is under contract with the DISTRICT to perform work on DISTRICT facilities (Contractor) must perform all the work necessary to complete the construction (Work) in accordance with the DISTRICT's Standards & Specifications and DISTRICT signed Plans (Construction Drawings). The Work shall include all changes, repairs, removals, and adjustments required by the DISTRICT.

For Work undertaken pursuant to a public works contract between the Contractor and the DISTRICT that includes an order of precedence, the order of precedence set forth in the contract shall apply to resolve conflicts among contract documents. For all other Work, the following order of precedence shall apply:

1. Change Orders, Work Change Directives, or Written Amendments; and
2. DISTRICT Standard Details;
3. DISTRICT Standards & Specifications;
4. Permits from other agencies;
5. Construction Drawings, i.e. Plans, reviewed and signed by the DISTRICT.

In resolving disputes resulting from conflicts, errors, omissions, ambiguities in the construction drawings, the following hierarchy applies to information shown on construction drawings:

1. Notes and specifications on drawings govern over graphic representations on the drawings;
2. Written numbers govern over scaled dimensions;
3. Detail drawings govern over general drawings; and
4. Change order drawings govern over original construction drawings.

4.01.02 Materials and Procedures

Refer to the District's Approved Materials List for approved materials / manufacturers and to Part V, Technical Specifications for procedures.

4.01.03 Qualifications

All Work must be performed by a contractor possessing a current California Class A or other appropriate class contractor's license such as Class C-34 for waterline work. A copy of the Contractor's current license must be provided to the DISTRICT at least two days prior to beginning construction.

4.01.04 Safety and Sanitation

The Contractor must comply with the requirements of all applicable Construction Safety Orders issued by the State of California Division of Industrial Safety and all other applicable laws, ordinances, and regulations. Prior to commencing Work, the Contractor must provide to the DISTRICT a copy of all CAL-OSHA permits required for the Work.

The Contractor must maintain sanitary conditions at all times near any potable water facilities. The Contractor must keep the Work site clean, neat, and sanitary. Facilities to maintain the Work site in such a condition are the responsibility of the Contractor. Trash removal must be provided

by the Contractor on a weekly basis unless conditions require a more frequent removal or as required by the DISTRICT. Portable toilets must be supplied on site if no other approved facilities exist. The number and location of portable toilets shall be as required by State and County Health Departments.

4.01.05 Preconstruction Conference

After the construction drawings have been signed by the DISTRICT, the Project Engineer must arrange a preconstruction conference. The preconstruction conference must be scheduled a minimum of 5 working days prior to the start of construction. The preconstruction conference must include the DISTRICT's Inspector, Applicant's representative, Project Engineer, Contractor, and other appropriate personnel. The Contractor must be prepared to discuss any work that may affect existing DISTRICT facilities/waterlines and any shutdowns that may be required to connect new waterlines to existing DISTRICT waterlines. The Project Engineer must conduct the meeting and submit minutes of the meeting to the DISTRICT Inspector.

4.01.06 Inspection

All Work and materials will be subject to rigid inspection by DISTRICT personnel. DISTRICT inspection is for the sole benefit of the DISTRICT and does not relieve the Applicant or the Contractor of their contractual obligations and responsibility to perform quality work and to protect the facilities from damage prior to acceptance. Verbal communications during DISTRICT inspection shall not constitute direction from the DISTRICT; only a field order or contract amendment issued by the DISTRICT shall constitute direction from the DISTRICT. Inspection of materials and the Work shall be as stipulated in these Standards & Specifications and Contract Documents and as required by the DISTRICT Chief Engineer. The Contractor must notify the DISTRICT Inspector two working days in advance of the time inspection is required. Below grade work and water improvements covered without DISTRICT inspection must be completely uncovered for inspection at the Contractor's expense.

On-Site Recycled Water Facilities

The DISTRICT will inspect the construction of on-site recycled water facilities and must be notified at least two working days in advance of construction by the Applicant or Contractor.

If any on-site recycled water facilities are installed prior to completion of DISTRICT plan review and/or inspection, they must be exposed to permit inspection by the DISTRICT. In no case shall constant pressure pipelines be backfilled before inspection by the DISTRICT Inspector. Corrective measures must be completed by the Contractor as necessary to comply with DISTRICT Standards & Specifications. Failure to comply will result in termination of service.

Subsequent to cross-connection plan check review, field conditions may dictate modifications to the on-site system either in material or in intended use. If directed by the DISTRICT Inspector, the Applicant or Contractor must modify the on-site system to bring the system or uses into full compliance with GWD rules and regulations and including the DISTRICT Code and these Standards & Specifications. If for any reason the system cannot be corrected or modified to the satisfaction of the DISTRICT, the use of recycled water will not be permitted.

4.01.07 Line and Grade

All Work must conform to the lines, elevations, and grades shown on the DISTRICT signed Plans. Work constructed by the Contractor must conform to grade and alignment control stakes set by a licensed land surveyor hired by the CONTRACTOR, and any conflict or discrepancy must be immediately reported to the Project Engineer and DISTRICT Inspector. Any survey monuments disturbed, moved, or destroyed by the performance of the work must be reset by a licensed land surveyor at the Applicant's or Contractor's expense.

4.01.08 Changes During Construction

During construction, changes that are not shown on the approved plans may be proposed by the Contractor, the Project Engineer, the Applicant, or the DISTRICT. All proposed changes must be made in writing and submitted to all of the other parties. Any changes not submitted by the DISTRICT will be subject to District review and approval. The DISTRICT may require sketches or revised construction drawings of the proposed changes and may require a plan check of any sketches or revised construction drawings. All proposed changes must be approved in writing by the DISTRICT prior to commencement of any construction incorporating the change. All approved changes in construction must be shown on the Record Drawings prepared at completion of the Work in accordance with Section 3.02.04 of these Specifications.

For recycled water systems, failure to receive prior approval of changes during construction may result in termination of service.

4.01.09 Record Drawings

A complete set of the DISTRICT signed construction drawings must be kept by the Contractor at the site at all times during construction for use in recording field changes. The Contractor must mark on the drawings all approved changes and revisions from the original Plans, including change orders, changes in pipe alignment and depth, utility locations, and any other changes or deviations from the original Plans. Upon completion of construction, inspection, and testing, the Contractor must supply the modified drawings to the Project Engineer. The Project Engineer shall use these drawings to prepare “Record Drawings.” The Project Engineer shall submit Record Drawings to the DISTRICT as specified in Section 3.02.04 of these Specifications, prior to DISTRICT acceptance of the water system improvements and release of the Applicant’s surety.

4.01.10 Meters

The DISTRICT will not generally install meters contemporaneously with the Developer’s installation of service connections. Therefore, the Contractor must install temporary solid spacers between the angle ball meter stops and the curb stops unless otherwise directed by DISTRICT. All meters will be furnished and installed by the DISTRICT unless otherwise directed by the DISTRICT.

4.01.11 System Tie-ins and Shutdowns

The Contractor must submit to the DISTRICT a written request for all proposed shutdowns of existing in-service waterlines for making connections to new waterlines. The Contractor must submit a written “shutdown” request a minimum of 10 working days prior to the proposed date of the shutdown. The written “shutdown’ request must also clearly state if any field welding is required as part of the tie-in work. The DISTRICT will determine the actual date and time of all shutdowns. The Contractor must properly plan and prepare for the tie-in work so as to limit the duration of the shutdown to no longer than eight (8) hours.

4.01.12 Testing and Disinfection

The Contractor must test and disinfect new water mains and system facilities per Section 330110 of the Technical Specifications in Part V of the DISTRICT’S Standards & Specifications.

4.02 -- PROJECT COMPLETION

4.02.01 General

Near the end of a project, several items must be coordinated simultaneously by the Applicant and Contractor in order to achieve project completion. These items include: meter installation (by DISTRICT personnel), backflow testing (where applicable), preparation of Contractual Cost and Dedication of Water Facilities forms, submission of trench compaction report and Record Drawings, etc.

When all Work has been completed by the Contractor and all improvements have been disinfected and tested, the Contractor shall prepare the project for completion by meeting the requirements of this section.

4.02.02 Final Inspection

When the Contractor determines that all of the work has been done and successfully tested in accordance with the plans, standards, and specifications of the DISTRICT, the Contractor must notify the DISTRICT in writing and request a final inspection. Final inspection will not be conducted until all phases of construction are completed including roadway improvements. Representatives from the DISTRICT's Engineering and Operations staff will conduct a final inspection and make a Final Punch List of any items that need to be completed and/or corrected. The Final Punch List will be provided to the Contractor for completion.

Upon completion or correction by the Contractor of all of the items on the Final Punch List, the DISTRICT will conduct a field verification. If the work is completed to the satisfaction of the DISTRICT, a Field Acceptance Form will be prepared and signed by the DISTRICT's Engineering and Operations Departments. If the work is not completed to the satisfaction of the DISTRICT, the Contractor must remedy work and/or complete unfinished work and repeat the steps described above. A sample form is available from the DISTRICT upon request.

4.02.03 Fire Hydrant Flow Tests

Prior to the DISTRICT conducting Final Inspection, the Applicant must coordinate to have flow tests conducted by the DISTRICT at all new or replaced fire hydrants installed as part of the Work. The Applicant must provide 10 days advance notice in writing to the DISTRICT for planning and scheduling the flow tests. The Applicant must also provide a minimum 48 hours advance notification to the Santa Barbara County Fire Department to witness the tests and provide copies of the written results to both the DISTRICT and Santa Barbara County Fire Department.

4.02.04 Record Drawings

Upon completion of the Work, the Contractor shall note any and all information and dimensions to the field drawings of any construction changes or variances from the approved signed construction drawings as an exact record of what was actually constructed. Changes and dimensions must be recorded in a clear and legible manner. Field record drawings must be maintained at the job site during construction.

Upon completion of construction, the Contractor must submit to the Project Engineer (or other designer in the case of on-site recycled water systems) a copy of its field records of construction so that an official set of Record Drawings can be made. The Project Engineer must revise the signed construction original plans to show all field recorded changes. The plans must show the actual constructed improvements. The Drawings must be marked as "RECORD DRAWINGS" on all sheets and signed by the Project Engineer.

Upon completion of the preparation of RECORD DRAWINGS by the Project Engineer or designer, the Applicant must provide the DISTRICT with one (1) full size printed copy and one (1) electronic pdf file of the marked "RECORD DRAWINGS". After the DISTRICT has reviewed the RECORD DRAWINGS, it will return a copy with comments of any needed changes. Once any and all needed changes are made, one (1) set of the RECORD DRAWINGS signed by the Project Engineer (or licensed designer for on-site recycled water plans) and printed ink on mylars or on matte Chronoflex photo mylar must be submitted to the DISTRICT. The DISTRICT will not make any final release of surety until the RECORD DRAWINGS have been completed with all changes and submitted signed on mylars.

On-Site Recycled Water

Record drawings for on-site recycled water facilities must also be prepared and submitted to the DISTRICT. All changes in the work constituting departures from the original contract drawings including those involving both constant-pressure and intermittent-pressure lines and appurtenances must be incorporated into the Record Drawings.

Facilities and items to be located and verified on the record drawings for on-site recycled water facilities must include the following: point of connection, routing of sprinkler pressure lines, gate valves, sprinkler control valves, quick-coupling valves, routing of control wires, and other related equipment as required by the DISTRICT inspector or the owner.

4.02.05 District Approval

Upon completion of the Work and all requirements of the DISTRICT by the Contractor, Applicant, and Project Engineer, and the submittal of Record Drawings, the Applicant must offer the new water facilities for dedication to the DISTRICT. DISTRICT staff will review the Offer of Dedication and submit their recommendations to the General Manager. The DISTRICT will not accept for dedication any work observed to be damaged or defective water facilities or facilities observed to be not in conformance with the DISTRICT Code, Standards & Specifications, and applicable contract documents. All damaged water facilities must be repaired or restored to the satisfaction of the DISTRICT at the Contractors/Applicants expense at no cost to the DISTRICT.

The applicant must also submit to the DISTRICT waivers of lien, release of liens and/or affidavits of payments made to all suppliers of labor and materials used to construct the water system improvements prior to acceptance of the improvements by the DISTRICT.

4.02.06 Dedication and Acceptance of Facilities

Upon approval of dedication of the Work by the DISTRICT's General Manager, the Applicant shall dedicate the water system facilities to the DISTRICT. The Applicant must prepare the Dedication of Water Facilities form in conformance with the format sample available from the DISTRICT upon request.

After acceptance of dedication of the facilities to the DISTRICT, the Contractor is relieved of his responsibility to protect the Work, however, this does not relieve the Contractor or the Applicant from their responsibilities or liabilities under the guarantee or warrantee for the new water facilities.

4.02.07 Period of Guarantee

The Work must be guaranteed for a period of one year from the date of acceptance of the water system improvements by the DISTRICT. At any time during the one-year period of guarantee, if the DISTRICT finds that the Work is defective in material or in workmanship, is inconsistent with applicable Contract documents, or deviates from the DISTRICT GWD Standards & Specifications, the Applicant will be notified of the deficiencies, and the DISTRICT will repair or

replace said defects at the Applicant's sole expense. The DISTRICT may also use the surety to pay for the correction or replacement of the defects.

4.02.08 Release of Surety

If there are no liens against the project for labor or materials supplied to construct the water system improvements, and all waivers of lien rights have been submitted to the DISTRICT, then the DISTRICT will release fifty percent (50%) of the performance surety within 90 days after acceptance of the improvements by the DISTRICT.

The remaining fifty percent (50%) will be retained for a period of one year after the date of acceptance of dedication of the Work by the DISTRICT's General Manager or authorized representative. If the guarantee on the Work is fulfilled, and if all conditions for water service in accordance with the DISTRICT Standards & Specifications have been met, then the DISTRICT will release the remainder of the surety.

4.02.09 Certificate of Occupancy/Clearance Request

In order for the DISTRICT to sign off on the County or City Building Department's Occupancy Clearance Request, the following conditions must be met:

- All water system improvements shown on the construction drawings must be constructed, tested and operational and accordance with the DISTRICT's Standards & Specifications.
- Repairs must be completed for damaged, defective, and improperly installed meter boxes, lids, service connections, and other water system improvements.
- All meters must be installed.
- All application fees, water system development fees, meter fees, and other charges owed to the DISTRICT must be paid.
- All required backflow prevention devices must be installed and tested by a certified tester as required by the DISTRICT and County of Santa Barbara Environmental Health Services Division.

The DISTRICT signing of a City or County Occupancy Clearance Request does not constitute "Acceptance for Dedication" by the DISTRICT of water system improvements that have been provided to the District. The DISTRICT sign off only constitutes an acknowledgment that the property is being served by the water system.

IRREVOCABLE STANDBY LETTER OF CREDIT
No. _____

Date of Issue:
(Date of Issue)

Expiry Date:
(Minimum of two years from date of issue)

Beneficiary:
Goleta Water District
4699 Hollister Avenue
Goleta, CA 93110-1999:

Applicant:
(Name and Address of Applicant)
GWD Job No. XX-XXXX

Gentlemen:

We hereby establish our Irrevocable Letter of Credit No._____ in your favor, for the account of (name of applicant) the aggregate amount of (amount of credit in words and numbers) representing the following:

$ (total amount in numbers) for Faithful Performance, Labor/Materials, and/or Warranty

The amount is available by presentation of your draft(s) drawn on us, at sight and duly endorsed, accompanied by the following:

Original letter of credit

A dated statement purportedly signed by the General Manager of the Goleta Water District certifying that

1) (name of applicant) has failed to perform under the terms and conditions of their application with Goleta Water District for water service, ***OR***

2) that (name of applicant) has failed to pay for the labor and/or materials to design and/or construct the water system improvements, ***OR***

3) that the water system improvements constructed and dedicated to Goleta Water District by (name of applicant) have failed within one year of the date of acceptance by the District and are in need of repair,

and that the amount of the drawing is due and payable.

Other Conditions:

Partial drawings are allowed

This Letter of Credit shall be automatically renewed, without amendment, for additional one year periods from each present or future expiration date, unless we notify the Goleta Water District, in writing, by certified or express mail, at least **one hundred twenty (120**) days prior to any such expiration date, that we elect not to renew our commitment.

All Draft(s) so drawn must bear the clause, **"Drawn under the (Name of Issuing Bank) Irrevocable Letter of Credit No. _____ dated (Date of Issue)".**

We hereby engage with you that drafts so drawn shall be duly honored upon presentation if drawn and negotiated in compliance with the terms hereof.

Except so far as otherwise expressly stated herein, this Letter of Credit is subject to the "International Standby Practices, 1998 Edition (“ISP98”) International Chamber of Commerce Publication No. 590”.

(Name of Issuing Bank)

By: _____
(Name of Authorized Bank Signature and Title)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____as Owner/Contractor,

And _____as Surety,

are held firmly bound unto the Goleta Water District, a County Water District, organized under the laws of the State of California and existing in the County of Santa Barbara, California, hereinafter called the "District," in the sum of: _____dollars,

for the payment of which sum will and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS said Owner/Contractor has applied for water service from said District and is about to construct water system improvements which are required for water service and include potable water distribution mains, reclaimed water mains, service connections, meters, fire service connections, fire hydrants, valves and appurtenances as shown and specified in the drawings and specifications entitled "_____"
_____
and prepared by _____ and signed and dated _____, _____ hereinafter referred to as "the Work".

NOW THEREFORE, if said Owner/Contractor shall perform all of the Work required to be performed on its part, at the times and in the manner specified herein, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED, that any alterations in the Work to be done or the materials to be furnished, or changes in the time of completion, which may be made pursuant to the terms of said construction documents, shall not in any way release said Owner or said Surety thereunder, nor shall any extensions of time granted under the provisions of said construction documents, release either said Owner/Contractor or said Surety, and notice of such alterations or extensions of the Agreement is hereby waived by said Surety.

SIGNED AND SEALED, this _____ day of _____, 20 _____.

Owner/Contractor: _____

By

Title

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY)

Surety

Address _____

_____

Phone No. _____

By

Title

LABOR AND MATERIALS BOND

KNOW ALL MEN BY THESE PRESENTS,

That we, _____, as Owner/Contractor,

and _____as Surety,

are held firmly bound unto the GOLETA WATER DISTRICT, a County Water District, organized under the laws of the State of California and existing in the County of Santa Barbara, State of California, hereinafter called the District in the just and full sum of:

_____dollars,

for the payment whereof which sum will and truly to be made, said Owner/Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

The condition of the foregoing obligation is such that whereas the above bounded Owner has agreed to do and perform the following work, to wit:

Construct the WORK which is comprised of the following described improvements:

_____
_____
_____
_____

NOW THEREFORE, if said Owner, its contractor(s), its subcontractor(s), its heirs, executors, administrators, successors, or assigns shall fail to pay for any materials, provisions, provender, equipment or other supplies used in, upon, for or about the performance of the Work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Contractor and its subcontractors pursuant to Section 13020 of the Unemployment Insurance Code with respect to such labor, all as required by the provisions of Title XV, Chapter 7, Sections 3247-3252, inclusive, of the Civil Code of the State of California and acts amendatory thereof, and sections of other codes of the State of California referred to therein and acts amendatory thereof, and provided that the persons, companies, or corporations so furnishing said materials, provisions, equipment or other supplies, appliances or power used in, upon, for or about performance of the WORK contracted to be executed or performed, or any person, company or corporation renting or hiring implements or machinery or power for or contributing to said WORK to be done, or any person who performs work or labor upon the same, or any person who supplies both work and materials therefor, shall have complied with the provisions of said laws, then said Surety will pay the same in an amount not exceeding the sum herein before set forth and also will pay, in case suit is brought upon this bond, a reasonable attorneys fee, as shall be fixed by the Court. This bond shall inure to the benefit of any and all persons named in Section 3181 of the Civil Code of the State of California so as to give a right of action to them or their assigns in any suit brought upon this bond.

PROVIDED, that any alterations in the Work to be done or the materials to be furnished, or changes in the time of completion, which may be made pursuant to requirements and agreement of the Goleta Water District, shall not in any way release said Owner/Contractor or said Surety thereunder, nor shall any extensions of time granted by the District release either said Owner/Contractor or said Surety, and notice of said alterations or extensions is hereby waived by said Surety.

SIGNED AND SEALED, this _____ day of _____, 20____.

Owner/Contractor
_____

By _____

Title _____

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY)

Surety _____

Address _____

_____

Phone No. _____

By _____

Title _____

PART V

TECHNICAL SPECIFICATIONS
TABLE OF CONTENTS

SECTION 011000

GENERAL

PART 1 - GENERAL

1.1 PROJECT MEETINGS

A. The Contractor, along with the Contractor's superintendent or project manager, as a minimum, shall attend all meetings scheduled by the Engineer for coordination and collection and dissemination of information related to the work. This will include a minimum of one weekly meeting to discuss the progress of the Project, to be held at the District office, telephone, or web-video conference.

B. Prior to the commencement of work, a pre-construction conference will be held at a mutually agreed time that shall be attended by the Contractor, its superintendent, its subcontractors, and other agencies, utilities, and parties that may be affected by the work. Unless previously submitted to the Engineer, the Contractor shall bring to the conference two copies of the Preliminary Construction Schedule. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda may include the following:

1. Contractor's schedule.
2. Critical work sequencing.
3. Submittal log.
4. Transmittal, review, and distribution of Contractor's submittals.
5. List of all permits.
6. Processing applications for payment.
7. Maintaining of record documents.
8. Field decisions and Change Orders.
9. Use of project site, office and storage areas, security, housekeeping, and District's needs.
10. Major equipment deliveries and priorities.
11. Contractor's assignments for safety and first aid.
12. Contractor's emergency contact person.

1.2 COORDINATION AND COOPERATION WITH OTHERS

A. During the course of the work to be performed under this contract, it is expected that public agencies, utility companies, and other contractors will be performing work in the immediate vicinity. The Contractor shall notify the other public agencies, utilities, and contractors affected at least five (5) working days prior to beginning construction. The Contractor under this contract shall schedule their work and coordinate their operation with others so as to minimize conflicts and interference between their operations and those of other contractors.

B. Agencies that may be performing work in the immediate vicinity may include, but are not limited to:

1. Goleta Water District
2. City of Goleta
2. Goleta Sanitary District
3. Goleta West Sanitary District

4. Southern California Edison
5. Southern California Gas
6. Frontier (Telephone)
7. AT&T (Telephone)
8. Mobil Oil Company
9. Santa Barbara Flood Control District
10. Cox Communications

1.3 QUALITY CONTROL

A. The Contractor shall verify all dimensions in the field and shall check all field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the Work.

B. The Contractor shall inspect related and appurtenant work and shall report in writing to the Engineer any conditions that may prevent proper completion of the Work. Any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor at its sole expense.

C. The Work shall be conducted under the general observation of the Engineer and shall be subject to intermittent or continuous inspection by representatives of the District to assure strict compliance with the requirements of the Contract Documents.

D. The work hereunder shall be under the general direction of the Engineer, acting directly and through their authorized representatives. The presence of an inspector, however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance is distinctly a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of an inspector.

E. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no material or articles shall be used in the Work until it has been inspected and accepted by the Engineer for the District.

F. Unless otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM or other specified published standards, as applicable to the class and nature of the article or materials considered. However, the District reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the Engineer will assure the District that the quality of the workmanship is in full accord with the Contract Documents.

G. Samples and test specimens required under the Contract Documents shall be furnished by the Contractor and prepared for testing in ample time for the completion of the necessary tests and analyses before the subject materials or articles are to be used. The Contractor shall furnish all required test specimens at its own expense. Except as otherwise provided in the Contract Documents, performance of the required tests will be by the District, and all costs therefor will be borne by the District; except, that the cost of any test which shows unsatisfactory results shall be borne by the Contractor.

H. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide, or otherwise cover or make inaccessible any work under the Contract, the Contractor shall notify the Engineer not less than 24 hours in advance of beginning any such work so that the required inspections can be scheduled and performed. Failure of the Contractor to notify the Engineer at least 24 hours in advance of any such work shall be reasonable cause for the Engineer to require sufficient delay in the Contractor's schedule to allow time for such inspections and any remedial or corrective work required. All costs of such delays, including its impact or effect upon other portions of the Work shall be borne by the Contractor.

1.4 TEMPORARY UTILITIES

A. The Contractor shall provide, at its own expense, all necessary power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform the work in a safe and satisfactory manner. All temporary connections for electricity shall be subject to the approval of the Engineer and the power company representative, and shall be removed in the like manner at the Contractor's expense prior to final acceptance of the work.

B. The Contractor shall provide, at its own expense, all necessary water required for construction of the project, including disinfecting of the pipelines, valving, and appurtenances. The Contractor shall not make connection to, or draw water from any fire hydrant or pipeline without first making application for and obtaining a temporary water meter for construction from the District. For each such connection made, the Contractor shall first attach to the fire hydrant or pipeline a valve, meter, and backflow prevention device of a size and type acceptable to the District. The backflow prevention device shall be tested and certified prior to use of the temporary meter with a copy of the certification provided to the District.

C. Before final acceptance of the work on the project, all temporary connections and piping installed by the Contractor shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the District and to the agency owning the affected utility.

1.5 PROTECTION OF EXISTING FACILITIES

A. All oil, gasoline, power, telephone, communication, gas, water, irrigation, sewer, and storm drain facilities, both underground and overhead, encountered along the line of the Work shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the Engineer are made with the owner of said facilities.

B. Prior to any construction in the vicinity of existing underground facilities, the Contractor shall notify the Underground Service Alert agency and the authorized representatives of such utility owners or agencies not less than 3 days nor more than 7 days prior to construction so that a representative of said owners or agencies can be present during such work if they so desire.

C. The right is reserved to the District and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work of this Contract.

D. The Contractor shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.

E. The Contractor shall not perform any work that would affect oil, gas, sewer, or water pipelines, telephone, communications, or electric lines, fences or other structures, nor shall the Contractor enter upon the right-of-way involved until notified by the Engineer that the District has secured the necessary authorization from the proper party. After authorization has been obtained, the Contractor shall give said party due notice of its intention to begin work, and shall give said party convenient access and every facility for removing, shoring, supporting, or otherwise protecting such pipeline, line, or structure, and for replacing same.

F. Existing utility lines that are discovered during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired by the Contractor. The Contractor shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary. When

utility lines that are to be removed are encountered, the Contractor shall notify the Engineer a sufficient time in advance for the necessary measures to be taken to prevent interruption of service

G. In the event that the Contractor damages any existing utility lines that are not shown or the locations of which are not made known to the Contractor prior to excavation, a written report thereof shall be made immediately to the Engineer. If directed by the Engineer, repairs shall be made by the Contractor under the provisions for changes and extra work contained in Articles 10, 11, and 12 of the General Conditions. All costs of locating, repairing damage not due to failure of the Contractor to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of Articles 10, 11, and 12 of the General Conditions.

H. The Contractor shall be responsible for and shall repair all damage caused by its operations even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling. All repairs to a damaged improvement are subject to inspection and approval by an authorized representative of the improvement owner before being concealed by backfill or other work.

I. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is shown, the Contractor, without unnecessary delay, shall temporarily replace or relocate such utility or the facility. Restoration to former location shall be accomplished by the Contractor in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

J. The Contractor shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced for easy and accurate restoration. All survey markers or points disturbed by the Contractor shall be accurately restored by the Contractor at the Contractor's expense after all street or roadway resurfacing has been completed.

K. All paved areas, including curbs and berms, cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the permit of the governing agency. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

L. Wherever sidewalks, driveways, or private roads have been removed for purposes of construction, the Contractor shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the governing agency before proceeding with the final restoration or, if no such period of times is so fixed, the Contractor shall maintain temporary sidewalks or roadways until the final restoration has been made.

1.6 POTHOLING AND LOCATING EXISTING UNDERGROUND UTILITIES

A. The Contractor shall notify Underground Service Alert (USA) at least 48 hours in advance of any construction or potholing and make arrangements for the existing utilities to be marked by the affected utility companies.

B. The Contractor shall verify the exact location, depth, alignment, and grade of all utilities shown on the construction drawings and marked as part of the USA procedure. The Contractor shall make exploratory excavations (potholing) of all utilities that may interfere with the Work. All such exploratory excavations shall be performed as soon as practicable after award of contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the Contractor's work.

When such exploratory excavations show the utility location as shown to be in error, the Contractor shall immediately notify the Engineer.

C. **The Contractor shall pothole and locate the existing underground utilities at locations where connections will be made to existing utilities or where proposed facilities cross existing utilities and as shown on the drawings prior to submitting shop drawings.** The Contractor shall submit the pothole data to the engineer for review. The Engineer will not review any submittals by the Contractor until the potholing is completed and the pothole data has been submitted to the Engineer for review. No extension of time or additional compensation will be made for delays caused by the failure of the Contractor to complete the potholing in a timely manner.

D. All costs incurred in exposing and locating the existing utilities including all labor, tools, equipment for excavation, backfill and restoring existing surface improvements, shall be borne by the Contractor. The Contractor shall bear the cost of repairing or replacing any existing utility damaged by their potholing work.

1.7 TEMPORARY ENVIRONMENTAL CONTROLS

A. The use of explosives on the Work will NOT be permitted.

B. The Contractor shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from any dust originating from its operations. The Contractor's dust abatement measures shall be in accordance with the Santa Barbara County Air Pollution Control District standard dust mitigation measures and any other appropriate agency's dust abatement measures.

C. During the progress of the Work, the Contractor shall keep the site of the Work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the Work site, and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with all applicable laws and regulations.

D. Fixed or portable chemical toilets shall be provided by the Contractor wherever needed for the use of employees. The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the site in a manner satisfactory to the Engineer and in accordance with all applicable laws and regulations.

E. The Contractor's attention is directed to the Federal Clean Water Act (1977) which requires a Corps of Engineers permit under Section 404 of the Act, for the discharge of one cubic yard or more of any dredged or fill material into "navigable waters" as defined in "Permits for Activities in Navigable Waters or Ocean Waters, Paragraph (d)(2), Federal Register of 25 July 1975, page 3134.

F. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

1.8 PERMANENT UTILITY SERVICES

A. Electrical power shall conform to the requirements of the serving utility companies and shall meet with the approval of local, state and national inspecting authorities. The Contractor shall verify the location of services and the serving utility company requirements.

B. The Contractor shall apply for permanent electrical service in the name of the District, and forward the service application to the General Manager for execution on behalf of the District. The District will pay all connection and cable charges or other charges levied by the utility. The Contractor shall have the sole responsibility for coordinating the service installation to ensure that service is available as required by the Contractor's schedule.

C. The Contractor shall be responsible for all service charges until the facility is placed into service and final acceptance of the work is made by the District. All service charges, paid by the District prior to acceptance of the facility, will be deducted from the Contractor's progress or final payment.

1.9 ELECTRICAL CONTINUITY TEST OF METAL PIPELINES

All metallic pipelines requiring joint bonding, including mortar lined and coated steel pipe (CML&C), shall be tested for electrical continuity upon completion of construction and prior to acceptance by the District. The Contractor shall pay for retesting of work not conforming to the Specifications and the Contract Drawings.

1.10 COSTS OF OVERTIME INSPECTION AND OTHER SERVICES

A. Inspection of the work as well as other required services will be provided by the District between the hours of 7:30 a.m. and 4:00 p.m. on Monday through Friday only except District holidays. Any inspections or other services by the District requested by or made necessary as a result of the actions of the Contractor beyond the hours stated above shall be paid for by the Contractor at the prevailing rate of 1-1/2 times the regular hourly rate plus equipment charges.

B. Inspections or other services by the District requested by or made necessary as a result of the actions of the Contractor on Saturdays, Sundays, or holidays, must be scheduled and approved by the District and paid for by the Contractor in advance, at the prevailing rate for overtime and/or holiday work. The following holidays are observed by the District: New Year's Day, Presidents Day, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas. Contact the District for specific dates and days holidays will be observed prior to scheduling any construction operations.

C. The need for overtime inspection or other services by the District shall be determined by the Engineer, and their decision shall be final.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 013300

CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.1 GENERAL

A. **Submittals are required for all tapping sleeves, vaults, vault lids, combination air valve covers, and where called for in the DISTRICT Technical Specifications.** Submittals are also required for all materials not otherwise specified in the DISTRICT Technical Specifications, or whenever an "or equal" item is requested for use by the CONTRACTOR. Wherever submittals are required, they shall be submitted to the DISTRICT.

B. Frequently Used Specification Sections include but are not necessarily limited to:
   a. Division 00 - Procurement and Contracting Requirements.
   b. Division 01 - General Requirements.
   c. Technical Specification Sections identifying required submittals.

1.2 PRECONSTRUCTION CONFERENCE SUBMITTALS

A. At the preconstruction conference, the CONTRACTOR shall submit the following items to the DISTRICT for review:

1. A preliminary schedule of Shop Drawing, Sample, and proposed Substitute ("Or-Equal") submittals.

2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit.

3. A project overview bar chart.

1.3 SHOP DRAWINGS

A. Wherever called for in the Contract Documents, or where required by the DISTRICT, the CONTRACTOR shall furnish to the DISTRICT for review, two (2) physical copies of each Shop Drawing submittal and one (1) electronic copy. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop-prepared drawings, fabrication and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items. Whenever the CONTRACTOR is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of an engineer registered in the State of California in the appropriate area of expertise.

B. Organization

1. A single submittal transmittal form shall be used for each technical specification section or item or class of material or equipment for which a submittal is required. A single submittal covering multiple sections will not be acceptable, unless the primary specification references other sections for components. Example: if a pump section references other section for the motor, Protective Coatings, anchor bolts, local control panel, and variable frequency drive, a single submittal would be accepted; a single submittal covering vertical turbine pumps and horizontal split case pumps would not be acceptable.

2. On the transmittal form, index the components of the submittal and insert tabs in the submittal

to match the components. Relate the submittal components to Technical Specification paragraph and subparagraph, Drawing number, detail number, schedule title, as applicable.

3. Unless indicated otherwise, terminology and equipment names and numbers used in submittals shall match the Contract Documents.

D. Format

1. Minimum sheet size shall be 8.5 inches by 11 inches. Maximum sheet size shall be 24 inches by 36 inches. Every page in a submittal shall be numbered in sequence. Each copy of a submittal shall be collated and stapled or bound, as appropriate.

2. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with all pertinent data, capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports. Sufficient level of detail shall be presented for assessment of compliance with the Contract Documents.

3. Each submittal shall be assigned a unique number. Submittals shall be numbered sequentially. The submittal numbers shall be clearly noted on the transmittal. Original submittals shall be assigned a numeric submittal number. Resubmittals shall bear an alpha-numeric system which consists of the number assigned to the original submittal for that item followed by a letter of the alphabet to represent that it is a subsequent submittal of the original. For example, if submittal 25 requires a resubmittal, the first resubmittal will bear the designation “25-A” and the second resubmittal will bear the designation “25-B” and so on.

4. A submittal log will be maintained by the CONTRACTOR and submitted to the DISTRICT that includes, at a minimum, the unique number, subject, anticipated date of submittal, date submitted, date returned by the DISTRICT, and DISTRICT response.

E. Disorganized submittals that do not meet the requirements above will be returned without review.

F. Except as may otherwise be indicated herein, the DISTRICT will return prints of each submittal to the CONTRACTOR with its comments noted thereon, within 14 calendar days following receipt by the DISTRICT. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the DISTRICT by the second submission of a submittal item. The DISTRICT maximum review period for each submittal, including all resubmittals, will be 14 days per submittal.

G. If a submittal is returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and resubmission of said submittal is not required.

H. If a submittal is returned marked "MAKE CORRECTIONS NOTED," CONTRACTOR shall make the corrections on the submittal, but formal revision and resubmission of said submittal is not required.

I. If a submittal is returned marked "AMEND-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the DISTRICT for review.

J. If a submittal is returned marked "REJECTED-RESUBMIT," it shall mean that the submitted material or product does not satisfy the specification, the submittal is so incomplete that it cannot be reviewed, or is a substitution request not submitted in accordance with Section 016000 - Products, Materials, Equipment, and Substitutions. The CONTRACTOR shall prepare a new submittal and shall resubmit the required number of copies of said revised submittal to the DISTRICT for review.

K. Fabrication of an item shall be commenced only after the DISTRICT has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or MAKE

CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as changes to the contract requirements.

L. The DISTRICT's review of submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

1.4 SAMPLES

A. Whenever in the Specifications samples are required, the CONTRACTOR shall submit not less than two samples of each item or material to the DISTRICT for acceptance. Unless otherwise indicated, samples, shall be submitted a minimum of 14 days prior to ordering such material.

B. Samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Manufacturer's name. Upon receiving acceptance of the DISTRICT, one set of the samples will be stamped and dated by the DISTRICT and returned to the CONTRACTOR, and one set of samples will be retained by the DISTRICT.

C. Unless indicated otherwise, all colors and textures of items presented in sample submittals shall be from the manufacturer's standard colors and standard materials, products, or equipment lines.

D. The CONTRACTOR shall schedule sample submittals such that:

1. Samples are submitted in an orderly sequence which allows the DISTRICT 14 days to assemble color panels and select color and texture dependent products and materials without delay to the construction schedule.

2. The CONTRACTOR has sufficient time after approval or selection of color or texture to provide the products or materials without delay to the construction schedule. The Contract Times will not be extended for the CONTRACTOR’s failure to allow enough review and approval or selection time, failure to submit all samples requiring color or texture selection, or failure to submit complete samples.

1.5 HEALTH AND SAFETY PLANS

A. The CONTRACTOR shall submit the following items to the DISTRICT for review at no less than 60 days prior to construction site mobilization:

1. Health and Safety Plan in conformance with all applicable OSHA and Cal-OSHA regulations. The Health and Safety Plan shall:
    a. Identify the person(s) responsible for implementation and enforcement of Safety/Health and Security rules and regulations for the project.
    b. Address safe work procedures for the activities within the CONTRACTOR’s scope of work.
    c. Include a new employee orientation program which addresses job and site-specific rules, regulations and hazards.
    d. Include the CONTRACTOR’s Drug Free Work Place Policy.
    e. Include provisions to protect the CONTRACTOR’s employees, other persons and organization who may be affected by the work from injury, damage or loss.
    f. Comply with current OSHA, CalOSHA, and locally accepted safety codes, regulations and practices.
    g. Assign a qualified, experienced person as the site safety officer.
    h. Include Hazard Communication/Right to Know Program.

i. Include a site-specific emergency action and evacuation plan.
j. Include security procedures for the CONTRACTOR's work, tools, and equipment.
k. Identify documentation to show compliance, including accident and investigation reports.
l. Be updated, revised, and resubmitted to account for changes in safety conditions, responsible persons, and policies.

1.6 OPERATIONS & MAINTENANCE MANUAL

A. When so specified in the Contract documents, the CONTRACTOR shall submit technical operation and maintenance information for each item of mechanical and electrical equipment in an organized manner in the Operations & Maintenance (O&M) Manual. It shall be written so that it can be used and understood by the DISTRICT'S operation and maintenance staff.

B. The O&M Manual shall be subdivided first by specification section number; second, by equipment item; and last, by "Category" with the following information provided for each item of equipment (as applicable):

1. Category 1 - Equipment Summary: A summary table shall indicate the equipment name, equipment number, and location in which the equipment is installed.

2. Category 2 - Operational Procedures: Manufacturer-recommended procedures shall be included covering: Installation, Adjustment, Operation procedures, Troubleshooting, Disassembly, Re-assembly; and Tabulation of proper settings for all pressure relief valves, low and high pressure switches, and other protection devices.

3. Category 3 - Preventative Maintenance Procedures: Preventative maintenance procedures shall include all manufacturer-recommended procedures to be performed and recommended frequency of preventative maintenance procedures shall be included.

4. Category 4 - Parts List and Drawings: A complete parts list shall be furnished, including a generic description and manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included. Cross-sectional or exploded view drawings shall accompany the parts list.

5. Category 5 – Safety Procedures: Engineering, industry, and manufacturer-recommended safety procedures shall be provided covering the safety precautions to be taken when operating and maintaining the equipment or working near it.

6. Category 6 - Documentation: All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this category.

7. Spare Parts List: The spare parts list shall include those spare parts which each manufacturer recommends be maintained by the DISTRICT in inventory at the plant site. The CONTRACTOR shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to assist the DISTRICT in ordering spare parts. The list shall include the current list price of each spare part.

C. The CONTRACTOR shall furnish to the DISTRICT 3 identical physical O&M Manuals and one (1) electronic copy. Each set shall consist of one or more volumes, each of which shall be bound in a

standard size, 3-ring, loose leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents indicating all equipment in the manuals shall be included.

D. Manuals shall be submitted in final form to the DISTRICT not later than the 75 percent of construction completion date. All discrepancies found by the DISTRICT shall be corrected within 30 days from the date of written notification by the DISTRICT.

1.7 RECORD DRAWINGS

A. The CONTRACTOR shall maintain one record set of Drawings at the Site. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the information represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. The CONTRACTOR shall provide supplemental detailed sketches as necessary or directed to fully indicate the WORK as actually constructed. These master record drawings of the CONTRACTOR's representation of record drawing conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the WORK. Red ink shall be used for alterations and notes.

B. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final Shop Drawings, and by including appropriate reference information describing the change orders by number and the Shop Drawings by manufacturer, drawing, and revision numbers.

C. Record drawings shall be accessible to the DISTRICT at all times during the construction period. Said up-to-date record drawings shall be in the form of a set of prints with carefully plotted information overlaid.

D. Upon Substantial Completion of the WORK and prior to final acceptance, the CONTRACTOR shall finalize and deliver a complete set of record drawings to the PROJECT ENGINEER or DISTRICT as applicable. This set of drawings shall consist of corrected Drawings showing the reported location of the WORK. The information submitted by the CONTRACTOR and incorporated by the PROJECT ENGINEER into the record drawings will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the record drawings as a result.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 014200

REFERENCE STANDARDS

PART 1 – GENERAL

1.1 GENERAL

A. **Titles of Sections and Paragraphs:** Titles and subtitles accompanying specification sections and paragraphs are for convenience and reference only, and do not form a part of the Specifications.

B. **Applicable Publications:** Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that construction is started shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth in the Standards & Specifications or shown on the Construction Drawings will be waived because of any provision of, or omission from, said standards or requirements.

C. **Specialists, Assignments:** In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The CONTRACTOR shall construct the WORK in accordance with the Contract Documents and the referenced portions of those referenced codes, standards, and specifications.

B. References herein to "Building Code" or "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO). Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electrical Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the DISTRICT for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.

D. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

E. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

F. References herein to Caltrans Standards and Specifications Shall mean State of California Department of Transportation Standards and Specifications.

G. **Applicable Safety Standards:** References herein to "Cal-OSHA" shall mean State of California, Department of Industrial Relations, Construction Safety Orders, as amended to date, and all changes and amendments thereto.

H. References herein to County Standards and Specifications Shall mean County of Santa Barbara, Department of Public Works, Standards and Specifications.

I. References herein to City of Goleta Standards and Specifications Shall mean City of Goleta, Department of Public Works, Standards and Specifications.

1.3 REGULATIONS RELATED TO HAZARDOUS MATERIALS

A. The CONTRACTOR shall be responsible that all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of hazardous materials, including petroleum products.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 015526

TRAFFIC CONTROL & ACCESS

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide traffic control and access in accordance with these Specifications, Caltrans Standard Specifications and Plans, and the standards contained in the "Work Area Traffic Control Handbook" (WATCH) published by Building News, Inc. The CONTRACTOR shall take all necessary precautions for the protection of the Work and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall prepare and submit Traffic Control plans and comply with special safety regulations relating to traffic control as may be required by the County of Santa Barbara or other public authorities within their respective jurisdiction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EQUIPMENT TRAVEL ROUTE

A. The CONTRACTOR shall make its own investigation of the condition of available access routes to and from the site of the Work. If suitable access is not available, it shall be the CONTRACTOR's responsibility to construct and maintain any access or haul roads required for its construction operations. The travel route for the CONTRACTOR's equipment shall follow the safest route possible and minimize inconvenience to motorists and pedestrians.

3.2 TEMPORARY STREET USE

A. Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alley, way, or parking area during the performance of the Work hereunder. The CONTRACTOR shall conduct its operations as not to interfere unnecessarily with the authorized work of the District, utility companies, or other agencies in such streets, alleys, ways, or parking areas.

B. No street shall be closed to the public without first obtaining the permission of the County of Santa Barbara, the DISTRICT, and other proper governmental authority, where applicable. Where excavation is being performed in primary streets or highways, at least one lane of traffic shall be kept open in each direction at all times unless otherwise provided in the Contract Documents or under the terms of the permits issued by the County of Santa Barbara, State, District or other public agencies, as required.

C. Toe boards shall be provided to restrict movement of excavated material if required by the County, the DISTRICT, or other agency having jurisdiction over the affected street or highway. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of all gutters, drainage inlets, and other drainage facilities.

3.3 TRAFFIC CONTROL

A. For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of Caltrans "Manual of Traffic Controls - Warning Signs, Lights, and Devices for Use in Performance of Work Upon Highways."

B. Provide, place and maintain all necessary barricades, traffic cones, warning signs, lights and other safety devices. Post and maintain adequate detour signs at all applicable approaches to forewarn and direct traffic. Use

illuminated and/or reflective warning/construction signs at appropriate locations for the project. Use solar powered flashing arrow boards for each lane closure taper in addition to other delineation. Provide safe and effective work areas and warn, control, protect and expedite vehicular and pedestrian traffic through the construction project.

C. Provide temporary traffic re-striping at the conclusion of any working day for any centerline or lane line which is obliterated by construction. Use temporary asphalt surfacing at the CONTRACTOR's own expense as required to maintain traffic in a safe and non-disruptive manner. Provide temporary delineation as required which includes sandblasting of conflicting markings, installation and removal of temporary centerlines or lane lines, detour signing, barricading, and replacement of traffic lines, and markings in their proper locations upon termination of the detour. Provide any temporary pavement marking. Provide for removal of existing markings and the later removal of temporary markings to restore the permanent markings.

D. Through traffic shall be maintained in both directions during working hours. Reopen all traffic lanes for the traffic circulation at the end of each working day, and during non-working hours including holidays, Saturdays, and Sundays. Provide traffic re-striping and markings prior to opening street traffic.

E. Where required, the CONTRACTOR shall furnish, install, and maintain in-place "No Parking – Tow Away" signs (even if streets have posted "No Parking" signs) which shall be posted at least two (2) working days prior to commencement of work. On the sign, CONTRACTOR shall print the hours, day(s) and date of closure in two-inch-high letters and numbers. The signs shall be spaced at a maximum of 50 feet from street intersection and/or from each adjacent sign.

F. The CONTRACTOR shall be responsible for the project safety on a 24-hours basis each calendar day for the entire duration of the project.

3.4 ACCESS

A. Wherever necessary or required for the convenience of the public or individual residents or business places at street or highway crossings, private driveways, or elsewhere, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates. Such written consent shall be delivered to the DISTRICT prior to beginning the excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation.

B. Temporary bridges or steel plates for street and highway crossings shall conform to the requirements of the County of Santa Barbara or authority having jurisdiction in each case. The CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

C. Maintain adjacent streets open for ingress and egress and for parking; Provide emergency access for fire trucks, police cars, and other emergency vehicles at all times. The CONTRACTOR shall notify each agency in writing at least three (3) working days prior to work, and submit a copy of notice to DISTRICT. Fire hydrants on or adjacent to the Work shall be kept accessible to fire-fighting equipment at all times.

D. Construct temporary AC ramps to provide safe and drivable access to residents and businesses and safe pedestrian crossing paths at all times. Provide alternate crossing areas with appropriate signing and other devices where construction prohibits pedestrian and bicycle access. Provide safe and adequate pedestrian zones and public transportation stops, as well as reasonable pedestrian crossings of the work at frequent intervals. Keep the areas through and adjacent to the construction site clear of any objects that may be hazardous to pedestrians.

3.5 WORKING HOURS

A. Construction work operations shall be performed Monday through Friday except DISTRICT observed holidays unless otherwise noted. The CONTRACTOR work hours shall be at District discretion Monday through Friday except that work within the street right-of-way that effects the flow of traffic shall only be allowed in

accordance with the issued encroachment permit.

3.6 NOTIFICATION

A. The CONTRACTOR shall provide notification in writing to affected residences, schools, churches, and businesses informing them of the pending project. A draft notification letter shall be submitted to the DISTRICT five working days in advance of required notification date for verification and approval. The CONTRACTOR shall hand deliver copies of the approved notification letter to the affected residences, school, churches, and businesses at least 14 days prior to the scheduled construction on each block. The notification letter shall state the project name, scope of work, date and time of restricted travel on the affected streets, and the CONTRACTOR's and DISTRICT's contact persons and phone numbers. Failure to meet the approved schedule requires that the CONTRACTOR immediately notify residents of the cancellation for that day's work and reschedule construction of the affected area at a later date. Notification of rescheduled work shall follow this same procedure.

3.7 TRAFFIC CONTROL PLANS

A. Traffic control plans shall be provided by the CONTRACTOR and submitted to the County of Santa Barbara, Caltrans or other agencies having jurisdiction as may be required. Traffic control plans shall conform to the requirements of the County of Santa Barbara or Caltrans as applicable and shall include the location and wording of all signs, barricades, delineators, lights, warning devices, and temporary parking restrictions; separate plan for each stage of construction; and separate detour routing plan.

3.8 TEMPORARY STREET CLOSURE

A. If closure of any street is required during construction, a formal application for a street closure shall be made to the County of Santa Barbara or other authority having jurisdiction at least 30 days prior to the required street closure to allow them to determine the necessary signing and detour requirements to be provided by the CONTRACTOR.

END OF SECTION

SECTION 016000

PRODUCTS, MATERIALS, EQUIPMENT & SUBSTITUTIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. The word "Products," as used in the Contract Documents, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form WORK. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying, and erection of the WORK.

1.2 QUALITY ASSURANCE

A. **Source Limitations:** To the greatest extent possible for each unit of WORK, the CONTRACTOR shall provide products, materials, and equipment of a singular generic kind from a single source.

B. **Compatibility of Options:** Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.3 SUBSTITUTIONS

A. The CONTRACTOR shall, to the greatest extent possible, provide the materials as specified in these Contract Documents. Where procurement of the material as specified is not possible or the CONTRACTOR would like to submit for consideration an alternative, the CONTRACTOR shall submit shop drawings in accordance Section 013300 and shall clearly indicate the product being substituted.

1.4 PRODUCT DELIVERY AND STORAGE

A. The CONTRACTOR shall deliver and store the products, materials and equipment in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at the Site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss.

1.5 TRANSPORTATION AND HANDLING

A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.

B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment including those furnished by DISTRICT, by methods to prevent soiling and damage.

C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.6 STORAGE AND PROTECTION

A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature.

B. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.

C. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

1.7 MAINTENANCE OF PRODUCTS IN STORAGE

A. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations. The CONTRACTOR shall maintain a log of inspections and shall make the log available on request. The CONTRACTOR shall periodically inspect products to assure they are undamaged and are maintained under required conditions. The CONTRACTOR shall maintain manufacturer-required environmental conditions continuously.

B. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.

C. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.

D. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to final acceptance by the DISTRICT.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 028200

ASBESTOS CEMENT PIPE REMOVAL & DISPOSAL

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR may encounter asbestos cement pipe (ACP) during the prosecution of this work. The CONTRACTOR shall remove and dispose of ACP in accordance with State of California requirements, and the Contract Documents. Removal of ACP shall be performed by a CONTRACTOR licensed and certified by Cal/OSHA for such removal.

B. The CONTRACTOR sha1l follow the AWWA guidelines for handling, removing and disposing of ACP as stated in the applicable sections of AWWA Standards C400, C401, C402, and C403 covering Asbestos-Cement Transmission and Distribution Pipe.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 312316 – Trenching, Backfill and Compaction
Section 330509 – Piping, General

1.3 SUBMITTALS

A. **Asbestos Cement Pipe Removal and Disposal Plan:** The CONTRACTOR shall complete and submit to the DISTRICT INSPECTOR an "Asbestos Cement Pipe Removal and Disposal Plan." The CONTRACTOR shall clearly describe their proposed methods for the removal and disposal of ACP that ensures no exposure to airborne asbestos by the CONTRACTOR'S personnel. The written plan shall be submitted to the DISTRICT INSPECTOR for review and approval at least one week in advance of the proposed date of removal.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Snap cutting tools shall be used for the removal of asbestos cement pipe whenever the removal of intact pipe sections is not possible. Power "Cut-Off" saws, hand-saws, and other devices and methods that result in the release of asbestos fibers into the air shall not be used for the removal of ACP.

2.2 ENCAPSULANT

A. If during the removal of ACP broken edges occur, the broken edges shall be encapsulated with Certane 1000 Post Removal Encapsulant, or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall perform all cutting and handling of asbestos cement pipe in accordance with State of California requirements. The CONTRACTOR shall provide sufficient supervision and perform monitoring to assure conformance with State requirements. Under no circumstances shall the CONTRACTOR utilize methods of removal that result in the release of asbestos fibers into the air.

3.2 REMOVAL

A. The CONTRACTOR shall, whenever possible, accomplish the removal of ACP by removing intact pipe sections. Where connections are to be made to existing ACP waterlines, the ACP shall be removed in sections back to the nearest ACP coupling. The CONTRACTOR shall pothole and expose the pipe and ACP couplings prior to developing their proposed "Asbestos Cement Pipe Removal and Disposal Plan".

B. Snap cutting tools shall be used for the removal of asbestos cement pipes whenever the removal of intact pipe sections is not possible. The pipe shall be wetted prior to the snapping operation being performed. Use of a hammer and chisel to gradually split an ACP coupling lengthwise may only be performed if the "Asbestos Cement Pipe Removal and Disposal Plan" developed by the CONTRACTOR incorporates measures to prevent the release of asbestos fibers into the air, and is approved by the DISTRICT. Power "Cut-Off" saws, hand-saws, and other devices and methods that result in the release of asbestos fibers into the air shall not be used for the removal of ACP.

C. A pipe snapper or pneumatic reciprocating saw are approved for cutting pipe. ACP cutting and asbestos gasket removal shall be done by the wet method, which is keeping the asbestos constantly wet by spraying it with water. Abrasive circular saws shall not be used for cutting ACP. In addition, hammering ACP to break it and use of a grinder on asbestos gaskets is not allowed.

D. The CONTRACTOR shall continuously wet the ACP around the snap cutting tool during the removal operation. All personnel handling the ACP shall wear properly fitted respirators during the removal and bagging operation, and shall be trained in the use of the respirator equipment. All pedestrian traffic shall be rerouted to maintain 30 feet clear of the ACP work area.

E. All removed sections or pieces of ACP shall be bagged and prepared for disposal immediately after removal as described below. If during the removal of ACP broken edges occur, the broken edges shall be encapsulated with Certane 1000 Post Removal Encapsulant, prior to bagging, in accordance with the manufacturers' recommendations.

3.3 DISPOSAL

A. The CONTRACTOR shall transport all sections and pieces of ACP in accordance with State requirements and shall be delivered to the District yard for disposal. All sections or pieces of ACP shall be wetted and double wrapped or bagged with polyethylene wrap immediately after removal. The minimum thickness of polyethylene wrap shall be 6 mils. The outer wrap shall be securely held in place with tape in a manner to prevent the release of airborne asbestos fibers.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.

B. The following types of concrete are covered in this Section:

1. **Structural Concrete:** Concrete to be used in all cases except where indicated otherwise in the Contract Documents.

2. **Sitework Concrete:** Concrete to be used for curbs, gutters, catch basins, sidewalks, pavements, fence and guard post embedment, underground pipe encasement, underground duct bank encasement and all other concrete appurtenant to electrical facilities unless otherwise indicated.

3. **Lean Concrete:** Concrete to be used for thrust blocks, pipe trench cut-off blocks and cradles that are detailed on the Drawings as unreinforced. Lean concrete shall be used as protective cover for dowels intended for future connection.

C. The term "hydraulic structure" used in these specifications means environmental engineering concrete structures for the containment, treatment, or transmission of water, wastewater, or other fluids.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. **Federal Specifications:**

UU-B-790A (1) (2)	Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant)

B. **Commercial Standards:**

ACI 117	Tolerances for Concrete Construction and Materials
ACI 214R-11	Guide to Evaluation of Strength Test Results of Concrete
ACI 301	Structural Concrete
ACI 306.1	Cold Weather Concreting
ACI 309	Consolidation of Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Structural Concrete
ASTM C 31	Practices for Making and Curing Concrete Test Specimens in the Field
ASTM C 33	Concrete Aggregates

ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 94	Ready-Mixed Concrete
ASTM C 136	Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143	Test Method for Slump of Hydraulic Cement Concrete
ASTM C 150	Portland Cement
ASTM C 156	Test Methods for Water Loss Through Liquid Membrane Forming Curing Compounds for Concrete
ASTM C 157	Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
ASTM C 192	Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 1077	Practice for Agencies Testing Concrete and Concrete Aggregates for use in Construction & Criteria for Testing Agency Evaluation
ASTM D 448	Classification for Sizes of Aggregate for Road and Bridge Construction
ASTM D 2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM E 119	Method for Fire Tests of Building Construction and Materials
ASTM E 1643	Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
ASTM E 1745	Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs

1.4 CONTRACTOR SUBMITTALS

A. **Mix Designs:** Prior to beginning the WORK and within 14 days of the notice to proceed, the CONTRACTOR shall submit to the DISTRICT, for review, preliminary concrete mix designs which shall show the proportions and gradations of all materials proposed for each class and type of concrete specified herein in accordance with Section 013300 - Contractor Submittals.

B. **Delivery Tickets:** Where ready-mix concrete is used, the CONTRACTOR shall furnish delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state certified equipment used for measuring and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate added at the batching plant, and the amount allowed to be added at the site for the specific design mix. In addition, each ticket shall state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the times when the batch was dispatched, when it left the plant, when it arrived at the site, when unloading began, and when unloading was finished.

C. Furnish the following submittals in accordance with ACI 301:

1. Mill tests for cement.
2. Admixture certification. Chloride ion content must be included.
3. Aggregate gradation test results and certification.
4. Materials and methods for curing.
5. Reinforcing steel certification.

1.5 QUALITY ASSURANCE

A. General

1. Tests on component materials and for compressive strength and shrinkage of concrete shall be performed as indicated herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.

2. Testing for aggregate shall include sand equivalence, reactivity, organic impurities, abrasion resistance, and soundness, according to ASTM C 33.

3. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the DISTRICT. However, the CONTRACTOR shall pay the cost of any additional tests and investigation on WORK performed which does not meet the specifications. The laboratory will meet or exceed the requirements of ASTM C 1077.

4. Concrete for testing shall be supplied by the CONTRACTOR, and the CONTRACTOR shall assist the DISTRICT in obtaining samples, and disposal and cleanup of excess material.

B. **Field Compression Tests:**

1. Compression test specimens will be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the DISTRICT to insure continued compliance with these specifications. Each set of test specimens will be a minimum of 5 cylinders.

C. **Evaluation and Acceptance of Concrete:**

1. Evaluation and acceptance of the compressive strength of concrete will be according to the requirements of ACI 318, Chapter 5 "Concrete Quality," and as indicated herein.

2. A statistical analysis of compression test results will be performed according to the requirements of ACI 214. The standard deviation of the test results shall not exceed 640 psi, when ordered at equivalent water content as estimated by slump.

3. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.

4. When the standard deviation of the test results exceeds 640 psi, the average strength for which the mix is designed shall be increased by an amount necessary to satisfy the statistical requirement that the probability of any test being more than 500 psi below or the average of any 3 consecutive tests being below the required compressive strength is 1 in 100. The required average strength shall be calculated by Criterion No. 3 of ACI 214 using the actual standard of deviation.

5. All concrete which fails to meet the ACI requirements and these specifications, is subject to removal and replacement.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. **General:**

1. All materials shall be classified as acceptable for potable water use according to NSF Standard 61.

2. Cement for concrete which will contact potable water shall not be obtained from kilns which burn metal rich hazardous waste fuel.

3. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.

B. All materials shall comply with the requirements of Section 4 of ACI 301.

C. Storage of materials shall conform to the requirements of Section 4 of ACI 301.

D. Materials for concrete shall conform to the following requirements:

1. Cement shall be standard brand Portland cement conforming to ASTM C 150 for Type II or Type V, including Table 2 optional requirements. A minimum of 85 percent of cement by weight shall pass a 325 screen. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be acceptable to the DISTRICT. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling. Certified mill test reports, including fineness, for each shipment of cement to be used shall be submitted to the DISTRICT, if requested, regarding compliance with these Specifications.

2. Water for mixing and curing shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts, and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1000 mg/l TDS) shall not be used.

3. Aggregates shall be obtained from pits acceptable to the DISTRICT, shall be non-reactive, and shall conform to ASTM C 33. Maximum size of coarse aggregate shall be as indicated herein. Lightweight sand for fine aggregate will not be permitted.

a. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock, or a combination thereof. The coarse aggregates shall be prepared and handled in two or more size groups for combined aggregates with a maximum size greater than 3/4-inch. When the aggregates are proportioned for each batch of concrete, the two size groups shall be combined. See the Paragraph in Part 2 entitled "Trial Batch and Laboratory Tests" for the use of the size groups.

b. Fine aggregates shall be natural sand or a combination of natural and manufactured sand that are hard and durable. When tested in accordance with ASTM D 2419, the sand equivalency shall not be less than 75 percent for an average of three samples, nor less than 70 percent for an individual test. Gradation of fine aggregate shall conform to ASTM C 33. The fineness modulus of sand used shall not be over 3.00.

c. Combined aggregates shall be well graded from coarse to fine sizes and shall be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final

combined aggregate gradations will be established during the trial batch process.

4. Ready-mix concrete shall conform to the requirements of ASTM C 94.

5. Admixtures: All admixtures shall be compatible and be furnished by a single manufacturer capable of providing qualified field service representation. Admixtures shall be used in accordance with manufacturer's recommendations. If the use of an admixture is producing an inferior end result, the CONTRACTOR shall discontinue use of the admixture. Admixtures shall not contain thiocyanates nor more than 0.05 percent chloride ion, and shall be non-toxic after 30 days.

a. Air-entraining agent meeting the requirements of ASTM C 260 shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 5 percent. The DISTRICT reserves the right, at any time, to sample and test the air-entraining agent. Air entraining agent shall be at the District's discretion.

b. Set controlling and water reducing admixtures: Admixtures may be added at the CONTRACTOR's option, subject to the DISTRICT's approval, to control the set, effect water reduction, and increase workability. The addition of an admixture shall be at the CONTRACTOR's expense. Concrete containing an admixture shall be first placed at a location determined by the DISTRICT. Admixtures shall conform to the requirements of ASTM C 494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used.

1. Concrete shall not contain more than one water reducing admixture.

7. **Flyash:** Flyash shall not be used.

2.2 REINFORCEMENT STEEL

A. Reinforcement steel for cast-in-place reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A 615 - Deformed and Plain Billet - Steel Bars, for Grade 60 reinforcement unless otherwise indicated.

2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete, and the details indicated. Welded wire fabric with longitudinal wire of W4 size wire and smaller shall be in flat sheets or in rolls with a core diameter of not less than 10 inches. Welded wire fabric with longitudinal wires larger than W4 size shall be in flat sheets only.

3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

B. Accessories

1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. Bar supports shall meet the requirements of the CRSI Manual of Standard Practice including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating which extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.

2. Concrete blocks (dobies) used to support and position reinforcement steel shall have the same or higher compressive strength as required for the concrete in which they are located. Wire ties shall be embedded in concrete block bar supports.

C. Epoxy coating for reinforcing and accessories, where indicated, shall conform to ASTM A 775 - Epoxy - Coated Reinforcing Steel Bars.

2.3 CURING MATERIALS

A. Materials for curing concrete as indicated herein shall conform to the following requirements and ASTM C 309:

1. All curing compounds shall be white pigmented and resin based. Sodium silicate compounds shall not be allowed.

2. Polyethylene sheet for use as concrete curing blanket shall be white and shall have a nominal thickness of 6 mils. The loss of moisture when determined in accordance with the requirements of ASTM C 156 shall not exceed 0.055 grams per square centimeter of surface.

3. Polyethylene-coated waterproof paper sheeting for use as concrete curing blanket shall consist of white polyethylene sheeting free of visible defects, uniform in appearance, have a nominal thickness of 2 mils, and be permanently bonded to waterproof paper conforming to the requirements of Federal Specification UU-B-790A (1) (2). The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

4. Polyethylene-coated burlap for use as concrete curing blanket shall be 4-mil thick, white opaque polyethylene film impregnated or extruded into one side of the burlap. Burlap shall weigh not less than 9 ounces per square yard. The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 grams per square centimeter of surface.

5. Curing mats for use in Curing Method 6 as indicated in Section 3.9, shall be heavy shag rugs or carpets or cotton mats quilted at 4 inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.

6. Evaporation retardant shall be a material such as MasterKure ER 50 as manufactured by Master Builders Solutions; Eucobar as manufactured by Euclid Chemical Company; E-CON as manufactured by L & M Construction Chemicals, Inc. or equal.

2.4 NON-WATERSTOP JOINT MATERIALS

A. Materials for non-waterstop joints in concrete shall conform to the following requirements:

1. Preformed joint filler shall be a non-extruding, neoprene sponge or polyurethane type

3. Mastic joint sealer shall be a material that does not contain evaporating solvents; that will tenaciously adhere to concrete surfaces; that will remain permanently resilient and pliable; that will not be affected by continuous presence of water and will not in any way contaminate potable water; and that will effectively seal the joints against moisture infiltration even when the joints are subject to movement due to expansion and contraction. The sealer shall be composed of special asphalts or similar materials blended with lubricating and plasticizing agents to form a tough, durable mastic substance containing no volatile oils or lubricants and shall be capable of meeting the test requirements set forth below, if testing is required by the DISTRICT.

2.5 CONCRETE DESIGN REQUIREMENTS

A. **General:** Concrete shall be composed of cement, admixtures, aggregates, and water of the qualities indicated. The exact proportions in which these materials are to be used for different parts of the work will be

determined during the trial batch. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage, and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results. All changes shall be subject to review by the DISTRICT.

C. **Water-Cement Ratio and Compressive Strength:** Concrete shall have the following minimum properties:

Type of Work	Min. 28-Day Compressive Strength (psi)	Max. Size Aggregate (in)	Cement per cu. yd. (lbs)	Max W/C Ratio (by weight)
Structural Concrete:				
Roof, floor slabs, columns, walls and all other concrete items not specified elsewhere.	4,000	1	564-600	0.45
12-inch and thicker walls, slabs on grade and footings. (optional)	4,000	1-1/2	564-600	0.45
Pea Gravel Mix. Thin sections and areas with congested reinforcing, at the CONTRACTOR'S option and with the written approval of the DISTRICT for the specific location. Maximum fine aggregate 50% by weight of aggregate.	4,000	3/8	752-786	0.40
Other Concretes:				
Sitework concrete	3,000	1	470 (min)	0.50
Lean concrete	2,000	1	376 (min)	0.60

NOTE: The CONTRACTOR is cautioned that the limiting parameters above are not a mix design. Additional cement or water reducing agent may be required to achieve workability required by the CONTRACTOR'S construction methods and aggregates. The CONTRACTOR is responsible for providing concrete with the required workability.

D. **Adjustments to Mix Design:** The mixes shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish, and the CONTRACTOR shall be entitled to no additional compensation because of such changes.

2.6 CONSISTENCY

A. The quantity of water in a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation and which can be compacted by vibratory methods to give the desired density, impermeability, and smoothness of surface. The quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

Part of Work	Slump (in)
All concrete, unless indicated otherwise	3 inches plus or minus 1 inch
With high range water reducer added	7 inches plus or minus 2 inches
Pea gravel mix	7 inches plus or minus 2 inches
Ductbank and pipe encasement	5 inches plus or minus 1 inch

2.9 READY-MIXED CONCRETE

A. At the CONTRACTOR's option, ready-mixed concrete may be used if it meets the requirements as to materials, batching, mixing, transporting, and placing as indicated herein and is in accordance with ASTM C 94, including the following supplementary requirements.

B. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first.

PART 3 - EXECUTION

3.1 PROPORTIONING AND MIXING

A. **Proportioning:** Proportioning of the mix shall conform to the requirements of Chapter 4.2.3 "Proportioning" of ACI 301.

B. **Mixing:** Mixing shall conform to the requirements of Chapter 4.3.1of said ACI 301 Specifications.

C. **Slump:** Slumps shall be as indicated herein.

D. **Retempering:** Retempering of concrete or mortar which has partially hardened shall not be permitted.

3.2 PREPARATION OF SURFACES FOR CONCRETING

A. **General:** Earth surfaces shall be thoroughly wetted by sprinkling prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. Vapor Retarder Sheet

2. Sand base shall be at least 2 inches thick within the foundation line after moistening and compaction by mechanical means. Sand surface shall be flat and level within a tolerance of plus 0 inches to minus 3/4-inch.

3. Place, protect, and repair defects in sheet according to ASTM E 1643 and the manufacturer's written instructions. Seams shall be lapped and sealed in accordance with ASTM E 1643.

4. Granular material above the sheet shall be moistened and compacted to 2 inches thickness within the same flatness criteria as the sand base.

C. **Joints in Concrete:** Concrete surfaces upon or against which concrete is to be placed, where the placement of the concrete has been stopped or interrupted so that, as determined by the DISTRICT, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bonding. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, foreign material, and be roughened to a minimum 1/4-inch amplitude. Such cleaning and

roughening shall be accomplished by hydro-blasting or sandblasting (exposing aggregate) followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.

D. After the surfaces have been prepared, all approximately horizontal construction joints shall be covered with a 6-inch lift of a pea gravel mix. The mix shall be placed and spread uniformly. Wall concrete shall follow immediately and shall be placed upon the fresh pea gravel mix.

E. **Placing Interruptions:** When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent work; provided that construction joints shall be made only where acceptable to the DISTRICT.

F. **Embedded Items:** No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the DISTRICT at least 4 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from previous work shall be cleaned before the surrounding or adjacent concrete is placed.

G. All inserts or other embedded items shall conform to the requirements herein.

H. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms at locations indicated on the Drawings or shown by shop drawings and shall be acceptable to the DISTRICT before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.

I. **Casting New Concrete Against Old:** Where concrete is to be cast against old concrete (any concrete which is greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydro-blasting or sandblasting (exposing aggregate). The joint surface shall be coated with an epoxy bonding agent unless indicated otherwise by the DISTRICT.

J. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the WORK. No concrete shall be deposited underwater nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, shall be subject to the review of the DISTRICT.

K. **Corrosion Protection:** Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2 inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

L. Openings for pipes, inserts for pipe hangers and brackets, and anchors shall, where practicable, be provided during the placing of concrete.

M. Anchor bolts shall be accurately set and shall be maintained in position by templates while being embedded in concrete.

N. **Cleaning:** The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

O. Reinforcement steel shall be accurately positioned as indicated, and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. Reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers which

are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. Concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, the CONTRACTOR shall provide concrete, metal, plastic, or other acceptable bar chairs and spacers.

P. Limitations on the use of bar support materials shall be as follows.

1. Concrete Dobies: permitted at all locations except where architectural finish is required.
2. Wire Bar Supports: permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.
3. Plastic Bar Supports: permitted at all locations except on grade.

3.3 HANDLING, TRANSPORTING, AND PLACING

A. **General:** Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete.

B. **Non-Conforming Work or Materials:** Concrete which during or before placing is found not to conform to the requirements indicated herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications or which is of inferior quality shall be removed and replaced.

C. **Unauthorized Placement:** No concrete shall be placed except in the presence of a duly authorized representative of the DISTRICT. The CONTRACTOR shall notify the DISTRICT in writing at least 24 hours in advance of placement of any concrete.

D. **Placement in Wall and Column Forms:** Concrete shall not be dropped through reinforcement steel or into any deep form, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, means such as hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4 feet in walls and 8 feet in columns below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in wall forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in wall forms shall not exceed 5 feet of vertical rise per hour. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

E. **Casting New Concrete Against Old:** Epoxy adhesive bonding agent shall be applied to the old surfaces according to the manufacturer's written recommendations. This provision shall not apply to joints where waterstop is provided.

G. **Placement in Slabs:** Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement. As the work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.

I. **Cold Weather Placement:**

1. Placement of concrete shall conform to ACI 306.1 - Cold Weather Concreting,
3. Maintain the concrete temperature above 50 degrees F for at least 3 days after placement.

3.4 PUMPING OF CONCRETE

A. **General:** If the pumped concrete does not produce satisfactory end results, the CONTRACTOR shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. **Pumping Equipment:** The pumping equipment shall have 2 cylinders and be designed to operate with one cylinder in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the site during pumping.

C. The minimum diameter of the hose conduits shall be in accordance with ACI 304.2R.

D. Pumping equipment and hose conduits that are not functioning properly shall be replaced.

E. Aluminum conduits for conveying the concrete shall not be permitted.

F. **Field Control:** Concrete samples for slump, air content, and test cylinders will be taken at the placement end of the hose.

3.5 ORDER OF PLACING CONCRETE

A. The order of placing concrete in all parts of the WORK shall be acceptable to the DISTRICT.

3.6 FINISHING CONCRETE SURFACES

A. **General:** Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions shown are defined as tolerances and are indicated in Part 1, above. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

B. **Formed Surfaces:** No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects. Where architectural finish is required, it shall be as indicated.

1. Surface holes larger than [1/2]-inch in diameter or deeper than [1/4]-inch are defined as surface defects in basins and exposed walls.]

C. **Unformed Surfaces:** After proper and adequate vibration and tamping, all unformed top surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each work operation as necessary to prevent drying shrinkage cracks. The classes of finish specified for unformed concrete surfaces are designated and defined as follows:

1. Finish U1 - Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.

2. Finish U2 - After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where indicated or as determined by the DISTRICT.

3. Finish U3 - After the finish U2 surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from

blemishes, ripples, and trowel marks. The finish shall be smooth and free of all irregularities.

4. Finish U4 - Trowel the Finish U3 surface to remove local depressions or high points. In addition, the surface shall be given a light hairbroom finish with brooming perpendicular to drainage unless otherwise indicated. The resulting surface shall be rough enough to provide a nonskid finish.

D. Unformed surfaces shall be finished according to the following schedule:

UNFORMED SURFACE FINISH SCHEDULE

Area	Finish
Grade slabs and foundations to be covered with concrete or fill material	U1
Floors to be covered with grouted tile or topping grout	U2
Water bearing slabs with slopes 10 percent and less	U3
Water bearing slabs with slopes greater than 10 percent	U4
Slabs not water bearing	U4
Slabs to be covered with built-up roofing	U2
Interior slabs and floors to receive architectural finish	U3
Top surface of walls	U3

E. Floor Hardener (Surface Applied)

1. The following additional requirements apply to the substrate concrete in areas indicated to be under floor hardener:

a. Slump shall be no greater than 4 inches when peak ambient temperatures are expected to exceed 65 degrees F and no greater than 3 inches when temperatures will not exceed 65 degrees F.
b. Air content shall not exceed 3 percent.
c. No calcium chloride or set accelerating admixture containing calcium chloride shall be used.
d. Do not use admixtures that increase bleeding.
e. Do not use fly ash.

2. The CONTRACTOR shall finish areas indicated to receive hardener in conformance with the manufacturer's recommendations and the following. After leveling the concrete surface and as soon as the concrete will support an operator and machine without disturbing the level or working up excessive fines, the CONTRACTOR shall float the surface of the slab with a mechanical float fitted with detachable float shoes. Then apply 1/2 to 2/3 of the total amount of dry shake surface hardener uniformly to the surface. A mechanical spreader is recommended. Float the surface once the shake has absorbed sufficient moisture, as indicated by darkening of the shake. Immediately apply the remainder of the shake and allow it to absorb moisture. Do not apply shake when bleed water is present.

3. Perform a third floating if time and setting characteristics of the concrete will allow, but do not add water to the surface.

4. As the surface stiffens further and loses sheen, trowel with blades set relatively flat, using hand or mechanical methods. Remove all marks and pinholes in a final raised trowel operation.

5. Cure the finished surface using the fill-forming curing compound recommended by the manufacturer at a coverage rate which will provide moisture retention in excess of the requirements of ASTM C 309. Maintain ambient temperatures above 50 degrees F during the curing period.

6. Keep floors covered and prohibit traffic and loads for 10 days minimum after completion.

3.7 CURING AND DAMPPROOFING

A. **General:** All concrete shall be cured for not less than 7 days after placing, in accordance with the methods indicated below for the different parts of the WORK.

Surface to be Cured or Dampproofed	Method
Unstripped forms	1
Wall sections with forms removed	6
Construction joints between footings and walls, and between floor slab and columns	2
Encasement concrete and thrust blocks	3
All concrete surfaces not specifically indicated in this Paragraph	4
Floor slabs on grade in hydraulic structures	5
Slabs not on grade	6

B. **Method 1:** Wooden forms shall be wetted immediately before concrete has been placed and shall be kept wet with water until removal. If steel forms are used the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 7 days of placing the concrete, curing shall be continued in accordance with Method 6 below.

C. **Method 2:** The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.

D. **Method 3:** The surface shall be covered with moist earth not less than 4 hours nor more than 24 hours after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete.

E. **Method 4:** The surface shall be sprayed with a liquid curing compound.

1. It shall be applied in accordance with the manufacturer's printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.

2. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the 7-day curing period. If the seal is damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.

3. Wherever curing compound has been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, compound shall be entirely removed by wet sandblasting just prior to the placing of new concrete.

4. Curing compound shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces and within 2 hours after removal of forms. Repairs to formed surfaces shall be made within the 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound.

5. At all locations where concrete is placed adjacent to a panel which has been coated with curing compound, the panel shall have curing compound reapplied to an area within 6 feet of the joint and to any other location where the curing membrane has been disturbed.

6. Prior to final acceptance of the WORK, all visible traces of curing compound shall be removed from all surfaces in such a manner that does not damage the surface finish.

F. **Method 5:**

1. Until the concrete surface is covered with curing compound, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed. The concrete shall be given a coat of curing compound in accordance with Method 4 above. Not less than one hour nor more than 4 hours after the curing compound has been applied, the surface shall be wetted with water delivered through a fog nozzle, and concrete-curing blankets shall be placed on the slabs. The curing blankets shall be polyethylene sheet, polyethylene-coated waterproof paper sheeting, or polyethylene-coated burlap. The blankets shall be laid with the edges butted together and with the joints between strips sealed with 2-inch wide strips of sealing tape or with edges lapped not less than 3 inches and fastened together with a waterproof cement to form a continuous watertight joint.

2. The curing blankets shall be left in place during the 7-day curing period and shall not be removed until after concrete for adjacent work has been placed. If the curing blankets become torn or otherwise ineffective, the CONTRACTOR shall replace damaged sections. During the first 3 days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the curing blankets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 5/8-inch minimum thickness, laid over the curing blanket. The CONTRACTOR shall add water under the curing blanket as often as necessary to maintain damp concrete surfaces at all times.

G. **Method 6:** This method applies to both walls and slabs.

1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 7 consecutive days beginning immediately after the concrete has reached final set or forms have been removed.

2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed.

3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held substantially in contact with the concrete surface to prevent being dislodged by wind or any other causes. All edges shall be continuously held in place.

4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.

5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted, and curing compound shall be immediately applied in accordance with Method 4 above.

6. The CONTRACTOR shall dispose of excess water from the curing operation to avoid damage to the work.

H. **Dampproofing**

1. The exterior surface of all buried roof slabs shall be dampproofed as follows.

2. Immediately after completion of curing the surface shall be sprayed with a dampproofing agent consisting of an asphalt emulsion. Application shall be in 2 coats. The first coat shall be diluted to one-half strength by the addition of water and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon of dilute solution. The second coat shall consist of an

application of the undiluted material, and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon. Dampproofing material shall be as indicated above.

3. As soon as the material has taken an initial set, the entire area thus coated shall be coated with whitewash. Any formula for mixing the whitewash may be used if it produces a uniformly coated white surface and remains until placing of the backfill. If the whitewash fails to remain on the surface until the backfill is placed, the CONTRACTOR shall apply additional whitewash.

3.08 PROTECTION

A. The CONTRACTOR shall protect all concrete against injury until final acceptance.

B. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. The CONTRACTOR shall provide such protection while the concrete is still plastic and whenever precipitation is imminent or occurring.

3.09 TREATMENT OF SURFACE DEFECTS

A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the DISTRICT. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall be repaired as indicated below. Concrete containing extensive voids, holes, honeycombing, or similar depression defects shall be completely removed and replaced. Repairs and replacements shall be performed promptly.

3.10 PATCHING HOLES IN CONCRETE

A. **Patching Small Holes:**

1. Holes which are less than 12 inches in the least dimension and extend completely through concrete members shall be filled.

2. Small holes in members which are water-bearing or in contact with soil or other fill material shall be filled with non-shrink grout. Where a face of the member is exposed to view, the non-shrink grout shall be held back 2 inches from the finished surface. The remaining 2 inches shall then be patched according to the Paragraph entitled "Treatment of Surface Defects."

3. Small holes through all other concrete members shall be filled with non-shrink grout, with exposed faces treated as above.

B. **Patching Large Holes:**

1. Holes which are larger than 12 inches in the least dimension shall have a keyway chipped into the edge of the opening all around, unless a formed keyway exists. The holes shall then be filled with concrete as indicated herein.

2. Holes which are larger than 24 inches in the least dimension and which do not have reinforcing steel extending from the existing concrete, shall have reinforcing steel set in grout in drilled holes. The reinforcing added shall match the reinforcing in the existing wall unless indicated otherwise.

3. Large holes in members which are water bearing or in contact with soil or other fill shall have a hydrophilic type waterstop material placed around the perimeter of the hole in accordance with Section 033500 - Joints in Concrete, unless there is an existing waterstop in place.

3.14 CARE AND REPAIR OF CONCRETE

A. The CONTRACTOR shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed WORK, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete.

END OF SECTION

SECTION 055000

MISCELLANEOUS METALWORK

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide miscellaneous metalwork and appurtenances, complete and in place, in accordance with the Standards & Specifications, and GWD Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 099000 – Protective Coatings

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

ASTM A 123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 193	Alloy Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM A 194	Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
ASTM A 307	Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength
ASTM A 325	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

1.4 CONTRACTOR SUBMITTALS

A. General: Furnish submittals in accordance with Section 013300 - Contractor Submittals.

B. Product Information: An ICBO report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor. CONTRACTOR shall submit manufacturer's recommended installation instructions, and procedures for adhesive anchors. Upon review, by DISTRICT, these instructions shall be followed specifically.

1.5 QUALITY ASSURANCE

A. No substitution for the indicated adhesive anchors will be considered unless accompanied with ICBO report verifying strength and material equivalency, including temperature at which load capacity is reduced to 90 percent of that determined at 75 degrees F.

PART 2 – PRODUCTS

2.01 BOLTS AND ANCHORS

A. **Bolt, Nut and Washer Requirements:** Unless otherwise indicated, bolts, anchor bolts, washers, and nuts shall be steel as indicated herein. All bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series. The bolt and nut material shall be free-cutting steel. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the Unified Thread Standard (UTS). Where galvanized bolts are specified, threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing.

1. Except as otherwise indicated, steel for bolt material, anchor bolts and cap screws shall be in accordance with the following:

a. Structural Connections: ASTM A 307 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile StrengthGrade A or B, hot-dip galvanized.

b. Anchor Bolts: ASTM A 307, Grade A or B, or ASTM A 36, hot-dip galvanized.

c. High Strength Bolts (where indicated): ASTM A 325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

d. Pipe and Equipment Flange Bolts: ASTM A 193 - Alloy Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications , Grade B-7.

2. Washers shall be installed wherever bolts are used to fasten plastic items, or wherever the corrosion protection coating of an item may be damaged when the bolt is tightened. Washers shall be fabricated of material matching the bolts, except that hardened washers for high strength bolts shall conform to the requirements of the AISC Specification. Lock washers and Nylock bolts shall be installed where indicated and shall be fabricated of material matching the bolts.

3. The length of each bolt shall be such that after the joint is made up, the bolt extends a minimum of 1/8-inch beyond the nut, but in no case more than 5/8-inch beyond the nut.

B. **Standard and Above Ground Service (Non-Corrosive Service):** All bolts, nuts, and washers in standard/above ground service on factory assembled items shall be stainless steel or in accordance with the manufacturers recommendations for such exposure. All field installed bolts, nuts, and washers in standard/above ground service shall be Cadmium or Zinc coated unless specified otherwise. Where exposed to moisture or other corrosive conditions, bolts shall be epoxy coated after installation in accordance with Section 099000- Protective Coatings, or as otherwise specified.

C. **Buried Service (Corrosive Service):** All bolts, nuts, and washers in buried service on factory assembled items shall be stainless steel unless specified otherwise. All field installed bolts, nuts, and washers in buried service shall be Cadmium or Zink coated unless specified otherwise. Buried bolts shall be coated/wrapped with #1 Wax-Tape by Trenton Corporation, Ann Arbor, MI 48103.

D. **Vault and Submerged Service (Corrosive Service):** Bolts shall be epoxy coated after installation in accordance with Section 099000- Protective Coatings. All bolts, nuts, and washers in the locations listed below shall be stainless steel unless specified otherwise.

1. Inside vaults, manholes, and buried structures.
2. Submerged locations.
3. Locations subject to seasonal or occasional flooding.
4. Inside hydraulic structures below the top of the structure.

5. Chemical handling areas.
6. Locations indicated by the Contract Documents, the GWD Standards & Specifications, or designated by the DISTRICT to be provided with stainless steel bolts.

E. **Stainless Steel Bolts:** Unless otherwise indicated, stainless steel bolts, anchor bolts, nuts, and washers shall be Type 316 stainless steel, class 2. Bolts shall conform to ASTM A 193. Nuts shall conform to ASTM A 194 - Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service or Both. All bolt threads shall be protected with an antiseize lubricant suitable for submerged service conforming to government specification MIL-A-907E - Antiseize Thread Compound, High Temperature. Antiseize lubricant shall be NSF-61 approved for use with potable water. Antiseize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733 or equal.

F. **Adhesive Anchors:** Unless otherwise indicated, drilled, concrete, and masonry anchors shall be epoxy adhesive anchors. Epoxy anchor grout shall comply with Section 036000 - Grout. No substitutions will be considered unless accompanied with ICBO report verifying strength and material equivalency.

1. Where exposed to weather, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring handrails, pumps, mechanical equipment, and reinforcing bars, threaded rod shall be stainless steel Type 316.

2. Where indicated, in locations not included above, galvanized steel threaded rod and glass capsule, polyester resin adhesive anchors will be permitted and shall be Hilti HVA or Cobra Anchors.

G. **Expanding-Type Anchors:** Expanding-type anchors, if indicated or permitted, shall be steel expansion type ITW Ramset/Redhead "Trubolt" anchors; Hilti "Kwik-Bolt;" or equal. Lead caulking anchors will not be permitted. Size shall be as indicated. Expansion type anchors which are to be embedded in grout may be steel. Non-embedded buried or submerged anchors shall be stainless steel.

2.12 IMPACT ANCHOR

A. Impact anchors shall be an expansion type anchor in which a nail type pin is driven to produce the expansive force. The pin shall have a zinc sleeve with a mushroom style head and stainless steel nail pin. Anchors shall be Metal Hit Anchors by Hilti, Inc., Zamac Nailin by Powers Fasteners; or equal.

PART 3 - EXECUTION

3.1 FABRICATION AND INSTALLATION REQUIREMENTS

A. **Fabrication and Erection:** Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the AISC "Steel Construction Manual."

B. **Aluminum Railings:** Aluminum railing fabrication and installation shall be performed by craftsmen experienced in the fabrication of architectural metalwork. Exposed surfaces shall be free from defects or other surface blemishes. Dimensions and conditions shall be verified in the field. All joints, junctions, miters and butting sections shall be precision fitted with no gaps occurring between sections, and with all surfaces flush and aligned. Electrolysis protection of materials shall be provided.

C. **Access Hatches:** Unless otherwise indicated, the CONTRACTOR shall provide a 1/2-inch drain line to the nearest floor drain for all floor hatches.

3.2 WELDING

A. Method: Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.

B. Quality: In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as indicated by the AWS Code. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

3.3 GALVANIZING

A. Structural steel plates shapes, bars, and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123. Any galvanized part that becomes warped during the galvanizing operation shall be straightened. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153. Field repairs to galvanizing shall be made using “Galvinox,” “Galvo-Weld,” or equal.

3.4 DRILLED ANCHORS

A. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill, cleaned and dry. Drilled anchors shall not be installed until the concrete has reached the required 28-day compressive strength. Adhesive anchors shall not be loaded until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 099000

PROTECTIVE COATINGS

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide Protective Coatings, complete and in place, in accordance with the Contract Documents.

B. Definitions

1. The term "paint," "coatings," or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, tape wraps, and all other Protective Coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.

2. The term "DFT" means minimum dry film thickness, without any negative tolerance.

C. The following surfaces shall not be protective coated:

1. Concrete, unless specifically indicated to be coated.
2. Brass fittings, Stainless Steel, and Copper.
3. Machined surfaces.
4. Grease fittings.
5. Glass.
6. Equipment nameplates.
7. Platform gratings, stair treads, door thresholds, and other walk surfaces, unless specifically indicated to be coated.

D. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the Construction Drawings are used to show the limits of coating requirements, to show exceptions to the requirements, or to clarify or show details for application of the coating systems.

E. Where Protective Coatings are to be performed by a subcontractor, the subcontractor shall possess a valid state license as required for performance of the painting and coating work called for in this specification and shall provide 2 references which show that the painting subcontractor has previous successful experience with the indicated or comparable coating systems. Include the name, address, and the telephone number for the DISTRICT of each installation for which the painting subcontractor provided the Protective Coatings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 330509 – Piping, General

1.3 CONTRACTOR SUBMITTALS

A. **General:** Submittals shall be furnished in accordance with Section 013300 - Contractor Submittals, unless indicated otherwise below.

B. Submittals shall include the following information and be submitted at least 21 calendar days prior to Protective Coatings work:

1. Coating Materials List: Four copies of a coating materials list showing the Manufacturer and

the coating number, keyed to the coating systems herein. The list shall be submitted prior to or at the time of submittal of samples.

2. Paint Manufacturer's Information: For each coating system to be used, the following data:

a. Paint Manufacturer's data sheet for each product proposed, including statements on the suitability of the material for the intended use.
b. Technical and performance information that demonstrates compliance with the system performance and material requirements.
c. Paint Manufacturer's instructions and recommendations on surface preparation and application.
d. Colors available for each product (where applicable).
e. Compatibility of shop and field applied coatings (where applicable).
f. Material Safety Data Sheet for each product used.

1.4 SPECIAL CORRECTION OF DEFECTS REQUIREMENTS

A. **Warranty Inspection:** A warranty inspection will be conducted during the eleventh month following completion of all coating and painting work. The CONTRACTOR and a representative of the coating material Manufacturer may attend this inspection. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the DISTRICT.

PART 2 - PRODUCTS

2.1 GENERAL

A. **Suitability:** The CONTRACTOR shall use suitable coating materials as recommended by the Manufacturer.

B. **Compatibility:** In any coating system only compatible materials from a single Manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.

C. **Containers:** Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, and name of manufacturer, all of which shall be plainly legible at the time of use.

D. **Colors:** All colors and shades of colors of all coats of paint shall be as indicated or selected by the PROJECT ENGINEER and approved by the DISTRICT. Each coat shall be of a different shade, to facilitate inspection of surface coverage of each coat. Colors for exterior (visible) surfaces shall be as follows unless specified otherwise. Finish color shall be ICI Devoe Car Blue, or equal, for all piping and isolation valves. Finish color shall be ICI Devoe Safety Blue, or equal, for all automatic control valves, pumps, and motors. Finish color shall be ICI Devoe Safety Yellow, or equal, for fire hydrants, and bollards.

E. Substitute or "Or-Equal" Products

1. To establish equality under Section 016000 - Products, Materials, Equipment and Substitutions, the CONTRACTOR shall furnish satisfactory documentation from the manufacturer of the proposed substitute or "or-equal" product that the material meets the indicated requirements and is equivalent or better than the specified product.

2. Protective Coatings Materials shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions.

3. If a proposed substitution requires changes in the WORK, the CONTRACTOR shall bear all

such costs involved.

2.2 MATERIAL SOURCES

A. Each of the following manufacturers is capable of supplying many of the industrial coating materials indicated herein. Proposed substitute materials will be considered as indicated above. All industrial coating materials shall be materials that have a record of satisfactory performance in water and wastewater treatment plants, and under the service conditions to which they will be subjected.

ICI Devoe Coatings
Tnemec Company
Ameron
Trenton Corporation
Carboline Coatings Company
Polyken Technologies
Sherwin Williams

2.3 INDUSTRIAL COATING SYSTEMS

A. **System 1 – Epoxy/Aliphatic Polyurethane:** Two component aliphatic acrylic polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, resistance to chemical fumes and severe weathering and with a minimum solids content of 63 percent by volume. Primer and intermediate coats shall be a two component rust inhibitive epoxy coating material with a minimum solids content of 65 percent by volume.

1. Prime coat (field or shop applied) DFT = 4 mils, Devoe 224HS, Tnemec N69, Ameron 385, or equal.

2. Intermediate coat DFT = 4 mils, Devoe 224HS, Tnemec N69, Ameron 385, or equal.

3. Finish coats (one or two coats, DFT = 3 mils), Devoe 379UVA, Tnemec 740, Ameron Amershield, or equal.

4. Total system DFT = 11 mils.

5. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.

B. **System 2 - Inorganic Zinc/Epoxy/Aliphatic Polyurethane:** The inorganic zinc primer shall be a water or solvent based, self-curing, two-component zinc silicate inorganic coating material containing at least 65 percent of metallic zinc by weight in the dried film. This coating material shall be recommended by the coating manufacturer as a primer for this system. The intermediate coat shall be a two component high-build epoxy coating material with a minimum solids content of 56 percent by volume. Finish coats shall be a 2-component aliphatic acrylic or polyester polyurethane coating material that provides superior color and gloss retention, resistance to chemical fumes and severe weathering, and a minimum solids content of 63 percent by volume.

1. Prime coat DFT = 3 mils, Devoe 302H, Tnemec 90-96, Ameron 21-5, or equal.

2. Intermediate coat DFT = 4 mils, Devoe 224HS, Tnemec N69, Ameron 385, or equal.

3. Finish coats (one or two coats, DFT = 3 mils), Devoe 379UVA, Tnemec 740, Ameron Amershield, or equal.

4. Total system DFT = 10 mils.

5. Intermediate coat shall be applied in excess of 4 mils DFT or in more than one coat as necessary to completely cover the inorganic zinc primer and prevent application bubbling of the polyurethane finish coat.

6. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.

7. If the inorganic zinc primer is used as a pre-construction or shop applied primer, all damaged and uncoated areas shall be spot abrasive blasted and coated after construction using the indicated material.

C. **System 3 – Epoxy(x3):** Two component, rust inhibitive polyamide cured epoxy coating material shall provide a recoatable finish that is available in a wide selection of colors. The coating material shall have a minimum solids content of 65 percent by volume and be resistant to service conditions of condensing moisture, splash and spillage of lubricating oils, and frequent washdown and cleaning.

1. Prime coat (field or shop applied) DFT = 4 mils, Devoe 224HS, Tnemec N69, Ameron 385, or equal.

2. Intermediate and finish coats (2 coats, DFT = 8 mils), Devoe 224HS, Tnemec N69, Ameron 385, or equal.

3. Total system DFT = 12 mils.

2.4 SUBMERGED AND SEVERE SERVICE COATING SYSTEMS

A. **System 101 - Amine Cured Epoxy(x3):** High build, amine cured, epoxy coating material shall have a minimum solids content of 80 percent by volume, and shall be suitable for long-term immersion service in potable water and municipal wastewater. For potable water service, the coating material shall be listed by the NSF International as in compliance with NSF Standard 61 - Drinking Water System Components - Health Effects.

1. Prime, intermediate, and finish coats (three coats, DFT = 18 mils), Devoe 233H, Tnemec 141, Ameron 395FD, or equal.

B. **System 102 - Polyamide Cured Epoxy(x3):** High build, polyamide cured epoxy coating material shall have a minimum solids content of 64 percent by volume, and shall be suitable for long-term immersion service in potable water and municipal wastewater. For potable water service, the coating material shall be listed by the NSF International as in compliance with NSF Standard 61.

1. Prime, intermediate, and finish coats (three coats, DFT = 12 mils), Devoe 233H, Tnemec N140, Ameron 90HS, or equal.

C. **System 103 - Fusion Bonded Epoxy:** The coating material shall be a 100 percent powder epoxy, certified as compliant with NSF Standard 61, applied in accordance with the ANSI/AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines, except that the surface preparation shall be as specified in the coating system schedule of this Section. The coating shall be applied using the electrostatic spray or fluidized bed process.

1. Powder coat DFT = 16 mils, Scotchkote 134 or 206N**,** or equal.

2. For coating of valves, DFT = 12 mils.

3. Liquid Epoxy: For field repairs, the use of a liquid epoxy will be permitted, applied to provide a DFT of 15 mils. The liquid epoxy shall be a 100 percent solids epoxy, ScotchKote 323, or equal.

4. For indoors or covered conditions, or inside hydraulic structures and vaults: Field applied finish coat DFT = 4 mils, Devoe 224HS, Tnemec N69, Ameron 385, or equal.

5. For outdoors or exposed conditions: Field applied finish coats (one or two coats, DFT = 3 mils), Devoe 379UVA, Tnemec 740, Ameron Amershield, or equal. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.

6. Total system DFT = 16-20 mils.

2.5 SPECIAL COATING SYSTEMS

A. **System 201 – Joint Wrap:** Prior to wrapping the pipe, nuts and bolts, fittings, flanges or other surfaces with heavy duty joint wrap, the items or surface shall be coated with a liquid adhesive primer. The items or surface shall be wrapped with a 35-mil adhesive joint wrap, half-lapped, to achieve a total thickness of 70 mils. Joint wrap shall be Polyken Technologies, Heavy Duty Joint Wrap, Product No. 930-35, or approved equal. Liquid adhesive primer shall be Polyken Technologies, Liquid Adhesive No. 1027, or approved equal.

B. **System 202 - Cement Mortar Coating:** A 1-1/2-inch minimum thickness mortar coating reinforced with 3/4-inch galvanized welded wire fabric shall be provided. The cement mortar shall contain no less than one part Type V cement to 3 parts sand. The cement mortar shall be cured by a curing compound meeting the requirements of "Liquid Membrane Forming Compounds for Curing Concrete," ASTM C 309, Type II, white pigmented, or by enclosure in an 8-mil thick polyethylene sheet with all edges and joints lapped by at least 6 inches.

C. **System 203 - Polyethylene Encasement:** Application of polyethylene encasement shall be in accordance with ANSI/AWWA C105 using Method C.

PART 3 - EXECUTION

3.1 MANUFACTURER'S SERVICES

A. The CONTRACTOR shall require the Protective Coatings manufacturer to furnish a qualified technical representative to visit the project site for technical support as may be necessary to resolve field problems attributable or associated with the manufacturer's products.

3.2 WORKMANSHIP

A. Skilled craftsmen and experienced supervision shall be used on all WORK.

B. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough cleaning and an adequate thickness of coating material. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given to insure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.

3.3 STORAGE, MIXING, AND THINNING OF MATERIALS

A. Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed. Coating materials shall be stored under

the conditions recommended by the Material Safety Data Sheets, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together. All Protective Coatings materials shall be used within the manufacturer's recommended shelf life.

3.4 PREPARATION FOR COATING

A. **General:** All surfaces to receive Protective Coatings shall be cleaned as indicated prior to application of coatings. The CONTRACTOR shall examine all surfaces to be coated, and shall correct all surface defects before application of any coating material. All marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any coating application. Surfaces to be coated shall be dry and free of visible dust.

B. **Protection of Surfaces Not to be Coated:** Surfaces which are not to receive Protective Coatings shall be protected during surface preparation, cleaning, and coating operations.

C. All hardware, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.

D. Care shall be exercised not to damage adjacent work during blast cleaning operations. Spray painting shall be conducted under carefully controlled conditions. The CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blast cleaning or coating operations.

E. **Protection of Painted Surfaces:** Cleaning and coating shall be coordinated so that dust and other contaminants from the cleaning process will not fall on wet, newly-coated surfaces.

3.5 SURFACE PREPARATION STANDARDS

A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:

1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.

2. White Metal Blast Cleaning (SSPC-SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.

3. Commercial Blast Cleaning (SSPC-SP6): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.

4. Brush-Off Blast Cleaning (SSPC-SP7): Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint.

5. Near-White Blast Cleaning (SSPC-SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.

3.6 METAL SURFACE PREPARATION

A. The minimum abrasive blasting surface preparation shall be as indicated in the coating system schedules included at the end of this Section. Where there is a conflict between these specifications and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.

B. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard SSPC-SP - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and SSPC-SP - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit.

C. All oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC-SP1 - Solvent Cleaning prior to blast cleaning.

D. All sharp edges shall be rounded or chamfered and all burrs, and surface defects and weld splatter shall be ground smooth prior to blast cleaning.

E. The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular coating and service conditions.

F. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.

G. Surfaces shall be cleaned of all dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming, or another approved method prior to painting.

H. Damaged or defective coating shall be removed by the specified blast cleaning to meet the clean surface requirements before recoating.

I. If the specified abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC-SP2 or SSPC-SP3 shall be used.

J. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.

3.7 SURFACE PREPARATION AND APPLICATION OF JOINT WRAP

A. Nuts and bolts, couplings, valves, fittings, flanges, and steel pipe to receive heavy duty joint wrap shall be cleaned to remove all visible oil, grease, soil, dust, rust, and other foreign matter. Surfaces to receive joint wrap shall be coated with liquid adhesive primer in accordance with the manufacturer’s recommendations, prior to application of joint wrap.

B. After being primed, the items or surface to be protected shall be wrapped with the 35-mil joint wrap, half-lapped, to achieve a total thickness of 70 mils. Care shall be taken to completely encapsulate all nuts and bolts.

3.8 SHOP COATING REQUIREMENTS

A. Unless otherwise indicated, all items of equipment, or parts of equipment which are not submerged in service, shall be shop primed and then finish coated in the field after installation with the indicated or selected color. The methods, materials, application equipment and all other details of shop painting shall comply with this section. If the shop primer requires top-coating within a specified period of time, the equipment shall be finish coated in the shop and then touch-up painted after installation.

B. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switch-gear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the indicated quality in the field. Such equipment shall be primed and finish coated in the shop and touched up in the field with the identical material after installation. The coating material data sheet shall be submitted with the shop drawings for the equipment.

C. For certain small pieces of equipment the manufacturer may have a standard coating system which is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the shop drawing submittals.

D. Shop painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 2 months before being top-coated, or less time if recommended by the coating manufacturer. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.

E. The CONTRACTOR shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment shop drawings.

3.9 APPLICATION OF COATINGS

A. The application of Protective Coatings to steel substrates shall be in accordance with SSPC-PA1 – Shop, Field, and Maintenance Painting of Steel.

B. Cleaned surfaces and all coats shall be inspected prior to each succeeding coat. The CONTRACTOR shall schedule such inspection with the DISTRICT in advance.

C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same working day.

D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and this Section, whichever has the most stringent requirements.

E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to be present. Use stripe painting for these areas.

F. Special attention shall be given to materials which will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.

G. Finish coats, including touch-up and damage repair coats shall be applied in a manner which will present a uniform texture and color matched appearance.

H. Coatings shall not be applied under the following conditions:

1. Temperature exceeding the manufacturer's recommended maximum and minimum allowable.
2. Dust or smoke laden atmosphere.
3. Damp or humid weather.
4. When the substrate or air temperature is less than 5 degrees F above dewpoint.
5. When air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.
6. When wind conditions are not calm.

I. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychometric tables.

J. Unburied steel piping shall be abrasive blast cleaned and primed before installation.

K. The finish coat on all work shall be applied after all concrete, masonry, and equipment installation is complete and the work areas are clean and dust free.

3.10 CURING OF COATINGS

A. The CONTRACTOR shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the most stringent, prior to placing the completed coating system into service. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.

3.11 FIELD INSPECTION AND TESTING

A. **General:** The CONTRACTOR shall give the DISTRICT a minimum of 3 days advance notice of the start of any field surface preparation work or coating application work.

B. Inspection by the DISTRICT, or the waiver of inspection of any particular portion of the WORK, shall not relieve the CONTRACTOR of its responsibility to perform the work in accordance with these Specifications.

C. **Inspection Devices:** The CONTRACTOR shall furnish, until final acceptance of such coatings, inspection devices in good working condition for the detection of holidays and measurement of dry-film thicknesses of Protective Coatings. Dry-film thickness gages shall be made available for the DISTRICT'S use at all times while coating is being done, until final acceptance of such coatings. The CONTRACTOR shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the DISTRICT.

D. **Holiday Testing:** The CONTRACTOR shall holiday test all coated surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures and surfaces coated with any of the submerged and severe service coating systems. Areas which contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested.

1. Coatings With Thickness Exceeding 20 Mils: For surfaces having a total dry film coating thickness exceeding 20 mils: pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.

2. Coatings With Thickness of 20 Mils or Less: For surfaces having a total dry film coating thickness of 20 mils or less: Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog, or equal shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flo, or equal, shall be added to the water prior to wetting the detector sponge.

E. **Film Thickness Testing:** On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC -PA 2 “Procedure for Determining Conformance to Dry Coating Thickness Requirements” using a magnetic-type dry film thickness gage such as Mikrotest model FM, Elcometer model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gage.

F. **Surface Preparation:** Evaluation of blast cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standards SSPC-SP.

3.12 COATING SYSTEM SCHEDULES

A. **Coating System Schedule, Ferrous Metal - Not Galvanized:**

	Item	Surface Prep.	System No.
FM-1	Piping and miscellaneous surfaces indoors or covered, except those included below.	Commercial Blast Cleaning SSPC-SP6	(3) Epoxy(x3)
FM-2	Miscellaneous surfaces outdoors or exposed, except those included below.	Commercial Blast Cleaning SSPC-SP6	(1) Epoxy/Aliphatic Polyurethane
FM-3	Piping outdoors or exposed, except as indicated below.	Near White Metal Blast Cleaning SSPC-SP10	(2) Inorganic Zinc/Epoxy/Aliphatic Polyurethane
FM-4	Piping and miscellaneous surfaces inside hydraulic structures and vaults.	Near White Metal Blast Cleaning SSPC-SP10	(3) Epoxy(x3)
FM-5	Piping and miscellaneous surfaces inside hydraulic structures and vaults where subject to frequent immersion.	Solvent Cleaning SSPC-SP1 followed by Near White Metal Blast Cleaning SSPC-SP10	(103) Fusion Bonded Epoxy
FM-6	Buried ductile iron pipe.	Removal of oil, grease, soil and salts	(203) Polyethylene Encasement
FM-7	Buried steel pipe where not mortar-coated, or coal-tar enamel coated.	Removal of oil, grease, soil and salts	(201) Joint Wrap
FM-8	Ferrous surfaces of valves and couplings.	Solvent Cleaning SSPC-SP1 followed by Near White Metal Blast Cleaning SSPC-SP10	(103) Fusion Bonded Epoxy
FM-9	Buried valves, couplings, fittings, and joints, including epoxy-coated surfaces (where piping is mortar-coated steel).	Removal of oil, grease, soil and salts	(202) Cement Mortar Coating
FM-10	Buried nuts and bolts, valves, couplings, fittings, and flanged joints (where piping is **not** mortar-coated steel).	Removal of oil, grease, soil and salts	(201) Joint Wrap
FM-11	Buried surfaces that are not indicated to be coated elsewhere.	Near White Metal Blast Cleaning SSPC-SP10	(101) Amine Cured Epoxy(x3)
FM-12	Piping and miscellaneous surfaces submerged in water (excluding shop coated valves, couplings, and pumps).	Near White Metal Blast Cleaning SSPC-SP10	(102) Polyamide Cured Epoxy(x3)
FM-13	Ferrous surfaces in water passages and submerged surfaces of pumps.	Near White Metal Blast Cleaning SSPC-SP10	(101) Amine Cured Epoxy(x3)

B. **Coating System Schedule, Ferrous Metal - Galvanized:** Pretreatment coatings, barrier coatings, or washes shall be applied as recommended by the coating manufacturer. All galvanized surfaces shall be coated except for the following items which shall be coated only if required by other Sections: Floor Gratings and Frames, Ladders, Handrails, Stair Treads, and Chain Link Fencing and Hardware.

	Item	Surface Prep.	System No.
FMG-1	Miscellaneous surfaces indoors or covered, except those included below.	Solvent Cleaning SSPC-SP1	(3) Epoxy(x3)
FMG-2	Miscellaneous surfaces outdoors or exposed, except those included below.	Solvent Cleaning SSPC-SP1	(1) Epoxy/Aliphatic Polyurethane
FMG-3	Buried steel piping.	Removal of oil, grease, soil and salts	(201) Joint Wrap
FMG-4	Miscellaneous buried surfaces.	Solvent Cleaning SSPC-SP1 followed by Brush-Off Blast Cleaning SSPC-SP7	(3) Epoxy(x3)
FMG-5	Surfaces submerged in water.	Solvent Cleaning SSPC-SP1 followed by Brush-Off Blast Cleaning SSPC-SP7	(102) Polyamide Cured Epoxy(x3)

C. **Coating System Schedule, Fire Hydrants, and Combination Air Valves:**

	Item	Surface Prep.	System No.
FH-1	Fire Hydrants.	Solvent Cleaning SSPC-SP1	(1) Epoxy/Aliphatic Polyurethane
FAV-1	Combination Air Valves.	Commercial Blast Cleaning SSPC-SP6	(1) Epoxy/Aliphatic Polyurethane

END OF SECTION

SECTION 134713

CORROSION MONITORING / CATHODIC PROTECTION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes installation of bonding across insulating devices, test stations, deep anode wells and rectifiers, as indicated in the plans and details, including electrical connections, installation of test stations, bond cables, exothermic welds, anodes, test leads, rectifiers, conduit, AC service to rectifiers, and all accessories required for a complete operable system, including testing the system after installation.

B. The WORK also includes coordination of assembly, installation and testing.

1.2 CODES AND STANDARDS

A. The WORK of this Section shall comply with the current editions of the following codes as adopted by Goleta Water District:

1. National Electric Code

B. The CONTRACTOR shall install each system component in a workmanlike manner and in strict conformance with the latest edition of the following standards:

1.	NEMA	National Electrical Manufacturers Association
2.	ASTM	American Society for Testing and Materials
3.	IEEE	Institute of Electrical and Electronic Engineers
4.	ANSI	American National Standard Institute
5.	ICEA	Insulated Cable Engineers Association
6.	OSHA	Occupational Safety and Health Administration
7.	NACE	National Association of Corrosion Engineers
8.	UL	Underwriters Laboratories

C. Where the drawings or these Specifications require a higher degree of workmanship or better quality of material than implied by the above codes and standards, these drawings and Specifications shall prevail.

1.3 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted to the District, prior to installation:

1. Catalog cuts, bulletins, brochures or data sheets for all equipment including test stations, wire/cable/test leads, exothermic welding equipment, anode assemblies, rectifiers, test station hardware and test boards, wire identifiers and any other equipment to be installed.

2. Certification that the equipment and materials proposed meets the Specifications and the intent of the Specifications.

1.4 OWNER'S MANUAL

A. The following shall be included in the OWNER'S MANUAL:

1. Operations and maintenance instructions.

2. List of spare parts recommended for 2 years' successful operation.

1.5 INTERFERENCE AND EXACT LOCATIONS

A. The locations of corrosion monitoring/cathodic protection equipment, devices, outlets and appurtenances as indicated are approximate only. The CONTRACTOR, subject to approval of the ENGINEER, shall determine exact locations.

B. The CONTRACTOR shall verify in the field, all data and final locations of work done under other Sections of the Specifications required for placing of the corrosion monitoring/cathodic protection, including installation of A.C. service or other electrical work.

C. In case of interference with other work or erroneous locations with respect to equipment or structures, the CONTRACTOR shall furnish all labor and materials necessary to complete the WORK in an acceptable manner.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials to be installed must be new and of a quality generally accepted by the industry and must comply with the codes and standards as specified in Section 1.2. Nothing in the drawings or Specifications is to be construed as permitting work not conforming to these codes and standards. Where larger size or better grade materials than required by the above-mentioned regulations and codes are specified, these drawings and Specifications shall have precedence. All equipment and materials supplied shall be similar to that which has been in satisfactory service for at least 5 years.

2.2 CONDUIT AND FITTINGS

A. The minimum conduit size shall be 3/4-inch unless otherwise indicated. Rigid steel conduit shall be galvanized conforming to UL 6. Rigid nonmetal conduit shall be PVC schedule 40 conduit approved for underground use.

B. Fittings for use with rigid steel conduit shall be galvanized cast ferrous metal, with gasketed covers, Crouse Hinds Condulets, Appleton Unilets, or equal. Rigid metallic conduit fittings shall be galvanized conforming to UL 514B.

C. Fittings for use with either rigid nonmetallic conduit or duct shall be PVC and shall have solvent weld type conduit connections. If such are not available, then the Specification for rigid steel fittings shall apply except in corrosive locations where PVC coating shall be provided.

D. Union couplings for conduits shall be the Ericson or Appleton type EC or 0-Z Gedney 3-piece Type 4, or equal.

2.3 TEST STATION HOUSINGS - POST MOUNTED TEST STATIONS

A. The test station housings shall be made from 3-inch diameter, schedule 80 PVC pipe, 6 feet in length. The test head shall be a “Fink” test head, mounted at the top of the PVC post, as shown in the details.

2.4 TRAFFIC VALVE BOXES - FLUSH MOUNTED TEST STATIONS

A. The traffic valve box for test stations shall be G05 Traffic Box as manufactured by Christy Concrete Products, Inc., No. 1-RT Traffic Valve Box as manufactured by Brooks Products or approved equal. Traffic box covers for anode beds and test stations shall be cast iron with welded bead legend "CP TEST" or “ANODE”.

2.5 TERMINAL BOARDS - FLUSH MOUNTED TEST STATIONS

A. Terminal boards for flush mounted test stations shall be “Fink” test heads, as shown in the details. Test boards shall be labeled as required to identify the piping to which the leads are connected. All hardware installed on the test boards shall be brass or bronze.

2.6 WIRE

A. Conductors shall consist of solid or stranded copper of the gauge indicated. Wire sizes shall be based on American Wire Gage (AWG). Copper wire shall be in conformance with ASTM Designations B3 and B8.

B. All wires terminating in a junction box or test station shall have a wire identifier attached within 4 inches of end of wire at terminal board, prior to backfill, as specified under "Wire Identification".

2.7 ANODE WIRES

A. The wire attached to the anodes shall be (AWG) stranded, single conductor, copper and insulated for 600 volts. Wire size shall be minimum No. 6 AWG Kynar for deep anode wells and shall conform to the requirements of ASTM D1248 Type 1, Class C, Grade 5. Connection of wire to the anode shall have a pulling strength, which shall exceed the tensile strength of the wire. Any damage to the wire insulation or anode shall require complete replacement of the wire and anode.

B. The anode supplier shall mark the reel holding the anode wire for shipment to the job site with the same anode numbering system used on the test records and the total length of attached anode wire.

C. Anode wires shall be of one continuous length from the anode connection to rectifier or anode splice box. Anode wires with the attached anode shall be shipped to the job site with the wire wound on a reel. The minimum core diameter of the reel shall be 5-1/2 inches. The anode wire insulation shall be free of surface damage such as nicks, abrasions, scratches, etc., in all respects throughout the entire length of the wire. Precaution shall be taken during fabrication, transportation and installation of the anodes to see that the wire is not kinked or sharply bent. Bends sharper than 2-1/2 inches in radius are not permissible.

D. All wires used for corrosion monitoring/cathodic protection systems shall be visually inspected for any damage to the insulation prior to and after installation by the CONTRACTOR. Any damage to the insulation will require replacement of the cable. Splicing of cables will not be permitted.

2.8 WIRE IDENTIFICATION

A. All test lead and drain cables shall be coded with circular brass stamped or engraved identifier or wrap around marker. The letters and numbers shall be printed, minimum 3/16-inch in size, and shall identify the piping to which the lead is connected.

B. Wire identifiers for anodes shall be the wrap around type with a high resistance to oils, solvents and mild acids. Marker shall fully encircle wire with imprinted alpha-numeric characters for pipe identification.

C. The following colors and minimum wire gauges have been used:

1.	Test Leads:		
	Impressed Current System	#10 THHN	White
2.	Drain Cable:		
	Impressed Current System	#6 HMWPE	Black
3.	Anode Leads:		
	Impressed Current System	#6 Kynar	Black

4. Bond Cables:

At AC Insulators	#4 HMWPE	Black

2.9 EXOTHERMIC WELDS

A. Exothermic welds shall be provided for connecting cables to structures in strict accordance with the manufacturers' recommendations. Connections shall be made at locations indicated. Exothermic welds shall be Cadweld, as manufactured by Erico Products, Inc. or Thermoweld, or approved equal. Duxseal packing as manufactured by JM Clipper or approved equal shall be used where necessary to prevent leakage of molten weld metal.

B. The shape and charge of the exothermic weld shall be chosen based on the following parameters:

1. Pipe material
2. Pipe size
3. Wire material
4. Number of strands to be welded
5. Orientation of weld (vertical or horizontal)

C. All exothermic weld locations shall be coated with a coating, which is compatible with the pipeline coating. The area of the weld shall be coated with a suitable epoxy, as shown in the details, to provide protection to the area of the cadweld and any metal surface exposed during the welding.

2.10 MIXED METAL OXIDE CONTINUOUS ANODE FOR DEEP ANODE WELL

A. Active anode area shall be mixed metal oxide coated titanium, installed in a preassembled unit, including anode lead cables, attached to either end of the active area of the anode, using a waterproof connection. The active area of the anode shall be equipped with a perforated vent pipe. The assembly shall be equipped with a lowering rope and supplied with sufficient coke breeze to fill the annular space between the anode assembly and the drilled hole for the active area of the anode. The active area shall be 100-feet.

2.11 CALCINED COKE BREEZE

A. Backfill material for impressed current system anodes shall be calcined coke breeze with a resistivity of 25 ohm-cm or less when tested with an applied pressure of 2 pounds per square inch. The material shall conform to the following gradation requirements:

Sieve Size	Percent Passing
3/8	100 minimum
1/8	5 maximum

B. The impressed current system anode backfill shall have the following chemical properties:

Fixed carbon	98.0% minimum
Ash	0.5% maximum
Sulfur	5.0% maximum
Volatile matter	1.0% maximum
Moisture	1.0% maximum

2.12 PEDESTAL MOUNTED AIR COOLED RECTIFIERS

A. Rectifiers shall have a minimum 120 Volt Single-phase AC input and have a minimum rated DC output of 20 volts-20 amperes. Rectifiers shall be pedestal mounted. Rectifiers shall be manufactured by Matcor, Inc., or an approved equal.

B. Rectifier shall be supplied with a set of slide out racks for the transformer and stacks.

C. Rectifiers shall meet with the following specifications: NEMA Pub. No. MR-20-1958, reaffirmed by NEMA 1971 and 1975. Rectifiers shall be capable of operating continuously at the rated output current at any voltage from zero to 100 percent without damaging any rectifier components. Full rated DC output voltage shall be adjustable by not less than 20 equal steps from approximately 5 percent of rated voltage to full rated output. This adjustment may be accomplished with studs and link-bars or tap switches. If tap switches are used, they shall not carry over 50 percent of the nominal current rating assigned by the manufacturer. Rectifiers shall be designed to operate continuously at rated maximum voltage and current in ambient temperature of 45 degrees C without damage to the rectifier components. Cooling shall be accomplished by natural convection. Fan cooling is not acceptable for unattended equipment.

D. All rectifiers shall have overload protection. Protection from overload on the input shall be accomplished by molded case, fully magnetic circuit breakers on the incoming power lines. These circuit breakers shall hold at 100 percent of load and may trip between 101 percent and 125 percent of rated load. They shall trip at 125 percent of rated load. The trip point shall be unaffected by changes in ambient temperature. Trip handles of individual pole breakers shall be mechanically linked to open all lines when an overload occurs. Units shall be equipped with silicon stacks, overload protection shall be provided by a quick opening fuse in the transformer secondary.

E. Voltage surge protection for units equipped with silicon stacks shall be supplied by AC and DC lightning arresters and metal oxides varistors across all secondary lines to the stack and across the DC output of the rectifier. The metal oxide varistors must fire before the voltage surge reaches the peak inverse voltage rating of the diodes used in the stack. Transformers shall be isolation type with a grounded electrostatic shield between the primary and secondary windings. Dielectric strength of all insulating materials shall not be less than 2,000 volts RMS as tested for one minute and applied between windings and the transformer core. Magnetic wire insulation and layer insulation shall be rated no less than 155 degrees C. Magnetic wire insulation shall not show signs of softening or crazing after 24 hours immersion in any of the following chemicals: Naptha, Toluene, Ethyl Alcohol, Trichloro-Ethylene, Styrene Polyester, Butyl Acetate, Mild Acids, or Acetone. Impregnating varnish used shall meet the standards for 155 degrees C when tested according to AIEE test procedures. The transformer shall be preheated before dipping and baked after dipping. The transformer temperature rise, as measured by thermocouples within the transformer, shall not exceed 85 degrees C. The transformer efficiency shall not be less than 85 percent. The transformer voltage regulation shall not exceed 3 percent from full rated load to 1/4 of rated load when measured in accordance with the procedure described in MR-20-1958. Chokes and reactors shall meet the requirements listed for transformers.

F. Silicon stacks shall be equipped with silicon diodes rated a minimum of 800 peak inverse volts. Heat sinks shall be sized to keep diode junction and case temperatures from exceeding 100 degrees C under 45 degrees C ambient temperature conditions.

G. Separate voltmeter and ammeter shall be provided for monitoring rectifier output. Minimum meter width shall be 3-1/2 inches round or rectangular with minimum scale length of 2-7/8 inches. Meter movement shall be jewel and pivot D'Arsonval type. Taut band meters are not acceptable because of a tendency to break when jolted during shipment. Meter accuracy shall be a minimum of plus or minus 2 percent of full scale at 80 degrees F and shall be temperature compensated to vary no more than 1 percent per 10 degrees F temperature variation. Scale faces shall be metal or plastic. Ammeter shunt shall be block type mounted on the front panel for easy access. Current and millivolt ratings shall be clearly stamped on the shunt. Shunt accuracy shall be at least plus or minus 1 percent.

H. Electrical tests shall be performed by the manufacturer and recorded as listed below:

- AC Volts Input
- DC Amperes Input

- Apparent Watts Input
- True Watts Input
- Power Factor
- DC Volts Output
- DC Amperes Output
- DC Watts Output
- Conversion Efficiency
- Dielectric Strength
- Transformer Primary to Ground
- Transformer Secondary to Ground
- Transformer Primary to Secondary
- Stack AC to Ground
- Stack DC to Ground
- Ripple Voltage at Full Output

I. Rectifier shall be heavy steel or anodized aluminum swing open case, with white baked-enamel finish, and 10-inch standard leg support, or shall be suitable for post mounting.

PART 3 - EXECUTION

3.1 GENERAL

A. Upon completion of installation of all components as shown on the drawings and in accordance with these specifications, testing shall be performed to demonstrate that the installation has been completed and is in working order in conformance with the Contract Documents. In no case shall the testing be less than that outlined herein unless requested in writing by the CONTRACTOR and approved by the ENGINEER. The interim testing described herein shall be in addition to and not substitution for any required testing of individual items at the manufacturers' plant. DISTRICT shall provide testing of the system. The test data shall be submitted to the ENGINEER for acceptance to demonstrate that the system is in proper working order.

3.2 EXCAVATION AND BACKFILL

A. Buried wires shall have a minimum cover of 24 inches. The bottom of the trenches shall be covered with 1 inch of mortar sand prior to placing wires, insulation, anodes, coatings or other underground appurtenances.

B. Wire identification tags shall be placed on the wires prior to placing wire in conduit or backfilling.

3.3 TEST STATIONS

A. Test stations shall be placed at the locations indicated. The CONTRACTOR shall field verify final location of the test stations. Wire identifiers shall be placed on all wire prior to backfill and installation of test stations.

3.4 WIRES

A. Wires buried in the ground shall be laid straight, without kinks. Each wire run shall be continuous in length and free of joints or splices, unless otherwise approved. Care shall be taken during installation to avoid punctures, cuts or other damage to the wire insulation. Damage to insulation shall require replacement of the entire length of wire at the CONTRACTOR'S expense.

B. At least 18 inches of slack (coiled) shall be left for each conductor, at each test station housing. Slack in the wire shall be sufficient to allow removal of wire extension for testing. Wire shall not be bent into a radius of less than 8 times the diameter of the wire. Copper split bolts or other appropriate connection hardware shall be used for all test station connections.

C. Where buried cable is to be placed in existing conduit, the conduit must be of sufficient diameter to accommodate the additional cable. This shall be determined by the number and size of both the existing and new cable in accordance with all applicable codes and standards. This shall also apply where new cable is to be installed in new PVC conduit. PVC conduit shall be installed to a minimum depth of 24 inches below grade.

D. Red caution tape, 3 inches in width, or colorized slurry shall be installed above buried wire and conduits at a maximum depth of 18 inches below grade over the wire and conduit location.

3.5 WIRE IDENTIFICATION

A. Brass wire identifiers or wrap around cable markers shall be placed on the wires prior to backfill.

3.6 EXOTHERMIC WELD CONNECTIONS

A. Exothermic weld connections shall be installed in the manner and at the locations indicated. Coating materials shall be removed from the surface over an area of sufficient size to make the connection. The steel surface shall be cleaned to white metal by grinding or filing prior to welding the conductor. The use of resin impregnated grinding wheels will not be allowed. The conductor shall be welded to the pipe by the exothermic welding process with a copper sleeve fitted over the conductor. Only enough insulation shall be removed such that the copper conductor can be placed in the welding mold.

B. After the weld has cooled, all slag shall be removed and the metallurgical bond shall be tested for adherence to the pipe or casing. All defective welds shall be removed and replaced. All exposed surfaces of the copper and steel shall be covered with insulating materials as indicated. No connections to the piping shall be buried prior to inspection and approval of the ENGINEER.

3.7 COATING OF WELDS

A. The CONTRACTOR shall furnish all materials, clean surfaces and repair any damage to protective coatings and linings damaged as a result of the welding.

B. A coating shall be applied to all exothermic weld locations. The coating shall be an epoxy, as shown in the details. All surfaces must be clean and dry and free of oil, dirt, loose particles and all other foreign materials prior to application of the coating.

3.8 JOINT BONDS

A. Bond cables shall be provided across flexible couplings, A/C insulators and nonwelded joints on steel pipe, on cement mortar coated steel cylinder pipe joints and ductile iron pipe joints as necessary to ensure electrical continuity. Joint bonds shall be installed as indicated. A minimum of two bonds shall be installed per joint. Joint bonds shall not be installed immediately across dielectric flange kits but shall be required around appurtenances, which are isolated, in order to provide electrical continuity along the main pipeline.

3.9 DEEP ANODE WELL INSTALLATION

A. The CONTRACTOR shall obtain and pay for all fees and permits required for well drilling. CONTRACTOR shall log the well in accordance with local and State agency requirements.

B. Anodes shall be installed in the deep anode well at the approximate location indicated. All drilling shall be done in strict conformance to California State Bulletin Number 74 regulating the classification, construction and sealing of wells. In addition, a well permit shall be obtained by the CONTRACTOR from the local, state or federal agency, as required prior to well construction. The CONTRACTOR shall provide a grout seal for a minimum of 50 feet.

C. The impressed current system anode holes shall be drilled by means of a rotary drill rig using circulating water based drilling mud or air, as required. Holes shall be drilled to obtain a nominal 8-inch diameter anode well at a minimum. The well shall be drilled to the minimum depth indicated and shall be essentially straight and plumb. Drilling mud may be circulated through a portable sump or through a sump dug in the ground at the drill site. If a "dug sump" is used, it shall be emptied and backfilled upon completion. Backfilling shall be such that the sump is safe for vehicle traffic without settling. Drilling mud and cuttings shall be disposed by the CONTRACTOR at a suitable disposal site at no additional cost to the OWNER, unless it is determined that the cuttings contain hazardous materials. If hazardous materials are suspected, the cuttings will be tested and disposal and chain of custody would be the responsibility of the District.

D. When the hole has been drilled to specified depth, and in the presence of the ENGINEER, fresh water shall be circulated from the bottom of the hole to clear the hole of drilling mud and cuttings. The hole shall be flushed until fluid is thinned as much as possible without danger of cave-in. The ENGINEER shall determine the degree to which the hole is flushed. The hole shall be maintained full to the top with fresh water throughout the entire loading operations. Preparation of the impressed current system anode hole and loading of anodes and other equipment in the hole shall be done in the presence of the ENGINEER. Loading of the anode hole shall be begun early enough in the day to insure completion of all loading, including backfilling, to accommodate inspection by County Health inspectors.

E. Anode assemblies shall be lowered into the hole supported by the attached lead wires. The ENGINEER shall visually inspect the insulation on the anode lead wire for abrasion or other damage to the insulation and wire as the anode is lowered into place. Splices and/or any form of wire repair shall not be allowed on the anode lead wire from the point of connection at the anode to the top of the deep well anode bed hole. In the event that an anode must be retrieved after it has been lowered into the hole, the entire length of the anode lead wire shall be inspected by the ENGINEER for abrasion or other forms of damage to the insulation and wire. Anodes with damaged wires shall be rejected by the ENGINEER and shall not be reinstalled.

F. When an anode has been placed at specified depth, it shall be securely fixed in that position by tying the anode lead wire to a rack, sawhorse, etc., placed over or adjacent to the anode hole.

G. All anodes shall be loaded prior to coke breeze backfill. No anodes shall be buried until the ENGINEER has inspected the placement of the anodes and given permission to backfill.

H. Coke breeze shall be placed in the hole by pouring directly from the bag into the anode hole or by pumping. Pouring shall be at a steady rate and shall be slow enough to insure that the coke breeze does not bridge or block in the hole. The hole shall be kept completely full of water during placement of backfill. The top of the hole shall be kept free of floating coke breeze particles.

I. Settling of the backfill and coverage of the anode shall be determined by observing the measurement of anode current output or circuit resistance through a 12V DC power source circuit.

J. Backfill of the hole above the coke breeze column shall be sealed with 5 feet of sand. Following placement of the sand, the hole shall be sealed within 3 feet of the top with premixed grout or bentonite as specified in California State Bulletin Number 74. Backfill of the uppermost 3-foot portion of the anode hole shall consist of round drain rock as indicated. Round drain rock used for backfill shall be 3/4-inch to 1/2-inch diameter thoroughly washed to insure removal of sand and fines.

K. A concrete traffic box shall be set near the top of the anode hole for termination of the vent pipe. From the top of the anode hole, the anode leads shall be run to the rectifier location. Anode leads shall be permanently marked with cable identifiers.

3.10 WIRE CONNECTIONS

A. After installation, all wire connections shall be tested at the test station, junction box locations, or at rectifiers to ensure that they meet the requirements of the Contract Documents.

3.11 EXOTHERMIC WELDS

A. Exothermic welds shall be tested by the CONTRACTOR for adherence to the pipe or casing and for electrical continuity between the pipe or casing and wires. A 22-ounce hammer shall be used for adherence testing by striking a blow to the weld. Care shall be taken to avoid hitting the wires.

3.12 JOINT BOND TESTING

A. After installation, all joint bonds shall be tested for effectiveness. The testing shall be performed prior to backfill of the pipe and shall be verified upon completion of backfilling operations. Prior to backfilling, resistance shall be measured along the pipe segment to ensure electrical continuity of the piping.

3.13 SYSTEM CHECK-OUT

A. Upon completion of the installation, the CONTRACTOR shall provide testing of the system by a qualified corrosion engineer to ensure compliance with the Contract Documents. The testing shall include, but not be limited to the following, at the discretion of the ENGINEER, measurement of all anode currents and potentials, potentials of metallic pipelines prior to and after connection of anodes. Measurements shall be made at all test station locations. Any deficiencies of systems tested shall be reported to the ENGINEER and retesting of systems and repairs to the systems shall be at no additional cost to the District.

END OF SECTION

SECTION 260553

IDENTIFICATION DEVICES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Tag, tape and stenciling systems for equipment, piping, valves, pumps, and similar items, and hazard and safety signs.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society of Mechanical Engineers (ASME):
      a. A13.1, Scheme for the Identification of Piping Systems.
   2. The International Society of Automation (ISA).
   3. National Electrical Manufacturers Association/American National Standards Institute (NEMA/ANSI):
      a. Z535.1, Safety Color Code.
      b. Z535.2, Environmental and Facility Safety Signs.
      c. Z535.3, Criteria for Safety Symbols.
      d. Z535.4, Product Safety Signs and Labels.
   4. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).
   5. Occupational Safety and Health Administration (OSHA):
      a. 29 CFR 1910.145, Specification for Accident Prevention Signs and Tags.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Catalog information for all identification systems.
      b. Acknowledgement that products submitted meet requirements of standards referenced.
   3. Identification register, listing all items in PART 3 of this Specification Section to be identified, type of identification system to be used, lettering, location and color.

B. Electrical Interconnection diagram:
   1. The CONTRACTOR shall prepare interconnection diagrams depicting all cable requirements installed by the CONTRACTOR or as noted on the Drawings, together with their actual terminations.
      a. Interconnection diagrams shall show all external connections between terminals of equipment and outside points, such as motors, auxiliary devices, and power sources.
      b. References shall be shown to all connection’s diagrams which interface to the interconnection diagrams.
      c. Interconnection diagrams shall be of the continuous line type.
      d. Bundled wires shall be shown as a single line with the directions of entry/exit of the individual wires clearly shown.
      e. Wireless diagrams and wire lists are not acceptable.
   2. Each wire identification as actually installed shall be shown.
      a. The wire identification for each end of the same wire shall be identical.
      b. All devices and equipment shall be identified.

c. Terminals blocks shall be shown as actually installed and identified in the equipment complete with individual terminal identifications.

3. All jumpers, shielding and grounding termination details not shown on the equipment connection diagrams shall be shown on the interconnection diagrams. Wires or jumpers shown on the equipment connection diagrams shall not be shown again on the interconnection diagrams.
4. Signal and DC circuit polarities and wire pairs shall be shown.
5. Spare wires and cables shall be shown.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. W.H. Brady Co.
   2. Panduit.
   3. Seton.
   4. National Band and Tag Co.
   5. Carlton Industries, Inc.

B. Submit request for substitution in accordance with Specification Section 01640.

2.2 MANUFACTURED UNITS

A. Type A1 - Round Metal Tags:
   1. Materials:
      a. Aluminum or stainless steel.
      b. Stainless steel shall be used in corrosive environments.
   2. Size:
      a. Diameter: 1-1/2 IN minimum.
      b. Thickness: 0.035 IN (20 GA) minimum.
   3. Fabrication:
      a. 3/16 IN minimum mounting hole.
      b. Legend: Stamped and filled with black coloring.
   4. Color: Natural.

B. Type A2 - Rectangle Metal Tags:
   1. Materials: Stainless steel.
   2. Size:
      a. 3-1/2 IN x 1-1/2 IN minimum.
      b. Thickness: 0.036 IN (20 GA) minimum.
   3. Fabrication:
      a. 3/16 IN minimum mounting hole.
      b. Legend: Stamped and filled with black coloring.
   4. Color: Natural.

C. Type A3 - Metal Tape Tags:
   1. Materials: Aluminum or stainless steel.
   2. Size:
      a. Width 1/2 IN minimum.
      b. Length as required by text.
   3. Fabrication:
      a. 3/16 IN minimum mounting hole.
      b. Legend: Stamped and filled with black coloring.
   4. Color: Natural.

D. Type B1- Square Nonmetallic Tags:
   1. Materials: Fiberglass reinforced plastic.

2. Size:
    a. Surface: 2 x 2 IN minimum.
    b. Thickness: 100 mils.
3. Fabrication:
    a. 3/16 IN mounting hole with metal eyelet.
    b. Legend: Preprinted and permanently embedded and fade resistant.
4. Color:
    a. Background: Manufacturer standard or as specified.
    b. Lettering: Black.

E. Type B2 - Nonmetallic Signs:
1. Materials: Fiberglass reinforced or durable plastic.
2. Size:
    a. Surface: As required by text.
    b. Thickness: 60 mils minimum.
3. Fabrication:
    a. Rounded corners.
    b. Drilled holes in corners with grommets.
    c. Legend: Preprinted, permanently embedded and fade resistant for a 10 year minimum outdoor durability.
4. Color:
    a. Background: Manufacturer standard or as specified.
    b. Lettering: Black.
5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.

F. Type C - Laminated Name Plates:
1. Materials: Phenolic or DR (high impact) acrylic.
2. Size:
    a. Surface: As required by text.
    b. Thickness: 1/16 IN.
3. Fabrication:
    a. Outdoor rated and UV resistant when installed outdoors.
    b. Two (2) layers laminated.
    c. Legend: Engraved through top lamination into bottom lamination.
    d. Two (2) drilled side holes, for screw mounting.
4. Color: Black top surface, white core, unless otherwise indicated.

G. Type D - Self-Adhesive Tape Tags and Signs:
1. Materials: Vinyl tape or vinyl cloth.
2. Size:
    a. Surface: As required by text.
    b. Thickness: 5 mils minimum.
3. Fabrication:
    a. Indoor/Outdoor grade.
    b. Weather and UV resistant inks.
    c. Permanent adhesive.
    d. Legend: Preprinted.
    e. Wire markers to be self-laminating.
4. Color: White with black lettering or as specified.
5. Standards for OSHA signs: NEMA/ANSI Z535.1, NEMA/ANSI Z535.2, NEMA/ANSI Z535.3, NEMA/ANSI Z535.4, OSHA 29 CFR 1910.145.

H. Type E - Heat Shrinkable Tape Tags:
1. Materials: Polyolefin.
2. Size: As required by text.
3. Fabrication:
    a. Legend: Preprinted.

4. Color: White background, black printing.

I. Type F - Underground Warning Tape:
   1. Materials: Polyethylene.
   2. Size:
      a. 6 IN wide (minimum).
      b. Thickness: 3.5 mils.
   3. Fabrication:
      a. Legend: Preprinted and permanently imbedded.
      b. Message continuous printed.
      c. Tensile strength: 1750 psi.
   4. Color: As specified.

J. Type G - Stenciling System:
   1. Materials:
      a. Exterior type stenciling enamel.
      b. Either brushing grade or pressurized spray can form and grade.
   2. Size: As required.
   3. Fabrication:
      a. Legend: As required.
   4. Color: Black or white for best contrast.

K. Type H – Split Sleeve Locking Clip:
   1. Materials: Nylon
   2. Size: Single alphanumeric per clip
   3. Fabrication:
      a. Split sleeve
      b. Chevron locking
   4. Color: White with black lettering

L. Underground Tracer Wire:
   1. Materials:
      a. Wire:
         1) 12 GA AWG.
         2) Solid.
      b. Wire nuts: Waterproof type.
      c. Split bolts: Brass.

2.3 ACCESSORIES

A. Fasteners:
   1. Bead chain: #6 brass, aluminum or stainless steel.
   2. Plastic strap: Nylon, urethane or polypropylene.
   3. Screws: Self-tapping, stainless steel.
   4. Adhesive, solvent activated.

2.4 MAINTENANCE MATERIALS

A. Where stenciled markers are provided, clean and retain stencils after completion and include in extra stock, along with required stock of paints and applicators.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Install identification devices at specified locations.

B. All identification devices to be printed by mechanical process, hand printing is not acceptable.

C. Attach tags to equipment with sufficient surface or body area with solvent activated adhesive applied to back of each tag.

D. Attach tags with 1/8 IN round or flat head screws to equipment without sufficient surface or body area, or porous surfaces.
   1. Where attachment with screws should not or cannot penetrate substrate, attach with plastic strap.

E. Single items of equipment enclosed in a housing or compartment to be tagged on outside of housing.
   1. Several items of equipment mounted in housing to be individually tagged inside the compartment.

F. Tracer Wire:
   1. Attach to pipe at a maximum of 10 FT intervals with tape or tie-wraps.
   2. Continuous pass from each valve box and above grade at each structure.
   3. Coil enough wire at each valve box to extend wire a foot above the ground surface.
   4. 1,000 FT maximum spacing between valve boxes.
   5. If split bolts are used for splicing, wrap with electrical tape.
   6. If wire nuts are used for splicing, knot wire at each splice point leaving 6 IN of wire for splicing.
   7. Use continuous strand of wire between valve box where possible.
      a. Continuous length shall be no shorter than 100 FT.

3.2 CONDUCTOR IDENTIFICATION

A. Except for interior lighting and receptacle circuits, identify each wire or cable at each termination and in each pullbox, junction box, handhole, and manhole using numbered and lettered wire markers.

B. All electrically common conductors shall have the same number. Each electrically different conductor shall be uniquely numbered.

C. Conductors shall be identified with numbers at both ends. Conductor tag numbers shall consist of the equipment number & terminal #, followed by a slash, followed by equipment number & terminal as specified on the control diagram or as designated in the equipment. Conductor numbering shall be coordinated with the Interconnection Diagrams specified in Part 1.3B.
   1. Example: AIT-240 L1/CP-20 TB3-42

      Equipment Tag number = AIT-240 Equipment Tag number = CP-20 (control panel)

      L1 = terminal in AIT-240 TB3-42 = terminal in CP

D. Conductors between terminals of different numbers shall have both terminal numbers shown at each conductor end.

E. Where factory-wired equipment has terminal numbers different than the conductor numbers shown on the control diagrams:
   1. Both shall be shown on the interconnection diagram
   2. Include a copy of the interconnection diagram inside of the equipment cabinet.

3.3 SCHEDULES

A. Process Systems:
   1. General:
      a. Provide arrows and markers on piping.
         1) At 20 FT maximum centers along continuous lines.
         2) At changes in direction (route) or obstructions.
         3) At valves, risers, "T" joints, machinery or equipment.
         4) Where pipes pass through floors, walls, ceilings, cladding assemblies and like obstructions provide markers on both sides.
      b. Position markers on both sides of pipe with arrow markers pointing in flow direction.
         1) If flow is in both directions use double headed arrow markers.
      c. Apply tapes and stenciling in uniform manner parallel to piping.

2. Trenches with piping:
    a. Tag type: Type F - Underground Warning Tape
    b. Location: Halfway between top of piping and finished grade.
    c. Letter height: 1-1/4 IN minimum.
    d. Potable water:
        1) Color: Blue with black letters.
        2) Legend:
            a) First line: "CAUTION CAUTION CAUTION"
            b) Second line: "BURIED WATER LINE BELOW"
    e. Storm and sanitary sewer lines:
        1) Color: Green with black letters.
        2) Legend:
            a) First line: "CAUTION CAUTION CAUTION"
            b) Second line: "BURIED SEWER LINE BELOW"
    f. (Nonpotable) water piping, except 3 IN and smaller irrigation pipe:
        1) Color: Green with black letters.
        2) Legend:
            a) First line: "CAUTION CAUTION CAUTION"
            b) Second line: "BURIED NONPOTABLE WATER LINE BELOW"
    g. Chemical feed piping (e.g., polymer solution):
        1) Color: Yellow with black letters.
        2) Legend:
            a) First line: "CAUTION CAUTION CAUTION"
            b) Second line: "BURIED CHEMICAL LINE BELOW"
3. Yard valves, buried, with valve box and concrete pad:
    a. Tag type: Type A2 - Rectangle Metal Tags.
    b. Fastener: 3/16 IN x 7/8 IN plastic screw anchor with 1 IN #6 stainless steel pan head screw.
    c. Legend:
        1) Letter height: 1/4 IN minimum.
        2) Valve designation as indicated on the Drawings (e.g., "V-xxx").
4. Valves and slide gates:
    a. Tag type:
        1) Outdoor locations: Type B1 - Square Nonmetallic Tags.
        2) Indoor noncorrosive:
            a) Type A1 - Round Metal Tags.
            b) Type B1 - Square Nonmetallic Tags.
        3) Indoor corrosive:
            a) Stainless steel Type A1 - Round Metal Tags.
            b) Type B1 - Square Nonmetallic Tags.
    b. Fastener:
        1) Type A1: Chain of the same material.
        2) Type B1: Stainless steel chain.
    c. Color: Per ASME A13.1 corresponding to the piping system.
    d. Legend:
        1) Letter height: 1/4 IN minimum.
        2) Valve designation as indicated on the Drawings (e.g., "V-xxx").
5. Process equipment (e.g., pumps, pump motors)
    a. Tag type:
        1) Type B2 - Nonmetallic Signs.
        2) Type D - Self-Adhesive Tape Tags and Signs.
        3) Type G - Stenciling System.
    b. Fastener:
        1) Self.
        2) Screws.
        3) Adhesive.

c. Legend:
1) Letter height: 1/2 IN minimum.
2) Equipment designation as indicated on the Drawings (e.g., “Primary Sludge Pump P-xxx”).

6. Piping systems:
a. Tag type:
1) Outdoor locations: Type G - Stenciling System.
2) Indoor locations:
a) Type D - Self-Adhesive Tape Tags and Signs.
b) Type G - Stenciling System.
b. Fastener: Self.
c. Color: Per ASME A13.1.
d. Legend:
1) Letter height: Manufacturers standard for the pipe diameter.
2) Mark piping in accordance with ASME A13.1.
3) Use piping designation as indicated on the Drawings.
4) Arrow: Single arrow.

7. Tanks (less than 1000 GAL) (e.g., chemical tanks,):
a. Tag type:
1) Type D - Self-Adhesive Tape Tags and Signs.
2) Type G - Stenciling System.
b. Fastener: Self.
c. Legend:
1) Letter height: 2 IN minimum.
2) Equipment designation as indicated on the Drawings (e.g., “Polymer Storage Tank Txxx”)

8. Equipment that starts automatically:
a. Tag type:
1) Type B2 - Nonmetallic Signs.
2) Type D - Self-Adhesive Tape Tags and Signs.
b. Fastener:
1) Type B2 - Screw or adhesive.
2) Type D - Self.
c. Size: 5 IN x 7 IN
d. Legend:
1) OSHA Warning Sign.
2) Description of Warning: “THIS MACHINE STARTS AUTOMATICALLY”.

B. Instrumentation Systems:
1. Instrumentation Equipment (e.g., flow control valves, primary elements, etc.):
a. Tag type:
1) Outdoor locations: Type B1 - Square Nonmetallic Tags.
2) Indoor noncorrosive:
a) Type A1 - Round Metal Tags.
b) Type B1 - Square Nonmetallic Tags.
3) Indoor corrosive:
a) Stainless steel Type A1 - Round Metal Tags.
b) Type B1 - Square Nonmetallic Tags.
b. Fastener:
1) Type A1: Chain of the same material.
2) Type B1: Stainless steel chain.
c. Legend:
1) Letter height: 1/4 IN minimum.
2) Equipment ISA designation as indicated on the Drawings (e.g., “FIT-xxx”).
2. Enclosure for instrumentation and control equipment, (e.g., PLC control panels, etc.):
a. Tag type: Type C - Phenolic Name Plates.
b. Fastener: Screws.

c. Legend:
1) Letter height: 1/2 IN minimum.
2) Equipment name (e.g., "PLC CONTROL PANEL PCP-xxx").

3. Components inside equipment enclosure, (e.g., PLC's, control relays, contactors, and timers):
a. Tag type: Type D - Self-Adhesive Tape Tags.
b. Fastener: Self.
c. Legend:
1) Letter height: 3/16 IN minimum.
2) Description or function of component (e.g., "PLC-xxx" or "CR-xxx").

4. Through enclosure door mounted components (e.g., selector switches, controller digital displays, etc.):
a. Tag type: Type C - Phenolic Name Plates.
b. Fastener: Screws.
c. Legend:
1) Letter height: 1/4 IN minimum.
2) Component ISA tag number as indicated on the Drawings (e.g., "HS-xxx").

C. Electrical Systems:
1. Trenches with ductbanks, direct-buried conduit, or direct-buried wire and cable.
a. Tag type: Type F - Underground Warning Tape.
b. Letter height: 1-1/4 IN minimum.
c. Location:
1) Where trench is 12 IN or more below finished grade: In trench 6 IN below finished grade.
2) Where trench is less than 12 IN below finished grade: In trench 3 IN below finished grade.
d. Electrical power (e.g., low and medium voltage):
1) Color: Red with black letters.
2) Legend:
a) First line: "CAUTION CAUTION CAUTION".
b) Second line: "BURIED ELECTRIC LINE BELOW".
e. Communications (e.g., telephone, instrumentation, LAN, SCADA):
1) Color: Orange with black letters.
2) Legend:
a) First line: "CAUTION CAUTION CAUTION".
b) Second line: "BURIED COMMUNICATION LINE BELOW".

2. Switchgear, switchboards and motor control centers:
a. Tag type: Type C - Phenolic Name Plates.
b. Fastener: Screws.
c. Main equipment legend:
1) Letter height:
a) First line: 1 IN minimum.
b) Subsequent lines: 3/8 IN minimum.
2) First line: Equipment name (e.g., "MAIN SWITCHBOARD MSBxxx").
3) Second line:
a) Source of power (e.g., "FED FROM MCCxxx LOCATED IN ROOM xxx").
b) Include the building name or number if the source is in another building.
4) Third line: System voltage and phase (e.g., "480/277 V, 3PH").
5) Fourth line: Date installed (e.g., "INSTALLED JULY 20xx").
d. Main and feeder device legend:
1) Letter height: 3/8 IN minimum.
2) Description of load (e.g., "MAIN DISCONNECT", "PUMP Pxxx" or "PANELBOARD HPxxx").

3. Panelboards and transformers:
a. Tag type: Type C - Phenolic Name Plates.
b. Fastener: Screws.

c. Legend:
    1) Letter height:
        a) First line: 3/8 IN minimum.
        b) Subsequent lines: 3/16 IN minimum.
    2) First line: Equipment name (e.g., "PANELBOARD LPxxx" or "TRANSFORMER Txxx").
    3) Second line (panelboards only): System voltage and phase (e.g., “208/120V, 3PH”).
    4) Third line:
        a) Source of power (e.g., "FED FROM MCCxxx LOCATED IN ROOM xxx").
        b) Include the building name or number if the source is in another building.
    5) Fourth line: Date installed (e.g., “INSTALLED JULY 20xx”).

4. Transfer switches:
    a. Tag type: Type C - Phenolic Name Plates.
    b. Fastener: Screws.
    c. Legend:
        1) Letter height:
            a) First line: 3/8 IN minimum.
            b) Subsequent lines: 3/16 IN minimum.
        2) First line: Equipment name (e.g., "AUTOMATIC TRANSFER SWITCH ATSxxx").
        3) Second line: Normal source of power (e.g., "NORMAL SOURCE FED FROM MCCxxx").
        4) Third line: Emergency source of power (e.g., "EMERGENCY SOURCE FED FROM SGENxxx").
        5) Fourth line: Date installed (e.g., “INSTALLED JULY 20xx”).
5. Safety switches, separately mounted circuit breakers and motor starters, VFD’s, etc.:
    a. Tag type: Type C - Phenolic Name Plates.
    b. Fastener: Screws.
    c. Legend:
        1) Letter height: 1/4 IN minimum.
        2) First line: Description of load equipment is connected to (e.g., "PUMP Pxxx").
6. Enclosure for instrumentation and control equipment, (e.g., lighting control panels, etc.):
    a. Tag type: Type C - Phenolic Name Plates.
    b. Fastener: Screws.
    c. Legend:
        1) Letter height: 1/2 IN minimum.
        2) Equipment name (e.g., "LIGHTING CONTROL PANEL LCPxxx").
7. Components inside equipment enclosures (e.g., circuit breakers, fuses, control power transformers, control relays, contactors, timers, etc.):
    a. Tag type: Type D - Self-Adhesive Tape Tags and Signs.
    b. Fastener: Self.
    c. Legend:
        1) Letter height: 3/16 IN minimum.
        2) Description or function of component (e.g., "M-xxx”, “CR-xxx” or “TR-xxx").
8. Through enclosure door mounted equipment (e.g., selector switches, controller digital displays, etc.):
    a. Tag type: Type C - Phenolic Name Plates.
    b. Fastener: Screws.
    c. Legend:
        1) Letter height: 1/4 IN minimum.
        2) Component tag number as indicated on the Drawings or as defined by contractor (e.g., “HS-xxx”).
9. Conductors in control panels and terminations 10 AWG or smaller:
    a. Tag type: Type E - Heat Shrinkable Tape Tags.
    b. Fastener: Self.

c. Tag conductor at both ends.
d. Legend:
    1) Letter height: 1/8 IN minimum.
    2) Naming convention per Part 3.2

10. Conductors in control panels and terminations 8 AWG or larger:
    a. Tag type: Type H – Split Sleeve Locking Clip.
    b. Fastener: Self.
    c. Tag conductor at both ends.
    d. Legend:
        1) Letter height: per clip size.
        2) Naming convention per Part 3.2
11. Conductors in pull or junction boxes where multiple circuits exist:
    a. Tag type: Type D - Self-Adhesive Tape Tags.
    b. Fastener: Self.
    c. Tag conductor at both ends.
    d. Legend:
        1) Letter height: 1/8 IN minimum.
        2) Naming convention per Part 3.2
12. Conductors in handholes and manholes.
    a. Tag type: Type A3 - Metal Tape Tags.
    b. Fastener: Nylon strap.
    c. Tag conductor at both ends.
    d. Legend:
        1) Letter height: 1/8 IN minimum.
        2) Naming convention per Part 3.2
13. Grounding conductors associated with grounding electrode system in accordance with the following:
    a. Tag type: Type E - Heat Shrinkable Tape Tags.
    b. Fastener: Self.
    c. Legend:
        1) Letter height: 1/8 IN minimum.
        2) Function of conductor (e.g., "MAIN BONDING JUMPER", "TO GROUND RING", "TO MAIN WATER PIPE").
14. Flash protection for switchboards, panelboards, industrial control panels and motor control centers:
    a. Tag type: Type D - Self-Adhesive Tape Signs.
    b. Fastener: Self.
    c. Legend: Per NFPA 70.
15. Entrances to electrical rooms:
    a. Tag type: Type B2 - Nonmetallic Signs.
    b. Fastener: Screw or adhesive.
    c. Size: 5 IN x 7 IN.
    d. Location: Each door to room.
    e. Legend:
        1) OSHA Danger Sign.
        2) Description of Danger: “HIGH VOLTAGE, AUTHORIZED PERSONNEL ONLY”.
16. Equipment where more than one (1) voltage source is present:
    a. Tag type:
        1) Type B2 - Nonmetallic Signs.
        2) Type D - Self-Adhesive Tape Signs.
    b. Fastener:
        1) Screw or adhesive.
        2) Self.
    c. Size: 1-3/4 IN x 2-1/2 IN.
    d. Location: Exterior face of enclosure or cubical.

e. Legend:
   1) OSHA Danger Sign.
   2) Description of Danger: “MULTIPLE VOLTAGE SOURCES”.

3.4 HAZARD AND SAFETY SIGNS

1. Provide Hazard and Safety Signs as directed by Owner.

END OF SECTION

SECTION 311000

SITE PREPARATION

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The WORK of this Section includes measures required during the CONTRACTOR's initial move onto the Site to protect existing fences, houses, and associated improvements, streets, creeks and water bodies, and utilities down-slope of construction areas from damage due to rain, and boulders, trees, or other objects dislodged during the construction process; clearing, grubbing and stripping; and regrading of certain areas to receive embankment fill.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 015526 – Traffic Control & Access

1.3 SITE INSPECTION

A. Prior to moving onto the Site, the CONTRACTOR shall inspect the Site conditions and review maps of the project site and off-site pipeline routes and facilities delineating the DISTRICT's property and right-of-way lines.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRIMARY PROJECT SITE ACCESS

A. The CONTRACTOR shall develop any necessary access to the Site, including access barriers to prohibit entry of unauthorized persons.

B. Utility Interference: Where existing utilities interfere with the WORK, notify the utility owner and the PROJECT ENGINEER before proceeding in accordance with the General Conditions.

3.2 CLEARING, GRUBBING, AND STRIPPING

A. Construction areas shall be cleared of grass and weeds to at least a depth of six inches and cleared of structures, pavement, sidewalks, concrete or masonry debris, trees, logs, upturned stumps, loose boulders, and any other objectionable material of any kind which would interfere with the performance or completion of the WORK, create a hazard to safety, or impair the subsequent usefulness of the WORK, or obstruct its operation. Loose boulders within 10 feet of the top of cut lines shall be incorporated in landscaping or removed from the Site. Trees and other natural vegetation outside the actual lines of construction shall be protected from damage during construction, as directed by the DISTRICT.

B. Within the limits of clearing, the areas below the natural ground surface shall be grubbed to a depth necessary to remove all stumps, roots, buried logs, and all other objectionable material. Septic tanks, drain fields, and connection lines and any other underground structures, debris or waste shall be removed if found on the Site. All objectionable material from the clearing and grubbing process shall be removed from the Site and wasted in approved safe locations.

C. The entire area to be affected by construction shall be stripped to a depth of 1.0 foot below the

existing ground contours. The stripped materials shall be stockpiled and incorporated into landscaped areas or other non-structural embankments.

D. Unless otherwise indicated, native trees larger than three inches in diameter at the base shall not be removed without the DISTRICT's approval. The removal of any trees, shrubs, fences, or other improvements outside of rights-of-way, if necessary for the CONTRACTOR's choice of means and methods, shall be arranged with the owner of the property, and shall be removed and replaced at no additional cost to the DISTRICT.

3.3 OVEREXCAVATION, REGRADING, AND BACKFILL UNDER FILL AREAS

A. After the fill areas have been cleared, grubbed, and excavated, the areas to receive fill will require over-excavation, regrading, and backfill, consisting of the removal and/or stockpiling of undesirable soils. The ground surface shall be re-contoured for keying the fill and removing severe or abrupt changes in the topography of the Site. The overexcavated volumes to a level 1.0 foot below the existing ground contours shall be backfilled.

B. Any undesirable topsoil and colluvium shall be removed to the level designated by the DISTRICT and stockpiled for subsequent use as the first material to be placed in the compacted fill.

3.4 STORMWATER POLLUTION PREVENTION

A. The CONTRACTOR shall implement Stormwater pollution prevention best management practices to prevent Stormwater runoff and pollution from leaving the project site. Exposed soils and materials shall be covered to prevent erosion and limit the pollution from the effects of rain or wind. Sediment and Stormwater control best management practices include, but are not limited to, the installation of soxx, wattles or fiber rolls, silt fencing, hydroseeding, street sweeping and proper disposal, sandbagging, storm drain inlet protection. These measures shall be implemented to the extent necessary as determined by the DISTRICT.

END OF SECTION

SECTION 312316

TRENCHING, BACKFILL, AND COMPACTION

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall dewater trench and structure excavations, perform all earthwork and trenching operations indicated and required for construction of the WORK, mobilize for pavement work, provide advance notification of the affected residents, perform preparation work, construct all asphalt concrete pavements, furnish and apply all prime coats and tack coats as required, and replace pavement markings and striping complete and in place, in accordance with GWD Standards & Specifications and the Contract Documents. The CONTRACTOR shall secure all necessary permits to complete the requirements of this Section of the Specifications.

B. Where indicated and approved by the DISTRICT, the CONTRACTOR shall provide Controlled Low Strength Material (CLSM), complete and in place, in accordance with the Contract Documents for the following purposes:

1. Normal CLSM with high slump, non-segregating consistency that readily flows and fills voids and difficult to reach places: trench zone fill, pipe abandonment, structure backfill, and structure cavity fill.

2. Foundation CLSM is used where higher early strengths are required and future excavation is not likely to be required.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 015526 – Traffic Control & Access
Section 330507 – Boring & Jacking

1.3 CONTRACTOR SUBMITTALS

A. Prior to commencement of excavation, the CONTRACTOR shall submit a detailed plan and operation schedule for dewatering of excavations. The CONTRACTOR may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The CONTRACTOR's dewatering plan is subject to review by the DISTRICT and PROJECT ENGINEER.

B. The CONTRACTOR's attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. The CONTRACTOR, prior to beginning any trench or structure excavation 5 feet deep or over shall submit to the DISTRICT and shall be in receipt of the DISTRICT's written acceptance of the CONTRACTOR's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative systems plans shall be prepared by a civil or structural engineer licensed in the State of California.

C. The CONTRACTOR shall submit a copy of the excavation permit issued by the California Department of Industrial Safety.

D. The CONTRACTOR shall submit samples of all materials as well as the asphalt concrete mix design and associated materials proposed to be used in the work in accordance with the requirements in Section 013300.

E. Submit CLSM mix designs which show the proportions and gradations of all materials proposed for

each type of CLSM indicated. Each mix design shall be accompanied by independent laboratory test results of the indicated properties.

1.4 QUALITY CONTROL

A. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the CONTRACTOR.

B. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop. The responsibility for conducting the dewatering operation in a manner that will protect adjacent structures and facilities rests solely with the CONTRACTOR. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the CONTRACTOR.

C. At the option of the DISTRICT INSPECTOR, asphalt mix, subgrade, aggregate base course, and asphalt pavement may be tested by the DISTRICT's testing laboratory and paid for by the DISTRICT in accordance with Section 014200 – Reference Standards. Sample sizes shall be as determined by the testing laboratory.

D. All CLSM testing will be done by a testing laboratory selected by the DISTRICT at the DISTRICT's expense, except as otherwise indicated.

E. If tests of the CLSM show non-compliance with the specifications, the CONTRACTOR shall make changes as may be required to achieve compliance. Performing and paying for subsequent testing to show compliance shall be the CONTRACTOR's responsibility.

PART 2 - PRODUCTS

2.1 DEWATERING EQUIPMENT

A. Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the job site.

2.2 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

A. **General:** Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation.

B. Fill and backfill materials to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.

C. **Suitable Materials:** Materials not defined as unsuitable in Section 2.3 shall be reviewed by the DISTRICT and may be used in fills, backfilling, and embankment construction subject to the indicated limitations and at the DISTRICT's discretion. In addition, when acceptable to the DISTRICT, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.

D. Suitable materials may be obtained from on-site excavations (if applicable), may be processed on-site materials, or may be imported. If imported materials are required by this Section or to meet the quantity requirements of the project, the CONTRACTOR shall provide the imported materials at no additional expense to the DISTRICT, unless a unit price item is included for imported materials in the bidding schedule.

E. The following types of suitable materials are defined:

1. **Type A (three-quarters inch minus granular backfill):** Crushed rock or gravel, and sand

with the gradation requirements below. The material shall have a minimum sand equivalent value of 28 and a minimum R-value of 78. If the sand equivalent value exceeds 35 the R-value requirement is waived.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 - 50
No. 200	0 - 12

2. **Type B (Class I crushed stone):** Manufactured angular, crushed stone, crushed rock, or crushed slag with the following gradation requirements. The material shall have a minimum sand equivalent value of 75.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 - 50
No. 200	0 - 5

3. **Type C (sand backfill):** Sand with the following gradation requirements, and with a sand equivalent value not less than 30.

Sieve Size	Percentage Passing
1/2-inch	100
No. 4	85 - 100
No. 8	70 - 95
No. 200	0 - 10

4. **Type F (coarse drainrock):** Crushed rock or gravel with the size gradation for Size Number 4 in ASTM C 33

5. **Type G (aggregate base):** Crushed rock aggregate base material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. At the option of the CONTRACTOR, the grading for either the 1-1/2-inch maximum size or 3/4-inch maximum size gradation shall be used. The sand equivalent value shall be not less than 22, and the material shall meet the following gradation requirements:

	Percentage Passing	
Sieve Size	1-1/2-inch Max Gradation	3/4-inch Max. Gradation
2-inch	100	-
1-1/2-inch	90 - 100	-
1-inch	-	100
3/4-inch	50 - 85	90 - 100
No. 4	25 - 45	35 - 55
No. 30	10 - 25	10 - 30
No. 200	2 - 9	2 - 9

6. **Type H (graded drainrock):** Drainrock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the gradation requirements for Size Number 57 in ASTM C 33. The drainrock shall have a sand equivalent value not less than 75. The finish graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth

surface upon which to construct reinforced concrete floor slabs.

7. **Type I:** Not Used.

8. **Type K (topsoil):** Stockpiled topsoil material which has been obtained at the site by removing soil to a depth not exceeding 1 foot. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris.

9. **Type L (controlled low strength material):** Controlled low strength material shall be in accordance with this section.

2.3 UNSUITABLE FILL MATERIAL

A. Unsuitable materials include the materials listed below.

1. Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for engineering Purposes (Unified Soil Classification System), fall in the classifications of Pt, OH, CH, MH, or OL.

2. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.

3. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

4. Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistivity or pH less than the existing on-site soils.

5. Topsoil, except as allowed by Section 2.4.

2.4 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction or with the requirements of a pipe material manufacturer, the DISTRICT shall be immediately notified. In case of conflict between types of pipe zone bedding, the CONTRACTOR shall use the agency-specified bedding material if that material provides a greater degree of structural support to the pipe, as determined by the DISTRICT. In case of conflict between types of trench or final backfill types, the CONTRACTOR shall use the agency-specified backfill material if that material provides the greater in-place density after compaction.

C. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of Type I material, as defined herein, or any mixture of Type I and Type A through Type H materials.

2. Pipe zone bedding for mortar coated steel pipe, ductile iron pipe, and PVC pipe shall be Type C backfill (pipe bedding) material. Pipe zone bedding for PVC pipe, coal tar enamel coated or tape wrapped steel pipe, and polyethylene encased ductile iron pipe shall be Type C backfill (pipe bedding) material.

3. Trench zone and final backfill for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill," shall be Type L backfill material unless otherwise shown or specified. Trench zone and final backfill under areas not paved shall be select native material free of rocks larger than 3-inches and free of deleterious material, or Types A, C or G, backfill materials or any mixture thereof.

In agricultural or landscaped areas Type K material shall be used for final backfill unless otherwise indicated.

4. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.

5. Backfill around structures shall be Type A through Type H materials, or any mixture thereof, except as shown.

6. Backfill materials beneath structures shall be as follows:

a. Drain rock materials under hydraulic structures or other water retaining structures with underdrain systems shall be Type H material.

b. Under concrete hydraulic structures or other water retaining structures without underdrain systems, Types G or H materials shall be used.

c. Under structures where groundwater must be removed to allow placement of concrete, Type F material shall be used. Before the Type F material is placed, filter fabric shall be placed over the exposed foundation.

d. Under all other structures, Type G or H material shall be used.

7. Backfill used to replace pipeline trench over-excavation shall be a layer of Type F material with a top layer of filter fabric to prevent migration of fines for wet trench conditions or the same material as used for the pipe zone bedding if the trench conditions are not wet.

8. The top 6 inches of embankment fills around hydraulic structures, and all other embankment fills shall consist of Type K material, topsoil.

9. Filter fabric shall be per DISTRICT direction.

2.5 SOIL MATERIALS TESTING

A. All soils testing of samples submitted by the CONTRACTOR will be done by a testing laboratory of the DISTRICT'S choice and at the DISTRICT'S expense. At its discretion, the DISTRICT may request that the CONTRACTOR supply samples for testing of any material used in the work.

B. Particle size analysis of soils and aggregates will be performed using ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils.

C. Determination of sand equivalent value will be performed using ASTM D 2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

D. **Unified Soil Classification System:** References in this Section to soil classification types and standards shall have the meanings and definitions indicated in ASTM D 2487. The CONTRACTOR shall be bound by all applicable provisions of said ASTM D 2487 in the interpretation of soil classifications.

E. The testing for chloride, sulfate, resistivity, and pH will be done in accordance with California Test Methods 417, 422 and 643 of the California Department of Transportation.

2.6 ASPHALT CONCRETE PAVING MATERIALS

A. All materials required for asphalt concrete pavement construction as specified herein shall conform to the Caltrans Standard Specifications:

B. Asphalt concrete for roadway pavement shall be Type B, Grade AR-4000 as specified in Section

39 with ½" mix, unless specified otherwise. Asphalt concrete for construction of sidewalks, berms, dikes, or curbs shall be Type B, Grade AR-4000 as specified in Section 39 with 3/8" mix, unless specified otherwise. Paint binder shall be SS-1h emulsified asphalt conforming requirements of Section 94. Base course shall be treated Class 2 aggregate base material. Paint for traffic stripes and pavement markings shall conform to Section 84.

2.7 CONTROLLED LOW STRENGTH MATERIAL

A. CLSM shall be a mixture of cement, pozzolan, coarse and fine aggregate, admixtures, and water, mixed in accordance with ASTM C 94 - Ready Mixed Concrete.

B. **Composition:** The following parameters shall be within the indicated limits and as necessary to produce the indicated compressive strengths.

1. Mix proportions as necessary

2. Entrained air content shall be between [0][20] percent minimum and [6][30] percent maximum.

3. Water reducing agent content as necessary

C. Properties

1. Density shall be between 120 PCF minimum and 145 PCF maximum

2. Slump shall be as required by the CONTRACTOR's methods, but shall not promote segregation nor shall slump exceed 9 inches.

3. Compressive strength at 28 days: **300** psi

a. Normal CLSM: Between 100 psi minimum and 300 psi maximum (1 sack of cement per cubic yard). Unless specifically indicated otherwise, all CLSM shall be Normal CLSM.

b. Foundation CLSM: 1,000 psi minimum.

D. Cement

1. Cement shall be Type I or II in accordance with ASTM C 150 - Portland Cement.

E. Pozzolan

1. Pozzolan shall be Type F or C in accordance with ASTM C 618 – Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete. Pozzolan content, by weight, in Normal CLSM shall not be greater than cement content.

F. Aggregate

1. Aggregate shall consist of a well graded mixture of crushed rock, soil, or sand, with a nominal maximum size of 3/8-inch. One hundred percent shall pass the 3/4-inch sieve; no more than 30 percent shall be retained on the 3/8-inch sieve; and no more than 12 percent shall pass the number 200 sieve. If more than 5 percent of the aggregate passes the number 200 sieve, the material passing the number 200 sieve shall have a plasticity index of less than 0.73 (liquid limit-20), when tested in accordance with ASTM D 4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils. All aggregate shall be free from organic matter and shall not contain more alkali, sulfates, or salts than the native materials at the Site.

G. Admixtures

1. Air entraining admixtures shall be in accordance with ASTM C 260 - Air-Entraining Admixtures for Concrete.

2. Water reducing admixtures shall be in accordance with ASTM C 494 - Chemical Admixtures for Concrete.

H. Water

1. Water shall be potable, clean and free from objectionable quantities of silt, organic matter, alkali, salt, and other impurities.

PART3 - EXECUTION

3.1 DEWATERING GENERAL REQUIREMENTS

A. The CONTRACTOR shall provide all equipment necessary for dewatering. It shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.

B. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements. Water shall be kept from entering the open ends of newly installed pipe or the cut end of a waterline where a connection is to occur.

C. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock.

F. The CONTRACTOR shall remove water that accumulates in the excavation during the progress of the WORK so that work occurs in a substantially dry trench. The CONTRACTOR shall maintain trenches or other excavations free from water while the pipe or structures are being installed, while concrete is setting, and until backfill has progressed to a sufficient height to anchor the WORK against possible flotation or leakage. All loose material shall be removed from the bottom of the trench prior to placement of any pipe bedding material.

G. The CONTRACTOR shall prevented flotation by maintaining positive and continuous removal of water. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sand packed and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the CONTRACTOR shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

I. The CONTRACTOR shall dispose of water from the WORK in a safe manner without damage to adjacent properties in accordance with DISTRICT direction. CONTRACTOR shall be responsible for obtaining

any permits that may be necessary to dispose of water. No water shall be drained into work built or under construction without prior consent of the DISTRICT. Water shall be filtered using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system.

J. When making connection to the domestic water system, if greater than 25% of the water within a trench or excavation is caused by leakage of a system isolation valve from the domestic water system, the CONTRACTOR shall dechlorinate the water before disposal into any drainage system.

K. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

L. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the WORK and all costs thereof shall be included in the various items of work, unless a separate bid item has been established for dewatering.

3.2 EXCAVATION - GENERAL

A. **General:** Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the WORK. The removal of said materials shall conform to the lines and grades indicated or ordered.

B. **Sheeting, Shoring and Bracing:** The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations and trenches. Excavations and trenches shall be sloped or otherwise supported in a safe manner in accordance with applicable CAL/OSHA requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926). As a minimum, lateral pressures for design of trench sheeting, shoring, and bracing shall be based on type of soil exposed in the trench, groundwater conditions, surcharge loads adjacent to the trench, and type of shoring that will be used in the trench.

3.3 PROTECTION OF EXISTING UTILITES AND FACILITIES

A. **General:** The CONTRACTOR shall be responsible for the care and protection of all existing sewer pipelines, water pipelines, gas mains, electrical and communications conduits, cables, storm drains, culverts, or other facilities and structures that may be encountered in or near the area of Work.

B. **Notification:** It shall be the duty of the CONTRACTOR to notify each agency having jurisdiction and make arrangements for locating each agency's facilities prior to beginning construction.

C. **Damage:** In the event of damage to any existing facilities during the progress of the work due to the failure of the CONTRACTOR to exercise the proper precautions, the CONTRACTOR shall be responsible for the cost of all repairs and protection to said facilities. The CONTRACTOR's work may be stopped until repair operations are complete.

D. **Storage and Disposal of Excavated Material:** During trench excavation, store excavated material only within the Work area. Do not obstruct roadways, streets, bike paths, or sidewalks. CONTRACTOR shall remove and dispose of excess excavated soil material off the Project site at no additional cost to the DISTRICT, in accordance with local regulations.

3.4 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

A. **Excavation Beneath Structures and Embankments:** Except where otherwise indicated for a particular structure or ordered by the DISTRICT, excavation shall be carried to the grade of the bottom of the footing or slab. Where indicated or ordered, areas beneath structures or fills shall be over-excavated. The

subgrade areas beneath embankments shall be excavated to remove not less than the top 6 inches of native material and where such subgrade is sloped, the native material shall be benched. When such over-excavation is indicated, both over-excavation and subsequent backfill to the required grade shall be performed by the CONTRACTOR. When such over-excavation is not indicated but is ordered by the DISTRICT, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density.

B. **Excavation Beneath Paved Areas:** Excavation under areas to be paved shall extend to the bottom of the aggregate base or subbase, if such base is called for; otherwise it shall extend to 1 inch below the existing paving thickness. After the required excavation has been completed, the top 6 inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.

C. **Notification of DISTRICT:** The CONTRACTOR shall notify the DISTRICT at least 3 days in advance of completion of any structure excavation and shall allow the DISTRICT a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.5 PIPELINE AND UTILITY TRENCH EXCAVATION

A. **General:** Unless otherwise indicated or ordered, excavation for pipelines and utilities shall be open-cut trenches with widths as indicated. Trenches shall be excavated to line and grade as shown on the Plans (Construction Drawings). Excavation for water lines shall be made only after pipe and other necessary materials are delivered to the project site and inspected by the DISTRICT's INSPECTOR. Where trenching occurs in paved areas, the pavement shall be saw cut ahead of the trenching operations. The proper tools and equipment shall be used in marking and breaking so that the pavement will be cut accurately and on neat lines parallel to the trench. Material excavated from trenches shall be placed in such a way as not to endanger the health of the workers or the public. Excavated material shall not be stockpiled within the public right-of-way, or placed in areas where it could be hazardous to traffic, or block access to roads or driveways. Excavation within the public right-of-way shall be performed In compliance with the requirements of the County of Santa Barbara Department of Public Works.

B. **Trench Geometry:** Trenches shall be constructed to allow for safe installation of pipe and structures. Trench width shall be in accordance with GWD Standard Details except when stated otherwise on the Plans and Specifications. The bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe bedding. Trench bottom shall consist of firm native soil or imported compacted soil able to evenly support pipe bedding for the full length of the pipe. Excavations for pipe bells and welding shall be made as required.

C. **Abrasive Materials:** When rocks, concrete, or other hard and abrasive materials are encountered during excavation, it may be required that all or a portion of the material be removed to provide a minimum clearance of 12 inches below and on each side of pipe, valves and fittings. If in the opinion of the DISTRICT damage to other systems or structures will occur by the removal of material, CONTRACTOR shall not proceed until receiving further instructions from the DISTRICT.

D. **Unsuitable Foundation:** If soft, spongy, unstable or other similar material is encountered upon which the pipe bedding material is to be placed, an additional 12 inches in depth of this unsuitable material shall be removed and replaced with bedding material placed in the manner specified for pipe bedding material. Tree roots are to be removed.

E. **Protection of Property:** Tree, shrubs, fences and all other property and surface structures shall be protected during construction unless the Plans and Specifications call for their removal.

F. **Temporary Supports:** When other structures, pipes, conduits, cables, wires or any underground improvements are encountered during excavation they shall be temporarily supported as necessary to prevent damage to or disturbance of said improvements.

G. Exploratory Excavation

1. The CONTRACTOR shall excavate and expose buried points of connection to existing utilities where indicated on the Drawings. Excavation shall be performed prior to preparation of Shop Drawings for connections and before fabrication of pipe, and the data obtained shall be used in preparing Shop Drawings.

2. Data, including dates, locations excavated, and sketches, shall be submitted to the DISTRICT within one week of excavation.

3. Damage to utilities from excavation activities shall be repaired by the CONTRACTOR.

H. **Open Trench:** The maximum amount of open trench permitted in any one location shall be 300 feet, or a length equivalent to the amount of pipe able to be installed in a single day, whichever is less. Trenches shall not remain open overnight. All trenches shall be fully backfilled at the end of each workday, or shall be properly shored and covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plates may be waived at the discretion of the INSPECTOR in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting safety requirements shall be provided and maintained.

I. Over-Excavation (Not Indicated)

1. When ordered by the DISTRICT to over-excavate trenches deeper and/or wider than required by the Contract Documents, the CONTRACTOR shall over-excavate to the dimensions ordered and backfill to the indicated grade of the bottom of the pipe bedding.

2. **Payment.** Over-excavation less than 6-inches more than the indicated trench depth and/or width shall be done at no increase in cost. Additional payment will be made for over-excavation 6 inches or more than the indicated depth and/or width. Additional payment will be based on unit price bid items for over-excavation if such bid items were established; otherwise payment will be based on a negotiated price. Volumes of material will be based on survey measurements of the over-excavated area.

J. Where pipelines are to be installed in embankments, fills, or structure backfills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

K. If a moveable trench shield is used during excavation operations, the trench width shall be wider than the shield so that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls. If the trench walls cave in or slough, the trench shall be excavated as an open excavation with sloped sidewalls or with trench shoring, as indicated and as required by the pipe structural design.

3.6 OVER-EXCAVATION NOT ORDERED OR INDICATED

A. Any over-excavation carried below the grade ordered or indicated, shall be backfilled and compacted to the required grade with the indicated material.

3.7 EXCAVATION IN LAWN AND LANDSCAPED AREAS

A. Where excavation occurs in landscaped areas, CONTRCTOR shall protect all trees, shrubs, sidewalk, walls, fences, and other landscape items adjacent to or within the work area unless directed otherwise by the Contract Documents. In the event of damage to landscape items, CONTRACTOR shall replace the damaged items in a manner satisfactory to the DISTRICT at no cost to the DISTRICT.

B. Where excavation occurs in lawn areas, the sod shall be carefully removed, dampened, and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling [and testing of the pipeline], the sod shall be replaced and lightly rolled in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if stockpiled sod has not been replaced within 72 hours.

C. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the DISTRICT. Trees shall be supported during excavation by any means previously reviewed by the DISTRICT.

3.8 ROCK EXCAVATION

A. **Explosives and Blasting:** Blasting will not be permitted.

3.9 BACKFILL - GENERAL

A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

B. Except for drain rock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation, and the trench sidewalls and bottom have been dried to a moisture content suitable for compaction.

C. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have all loose sloughing, or caving soil and rock materials removed. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

3.10 PLACING AND SPREADING OF BACKFILL MATERIALS

A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment, the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.

B. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone bedding materials shall be manually spread around the pipe so that when compacted the pipe bedding will provide uniform bearing and side support.

C. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is achieved. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

3.11 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

A. Each layer of Types A, B, C, G, H, I, and K backfill materials as defined herein, where the material is graded such that 10 percent or more passes a No. 4 sieve, shall be mechanically compacted to the indicated

percentage of density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

B. Each layer of Type F backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.

C. Flooding, ponding, or jetting shall not be used for backfill around structures, for final backfill materials, or aggregate base materials.

D. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

E. Backfill around and over pipelines that is mechanically compacted shall be compacted using light, hand operated, vibratory compactors and rollers. After completion of at least two feet of compacted backfill over the top of pipeline, compaction equipment weighing no more than 8,000 pounds may be used to complete the trench backfill.

3.12 TESTING FOR COMPACTION

A. **Methods:** Classification of pipe bedding and trench backfill materials shall be determined in accordance with ASTM D 2487. The density of soil in place shall be determined by the sand cone method, ASTM D 1556, or by the nuclear method, ASTM D 2922 or D 3017. When ASTM D 2922 is used and a one-sack slurry in not used to backfill the trench, the calibration curves shall be checked and adjusted using the sand cone method. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 (Nuclear Gauge Method for Water Content) shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks, as described in ASTM D 3017. The calibration checks of both the density and moisture curves shall be made at the beginning of the job and on each different type of material used. Copies of calibration curves, results of calibration tests, and results of laboratory tests shall be furnished to the DISTRICT prior to performing any field tests. Field test results shall be furnished to the DISTRICT within 48 hours of the testing. Trenches improperly compacted shall be reopened to the depth directed by the DISTRICT, then filled and compacted to the density specified at no additional cost to the DISTRICT.

B. **Soil Moisture-Density Relationship:** Laboratory moisture-density relations of soils shall be determined per ASTM D 1557.

C. **Cohesionless Materials:** Relative density of cohesionless materials by ASTM D 4253 and D 4254.

D. **Sampling:** Sample backfill materials per ASTM D 75.

E. **Relative Compaction:** "Relative compaction" shall be defined as the ratio, expressed as a percentage, of the in place dry density to the laboratory maximum dry density.

F. **Compaction Compliance:** Compaction shall be deemed to comply with the specifications when none of the tests falls below the specified relative compaction. Notify the DISTRICT 24-hours in advance of when backfill lifts are ready for testing to allow inspection by the DISTRICT. The CONTRACTOR shall pay the costs of any re-testing of work not conforming to the Specifications.

G. **Testing Frequency:** Testing shall be performed by a certified soils testing service. All tests shall be performed at locations specified by the DISTRICT. A minimum of one soil classification and one moisture-density relation test shall be performed for each different type of soil material used for pipe bedding

and trench backfill. These tests shall also be performed for every 1500 cubic yards of material placed. A minimum of one field density test shall be performed for each soil type, and at least one test for each 24" compacted thickness. These test requirements shall be repeated for every 300 feet of trench length.

H. **Compaction Requirements:** The following compaction test requirements shall be in accordance with ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft - lbf/ft^3) (2,700 kN-m/m^3) for Type A, B, C, G, H, I, K, M, and N materials and in accordance with ASTM D 4253 - Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table, and D 4254 - Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density, for Type B, E, F, and J materials. Where agency or utility company requirements govern, the highest compaction standards shall apply.

Location or Use of Fill	Percentage of Maximum Density	Percentage of Relative Density
Pipe bedding and over-excavated zones under bedding for flexible pipe, including trench plugs.	95	70
Pipe bedding and over-excavated zones under bedding for rigid pipe.	90	55
Final backfill, beneath paved areas or structures.	95	70
Final backfill, not beneath paved areas or structures.	90	55
Trench zone backfill, beneath paved areas and structures.	95	70
Trench zone backfill, not beneath paved areas or structures.	90	55
Embankments and fills.	90	55
Embankments and fills beneath paved areas or structures.	95	70
Backfill beneath structures and hydraulic structures.	95	70
Topsoil (Type K material)	80	N.A.
Aggregate base or sub-base (Type G or M material)	95	N.A.

3.13 PIPE AND UTILITY TRENCH BACKFILL

A. Pipe Zone Bedding

1. The pipe zone is defined as that portion of the vertical trench cross-section lying between the trench bottom and a plane 12-inches above the top surface of the pipe as indicated. The pipe bedding is defined as backfill material within the pipe zone. Bedding shall be placed across the entire trench extending from a minimum of four inches below the bottom of the pipe to 12 inches above the top

of pipe. Bedding shall be placed in layers not exceeding six inches loose thickness for compaction by hydraulic or hand operated mechanical compactors, and eight inches loose thickness when compacted by other mechanical compactors. Bedding shall be compacted to at least 90% of its maximum dry density as determined by ASTM D 1557. Bell holes in bedding shall be provided for each joint, but shall be no larger than necessary to allow joint assembly and to ensure that pipe will lie flat on the bedding. CONTRACTOR shall ensure that pipe is not being supported by the bell portion of the pipe at any joint and shall ensure that no less than 2 inches of bedding is provided for yokes, restraints, bells and all other extensions of fittings and joints.

2. The pipe zone shall be backfilled with the indicated backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, and the pipe itself during the installation and backfill operations.

B. Trench Zone Backfill: After the pipe zone backfill has been placed, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section from 12 inches above the top of the pipe to the bottom of the pavement zone if the trench is under pavement, or to within 12 inches of finished grade if the trench is in an unpaved area. Where slurry backfill is not used, material shall be compacted to at least 95% of maximum dry density as determined by ASTM D 1557. Trench shall be backfilled in lifts not exceeding eight inches, uncompacted depth, and then compacted by mechanical means prior to placement of succeeding lifts. Where the pipeline is located within an existing paved street within the public right of way, trench shall be backfilled with Type L backfill material as described above.

C. Pavement Zone Backfill and Final Backfill: The pavement zone includes the asphalt concrete and aggregate base pavement section. Final backfill applies to trenches not beneath paved areas and is all backfill in the trench cross-sectional area within 12 inches of finished grade.

D. Identification Tape: Install identification tape as indicated.

3.14 FILL AND EMBANKMENT CONSTRUCTION

A. The area where a fill or embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of six inches, and rolled or otherwise mechanically compacted. Embankment and fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the DISTRICT, each layer shall not exceed 6 inches of compacted thickness. The embankment, fill, and the scarified layer of underlying ground shall be compacted to 95 percent of maximum density under structures and paved areas, and 90 percent of maximum density elsewhere.

B. When an embankment or fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment or fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and re-compacted as the embankment or fill is brought up in layers. Material thus cut shall be re-compacted along with the new material. Hillside or fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

C. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

3.15 FIELD TESTING

A. **General:** All field soils testing will be done by a testing laboratory of the DISTRICT's choice at the DISTRICT's expense except as indicated below.

B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with Method C of ASTM D 1557. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the

calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place By Nuclear Methods (Shallow Depth), or by such other means acceptable to the DISTRICT.

C. In case the test of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the DISTRICT and paid by the CONTRACTOR.

D. The CONTRACTOR shall provide test trenches and excavations including excavation, trench support, and groundwater removal for the DISTRICT'S field soils testing operations. The trenches and excavations shall be provided at the locations and to the depths required by the DISTRICT.

3.16 ASPHALT CONCRETE

A. General: Furnishing, placing, shaping, rolling, and finishing asphalt concrete for pavement, berms, dikes, and curbs shall be performed in accordance with local jurisdiction's Standards and Section 39 of the Caltrans Standard Specifications.

B. Wherever required by the governing agency, the Contractor shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said agency before proceeding with the final restoration of improvements.

C. All paved areas, including curbs and berms, cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the permit of the governing agency. All temporary and permanent pavement shall conform to the requirements of the governing agency.

D. In order to obtain a satisfactory junction with adjacent surfaces, the Contractor shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent resurfacing of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines.

E. Pavement and base shall be constructed to the line, grade and thickness shown on the Construction Drawings. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

3.17 BASE AND SUBGRADE BELOW ASPHALT CONCRETE

A. The preparation of the subgrade to receive aggregate base course, and preparation and construction of aggregate base for construction of asphalt concrete paving shall conform to the requirements of the applicable sections of the Caltrans Standard Specifications.

B. Spreading and compacting of base material shall conform to the requirements of Section 26 of the Caltrans Standard Specifications.

C. Base course shall be maintained until asphalt pavement is placed. Areas of base course which are damaged or do not conform to the requirements herein shall be conditioned, reshaped, and recompacted in accordance with the requirements herein.

D. Compaction tests will be performed by the DISTRICT, in accordance with the requirements of the applicable sections of the Caltrans Standard Specifications.

3.18TACK COAT

A. An asphalt tack coat shall be applied to all existing asphalt concrete or concrete surfaces upon or

against which asphalt concrete is to be placed. Application of tack coat shall conform to the requirements of Section 39 of the Caltrans Standard Specifications.

3.19 ASPHALT CONCRETE PAVING

A. Asphalt concrete paving shall be constructed in accordance with the requirements of Section 39 of the Caltrans Standard Specifications.

3.20 ASPHALT CONCRETE PAVEMENT MARKING AND STRIPING

A. Asphalt concrete pavement shall be marked and striped to replace all markings and striping disturbed by the paving operation in accordance with Section 84 of the Caltrans Standard Specifications.

3.21 CLSM PREPARATION

A. Subgrade and compacted fill to receive CLSM shall be prepared according to this section.

3.22 BATCHING, MIXING AND DELIVERY OF CLSM

A. Batching, mixing, and delivery of CLSM shall conform to ASTM C 94. CLSM shall be mixed at a batch plant acceptable to the DISTRICT and shall be delivered in standard transit mix trucks.

3.23 PLACEMENT OF CLSM

A. CLSM shall be placed by tailgate discharge, conveyor belts, pumped, or other means acceptable to the DISTRICT. CLSM shall be directed in place by vibrator, shovel, or rod to fill all crevices and pockets. Avoid over-consolidation which causes separation of aggregate sizes.

B. CLSM shall be continuously placed against fresh material unless otherwise approved by the DISTRICT. When new material is placed against existing CLSM, the placement area shall be free from all loose and foreign material. The surface of the existing material shall be soaked a minimum of one hour before placement of fresh material but no standing water shall be allowed when placement begins.

C. Temperature of the CLSM shall be between 50 and 90 degrees F, when placed. CLSM shall not be placed when the air temperature is below 40 degrees F. No CLSM shall be placed against frozen subgrade or other materials having temperature less than 32 degrees F.

3.24 FINISHING OF CLSM

A. The finish surface shall be smooth and to the grade indicated or directed by the DISTRICT. Surfaces shall be free from fins, bulges, ridges, offsets, and honeycombing. Finishing by wood float, steel trowel, or similar methods is not required.

3.25 CURING OF CLSM

A. CLSM shall be kept damp for a minimum of 7 days or until final backfill is placed.

3.26 PROTECTION OF CLSM

A. CLSM shall be protected from freezing for 72 hours after placement.

B. No fill or loading shall be placed on CLSM until probe penetration resistance, as measured in accordance with ASTM C 803 - Standard Test Method for Penetration Resistance of Hardened Concrete, exceeds 650 psi.

C. CLSM shall be protected from running water, rain, and other damage until the material has been accepted and final fill completed.

END OF SECTION

SECTION 330110

WATERLINE DISINFECTION & TESTING

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall perform flushing, disinfection, and testing of all waterlines, services, and appurtenances, complete, in accordance with the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 330509 – Piping, General
Section 330519 – Ductile Iron Pipe (AWWA C151, Modified)
Section 330524 – Steel Pipe (AWWA C200, Modified)
Section 330531 – PVC Pressure Pipe (ACCA C900, Modified)

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards:

ANSI/AWWA B300 Hypochlorites.
ANSI/AWWA B301 Liquid Chlorine.
ANSI/AWWA C651 Disinfecting Water Mains.

1.4 CONTRACTOR SUBMITTALS

A. A proposed plan and schedule for water conveyance, cleaning, disinfection, flushing and water disposal, and pressure testing shall be submitted in writing for approval a minimum of two weeks before testing is to start. The plan shall demonstrate that personnel are experienced and prepared to resolve problems which may arise.

PART 2 - PRODUCTS

2.1 MATERIALS REQUIREMENTS

A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, or other water control equipment and materials shall be selected and furnished by the CONTRACTOR subject to the DISTRICT's review. No materials shall be used which would be injurious to the construction or its future function.

B. Chlorine for disinfection may be in the form of liquid chlorine or sodium hypochlorite solution.

C. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301. Liquid chlorine shall be used only:

1. In combination with appropriate gas flow chlorinators and ejectors;
2. Under the direct supervision of an experienced technician;
3. When appropriate safety practices are observed.

D. Sodium hypochlorite and calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300.

PART 3 - EXECUTION

3.1 GENERAL

A. All waterlines, services, and appurtenances shall be disinfected prior to pressure and leakage testing. Unless otherwise indicated, water for disinfecting and testing waterlines shall be furnished by the CONTRACTOR on private contracts and by Goleta Water District on DISTRICT contracts. In both cases the CONTRACTOR shall make all necessary provisions for conveying the water from the DISTRICT-designated source to the points of use. The CONTRACTOR shall furnish all equipment and materials for disinfection and testing of waterlines.

B. Disinfection shall be accomplished by chlorination. All disinfection and testing operations shall be performed in the presence of the DISTRICT. All pressure waterlines, services, and appurtenances shall be disinfected and tested.

C. Disinfection operations shall be scheduled by the CONTRACTOR as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the WORK is accepted by the DISTRICT.

3.2 DISINFECTING PIPELINES

A. **General:** All potable waterlines, services, and appurtenances shall be disinfected in accordance with the requirements of ANSI/AWWA C651. Prior to disinfecting, waterlines shall be flushed or blown out as appropriate.

B. **Chlorine-water solution method:** A chlorine-water solution shall be uniformly introduced into the waterline by means of a solution-feed chlorinating device. The chlorine solution shall be introduced at one end of the pipeline through a tap such that the concentration of free chlorine in the water entering the pipe is a minimum of 25 mg/l. Care shall be taken to prevent the strong chlorine solution in the waterline being disinfected from flowing back into the line supplying the water. The table below provides the quantity of chlorine required to produce 25 mg/L concentration in 100 feet of pipe – by diameter.

Pipe Diameter (inches)	12.5 % Chlorine Solution (ounces)
4	0.16
6	0.36
8	0.65
10	1.02
12	1.44
16	2.60

C. Tablet Method: The tablet method may be used only when all foreign materials have been kept out of the waterline during construction. If groundwater has entered the pipe during installation and tablets have been installed, CONTRACTOR shall flush main and use chlorine-water solution method. Do not use this method if the temperature is below 41 degrees Fahrenheit. Tablets shall be secured with non-toxic adhesive in each pipe length in top of pipe. The table below provides the number of 5-g hypochlorite tablets required for a minimum dose of 25 mg/L, based on 3.25g available chlorine per tablet.

Pipe Diameter	Length of pipe section				
	13 ft	18 ft	20 ft	30 ft	40 ft
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

D. **Disinfection:** Assure valves are closed on existing system to prevent chlorine solution flowing into water supply system. Chlorinated water shall be retained in the waterline long enough to destroy all non-spore-forming bacteria. This period shall be at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual at the waterline extremities and at other representative points shall be at least 10 mg/l. Should the chlorine level drop below 10 mg/l at the end of 24 hours, the waterline shall be flushed and the disinfection procedure repeated until 10 mg/l residual is achieved.

E. **Chlorinating Valves:** During the disinfection process of chlorinating the waterline, all valves, hydrants, and other appurtenances shall be operated while the pipeline is filled with the heavily-chlorinated water.

F. **Sampling Ports:** The CONTRACTOR shall provide sampling ports along the waterline as defined in AWWA C651.

G. **Preliminary Flushing:** Prior to chlorinating, waterlines shall be filled to eliminate air pockets and flushed to remove particulates.

H. **Final Flushing:** After disinfection is successfully completed, the heavily chlorinated water shall be flushed from the pipeline using fresh potable water until chlorine measurements show that the concentration in the water leaving the pipeline is no higher than 2 mg/l. The CONTRACTOR shall notify the DISTRICT that final flushing will be required. The DISTRICT will then send personnel to operate DISTRICT valves and assist the CONTRACTOR with the final flushing. If there is any question that the chlorinated discharge will

cause damage to the environment, a reducing agent shall be applied to the water to neutralize thoroughly the chlorine residual remaining in the water.

I. **Bacteriological Testing:** After final flushing and before the waterline is placed in service, two consecutive sets of samples, taken at least 24 hours apart shall be collected from the ends and intermediate points of the line. Samples shall be tested for bacteriological quality in accordance with the requirements of the State Department of Health Services. For this purpose, for the first set of samples, the pipe shall be re-filled with fresh potable water and left for a period of 24 hours before any sample is collected, for the second set of samples, wait at least 24 hours after the first set of samples were collected and tested before any sample is collected. CONTRACTOR shall contact the DISTRICT a minimum of 3 working days prior to requested date of sampling. The DISTRICT will collect samples and perform bacteriological tests. Should the initial disinfection treatment fail to produce satisfactory bacteriological test results, the disinfection procedure shall be repeated until acceptable results are obtained.

3.3 PRESSURE AND LEAKAGE TESTING OF WATERLINES

A. Prior to pressure and leakage testing, waterlines shall be flushed or blown out as appropriate. The CONTRACTOR shall test all waterlines either in sections or as a unit. Test sections shall not exceed 1000 feet in length. No section of waterline shall be tested until all field-placed concrete or mortar has attained an age of 14 days, or the waterline has been fully restrained against thrust forces. 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. The CONTRACTOR shall be responsible for ascertaining that all test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Any unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test, to avoid movement and damage to piping and equipment. The CONTRACTOR shall utilize waterline appurtenances or provide sufficient temporary air tappings in the waterline to allow for evacuation of all entrapped air in each pipe segment to be tested. After completion of the tests, such taps shall be permanently plugged. Care shall be taken to see that all air vents are open during filling.

B. The waterline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the air valves at a reasonable velocity and all the air within the pipeline shall be properly purged. For steel and ductile iron pipe, after the waterline has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the mortar lining to absorb what water it will and to allow air to escape from any air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures shall be taken.

C. **Pressure Test:** The hydrostatic test shall consist of holding the test pressure (+/- 5 psi) on the waterline for a period of 2 hours. The test pressure at the low point of the section being tested shall be 1.5 times the working pressure or 100 psi, whichever is greater. At the end of the pressure test period, the amount of water used to maintain the test pressure shall be determined.

D. **Leakage Test:** The leakage test shall be conducted concurrently with the pressure test. Leakage is defined as the quantity of water that must be supplied to a section of pipe to maintain the pressure within 5 psi of the specified test pressure after the pressure test has begun. The maximum allowable leakage shall be according to the following formula:

$$L = S \times D \times P^{1/2} / 133{,}200$$

where:
L = leakage (gallons per hour)
S = length (feet), the lessor of the actual length being tested or the maximum length for determining leakage. Maximum length for determining leakage is [2000 feet].
D = pipe diameter (inches)
P = test pressure (psi)

Pipe with welded joints shall have no leakage.

E. Waterlines, services, and appurtenances that fail to pass the prescribed pressure and leakage test shall be considered defective WORK. The CONTRACTOR shall determine the cause of the failure/leakage, repair the leaks, and shall retest the waterline.

3.4 CONNECTIONS TO EXISTING SYSTEM

A. Where connections are to be made to an existing potable water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a one percent hypochlorite solution before they are installed. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

END OF SECTION

SECTION 330507

BORING AND JACKING

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide bored or jacked steel casing, complete and in place, all in accordance with the Contract Documents. Carrier pipe installation within the steel casing shall be in accordance with the requirements contained within this Section.

B. In the performance of the work, the CONTRACTOR shall comply with the lawful requirements of the affected railway companies, public agencies, and owners of public utilities or other facilities for the safeguarding of traffic and improvements which might be endangered by the boring and jacking operations. Approach trenches in public streets will not be permitted to remain open for extended periods of time.

C. If the CONTRACTOR is not ready to place the carrier pipe in the casing at the time of completion of boring and jacking operations, the ends shall be bulkheaded, and the approach trenches in public streets shall be backfilled, temporary surfacing placed thereon, and the affected portion of the street reopened to traffic.

D. The CONTRACTOR shall be responsible for maintaining the required line and grade, and for preventing settlement of overlying structures, or other damage due to the boring and jacking operations.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 312316 – Trenching, Backfill and Compaction
Section 330509 – Piping, General

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards:

ASTM A 283	Low and Intermediate Tensile Strength Carbon-Steel Plates
ANSI/AWS D1.1	Structural Welding Code.
ANSI/AWWA C200	Steel Water Pipe 6 Inches and Larger.

1.2 CONTRACTOR SUBMITTALS

A. **Shop Drawings:** The CONTRACTOR shall submit shop drawings of pipe casing in accordance with the requirements in Section 013300 - Contractor Submittals and the following supplemental requirements as applicable:

1. Casing installation schedules which include schedules of excavation, pipeline installation, and backfill operations.

2. Material list including diameter, thickness, and class of steel casing.

3. Detailed locations and sizes of all boring or jacking and receiving pits.

4. Permits associated with the boring or jacking operations.

5. The CONTRACTOR, prior to beginning any trench or structure excavation 5 feet deep or over, shall submit to the DISTRICT and shall be in receipt of the DISTRICT'S written acceptance of the CONTRACTOR's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. The CONTRACTOR'S attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative systems plans shall be prepared by a civil or structural engineer licensed in the State of California.

B. **Certifications:** The CONTRACTOR shall furnish a certified affidavit of compliance for the physical and chemical properties of all steel pipe furnished. All costs incurred in making samples for certification of tests shall be the CONTRACTOR's responsibility.

1.3 QUALITY ASSURANCE

A. Boring or jacking operations shall be done by a qualified CONTRACTOR with at least 5 years' experience involving work of a similar nature.

B. The CONTRACTOR shall give the DISTRICT a minimum of 3 days advance notice of the start of excavation or boring operations.

C. WORK shall be performed in the presence of the DISTRICT, unless the DISTRICT has granted prior approval to perform such WORK in its absence.

D. **Welding Requirements:** Welding procedures used to fabricate steel casings shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, at a minimum, longitudinal and girth or special welds for pipe cylinders, casing joint welds, reinforcing plates, and grout coupling connections.

E. Welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the type of materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the casing or pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. The CONTRACTOR shall be responsible for all material and bear the expense of qualifying welders.

1.4 SAFETY

A. The PROJECT ENGINEER has obtained from the Division of Occupational Safety and Health Administration a preliminary gas classification for each bore. The CONTRACTOR shall contact the PROJECT ENGINEER at time of bidding to verify preliminary gas classification for each line. It shall be the CONTRACTOR's responsibility to see that the WORK is done in conformance with all applicable federal, state, and local safety requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Steel casings shall be welded steel pipe with minimum diameters and plate thicknesses indicated and shall be furnished complete with welded joint ends and pressure grout couplings. The steel pipe casings shall conform to ANSI/AWWA C200, subject to the following supplemental requirements. The CONTRACTOR may select a greater diameter or thickness for the method of work and loadings involved, site conditions, and possible interferences.

B. Annular space between the carrier pipe and the casing shall be filled with sand.

2.2 MATERIALS

A. **Steel Casing:** The casing pipe steel shall be in accordance with ASTM A283, Grade C, unless indicated otherwise. Casing section joints shall be butt welded, lap welded, or welded using butt straps in the field. Each end of the casing for butt welding shall be prepared by providing a 1/4-inch by 45-degree chamfer on the outside edges.

B. **Grout:** Grout shall consist of one part portland cement, three parts sand, and the minimum amount of water necessary to obtain the desired consistency; all grout mixtures shall contain 2 percent of bentonite by weight of the cement. Portland cement, water, and sand shall conform to the applicable requirements of Section 033000 - Cast-in-Place Concrete, except that sand to be used shall be of such fineness that 100 percent will pass a Standard No. 8 sieve and at least 45 percent, by weight, will pass a Standard No. 40 sieve. Bentonite shall be a commercial-processed powdered bentonite, Wyoming type, such as Black Hills**,** or equal.

C. **Grout Connections:** The CONTRACTOR shall provide 2-inch grout connections on the interior of the steel casing pipe, regularly spaced at 5 feet on center, alternating at 30 degrees from plumb on each side of the vertical centerline. Longitudinal spacing between the connections may be decreased to provide more extensive grouting, but in no case shall the spacing be exceeded.

D. **Sand:** Sand for the annular space between the carrier pipe and the steel casing shall be clean, sized such that 100 percent passes a Standard No. 30 sieve.

PART 3 - EXECUTION

3.1 INSTALLATION OF STEEL CASING

A. **Jacking Head:** A steel jacking head shall be fitted to the lead section of the casing in such a manner that it extends around the entire outer surface of the steel casing and projects at least 18 inches beyond the driving end of the casing. The jacking head shall not protrude more than 1/2-inch outside of the outer casing surface. The head shall be securely anchored to prevent any wobble or alignment variation during the boring or jacking operations. To minimize voids outside the casing, excavation shall be carried out entirely within the jacking head and not in advance of the head. Excavated materials shall be removed from the casing as the boring or jacking operation progresses and no accumulation of excavated materials within the casing shall be permitted.

B. **Jacking Pit:** The excavations for the boring or jacking operations shall be adequately shored to safeguard existing substructures and surface improvements and to ensure against ground movement in the vicinity of the jack supports. Heavy guide timber, structural steel, or concrete cradles of sufficient length shall be provided to assure accurate control of boring or jacking alignment. The CONTRACTOR shall provide adequate space within the excavation to permit the insertion of the lengths of casing to be bored or jacked. Timbers and structural steel sections shall be anchored to ensure action of the jacks in line with the axis of the casing. A bearing block, consisting of a timber or structural steel framework, shall be constructed between the jacks and the end of the casing to provide uniform end bearing over the perimeter of the casing and distribute the jacking pressure evenly.

C. **Control of Alignment and Grade:** The CONTRACTOR shall control the application of the jacking pressure and excavation of materials ahead of the casing as it advances to prevent the casing from becoming earthbound or deviating from the required line and grade. The CONTRACTOR shall restrict the excavation of the materials to the least clearance necessary to prevent binding in order to avoid loss of ground and consequent settlement or possible damage to overlying structures. Allowable grade deviations in horizontal and vertical alignments shall be no greater than 0.2 feet per 100 feet in any direction over the length of the jacking or boring to a maximum deviation of 0.5 feet at any point.

D. **Grouting:** Immediately after completion of the boring or jacking operations, the CONTRACTOR shall inject grout through the grout connections in such a manner as to completely fill all voids outside the casing pipe resulting from the boring or jacking operations. Grout pressure shall be controlled so as to avoid deformation of the steel casing and avoid movement of the surrounding ground. After completion of the grouting operations, the CONTRACTOR shall close the grout connections with cast-iron threaded plugs.

E. **Installation:** The installation of the casing shall be in accordance with the Contract Documents and be subject to the approval of the agency having jurisdiction over the area containing the boring or jacking operations.

3.2 INSTALLATION OF CARRIER PIPE

A. **Joints:** Where steel carrier pipe is called for, joints of the carrier pipe within the casing shall be welded in accordance with the specifications for the carrier pipe. No exterior or interior joints of the carrier pipe shall have mortar grout applied over a seam until the seam has cooled. Exterior and interior joints of the carrier pipe shall be mortar coated and lined in the field, in accordance with the requirements of the carrier pipe specifications.

B. **Application of Mortar Lining and Coating to Joints:** Application of mortar to the interior and exterior joints shall be performed in accordance with the carrier pipe specification.

C. **Testing of the Carrier Pipe:** Hydrostatic testing of the carrier pipe shall be completed prior to the filling of the annular space with sand. Hydrostatic testing shall be performed in accordance with Section 330110 - Waterline Disinfection & Testing.

D. **Sand Backfill for Annular Space in Jacked Casing:** Sand shall be conveyed by air through a hose to its final position. The sand shall be free of lumps to flow unimpeded and to completely fill all voids. In general, sand backfill will be considered completed when no more sand can be forced into the annular space. The CONTRACTOR shall protect and preserve the interior surfaces of the steel casing from damage.

E. **Closing of Pits:** After jacking equipment and excavated materials from the boring or jacking operations have been removed from the jacking pit, the CONTRACTOR shall prepare the bottom of the jacking pit as a pipe foundation. The CONTRACTOR shall remove loose and disturbed materials below pipe grade down to undisturbed earth and shall recompact the material in accordance with Section 312316 –Trenching, Backfill and Compaction.

END OF SECTION

SECTION 330509

PIPING, GENERAL

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide all piping systems indicated, complete and operable, including pipe supports, hangers, guides, anchors, and connection to and abandonment of existing water facilities in accordance with the GWD Standards & Specifications and Contract Documents.

B. The provisions of this Section shall apply to all piping sections in Divisions 2 and 33.

C. The drawings define the general layout, configuration, routing, method of support, pipe size, and pipe type. The drawings are not pipe construction or fabrication drawings. It is the CONTRACTOR's responsibility to develop the details necessary to construct all piping systems, to accommodate the specific equipment provided, and to provide all spools, spacers, adapters, and connectors for a complete and functional system.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 028200 – Asbestos Cement Pipe Removal and Disposal
Section 055000 – Miscellaneous Metalwork
Section 099000 – Protective Coatings
Section 312316 – Trenching, Backfill, and Compaction
Section 330110 – Waterline Disinfection and Testing

1.3 CONTRACTOR SUBMITTALS

A. **General:** Submittals shall be furnished in accordance with Section 013300 - Contractor Submittals.

B. **Shop Drawings:** Shop Drawings shall contain the following information:

1. Drawings: Layout drawings including all necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate all spool pieces, spacers, adapters, connectors, fittings, and supports to accommodate the equipment and valves in a complete and functional system.

2. Drawings of pipe supports, hangers, anchors, and guide rails.

3. Calculations for special supports and anchors

C. **Samples:** Performing and paying for sampling and testing as necessary for certifications are the CONTRACTOR'S responsibility.

D. Certifications

1. All necessary certificates, test reports, and affidavits of compliance shall be obtained by the CONTRACTOR.

2. A certification from the pipe fabricator that all pipes will be manufactured subject to the fabricator's or other recognized Quality Control Program.

1.4 EXISTING FACILITIES

A. **Location:** As the Contractor's first order of work, the various connection points to the existing waterlines shall be potholed to identify depth, diameter and pipe material. Pothole information shall be immediately provided to the DISTRICT for review. The DISTRICT will not review any other Contractor Submittals until after the pothole data is received.

B. **Leak-By:** The Contractor shall note that existing DISTRICT valves do not close drip tight. Existing valves in many areas are known to allow significant leak-by when fully closed. The Contractor shall expect leak-by conditions and provide the necessary labor, materials, and equipment to address this condition such that the connection can be made under safe conditions for personnel and contaminated water is prevented from entering the open ends of the existing and new mains. The Contractor shall not operate any DISTRICT valves. Only DISTRICT personnel shall operate existing system valves to facilitate the Contractors connection work. Also, only DISTRICT personnel shall operate valves connecting new mains to the existing in-service mains

PART 2 - PRODUCTS

2.1 GENERAL

A. **Extent of Work:** Pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable Sections of Divisions 2 and 33 and as indicated.

B. **Pipe Supports:** Pipes shall be adequately supported, restrained, and anchored in accordance with this Section and as indicated.

C. **Coating:** Pipes above ground or in structures shall be field-coated in accordance with Section 099000 - Protective Coatings.

D. **Pressure Rating:** Piping systems shall be designed for the maximum expected pressure as defined in Section 330110 - Water Pipeline Testing and Disinfection, or as indicated on the Piping Schedule. Minimum pressure rating shall be 200 psi, which corresponds to a working pressure of 133 psi when pressure tested at 1.5 times the working pressure. Where there is a working pressure greater the 133 psi, the minimum pressure rating shall be 305 psi.

E. **Inspection:** Pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the DISTRICT shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with requirements.

F. **Tests:** Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. The CONTRACTOR shall be responsible for performing material tests.

H. **Welder Qualifications:** Welding shall be done by skilled welders and welding operators who have adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the work shall be used in qualification tests. Qualification testing of welders and materials used during testing are part of the work.

2.2 PIPE FLANGES

A. **General:** Flanges shall have flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe (2-holed) unless otherwise indicated. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flange faces shall be perpendicular to the axis of the adjoining pipe. Flanges for miscellaneous small pipes shall be in accordance with the standards indicated for these pipes.

B. Pressure Ratings

1. **150 psi or less:** Flanges shall conform to either ANSI/AWWA C207 - Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In., Class D, or ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings, 150-lb class.

2. **150 psi to 275 psi:** Flanges shall conform to ANSI/ASME B16.5, 300-lb class.

3. **275 psi to 700 psi:** Flanges shall conform to ANSI/ASME B16.5, 300-lb class.

4. **Selection based on test pressure:** AWWA flanges shall not be exposed to test pressures grater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.

C. **Blind Flanges:** Blind flanges shall be in accordance with ANSI/AWWA C207, or as indicated for miscellaneous small pipes. Blind flanges for pipe sizes 12 inches and greater shall be provided with lifting eyes in form of welded or screwed eye bolts.

D. **Flange Coating:** Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

E. **Flange Bolts:** Bolts and nuts shall conform to Section 055000 - Miscellaneous Metalwork.

Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.

F. **Insulating Flanges:** Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.

G. **Insulating Flange Sets:** Insulating flange sets shall be provided where indicated. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic material. Steel washers shall be in accordance with ASTM A 325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength. Insulating gaskets shall be full-face.

H. Insulating Flange Manufacturers, or equal

JM Red Devil, Type E
Maloney Pipeline Products Co., Houston
PSI Products, Inc.

I. Flange Gaskets: Gaskets for flanged joints shall be ring type, with material and thickness in accordance with ANSI/AWWA C207, suitable for temperatures to 700 degrees F, a pH of one to eleven, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange.

J. Flange Gasket Manufacturers, or equal

John Crane, Style 2160
Garlock, Style 3000

2.3 THREADED INSULATING CONNECTIONS

A. **General:** Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.

B. **Materials:** Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.4 MECHANICAL-TYPE COUPLINGS & MECHANICAL JOINT ADAPTERS

A. **Mechanical-type Couplings:** Cast mechanical-type couplings (grooved or banded pipe) shall be provided where indicated. The couplings shall conform to the requirements of ANSI/AWWA C606 - Grooved and Shouldered Joints. Bolts and nuts shall conform to the requirements of Section 055000 - Miscellaneous Metalwork. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations. The wall thickness of grooved piping shall conform with the coupling manufacturer's recommendations to suit the highest expected pressure. To avoid stress on equipment, equipment connections with mechanical-type couplings shall have rigid-grooved couplings or flexible type coupling with harness in sizes where rigid couplings are not available, unless thrust restraint is provided by other means. Mechanical-type couplings shall be bonded. Have the coupling manufacturer's service representative verify the correct choice and application of couplings and gaskets, and the workmanship, to assure a correct installation. To assure uniform and compatible piping components, all grooved fittings, couplings, and valves shall be from the same manufacturer.

B. Manufacturers of Couplings for Steel Pipe, or equal

Aeroquip Corp. (banded or grooved)
Victaulic Style 41 or 44 (banded, flexible)
Victaulic Style 77 (grooved, flexible)
Victaulic Style 07 or HP-70 (grooved, rigid)

C. Manufacturers of Ductile Iron Pipe Couplings, or equal

Aeroquip Corp.
Victaulic Style 31 (flexible or rigid grooving)

Note: Ductile iron pipe couplings shall be furnished with flush seal gaskets.

D. Manufacturers of Couplings for PVC Pipe, or equal

Aeroquip Corp
Victaulic Style 77

Note: Couplings for PVC pipe shall be furnished with radius cut or standard roll grooved pipe ends.

E. **Mechanical Joint Adapters:** The direct connection of mechanical joint (MJ) fittings shall be made using MJ restraint adapters where indicated on the Construction Drawings. The MJ restraint adapters shall be constructed of ductile iron and comply with applicable AWWA Standards. Bolts and nuts shall conform to the requirements of Section 055000 - Miscellaneous Metalwork. The MJ restraint adapters shall be designed for a working pressure of 200 psi and to withstand a test pressure of 250 psi. MJ restraint adapters shall be lined and coated in accordance with AWWA C104 and C110. Manufacturer shall be Infact Corporation, Foster Adaptor, or approved equal.

2.5 SLEEVE-TYPE COUPLINGS

A. **Construction:** Sleeve-type couplings shall be provided where indicated, in accordance with ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. Couplings shall be steel with steel bolts, without pipe stop. Couplings shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long for sizes up to and including 30 inches and 10 inches long for sizes greater than 30 inches, for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall conform to the requirements of Section 055000 – Miscellaneous Metal Work. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

B. **Pipe Preparation:** Where indicated, the ends of the pipe shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:

   a. Color - Jet Black
   b. Surface - Non-blooming
   c. Durometer Hardness - 74 plus or minus 5
   d. Tensile Strength - 1000 psi Minimum
   e. Elongation - 175 percent Minimum

2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Gaskets shall be compatible with the piping service and fluid utilized.

D. **Insulating Couplings:** Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

E. **Restrained Joints:** Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided byother means. Harnesses shall be designed by the pipe manufacturer in accordance with Manual M11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed.

F. Manufacturers, or equal

Dresser
Ford Meter Box Co.
Smith-Blair
Romac

2.6 FLANGED COUPLING ADAPTERS

A. **Construction:** Flanged coupling adapters (FCA's) shall be provided where indicated, in accordance

with the applicable provisions of ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe. FCA's shall be steel with steel bolts, and sized to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4-inch in thickness and shall be a minimum of 5 inches long for sizes up to and including 30 inches. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle ring, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Bolts and nuts shall be stainless steel. FCA's shall be epoxy-coated at the factory as indicated.

B. **Pipe Preparation:** Where indicated, the end of the pipe shall be prepared for use with the FCA and shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe.

C. Gaskets:

1. Gaskets for FCA's shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. The rubber in the gasket shall meet the following specifications:

Color - Jet Black
Surface - Non-blooming
Durometer Hardness - 74 plus or minus 5
Tensile Strength - 1000 psi Minimum
Elongation - 175 percent Minimum

2. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. Gaskets shall be compatible with the piping service and fluid utilized.

D. **Restrained Joints:** FCA's shall be restrained by the use of thrust blocks, harnesses, or other means. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed. For PVC and ductile iron pipe, EBAA Iron Sales, Mega-Flange may be substituted for restrained FCA's.

E. Manufacturers, or equal

Dresser, Style 127 & 128W
Smith-Blair, Style 911
Romac, Style FC400 & FCA501
EBAA Iron Sales, Mega-Flange

2.7 EXPANSION JOINTS

A. Piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be of stainless steel, monel, rubber, or other materials best suited for each individual service. Submit detailed calculations and manufacturer's Shop Drawings of all proposed expansion joints, piping layouts, and anchors and guides, including information on materials, temperature and pressure ratings.

2.8 PIPE THREADS

A. Pipe threads shall be in accordance with ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (inch), and be made up with Teflon tape unless otherwise indicated.

2.9 RESTRAINING GLANDS AND JOINT HARNESSES

A. Restraining glands shall be of a model and type designed for the intended pipe material and service conditions, and shall be EBAA Iron Sales, Romac, or approved equal. Joint harnesses shall be of a model and type designed for the intended pipe material and service conditions, and shall be EBAA Iron Sales, Romac, Star, Sigma, or approved equal.

2.10 THRUST BLOCKS

A. Thrust blocks and anchor blocks shall be constructed of Portland Cement Concrete with a minimum compressive strength of 2500 psi. Anchor rods for anchor blocks shall be #5 rebar or 5/8 inch diameter steel rods, and shall be epoxy coated.

2.11 TAPE WRAPPING AND CATHODIC PROTECTION

A. All nuts and bolts on all pipe fittings shall be primered and single tape wrapped with Trenton Wax Tape #1 to fully encapsulate the nuts and bolts without any air voids. The nuts and bolts should broadcast through the wax tape . Manufacturer shall be Polyken or approved equal.

B. Existing buried steel piping shall be cathodically protected by welding a sacrificial anode to the pipe and flat strap jumpers across couplers whenever uncoverecd for work,

2.12 TRACER WIRE

A. For non-metallic pipelines, 12 gauge continuous location wire shall be placed on all water mains and brought up in valve can per District direction. Underground detectable warning tape shall also be used.

2.13 PIPE HANGERS AND SUPPORTS

A. **Code Compliance:** All piping systems and pipe connections to equipment shall be properly anchored and supported to prevent undue deflection, vibration, dislocation due to seismic events and line pressures, and stresses on piping, equipment, and structures. All supports and parts thereof shall conform to the requirements of ANSI/ASME B31.1 - Power Piping, except as supplemented or modified below. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code or local administration requirements.

B. **Structural Members:** Wherever possible, pipes shall be supported from structural members. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided. All supplementary members shall be in accordance with the requirements of the building code and the American Institute of Steel Construction and shall be acceptable to the DISTRICT.

C. **Pipe Hangers:** Pipe hangers shall be capable of supporting the pipe in all conditions of operation, allowing free expansion and contraction of the piping, and preventing excessive stress on equipment. All hangers shall have a means of vertical adjustment after erection. Hangers shall be designed to prevent becoming disengaged by any movement of the supported pipe. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves, shall include hydraulic shock suppressors. All hanger rods shall be subject to tensile loading only.

D. **Hangers Subject to Horizontal Movements:** At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement. Where horizontal pipe movement is greater than 1/2-inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold to the hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.

E. **Spring-Type Hangers:** Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping. All spring-type hangers shall

be sized to the manufacturer's printed recommendations and the loading conditions encountered. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate at all times the compression of the spring. Supports shall be capable of accommodating at least 4 times the maximum travel due to thermal expansion.

F. **Thermal Expansion:** Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints permitting the piping to expand and contract freely in directions away from the anchored points. All components shall be structurally suitable to withstand all loads imposed.

G. **Heat Transmission:** Supports, hangers, anchors, and guides shall be so designed and insulated, that excessive heat will not be transmitted to the structure or to other equipment.

H. **Riser Supports:** Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.

I. **Freestanding Piping:** Free-standing pipe connections to equipment such as chemical feeders and pumps shall be firmly attached to steel frames fabricated from angles, channels, or I-beams anchored to the structure. Exterior, free-standing overhead piping shall be supported on fabricated pipe stands consisting of pipe columns anchored to concrete footings, with horizontal, welded steel angles and U-bolts or clamps securing the pipes.

J. Materials of Construction:

1. **General:** All pipe support assemblies, including framing, hardware, and anchors, shall be steel construction, galvanized after fabrication, unless otherwise indicated.

2. **Submerged Supports:** All submerged piping, as well as piping, conduits, and equipment in hydraulic structures within 24 inches of the water level, shall be supported with support assemblies, including framing, hardware, and anchors, constructed of Type 316 stainless steel, unless otherwise indicated.

K. **Point Loads:** Any meters, valves, heavy equipment, and other point loads on PVC, FRP, and other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations to avoid undue pipe stresses and failures. To avoid point loads, all supports on PVC, FRP, and other plastic piping shall be equipped with extra wide pipe saddles or galvanized steel shields.

L. **Noise Reduction:** To reduce transmission of noise in piping systems, all copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar, suitable material at each pipe support, bracket, clip, or hanger.

2.14 SUPPORT SPACING

A. Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending, and shear stresses in the piping, with special consideration given where components such as flanges and valves impose concentrated loads. Pipe support spacing shall not exceed the maximum spans in the tables below. For temperatures other than ambient temperatures, or those listed, and for other piping materials or wall thicknesses, the pipe support spacings shall be modified in accordance with the pipe manufacturer's recommendations. Vertical supports shall be provided to prevent the pipe from being overstressed from the combination of all loading effects.

1. Support Spacing for Schedule 40 and Schedule 80 Steel Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
1/2	6
3/4 and 1	8
1-1/4 to 2	10
3	12
4	14
6	17
8 and 10	19
12 and 14	23
16 and 18	25
20 and greater	30

2. Support Spacing for Welded Fabricated Steel Pipe:

Maximum Spans for Pipe Supported in Minimum 120 degree Contact Saddles (feet)

Nominal Pipe Diameter (inches)	Wall Thickness (inches)							
	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4
24	33	37	41	43	45	47		
26	34	38	41	44	46	48		
28	34	38	41	44	47	49		
30	34	38	42	45	48	49		
32	34	39	42	45	48	50		
34	35	39	43	46	48	50		
36	35	39	43	46	49	51	55	
38	35	39	43	46	49	51	55	
40	35	40	43	47	49	52	56	
42	35	40	44	47	50	52	56	
45	--	40	44	47	50	53	57	
48	--	40	44	47	50	53	58	61

For steel pipe sizes not presented in this table, the support spacing shall be designed so that the stress on the pipe does not exceed 5,000 psi. Maximum deflection of pipe shall be limited to 1/360th of the span and shall be calculated by using the formula:

$$L = (7500tD/(32t+D))^{1/2}$$

where: t = Thickness (inches)
D = Diameter (inches)
L = Maximum span (feet)

3. Support Spacing for Ductile-Iron Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
All Diameters	Two supports per pipe length or 10 feet (one of the 2 supports located at joint)

4. Support Spacing for Copper Tubing:

Nominal Pipe Diameter (inches)	Maximum Span (feet)
1/2 to 1-1/2	4
2 to 4	6
6 and greater	8

5. Support Spacing for Schedule 80 PVC Pipe:

Nominal Pipe Diameter (inches)	Maximum Span (at 100 degrees F) (feet)
1/2	4
3/4	4.5
1	5
1-1/4	5.5
1-1/2	5.75
2	6.25
3	7.5
4	8.25
6	10
8	11
10	12.25
12	13.25

2.15 MANUFACTURED SUPPORTS

A. **Stock Parts:** Where not specifically indicated, designs which are generally accepted as exemplifying good engineering practice and use stock or production parts, shall be utilized wherever possible. Such parts shall be locally available, new, of best commercial quality, designed and rated for the intended purpose.

B. Manufacturers, or Equal:

Basic-PSA, Johnstown, PA;
Bergen-Paterson Pipesupport Corp., Woburn, MA;
Power Piping Company, Pittsburgh, PA.
Standon, Model S89 &S92
Pipeline Products

2.16 COATING

A. **Galvanizing:** Unless otherwise indicated, all fabricated pipe supports other than stainless steel or non-ferrous supports shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A 123 - Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. **Other Coatings:** Other than stainless steel or non-ferrous supports, all supports shall receive

Protective Coatings in accordance with the requirements of Section 099000 - Protective Coatings.

2.17 CONNECTIONS TO EXISTING FACILITIES

A. All materials used in making the connection or removing the facility from service shall conform to the applicable sections of the DISTRICT Standards & Specifications and the Construction Drawings.

PART 3 - EXECUTION

3.1 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. Pipe and pipe appurtenances such as fittings, valves, etc. shall be delivered in a clean and undamaged condition. The CONTRACTOR shall be responsible for unloading and loading of pipe and pipe appurtenances at the job site in accordance with the manufacturer's printed instructions and recommendations. All pipe shall be unloaded at the site with care using a double padded sling or as specified in the applicable Sections. Pipe appurtenances shall be unloaded at the site with care using hoists or skids to avoid damage to materials. Under no circumstances shall materials be dropped. When unloading pipe, trucks shall be parked on level ground. All pipe and pipe appurtenances shall be kept in a safe storage area where they can be protected from heat, dirt, weather, or other detrimental factors. Cement mortar lined pipe shall be stored with proper stulling per the manufacturer's recommendations. Pipe shall be stored in such a way as not to inflict loading which may cause bending, cracking or other damage. Pipe appurtenances shall be stored off the ground for protection against oxidation caused by ground contact. Defective or damaged materials shall be replaced with new materials at the CONTRACTORs expense.

3.2 GENERAL

A. Pipes, fittings, and appurtenances shall be installed in accordance with the requirements of the applicable Sections of Divisions 2 and 33.

B. **Corrosion Protection:** All nuts and bolts on flanges, fittings, couplings, joint harnesses, etc. for buried service shall be tape wrapped, after installation is completed, using heavy duty joint wrap, in accordance with Section 099000 – Protective Coatings. Entire length of bolts and all hardware shall be fully encapsulated with tape wrapping.

C. **Core Drilling:** Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and rebar.

D. **Cleanup:** After completion of the WORK, cuttings, joining and wrapping materials, and other scattered debris shall be removed from the Site. The entire piping system shall be handed over in a clean and functional condition.

3.3 THRUST RESTRAINT

A. **General**: Thrust restraint shall be provided at all vertical and horizontal bends, tees, crosses, dead ends, hydrants, reducers, valves, and fittings. Thrust restraint shall be accomplished by the use of restraining glands and joint harnesses, or thrust blocks. Restraining Glands shall be used where specified on mechanical joint fittings for PVC and ductile iron pipe.

B. **Restraining Glands and Joint Harnesses:** Restraining glands and joint harnesses shall be installed in accordance with manufacturer recommendations. After installation, all nuts and bolts shall be primered and wrapped with 2 layers of 35 mil adhesive pipe wrap. Joint harnesses shall be used in conjunction with retainer glands wherever retainer glands are to be used to provide thrust restraint.

C. **Thrust Blocks:** Thrust and anchor blocks shall be formed out of concrete meeting requirements of Section 033000 – Cast-in-Place Concrete. Blocks shall be sized and configured in accordance with Section 2.04 C and Standard Detail 2-08 of these Standards & Specifications. Concrete shall be poured against undisturbed ground.

D. Epoxy coated number 5 reinforcement bar shall be embedded and wrapped around appurtenance as shown in Standard Detail 2-08. Care shall be taken not to cover fittings, valves, bolts, nuts, or other appurtenances with concrete. Blocks shall be cured 24 hours prior to backfill, and shall be cured a minimum of 7 days or have 75% of the 28-day strength before the water line can be filled and pressurized.

3.4 TRACER WIRE

A. Continuous tracer wire shall be placed directly on the top surface of all water mains. Where detectable warning tape is also used, place it no less than 1 foot above the top of the water main.

3.5 INSTALLATION OF PIPE SUPPORTS

A. **General:** All pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ANSI/ASME B31.1 - Power Piping. All concrete inserts for pipe hangers and supports shall be coordinated with the formwork.

B. **Appearance:** Pipe supports and hangers shall be positioned to produce an orderly, neat piping system. All hanger rods shall be vertical, without offsets. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, without interference with other work.

3.6 FABRICATION

A. **Quality Control:** Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available. Fabricated supports shall be neat in appearance without sharp corners, burrs, and edges.

3.6 CONNECTION TO EXISTING WATER LINES

A. **Shutdown Request:** The Contractor shall submit a written request to the DISTRICT a minimum of ten (10) working days before the time of any desired shutdown of existing waterlines or services. The written request shall include the date of the proposed shutdown and the estimated number of hours required to complete the work. The DISTRICT will review the request and determine the actual time and date of the shutdown based on the availability of DISTRICT staff.

B. **Authorization:** Connections shall be made only by the DISTRICT. No connection work shall be performed prior to authorization by the DISTRICT.

C. **Time Schedule:** Work which will require disruption of service in water mains shall be planned and executed so that it will not disrupt service before 8:30 A.M. and insure restoration of service before 4:00 P.M. each day, unless an exception in writing is obtained from the DISTRICT prior to the shutdown. To comply with this schedule the Contractor must consider the time required to:

1. Turn off customer services and isolation valves;
2. Drain and dispose the water from the isolated section of the water line to be cut;
3. Perform cut-in operations; and
4. Flush the water line prior to service restoration.

Note: If the DISTRICT determines that the disruption of service may exceed the time limitations, the Contractor shall re-plan the work for more than one day of operation to ensure service is restored by 4:00 P.M. each day.

D. **Material:** The Contractor shall provide the DISTRICT with verification that all materials are on hand a minimum of five working days in advance of the proposed shutdown date. The Contractor shall furnish all pipe and materials as may be required for connections the day before of the shutdown date the Contractor shall be fully prepared for the planned work with all required materials, tools, equipment, dewatering equipment, lights, barricades, permits, skilled personnel, and supervision. If adequate preparations have not been made by the Contractor, the DISTRICT will cancel the shutdown and the Contractor shall be responsible for all costs associated with the cancelled shutdown.

E. **Inadequate Progress:** If progress is inadequate during the connection operations to complete the connection in the time specified, the DISTRICT shall order necessary corrective measures. All costs for corrective measures shall be paid by the Contractor.

F. **Connections:** New mains shall be connected to existing in-service mains against a closed valve prior to disinfection, flushing and pressure testing of the new mains. The Contractor shall not operate the closed valve. Only DISTRICT field personnel shall operate and/or open existing system valves and valves connecting new mains to the existing in-service mains. Connections shall be made with as little change as possible in the grade of new main. If the grade of the existing pipe is below that of the new pipeline, a sufficient length of the new line shall be deepened so as to prevent the creation of any high spot or abrupt changes in grade of the new line. Where the grade of the existing pipe is above that of the new pipeline, the new line shall be laid at specified depth, except for the first joint adjacent to the connection, which shall be deflected as necessary to meet the grade of the existing pipe. If sufficient change in direction cannot be obtained by the limited deflection of the first joint, a fitting of the proper angle shall be installed. Where the connection creates a high or low spot in the line, a combination air valve or blowoff assembly shall be installed as directed by the DISTRICT.

G. **Testing:** The new pipeline shall be disinfected and pressure tested in accordance with Section 02643 – Waterline Disinfection & Testing.

3.7 REMOVAL OF EXISTING MAINS AND APPURTENANCES FROM SERVICE

A. **General:** Existing waterlines, conduits, or structures shall be abandoned and removed from service at the locations shown on the Construction Drawings or as directed by the DISTRICT, in accordance with the DISTRICTs Standards & Specifications. At all locations where new waterlines are to be connected to existing waterlines and where portions of the existing waterlines are to be abandoned, the existing waterlines to be abandoned shall be removed for a minimum distance of five feet clear from any waterlines to remain in service. Conduits to be abandoned in place shall be plugged with concrete to form a 2 foot long plug at all openings. Existing valves removed from service due to the abandonment of a waterline shall be closed, the valve can removed, and the hole backfilled with concrete slurry and patched with asphalt.

B. **Removed Material:** Removed pipe and appurtenances may be temporarily stockpiled on the job in a location that will not disrupt traffic or be a safety hazard per restrictions and requirements of the County of Santa Barbara. Materials from abandoned facilities shall be salvaged as shown on the Construction Drawings or as indicated in the DISTRICTs Standards & Specifications. Removed appurtenances to be salvaged shall be delivered to the DISTRICT's storage yard as directed by the DISTRICT. Removed pipe shall be disposed of by the CONTRACTOR in accordance with State and local regulations.

C. **Maintenance of Service:** Before excavating for laying mains that are to replace existing pipes and/or services, the Contractor shall make provisions for maintaining continuous service as directed by the DISTRICT.

END OF SECTION

SECTION 330519

DUCTILE IRON PIPE (AWWA C151, MODIFIED)

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide ductile iron pipe with polyethylene encasement and all appurtenant work, complete in place, in accordance with the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 312316 –Trenching, Backfill and Compaction
Section 330110 – Waterline Disinfection & Testing
Section 330509 – Piping, General
Section 331216 – Valves and Appurtenances
Section 331417 – Service Connections

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards:

ANSI/AWWA C104/A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
ANSI/AWWA C105/A21.5	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in Through 48 in for Water and Other Liquids
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings, 3 in. Through 12 in. for Water and Other Liquids
AWWA C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances
ASTM C 150	Specification for Portland Cement

1.4 CONTRACTOR SUBMITTALS

A. **Shop Drawings:** The CONTRACTOR shall submit shop drawings of pipe in accordance with the requirements in Section 013300 - Contractor Submittals, the requirements of the referenced standards and the following supplemental requirements as applicable:

1. For pipe 24 inches in diameter and larger, line layout and marking diagrams which indicate the specific number of each fitting and the location and the direction of each fitting in the completed line. In addition, the line layouts shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained joints, or of concrete encasement.

1.5 QUALITY ASSURANCE

A. **Tests:** Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of the referenced standards as applicable.

PART 2 - PRODUCTS

2.1 GENERAL

A. Mortar-lined and polyethylene-wrapped ductile iron pipe shall conform to ANSI/AWWA C150/A121.50, C151, C104, and C105, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents.

B. **Markings:** The CONTRACTOR shall legibly mark specials 24 inches in diameter and larger in accordance with the laying schedule and marking diagram. All fittings shall be marked at each end with top field centerline.

C. **Handling and Storage:** The pipe shall be handled by devices acceptable to the DISTRICT, designed and constructed to prevent damage to the pipe coating/exterior. The use of equipment which might injure the pipe coating/exterior will not be permitted. Stockpiled pipe shall be suitably supported and shall be secured to prevent accidental rolling. All other pipe handling equipment and methods shall be acceptable to the DISTRICT.

D. **Laying Lengths:** Maximum pipe laying lengths shall be 20 ft with shorter lengths provided as required by the Drawings.

E. **Finish:** The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness.

F. **Bonding and Electrical Conductivity:** All pipe joints shall be prepared for bonding for electrical conductivity in accordance with the details shown. The CONTRACTOR shall furnish all materials required for joint bonding and electrolysis test station installations.

G. **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 shown on the Drawings. The locations of correction pieces and closure assemblies are shown on the Drawings. Any change in location or number of said items shall be acceptable to the DISTRICT.

2.2 PIPE DESIGN CRITERIA

A. **General:** Ductile iron pipe shall be designed in accordance with the requirements of ANSI/AWWA C150 as applicable and as modified in this Section. As a minimum, ductile iron pipe shall be designed for a working pressure of 350 psi with an additional surge allowance of 100 psi. In addition to the requirements of this Section, the minimum wall thickness shall be in accordance with Table 50.5 of ANSI/AWWA C150.

B. **Pipe Wall Thickness for External Load:** The pipe shall also be designed with a net thickness to withstand external loads using ANSI/AWWA C150 Design Equation (2) with the appropriate bending moment and deflection coefficients for Laying Condition Types 4 and 5 as applicable. The pipe deflection shall be checked using ANSI/AWWA C150 Design Equation (3) and the coefficients stated above. The allowable deflection shall not exceed 0.0225 times the nominal diameter. In lieu of ANSI/AWWA C150 Design Equation (4), the earth loads will be computed using the following 2 equations for trench or embankment loading as applicable:

1. Trench Condition:

$$W_d = C_d w B_d^2$$

Where:
- W_d = Earth Load in pounds per linear foot
- C_d = Calculation Coefficient
- Ku' = [0.13]
- w = [120] lb/ft^3
- B_d = Trench width at top of pipe, feet

2. Positive Projecting Embankment Condition:

$$W_c = C_c w B_c^2$$

Where:
- W_c = Earth Load in pounds per linear foot
- C_c = Calculation Coefficient (based on $r_{sd}P$ of 0.25)
- Ku = [0.19]
- w = [120] lb/ft^3
- B_c = Outside diameter of pipe, feet

C. The above 2 formulas are based on a depth of cover of 10 feet or greater. For depths of cover of less than 10 feet, HS-20 live load shall be included. For depths of cover of 3 feet or less, HS-20 live load plus impact shall be included. The determination of live load and impact factors shall be as recommended by AASHTO in "Standard Specifications for Highway Bridges."

D. If the calculated deflection, $Defl_x$, exceeds 0.0225 times the nominal diameter, the pipe class shall be increased.

2.3 MATERIALS

A. **Ductile Iron Pipe:** Pipe materials shall conform to the requirements of ANSI/AWWA C151.

B. **Cement:** Cement for mortar lining shall conform to the requirements of ANSI/AWWA C104; provided, that cement for mortar lining shall be Type II or V. Cement shall not originate from kilns which burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement.

C. **Polyethylene Encasement:** Material for the polyethylene encasement shall conform to the requirements of ANSI/AWWA C105 with a minimum thickness of 20 mils.

2.4 SPECIALS AND FITTINGS

A. Fittings for ductile iron pipe shall conform to the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10 for diameters 3-inch through 48-inch and shall have a minimum pressure rating of 250 psi. Ductile iron fittings larger than 48-inch shall conform to the above referenced standard with the necessary modifications for the larger size.

2.5 PIPE

A. **General:** The pipe furnished shall be ductile iron pipe, mortar-lined and polyethylene- wrapped, with rubber-gasket joints as shown. The pipe shall be designed, manufactured, tested, inspected, and marked according to applicable requirements previously stated and except as hereinafter modified, shall conform to ANSI/AWWA C151. The diameter and minimum wall thickness for each pipe size shall be as specified or shown.

B. **Fitting Dimensions:** The fittings shall be of the diameter and class shown.

1. Special ductile iron flanges to match up to 250 psi valve and equipment flanges shall meet ANSI/AWWA C110 and be specially drilled to ANSI/ASME B16.1 class 250 standard dimensions with raised face.

C. **Joint Design:** Ductile iron pipe and fittings shall be furnished with flanged joints, or restrained joints as required.

1. Push-on joints shall conform to ANSI/AWWA C111/A21.11.

2. Flanged joints shall conform to ANSI/AWWA C115/A21.15.

3. Restrained joints shall be ["Flex-Ring"] ["Lok-Ring"] ["Fast-Grip"] Restrained Joint by AMERICAN Cast Iron Pipe Company, "TR FLEX" Restrained Joint by U.S. Pipe, Megalug by EBAA, One-Lok by Sigma, or equal.

D. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself, will provide watertight joints under all operating conditions when properly installed. The CONTRACTOR shall require the pipe manufacturer to submit details complete with significant dimensions and tolerances and also to submit performance data indicating that the proposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted.

E. Shop-applied interior linings and exterior coatings shall be held back from the ends of the pipe as shown or as otherwise acceptable to the DISTRICT.

2.6 CEMENT-MORTAR LINING

A. **Cement-Mortar Lining for Shop Application:** Except as otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with ANSI/AWWA C104. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. The lining machines shall be of a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications. All shop-applied cement mortar lining shall be given a seal coat of asphaltic material in conformance with ANSI/AWWA C104.

B. The minimum lining thickness shall be as follows:

Nominal Pipe Diameter (in)	Minimum Lining Thickness (in)

3-12	1/8
14-24	3/16
30-54	1/4

2.7 EXTERIOR COATING OF PIPE

A. **Exterior Coating of Exposed Piping:** The exterior surfaces of pipe which will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of rust-inhibitive primer. The CONTRACTOR shall paint the pipe with 2 coat of epoxy paint as described in spec section 099000.

B. **Exterior Coating of Risers Transitioning from Buried to Exposed Piping** - The exterior surfaces of pipe transitioning form buried to exposed which will delivered to the site with a shop coat of rust-inhibitive primer and then field painted with two coats of epoxy painting.

C. **Exterior Coating of Buried Piping:** The exterior coating shall be an asphaltic coating approximately 3 mils thick.
The exception to the requirements above is: risers for DCDAs can be install with 3 mils of asphaltic exterior coating with the buried portion wrapped in polyethylene encasement, because the District has always done it that way.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall conform to the requirements of AWWA M41, instructions furnished by the pipe manufacturer, and to the supplementary requirements herein. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

B. Laying, jointing, testing for defects and for leakage shall be performed in the presence of the DISTRICT, and shall be subject to approval before acceptance. Material found to have defects will be rejected and the CONTRACTOR shall promptly remove such defective materials from the Site.

C. The CONTRACTOR shall determine the location of existing underground utility structures in the vicinity of proposed pipe installation prior to excavation. All existing above and below ground structures within the work area shall be protected in place unless indicated otherwise on the Construction Drawings.

D. Whenever the WORK is not actively in progress, the open ends of all installed pipe shall be plugged or capped with bulkhead mechanical joint end cap to prevent the entry of animals, water, or other undesirable substances.

3.2 HANDLING AND STORAGE

A. **Handling and Storage:** All pipe, fittings, etc., shall be carefully handled and protected against damage, impact shocks, and free fall. All pipe handling equipment shall be acceptable to the DISTRICT. Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the trench site or elsewhere. No pipe shall be installed where the lining or coating show defects that may be harmful as determined by the DISTRICT. Such damaged lining or coating shall be repaired, or a new undamaged pipe shall be furnished and installed.

B. The CONTRACTOR shall inspect each pipe and fitting prior to installation to insure that there are no damaged portions of the pipe. All pipe damaged prior to Substantial Completion shall be repaired or replaced by the CONTRACTOR.

3.3 INSTALLATION OF PIPE

A. **Pipe Laying:** The pipe shall be installed in accordance with ANSI/AWWA C600. Bell-and-spigot pipe shall be laid with the bell end pointing in the direction work is progressing. Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the DISTRICT may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint. Pipe shall not be laid when the conditions of trench or weather are unsuitable. Pipe shall be laid uphill on grades 10% or greater. Pipe which is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement.

B. Each section of pipe 24 inches in diameter and larger shall be laid in the order and position shown on the laying schedule. Pipe shall be laid to the set line and grade, within approximately one inch plus or minus.

C. Pipe shall be supported at its proper elevation and grade, care being taken to secure firm and uniform support. Wood support blocking will not be permitted. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recessed excavation to accommodate bells, joints, and couplings. Anchors and supports shall be provided where indicated and where necessary for fastening work into place. Fittings shall be independently supported.

D. Short lengths of pipe shall be used in and out of each rigid joint or rigid structure. Piping that does not allow sufficient space for proper installation of jointing material shall be replaced by one of proper dimensions. Blocking or wedging between bells and spigots will not be permitted. Pipe alignment shall be checked after each length of pipe is installed to insure the downstream pipe did not deflect. Pipe shall not deflect at the joints more than 75% of manufacturer’s printed recommendations. Trench shall not be backfilled prior to pipeline inspection by the DISTRICT. Any pipeline buried prior to inspection shall be uncovered by the CONTRACTOR, at their own expense, for the DISTRICT to inspect.

E. Joints shall be installed according to manufacturer's recommendations. The surfaces of the pipe spigot end, bell and gasket shall be cleaned just prior to joining pipes. The spigot end of the pipe shall be beveled and checked for proper fit in the bell end without causing damage to the gasket. A lubricant, approved by the pipe manufacturer, shall be applied to the spigot end prior to joining pipes. The spigot shall penetrate bell completely as indicated by penetration line. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall be in accordance with the manufacturer's recommendations.

F. Pipe shall be cut by means of saws, power driven abrasive wheels, or pipe cutters, which will produce a square cut. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander, or abrasive disc. The pipe shall be remarked with a penetration line at the required penetration depth.

G. **Work Stoppage:** At the end of each working day, CONTRACTOR shall plug or cap the open ends of all unfinished pipelines with securely bolted mechanical joint plugs, mechanical joint end caps, or blind flanges. If the pipe is subject to flooding, pipe shall be anchored as precaution against flotation. Trenches shall be backfilled in accordance with the DISTRICT Standards & Specifications, Part V, Section 312316, 3.5, H,, and GWD Std. Detail 2-03.

H. **Cold Weather Protection:** No pipe shall be installed upon a foundation into which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.

I. **Pipe Cleanup:** As pipe laying progresses, the CONTRACTOR shall keep the pipe interior free of all debris. The CONTRACTOR shall completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints and any necessary interior repairs prior to testing and disinfecting the completed pipeline.

3.4 RUBBER GASKETED JOINTS

A. Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket lubricated with an approved vegetable-based lubricant shall be placed in the bell groove. The spigot end of the pipe shall be carefully cleaned and lubricated with a vegetable-based lubricant. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted.

3.5 POLYETHYLENE ENCASEMENT UNBONDED COATING

A. Buried ductile iron pipe shall be polyethylene encased in accordance with the requirements of ANSI/AWWA C105/A21.5.

3.6 INSTALLATION OF PIPE APPURTENANCES

A. **Protection of Appurtenances:** Where the joining pipe is tape-coated, buried appurtenances shall be coated with Trenton Wax Tape #1. Where pipe is encased in polyethylene sleeves, buried appurtenances shall also be encased in polyethylene.

B. **Installation of Valves:** All valves shall be handled in a manner to prevent any injury or damage to any part of the valve. All joints shall be thoroughly cleaned and prepared prior to installation. The CONTRACTOR shall adjust all stem packing and operate each valve prior to installation to insure proper operation. All valves shall be installed so that the valve stems are plumb and in the location shown.

END OF SECTION

SECTION 330524

STEEL PIPE (AWWA C200, MODIFIED)

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide mortar-lined and mortar-coated steel pipe, and/or mortar-lined and enamel/tape-coated steel pipe, and/or mortar lined-epoxy coated, bends, reducers, wyes, tees, crosses, outlets, manifolds, and other steel plate specials, complete in place, in accordance with the Contract Documents.

B. A single pipe manufacturer shall be made responsible for furnishing all steel pipe and smaller diameter appurtenant steel pipe and specials, as required by the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 099000 – Protective Coatings
Section 312316 –Trenching, Backfill and Compaction
Section 330110 – Waterline Disinfection & Testing
Section 330509 – Piping, General
Section 331216 – Valves and Appurtenances
Section 331417 – Service Connections

1.3 CONTRACTOR SUBMITTALS

A. **Shop Drawings:** The CONTRACTOR shall submit Shop Drawings and laying diagrams of pipe, joints, bends, reducers, wyes, tees, crosses, outlets, manifolds, and other steel plate specials in accordance with the requirements in Section 013300 - Contractor Submittals, and the following supplemental requirements:

1. Certified dimensional drawings of all fittings and appurtenances.

2. Joint and pipe/fitting wall construction details which indicate the type and thickness of cylinder; the position, type, size, and area of reinforcement; coating and lining holdbacks, manufacturing tolerances; and all other pertinent information required for the manufacture of the product. Joint details shall be submitted where deep bell or butt strap joints are required for control of temperature stresses.

3. Fittings and specials details such as elbows, wyes, tees, outlets, connections, test bulkheads, and nozzles or other specials which indicate amount and position of all reinforcement. All fittings and specials shall be properly reinforced to withstand the internal pressure, both circumferential and longitudinal, and the external loading conditions as indicated in the Contract Documents.

4. Material lists and steel reinforcement schedules which describe all materials to be utilized.

5. Line layout and marking diagrams which indicate the specific number of each pipe and fitting and the location of each pipe and the direction of each fitting in the completed line. In addition, the line layouts shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; the station and invert elevation to which the bell end of each pipe will be laid; all elements of curves and bends, both in horizontal and vertical alignment; and the limits within each reach of restrained and/or welded joints or of concrete encasement.

6. Full and complete information regarding location, type, size, and extent of all welds shall be shown on the Shop Drawings. The Shop Drawings shall distinguish between shop and field welds. Shop drawings shall indicate by welding symbols or sketches the details of the welded joints, and the

preparation of parent metal required to make them. Joints or groups of joints in which welding sequence or technique are especially important shall be carefully controlled to minimize shrinkage stresses and distortion.

7. Rubber gasket joint design and details

8. Drawings showing the location, design, and details of bulkheads (test plates) for hydrostatic testing of the pipeline, and details for removal of test bulkheads and repair of the lining.

9. Details and locations of closures for length adjustment and for construction convenience.

10. Detail drawings indicating the type, number, and other pertinent details of the slings, strutting, and other methods proposed for pipe handling during manufacturing, transport, and installation.

11. Manufacturer's written Quality Assurance/Control Program.

B. Design calculations shall be submitted to the PROJECT ENGINEER for review prior to manufacture of pipe specials.

C. **Certifications:** A certified affidavit of compliance shall be furnished for all steel plate specials and other products or materials furnished under this Section.

D. **Manufacturer's Qualifications:** Furnish a copy of manufacturer's certification by SPFA or LRQA and documentation of manufacturer's experience in fabricating AWWA C200 pipe.

E. **Certifications:** The CONTRACTOR shall furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, as specified in ANSI/AWWA C200 - Steel Water Pipe 6-inch and Larger, C203 - Coal Tar Protective Coatings and Linings for Steel Water Pipelines-Enamel and Tape-Hot Applied, and C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4-inch and Larger-Shop Applied, respectively, and the following supplemental requirements:

1. Physical and chemical properties of all steel.
2. Hydrostatic test reports.
3. Results of production weld tests.
4. Sand, cement, and mortar tests.
5. Rubber gasket tests.

F. Performing and paying for sampling and testing necessary for certification are the CONTRACTOR'S responsibility.

1.4 QUALITY ASSURANCE

A. **Pipe and Specials Manufacturer Qualifications:** The pipe manufacturer shall be certified by the Steel Plate Fabricator's Association (SPFA) or Lloyd's Register Quality Assurance (LRQA) and shall be experienced in fabrication of AWWA C200 pipe of similar diameters, lengths, and wall thickness to this WORK. Experience shall be in the production facilities and personnel, not the name of the company that owns the production facility or employs the personnel.

B. **Tests:** Except as modified herein, materials used in the manufacture of the pipe shall be tested in accordance with the requirements of ANSI/AWWA C200 and C205, as applicable.

1. Joint gaskets shall be tested in accordance with ANSI/AWWA C200.

2. After the joint configuration is completed and prior to lining with-cement-mortar, each length of pipe of each diameter and pressure class shall be shop-tested and certified to a pressure of at least 80 percent of the yield strength of the steel.

C. Shop Testing of Steel Pipe Specials

1. If any special has been fabricated from straight pipe not previously tested and is of the type listed below, the special shall be hydrostatically tested with a pressure equal to 1-1/2 times the design working pressure: all bends, wyes, crosses, tees with side outlet diameter greater than 30 percent of the main pipe diameter, and manifolds.

2. All specials not required to be hydrostatically tested shall be tested by liquid dye penetrant inspection method in accordance with ASTM E 165 - Standard Test Methods for Liquid Penetrant Examination, Method A or the magnetic particle method in ASME Section VIII, Division 1, Appendix VI.

3. Reinforcing plates shall be tested by the solution method using approximately 40 psi air pressure introduced between the plates through a threaded test hole. Test hole shall be properly plugged following successful testing.

4. Any weld defects, cracks, leaks, distortion, or signs of distress during testing shall require corrective measures. Weld defects shall be gouged out and re-welded. After corrections, the special shall be retested.

5. Where welded test heads or bulkheads are used, extra length shall be provided to each opening of the special. After removal of each test head, the special shall be trimmed back to the design points with all finished plate edges ground smooth, straight, and prepared for the field joint.

6. Testing shall be performed before joints have been coated or lined.

D. The CONTRACTOR shall be responsible for performing and paying for said material tests. The DISTRICT shall have the right to witness all testing conducted by the CONTRACTOR; provided, that the CONTRACTOR's schedule is not delayed for the convenience of the DISTRICT.

E. Ultrasonic Examination

1. Steel plate that will be in welded joints or welded stiffener elements shall be examined ultrasonically for laminar discontinuities where both of the following conditions exist:

a. Any plate in the welded joint has a thickness exceeding 1/4 inch.

b. Any plate in the welded joint is subject to transverse tensile stress through its thickness during the welding or service.

2. Ultrasonic examination may be waived where joints are designated to minimize potential laminar tearing.

3. The ultrasonic examination shall be in accordance with ASTM A 578 - Straight Beam Ultrasonic Examination of Plain and Clad Steel Plates for Special Applications with a Level I acceptance standard.

4. Plates that are not in conformance with the acceptance criteria in ASTM A 578 may be used in the WORK if the areas that contain the discontinuities are a distance at least four times the greatest dimension of the discontinuity away from the weld joint.

F. In addition to those tests specifically required, the DISTRICT may request additional samples of any material including lining and coating for testing by the DISTRICT. The additional samples shall be furnished as part of the WORK.

G. **Field Testing:** Field testing shall conform to the requirements of Section 330110 – Waterline Disinfection & Pressure Testing.

H. **Welding Requirements:** Welding procedures used to fabricate and install pipe shall be prequalified under the provisions of ANSI/AWS D1.1 - Structural Welding Code-Steel or the ASME Boiler and Pressure Vessel Code, Section 9. Welding procedures shall be required for longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

I. **Welder Qualifications:** Welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 or the ASME Boiler and Pressure Vessel Code, Section 9 by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests.

PART 2 - PRODUCTS

2.1 GENERAL

A. Mortar-lined and mortar-coated steel pipe shall conform to ANSI/AWWA C200 and C205 and mortar-lined and epoxy coated steel pipe shall conform to ANSI/AWWA C200 and C203, subject to the following supplemental requirements. The pipe shall be of the diameter and class indicated, shall be provided complete with rubber gaskets or welded joints, as indicated in the Contract Documents. 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 ANSI/AWWA C200, C203 and C205. Pipe smaller than 14 inches in diameter may be furnished in standard outside diameters. When indicated as a minimum, wall thickness shall include zero minus tolerance.

B. Specials are defined as fittings, closure pieces, bends, reducers, wyes, tees, crosses, outlets, manifolds, and other steel plate specials wherever located, and all piping above ground or in structures.

C. **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 pipe sections and fittings shall be marked at each end with top field centerline.

D. **Handling and Storage:** The pipe shall be handled as a minimum at the 1/3 points by use of wide slings, padded cradles, or other devices designed and constructed to prevent damage to the pipe coating/exterior. The use of chains, hooks, or other equipment which might injure the pipe coating/exterior will not be permitted. Stockpiled pipe shall be suitably supported on padded skids, sand or earth berms free of rock exceeding 3 inches in diameter, sand bags, or suitable means so that the coating will not be damaged. The pipe shall not be rolled and shall be secured to prevent accidental rolling.

E. Handling of coal tar enamel/tape-coated pipe shall have the following additional requirements:

1. It shall be the responsibility of the CONTRACTOR and manufacturer of coal tar enamel/tape coated steel pipe to prevent damage of the coating which might be caused by handling and/or storage of the completed pipe at low temperature.

2. In no case shall coal tar enamel/tape coated steel pipe be handled when the ambient air temperature is below 0 degrees F. When the temperature is between 0 and 25 degrees F, the pipe may be handled, provided the pipe is heated to a temperature of 25 degrees F, as approved by the DISTRICT.

3. In no case shall coal tar enamel/tape coated steel pipe be transported when the ambient air temperature is below 30 degrees F. When the ambient air temperature is between 25 degrees F and

30 degrees F, the pipe may be transported, provided special padded supports are used to absorb and minimize impact, as approved by the DISTRICT.

F. The CONTRACTOR shall replace or repair damaged pipe.

G. **Strutting:** Adequate strutting shall be provided on all specials, fittings, and straight pipe so as to avoid damage to the pipe and fittings during handling, storage, hauling, and installation. For mortar-lined or mortar-coated steel pipe, the following requirements shall apply:

1. The strutting shall be placed as soon as practicable after the mortar lining has been applied and shall remain in place while the pipe is loaded, transported, unloaded, installed, and backfilled at the Site.

2. The strutting materials, size and spacing shall be adequate to support the earth backfill plus any greater loads which may be imposed by the backfilling and compaction equipment.

3. Any pipe damaged during handling, hauling, storage, or installation due to improper strutting shall be repaired or replaced.

H. **Laying Lengths:** Maximum pipe laying lengths shall be 40 ft with shorter lengths provided as required.

I. **Lining:** The pipe lining shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness.

J. **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.

2.2 MATERIALS

A. **Mortar:** Materials for mortar shall conform to the requirements of ANSI/AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4-inch and Larger - Shop Applied; provided, that cement for mortar coating shall be Type II and mortar lining shall be Type II or V. Cement in mortar lining and/or coating shall not originate from kilns which burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement. Admixtures shall contain no calcium chloride.

B. **Steel for Cylinder and Fittings:** Pipe manufactured under ANSI/AWWA C200 shall satisfy the following requirements:

1. Minimum yield strength of steel is 42,000 psi.
2. Be manufactured by a continuous casting process
3. Be fully kilned
4. Be fine grain practice
5. Have maximum carbon content of 0.25 percent
6. Have maximum sulfur content of 0.015 percent
7. Have minimum elongation of 22 percent in a 2-inch gauge length.
8. Be in accordance with one of the following:

ASTM A 570 - Steel Sheet and Strip, Hot-Rolled, Structural Quality
ASTM A 36 - Carbon Structural Steel
ASTM A 283 - Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 572 - High Strength Low-Alloy Columbium-Vanadium Structural Steel

C. **Coal Tar Enamel/Tape Coating:** Coal tar protective coatings shall be a coal tar enamel fibrous

glass mat and mineral glass felt wrap conforming to the requirements of ANSI/AWWA C203, Section 2, as modified by Appendix A, Section A1.5, thereto. The coal tar enamel coating system shall include:

1. Blasting
2. Priming
3. Coal tar enamel (finish coat)
4. Fibrous glass wrapping consisting of fibrous glass mat 0.018 inches thick placed in enamel while enamel is hot
5. Coal tar enameling, second coat
6. Fibrous glass or felt wrapping
7. Whitewashing, latex painting, or Kraft paper

2.3 DESIGN

A. **Design:** Except as otherwise indicated, materials, fabrication and shop testing of straight pipe shall conform to the requirements of ANSI/AWWA C200 - Steel Water Pipe 6 in and Larger, and shall conform to the dimensions of ANSI/AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings. The minimum thickness of plate for pipe from which specials are to be fabricated shall be the greatest of those determined by the following 4 criteria:

1. Working and Transient Pressure Design

$$T = \frac{P_W D/2}{Y/S_W} \qquad T = \frac{P_t D/2}{Y/S_t}$$

Where: T = Steel cylinder thickness in inches
D = Outside diameter of steel cylinder in inches
P_w = Design working pressure in psi
P_t = Design transient pressure in psi
Y = Specified minimum yield point of steel in psi
S_w = Safety factor of 2.5 at design working pressure
S_t = Safety factor at design transient pressure; for elbows 1.875, and 2.0 for other specials

2. **Mainline Pipe Thickness:** Plate thickness for specials shall not be less than for the adjacent mainline pipe.

3. **Thickness based on Pipe Diameter:**

Nominal Pipe Diameter (in)	**Pipe Manifolds Piping Above Ground Piping Structures**	**Elbows Bends Reducers**
24 and under	3/16-in	10-ga
25 to 48	1/4-in	1/4-in
over 48	5/16-in	5/16-in

B. Specials installed on saddle supports shall be designed to limit the longitudinal bending stress to a maximum of 10,000 psi. Design shall be in accordance with the provisions of Chapter 7 of AWWA M-11.

2.4 SPECIALS AND FITTINGS

A. General

1. **Mortar:** Materials for mortar shall conform to the requirements of ANSI/AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4-inch and Larger - Shop Applied; provided, that cement for mortar coating shall be Type [II] [V], and mortar lining shall be Type II or V. Cement in mortar lining and coating shall not originate from kilns which burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement. Admixtures shall contain no calcium chloride.

2. Reinforcement for wyes, tees, outlets, and nozzles shall be designed in accordance with AWWA Manual M-11. Reinforcement shall be designed for the design pressure indicated and shall be in accordance with the Drawings. Specials and fittings shall be equal in pressure design strength and shall have the same lining and coating as the adjoining pipe. Unless otherwise indicated, the minimum radius of elbows shall be 2.5 times the pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11-1/4 degrees.

B. Specials and fittings that cannot be mechanically lined and coated shall be lined and coated by hand-application using the same materials as used for the pipe and in accordance with the applicable AWWA or ASTM Standards, as modified by the applicable pipe section in these Specifications. Coating and lining applied in this manner shall provide protection equal to that for the pipe. Fittings may be fabricated from pipe that has been mechanically lined and/or coated. Areas of lining and coating that have been damaged by such fabrication shall be repaired by hand-applications.

C. Access manholes with covers shall be as indicated. Threaded outlets shall be forged steel suitable for 3000 psi service, and shall be as manufactured by Vogt or equal.

D. Moderate deflections and long radius curves may be made by means of beveled joint rings, by pulling standard joints, by using short lengths or pipe, or a combination of these methods; provided that pulled joints shall not be used in combination with bevels. The maximum total allowable angle for beveled joints shall be 5 degrees per pipe joint. Bevels shall be provided on the bell ends. Mitering of the spigot ends will not be permitted. The maximum allowable angle for pulled joints shall be in accordance with the manufacturer's recommendations or the angle which results from a 3/4-inch pull out from normal joint closure, whichever is less. All horizontal deflections or fabricated angles shall fall on the alignment. In congested city streets or at other locations where underground obstructions may be encountered, the chord produced by deflecting the pipe shall be no further than 6 inches from the alignment indicated.

E. Vertical deflections shall fall on the alignment and at locations adjacent to underground obstructions, points of minimum earth cover, and pipeline outlets and structures. The pipe angle points shall match the angle points indicated.

F. Outlets, Tees, Wyes, and Crosses

1. Outlets 12-inch and smaller may be fabricated from Schedule 30 or heavier steel pipe in the standard outside diameters, i.e., 12-3/4-inch, 10-3/4-inch, 8-5/8-inch, 6-5/8-inch, and 4-1/2-inch. Minimum plate thickness for reinforcements shall be 10-gauge.

2. The design of outlet reinforcement shall be in accordance with the procedures given in Chapter 13 of AWWA Manual M-11, and the design pressures and factors of safety above.

3. In lieu of saddle or wrapper reinforcement as provided by the design procedure in Manual M-11, pipe or specials with outlets may be fabricated in their entirety of steel plate having a thickness equal to the sum of the pipe wall plus the required reinforcement.

4. Where Manual M-11 requires the design procedure for crotch plate reinforcement, such reinforcement shall be provided.

5. Outlets shall be fabricated so that there is always at least a 12-inch distance between the outer edge of the reinforcing plate and any field welded joints. For outlets without reinforcing plates, outlets shall penetrate the steel cylinders so that there is at least a 12-inch clearance between the outlet and any field welded joints.

G. Tees, wyes, crosses, elbows, and manifolds shall be fabricated so that the outlet clearances and reinforcing plates from any weld joints are a minimum of 5 times cylinder thickness or 2 inches, whichever is greater. Longitudinal weld joints in adjacent cylinder sections shall be oriented so that there is a minimum offset of 5 times cylinder thickness or 2 inches, whichever is greater.

H. **Steel Welding Fittings:** Steel welding fittings shall conform to ASTM A 234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

I. **Ends for Mechanical-Type Couplings:** Except as otherwise indicated, where mechanical-type couplings are indicated, the ends of pipe shall be banded with Type C collared ends using double fillet welds. Where pipe 12-inch and smaller is furnished in standard schedule thicknesses, and where the wall thickness equals or exceeds the coupling manufacturer's minimum wall thickness, the pipe ends may be grooved.

J. Lining shall conform to the requirements of ANSI/AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 in and Larger - Shop Applied, for lining of specials.

K. **Coating:** All requirements pertaining to thickness and application of coating of adjacent straight pipe shall apply to specials. Unless otherwise indicated, the coating on the buried portion of a pipe section passing through a structure wall shall extend to the center of the wall, or to a wall flange, if one is indicated. Pipe above ground or in structures shall be field-painted in accordance with Section 099000 - Protective Coatings.

L. **Marking:** A mark indicating the true vertical axis of the special shall be placed on the top and bottom of the special.

2.5 PIPE

A. **General:** The pipe shall be steel pipe, mortar-lined and mortar-coated, tape-coated, with rubber gasketed or field welded joints as indicated. The pipe shall consist of a steel cylinder, either shop-lined or lined-in-place with portland cement-mortar with an exterior coating of cement-mortar.

B. The pipe shall be designed, manufactured, tested, inspected, and marked according to applicable requirements previously stated and, except as hereinafter modified, shall conform to ANSI/AWWA C200. Flanged joints shall conform to the requirements of AWWA C207.

C. **Pipe Dimensions:** The pipe shall be of the diameter and minimum wall thickness indicated. In no case shall the wall thickness be less than 0.125 inch. Minimum wall thickness shall include zero minus mill tolerance.

D. **Fitting Dimensions:** The fittings shall be of the diameter and class indicated.

E. Joint Design.

1. Unless indicated otherwise, the standard field joint for cement mortar lined and coated steel pipe shall be a lap welded joint. Single-butt welded or butt-strap joints shall be used only where required for closures or where indicated.

2. Unless indicated otherwise, the standard field joint for mortar lined and coal tar enamel/tape coated pipe shall be a rubber gasket joint. Welded joints shall be provided where indicated. Butt-strap joints shall be used only where required for closures or where indicated.

F. Lap joints prepared for field welding shall be in accordance with ANSI/AWWA C200. The method

used to form, shape, and size bell ends shall be such that the physical properties of the steel are not substantially altered. Unless otherwise approved by the DISTRICT, bell ends shall be formed by an expanding press or by being moved axially over a die in such a manner as to stretch the steel plate beyond its elastic limit to form a truly round bell of suitable diameter and shape. Faying surfaces of the bell and spigot shall be essentially parallel, but in no case shall the bell slope vary more than 2 degrees from the longitudinal axis of the pipe.

G. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself, it will provide watertight joints under all operating conditions when properly installed. The CONTRACTOR shall require the pipe manufacturer to submit details complete with significant dimensions and tolerances and also to submit performance data indicating that the proposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted. Unless otherwise approved by the DISTRICT, bell ends shall be formed by an expanding press or by being moved axially over a die in such a manner as to stretch the steel plate beyond its elastic limit to form a truly round bell of suitable diameter and shape. No process will be permitted in which the bell is formed by rolling.

H. Shop-applied interior linings and exterior coatings shall be held back from the ends of the pipe as indicated or as otherwise acceptable to the DISTRICT.

I. **Restrained Joints:** Located where indicated, restrained joints shall be field-welded joints, either single, or inside and outside lap-weld, or butt-weld, or butt-straps as indicated. Designs shall include stresses created by the greater of:

1. Temperature differential of 40 degrees F plus poisson's effect in combination with hoop stress, or;

2. Thrust due to bulkheads, bends, reducers, and line valves resulting from working pressure in combination with hoop stress.

For field welded joints on cement mortar lined and coated pipe, design hoop stresses shall not exceed 50 percent of the allowable yield stress of the material or 18,000 psi, whichever is smaller. For mortar lined and coal tar enamel/tape coated pipe, design hoop stresses shall not exceed 50 percent of the allowable yield stress of the material or 21,000 psi, whichever is smaller. At the CONTRACTOR's option, the steel cylinder area may be progressively reduced from the point of maximum thrust to the end of the restrained length.

2.5 CEMENT-MORTAR LINING

A. **Cement-Mortar Lining for Shop Application:** Unless indicated otherwise, interior surfaces of all pipe, shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with ANSI/AWWA C205. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. The lining machines shall be of a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found defective at the Site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications.

B. The minimum lining thickness and tolerance shall be in accordance with ANSI/AWWA C205.

C. The pipe shall be left bare as indicated where field joints occur. Ends of the linings shall be left square and uniform. Feathered or uneven edges will not be permitted.

D. Defective linings, as determined by the DISTRICT, 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.

E. The progress of the application of mortar lining shall be regulated in order that all hand work, including the repair of defective areas is cured in accordance with the provisions of ANSI/AWWA C205. Cement-mortar

for patching shall be the same materials as the mortar for machine lining, except that a finer grading of sand and mortar richer in cement shall be used when field inspection indicates that such mix will improve the finished lining of the pipe.

F. **Cement-Mortar Lining for Field Application:** The materials and design of in-place cement-mortar lining shall be in accordance with ANSI/AWWA C602 - Cement-Mortar Lining of Water Pipeline-4in and Larger-Shop Applied. The minimum lining thickness and finished inside diameter shall be as indicated for shop-applied cement-mortar lining.

G. Protection of Pipe Lining/Interior: For all pipe and fittings with plant-applied or cement-mortar linings, the CONTRACTOR shall provide a 12 mil polyethylene sheet 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.

2.6 EXTERIOR COATING OF PIPE

A. **Exterior Coating of Exposed Piping:** The exterior surfaces of pipe which will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of primer compatible with the finish coating required by Section 099000 - Protective Coatings.

B. **Exterior Cement Mortar Coating of Buried Piping:** Pipe for buried service, including bumped heads, shall be coated with a 1-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. The coating shall be reinforced with a spiral wire reinforcement or welded wire fabric in accordance with ANSI/AWWA C205. The welded wire fabric shall be securely fastened to the pipe with welded clips or strips of steel. The wire spaced 2 inches on centers shall extend around the circumference of the pipe. The ends of reinforcement strips shall be lapped 4 inches and the free ends tied or looped to assure continuity of the reinforcement.

C. **Exterior Coal Tar Enamel/Tape Coating of Buried Piping:** Coal tar enamel/tape coating of pipe for buried service shall be applied in accordance 099000- Protective Coatings with ANSI/AWWA C203 as modified herein. Unless otherwise indicated, exterior surfaces of pipe or fittings passing through structure walls shall be coated from the center of the wall or from the wall flange to the end of the underground portion of pipe or fitting. Coal tar enamel/tape coating of pipe for buried service shall be applied in accordance with ANSI/AWWA C203 as modified herein.

2.7 PIPE APPURTENANCES

A. Pipe appurtenances shall be in accordance with the requirements of applicable sections of the specifications. Access manholes with covers shall be as indicated, installed during fabrication, not in the field. Threaded outlets shall be forged steel suitable for 3000 psi service, and shall be as manufactured by Vogt, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall conform to the requirements of AWWA M23, instructions furnished by the pipe manufacturer, and to the supplementary requirements herein. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

B. The CONTRACTOR shall provide all fittings, closure pieces, bends, reducers, wyes, tees, crosses, outlets, manifolds, and other steel plate specials, bolts, nuts, gaskets, jointing materials, and all other appurtenances as required to provide a complete and workable installation. Where pipe support details are indicated, the supports shall conform thereto and shall be placed as indicated; provided, that the support for all

exposed piping shall be complete and adequate regardless of whether or not supporting devices are specifically indicated. Where indicated, concrete thrust blocks and welded joints shall be provided. At all times when the WORK of installing pipe is not in progress, openings into the pipe and the ends of the pipe in trenches or structures shall be kept tightly closed to prevent entrance of animals and foreign materials. The CONTRACTOR shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, shall assume full responsibility for any damage due to this cause, and shall at its own expense restore and replace the pipe to its required condition and grade if it is displaced due to floating. The CONTRACTOR shall maintain the inside of the pipe free from foreign materials and in a clean and sanitary condition until acceptance by the DISTRICT.

C. Laying, jointing, testing for defects and for leakage shall be performed in the presence of the DISTRICT, and shall be subject to approval before acceptance. Material found to have defects will be rejected and the CONTRACTOR shall promptly remove such defective materials from the Site.

D. The CONTRACTOR shall determine the location of existing underground utility structures in the vicinity of proposed pipe installation prior to excavation. All existing above and below ground structures within the work area shall be protected in place unless indicated otherwise on the Construction Drawings.

E. Whenever the WORK is not actively in progress, the open ends of all installed pipe shall be plugged or capped with bulkhead mechanical joint end cap to prevent the entry of animals, water, or other undesirable substances.

3.2 HANDLING AND STORAGE

A. Pipe and fittings shall be carefully handled and protected against damage to lining and coating/interior and exterior surfaces, impact shocks, and free fall. The pipe shall be handled as a minimum at the 1/3 points by use of wide slings, padded cradles, or other devices designed and constructed to prevent damage to the pipe coating/exterior. The use of chains, hooks, or other equipment which might injure the pipe coating/exterior will not be permitted Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the Site or elsewhere. Pipe shall be stored at the Site in accordance with the requirements stated: Stockpiled pipe shall be suitably supported on padded skids, sand or earth berms free of rock exceeding 3 inches in diameter, sand bags, or suitable means so that the coating will not be damaged. The pipe shall not be rolled and shall be secured to prevent accidental rolling.. No pipe shall be installed when the lining or coating/interior or exterior surfaces show cracks that may be harmful as determined by the DISTRICT. Such damaged lining and coating/interior and exterior surfaces, shall be repaired or a new undamaged pipe shall be provided.

B. The CONTRACTOR, shall inspect each pipe and fitting to insure that there are no damaged portions of the pipe. The CONTRACTOR shall remove or smooth out any burrs, gouges, weld splatter, or other small defects prior to laying the pipe. Pipe damaged prior to Substantial Completion shall be repaired or replaced.

3.3 INSTALLATION OF PIPE AND SPECIALS

A. Trenches shall be in a reasonably dry condition when the pipe special is laid. Necessary facilities including slings shall be provided for lowering and properly placing the pipe sections in the trench without damage. The pipe and specials shall be laid to the line and grade indicated and shall be closely jointed to form a smooth flow line. Immediately before placing each section of pipe in final position for jointing, the bedding shall be checked for firmness and uniformity of surface.

B. Pipe shall be laid directly on the imported bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.

C. **Installation Tolerances:** Each section of pipe shall be laid in the order and position shown on the laying diagram and in accordance with the following:

1. Each section of pipe having a nominal diameter less than 48 inches shall be laid to line and grade, within plus or minus 2 inches horizontal deviation and plus or minus 1-inch vertical deviation.

2. Each section of pipe having nominal diameter 48 inches and larger shall be laid to line and grade, within plus or minus 5 percent of diameter horizontal deviation and plus or minus 2.5 percent of diameter vertical deviation.

3. In addition to the horizontal and vertical tolerances above, lay the pipe so that no high or low points other than those on the laying diagram are introduced.

D. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the DISTRICT may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed 75 percent of the maximum deflection recommended by the pipe manufacturer. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint. In all cases the joint opening, before finishing with the protective mortar inside the pipe, or prior to applying in-place mortar lining, shall be the controlling factor.

E. Except for short runs which may be permitted by the DISTRICT, pipes shall be laid uphill on grades that exceed 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement. Bends shall be installed as indicated.

F. Pipe struts shall be left in place until backfilling operations have been completed for pipe 42 inches in diameter and larger. Struts in pipe smaller than 42 inches may be removed immediately after laying. A laboratory selected and paid by the DISTRICT may monitor pipe deflection by measuring pipe inside diameter before struts are removed and 24 hours after struts are removed. Pipe deflection shall not exceed 2 percent 24 hours after the struts are removed. After the backfill has been placed, the struts shall be removed and shall remain the property of the CONTRACTOR.

G. **Work Stoppage:** At the end of each working day, CONTRACTOR shall plug or cap the open ends of all unfinished pipelines with securely bolted mechanical joint plugs, mechanical joint end caps, or blind flanges. If Pipe is subject to flooding, pipe shall be anchored as precaution against flotation. Trenches shall be backfilled in accordance with the DISTRICT Standards and Specifications.

H. **Pipe and Specials Protection:** The openings of pipe and specials where the pipe and specials have been mortar lined in the shop shall be protected with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water, or any undesirable substance. The bulkheads shall be so designed to prevent drying out of the interior of the pipe. The CONTRACTOR shall introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged bulkheads. At all times, means shall be provided to prevent the pipe from floating due to water in the trench from any source. Pipe which has floated shall be repaired, including restoration to original condition and grade.

I. **Pipe Cleanup:** As pipe laying progresses, the CONTRACTOR shall keep the pipe interior free of all debris. The CONTRACTOR shall completely clean the interior of the pipe of all sand, dirt, mortar splatter, and any other debris following completion of pipe laying, pointing of joints, and any necessary interior repairs prior to testing and disinfecting the completed pipeline.

3.3 RUBBER GASKETED JOINTS

A. **Rubber Gasketed Joints:** Immediately before jointing pipe, the spigot end of the pipe shall be thoroughly cleaned, and a clean rubber gasket lubricated with a non-toxic vegetable-based lubricant shall be placed in the spigot groove. The lubricant shall be a compound listed as in compliance with NSF Standard 61.

The volume of the gasket shall be "equalized" by moving a metal rod between the gasket and the spigot ring around the full circumference of the spigot ring. The bell of the pipe already in place shall be carefully cleaned and lubricated. The spigot of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted. After the pipe units have been joined, a feeler gage shall be inserted into the recess and moved around the periphery of the joint to detect any irregularity in the position of the rubber gasket. If the gasket cannot be "felt" all around, the joint shall be disassembled. The joint shall be reassembled with a new gasket.

3.4 WELDED JOINTS

A. **General:** Field welded joints shall be in accordance with ANSI/AWWA C206 - Field Welding of Steel Water Pipe.

B. Where exterior welds are performed, adequate space shall be provided for welding and inspection of the joints.

C. Butt straps shall be as indicated.

D. After the pipe and joint are properly positioned in the trench, the length of pipe between joints shall be backfilled to at least one foot above the top of the pipe. Care shall be exercised during the initial backfilling to prevent movement of the pipe and to prevent any backfill material from being deposited on the joint.

E**.** For coal tar enamel/tape coated pipe, a heat resistant shield shall be draped over at least 24 inches of coating beyond the holdback on both sides of the weld during welding to avoid damage to the coating by hot weld splatter. Welding grounds shall not be attached to the coated part of the pipe

F. To control temperature stresses, the unbackfilled joint areas of the pipe shall be shaded from the direct rays of the sun by the use of properly supported awnings, umbrellas, tarpaulins, or other suitable materials for a minimum period of 2 hours prior to the beginning of the welding operation and until the weld has been completed. Shading materials at the joint area shall not rest directly on the pipe but shall be supported to allow air circulation around the pipe. Shading of the pipe joints need not be performed when the ambient air temperature is below 45 degrees F.

G. **Shrinkage Control Joints:** At intervals not exceeding 250 feet along welded reaches of the pipeline and at the first regular lap-welded field joints outside concrete encasements and structures, the pipe shall be laid with an initial lap of not less than 1-inch greater than the minimum lap dimension. The welding of each such shrinkage control joint shall be performed when the temperature is approximately the lowest during the 24-hour day, after at least 250 feet of pipe have been laid and the joints have been welded ahead of and in back of the shrinkage control joint, and after backfill has been completed to at least 1-foot above the top of the pipe ahead of and in back of the shrinkage control joint. Where shrinkage control joints occur in a traveled roadway or other inconvenient location, the location of the shrinkage control joint may be adjusted, as acceptable to the DISTRICT.

H. Prior to the beginning of the welding procedure, any tack welds used to position the pipe during laying shall be removed. Any annular space between the faying surfaces of the bell and spigot shall be equally distributed around the circumference of the joint by shimming, jacking, or other suitable means. The weld shall then be made in accordance with ANSI/AWWA C206. Where more than one pass is required, each pass except the first and final one shall be peened to relieve shrinkage stresses; and all dirt, slag, and flux shall be removed before the succeeding bead is applied.

I. Prior to butt welding, the pipe and joint shall be properly positioned in the trench using line up clamps so that, in the finished joint, the abutting pipe sections shall not be misaligned more than 1/16-inch.

J. **Joints:** The pipe ends shall be cut straight on joints where butt straps are used for realignment, adjustment, or deflection, and fillet welds shall be made as indicated.

K. Full circumference lap joint welds shall be performed inside and outside for steel pipe 24-inches and larger. Joints shall be either single-butt welded or lap welded on the outside of pipe for steel pipe less than 24 inches in diameter. Unless double fillet welds are indicated, field welded lap joints shall be made on the outside of the pipe.

L. Unless double fillet welds are indicated, field welded lap joints may, at the CONTRACTOR option, be made on either the inside or the outside of the pipe.

M. **Inspection of Field Welded Joints:** An independent testing laboratory acceptable to the DISTRICT but paid by the CONTRACTOR shall inspect the joints. Inspection shall be as soon as practicable after the welds are completed.

1. Fillet welds shall be tested by the Magnetic Particle Inspection Method in accordance with ASME Section VIII, Division 1, Appendix VI.

2. In addition, double fillet welds on butt strap joints shall be tested by the soap solution method using approximately 40 psi air pressure introduced between the plates through a threaded hole as indicated. Test holes shall be plugged by a threaded plug or welding following successful testing.

3. Butt welds shall be inspected by radiographic methods in accordance with API Standard 1104.

N. Following tests of the joint, the exterior joint spaces shall be coated in accordance with these specifications after which backfilling may be completed.

O. **Repair of Welds:** Welds that are defective shall be repaired by the CONTRACTOR to meet the requirements of the applicable sections of these specifications. Defects in welds or defective welds shall be removed, and that section of the joint shall then be re-welded. Only sufficient removal of defective material that is necessary to correct the defect is required. After the repair is made, the joint shall be checked by repeating the original test procedure. Welds deficient in size shall be repaired by adding weld metal.

3.5 JOINT COATING AND LINING

A. **General:** The interior and exterior joint recesses shall be thoroughly wiped clean and all water, loose scale, dirt, and other foreign material shall be removed from the inside surface of the pipe. The grout for joint coating and lining for cement mortar coated pipe shall be cement grout in accordance with Section 036000 - Grout, except that composition shall be one part cement to two parts sand and sufficient water for dry-pack consistency for joint linings and thick cream consistency for joint coatings. Cement, sand, and water shall comply with Section 036000 - Grout.

B. **Joint Coating of Cement Mortar Coated Pipe:** After the pipe has been laid and after sufficient backfill has been placed between the joints to hold the pipe securely in place, the outside annular space between pipe sections shall be completely filled with grout formed by the use of polyethylene foam-lined fabric bands. The grout space shall be flushed with water prior to filling so that the surface of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured. The joint shall be filled with grout by pouring from one side only, and shall be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the pipe and up the opposite side. Pouring and rodding the grout shall be continued to allow completion of the filling of the entire joint recess in one operation. Care shall be taken to leave no unfilled space. Grouting of the outside joint spaces shall be kept as close behind the laying of the pipe as possible except that in no case shall grouting be closer than 3 joints of the pipe being laid.

C. **Joint Coating of Shop-Applied Coal Tar Enamel/Tape Coated Pipe:** Joints shall be coated using heavy duty joint wrap in accordance with Section 099000 - Protective Coatings.

D. All joints will be tested by the DISTRICT with an electrical flaw detector capable of at least a 12,000

volt output, furnished by the CONTRACTOR. The tests will be made using a voltage of 6,000 to 7,000 volts. Holidays shall be repaired by the CONTRACTOR at no expense to the DISTRICT.

E. **Coating Repair:** Coating repair shall be made using heavy duty joint wrap and primer in accordance with Section 099000 - Protective Coatings.

F. **Coating of Fittings and Specials:** Fittings and specials shall be coated using heavy duty joint wrap in accordance with Section 099000 - Protective Coatings.

G. **Grout Bands (Diapers):** The grout bands or heavy-duty diapers shall be polyethylene foam-lined fabric with steel strapping of sufficient strength to hold the fresh mortar, resist rodding of the mortar, and allow excess water to escape. The foam plastic shall be 100 percent closed cell, chemically inert, insoluble in water and resistant to acids alkalies and solvents, and shall be Dow Chemical Company, Ethafoam 222, or equal.

H The fabric backing shall be cut and sewn into 9-inch wide strips with slots for the steel strapping on the outer edges. The polyethylene foam shall be cut into strips 6 inches wide and slit to a thickness of 1/4-inch which will expose a hollow or open cell surface on one side. The foam liner shall be attached to the fabric backing with the open or hollow cells facing towards the pipe. The foam strip shall cover the full interior circumference of the grout band with sufficient length to permit an 8-inch overlap of the foam at or near the top of the pipe joint. Splices to provide continuity of the material will be permitted. The polyethylene foam material shall be protected from direct sunlight.

I. The polyethylene foam-lined grout band shall be centered over the joint space with approximately equal widths extending over each pipe end and securely attached to the pipe with the steel straps. After filling the exterior joint space with grout, the flaps shall be closed and overlapped in a manner that fully encloses the grout with polyethylene foam. The grout band shall remain in position on the pipe joint.

J. **Joint Lining:** After the backfill has been completed to final grade, the interior joint recess shall be filled with grout. The grout shall be tightly packed into the joint recess and troweled flush with the interior surface. All excess shall be removed. At no point shall there be an indentation or projection of the mortar exceeding 1/16-inch. With pipe smaller than 24 inches in diameter, before the spigot is inserted into the bell, the bell shall be daubed with grout. The joint shall be completed and excess mortar on the inside of the joint shall be swabbed out.

3.6 INSTALLATION OF PIPE APPURTENANCES

A. **Protection of Appurtenances:** Where the joining pipe is concrete or coated with cement mortar, buried appurtenances shall be coated with a minimum thickness of one inch of cement mortar having one part cement to not more than 2 parts plaster sand. Where the joining pipe is coal tar enamel/tape coated, buried appurtenances shall be coated with Trenton Wax Tape #1 in accordance with Section 330509-Piping General.

B. **Installation of Valves:** Valves shall be handled in a manner to prevent any injury or damage to any part of the valve. Joints shall be thoroughly cleaned and prepared prior to installation. The CONTRACTOR shall adjust stem packing and operate each valve prior to installation to insure proper operation. Valves shall be installed so that the valve stems are plumb and in the location indicated.

C. Buried valves and flanges shall be coated and protected in accordance with Section 099000 - Protective Coatings.

D. **Installation of Flanged Joints:** Before the joint is assembled, the flange faces shall be thoroughly cleaned of all foreign material with a power wire brush. The gasket shall be centered and the connecting flanges drawn up watertight without unnecessarily stressing the flanges. Gaskets shall be 1/8 inch thick for steel pipe 14 inches in diameter and greater. Bolts shall be tightened in a progressive diametrically opposite sequence and torqued with a suitable, approved, and calibrated torque wrench. Clamping torque shall be applied to the nuts only. Ring type non-asbestos gaskets shall be applied to the inside face of blind flanges with adhesive.

E. **Insulated Joints:** Insulated joints and appurtenant features shall be provided as indicated. The CONTRACTOR shall exercise special care when installing these joints to prevent electrical conductivity across the joint. After the insulated joint is completed, an electrical resistance test shall be performed by the CONTRACTOR. Should the resistance test indicate a short circuit, the CONTRACTOR shall remove the insulating units to inspect for damage, replace all damaged portions, and reassemble the insulating joint. The insulated joint shall then be retested to assure proper insulation.

F. **Flexible Coupled Joints:** When installing flexible couplings, care shall be taken that the connecting pipe ends, couplings and gaskets are clean and free of all dirt and foreign matter with special attention being given to the contact surfaces of the pipe, gaskets, and couplings. The couplings shall be assembled and installed in conformity with the recommendation and instruction of the coupling manufacturer.

G. Wrenches used in bolting couplings shall be of a type and size recommended by the coupling manufacturer. Coupling bolts shall be tightened so as to secure a uniform annular space between the follower rings and the body of the pipe with all bolts tightened approximately the same amount. Diametrically opposite bolts shall be tightened progressively and evenly. Final tightening shall be done with a suitable, approved, and calibrated torque wrench set for the torque recommended by the coupling manufacturer. Clamping torque shall be applied to the nut only.

3.7 CORROSION CONTROL

A. **Joint Bonding/Electrolysis Test Stations:** Except where otherwise indicated, all joints shall be bonded with a minimum of one steel jumper rod, cad-welded to each pipe, or as shown on the Construction Drawings. Jumper rods shall a minimum length of 3", and a minimum diameter of ¼" with a minimum welded contact length of 1" on each pipe. Plastic coated steel jumper wire (8 gauge minimum) shall also be installed across all valves and fittings. The pipe shall be cleaned to bare bright metal at the point where the bond is installed. In addition, electrolysis test stations shall be installed where indicated.

B. **Cathodic Protection:** Corrosion mitigation and testing materials, such as an impressed current cathodic protection system, magnesium anodes, reference electrodes, and test lead wires shall be provided where indicated on the Construction Drawings and in accordance with Section 134713 Cathodic Protection for Underground and Submerged Piping.

END OF SECTION

SECTION 330531
PVC PRESSURE PIPE (AWWA C900, MODIFIED)

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide 305 psi or Class 235 polyvinyl chloride (PVC) pressure pipe, complete in place, in accordance with the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 312316 –Trenching, Backfill and Compaction
Section 330110 – Waterline Disinfection & Testing
Section 330509 – Piping, General
Section 330519 - Ductile Iron Pipe
Section 331216 – Valves and Appurtenances
Section 331417 – Service Connections

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. **Commercial Standards:**

ANSI/AWWA C104/A21.5	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings 3-inch Through 48-inch for Water and Other Liquids
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings, 3 in. Through 12 in. for Water and Other Liquids
ANSI/AWWA C600	Installation of Ductile-Iron Water Mains and Appurtenances
ANSI/AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-inch (100 mm) Through 60-inch (1,500 mm)
AWWA Manual M23	PVC Pipe - Design and Installation
ASTM D 2584	Test Method for Ignition Loss of Cured Reinforced Resins
PPI Technical Report TR 3	Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB) Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe
PPI Technical Report TR 4	PPI Listing of Hydrostatic Design Basis (HDB), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

AWWA Manual M23 PVC Pipe - Design and Installation

1.4 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 013300 - Contractor Submittals.

B. **Shop Drawings:** Design calculations to demonstrate compliance of pipe and fittings with this Section. Manufacturer's literature for metallic locating tape.

C. **Certifications:** A certified affidavit of compliance for pipe and other products or materials under this Section and the following supplemental requirements:

1. Hydrostatic proof test reports.
2. Sustained pressure test reports.
3. Burst strength test reports.

D. The CONTRACTOR shall be responsible for performing and paying for sampling and testing as necessary for the certifications.

PART 2 - PRODUCTS

2.1 GENERAL

A. All PVC pressure pipe (4-inch through 12-inch) shall be Class 200, and shall conform to the applicable requirements of ANSI/AWWA C900 subject to additional requirements herein. All large diameter PVC pressure pipe (14-inch through 36-inch) shall be Class 235, and shall conform to the applicable requirements of AWWA C900 and the additional requirements herein. Materials used in manufacture of the pipe shall be tested in accordance with the requirements of this Section and the referenced standards, as applicable.

2.2 PIPE DESIGN CRITERIA

A. **General:** PVC pressure pipe shall be designed in accordance with the requirements of Appendix A of ANSI/AWWA C900, Large PVC pressure pipe shall be designed in accordance with the requirements of Manual M23, as applicable, and the supplemental requirements in this Section.

B. **Pipe Wall Thickness for Internal Pressure:** The pipe shall be designed with a minimum thickness (t) or dimension ratio (DR) in accordance with paragraph A.3 of the above referenced Appendix A.

C. **Determination of External Loads:** Instead of the equations in paragraph A.4 of the above referenced Appendix A, the dead (earth) loads shall be computed using the following 2 equations for trench or embankment conditions as applicable:

D. In lieu of the equations in the Manual, the dead (earth) loads shall be computed using the following 2 equations for trench or embankment conditions as applicable:

1. Trench Condition:

$$W_d = C_d w B_d^2$$

Where:
W_d = Earth load in pounds per linear foot
C_d = Calculation coefficient
Ku' = [0.13]
w = [130] lb/ft^3
B_d = Trench width at top of pipe, feet

2. Positive Projecting Embankment Condition:

$W_c = C_c w B_c^2$

Where:

W_c	=	Earth load in pounds per linear foot
C_c	=	Calculation coefficient (based on $r_{sd}P$ of 0.75)
C_c	=	Calculation coeff. for lg dia. (based on $r_{sd}p$ = 0.25)
Ku	=	[0.19]
w	=	[130] lb/ft^3
B_c	=	Outside diameter of pipe, feet

D. Instead of the equations in paragraph A.4, the truck live loads shall be determined using the method recommended by AASHTO in "Standard Specifications for Highway Bridges." For depths of cover less than 10 feet HS-20 live loads shall be added to the earth loads to determine the total load. For depths of cover 3 feet or less, HS-20 live load plus impact shall be included.

E. **Pipe Deflection:** With reference to paragraph A.5, the deflection of the pipe after installation shall not exceed 0.03 times the outside diameter.

2.3 PIPE

A. The pipe shall be Class 200 or 235 (diameter 14 inch and greater) and of the diameter specified or shown, shall be furnished complete with rubber gaskets, and all specials and fittings shall be provided as required in the Contract Documents. The dimensions and pressure classes for PVC pressure pipe with Cast-Iron Pipe Equivalent O.D.'s shall conform to the requirements of AWWA C900. No pipe shall be installed if stored in sun for a period exceeding 365 days.

B. **Additives and Fillers:** Unless otherwise allowed in alternate qualification procedures of PPI-TR3, compounds which have a Hydrostatic Design Basis (HDB) of 4000 psi at 73.4 degrees F and for water shall not contain additives and fillers that exceed the recommended values in Table 1, Part Y of PPI-TR3 (e.g., allowable content range for calcium carbonate is 0.0-5.0 parts per hundred of resin). If requested by the DISTRICT, the additive and filler content shall be determined using the pyrolysis method as specified in ASTM D 2584.

C. **Joints and Deflection:** Joints for the buried PVC pipe shall be integral bell and spigot push–on joints employing a rubber gasket. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. Deflection at the joint shall not exceed 1.5 degrees or the maximum deflection recommended by the manufacturer. No deflection of the joint shall be allowed for joints which are over-belled or not belled to the stop mark.

2.4 FITTINGS

A. Fittings shall be ductile iron and shall conform to the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10 for diameters 3-inch through 48-inch and shall have a minimum pressure rating of 250 psi. PVC pipe fittings shall be mechanical joint or flanged as indicated on the plans. Each fitting shall be clearly labeled to identify its size and pressure class.

B. All fittings shall be lined and coated in accordance with AWWA Standards and the requirements of Section 099000 - Protective Coatings.

C. All mechanical joint fittings shall be supplied with restraining glands for thrust restraint unless otherwise specified on the Construction Drawings.

D. Couplings shall be Romac 501 straight, Romac XR501, or Smith-Blair.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall conform to the requirements of AWWA M23, instructions furnished by the pipe manufacturer, and to the supplementary requirements herein. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

B. Laying, jointing, testing for defects and for leakage shall be performed in the presence of the DISTRICT, and shall be subject to approval before acceptance. Material found to have defects will be rejected and the CONTRACTOR shall promptly remove such defective materials from the Site.

C. The CONTRACTOR shall determine the location of existing underground utility structures in the vicinity of proposed pipe installation prior to excavation. All existing above and below ground structures within the work area shall be protected in place unless indicated otherwise on the Construction Drawings.

D. Whenever the WORK is not actively in progress, the open ends of all installed pipe shall be plugged or capped with bulkhead mechanical joint end cap to prevent the entry of animals, water, or other undesirable substances.

3.2 HANDLING AND STORAGE

A. **Handling:** Pipe, fittings and accessories shall be carefully inspected before and after installation and those found defective will be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings or any other material be dropped or dumped into trenches.

B. **Storage:** Pipe should be stored, if possible, at the Site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe should be stored in such a way as to prevent sagging or bending and be protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets should be stored in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

3.3 TRENCHING AND BACKFILL

A. Trench excavation and backfill shall conform to the requirements of Section 312316 –Trenching, Backfill and Compaction.

3.4 INSTALLATION

A. Bell-and-spigot pipe shall be laid with the bell end pointing in the direction work is progressing. Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. Pipe shall be laid uphill on grades 10% or greater.

B. Pipe shall be supported at its proper elevation and grade, care being taken to secure firm and uniform support. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recessed excavation to accommodate bells, joints, and couplings. Anchors and supports shall be provided where indicated and where necessary for fastening work into place. Fittings shall be independently supported.

C. Short lengths of pipe shall be used in and out of each rigid joint or rigid structure. Piping that does not allow sufficient space for proper installation of jointing material shall be replaced by one of proper dimensions. Blocking or wedging between bells and spigots will not be permitted. Pipe alignment shall be checked after each length of pipe is installed to insure the downstream pipe did not deflect. Pipe shall not deflect at the joints more than 75% of manufacturer's printed recommendations. Trench shall not be backfilled prior to

pipeline inspection by the DISTRICT. Any pipeline buried prior to inspection shall be uncovered by the CONTRACTOR, at their own expense, for the DISTRICT to inspect.

D. Joints shall be installed according to manufacturer's recommendations. The surfaces of the pipe spigot end, bell and gasket shall be cleaned just prior to joining pipes. The spigot end of the pipe shall be beveled and checked for proper fit in the bell end without causing damage to the gasket. A lubricant, approved by the pipe manufacturer, shall be applied to the spigot end prior to joining pipes. The spigot shall penetrate bell completely as indicated by penetration line. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall be in accordance with the manufacturer's recommendations.

E. Pipe shall be cut by means of saws, power driven abrasive wheels, or pipe cutters, which will produce a square cut. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander, or abrasive disc. The pipe shall be remarked with a penetration line at the required penetration depth.

F. **Work Stoppage:** At the end of each working day, CONTRACTOR shall plug or cap the open ends of all unfinished pipelines with securely bolted mechanical joint plugs, mechanical joint end caps, or blind flanges. If pipe is subject to flooding, pipe shall be anchored as precaution against flotation. Trenches shall be backfilled in accordance with the DISTRICT Standards and Specifications.

3.5 SERVICE CONNECTIONS

A. **Service Connections:** Direct tapping will not be permitted. Bronze service clamps shall be used for all service connections. Service clamps shall have a bearing area of sufficient width along the axis of the pipe, so that the pipe will not be distorted when the saddle is made tight. An internal shell cutter shall be used to drill through the corporation stop to minimize PVC shavings, retain the coupon, and reduce stress. Single fluted shell cutters or twist drills are not acceptable. Lubricate the cutting and tapping edges of the tool with cutting lubricant. Make the cuts slowly and use the follower very lightly - do not force cutter through pipe wall. Shell cutter shall have sufficient throat depth to handle the heavy wall PVC pipe. Maximum outlet size permitted with service clamps or saddle is 2 inches.

B. Tapping sleeves and valves shall be used for all outlet sizes greater than 2 inches in diameter. Tapping sleeves shall be assembled and installed in accordance with the manufacturer's recommendations.

3.6 CONNECTIONS TO EXISTING PIPELINES

A. The CONTRACTOR shall locate all underground improvements and install the pipelines to the depths indicated. Where the new work is to be connected to existing pipelines, the CONTRACTOR shall make its arrangements with the DISTRICT well in advance of the connections, to allow adequate time for dewatering of the existing line, if necessary, and shall expedite the work to minimize water outages to the users. Where sections of existing distribution mains are taken permanently out of service and abandoned in place, the cut ends shall be plugged solid with concrete to a depth of not less than two pipe diameters.

3.7 FIELD TESTING AND DISINFECTION

A. Field testing and disinfection and water mains shall conform to the requirements of Section 330110 - Waterline Disinfection & Testing.

END OF SECTION

SECTION 331213

BACKFLOW PREVENTION DEVICES

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall furnish and install all lead-free backflow prevention devices with associated valves, piping, instrumentation, and controls as shown on the Construction Drawings and specified herein, complete and operable, for backflow prevention. For fire lines, a double check detector assembly shall be used unless there is secondary source of pressurized water or recycled water on site, in which case a Reduced Pressure (RP) Zone Backflow device shall be used.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 330509 – Piping, General
Section 331417 – Service Connections
Section 331423 – Manholes, Vaults, & Meter Boxes

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. **Codes:** All codes, as referenced herein, are specified in Section 014200 - Reference Standards.

B. **Commercial Standards:**

ISA - S 5.1	Instrumentation Symbols and Identification
ANSI - B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ANSI/AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 In Through 144 In.
ANSI/AWWA C510	Double Check Valve Backflow Prevention Assembly
ANSI/AWWA C511	Reduced Pressure Principle Backflow Prevention Assembly

1.4 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit complete shop drawings of backflow prevention devices for review in accordance with Section 013300 - Contractor Submittals. With the shop drawings, the CONTRACTOR shall also furnish certified curves indicating flow versus differential pressure.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTION DEVICES

A. Approved devices shall be lead-free and shall be as outlined in Part III of these Standards & Specifications. Devices shall conform to the requirements of the DISTRICT, the County of Santa Barbara Environmental Health Services Division, the State of California Department of Drinking Water, and AWWA Standards C510 and C511.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The CONTRACTOR shall assemble and install all equipment specified herein, in strict accordance with the manufacturer's published instructions, under the supervision of the manufacturer's representative, under the general review of the DISTRICT. All installations shall be accomplished by competent craftsmen in a workmanlike manner. At a minimum testing and certifications shall be completed after meter installation and before it is unlocked for permanent use. Ongoing testing shall be performed on an annual basis.

3.2 BACKFLOW PREVENTION DEVICES

A. Backflow Prevention devices shall be installed as required by the signed Plans, the DISTRICT's Standards & Specifications and the County of Santa Barbara Environmental Health Services Division.

3.3 TESTING

A. Equipment shall be prepared for operational use in accordance with manufacturer's instructions, including bench test and calibration, where required. Each item shall be subjected to an operating test over the total range of capability of the equipment. Where applicable, tests shall be conducted in accordance with the Test Code of the Standards of the Hydraulic Institute.

3.4 ACCEPTANCE BY AGENCY

A. Final acceptance of the equipment is contingent on satisfactory operation after installation and certification of backflow prevention device.

END OF SECTION

SECTION 331216

VALVES AND APPURTENANCES

PART 1 - GENERAL

1.1 DESCRIPTION

This section describes the materials and installation procedures gate valves, butterfly valves, ball valves, combination air valves (CAV), pressure reducing valves, pressure relief valves, check valves, stainless steel tapping sleeves, pressure gauges, and appurtenances (valve cans, extensions, CAV enclosures).

1.2 REQUIREMENTS

A. The CONTRACTOR shall provide all valves, actuators, valve cans, and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to all valves and valve actuators except where otherwise indicated. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls indicated in other Sections of the Specifications.

C. Where a valve is to be supported by means other than the piping to which it is attached, the CONTRACTOR shall obtain from the valve manufacturer a design for support and foundation. The design, including drawings and calculations sealed by the PROJECT ENGINEER, shall be submitted with the Shop Drawings. When the design is approved, the support shall be provided.

D. **Unit Responsibility:** A single manufacturer shall be made responsible for coordination of design, assembly, testing, and furnishing of each valve, sleeve, and actuator; however, the CONTRACTOR shall be responsible to the DISTRICT for compliance with the requirements of each valve section or sleeve. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve or sleeve.

E. **Single Manufacturer:** Where two or more valves of the same type and size are required, the valves and actuators shall be furnished by the same manufacturer. Where indicated, valves may be provided with actuators manufactured by the valve manufacturer. Where actuators are furnished by different manufacturers, the CONTRACTOR shall coordinate selection to have the fewest number of manufacturers possible. Where two or more tapping sleeves of the same type or size are required, the sleeves shall be produced by the same Manufacturer.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 033000 – Cast-in-Place Concrete
Section 099000 – Protective Coatings
Section 312316 –Trenching, Backfill and Compaction
Section 330110 – Waterline Disinfection & Testing
Section 330509 – Piping, General

1.3 CONTRACTOR SUBMITTALS

A. **General:** Submittals shall be furnished in accordance with Section 013300 – Contractor Submittals.

B. Submit shop drawings. Submit manufacturer's catalog data. Show dimensions, materials of construction by ASTM reference and grade, and coatings. A cavitation study shall be submitted for pressure reducing valves.

C. Shop Drawings of all tapping sleeves and service saddles shall be submitted as a completed package. Shop Drawings shall contain the following information:

1. Valve name, size, Manufacturer, model number, pressure rating, identification number (if any), and specification section number.

2. Assembly drawings with part nomenclature, materials, dimensions, and weights.

3. Tapping Sleeve Labeling: A schedule of sleeves to be labeled, indicating in each case the sleeve location and the proposed wording for the label.

D. Shop Drawings. The CONTRACTOR shall submit complete Shop Drawings of butterfly valves and actuators, with drawings showing valve port diameter complete with dimensions, part numbers and materials of construction. Certification of proof-of-design test from the valve manufacturer shall also be provided.

E. Manufacturer's Certification that the valve complies with all applicable provisions of AWWA C504 – Rubber-Seated Butterfly Valves.

F. **Technical Manual and Spare parts List:** The Technical Manual shall contain the required information for each valve. A Spare Parts List

1.4 QUALITY ASSURANCE

A. Valves shall be subjected to performance, leakage, and hydrostatic tests in accordance with procedures and acceptance criteria established by AWWA C504.

PART 2 – PRODUCTS

2.1 GENERAL

A. **General:** Valves and actuators shall be new and of current manufacture. Shut-off valves 6-inches and larger within vaults and above ground shall have actuators with position indicators. Buried valves shall be provided with valve cans and lids, and valve stem extensions.

B. **Protective Coatings:** The exterior surfaces of all valves and the wet interior surfaces of ferrous valves of sizes 4 inches and larger shall be coated in accordance with Section 099000-Protective Coatings. The valve Manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.

C. **Valve Labeling:** Except when such requirement is waived by the DISTRICT in writing, a label shall be provided on all shut-off valves and control valves except for hose bibs. The label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall by permanently attached to the valve or on the wall adjacent to the valve as directed by the DISTRICT.

D. **Valve Testing:** As a minimum, unless otherwise indicated or recommended by the reference Standards, valves 3 inches in diameter and smaller shall be tested in accordance with manufacturer's standard and 4 inches in diameter and larger shall be factory tested as follows:

1. **Hydrostatic Testing:** Valve bodies shall be subjected to internal hydrostatic pressure equivalent to twice the water rated pressure of the valve. Metallic valves rating pressures shall be at 100 degrees F and plastic valves shall be 73 degrees, or at higher temperature according to type of material. During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall any part of the valve be permanently deformed. The duration shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes.

2. **Seat Testing:** Valves shall be tested for leaks in the closed position with the pressure differential across the seat equal to the water rated pressure of the valve. The duration of test shall be sufficient time to allow visual examination for leakage. Test duration shall be at least 10 minutes. Leakage past the closed valve shall not exceed 1 fluid ounce per hour per inch diameter for metal seated valves and drop-tight for resilient seated valves.

3. **Performance Testing:** All valves shall be shop operated from fully closed to fully open position and reverse under no-flow conditions in order to demonstrate the valve assembly operates properly.

E. **Certification:** Prior to shipment, the CONTRACTOR shall submit for valves over 12 inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.

F. **Valve Marking:** Valve bodies shall be permanently marked in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

2.2 MATERIALS

A. **General:** Materials shall be suitable for the intended application. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Actuators shall be current models of the best commercial quality materials and liberally-sized for the required torque. Unless otherwise indicated, valve and actuator bodies shall conform to the following requirements:

1. **Cast Iron:** Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

2. **Ductile Iron:** ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

3. **Bronze:** ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications.

4. **Stainless Steel:** Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature ServicePressure- Containing Parts, Grade CF8M, or shall be Type 316 stainless steel.

5. **NSF Standard 61:** All materials shall be listed for use in contact with potable water.

2.3 VALVE CONSTRUCTION

A. **Bodies:** Valve bodies shall be cast, molded (in the case of plastic valves), forged, or welded of the materials indicated, with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of valve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bodies shall be done by certified

welders and shall be ground smooth. Valve ends shall be as indicated, and be rated for the maximum temperature and pressure to which the valve will be subjected.

B. **Bonnets:** Valve bonnets shall be clamped, screwed, or flanged to the body and shall be of the same material, temperature, and pressure rating as the body. The bonnets shall have provision for the stem seal with the necessary glands, packing nuts, or yokes.

C. **Stems:** Valve stems shall be of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, Chevron V-type packing, or other suitable seal. Where subject to dezincification, bronze valve stems shall conform to ASTM B 62, containing not more than 5 percent of zinc or more than 2 percent of aluminum, with a minimum tensile strength of 30,000 psi, a minimum yield strength of 14,000 psi, and an elongation of at least 10 percent in 2 inches. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used, except that zinc content shall not exceed 16 percent.

E. **Internal Parts:** Internal parts and valve trim shall be as indicated for each individual valve. Where not indicated, valve trim shall be of Type 316 stainless steel or other best suited material.

F. **Operating Nuts:** Buried operating nuts shall comply with AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.

G. **Nuts and Bolts:** Nuts and bolts on valve flanges and supports shall be in accordance with Section 05500 - Miscellaneous Metalwork.

2.4 ACTUATORS

A. **General:** Unless otherwise indicated, valves and gates shall be furnished with manual actuators. Valves in sizes up to and including 4 inches shall have direct acting lever or handwheel actuators of the Manufacturer's best standard design. Larger valves and gates shall have gear-assisted manual actuators, with an operating pull of maximum 60 pounds on the rim of the handwheel. Buried and submerged gear-assisted valves, valves 30 inches in diameter and larger, and where so indicated, shall have worm-gear actuators, hermetically-sealed and grease-packed, where buried or submerged. All other valves 6 inches to 24 inches in diameter may have traveling-nut actuators, worm-gear actuators, spur- or bevel-gear actuators, as appropriate for each valve. The CONTRACTOR shall furnish actuators complete and operable with mounting hardware, handwheels, levers, and extensions, as applicable. Actuators shall have the torque ratings equal to or greater than required for valve seating and dynamic torques, whichever is greater and shall be capable of holding the valve in any intermediate position between fully-open and fully-closed without creeping or fluttering.

B. **Mounting:** Actuators shall be securely mounted by means of brackets or hardware specially designed and sized for this purpose and of ample strength. The word "open" shall be cast on each valve or actuator with an arrow indicating the direction to open in the counter-clockwise direction. Non-buried gear and power actuators shall be equipped with position indicators.

C. **Manual Worm-Gear Actuator:** The actuator shall consist of a single or double reduction gear unit contained in a weather-proof cast-iron or steel body with cover and minimum 12-inch diameter handwheel. The actuator shall be capable of 90-degree rotation and shall be equipped with travel stops capable of limiting the valve opening and closing. The actuator shall consist of spur or helical gears and worm-gearing. The spur or helical gears shall be of hardened alloy steel and the worm-gear shall be alloy bronze. The worm-gear shaft and the handwheel shaft shall be of 17-4 PH or similar stainless steel. All gearing shall be accurately cut with hobbing machines. Ball or roller bearings shall be used throughout. Actuator output gear changes shall be mechanically possible by simply changing the exposed or helical gearset ratio without further disassembly of the actuator. All

gearing shall be designed for a 100 percent overload.

D. **Traveling-Nut Actuator:** The actuator shall consist of a traveling-nut with screw (Scotch yoke) contained in a weather-proof cast-iron or steel housing with spur gear and minimum 12-inch diameter handwheel. The screw shall run in 2 end bearings, and the actuator shall be self-locking to maintain the valve position under any flow condition. The screw and gear shall be of hardened alloy steel or stainless steel, and the nut and bushings shall be of alloy bronze. The bearings and gear shall be grease-lubricated by means of grease nipples. All gearing shall be designed for a 100 percent overload.

2.5 VALVE CANS AND LIDS

A. Unless otherwise indicated, buried valves shall be in cast iron valve cans with lids permanently labeled "WATER" for potable waterlines and "RW" for recycled waterlines. Valves shall have extension stems with square nuts or floor stands, position indicators, and PVC pipe extensions for valve cans. Size and type of valve cans and lids shall match existing valve cans and lids so as to be interchangeable. Valve cans shall be the 3-piece adjustable type. All materials used in manufacturing shall conform to ASTM 48-30. Frame and Cover shall exceed H-20 wheel loading. Castings shall be dipped in black bituminous coating. Valve cans shall be Parkson "Buffalo" style, South Bay Foundry, Sigma, or approved equal.

2.6 VALVE STEM EXTENSIONS AND ACCESSORIES

A. **Extensions**: Unless otherwise indicated, buried valves shall be furnished complete with valve stem extensions and other accessories required to provide a functional system. Buried valves shall have valve stem extensions extending to 12 inches below finished grade. Valve stem extensions shall be fabricated steel or fiberglass as indicated in GWD Standard Detail 3-08. The maximum length of fiberglass valve stem extensions shall be 8 feet. Fiberglass valve stem extensions shall be manufactured by Pipeline Products, San Marcos, CA, or approved equal.

B. **Stem Guides:** Stem guides shall be provided, spaced 10-feet on centers unless the manufacturer can demonstrate by calculation that a different spacing is acceptable. Submerged stem guides shall be 304 stainless steel.

2.7 SPARE PARTS

A. The CONTRACTOR shall furnish the required spare parts suitably packaged and labeled with the valve name, location, and identification number. The CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve. Spare parts are intended for use by the DISTRICT, after expiration of the warranty period.

2.8 COMBINATIONS AIR VALVES, CLASS 250

A. CAV's 3-inches and smaller shall have ½-inch threaded outlets with bronze plugs in the top cover and near the bottom of the valve body. Valves larger than 3-inches shall have a 1-inch threaded drain outlet with bronze plug near the bottom of the valve body and a 1-inch threaded outlet with bronze plug on the side of the valve body above the minimum water level in the valve which forces the float against the valve seat. Valves shall be designed for an operating pressure of 250 psi.

B. Valves smaller than 3-inches shall have threaded ends. Valves 3-inches and larger shall have flanged ends. Flanges for Class 250 valves shall comply with AWWA Class E250. Threaded ends shall comply with ANSI B1.20.1. The minimum CAV size shall be 1-inch.

Valves manufacturer shall be:

APCO, Model 143C or 145C
Valmatic, Model 201C or 202C
Crispin, Model UL10 or UL20
Cla-Val, Model 361CAV or 362CAV, or equal.

C.. CAV's shall be equipped with schedule 40 PVC venting system and insect screen as shown in GWD Standard Detail 3-03. Insect screen shall be Northtown Company, Hytech Air Vac Screen, McMaster-Carr, Suction Screen with Nylon Base, or approved equal.

2.9 TAPPING SLEEVES

A. Stainless steel tapping sleeves shall be new and of current manufacture. Where a sleeve is to be supported by means other than the piping to which it is attached, obtain from the sleeve manufacturer a design for support and foundation. Tapping sleeves shall be of full sleeve type capable of containing pressure within the full volume of the sleeve. Weld-on "nozzle" type steel tapping sleeves and mechanical joint tapping sleeves shall only be allowed when approved by the DISTRICT. Tapping procedures shall be in accordance with the Manufacturer's published recommendations for tapping of pipes 4 inches or larger. Furnish tapping valve that is coordinated with tapping sleeve and conforming in every respect with this Section.

B. **Protective Coatings:** The exterior surfaces of the tapping sleeve shall be double wrapped with 35 mil Polyken tape wrap.

C. **Tapping Sleeve Testing:** As a minimum, unless otherwise indicated, each sleeve body 4 inches and larger shall be tested hydrostatically to 1.5 times its rated design water-working pressure, for a period of 5 minutes, without showing any leaks or loss of pressure. In addition, each valve 4 inches and larger shall undergo a functional test to demonstrate satisfactory operation throughout its operating cycle, and a closure test at rated water-working pressure for a period of 5 minutes to demonstrate tight seal during shut-off.

D. **Certification:** Prior to shipment, the CONTRACTOR shall submit for all tapping sleeves over 12 inches in size; certified, notarized copies of the hydrostatic factory tests showing compliance with the applicable standards of AWWA, ANSI and ASTM.

2.10 MATERIALS FOR TAPPING SLEEVES

A. **General:** Materials shall be suitable for the intended application. Materials not indicated shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended. Unless otherwise indicated, tapping sleeves and gaskets shall conform to the following requirements:

1. **Stainless Steel:** 316 stainless steel, outlet flange conforming to AWWA C207 Class D, ANSI 150 lb. Drilling shall be recessed for tapping valve.

2. **Gasket:** Red rubber SBR grade 30 or equal. Gaskets should conform with section AWWA C111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings and contain only 100 percent new rubber suitable for mild acids, water, and salt media.

3. **Tapping Sleeve:** Outlet flange conforming to AWWA C207 with an ANSI 150 lb. flange bolt pattern for the tapping valve. Tapping sleeve shall fit AWWA standards; Class AB-CD cast iron pipe.

2.11 TAPPING SLEEVE CONSTRUCTION

A. **Bodies:** Sleeve bodies shall be cast, forged, or welded of the materials indicated with smooth interior passages. Wall thicknesses shall be uniform in agreement with the applicable standards for each type of sleeve, without casting defects, pinholes, or other defects that could weaken the body. Welds on welded bodies shall be done by certified welders and shall be ground smooth. Sleeve ends shall be as indicated, and be rated for the maximum pressure to which the sleeve will be subjected.

B. **Nuts and Bolts:** Nuts and bolts on sleeve flanges and supports shall have stainless steel bolts, nuts, and washers of Type 316 stainless steel, class 2, conforming to ASTM A 193 for bolts and ASTM A 194 for sleeves with stainless nuts.

C. **Branches:** The inside diameter of each branch shall be oversized to permit entry and exit of tapping machine cutters. Each shall have a recess to center a tapping valve. Flange dimensions and drilling shall meet the requirements of ANSI B16.1. Sleeve length shall be a minimum of twice the diameter of the pipe being tapped such that the sleeves will not leak when installed on cast iron, ductile iron, or polyvinyl chloride pipe (PVC) with outside diameters shown in AWWA Standards.

2.12 MANUFACTURERS OF TAPPING SLEEVES

A. **Manufacturer's Qualifications:** Sleeve manufacturers shall have a successful record of not less than 5 years in the manufacture of the sleeves indicated.

B. **Manufacturers, or Equal:** Ford; Dresser Industries; Romac; KOPPL; Powerseal; and Smith-Blair.

2.13 RUBBER SEATED BUTTERFLY VALVES 25 TO 150 PSI (AWWA)

A **General:** Butterfly valves for steady-state water working pressures and steady-state differential pressure up to 150 psi and for fresh water service having a pH range from 6 to 10 and temperature range from 33 to 125 degrees F shall conform to AWWA C504 and be as indicated.

B. Valves shall be of the body type, pressure class, end joint, and actuator indicated. The valve actuators shall be equipped with counter-clockwise opening stems. Valves shall be marked with manufacturers name, size, pressure rating, and year manufactured.

C. **Construction:** Unless otherwise indicated, all materials of construction shall be in accordance with AWWA C504, suitable for the service. The seats shall be positively clamped or bonded into the disc or body of the valve, but cartridge-type seats which rely on a high coefficient of friction for retention shall not be acceptable.

Description	**Material Standards**
Valve Bodies	[ASTM A 48, Class 40] or [Cast iron, ASTM A 126, Class B], or [Ductile iron, ASTM A 536, grade 65-45-12 or 70-50-05] [Alloy cast iron, ASTM A 436, Type1 or 2], or [ASTM A 439, Type D2, with minimum lead content of 0.003 percent]
End flanges	The same material as the valve bodies
Valve shafts	Stainless steel ASTM A 276, Type 316
Valve discs	The same material as for the valve bodies.
Rubber sets	New natural or synthetic rubber
Seat mating surfaces	Stainless steel, ASTM A 276, Type 316
Clamps and retaining rings	Type 316 retaining rings and cap screws.
Valve bearings	Self-lubricating materials per AWWA C504
Shaft seals	Resilient non-metallic materials suitable for service

Painting and coating	Refer to Section 09800 – Protective Coatings

D. Manufacturers, or Equal

De Zurik Corporation
Clow Valve Company
M & H Valve Company
Mueller Company
Henry Pratt Company
Rodney Hunt Company (24 inches and larger)

2.14 RUBBER SEATED BUTTERFLY VALVES, 250 PSI (AWWA).

A **General:** Butterfly valves for steady-state water working pressures and steady-state differential pressure up to 250 psi and for fresh water service having a pH range from 6 to 10 and temperature range from 33 to 125 degrees F shall conform to AWWA C504. Valves shall be designed and manufactured in accordance with the intent of AWWA C504 except valves shall be suitable for 250 psi service and as indicated herein.

B. Valves shall be of the body type, pressure class, end joint, and actuator indicated.

C. One prototype valve for each size of valve required by the project shall be subjected to proof of design test in accordance with the procedures established by AWWA C504. Certificate of proof-of-design test shall be submitted to the DISTRICT prior to delivery of the valves.

D. **Construction:** Unless otherwise indicated, all materials of construction shall be in accordance with AWWA C504, suitable for the service. The seats shall be positively clamped or bonded into the disc or body of the valve, but cartridge-type seats, which rely on a high coefficient of friction for retention, shall not be acceptable.

Description	**Materials Standards**
Valve Bodies	[ASTM A 48, Class 40] or [Cast iron, ASTM A 126, Class B], [Ductile iron, ASTM A 536, grade 65-45-12 or 70-50-05] [Alloy cast iron, ASTM A 436, Type1 or 2], or [ASTM A 439, Type D2, with minimum lead content of 0.003 percent]
End flanges	The same material as the valve bodies
Valve shafts	Stainless steel ASTM A 276, Type 316
Valve discs	The same material as for the valve bodies.
Rubber sets	New natural or synthetic rubber
Seat mating surfaces	Stainless steel, ASTM A 276, Type 316
Clamps and retaining rings	Type 316 retaining rings and cap screws.
Valve bearings	Self lubricating materials per AWWA C504
Shaft seals	Resilient non-metallic materials suitable for service
Painting and coating	Refer to Section 09800 – Protective Coatings

E. **Manual Actuators:** Unless otherwise indicated, all manually-actuated butterfly valves shall be equipped with a handwheel and 2-inch square actuating nut and position indicator. Screw-type (traveling nut) actuators will not be permitted for valves 30 inches in diameter and larger.

F. **Worm Gear Actuators:** Valves, 30 inch and larger, as well as all submerged and buried valves, shall be equipped with worm-gear actuators, lubricated and sealed to prevent entry of dirt or water into the housing.

G. Manufacturers, or Equal

De Zurik Corporation
Henry Pratt Company
Rodney Hunt Company (24 inches and larger)

2.15 PRESSURE AND VACUUM GAUGES

A. **General:** Pressure gauges shall be provided on suction and discharge connections to pumps as indicated in the pump specifications; on discharge connections from blowers and compressors; each side of pressure reducing valves; and wherever indicated. Vacuum gauges shall be provided for vacuum pumps and wherever indicated. In all locations (such as certain pump suction connections) where pressures may vary from below to above atmospheric head, compound gauges shall be installed.

B. **Gauge Construction:** Gauges shall be industrial quality type with Type 316 stainless steel movement and stainless steel or alloy case. Unless otherwise indicated, gauges shall have a 3-1/2-inch dial, 1/4-inch threaded connection, a Type 316 stainless steel snubber adapter, and a shut-off valve. Gauges shall be calibrated to read in applicable units, with an accuracy of plus and minus 1 percent, to 150 percent of the working pressure or vacuum of the pipe or vessel to which they are connected. All gauges shall be vibration and shock resistant.

C. **Diaphragm Seal:** Gauges attached to systems involving chemical solutions, corrosive fluids, sludge, sewage, or other liquids containing solids at less than 1 percent dry solids shall be equipped with diaphragm seals, or equal protective pressure or vacuum sensing devices.

D. **Gauge Manufacturers, or Equal:** Marsh Instrument Company; Ashcroft Industrial Instruments (Dresser); Foxboro; Marshalltown Instruments, Inc.; and U.S. Gauge Div. of Ametek.

E. Snubber Manufacturers, or Equal: Weksler Instruments, Corp.

2.16 SWING CHECK VALVES (3-INCH AND LARGER)

A. **General:** Swing check valves for water, sewage, sludge, and general service shall be of the outside lever and spring or weight type, in accordance with ANSI/AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in. through 24 in. NPS, unless otherwise indicated, with full-opening passages, designed for a water-working pressure of 150 psi. They shall have flanged ends and a flanged cover piece to provide access to the disc.

B. **Body:** The valve body and cover shall be of cast iron conforming to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with flanged ends conforming to ANSI/ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800, or mechanical joint ends, as indicated.

C. **Disc:** The valve disc shall be of cast iron, ductile iron, or bronze conforming to ASTM B 62 - Composition Bronze or Ounce Metal Castings.

D. **Seat and Rings:** The valve seat and rings shall be of bronze to conforming ASTM B 62 or B 148 - Aluminum-Bronze Castings, or of Buna-N.

E. **Hinge Pin:** The hinge pin shall be of bronze or stainless steel.

F. Manufacturers, or Equal

American Flow Control (Darling)

APCO (Valve and Primer Corporation)
Kennedy Valve
Mueller Company (Grinnell Corporation)
Stockham Valves and Fittings

2.7 SWING CHECK VALVES (2-1/2-INCH AND SMALLER)

A. **General:** Swing 2check valves for steam, water, oil, or gas in sizes 2-1/2-inch and smaller shall be suitable for a steam pressure of 150 psi and a cold water pressure of 300 psi. They shall have screwed ends, unless otherwise indicated, and screwed caps.

B. **Body:** The valve body and cap shall be of bronze conforming to ASTM B 61 - Steam or Valve Bronze Castings, or ASTM B 62 with threaded ends conforming to ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (inch).

C. **Disc:** Valves for steam service shall have bronze or brass discs conforming to ASTM B 16 - Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines, and for cold water, oil, and gas service replaceable composition discs.

D. **Hinge Pin:** The hinge pins shall be of bronze or stainless steel.

E. Manufacturers, or Equal

Crane Company
Milwaukee Valve Company
Stockham Valves and Fittings
Wm. Powell Company

2.18 INTERNAL SPRING-LOADED CHECK VALVES (GLOBE STYLE)

A. **General:** Internal spring-loaded check valves for water pumps, compressors, gas, air, and steam shall be of the full-flow internal spring-loaded poppet type. The valves shall be designed for a water-working pressure of not less than 150 psi unless otherwise indicated.

B. **Body:** The bodies of all valves in sizes 3-inch and larger shall be of cast iron conforming to ASTM A 126 with 125-lb flanged ends conforming to ANSI/ASME B 16.1 unless otherwise indicated. Where necessary, there shall be a positive, watertight seal between the removable seat and the valve body. The stem guide shall be integrally cast with the body or screwed into the body.

C. Valves smaller than 3 inches shall have bronze bodies with screwed ends conforming to ANSI/ASME B 1.201, suitable for a minimum working pressure of 200 psi, and a temperature of 250 degrees F, unless otherwise indicated. The type of bronze shall be suitable for the intended service.

D. **Disc and Stem:** The disc and stem of all valves in sizes 3-inch and larger shall be of bronze conforming to ASTM B 584 - Copper Alloy Sand Castings for General Applications or stainless steel. The stem shall have two-point bearings. The downstream bearing shall have a bronze or other suitable bushing, to provide a smooth operation.

E. Valves smaller than 3 inches shall have discs and retaining rings of Teflon, nylon, or other suitable material, and stems of bronze, brass, or stainless steel, suitable for the intended service.

F. **Stem Guide:** The stem guide shall be either firmly fixed in the valve body to prevent it from sliding into the adjacent pipe and damaging the pipe lining, or the valve manufacturer shall furnish each valve with one matching flange compatible with the adjacent pipe and its lining to prevent damage to the lining. The compatible flange shall be part of the Shop Drawing submittal.

G. **Seat:** Valves for general service at temperatures up to 250 degrees F shall have bubble-tight shut-off with resilient seats of Buna-N, Teflon, or other suitable material. Valves for steam service and temperatures over 250 degrees F shall have metal-to-metal seating of bronze or stainless steel, as recommended by the manufacturer for the specific service condition. Resilient seats shall be firmly attached to the seating ring by compression-molding or other acceptable method.

H. **Spring:** Valves in sizes 3-inch and larger shall have Type 316 stainless steel springs, and valves smaller than 3-inch shall have stainless steel or beryllium copper springs, as suitable for the service. The spring tension of the valves shall be designed for the individual pressure condition of each valve.

I. Manufacturers, or Equal

APCO (Valve and Primer Corp.)
CPV (Combination Pump Valve Company)
Miller Valve Co., Inc.
VAL-MATIC (Valve and Manufacturing Corporation)

2.19 METAL BALL VALVES (4-INCH AND SMALLER)

A. **General:** Unless otherwise indicated, general purpose metal ball valves in sizes up to 4-inch shall have direct acting lever actuators in accordance with this Specification.

B. **Body:** Ball valves up to 1-1/2-inch (incl.) in size shall have bronze or carbon steel 2-or 3-piece bodies with screwed ends for a pressure rating of not less than 600 psi WOG. Valves 2-inch to 4-inch in size shall have bronze or carbon steel 2-or 3-piece bodies with flanged ends for a pressure rating of ANSI 125 psi or 150 psi unless otherwise indicated.

C. **Balls:** The balls shall be solid chrome plated brass or bronze, or stainless steel, with standard port (single reduction) or full port openings.

D. **Stems:** The valve stems shall be of the blow-out proof design, of bronze, stainless steel, or other acceptable construction, with reinforced Teflon seal.

E. **Seats:** The valve seats shall be of Teflon or Buna-N, for bi-directional service and easy replacement.

F. Manufacturers, or Equal

Conbraco Industries, Inc. (Apollo)
ITT engineered Valves
Neles-Jamesbury, Inc.
NIBCO, Inc.
Watts Regulator
Worcester Controls

2.21 RESILIENT-SEATED GATE VALVES – GENERAL

A. Buried valves shall be of the inside screw, non-rising stem type. The valve actuators shall be as indicated, with counter-clockwise opening stems, shall be marked with manufacturers name, size, pressure rating, and year manufactured.

2.22 RESILIENT-SEATED GATE VALVES (4 to 6-inch)

A. **General:** All gate valves shall be resilient-wedge gate valves unless directed otherwise by the DISTRICT.

B. **Construction:** Resilient-wedge gate valves shall conform to ANSI/AWWA C509 - Resilient-Seated Gate Valves for Water and Sewerage Systems. The valves shall be suitable for a design working water pressure of 200 psig, with flanged, bell and spigot, or mechanical joint ends. The valve body, bonnet, and disc shall be of cast iron or ductile iron and the disc or body shall be rubber-coated. Body and bonnet wall thickness shall be equal to or greater than the minimum wall thickness as listed in Table 2 of ANSI/AWWA C509. The stem, stem nuts, glands, and bushings shall be of bronze, with the stem seal per ANSI/AWWA C 509. Valves shall be internally coated in accordance with AWWA C550.

C. **Actuators:** Unless otherwise indicated, resilient-wedge gate valves shall have manual actuators in accordance with this Section.

D. Manufacturers, or Equal

American Flow Control
American AVK Company
Clow Valve Co.
M & H Valve Company
Mueller Company (Grinnell Corp.)
Stockham Valves and Fittings

2.23 HIGH-PRESSURE GATE VALVES (2- TO 12-INCH)

A. **Construction:** High-pressure gate valves, except for buried valves, shall have cast iron bodies and flanged bonnets conforming to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with 250 psi flanged ends. The valves shall have outside screw & yoke rising stems, or non-rising stems as indicated on the Construction Drawings. The valves shall be rated for 250 psig steam and 500 psig cold water working pressure. The solid wedges shall be of bronze or cast iron, bronze-fitted and the stem shall be of bronze with non-asbestos fiber packing.

B. **Actuators:** Unless otherwise indicated, high-pressure gate valves shall have cast iron or ductile iron handwheels with 2-inch square operating nuts, in accordance with Section 15201 - Valve & Gate Actuators.

C. Manufacturers, or Equal

American AVK Company
Crane Company
Milwaukee Valve Company
Wm. Powell Company
Stockham Valves and Fittings
Walworth Company

2.24 TAPPING VALVES (4- TO 24-INCH)

A. **Construction:** Tapping valves shall meet the requirements of ANSI/AWWA C500 or C509 and shall have flanged ends. Double disc gate valve gates, gate rings, and body-seat rings shall be oversized to permit entry and exit of tapping machine cutters.

B. Valve end connecting to tapping sleeve shall have a flange for bolting to the sleeve. The flange shall have a tongue, which fits a recess in the sleeve. The flanged and bolt pattern of the tapping valve shall match the flange and bolt pattern of the tapping sleeve. Resilient-wedge gate valves having a port

diameter equal to or exceeding ¼ inch over nominal diameter shall not require a tongue. Flange dimensions and drilling shall meet the requirements of ANSI B16.1. Nuts, bolts, and gaskets for flange joints shall meet the requirements of ANSI/AWWA C110. Nuts and bolts shall be 316 stainless steel. A full nominal diameter cutter shall be used for tapping.

C. Tapping valve coating and lining shall be applied per Section 099000 – Protective Coatings and shall be System 103 Fusion Bonded Epoxy, unless otherwise directed by the DISTRICT.

2.25 PRESSURE REDUCING VALVES, GENERAL

A. **Function:** Pressure reducing valves shall reduce a higher upstream pressure to a pre-set, lower, constant pressure, regardless of fluctuations in the upstream pressure.

B. **Operation:** The valves shall be hydraulically operated, with diaphragm direct action, pilot-controlled, per paragraph 2.2, and shall be of the globe or angle pattern as indicated. All necessary repairs shall be possible without removing the valves from the pipeline. The smaller direct-acting valves with threaded ends per paragraph 2.3, shall be suitable for water or air service and shall be of the globe patterns.

2.26 FLANGED PRESSURE REDUCING VALVES, SIZES 1 ½ INCHES THROUGH 24 INCHES

A. **Valve Body:** The valve body shall be of cast iron to ASTM A 48 - Gray Iron Castings, or ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with [125 lb] [250 lb] flanged ends to ANSI/ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800, or the body shall be of ductile iron to ASTM A 536 - Ductile Iron Castings, with [150 lb] [300 lb] flanged ends to ANSI/ASME B 16.42 - Ductile Iron Pipe Flanges and Flanged Fittings. The valve cover shall be flanged and be the same material as the body.

B. **Valve Trim:** The valve stems with position indication, springs, body seat rings, and all bolts, nuts, and washers shall be of Type 302, 303, or 316 stainless steel. The valve stems shall have top and bottom guides. All rubber parts shall be of Buna-N. The diaphragms shall be of Nylon-reinforced Buna-N, supported firmly between body and valve cover.

C. **Valve Controls:** The valve shall be provided with a complete, externally mounted control system, including speed control needle valves, strainers, check valve, isolation valves, and all necessary copper or stainless steel connecting tubing and fittings. The controls shall be capable of achieving all the flow and speed adjustment indicated.

D. **Factory Tests and Warranty:** All valves shall be factory tested with a hydrostatic test and a functional test and a test certificate shall be submitted to the DISTRICT prior to delivery of the valve. The valve shall be warranted for a period of 3 years from the date of shipment to be free of defects in materials and workmanship

E. **Operating Conditions:** The valve shall be designed to operate under the following conditions, or as stated on the construction drawings:

1.	Maximum inlet pressure (psi)	-	[ ]
2.	Minimum inlet pressure (psi)	-	[ ]
3.	Minimum outlet pressure (psi)	-	[ ]
4.	Maximum flow (gpm)	-	[ ]
5.	Minimum flow (gpm)	-	[ ]
6.	Valve size (inches)	-	[ ]
7.	Size of pipeline (inches diameter)	-	[ ]

F. **Spare Parts:** The following spare parts shall be furnished in accordance with Section 15200 - Valves, General:

1. One set of all resilient seals and discs
2. One diaphragm

G. Manufacturer shall be Cla-Val Company, or equal.

2.27 FLANGED PRESSURE RELIEF VALVES, SIZES 1-1/2 INCHES THROUGH 24 INCHES

A. **Valve Characteristics:** The pressure relief valve shall open when the inlet pressure exceeds a set maximum level. It shall maintain that level and gradually close as the inlet pressure drops below the maximum pressure. The valve shall be a hydraulically operated, adjustable, pilot controlled, diaphragm or piston type globe or angle valve as indicated. All necessary repairs shall be possible without removing the valve from the pipeline.

B. **Valve Body:** The valve body shall be of cast iron, ASTM A 48 - Gray Iron Castings, or ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings, with [125 lb] [250 lb] flanged ends to ANSI/ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800, or the body shall be of ductile iron to ASTM A 536 - Ductile Iron Castings, with [150 lb] [300 lb] flanged ends to ANSI/ASME B 16.42 - Ductile Iron Pipe Flanges and Flanged Fittings. The valve cover shall be flanged and be of the same material as the body.

C. **Valve Trim:** The valve stems, springs, body seat rings, and all bolts, nuts, and washers shall be of Type 302, 303, or 316 stainless steel. The valve stems shall have top and bottom guides. All rubber parts shall be of Buna-N. The diaphragms shall be of Nylon-reinforced Buna-N, supported firmly between body and valve cover.

D. **Valve Controls:** The valve shall be furnished with a complete, externally mounted control system, including adjustable speed control needle valves, strainer, and all necessary copper or stainless steel connecting tubing and fittings. The controls shall be capable of achieving all the flow and speed adjustment indicated.

E. **Factory Tests and Warranty:** Valves shall be factory tested with a hydrostatic test and a functional test and a test certificate shall be submitted to the DISTRICT prior to delivery of the valve. The valve shall be warranted for a period of 3 years from the date of shipment to be free of defects in materials and workmanship.

F. **Operating Conditions:** The valve shall be designed to operate under the following conditions, or as stated on the construction drawings:

1.	Total flow from pump station [gpm]	-	[	]
2.	Maximum inlet pressure (psi)	-	[	]
3.	Maximum flow through valve (gpm)	-	[	]
4.	Valve size (inches)	-	[	]
5.	Size of pipeline (inches diameter)	-	[	]

G. **Spare Parts:** The following spare parts shall be furnished in accordance with Section 15200:

1. 1 set of all resilient seals, and discs
2. 1 diaphragm

H. Manufacturer shall be Cla-Val Company, or equal.

2.28 HARDWARE AND MISCELLANEOUS MATERIALS

A. **Indoor Use:** Bolts and nuts for flanged valves located indoors shall be carbon steel, ASTM A 307, Grade B.

B. **Exposed Use:** Bolts and nuts for flanged valves located outdoors above ground and flanges located in underground vaults and structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts.

C. Washers: Washers shall be provided for each nut. Washers shall be of the same material as the nuts.

D. Gaskets for flanged end valves shall be as specified in Section 330509 – Piping, General.

2.29 COATING AND LINING OF CAV

A. Combination Air Valves shall be coated in accordance with Section 099000 – Protective Coatings. Prime coat shall be applied at the place of manufacture. The interior surfaces of CAV's shall be epoxy coated. Seating areas and plastic, bronze, stainless steel, or other high alloy parts shall not be coated.

2.30 STEEL ENCLOSURE FOR CAV

A. The vented steel pipe vertical enclosure shall be manufactured and constructed as detailed on the DISTRICT's Standard Detail 3-03 and shall be hot dip galvanized after fabrication. The door on the cover shall be equipped with a handle and have the ability to be locked using a standard pad lock. Manufacturer shall be Groeniger & Co or approved equal

2.31 PRESSURE AND VACUUM GAUGES

A. **General:** Pressure gauges shall be provided on suction and discharge connections to pumps as indicated in the pump specifications; on discharge connections from blowers and compressors; each side of pressure reducing valves; and wherever indicated. Vacuum gauges shall be provided for vacuum pumps and wherever indicated. In all locations (such as certain pump suction connections) where pressures may vary from below to above atmospheric head, compound gauges shall be installed.

B. **Gauge Construction:** Gauges shall be industrial quality type with Type 316 stainless steel movement and stainless steel or alloy case. Unless otherwise indicated, gauges shall have a 3-1/2-inch dial, 1/4-inch threaded connection, a Type 316 stainless steal snubber adapter, and a shut-off valve. Gauges shall be calibrated to read in applicable units, with an accuracy of plus and minus 1 percent, to 150 percent of the working pressure or vacuum of the pipe or vessel to which they are connected. All gauges shall be vibration and shock resistant.

C. **Diaphragm Seal:** Gauges attached to systems involving chemical solutions, corrosive fluids, sludge, sewage, or other liquids containing solids at less than 1 percent dry solids shall be equipped with diaphragm seals, or equal protective pressure or vacuum sensing devices.

D. **Gauge Manufacturers, or Equal:** Marsh Instrument Company; Ashcroft Industrial Instruments (Dresser); Foxboro; Marshalltown Instruments, Inc.; and U.S. Gauge Div. of Ametek.

E. **Snubber Manufacturers, or Equal:** Weksler Instruments, Corp.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. **General:** Valves, actuating units, stem extensions, valve cans, and accessories shall be installed in accordance with the Manufacturer's written instructions and as indicated. CONTRACTOR shall carefully inspect valves and operate valves before installation to verify all parts are in proper working order. If a valve is found to be defective no attempt shall be made to repair it. The defective valve shall be returned to the manufacturer and replaced with a new properly working valve.

B. **Access:** Valves shall be installed with easy access for actuation, removal, and maintenance and to avoid interference between valve actuators and structural members, handrails, or other equipment. Valves shall be firmly supported to avoid undue stresses on the pipe. Mainline valves shall be set plumb and securely braced into place using concrete anchor blocks as shown in Std. Detail 2-08. Non-buried actuators shall be located to be readily accessible for operation and maintenance, and shall not be mounted where shock or vibrations will impair their operation, nor shall the support systems be attached to handrails, process piping, or mechanical equipment.

C. **Valve Accessories:** All buried valves shall be provided with valve cans as indicated in GWD Standard Detail 2-06. Valve cans shall be installed centered and plumb over the operating nut. Valve cans shall be supported on bonnet of valve. In areas where road construction is not completed, set PVC sleeve to pavement subgrade level to prevent damage during construction of road base and AC pavement. After road construction is complete, CONTRACTOR is to return and set cans to grade.

D. **Corrosion Protection:** All nuts and bolts on valves for buried service shall be tape wrapped, after valve installation is completed Trenton Wax Tape #1, in accordance with Section 330509 – Piping General.

3.2 SERVICES OF MANUFACTURER

A. Field representatives of manufacturers of valves with pneumatic, hydraulic, or electric actuators shall adjust actuator controls and limit-switches in the field for the required function.

3.3 INSTALLATION OF GATE VALVES

A. Care shall be taken when installing valves on plastic pipe. Valve shall be supported at each end of the valve.

3.4 INSTALLATION OF BUTTERFLY VALVES

A. All exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator. The installation shall be in accordance with Section 331216 – Valves, General.

3.5 INSTALLATION OF CAV

A. Combination Air Valves shall be installed as shown on the plans and the DISTRICT's Standard Detail 3-03. The tap for the air valves shall be made in a level section of pipe no closer than 24-inches to a bell, coupling, joint, or fitting. CAV's shall be located a minimum of five feet clear of any obstruction such as trees and fences.

B. **Flanged Connections:** Flanges shall be cleaned by wire brushing before installing flanged valves. Flange bolts and nuts shall be cleaned by wire brushing, and threads lubricated with oil and graphite. Nuts shall be tightened uniformly and progressively. If flanges leak under pressure testing, nuts and bolts shall be loosened or removed, the gasket reseated or replaced, the bolts and nuts reinstalled or re-tightened, and joints re-tested. Joints shall be watertight.

C. **Threaded Connections:** Threaded joints shall be cleaned by wire brushing or swabbing. Teflon joint compound or Teflon tape shall be applied to pipe threads before installing threaded valves. Joints shall be watertight.

3.6 VALVE PRESSURE TESTING OF CAV

A. CAV's shall be tested at the same time that the connecting pipelines are pressure tested.

3.7 APPLICATION

A. Install tapping sleeves and valves at locations and of sizes shown on Drawings. Size-on-size taps shall not be performed without the prior approval of the DISTRICT.

B. Clean tapping sleeve, tapping valve, and pipe prior to installing and in accordance with Manufacturer's instruction.

D. Inspect sleeve for leaks, and remedy leaks prior to tapping operation.

3.8 INSTALLATION

A. Hot tap connections to existing waterlines shall be made only after proper blocking has been installed under the pipe, the sleeve of the tapping tee, and the tapping equipment to prevent cracking of the existing pipe. At no time before, during, or after completion of the hot tap shall the tapping tee bear the weight of the pipe or tapping equipment.

B. There should be a minimum of two feet from the end of the sleeve to any joint. When multiple taps occur on the same length of pipe there should be a minimum of five feet of space between the sleeves and should be located in slightly different planes unless otherwise approved by the DISTRICT.

C. Tighten bolts in proper sequence so that undue stress is not placed on pipe.

D. Align and mount tapping valve tapping sleeve to achieve a good watertight connection. Make tap with sharp, shell cutter:

1. For 12-inch and smaller tap, use minimum cutter diameter one-half inch less than nominal tap size.

2. For 16-inch and larger tap, use Manufacturer's recommended cutter diameter.

E. Withdraw coupon and flush cuttings from newly made tap.

F. Wrap completed tapping sleeves and valves in accordance with Section 099000 – Protective Coatings, except for stainless steel sleeves and valves.

G. Place concrete thrust block behind tapping sleeve (not over tapping sleeve and valve) or encase existing pipe or appropriate restraint system as directed by the DISTRICT.

H. DISTRICT's construction supervisor shall inspect installation of tapping sleeve and valve prior to backfilling.

I. Backfill in accordance with Section 312316 –Trenching, Backfill and Compaction.

3.9 INSTALLATION OF GAUGES

A. Gauges shall be installed with the face in the vertical position, at the locations indicated and in

strict accordance with the manufacturer's printed instructions. Gauges shall be attached to a thread-o-let. Tapping the wall of the pipe for a threaded connection is not acceptable unless approved by the District. Care shall be taken to minimize the effect of water hammer or vibrations on the gauges.

3.10 INSTALLATION OF BUTTERFLY VALVES

All exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator. The installation shall be in accordance with Section 15200 – Valves, General.

3.11 SERVICES OF MANUFACTURERS FOR PRESSURE REDUCING OR RELIEF VALVES

A. **Inspection, Startup, and Field Adjustment:** The service representative of the valve manufacturer shall be present at the Site for one work day, to assist the CONTRACTOR in the installation and adjustment of the valve(s). For the purpose of this paragraph, a work day is defined as an eight hour period, excluding travel time.

END OF SECTION

SECTION 331219

FIRE HYDRANTS & END DRAINS

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide fire hydrants and end drains, complete and operable, including all appurtenances and accessories, in accordance with the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 033000 – Cast-in-Place Concrete
Section 099000 – Protective Coatings
Section 330509 – Piping, General
Section 331316 – Valves and Appurtenances

PART 2 - PRODUCTS

2.1 WET-BARREL FIRE HYDRANTS

A. Unless shown otherwise, all fire hydrants shall be of the wet-barrel type, in accordance with ANSI/AWWA C503.

B. Where a hydrant is installed it shall have the number, size and type of pumper connections required by the County of Santa Barbara Fire Department. The hydrant head shall have a minimum of one 4-inch pumper connection and one 2-1/2-inch hose connection. Operating nuts and caps shall be 1-1/8 inch pentagonal nuts measured "point to flat". Caps shall be bronze and shall be attached to hydrant with chains. Cap shall have 1/8-inch diameter weep hole drilled through its center adjacent to operating nut. The hydrant inlet shall be 6-inch in diameter. Hydrant shall be isolated by a buried gate valve. Hydrant bury shall be 6-inch diameter ductile iron conforming to the requirements of AWWA C502 with a 6-inch diameter flanged break-away spool connected to the hydrant head. Breakaway spool shall be 12-inch minimum length, 125-pound class, cast iron, 6 bolt-breakaway spool with breakaway (hallow) bolts on top flange. All bolts, nuts, and washers shall be 307A zinc plated steel with standard HEX head and machined per ASTM A325.

C. The hydrants shall be tested to 300 psig and they shall be suitable for a working pressure of 150 psig. All interior and exterior surfaces shall be coated in accordance with AWWA C550 and Section 099000 - Protective Coatings. Color of finish coat shall be DISTRICT approved "Safety Yellow" on fire hydrants in the public right of way while fire hydrants not in the public right of way (e.g., on private property) shall be factory painted red in accordance with Santa Barbara County requirements. Prior to final inspection of the water system improvements, the CONTRACTOR shall conduct fire flow tests at all new hydrants in accordance with section 3.02.03, Fire Hydrant Flow Tests.

D. Unless otherwise specified, hydrant bury shall be 6-inch diameter, 6-hole wet barrel fire hydrant bury with mechanical joint.

E. **Fire Hydrant Manufacturers, or Equal:**

MANUFACTURER	***SINGLE FAMILY RESIDENCE***		**MULTI-FAMILY RESIDENCE, COMMERCIAL & INDUSTRIAL**	
	Size	**Model**	**Size**	**Model**
Jones	6”x4”x2 ½ “	J-3700	6”x4”x2 ½”x2 ½”	J-3765R
	6”x4”x2 ½”x2 ½”	J-3765R		
Clow	6”x4”x2 ½ “	2050	6”x4”x2 ½”x2 ½”	2060
	6”x4”x2 ½”x2 ½”	2060		
American AVK Co	6”x4”x2 ½ “	2442	6”x4”x2 ½”x2 ½”	2452
	6”x4”x2 ½”x2 ½”	2452		

F. Bury Manufacturers, or Equal:

Clow Valve Company
US Pipe and Foundry
Star
Sigma/Napco
South Bay Foundry

2.2 END DRAINS

A. End drains shall have a 2-1/2-inch hose connection. Operating nuts and caps shall be 1-1/8 inch pentagonal nuts measured “point to flat”. Caps shall be bronze and shall be attached to end drain with chains. The end drains shall be tested to 250 psig and they shall be suitable for a working pressure of 150 psig.

B. Manufacturers, or Equal: James Jones, J-342

PART 3 - EXECUTION

3.1 INSTALLATION

A. All fire hydrants shall be installed in strict accordance with the manufacturer's published recommendations, applicable sections of AWWA Standard C600, AWWA Manual M17, and GWD Standard Detail 4-01. Hydrants shall be installed plumb and shall be installed before the construction of curb and gutter, and sidewalk where possible. All installations shall be to the satisfaction of the DISTRICT and the County of Santa Barbara Fire Department.

B. Hydrants located on roads where no sidewalk exists or where sidewalk and curb are separated by a parkway, shall be located 18 inches from the back of the curb to the fire hydrant centerline. Hydrants located on roads with sidewalk at the back of curb shall be located 18 inches from the back of sidewalk to the fire hydrant centerline and shall comply with the requirements of the Americans with Disabilities Act. Hydrants located where no curb exists shall be located a minimum of 36 inches from the edge of pavement and shall be protected by guard posts as shown in GWD Standard Detail 4-03.

C. A minimum of 18 inches and a maximum of 24 inches clearance shall be maintained between finished grade and the lowest operating nut on the hydrant. The center of the breakaway spool shall be at grade with the top of curb unless the hydrant is set in concrete in which case a 3-inch minimum clearance shall be maintained between the finished sidewalk surface and the top flange of the breakaway spool. Breakaway bolts shall be installed with tips pointing up and filled with silicone caulking. . Hydrant isolation valve shall be connected to the hydrant piping by means of a retainer gland. Hydrant shall be installed with a concrete thrust block, calculated for the maximum expected water pressure.

D. All end drains shall be installed in accordance with GWD Standard Detail 2-12 and applicable sections of AWWA Standards. End drains shall be installed before the construction of curb and gutter, and sidewalk where possible. End drains located on roads where no sidewalk exists or where sidewalk and curb are separated by a parkway, shall be located 18 inches from the back of the curb. End drains located on roads with sidewalk at the back of curb shall be located per the Santa Barbara County Department of Public Works requirements. End drains located where no curb exists shall be located a minimum of 36 inches from the edge of pavement.

END OF SECTION

SECTION 331233

METERS LARGE AND SMALL

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. CONTRACTORS shall furnish and install DCDA fire meters. The DISTRICT shall furnish and install all domestic, irrigation, and associated, service laterals, valves, piping, and boxes as shown on the Construction Drawings and specified herein, complete and operable, for flow measurement of water.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 331423 – Manholes, Vaults, & Meter Boxes
Section 330509 – Piping, General
Section 331417 – Service Connections

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. **Codes:** All codes, as referenced herein, are specified in Section 014200 - Reference Standards.

B. **Commercial Standards:**

ISA - S 5.1	Instrumentation Symbols and Identification
ANSI - B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ANSI/AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 In through 144 In.
ANSI/AWWA C510	Double Check Valve Backflow Prevention Assembly
ANSI/AWWA C703	Cold-Water Meters – Fire Service Type
AWWA C704	Cold-Water Meters - Propeller Type for Main Line Applications
ASME REPORT	Fluid Meters, Sixth Edition, 1971

1.4 CONTRACTOR SUBMITTALS

A. The CONTRACTOR on applicant projects isolated from the distribution during construction shall submit complete shop drawings of meters for review in accordance with Section 013300 - Contractor Submittals. Each meter shall be identified with its equipment number and property number, as shown or specified.

PART 2 - PRODUCTS

2.1 METERS

A. Meters 1-inch and smaller shall be Mach 10 Ultrasonic Meters manufactured by Neptune Technology Group. Meters 1-inch and 1-1/2"-inch shall be E-Series Ultrasonic Meters manufactured by Badger Meter. Meters 3-inch and larger shall be Octave Ultra Sonic Meters manufactured by Master Meter. Meters shall measure in units of one hundred cubic feet. The lay length of solid spacer shall match the lay length of the meter.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The DISTRICT shall assemble and install all service laterals and meters specified herein.

B. For private projects isolated from the District distribution system during construction, the CONTRACTOR shall assemble and install all service laterals excluding the meters in strict accordance with DISTRICT standard details, under the general review and observation of the DISTRICT. All installations shall be accomplished by competent craftsmen in a workmanlike manner.

3.2 METERS

A. All meters shall be installed by the DISTRICT. When the CONTRACTOR installs the service, the CONTRACTOR shall install a temporary solid PVC spacer in conjunction with installation of the service.

B. Per Senate Bill No. 7, approved September 25, 2016, Section 1954.203, all multi-unit rental property constructed after January 1, 2018 must provide residents with info on volume and cost of their water use through their own individual submeters. The submeter shall be capable of being accessed and read by the tenant of the dwelling unit and read by the landlord without entering the dwelling unit. A submeter installed before January 1, 2018 may be read by the landlord after entry into the unit, in accordance with this chapter and Section 1954.Per this section, the Goleta Water District is not required to assume responsibility for ensuring compliance with any law or regulation governing installation, certification, maintenance, and testing of submeters and associated onsite plumbing.

3.5 ACCEPTANCE BY THE DISTRICT

A. Final acceptance and unlocking the meter stop to use the meter is contingent on satisfactory operation after installation, certification of backflow prevention device, receipt and DISTRICT approval of record drawings, and the project dedication process.

END OF SECTION

SECTION 331417

SERVICE CONNECTIONS

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide water service connections, complete and in place, in accordance with the Contract Documents. The requirements of Section 330509 - Piping, General apply to the WORK of this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 015526 – Traffic Control & Access
Section 330110 – Waterline Disinfection & Testing
Section 330509 – Piping, General
Section 312316 –Trenching, Backfill and Compaction
Section 331233 – Meters Large and Small
Section 331423 – Manholes, Vaults, & Meter Boxes

PART 2 - PRODUCTS

2.1 COPPER WATER TUBE

A. Copper water tube shall conform to the requirements of ASTM B 88 - Seamless Copper Water Tube. All 1" copper water tube for buried locations shall be soft temper tube in rolls. All above ground installations, and 2" copper water tube for buried locations shall be hard drawn lengths. Unless otherwise indicated, all copper water tube shall be of Type K wall thickness. The minimum copper service size shall be 1 inch. Copper service size for service run-outs of 50 feet or greater, for ¾-inch and 1-inch meters, shall be increased to 2 inches. Service connections 4 inches in diameter and larger shall be constructed of C900 PVC DR-18 pressure rated to 235 psi in accordance with AWWA C900.

B. **Joints:** Copper water tube shall have either brazed joints, or flared ends and fittings. Brazed joints shall be made with silver brazing alloy metal filler. Brazing alloy metal filler shall contain a minimum of 15% silver and no lead. Brazing alloy metal filler shall be STAY SILV 15 Brazing Metal Filler manufactured by The Harris Products Group, SIL-CAN 15 manufactured by Canfield Technologies, or approved equal.

C. **Fittings:** Brazed fittings shall conform to ANSI/ASME B 16.18 - Cast Copper Alloy Solder Joint Pressure Fittings, or to ANSI/ASME B 16.22 - Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings. The brazing flux shall be the Manufacturer's approved type for the fitting and brazing used. Compression fittings shall conform to ANSI/ASME B 16.26 - Cast Copper Alloy Fittings for Copper Tubes. Cast copper alloy flanges and flanged fittings shall be in accordance with ANSI/ASME B 16.24 - Cast Copper Alloy Pipe Flanges and Flanged Fittings, and ASTM B 62 - Standard Specification for Composition Bronze or Ounce Metal Castings, with 150 lb ratings, or as indicated.

2.2 SERVICE FITTINGS

A. **Saddles and Tapping Sleeves:** Saddles shall be bronze with female iron pipe threads. On PVC pipe, saddles shall be secured by single flat strap. On steel and ductile iron pipe, service saddles shall be with two flat straps up to 2-inches. On all service connections 4-inch and larger, tapping sleeves shall be used. Manufacturer shall be as indicated on DISTRICT Approved Materials List.

B. **Corporation Stops:** Corp stops shall be bronze with male iron pipe threads to match saddle threads. Connection to service line shall be compression fitting (pack joint) outlet connection. Manufacturer shall be as indicated on DISTRICT Approved Materials List.

C. **Angle Ball Meter Stops:** Angle ball meter valves shall be bronze, equipped with padlock wings, and provide for 360 degree rotation of the tee head. Padlock wings for dedicated firelines shall have the ability be locked off in the open position Angle ball meter valves for ¾-inch and 1-inch meters shall have 1-inch compression fitting (pack joint) copper inlet and meter swivel nut outlet to match meter size. Angle ball meter valves for 1-1/2-inch and 2-inch meters shall have compression fitting (pack joint) copper inlets and flanged meter connection outlets. Angle ball meter valve manufacturers and model numbers shall be as indicated on DISTRICT Approved Materials List.

D. **Curb Stops:** Ball valve curb stops shall be bronze. Size, connection type and manufacturer shall be as indicated on DISTRICT Approved Materials List.

E. **Couplings and Adapters:** Manufacturers of couplings and adapters shall be as indicated on DISTRICT Approved Materials List.

F. **Other Brass Fitting:** Manufacturers of couplings and adapters shall be as indicated on DISTRICT Approved Materials List.

PART 3 - EXECUTION

3.1 INSTALLATION

A. **General:** Service runouts shall be installed perpendicular to the waterline. The configuration of the services shall be as shown on the applicable DISTRICT standard details. Meters shall be installed in accordance with DISTRICT Standards & Specifications. All copper tubes shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the site, to avoid interference's with structures or equipment. Exposed tubing shall afford maximum access to equipment, and where necessary all tubing shall be installed with sufficient slopes for venting or drainage of liquids. For 1-inch copper tubing, tubing may be curved around a minimum radius of 12 inches. For 1-1/2-inch and 2-inch copper tubing, copper fittings shall be silver brazed where bends are required. All installations shall be acceptable to the DISTRICT. There shall be a minimum of two feet in spacing between service saddles.

B. **Valves and Unions:** Unless otherwise indicated, tubing to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Low points in water systems shall have drainage valves. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection.

3.2 PREPARATION

A. Prior to installation, each tube length shall be carefully inspected, flushed clean of any debris or dust, and be straightened, if not true. Ends of tubes shall be reamed and filed smooth. All fittings shall be equally cleaned before assembly.

3.3 JOINTS

A. **Brazed and Soldered Joints:** Brazed and soldered joints shall conform to the Manufacturer's recommendations and to the specifications and recommendations of ANSI/ASME B 31.1 - Power Piping. All brazing shall be done by skilled and qualified welders per Section 330509 - Piping, General. Prior to the application of flux, the end of all tubes shall be thoroughly dried and cleaned.

3.4 INSPECTION AND FIELD TESTING

A. **Inspection:** All finished installations shall be carefully inspected for proper joints and supports, anchoring, interferences, and damage to tubing, fittings, and coating. Damage shall be repaired to the satisfaction of the DISTRICT.

B. **Field Testing:** When constructed independent of the District distribution system, all copper service connections shall be pressure tested in conjunction with new water mains for a period of not less than two hours, without exceeding the following tolerance: pipes shall show zero leakage for unburied pipe, and not more than 0.02 gallons per hour per inch diameter per 100 feet of buried pipe. Copper pipe shall be subject to 100 psi or 1-1/2 times the maximum working pressure, whichever is greater. The CONTRACTOR shall furnish all test equipment, labor, materials, and devices at no extra cost to the DISTRICT. For additional testing requirements refer to Section 330110 – Waterline Disinfection & Testing.

C. Leakage is determined by the change in incremental volume markings on the site reservoir on the test pressure pump. All fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines be plugged or capped as required during the testing procedures.

D. Leaks shall be repaired to the satisfaction of the DISTRICT, and the system shall be re-tested until no leaks are found.

END OF SECTION

SECTION 331423

MANHOLES, VAULTS, & METER BOXES

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The CONTRACTOR shall provide precast concrete manholes, vaults, meter boxes, complete and in place, in accordance with the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Section 312316 –Trenching, Backfill and Compaction
Section 330509 – Piping, General

1.3 SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

ASTM A 48	Gray Iron Castings
ASTM C 150	Portland Cement
ASTM C 478	Circular Precast Reinforced Concrete Manhole Sections
ASTM C 923	Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

1.4 CONTRACTOR SUBMITTALS

A. **General:** Furnish submittals for manholes and vaults in accordance with Section 013300 - Contractor Submittals.

B. Shop Drawings

1. Show dimensions, locations, lifting inserts, reinforcement, and joints.

1.5 QUALITY ASSURANCE

A. **Inspection:** After installation, the CONTRACTOR shall demonstrate that manholes and vaults have been properly installed, level, with tight joints, at the correct elevations and orientations, and that the backfilling has been carried out in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 MANHOLES

A. The CONTRACTOR shall provide precast manhole sections and conical sections conforming to ASTM C 478 and the requirements of this Section. Adjusting rings shall be standard items from the manufacturer of the manhole sections. Minimum wall thickness of rings shall be 4-inches if steel reinforced and 6-inches if not reinforced.

B. Axial length of sections shall be selected to provide the correct total height with the fewest joints.

C. Conical sections shall be designed to support cast iron frames and covers under an H-20 loading, unless indicated otherwise.

D. Where the manhole barrel diameter is greater than 48-inches, an eccentric flat slab-transition shall be used to transition to 48-inch diameter riser sections. Underside of the transition shall be at least 7-feet above the top of the bench.

E. **Design Criteria:** Manhole walls, transitions, conical sections, and base shall be designed per ASTM C 478 for the depths indicated and the following:

1. AASHTO H-20 loading applied to the cover.

2. Unit weight of soil of 120 pcf located above all portions of the manhole.

3. Lateral soil pressure based on saturated soil producing 100 pcf acting on an empty manhole.

4. Internal fluid pressure based on unit weight of 63 pcf with manhole filled from invert to cover with no balancing external soil pressure.

5. Dead load of manhole sections fully supported by the base and transition.

6. Additional reinforcing steel in walls to transfer stresses at openings.

7. The minimum clear distance between the edges of any 2 wall penetrations shall be 12-inches or one-half of the diameter of the smaller penetration, whichever is greater.

F. Joints shall be sealed with o-ring gaskets conforming to ASTM C 443.

G. Concrete for base and channel formation shall be 4000 psi concrete conforming to Section 033000 - Cast-In-Place Concrete.

H. Barrel section to sewer pipe connections shall be sealed with resilient connectors complying with ASTM C 923. Mechanical devices shall be stainless steel.

I. Manhole steps shall be comprised of 1/2-inch grade 60 steel reinforcement rod encased in polypropylene copolymer plastic. Steps shall have tread width of 14-inches. Furnish test results demonstrating step capability to resist a pull out force of 2200 pounds. Provide PS2-PF Manhole Step by M.A. Industries, or equal.

J. Manhole Manufacturers, or Equal

Hanson Concrete Products, Inc., Milpitas, CA
Teichert Precast, Sacramento, CA

2.2 FRAMES AND COVERS

A. **Castings:** Castings for manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A 48, Class 30. Unless otherwise indicated, cast iron covers and frames shall be heavy traffic type, 30 inches in diameter, with embossed lettering saying “Goleta Water District”. Frame and cover shall be designed for H-20 traffic loading.

B. Castings Manufacturers, or Equal

Alhambra Foundry Co., Ltd.
Neenah Foundry Co.
East Jordan Iron Works

2.3 VAULTS

A. The CONTRACTOR shall provide precast vaults designed for the indicated applications and of the sizes indicated.

B. The minimum structural member thickness for vaults shall be 5-inches. Cement shall be Type V Portland cement as specified in ASTM C 150. The minimum 28-day concrete compressive strength shall be 4,000 psi. All reinforcing steel shall be embedded in the concrete with a minimum clear cover as recommended by ACI 318.

C. **Design Loading:** Vaults in areas subject to vehicular traffic shall be designed for H-20 traffic loading. Vaults in other areas shall be designed for a vertical live load of 300 psf. Lateral loads on vaults in all areas shall be calculated from:

L = 90 h (+ surcharge of 240 psf in areas of vehicular traffic),

where L = loading in psf, and h = depth of fill in feet.

D. Where joints are designed in pre-cast concrete vaults, such joints shall be interlocking to secure proper alignment between members and prevent migration of soil through the joint. Structural sections at joints shall be sized sufficiently to reinforce the section against localized distress during transportation and handling and against excess contact bearing pressures through the joint.

E. Where openings for access to the vault are required, the full clear space opening indicated shall be provided, without obstructions from brackets or supports. For large openings where brackets or supports are designed to protrude into the opening for support of required covers, such brackets or supports shall be designed to be easily removed and replaced with a minimum of effort and without cutting or welding.

F. Covers for access openings shall be provided. Frames for lids shall be fabricated from steel (galvanized after fabrication) or aluminum, and shall be integrally cast into the vault concrete sections. Vault lids shall be fabricated from plate aluminum with stainless steel hardware. Aluminum plate (vault lids) shall incorporate an anti-slip aluminum surface permanently bonded to the plate with a minimum coefficient of friction of 0.6, and shall be UL listed as slip resistant. The anti-slip aluminum surface shall be “SlipNOT” Grade 2 Medium as manufactured by W.S. Molnar Company or approved equal. All lids shall be tight fitting to prevent the entrance of dirt and debris. Where edge seams are permitted, no gaps greater than 1/16-inch between edges will be accepted.

G. All covers, except round, heavy-weight, cast iron manhole covers, shall have securing mechanisms to hold the covers firmly in place against the effects of repetitious live loads such as pedestrian or vehicle traffic. All vaults shall have spring assisted or torsional lids. Hinges for lid sections shall run parallel to centerline of meter. Reading lids shall be fabricated in the field to align with meter register as approved by the GWD INSPECTOR. All vault covers for vaults containing meters shall be provided with appropriate hole for Touch-Read device.

H. Where penetration of the pre-cast concrete vault are required for piping, conduit, or ducts,

such penetrations shall be accommodated through pre-cast openings or thin-wall knock-out sections. All openings for penetrations shall be smooth and free of surface irregularities and without exposed steel reinforcing. Vaults need not be designed to resist thrust from piping passing through the vault.

I. All hardware, nuts, and bolts used inside vaults shall be stainless steel unless otherwise specified.

2.4 BLOW-OFF VAULTS

A. The CONTRACTOR shall provide precast or prefabricated circular vaults designed for the indicated application and of the size indicated. Blow-off vaults shall be reinforced concrete or fiber reinforced polymer.

B. **Design Loading:** Vaults in areas subject to vehicular traffic shall be designed for H-20 traffic loading. Vaults in other areas shall be designed for a vertical live load of 300 psf.

C. The full clear space opening indicated shall be provided, without obstructions from brackets or supports, and covers for access openings shall be provided. Covers shall be cast iron or reinforced polymer. All lids shall be tight fitting to prevent the entrance of dirt and debris. All covers, except round, heavy-weight, cast iron manhole covers, shall have securing mechanisms to hold the covers firmly in place against the effects of repetitious live loads such as pedestrian or vehicle traffic.

2.5 WARNING SIGNS

A. The entrance to every manhole and vault shall be fitted with a permanently affixed, plastic warning sign, located above and centered on the top step. The size and wording of each sign shall be as directed by the Goleta Water District.

B. Sign Manufacturer, or Equal

W. H. Brady Company
Seton Nameplate Corporation

2.6 METER BOXES

A. The CONTRACTOR shall provide meter boxes for the indicated applications and of the sizes indicated. Meter boxes and vaults shall be sized in accordance with the table below. All replacement and retrofit meters shall be located in the appropriate meter box or vault as shown. Any exceptions shall be approved in advance by the DISTRICT. Meter box and vault manufacturers and product numbers shall be as indicated on DISTRICT approved materials list.

B. Where specified by the DISTRICT, meter boxes shall be provided with single piece polymer concrete cover with appropriate hole for an Invensys (Sensus) Touch-Read device.

PART 3 - EXECUTION

3.1 GENERAL

A. Pre-cast concrete sections shall be transported and handled with care in accordance with the manufacturer's written recommendations. Where lifting devices are provided in pre-cast sections, such lifting devices shall be used as intended. Where no lifting devices are provided, the CONTRACTOR shall follow the manufacturer's recommendations for lifting procedures to provide proper support during lifting.

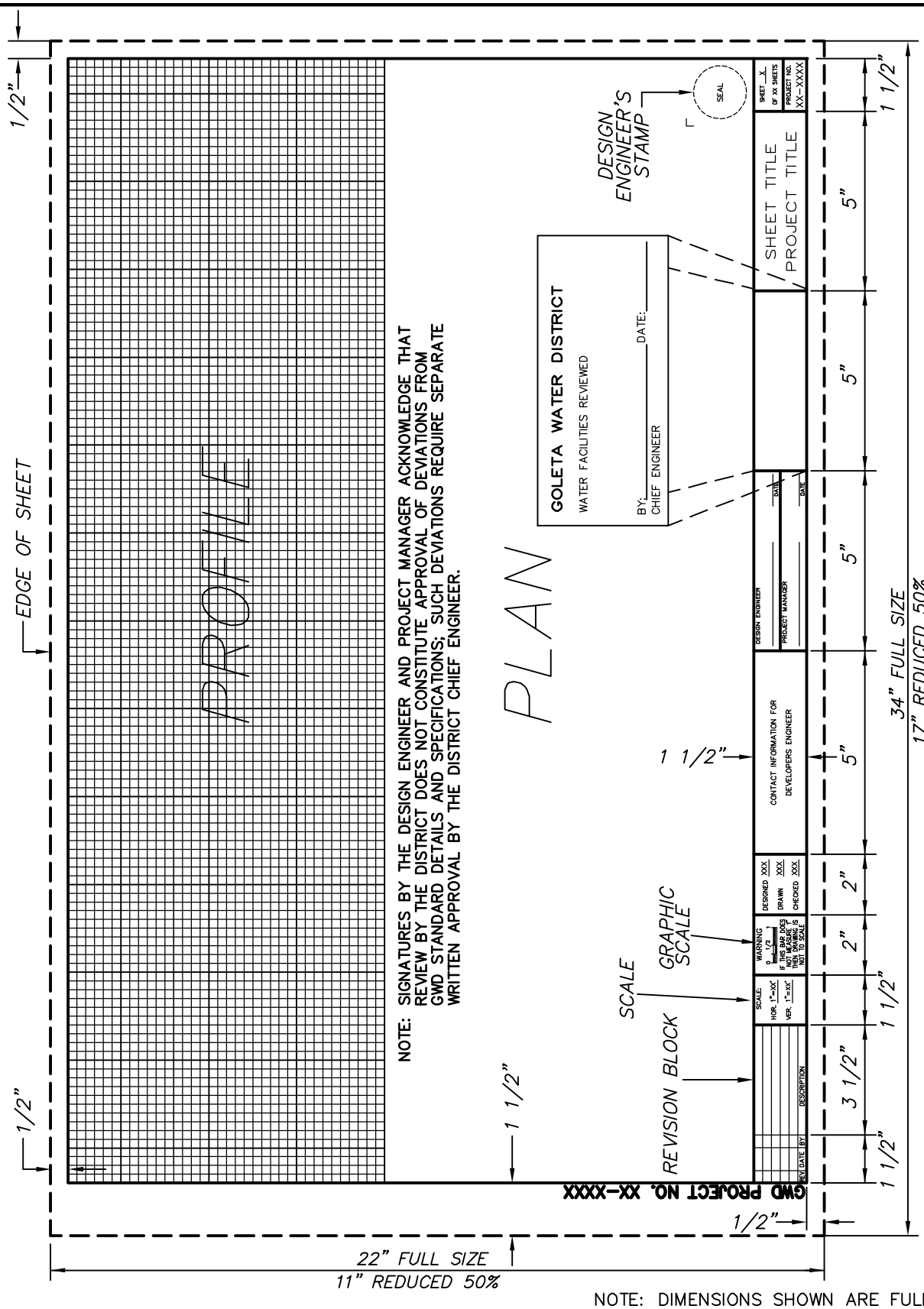
B. Meter Boxes shall be assembled and placed in excavations on properly compacted soil foundations as indicated. Meter boxes shall be set to grade and oriented to provide the required dimensions and clearances from pipes and other structures.

C. Prior to backfilling, all cracks and voids in meter boxes shall be filled with non-shrink grout. Around pipe and conduit penetrations, openings shall be sealed with non-shrink grout

END OF SECTION

PART VI

STANDARD DETAILS
TABLE OF CONTENTS



NOTE: DIMENSIONS SHOWN ARE FULL SIZE.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL 1-01
Daniel J. Brooks CHIEF ENGINEER — 2/3/2020 DATE	DRAFTING STANDARDS FOR GWD PLANS	1 OF 2

LINEWEIGHT	LINETYPE	TYPE
0.020"	32	EXISTING MAJOR CONTOUR (SCREENED)
0.015"		EXISTING MINOR CONTOUR (SCREENED)
0.020"	P/L	RIGHT OF WAY/PROPERTY LINE
0.015"	ESMT	EASEMENT
0.015"		CENTERLINE
0.010"	W	EXISTING WATERLINE
0.040"	RW	EXISTING RECYCLED WATERLINE
0.040"	S	EXISTING SEWER LINE
0.010"	SD	EXISTING STORMDRAIN
0.010"	G	EXISTING GAS LINE
0.010"	E	EXISTING ELECTRIC LINE
0.010"	COMM	EXISTING COMMUNICATIONS
0.010"	CATV	EXISTING CABLE TV
0.040"	W	PROPOSED WATERLINE
0.040"	RW	PROPOSED RECYCLED WATERLINE
0.040"	S	PROPOSED SEWER LINE
0.040"	SD	PROPOSED STORMDRAIN
0.010"		REMAINING TOPOGRAPHICAL FEATURES (SCREENED)

FONT	TEXT HEIGHT	SLANT
SIMPLEX	0.10" (MIN.)	15°

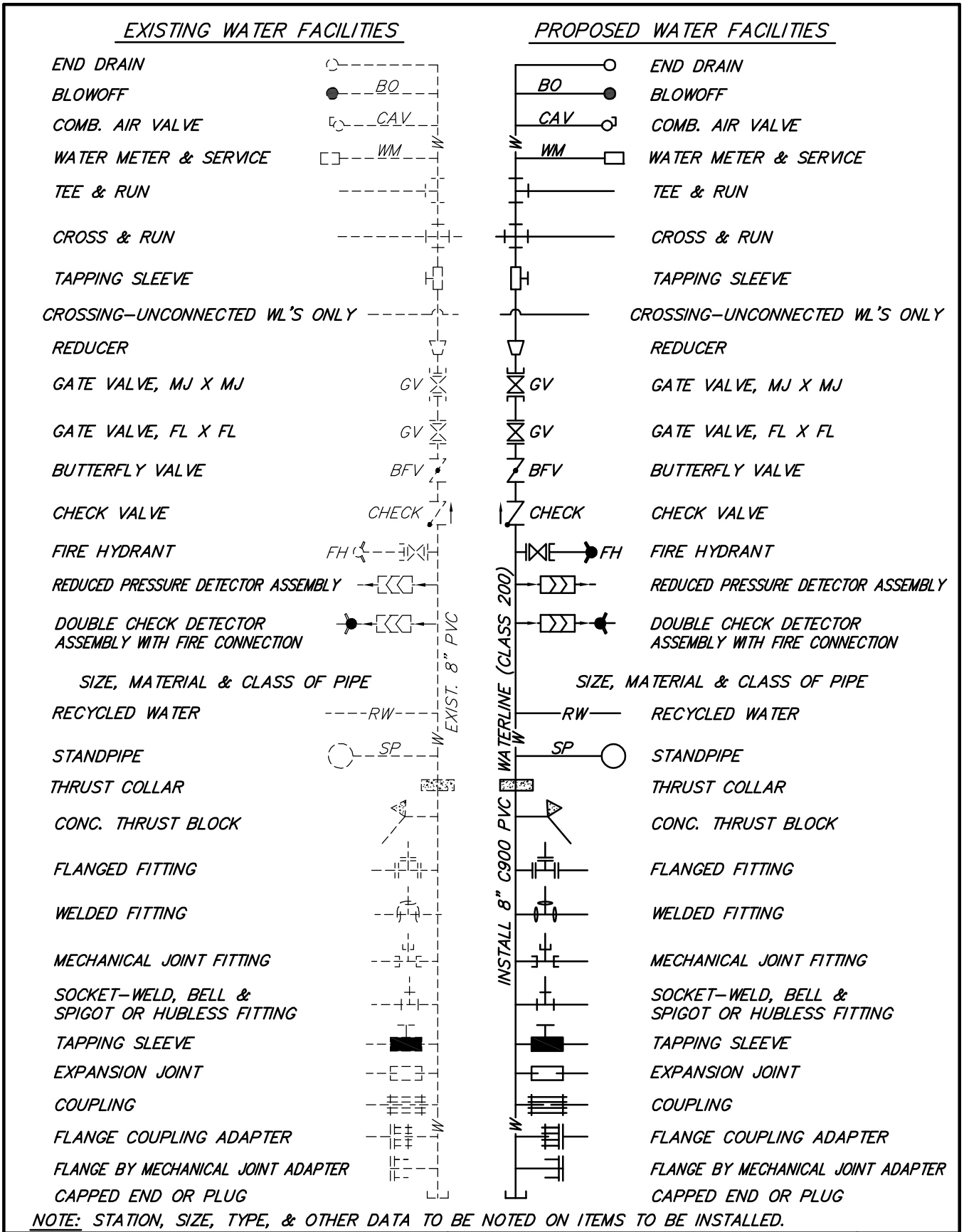
IF PLAN AND SECTION (OR DETAIL CALL-OUT AND DETAIL) ARE SHOWN ON THE SAME DRAWING, THEN DRAWING NUMBER IS REPLACED BY A LINE...

SECTION	1
SCALE	—

DETAIL	A
SCALE	—

REFERENCE SECTION AND DETAIL

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 1-01
Daniel J. Brooks ENGINEERING & INFRASTRUCTURE MANAGER	01/03/2023 DATE	DRAFTING STANDARDS FOR GWD PLANS	2 OF 2



NOTE: STATION, SIZE, TYPE, & OTHER DATA TO BE NOTED ON ITEMS TO BE INSTALLED.

APPROVED:

Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

STANDARD WATER SYMBOLS

STD. DETAIL 1–02

WATER GENERAL NOTES (CAPITAL IMPROVEMENT PROJECTS)

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE STATE OF CALIFORNIA DIVISION OF INDUSTRIAL SAFETY, CONSTRUCTION AND SAFETY ORDERS.

2. CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES WITH FACILITIES IN THE CONSTRUCTION AREA A MINIMUM OF 48 HOURS PRIOR TO COMMENCING CONSTRUCTION. CALL UNDERGROUND SERVICE ALERT (USA) AT 1-800-422-4133.

3. THE TERM "GWD MANAGER" SHALL BE INTERPRETED TO MEAN THE GOLETA WATER DISTRICT GENERAL MANAGER OR HIS OR HER AUTHORIZED AGENT.

4. COMMENCEMENT OF CONSTRUCTION SHALL NOT BEGIN UNTIL SUCH TIME THAT ALL PLANS ARE SIGNED BY GWD, ALL REQUIRED EASEMENTS TO GWD ARE GRANTED, SURETY BONDS AND CERTIFICATES OF INSURANCE ARE ON FILE WITH GWD, AND ALL REQUIRED CONSTRUCTION PERMITS HAVE BEEN ISSUED.

5. PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE PROJECT DESIGN ENGINEER SHALL ARRANGE FOR AND CONDUCT A PRE-CONSTRUCTION MEETING INCLUDING THE GOLETA WATER DISTRICT'S REPRESENTATIVE, THE CONTRACTOR, OWNER'S REPRESENTATIVE AND ANY OTHER APPROPRIATE REPRESENTATIVES. THE CONTRACTOR SHALL NOT COMMENCE CONSTRUCTION OF WATER SYSTEM IMPROVEMENTS UNTIL THE CONTRACTOR RECEIVES AN EXPLICIT WRITTEN NOTICE TO PROCEED FROM THE GOLETA WATER DISTRICT.

6. BARRICADES, TRAFFIC CONTROL, AND WARNING SIGNS SHALL BE PLACED IN ACCORDANCE WITH THE CURRENT CALTRANS TRAFFIC MANUAL AND THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

7. CONTRACTOR SHALL VERIFY EXISTING GAS, WATER, RECYCLED WATER, SEWER, ELECTRIC, COMMUNICATIONS, CATV, AND STORM DRAIN SIZE, LOCATION, AND ELEVATIONS WITHIN THE PROJECT AREA PRIOR TO COMMENCING CONSTRUCTION. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE GWD MANAGER AND THE PROJECT DESIGN ENGINEER OF ANY POTENTIAL CONFLICTS BETWEEN EXISTING FACILITIES AND CONSTRUCTION OF NEW IMPROVEMENTS. CONTRACTOR SHALL NOTIFY DISTRICT IN WRITING 48 HOURS IN ADVANCE OF CONSTRUCTION OF SEWER, STORMDRAIN, AND/OR RECYCLED WATER FACILITIES. POTABLE WATER SYSTEM WILL NOT BE ACTIVATED UNTIL ALL UNDERGROUND UTILITIES ARE INSTALLED.

8. CONTRACTOR SHALL VERIFY THE LOCATION, DEPTH, MATERIAL AND SIZE OF EXISTING WATER LINES AT POINTS OF PROPOSED CONNECTION. IF PIPE DATA IS MISREPRESENTED ON PLANS, THE PROJECT DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY AND NO CONNECTION SHALL BE MADE TO THE WATER SYSTEM AT THAT POINT UNTIL APPROVAL FROM THE PROJECT DESIGN ENGINEER IS RECEIVED BY THE CONTRACTOR.

9. WATER LINES, FIRE HYDRANTS, AND SERVICE STUBS SHALL BE INSTALLED AS SHOWN ON THE PLANS UNLESS OTHERWISE APPROVED BY THE PROJECT DESIGN ENGINEER AND THE DISTRICT IN WRITING. WATER LINES SHALL BE INSTALLED AFTER SEWER LINES AND SHALL MEET THE MINIMUM HORIZONTAL AND VERTICAL SEPARATION AS SPECIFIED IN THE GWD STANDARD DETAIL 2-01.

10. A COMPLETE SET OF DRAWINGS SHALL BE KEPT AND MAINTAINED AT THE SITE BY THE CONTRACTOR AT ALL TIMES DURING CONSTRUCTION. ALL UTILITY CROSSINGS SHALL BE HIGHLIGHTED ON PLAN VIEW AND ALSO SHOWN IN PROFILE VIEW. UPON COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT A COMPLETE SET OF RED-LINED CONSTRUCTION DRAWINGS SHOWING THE CONSTRUCTION WHICH HAS BEEN PERFORMED, INCLUDING CONSTRUCTION WHICH IS DIFFERENT FROM OR NOT SHOWN ON ORIGINAL SIGNED DRAWINGS. THIS SHALL INCLUDE DIMENSIONS, AND IDENTIFICATION NUMBERS FOR VALVES AND EQUIPMENT. EXACT DIMENSIONS SHALL ALSO BE PROVIDED FOR ALL UTILITY CROSSINGS. THE PROJECT DESIGN ENGINEER SHALL INCORPORATE THE RED-LINES INTO A FINAL SET OF DRAWINGS WITH THE WORDS "RECORD DRAWING" PRINTED ON EACH SHEET ALONG WITH THE DATE OF PREPARATION. THE COMPLETED SET OF DRAWINGS SHALL BE SUBMITTED FOR REVIEW BEFORE CREATION OF FINAL MYLARS, WHICH SHALL BE SIGNED BY THE PROJECT DESIGN ENGINEER ONCE HE/SHE HAS VERIFIED RED-LINES IN THE FIELD.

11. WORK PERTAINING TO WATER FACILITIES CONSTRUCTION SHALL BE PERFORMED BY A CONTRACTOR POSSESSING A VALID CLASS "A" OR OTHER APPROPRIATE CLASS STATE OF CALIFORNIA CONTRACTORS LICENSE.

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 1-03
Daniel J. Brooks CHIEF ENGINEER	6/3/2020 DATE	WATER GENERAL NOTES	1 OF 3

WATER GENERAL NOTES (CAPITAL IMPROVEMENT PROJECTS)

12. ALL MATERIAL SHALL CONFORM TO THE LATEST AWWA AND ASTM STANDARDS AND NSF STANDARDS 60 AND 61. CATHODIC PROTECTION MUST BE PROVIDED FOR ALL METALLIC PIPELINES AND TANKS AS DIRECTED BY GWD ON A PROJECT-SPECIFIC BASIS.

13. TRENCHES SHALL BE BACKFILLED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND GWD STANDARDS AND SPECIFICATIONS.

14. COMPACTION TESTS SHALL BE REQUIRED ON ALL WORK UNLESS EXPLICITLY WAIVED IN WRITING BY THE GWD CHIEF ENGINEER. THE TESTS SHALL COMPLY WITH ASTM D1557 AND SHALL BE MADE AND CERTIFIED BY A CERTIFIED SOILS TESTING SERVICE. ALL SOILS TESTS SHALL BE PERFORMED AT THOSE LOCATIONS SPECIFIED BY GWD. HOWEVER, AT LEAST ONE (1) TEST SHALL BE PERFORMED EVERY 300 LINEAL FEET OF PIPE INSTALLED AND AT LEAST ONE (1) TEST PER JOB UNLESS WAIVED BY THE GWD CHIEF ENGINEER. THE LOCATION OF THE TESTS SHALL BE DETERMINED BY GWD. COMPACTION TEST RESULTS SHALL BE PROVIDED TO GWD WITHIN THREE (3) WORKING DAYS FOLLOWING COMPLETION OF TEST.

15. ALL PAVING AND REPAVING WORK PERFORMED IN CONJUNCTION WITH WATER FACILITIES CONSTRUCTION SHALL CONFORM WITH THE APPLICABLE CITY OF GOLETA OR SANTA BARBARA COUNTY STANDARDS AND SPECIFICATIONS.

16. DURING CONSTRUCTION, A #12 COPPER INSULATED TRACER WIRE SHALL BE INSTALLED ALONG THE TOP OF ANY NON-METALLIC WATER MAIN. THE INSULATED TRACER WIRE SHALL BE GROUNDED WITH A 1/2" DIAMETER BY 36" LENGTH SOLID COPPER ROD USING PROPER CONNECTION FITTINGS. GROUNDING RODS SHALL BE PLACED AT EVERY JUNCTION TO ENSURE GOOD CONTINUITY. ALL SERVICE LINES, INCLUDING COMBINATION AIR VALVE AND END DRAIN RUN OUTS, SHALL ALSO BE CONNECTED TO THE INSULATED TRACER WIRE USING PROPER CONNECTION FITTINGS. THE INSULATED TRACER WIRE SHALL BE BROUGHT TO THE FINISHED SURFACE AT EACH VALVE BOX OR VALVE BOX CLUSTER. AFTER CONSTRUCTION IS COMPLETED, GWD WILL TEST ALL WATER MAINS, SERVICE LINES, COMBINATION AIR VALVES, AND END DRAINS TO ENSURE CONTINUITY BEFORE ACCEPTING OWNERSHIP OF THE WATER DEVELOPER SYSTEM. IF AT ANY TIME THERE IS A BREAK OF CONTINUITY DURING THE TEST, IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO DIG UP THE PROBLEM AREA AND MAKE REPAIRS AS NEEDED. ONCE ALL REPAIRS HAVE BEEN COMPLETED, GWD WILL RE-TEST FOR CONTINUITY. GROUNDING RODS SHALL BE PLACED ADJACENT TO THE INSIDE BRANCH OF A TEE.

17. A FOUR MIL BLUE PLASTIC/METALLIC TAPE MARKED "CAUTION-BURIED POTABLE WATER LINE" SHALL BE INSTALLED TWO FEET ABOVE TOP OF CONSTRUCTED POTABLE WATER MAIN. A FOUR MIL PURPLE PLASTIC/METALLIC TAPE MARKED "CAUTION-BURIED RECLAIMED/RECYCLED WATER LINE" SHALL BE INSTALLED ONE FOOT ABOVE CONSTRUCTED RECYCLED WATER MAIN.

18. ALL WATER SYSTEM IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST GWD STANDARDS AND SPECIFICATIONS POSTED AT HTTP://WWW.GOLETAWATER.COM/DOCUMENTS.

19. A MINIMUM COVER FOR WATER LINES IS AS FOLLOWS:

POTABLE WATER LINES

SIZE OF PIPE	MINIMUM COVER
LESS THAN 12 INCHES	36 INCHES
12 INCHES TO 24 INCHES	42 INCHES
GREATER THAN 24 INCHES	PER PLANS

20. ALL WATER LINE IMPROVEMENTS AND EXTENSIONS SHALL BE DISINFECTED PER GWD STANDARDS AND SPECIFICATIONS BEFORE BEING PLACED IN SERVICE. A VALVE SHALL BE INSTALLED IN THE CLOSED POSITION AT THE CONNECTION POINT TO THE EXISTING GWD WATER SYSTEM. THE VALVE SHALL BE OPERATED BY GWD PERSONNEL ONLY.

21. ALL WATER LINE IMPROVEMENTS AND EXTENSIONS SHALL BE PRESSURE TESTED PER GWD STANDARDS AND SPECIFICATIONS AFTER DISINFECTION.

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 1-03
Daniel J. Brooks CHIEF ENGINEER	6/3/2020 DATE	WATER GENERAL NOTES	2 OF 3

WATER GENERAL NOTES (CAPITAL IMPROVEMENT PROJECTS)

22. ALL WATER METERS, FIRE HYDRANTS, AND WATERLINE APPURTENANCES SHALL BE LOCATED A MINIMUM OF 3 FEET OUTSIDE OF CURB RETURNS (BCR/ECR), DRIVEWAY TOP OF X, AND ALL VERTICAL OBSTRUCTIONS SUCH AS STREET LIGHTS AND STREET SIGNS. METERS SHALL BE LOCATED A MINIMUM OF 5 FEET AWAY FROM DRAINAGE SWALES. WHERE A NEW WATER LINE IS BEING INSTALLED, SERVICE STUBS SHALL BE INSTALLED FOR EACH LOT TO BE SERVED BY THE NEW MAIN.

23. CONTRACTOR SHALL SUBMIT IN WRITING TO THE DISTRICT ALL PROPOSED SHUT-DOWNS OF EXISTING IN-SERVICE WATER LINES FOR MAKING CONNECTIONS OF NEW WATER LINES A MINIMUM OF 10 WORKING DAYS PRIOR TO THE PROPOSED DATE OF SHUT-DOWN. THE DISTRICT SHALL DETERMINE THE ACTUAL DATE AND TIME OF ANY AND ALL SHUT-DOWNS. PIT TO BE PREPARED BY CONTRACTOR. CUT-IN CONNECTION WORK TO BE PERFORMED BY DISTRICT. REFERENCE SPEC SECTION 15052. THE CONTRACTOR SHALL PROVIDE THE EXCAVATION FOR DISTRICT FORCES TO MAKE CONNECTION.

24. AFTER CONSTRUCTION OF WATER SYSTEM IMPROVEMENTS, ALL NEW FIRE HYDRANTS SHALL BE FLOW TESTED FOR COMPLIANCE WITH SANTA BARBARA COUNTY FIRE DEPARTMENT AND GWD REQUIREMENTS. TESTING SHALL BE PERFORMED USING GAUGES AND METHODS ACCEPTABLE TO GWD AND THE FIRE DEPARTMENT. A REPRESENTATIVE OF THE DISTRICT AND FIRE DEPARTMENT SHALL BE PRESENT DURING THE TEST.

25. ALL RECLAIMED/RECYCLED WATER FACILITIES EXPOSED TO ATMOSPHERE SHALL BE PAINTED PURPLE PER GWD SPECIFICATIONS.

26. ALL RECLAIMED/RECYCLED WATER VALVE CANS SHALL HAVE THE WORDS "RW" CAST ON TOP OF VALVE CAN LID. LETTERS SHALL BE A MINIMUM OF 3/4 INCHES HIGH.

27. ALL RECLAIMED/RECYCLED WATER BLOW-OFF VAULT LIDS AND MANHOLE COVERS SHALL HAVE THE WORDS "RECLAIMED WATER" CAST ON TOP OF LID. LETTERS SHALL BE A MINIMUM OF 3/4" HIGH.

28. VALVE CAN LIDS, BLOW-OFF VAULT LIDS, AND MANHOLE COVERS FOR RECLAIMED/RECYCLED WATER FACILITIES SHALL BE FACTORY COATED WITH PURPLE COLOR INDUSTRIAL GRADE EPOXY PAINT.

29. VALVES AT SERVICE LINE CONNECTIONS TO MAINS SHALL BE UP AGAINST MAINS AND SHALL MOUNT DIRECTLY TO TAPPING SLEEVE OR TIE-IN CONNECTION. THERE SHALL BE NO SPOOLS BETWEEN VALVES AND TIE-IN POINTS.

30. ALL ORGANIC WASTE GENERATED BY PROJECT SHALL BE DISPOSED AT GWD APPROVED OFFSITE LOCATION AT CONTRACTOR'S EXPENSE.

31. ALL BACKFLOW DEVICES SHALL BE LEAD-FREE AND INSTALLED AS CLOSE TO THE METER AS POSSIBLE.

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 1-03
Daniel J. Brooks CHIEF ENGINEER	6/3/2020 DATE	WATER GENERAL NOTES	3 OF 3

RECYCLED WATER GENERAL NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE GOLETA WATER DISTRICT STANDARDS AND SPECIFICATIONS FOR THE CONSTRUCTION OF WATER FACILITIES FEBRUARY 2020 OR LATER AND TITLE 7 OF THE GOLETA WATER DISTRICT CODE.

2. ALL REGULATIONS AND STANDARD DETAILS AND SPECIFICATIONS OF THE GOLETA WATER DISTRICT (DISTRICT) WHICH GOVERN POTABLE WATER USE ALSO APPLY TO RECYCLED WATER USE. THIS INCLUDES, BUT MAY NOT BE LIMITED TO: METER INSTALLATIONS, RIGHT OF ENTRY, WASTE OF WATER, TERMINATIONS OF SERVICE, BILLING AND CONSTRUCTION SPECIFICATIONS.

3. ALL PUBLIC FACILITIES SUCH AS COMFORT STATIONS, DRINKING FOUNTAINS, ETC. SHALL BE PROTECTED FROM SPRAY AND/OR MISTING BY RECYCLED WATER.

4. EXTERIOR DRINKING FOUNTAINS MUST BE SHOWN AND CALLED OUT ON THE RECYCLED WATER SYSTEM PLANS. THEY ARE NOT TO BE INSTALLED WITHIN 10 FEET OF THE RECYCLED WATER IRRIGATION ZONE. IF NO EXTERIOR DRINKING FOUNTAINS ARE PRESENT IN THE DESIGN AREA, IT MUST BE EXPLICITLY STATED ON THE PLAN THAT NONE EXISTS.

5. NO PONDING, RUNOFF, OR OVER-SPRAY IS PERMITTED. ADJUST ALL SPRINKLER HEADS TO PREVENT OVER-SPRAYING ONTO SIDEWALKS, STREETS AND PRIVATE LOTS.

6. HOSE BIBS ON RECYCLED WATER SYSTEMS ARE PROHIBITED.

7. ON-SITE CROSS-CONNECTION BETWEEN RECYCLED WATER LINES AND POTABLE WATER LINES IS STRICTLY PROHIBITED.

8. QUICK COUPLERS USED IN RECYCLED WATER SYSTEMS SHALL BE CONSTRUCTED OF BRASS WITH A PURPLE COLORED RUBBER OR VINYL COVER, AND SHALL HAVE A 1-INCH INLET. THE COVER SHALL HAVE A WARNING STATING "RECYCLED WATER – DO NOT DRINK".
QUICK COUPLERS FOR POTABLE WATER USE WITHIN A RECYCLED WATER AREA SHALL BE ¾" INLET SIZE AND SHALL HAVE A COVER MADE OF BRASS, METAL OR YELLOW RUBBER OR VINYL.

9. ALL PIPE MATERIALS SHALL BE INSTALLED IN ACCORDANCE WITH GOLETA WATER DISTRICT STANDARDS AND SPECIFICATIONS FOR THE CONSTRUCTION OF WATER FACILITIES, SECTIONS 3.01.07 AND 3.01.08. NO SUBSTITUTION OF PIPE MATERIALS WILL BE ALLOWED WITHOUT PRIOR APPROVAL BY THE DISTRICT.

10. ALL PRESSURE AND INTERMITTENT PRESSURE LINES SHALL BE IDENTIFIED IN ACCORDANCE WITH GOLETA WATER DISTRICT STANDARDS AND SPECIFICATIONS FOR THE CONSTRUCTION OF WATER FACILITIES, SECTION 3.01.08-J.

11. MINIMUM DEPTH FROM FINISHED GRADE TO TOP OF PIPE (MINIMUM COVER) SHALL BE AS FOLLOWS:

    1. CONSTANT PRESSURE LINES 3-INCHES AND LARGER: 24" MIN. COVER
    2. CONSTANT PRESSURE LINES 2-1/2-INCHES AND SMALLER: 18" MIN. COVER.
    3. INTERMITTENT PRESSURE LINES: 12" MIN. COVER.

    WHERE PIPING IS UNDER PAVED AREAS, THE MINIMUM COVER DEPTH LISTED ABOVE SHALL BE MEASURED FROM BELOW THE SUB GRADE OF THE ROAD.

12. PURSUANT TO GWD STANDARD DETAIL 2-01, THE FOLLOWING SEPARATION REQUIREMENTS SHALL BE OBSERVED:

a) RECYCLED WATER LINES PARALLEL WITH POTABLE WATER OR SANITARY SEWER LINES IN THE USER'S SYSTEM SHALL BE INSTALLED AT LEAST TEN FEET AWAY HORIZONTALLY.

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 1-04
Daniel J. Brooks ENGINEERING & INFRASTRUCTURE MANAGER	01/03/2023 DATE	RECYCLED WATER GENERAL NOTES	1 OF 3

RECYCLED WATER GENERAL NOTES

b) RECYCLED WATER LINES WHICH ARE PERPENDICULAR TO POTABLE WATER LINES SHALL BE INSTALLED AT LEAST ONE FOOT BELOW THE POTABLE WATER LINE, AND RECLAIMED WATER LINES PERPENDICULAR TO SANITARY SEWER LINES SHALL BE INSTALLED AT LEAST ONE FOOT HIGHER THAN THE SANITARY SEWER LINES.

13. THE DESIGN OF THE ON-SITE RECYCLED WATER IRRIGATION FACILITIES SHALL PROVIDE FOR WATERING DURING THE PERIODS OF MINIMAL PUBLIC USE OF THE DESIGN AREA. THIS IS TYPICALLY BETWEEN THE HOURS OF 7 P.M. AND 7 A.M. HOWEVER, THE EXACT IRRIGATION TIME SHALL BE APPROVED BY THE DISTRICT. CONSIDERATION SHALL BE GIVEN TO ALLOW A MAXIMUM DRY OUT TIME BEFORE THE DESIGN AREA WILL BE USED BY THE PUBLIC.

14. ALL SPRAY HEADS SHALL HAVE AN EXPOSED SURFACE COLORED PURPLE TO ASSOCIATE THEM WITH RECYCLED WATER USE. THEY MAY BE COLORED PURPLE THROUGH THE USE OF (1) PURPLE PLASTIC CAPS, OR (2) WEATHERPROOF PAINT.

15. TAG ALL VALVES AND OTHER BELOW GRADE APPURTENANCES WITHIN BOXES IN COMPLIANCE WITH GOLETA WATER DISTRICT STANDARDS AND SPECIFICATIONS FOR THE CONSTRUCTION OF WATER FACILITIES, SECTION 3.01.08.

16. CONTROLLER CHARTS SHALL BE PREPARED BY THE APPLICANT, OWNER, OR CUSTOMER AND APPROVED BY THE DISTRICT. COLOR CODED, LAMINATED CONTROLLER CHARTS SHALL BE PLACED IN THE CONTROL BOXES BEFORE COMMENCING SERVICE. THE OUTSIDE OF THE CONTROLLER BOX SHALL HAVE A WARNING SIGN OR STICKER ON IT OR PAINTED PURPLE.

17. CONTROLLERS SHALL BE LABELED INSIDE AND OUTSIDE, INDICATING THAT THE SYSTEM IS UTILIZING RECYCLED WATER. THE LABELS SHALL ALSO ALERT THE SYSTEM'S MAINTENANCE PERSONNEL OF ANY IMPORTANT CONSTRAINTS ON THE OPERATION OF THE SYSTEM.

18. ALL NEW BURIED DISTRIBUTION PIPING IN THE USER'S ON-SITE/PRIVATE WATER DISTRIBUTION SYSTEM, INCLUDING SERVICE LINES, VALVES AND OTHER APPURTENANCES, SHALL BE COLORED PURPLE AND EMBOSSED OR INTEGRALLY STAMPED/MARKED CONTINUOUSLY ON TWO SIDES WITH THE WORDS "RECYCLED WATER – DO NOT DRINK" AND IDENTIFIED IN ACCORDANCE WITH AWWA GUIDELINES FOR THE DISTRIBUTION OF NON-POTABLE WATER.

19. ALL AREAS WHERE RECYCLED WATER IS USED THAT ARE ACCESSIBLE TO THE PUBLIC SHALL BE POSTED WITH SIGNS THAT ARE VISIBLE TO THE PUBLIC, IN A SIZE NO LESS THAN 4 INCHES HIGH BY 8 INCHES WIDE THAT INCLUDE THE FOLLOWING WORDING: "RECYCLED WATER – DO NOT DRINK". EACH SIGN SHALL ALSO DISPLAY THE UNIVERSAL SYMBOL OF A GLASS WITH A SLASH THROUGH IT OR A PERSON DRINKING FROM A GLASS WITH A SLASH THROUGH IT. LETTERS ON THE SIGNS SHALL BE WHITE OR BLACK, A MINIMUM OF ½ INCH IN HEIGHT AND PRINTED ON A PURPLE BACKGROUND. LOCATION OF WARNING SIGNS SHALL BE APPROVED BY THE DISTRICT. DURING THE FIELD INSPECTION PERFORMED BY DISTRICT AND EHS PERSONNEL, ADDITIONAL WARNING SIGNS OR THE RELOCATION OF WARNING SIGNS AS SHOWN ON THE SIGNED PLANS MAY BE REQUIRED.

20. ALL POTABLE WATER METERS SERVING A SITE WHERE RECYCLED WATER IS AVAILABLE SHALL BE EQUIPPED WITH AN APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW ASSEMBLY (RP)

21. FOR EACH PROJECT SITE WHERE RECYCLED WATER IS USED, A USER SUPERVISOR SHALL BE DESIGNATED. THIS SUPERVISOR SHALL BE RESPONSIBLE FOR THE OPERATION AND USE OF RECYCLED WATER PIPELINES AND EQUIPMENT AND FOR THE PREVENTION OF CROSS-CONNECTIONS. THE DISTRICT SHALL BE KEPT INFORMED OF THE IDENTITY OF THE PERSON RESPONSIBLE.

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 1-04
Daniel J. Brooks ENGINEERING & INFRASTRUCTURE MANAGER	01/03/2023 DATE	RECYCLED WATER GENERAL NOTES	2 OF 3

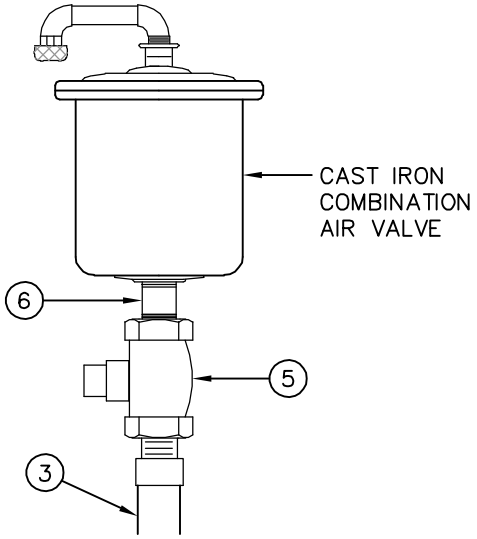
RECYCLED WATER GENERAL NOTES

22. GWD WILL INSPECT ALL PARALLEL AND PERPENDICULAR PIPING FOR PROPER HORIZONTAL AND VERTICAL SEPARATION. GWD REQUIRES A 48 HOUR NOTIFICATION PRIOR TO INSPECTION.

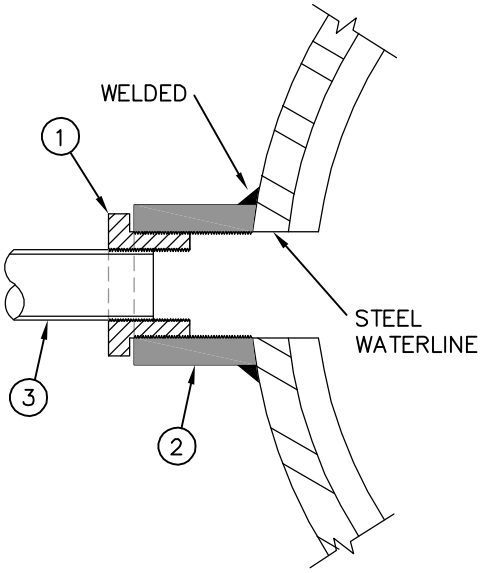
23. ANY RECYCLED WATER FACILITIES THAT PROVIDE ACCESS TO THE RECYCLED WATER SUPPLY SHALL BE CONTAINED IN LOCKABLE BOXES.

24. ANY REALIGNMENT OF ON-SITE RECYCLED AND/OR POTABLE WATERLINES DURING THE CONSTRUCTION OF THE WATER FACILITIES AS NOT DELINEATED ON THE SIGNED DISTRICT RECYCLED WATER PLANS MAY CREATE UTILITY CONFLICTS CONSTITUTING A VIOLATION OF STATE AND LOCAL GOVERNING CODES, RULES AND REGULATIONS REGARDING THE CONSTRUCTION OF RECYCLED WATER FACILITIES.

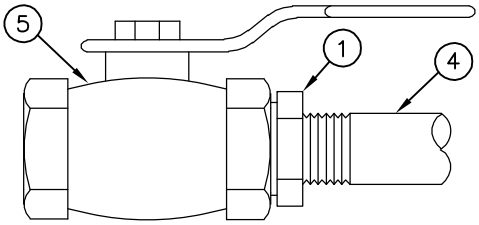
APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 1-04
Daniel J. Brooks CHIEF ENGINEER	2/3/2020 DATE	RECYCLED WATER GENERAL NOTES	3 OF 3



DETAIL "A" (PROFILE)



DETAIL "B" (CROSS SECTION)



DETAIL "C" (PROFILE)

SEE NOTE 7.

ITEM	QTY.	DESCRIPTION
1	—	NYLON BUSHING (1/2" REDUCTION, TYPICAL)
2	—	EXTRA-HEAVY HALF COUPLING OR THREDOLET
3	—	COPPER/BRASS CORP. STOP, VALVE, PIPE, NIPPLE OR FITTING
4	—	GALVANIZED STEEL PIPE, NIPPLE OR FITTING
5	—	BRASS CORP. STOP, BALL VALVE OR FITTING
6	—	SCHEDULE 80 PVC NIPPLE, THREADED

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. NO DIRECT CONNECTION OF STEEL OR CAST IRON TO BRASS, BRONZE, OR COPPER SHALL BE MADE WITHOUT SPECIFIC DISTRICT APPROVAL.
3. ONLY NYLON BUSHINGS SHALL BE ALLOWED. PVC BUSHINGS ARE NOT ALLOWED.
4. THREDOLETS AND EXTRA-HEAVY HALF COUPLINGS SHALL BE SIZED ONE-HALF INCH LARGER THAN BRASS, BRONZE, OR COPPER CONNECTION TO ALLOW FOR NYLON BUSHING.
5. WHERE EXTRA-HEAVY HALF COUPLINGS ARE USED, BASE OF COUPLING SHALL BE GROUND TO MATCH CURVATURE OF STEEL PIPE.
6. NYLON BUSHING SHALL BE OMITTED WHERE COPPER/BRASS/BRONZE NIPPLES/PIPES ARE CONNECTED TO BRASS/BRONZE VALVES, AND WHERE GALVANIZED STEEL PIPE IS CONNECTED TO STEEL WATERLINES.
7. DETAIL "C" APPLIES ONLY TO ABOVE GROUND INSTALLATIONS AT DISTRICT FACILITIES SUCH AS WELLS, BOOSTER STATIONS, AND PRESSURE REDUCING STATIONS.

APPROVED:

Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

CONNECTION OF DISSIMILAR METALS

STD. DETAIL 1-05

BASIC SEPARATION STANDARDS

- PARALLEL CONSTRUCTION: THE HORIZONTAL DISTANCE BETWEEN DOMESTIC WATER, INCLUDING SERVICE LINE MANIFOLDS, AND SANITARY SEWER LINES AND STORMWATER IMPOUNDMENTS, SWALES, AND DRYWELLS SHALL BE AT LEAST 10 FEET FROM EXTERNAL EDGE OF EACH PIPE. THE HORIZONTAL DISTANCE BETWEEN DOMESTIC WATER AND DRY UTILITIES SHALL BE AT LEAST 5 FEET. THE HORIZONTAL DISTANCE BETWEEN DOMESTIC WATER AND TERTIARY TREATED RECYCLED WATER AND STORM DRAINS SHALL BE AT LEAST 4 FEET. THE HORIZONTAL DISTANCE BETWEEN RECYCLED WATER AND OTHER UTILITIES SHALL BE AT LEAST 4 FEET.

- PERPENDICULAR CONSTRUCTION (CROSSING): DOMESTIC WATER LINE INCLUDING SERVICE LINE MANIFOLD SHALL BE AT LEAST ONE FOOT ABOVE SANITARY SEWER AND RECYCLED WATER LINES AND AT LEAST ONE FOOT ABOVE OR BELOW DRY UTILITIES WHERE THESE LINES MUST CROSS MEASURED FROM EXTERNAL EDGE OF EACH PIPE.

- THE VERTICAL DISTANCE OF WATER LINES SHALL BE AT LEAST ONE FOOT ABOVE SANITARY SEWER, RECYCLED WATER, AND STORM DRAIN PIPES. THE VERTICAL DISTANCE OF WATER LINES FROM OTHER UTILITIES SHALL BE AT LEAST ONE FOOT BELOW OR ABOVE.

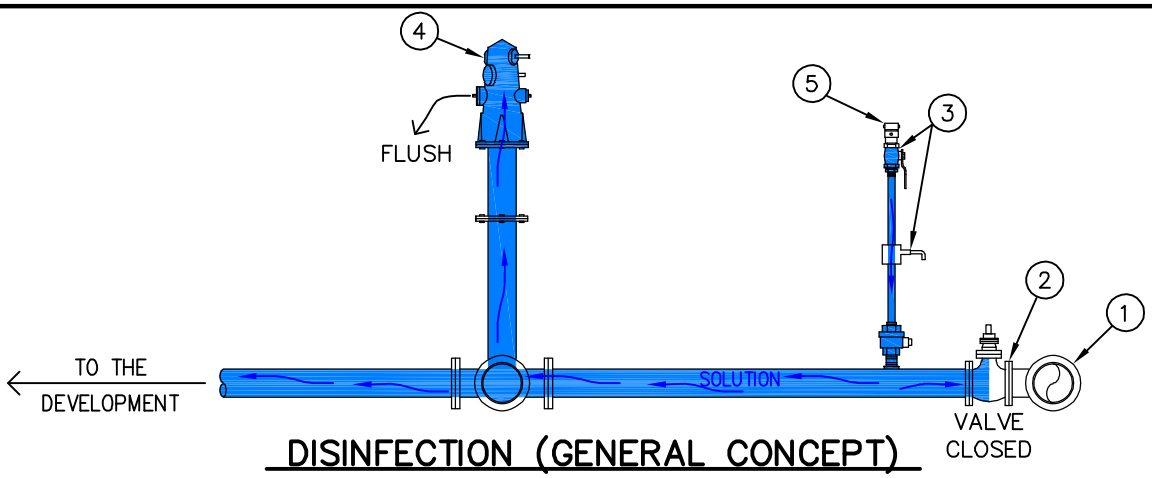
SPECIAL PROVISIONS GENERAL NOTES

1. THIS CRITERION DOES NOT APPLY FOR A RECYCLED WATER LINE CROSSING ANOTHER RECYCLED WATER LINE.

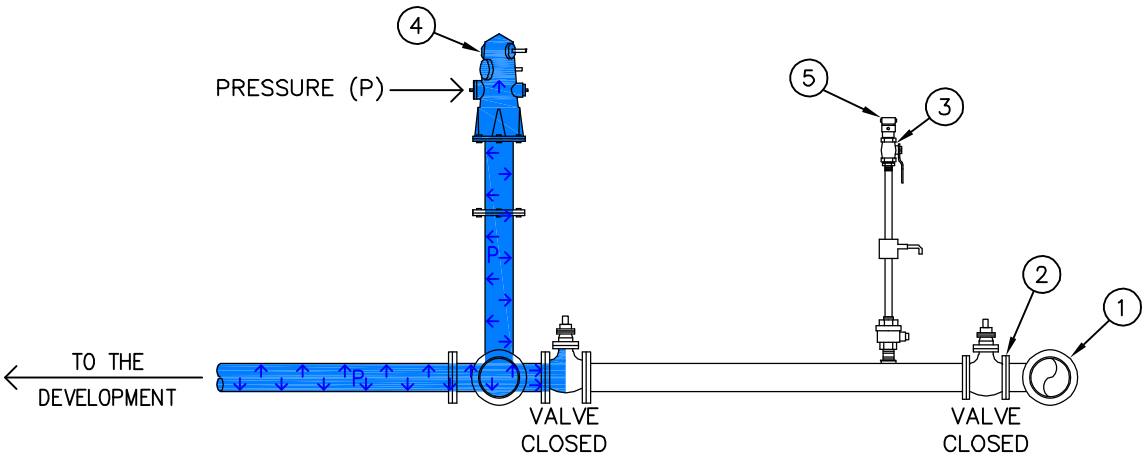
2. PIPE SHALL BE SEPARATED PER THE REQUIREMENTS OF SANTA BARBARA COUNTY DEPARTMENT OF PUBLIC HEALTH. IF DIFFERENCE BETWEEN DISTRICT AND SBCDPH OR STATE WATER RESOURCES CONTROL BOARD DIVISION OF DRINKING WATER REQUIREMENTS OCCURS, THEN MOST STRINGENT REQUIREMENTS SHALL APPLY.

3. NEW POTABLE WATER LINES SHALL BE INSTALLED PARALLEL TO STORM DRAIN AND SEPARATED BY 4 FEET HORIZONTAL AND 1 FOOT VERTICAL ABOVE. PERPENDICULAR POTABLE AT LEAST 1 FOOT ABOVE STORM DRAIN.

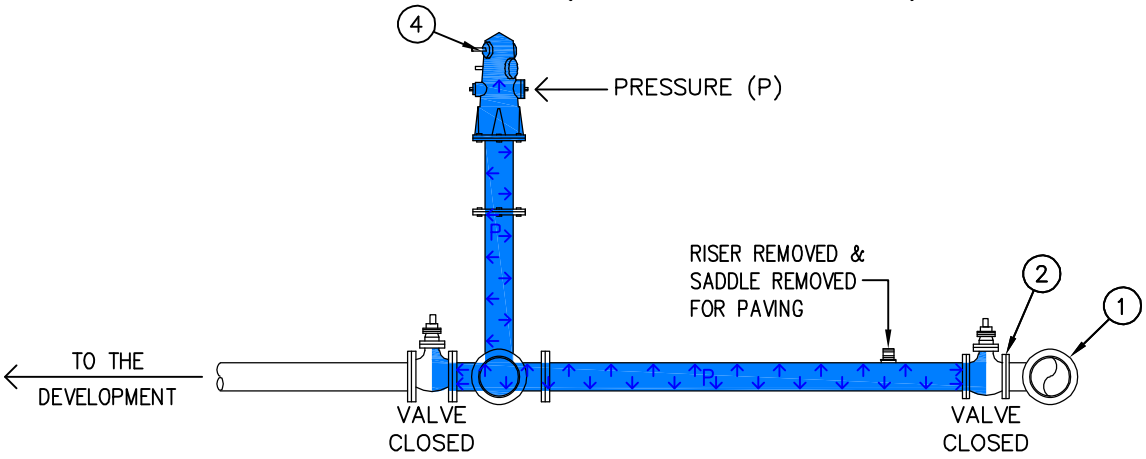
APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL
Daniel J. Brooks ENGINEERING & INFRASTRUCTURE MANAGER	01/03/2023 DATE	BASIC SEPARATION STANDARDS FOR DOMESTIC WATER, RECYCLED WATER, SANITARY SEWER PIPELINES, AND DRY UTILITIES	2-01



DISINFECTION (GENERAL CONCEPT)



PRESSURE TEST (GENERAL CONCEPT)



PRESSURE TEST – ISOLATION VALVE TO POC (GENERAL CONCEPT)

ITEM	DESCRIPTION
1	DISTRIBUTION SYSTEM
2	POINT OF CONNECTION (POC)
3	RISER FOR PRESSURE TEST OBSERVATION, DISINFECTION AND SAMPLING
4	FIRE HYDRANT
5	SWIVEL CONNECTION FOR FIRE HOSE

APPROVED:

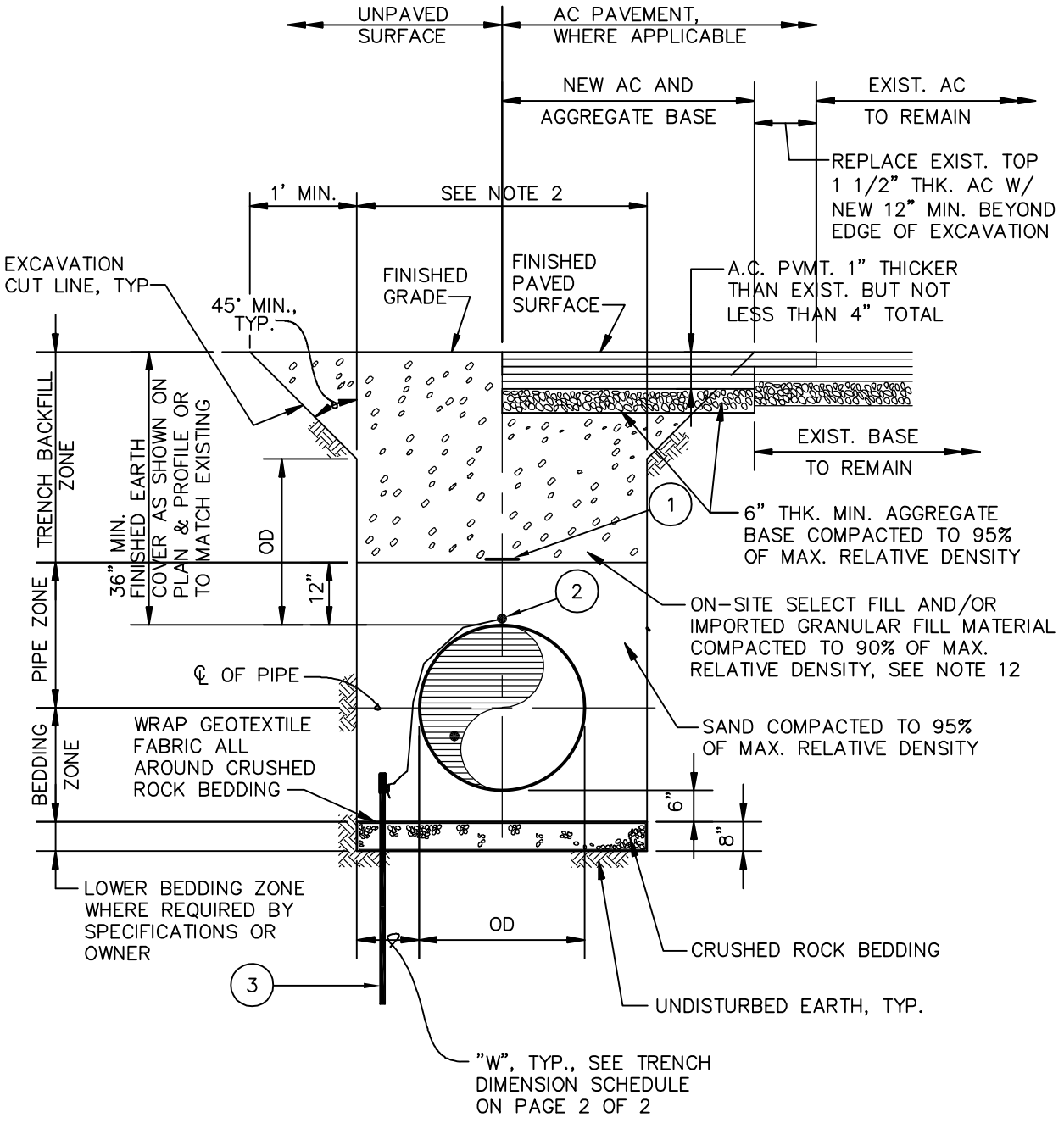
Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

DISINFECTION, SAMPLING, FLUSHING & PRESSURE TESTING

STD. DETAIL 2-02



ITEM	QTY.	DESCRIPTION
1	VAR	PLASTIC/METALLIC IDENTIFICATION TAPE AS SPECIFIED IN NOTE #17 OF STD. DETAIL 1-03.
2	VAR	CONTINUOUS STRAND OF INSULATED 12 GAGE SOFT COPPER TRACER WIRE REQUIRED FOR PVC OR HDPE PIPE INSTALLATION, TAPE TO PIPE AT 20' INTERVALS.
3	VAR	36" LONG, 5/8" DIA. COPPER GROUNDING ROD. SEE NOTE 4.

SEE NOTES AND TRENCH DIMENSION SCHEDULE ON PAGE 2 OF 2.

APPROVED:

Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

TYPICAL PIPE TRENCH SECTION

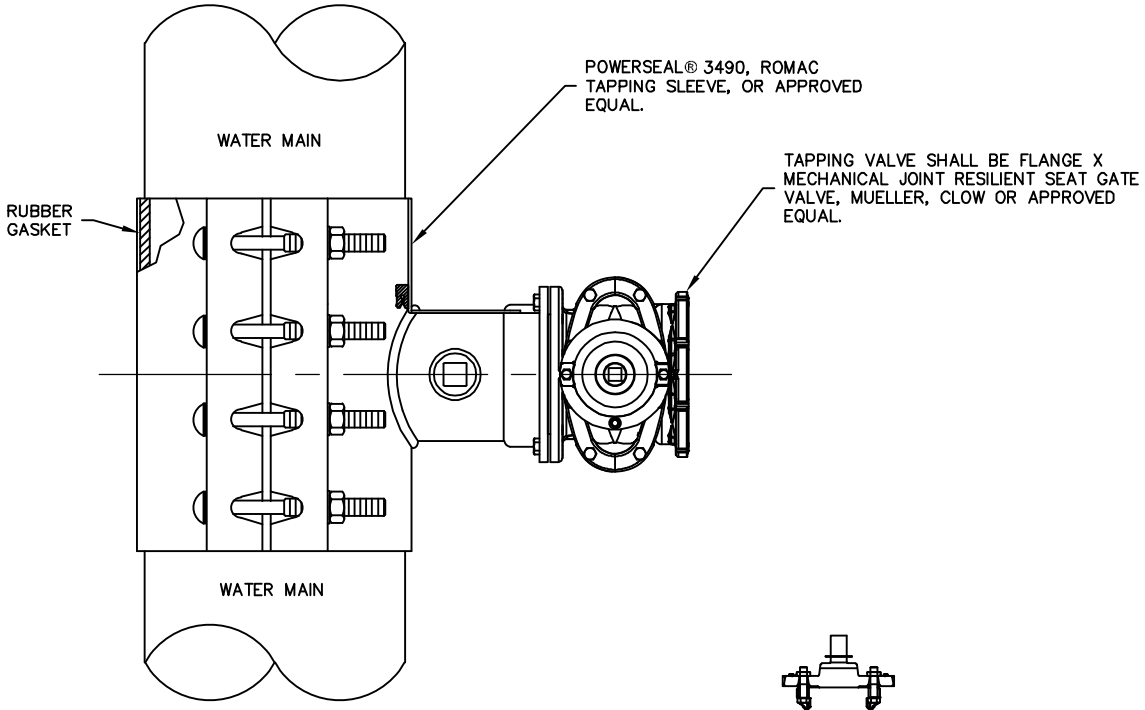
STD. DETAIL 2-03

NOTES

1. WHERE PIPE IS NOT LOCATED IN THE COUNTY, CITY OR STATE RIGHT OF WAY ASPHALT REPLACEMENT SHALL MATCH EXISTING PLUS 1 INCH, AND BASE REPLACEMENT SHALL MATCH EXISTING.
2. PIPE BEDDING AND TRENCH BACKFILL SHALL MEET THE REQUIREMENTS OF THE GWD TECHNICAL SPECIFICATIONS.
3. LOCATOR WIRE SHALL BE INSTALLED OVER ALL NON-METALLIC WATERLINES AND RECYCLED WATERLINES IN A CONTINUOUS STRAND, PLACED ON TOP OF PIPE, AND SECURED WITH TAPE.
4. GROUNDING RODS SHALL BE INSTALLED AT VALVES, TEES, CROSSES, DEAD ENDS, AND AT INTERVALS NOT GREATER THAN 500 FEET.
5. AT GROUNDING RODS, 2" OF INSULATION SHALL BE STRIPPED FROM LOCATOR WIRE AND WIRE SECURED TO GROUNDING ROD WITH 1/2" GROUND-ROD CLAMP.
6. VERTICAL TRENCH WALLS ARE REQUIRED WHEN NECESSARY TO PROTECT EXISTING STRUCTURES OR PARALLEL UTILITIES, MAINTAIN TRAFFIC OR MAINTAIN EXCAVATION WITHIN ALLOWED WORK AREA.
7. PROVIDE SHORING AS REQUIRED.
8. SLOPING TRENCH WALLS ARE ALLOWED FROM A DISTANCE EQUAL TO OUTSIDE DIAMETER OF PIPE ("OD") ABOVE THE TOP OF PIPE, EXCEPT FOR LOCATIONS WHERE NOTE 6 GOVERNS.
9. CONTRACTOR SHALL PROVIDE SAFE MEANS FOR CONDUCTING SOILS TESTS IN BEDDING AND BACKFILL BY GWD MATERIALS INSPECTOR.
10. GEOTEXTILE FILTER FABRIC SHALL BE TENCATE MIRAFI N-SERIES 160N OR APPROVED EQUIVALENT AND HAVE A MINIMUM OF 12" LAP AT ALL EDGES. CRUSHED ROCK BEDDING AND GEOTEXTILE WRAP AROUND CRUSHED BEDDING CAN BE EXCLUDED IF ALLOWED BY GEOTECHNICAL REPORT OR IF WAIVED IN WRITING BY THE DISTRICT.
11. UNLESS OTHERWISE SPECIFIED, MATERIAL SHALL BE PER GWD TECHNICAL SPECIFICATIONS.
12. IN AGRICULTURAL AND LANDSCAPED AREAS, TOP 3'-0" OF TRENCH BACKFILL MATERIAL SHALL BE STOCKPILED TOPSOIL MATERIAL COMPACTED TO 80% RELATIVE DENSITY.
13. ROADS, DRIVEWAYS AND WALKWAYS SHALL BE RESURFACED AS REQUIRED BY THE LOCAL AGENCY HAVING JURISDICTION AND BY THE SPECIFICATIONS.
14. CONTRACTOR TO VERIFY BACKFILL AND PAVEMENT REQUIREMENTS OF LOCAL AGENCY HAVING JURISDICTION. CONTRACTOR TO NOTIFY OWNER OF ANY REQUIRED DEVIATIONS FROM THIS STANDARD A MINIMUM OF TWO WEEKS PRIOR TO THE START OF WORK.
15. CONTRACTOR SHALL PROVIDE NECESSARY MEANS AND MEASURES TO AVOID FLOTATION AND MOVEMENT OF PIPE.

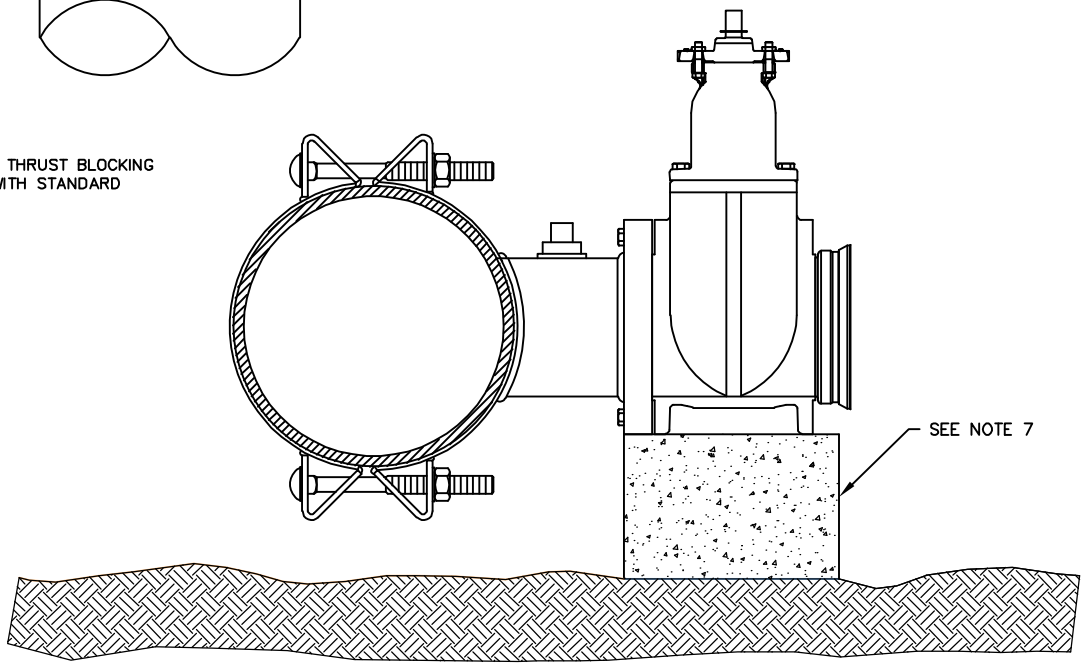
TRENCH DIMENSION SCHEDULE		
NOMINAL PIPE SIZE	"W" MINIMUM	"W" MAXIMUM
SMALLER THAN 12"	6"	12"
12" TO 24"	8"	18"
GREATER THAN 24"	12"	24"

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 2-03
Daniel J. Brooks	01/03/2023	TYPICAL PIPE TRENCH SECTION	
ENGINEERING & INFRASTRUCTURE MANAGER	DATE		2 OF 2



NOTE:

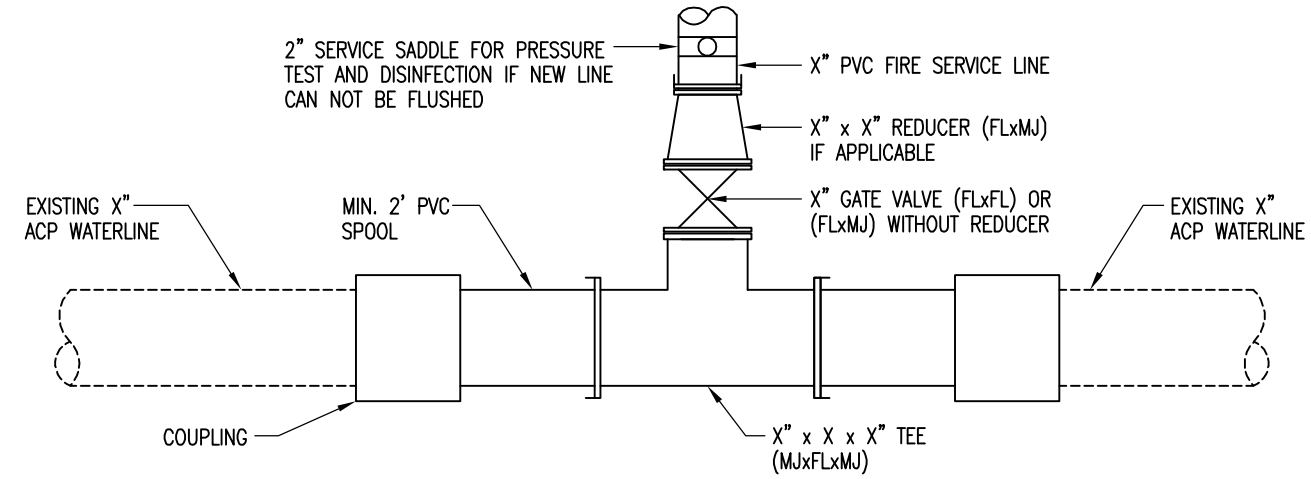
PROVIDE CONCRETE THRUST BLOCKING IN CONFORMANCE WITH STANDARD DETAIL NO. 3–09.



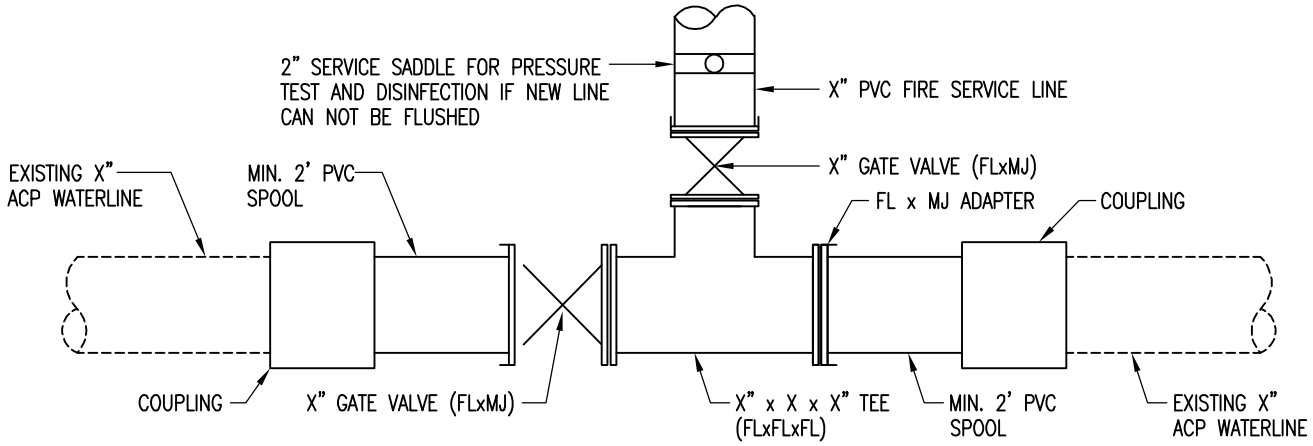
NOTES:

1. TAPPING SLEEVE SHALL BE CONSTRUCTED OF 304 STAINLESS STEEL AND SHALL BE FULLY PASSIVATED TO RETURN WELDED STAINLESS STEEL TO ITS ORIGINAL STATE.
2. RUBBER GASKET SHALL BE A 360° COMPLETE FULL CIRCLE. DO NOT USE GREASE OR PIPE LUBRICATES ON GASKET.
3. BRANCH SHALL BE A MINIMUM 3/8" LARGER THAN NORMAL TO ALLOW FOR FULL SIZE CUTTER HEAD.
4. TAPPING SLEEVE SHALL BE SUPPLIED WITH FLANGE FACE ON BRANCH.
5. TAPPING SLEEVE SHALL HAVE A FLANGE FACE GASKET PERMANENTLY ATTACHED TO SLEEVE AT FACTORY.
6. LUGS SHALL BE STRUCTURALLY WELDED TO THE SHELL.
7. VALVE AND TAPPING EQUIPMENT SHALL BE SUPPORTED BY CONCRETE BLOCK DURING AND AFTER INSTALLATION.
8. THOROUGHLY CLEAN WATER MAIN WITH WIRE BRUSH PRIOR TO INSTALLATION OF TAPPING SLEEVE.
9. FLANGE FACE SHALL BE INSTALLED VERTICALLY TRUE AND PLUMB.
10. TAPPING SLEEVE SHALL NOT BE INSTALLED WITHIN 4 (FOUR) PIPE DIAMETERS OF AN EXISTING PIPE BELL UNLESS APPROVED OTHERWISE.
11. NEW CONNECTIONS MUST BE A MINIMUM OF 3 FEET FROM CENTER LINE OF OTHER VALVES OR FITTINGS.

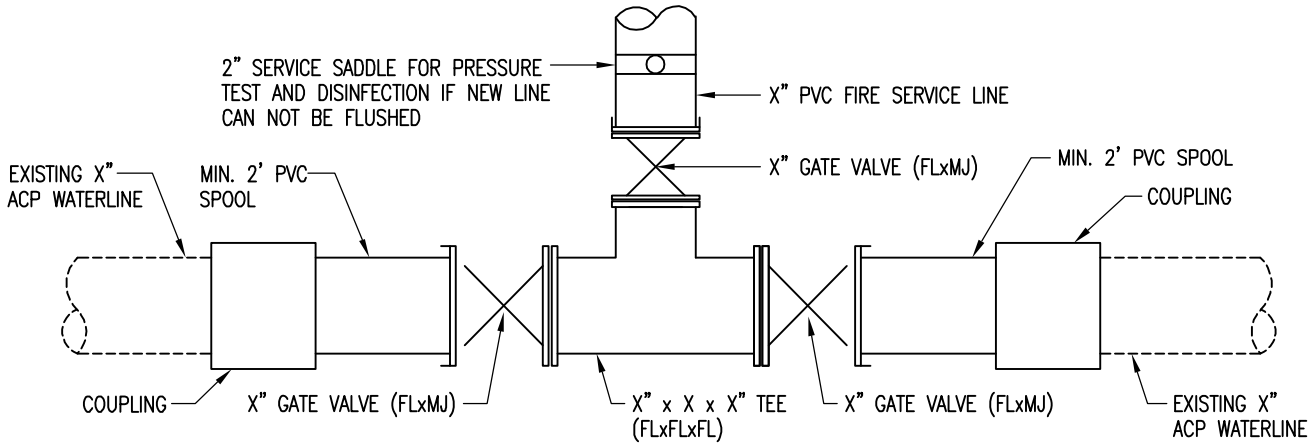
APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL
Daniel J. Brooks ENGINEERING & INFRASTRUCTURE MANAGER	DIRECT PIPELINE TAP	2–04
01/03/2023 DATE		



WITHOUT IN-LINE VALVE CONNECTION



WITH ONE (1) IN-LINE VALVE CONNECTION

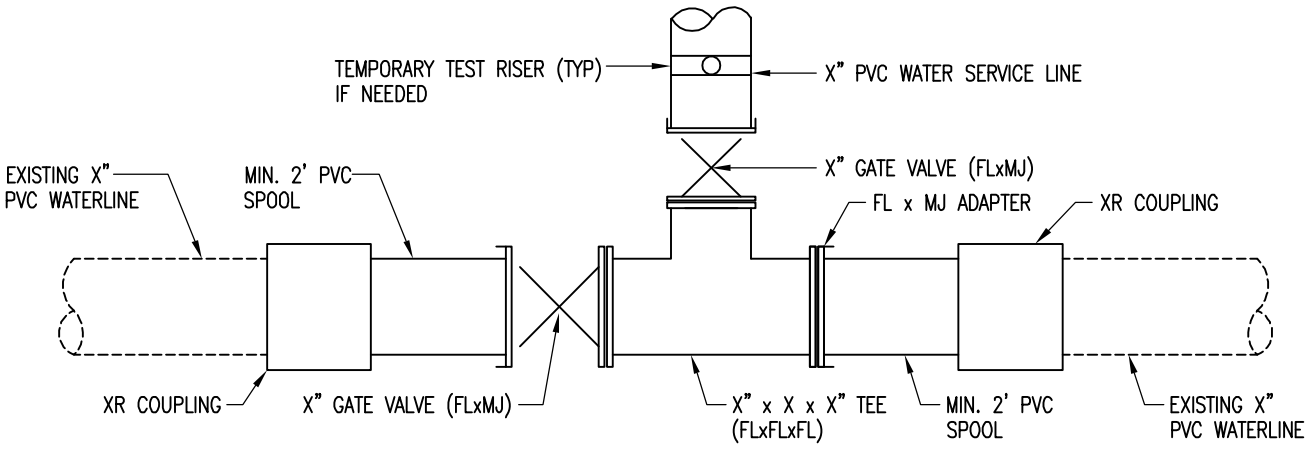


WITH TWO (2) IN-LINE VALVES CONNECTION

NOTE:

NEW COUPLING CONNECTIONS MUST BE A MINIMUM 2-FEET FROM ANY EXISTING ACP WATERLINE JOINT.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL
Daniel J. Brooks CHIEF ENGINEER 2/3/2020 DATE	CUT-IN CONNECTION DETAIL FOR ASBESTOS CEMENT (AC) PIPE	2-05



APPROVED:

Daniel J. Brooks

CHIEF ENGINEER

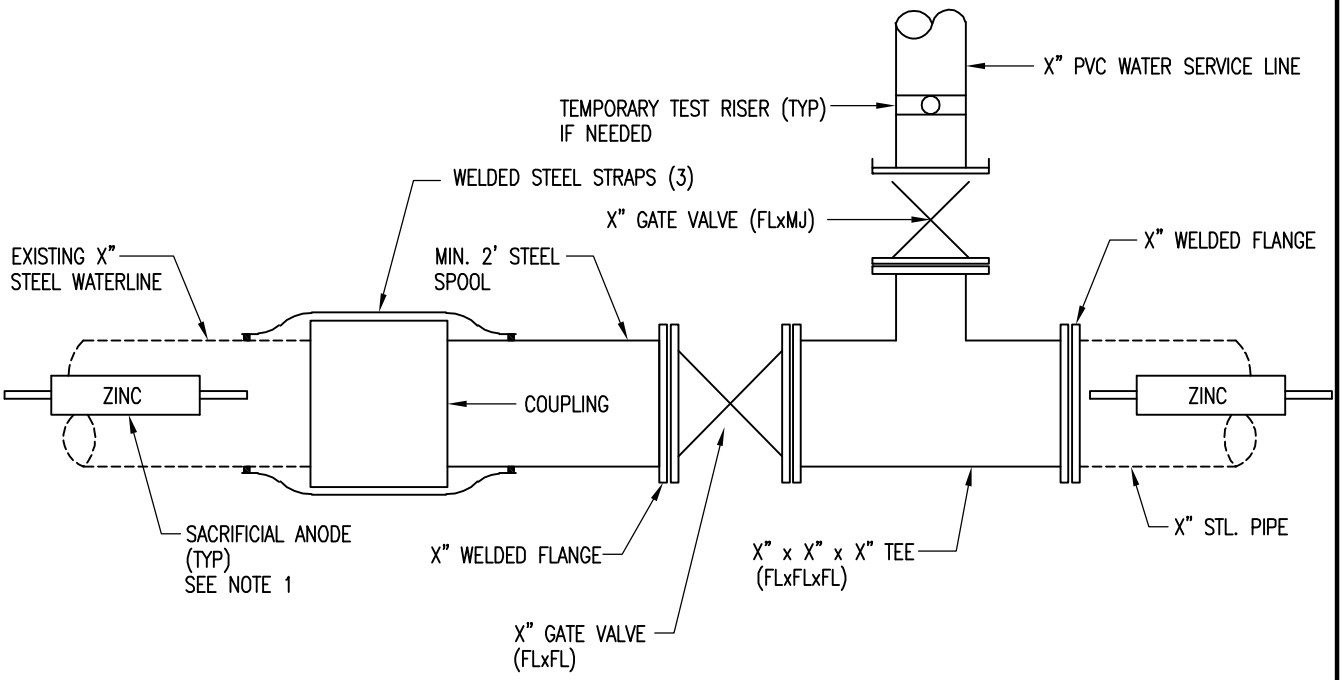
2/3/2020

DATE

GOLETA WATER DISTRICT

CUT–IN CONNECTION DETAIL FOR PVC PIPE

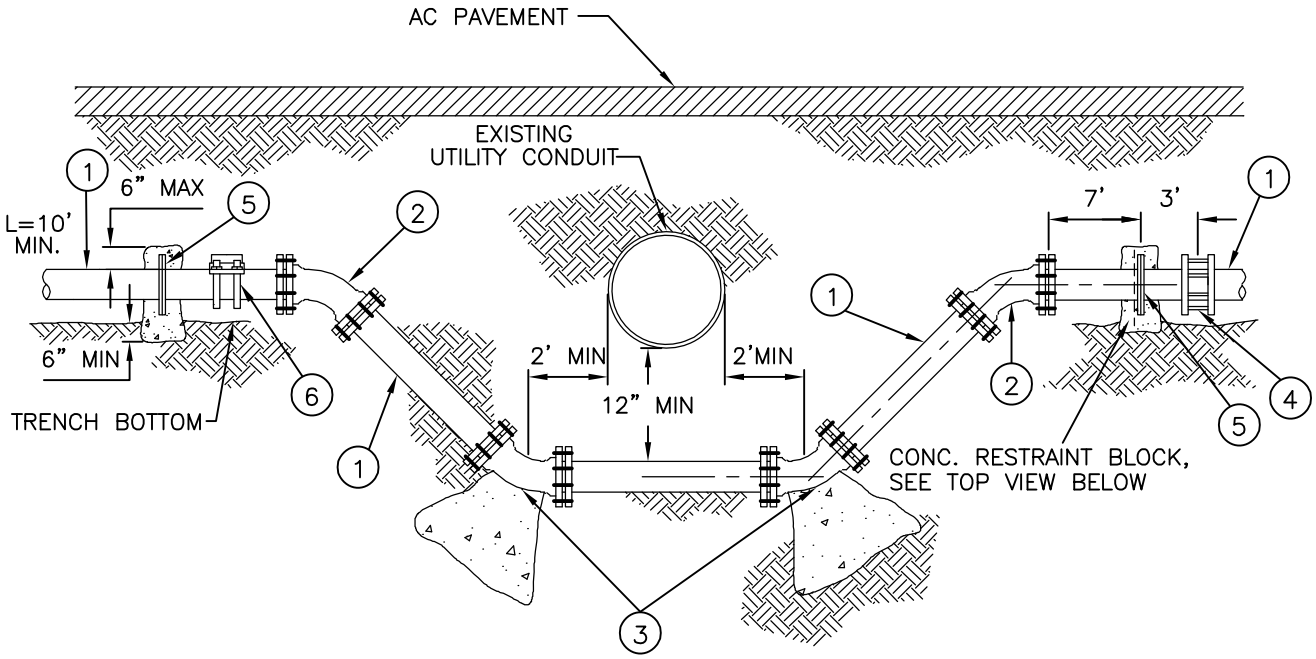
STD. DETAIL 2–06

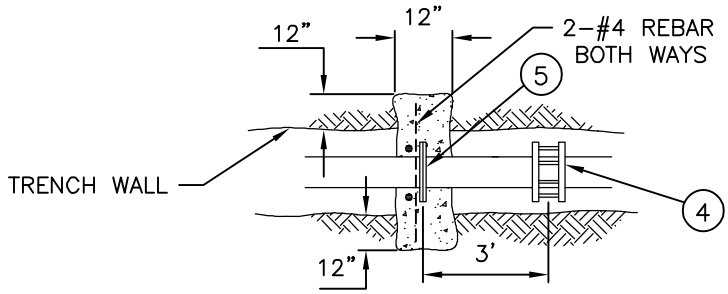


NOTE

1. SACRIFICIAL ANODE (CATHODIC PROTECTION) REQUIRED IF THERE IS ANY BREAK OR DISCONTINUITY IN STEEL PIPE.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL
Daniel J. Brooks CHIEF ENGINEER 2/3/2020 DATE	CUT–IN CONNECTION DETAIL FOR STEEL PIPE	2–07





RESTRAINT BLOCK/TOP VIEW

ITEM	QTY.	DESCRIPTION
1	VAR	CL 305 PVC PIPE, AWWA C900 (LENGTH AS SHOWN OR AS REQUIRED)
2	2	45 DEGREE DIP BEND, MJ WITH RETAINER GLANDS
3	2	45 DEGREE DIP BEND, MJ WITH RETAINER GLANDS AND/OR STANDARD THRUST BLOCK WITH DISTRICT APPROVAL
4	VAR	FLEXIBLE COUPLING (IF NECESSARY)
5	2	MJ RETAINER GLAND WITH CONCRETE RESTRAINT BLOCK
6	1	SERVICE SADDLE (SEE NOTE 3)

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. THE RESTRAINT BLOCKS SHALL BE A MINIMUM OF 24" IN HEIGHT AND 12 " THICK. THE TOP OF THE BLOCK SHALL BE NO MORE THAN 6" ABOVE THE TOP OF THE PIPE. CONCRETE THRUST BLOCKS SHALL BE CONSTRUCTED IN CONFORMANCE WITH STANDARD DETAIL NO. 3-09.
3. SERVICE SADDLE SHALL BE INSTALLED ON THE HIGH POINT OF THE OFFSET 2' FROM THE NEAREST FITTING, FOR THE INSTALLATION OF COMBINATION AIR VALVE SPECIFIED ON THE PLAN. CAV SHALL BE 1" ON 8" AND SMALLER MAINS AND 2" ON LARGER MAINS.
4. USE AWWA STANDARD C-153 DUCTILE IRON FITTINGS FOR ALL MECHANICAL JOINT FITTINGS.
5. DUCTILE OFFSET FITTINGS ARE AN ACCEPTABLE SUBSTITUTION.

APPROVED:

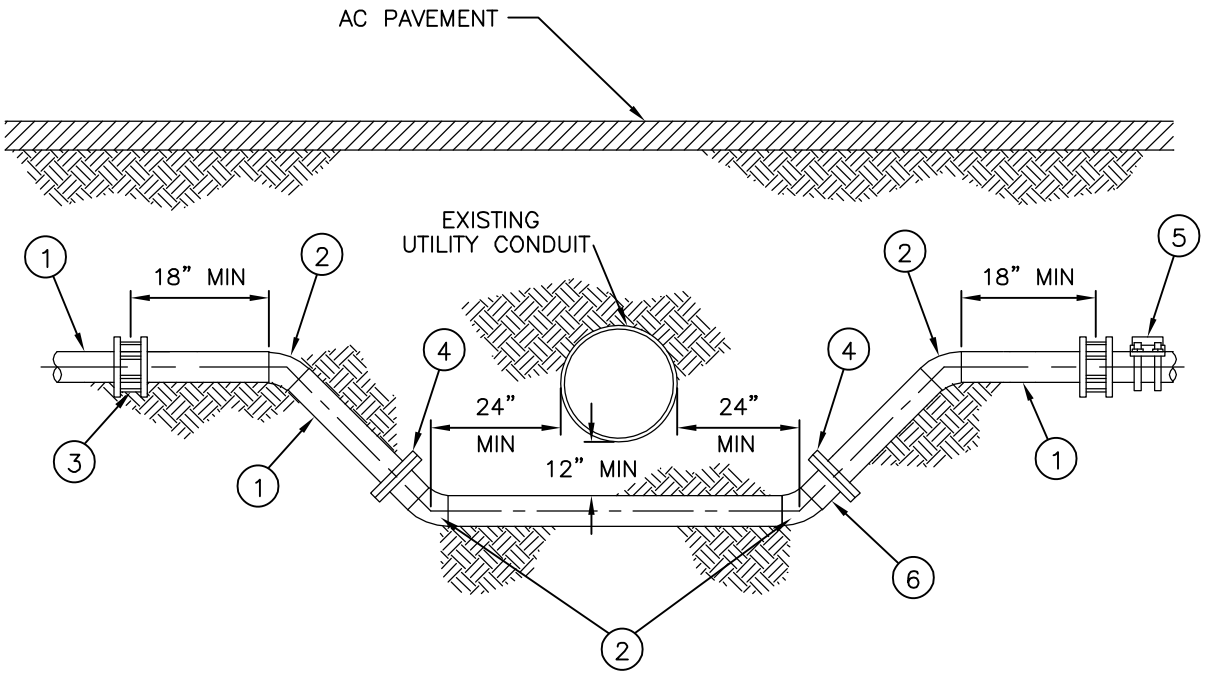
Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

VERTICAL OFFSET FOR PVC PIPE

STD. DETAIL 2-08

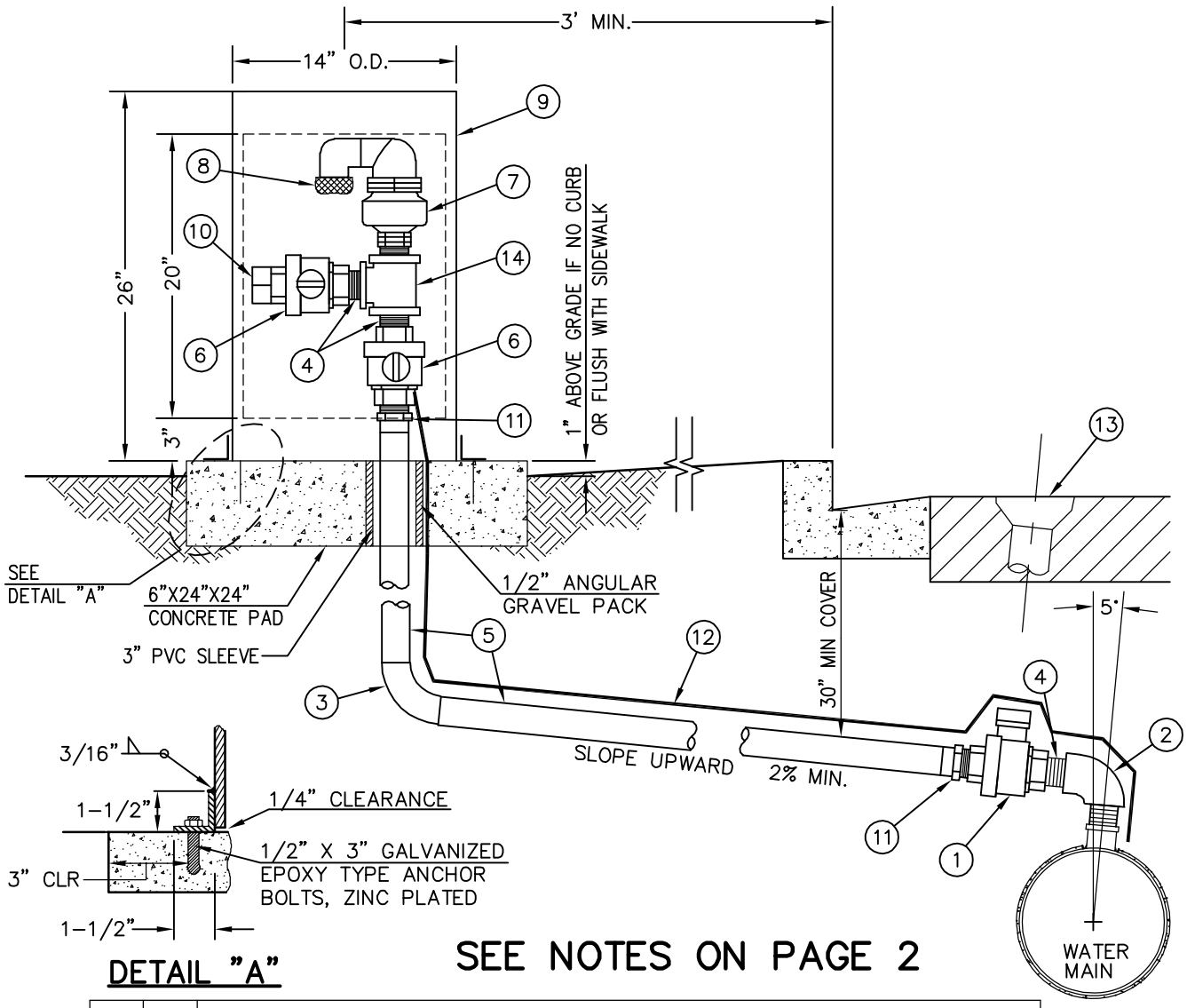


ITEM	QTY.	DESCRIPTION
1	VAR	CML&W STEEL PIPE, PE X PE (LENGTH AS SHOWN OR AS REQUIRED)
2	4	45 DEGREE LR WELDED BEND
3	VAR	FLEXIBLE COUPLING (IF NECESSARY)
4	2	SLIP ON WELD FLANGE
5	1	SERVICE SADDLE (SEE NOTE # 4)
6	2	CML&W STEEL PIPE, FL X PE (LENGTH = 6")

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. PIPE AND FITTINGS SHALL BE MINIMUM 10 GAUGE STANDARD STEEL, MORTAR LINED AND WRAPPED. ALL INVERTS SHALL BE SHOP FABRICATED WITH EXCEPTION OF FIELD INSTALLATION OF WELD ON FLANGES.
3. ALL WELDED JOINTS SHALL BE HAND COATED WITH MORTAR AFTER FABRICATION.
4. SERVICE SADDLE SHALL BE INSTALLED ON THE HIGH POINT OF THE OFFSET 2' FROM THE NEAREST FITTING, FOR THE INSTALLATION OF COMBINATION AIR VALVE SPECIFIED ON THE PLAN. CAV SHALL BE 1" ON 8" AND SMALLER MAINS AND 2" ON LARGER MAINS.
5. ELECTRICALLY BOND ACROSS NON WELDED JOINTS WITH #8 CABLE, THERMITE WELDED EACH END.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL
Daniel J. Brooks CHIEF ENGINEER 2/3/2020 DATE	VERTICAL OFFSET FOR STEEL PIPE	2-09



DETAIL "A"

SEE NOTES ON PAGE 2

ITEM	QTY.	DESCRIPTION
1	1	2" BALL VALVE, FIP THREAD X FIP THREAD, (WITH HANDLE ABOVE GROUND) FROM DISTRICT APPROVED MATERIALS LIST
2	1	2" BRASS 90° ELBOW, MIP THREAD X FIP THREAD
3	1	2" COPPER 90 DEGREE ELBOW, SILVER SOLDERED
4	3	2" X CLOSE BRASS NIPPLE
5	VAR	2" TYPE K COPPER TUBING, HARD TEMPERED, WITH MIP ADAPTER
6	2	2" BALL VALVE, FIP THREAD X FIP THREAD (WITH HANDLE)
7	1	2" COMBINATION AIR VALVE
8	1	INSECT SCREEN
9	1	14" OD, 10 GAUGE STEEL PIPE, FABRICATED COVER, GALVANIZED OR OTHER APPROVED PROTECTIVE COATING
10	1	2" THREADED BRASS PLUG
11	2	2" MALE ADAPTOR, SILVER SOLDERED
12	VAR	12 GAUGE INSULATED SOFT COPPER LOCATING WIRE FROM MAIN TAPED TO SERVICE LINE
13	1	ADJUSTABLE VALVE CAN PER STANDARD DETAIL 3-07
14	1	2" BRASS TEE, FIP

APPROVED:

Daniel J. Brooks
CHIEF ENGINEER

5/14/2020
DATE

GOLETA WATER DISTRICT

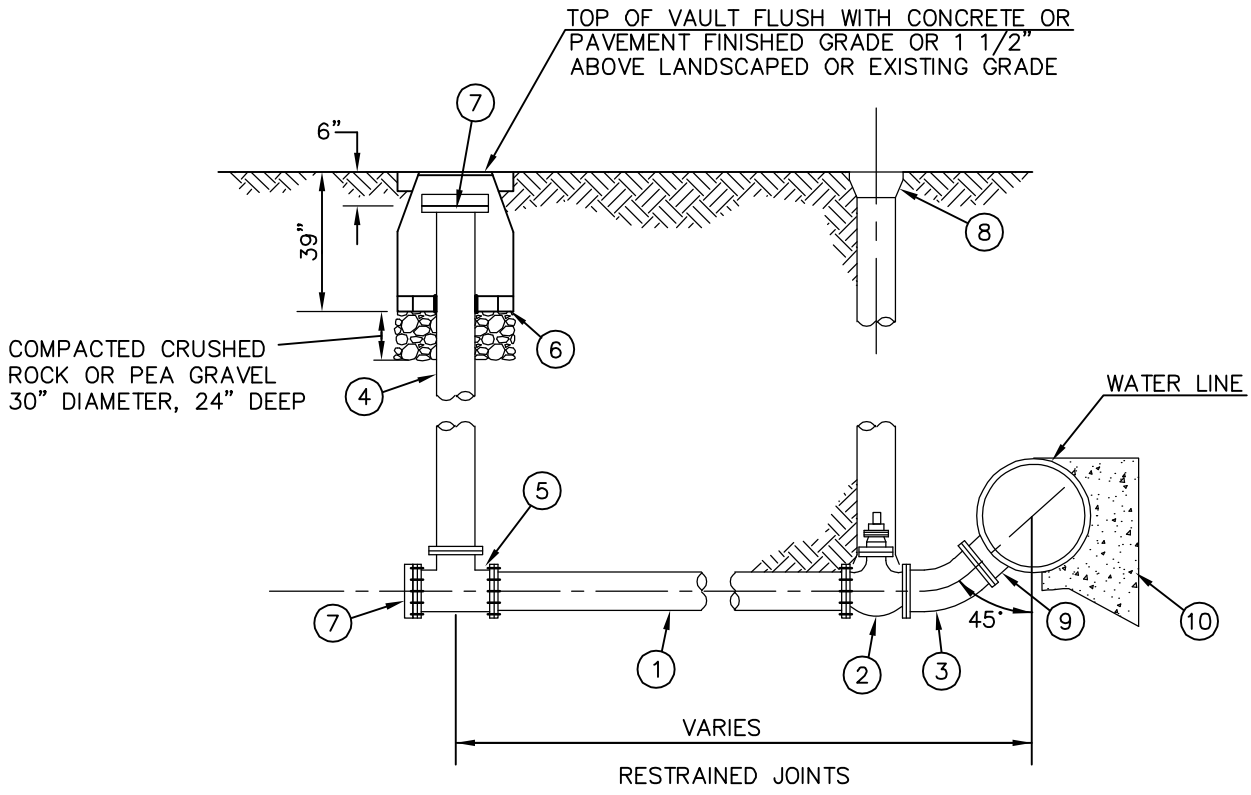
1" & 2" COMBINATION AIR VALVE

STD. DETAIL 2-10

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. THIS DETAIL APPLIES TO PIPELINES SIZES 10"–16" AND MAY BE MODIFIED FOR THE INSTALLATION OF 1" COMBINATION VALVES ON 6" AND 8" DIA. PIPELINES AS FOLLOWS: ITEMS 1–7, 10, 11 AND 14 ON PAGE 1 SHALL BE 1" AND ITEM 4 SHALL BE A 1" GALVANIZED STEEL NIPPLE WITH 2" NYLON BUSHING. VALVE CAN AND CONCRETE PAD MAY BE REDUCED IN SIZE ACCORDINGLY.
3. EXPOSED PIPING, AIR VALVE, AIR VALVE COVER SHALL BE PAINTED PER GWD TECHNICAL SPECIFICATION 09800 – PROTECTIVE COATINGS.
4. DRILL 2 ROWS OF 1/2" DIAMETER HOLES NEAR TOP OF COVER. TWELVE EVENLY SPACED HOLES SHALL BE DRILLED PER ROW.
5. WELD 3" x 1 1/2" x 1 1/2" x 3/16" BRACKET TO COVER IN 4 LOCATIONS.
6. DOOR SHALL BE ORIENTED TO FACE STREET.
7. CALCULATIONS PREPARED BY A REGISTERED ENGINEER SHALL BE PROVIDED FOR COMBINATION AIR VALVE SIZING FOR PIPELINES 16" DIAMETER AND LARGER.
8. CAV SHALL BE LOCATED 5' CLEAR OF EASEMENT AND R/W LINES AND ALL ABOVE–GROUND OBSTRUCTIONS SUCH AS UTILITY POLES, SIGNS, ETC.
9. COMBINED 2" CAV/END DRAIN SHALL BE USED AT DEAD END HIGH POINTS.
10. CAV SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.
11. CONCRETE SHALL HAVE A 28–DAY COMPRESSIVE STRENGTH OF 2,500 PSI.

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 2–10
Daniel J. Brooks CHIEF ENGINEER	2/3/2020 DATE	1" & 2" COMBINATION AIR VALVE	2 OF 2



ITEM	QTY.	DESCRIPTION
1	VAR	DIP, DIAMETER AS INDICATED AT RIGHT
2	1	GATE VALVE, MJ X FL WITH RETAINER GLAND, SIZE AS INDICATED AT RIGHT, 6" MIN.
3	1	45 DEGREE DIP BEND, FL X FL
4	VAR	DIP SPOOL, FL X FL, DIAMETER AS INDICATED AT RIGHT
5	1	TEE, MJ X FL WITH RETAINER GLAND, SIZE AS INDICATED AT RIGHT
6	1	30" TO 36" DIAMETER CIRCULAR VAULT WITH REINFORCED POLYMER COVER MARKED "BLOW OFF"
7	1	BLIND FLANGE, FASTENED WITH STAINLESS STEEL BOLTS & NUTS
8	1	ADJUSTABLE VALVE CAN PER STD DETAIL 3-07
9	1	MJ X FL TEE FOR DI OR PVC MAIN, WELDED SADDLE WITH FLANGED OUTLET FOR STEEL MAIN
10	1	CONCRETE THRUST BLOCK CONSTRUCTED PER STANDARD DETAIL 3-09

PIPELINE SIZE (IN)	BLOW OFF SIZE (IN)
6"–12"	6"
14"–22"	8"

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. SPECIAL DESIGN OF BLOW OFF ASSEMBLIES SHALL BE REQUIRED FOR PIPELINES 24" AND LARGER IN DIAMETER.
3. ALL EXPOSED PIPING SHALL BE FIELD PAINTED PER GWD TECHNICAL SPECIFICATION 09800 – PROTECTIVE COATINGS.
4. FOR RECYCLED WATER BLOW OFFS, THE LID OF VAULT SHALL BE PURPLE AND LABELED "R.W. BLOW OFF".
5. FOR RECYCLED WATER BLOW OFFS, BLIND FLANGE SHALL BE PAINTED PURPLE.
6. WHEN POSSIBLE, FIRE HYDRANTS SHALL BE INSTALLED INSTEAD OF BLOW OFFS.
7. BLOW OFFS SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.

APPROVED:

Daniel J. Brooks

ENGINEERING & INFRASTRUCTURE MANAGER

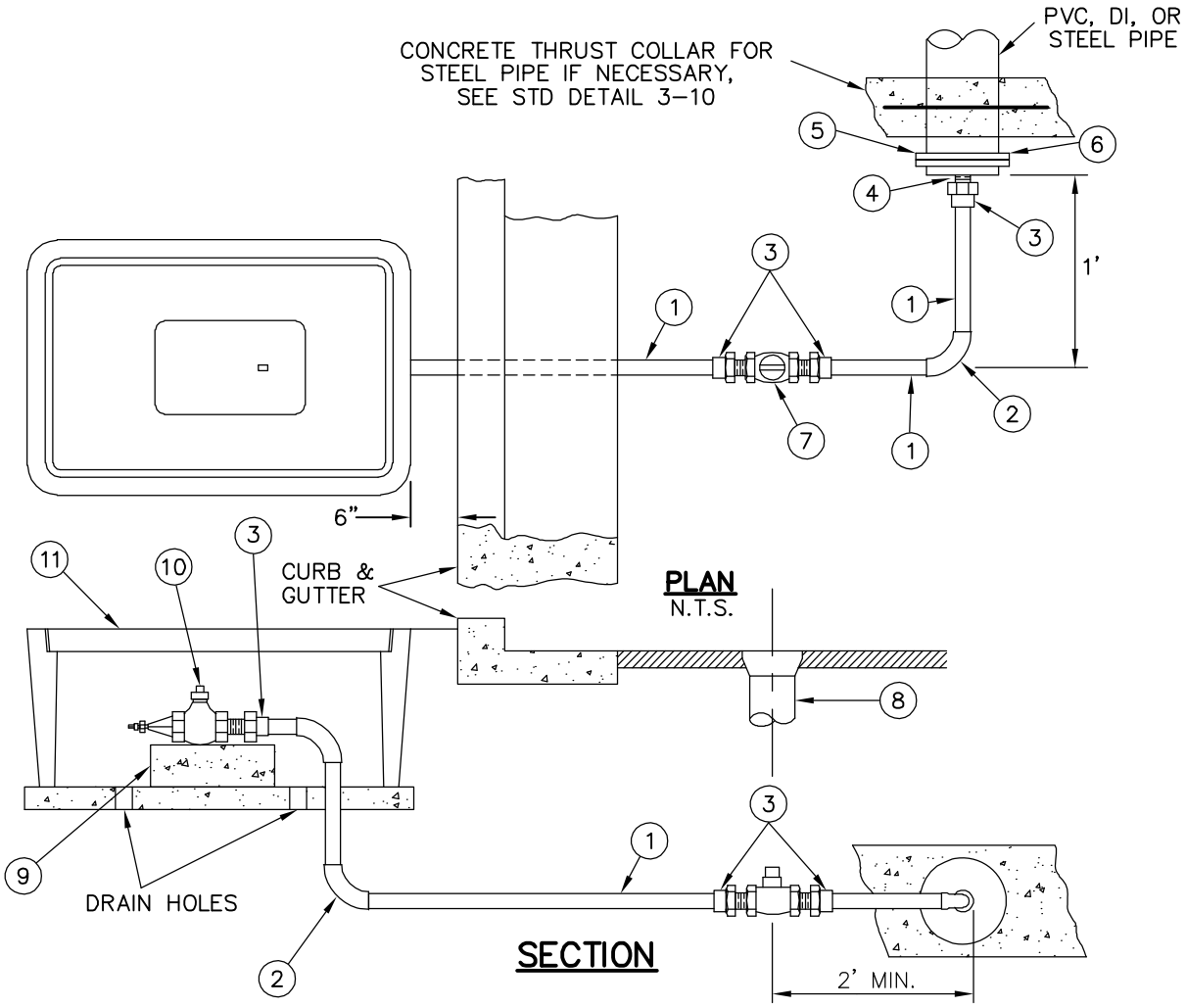
01/03/2023

DATE

GOLETA WATER DISTRICT

6" & 8" BLOW OFF ASSEMBLY

STD. DETAIL 2-11



ITEM	QTY.	DESCRIPTION
1	VAR	2" TYPE K COPPER TUBING, HARD TEMPERED
2	3	2" COPPER 90° ELBOW, SILVER SOLDERED
3	2	2" CU x MIP ADAPTER, SILVER SOLDERED
4	1	2 1/2" x 2" NYLON BUSHING
5	1	USE MJ CAP AND RETAINER GLANDS WITH 2 1/2" IPT TAP FOR PVC OR DI PIPE
6	1	USE WELD–ON FLANGE AND BLIND FLANGE WITH 2 1/2" IPT TAP FOR STEEL PIPE
7	1	2" BALL VALVE METER STOP, FIP THREAD X FIP THREAD
8	1	ADJUSTABLE VALVE CAN PER STD DETAIL 3–07
9	1	CONCRETE SUPPORT BLOCK, HEIGHT AS NECESSARY
10	1	WHARF HEAD, 2" IP THD x 2 1/2" NSH THD
11	1	METER BOX INSTALLED PER STD DETAIL 3–05

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. SIZE VALVE AND APPURTENANCES AS SHOWN ON PROJECT PLANS.
3. PIPE THREADS SHALL BE CLEAN AND SHARP AND WATER TIGHT SEALED WITH APPROVED JOINT COMPOUND.
4. END DRAINS SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.

APPROVED:

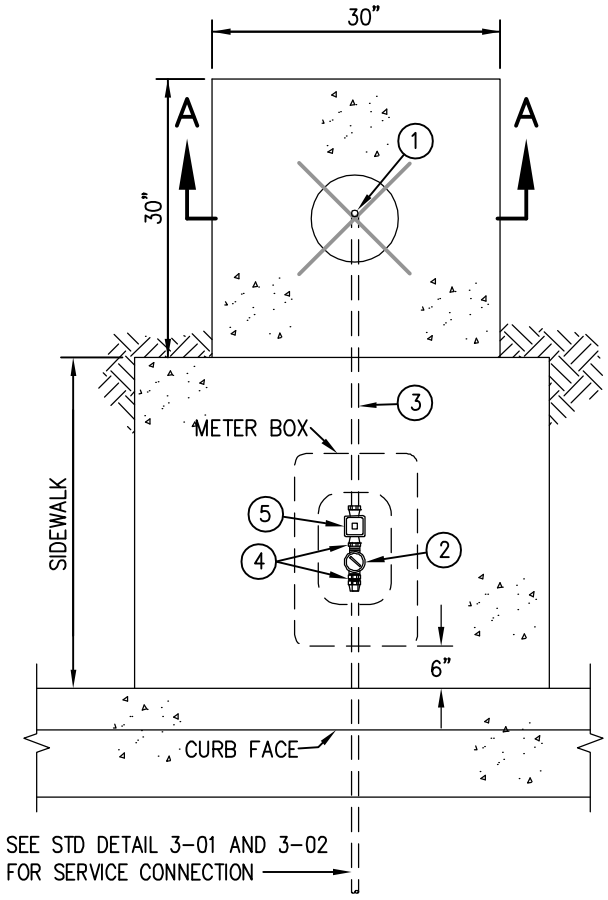
Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

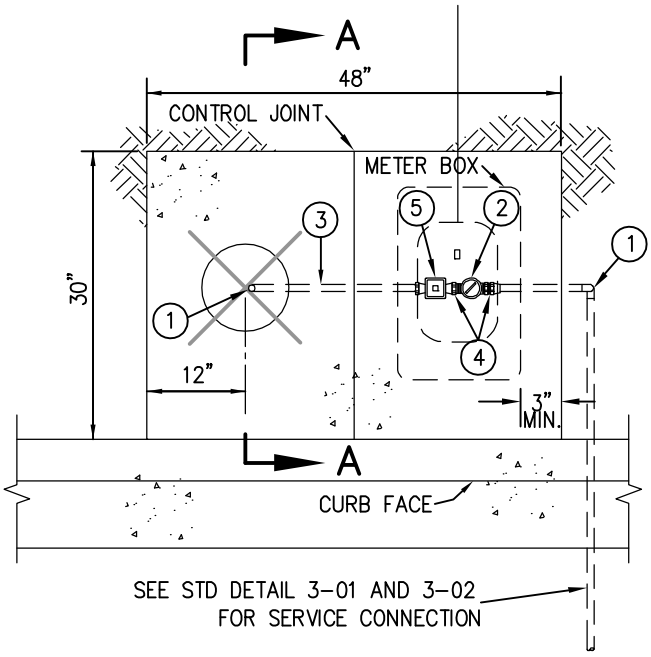
END DRAIN ASSEMBLY

STD. DETAIL 2–12



STANDARD INSTALLATION LAYOUT

NTS



ALTERNATE LAYOUT

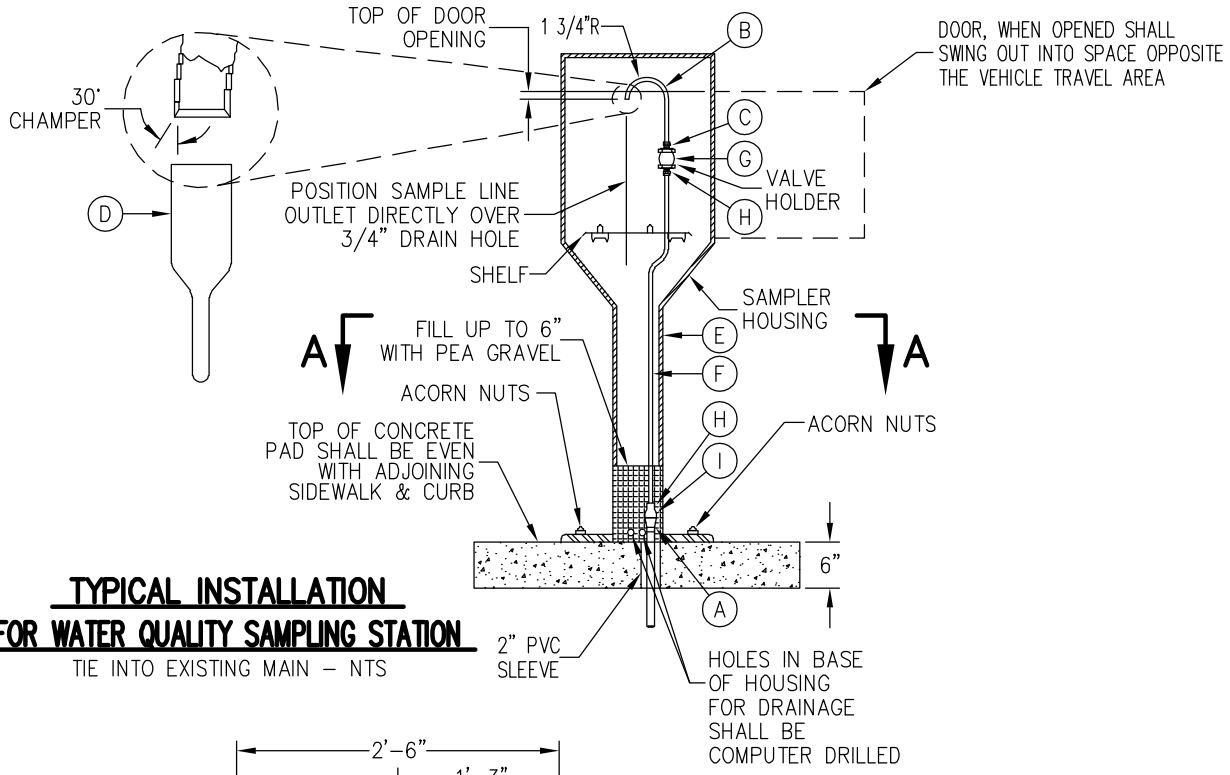
NTS

ITEM	QTY.	DESCRIPTION
1	1 OR 2	1" COPPER ELBOW, SILVER SOLDER
2	1	1" ANGLED BALL METER STOP WITH 360° TEE HEAD ROTATION, FLARED x SWIVEL METER COUPLING NUT
3	VAR	1" TYPE K SOFT COPPER TUBING, WITH SLIP X THREADED ADAPTERS
4	2	1" CU X MIP ADAPTER, SILVER SOLDER
5	1	ADD 3/4" METER TO BE SPECIFIED BY DISTRICT

NOTES

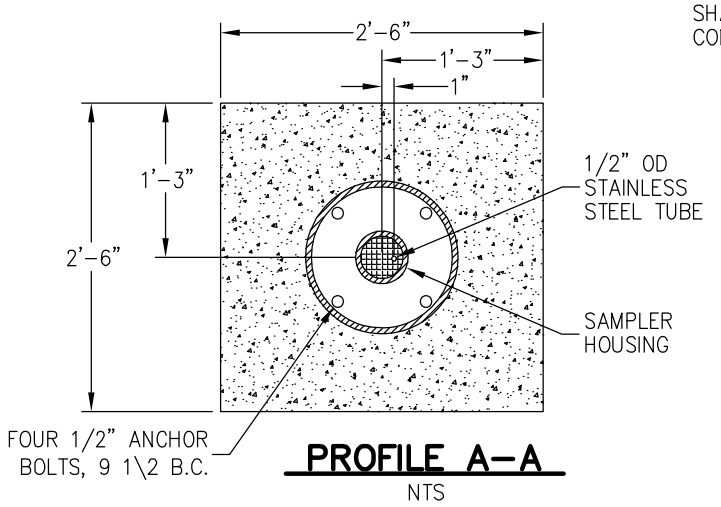
1. NO SAMPLE STATIONS SHALL BE INSTALLED BEYOND THE LIMITS OF THE PUBLIC RIGHT OF WAY WITHOUT A GWD EASEMENT.
2. STANDARD INSTALLATION LAYOUT SHALL BE USED IN AREAS WITH SIDEWALK WHERE SUFFICIENT R/W EXISTS.
3. WATER SAMPLING STATIONS SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.
4. DOOR SHALL BE MARKED "GOLETA WATER DISTRICT".

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL 2-13
Daniel J. Brooks CHIEF ENGINEER	WATER SAMPLING STATION	
4/2/2020 DATE		1 OF 2



TYPICAL INSTALLATION FOR WATER QUALITY SAMPLING STATION

TIE INTO EXISTING MAIN – NTS



PROFILE A–A

NTS

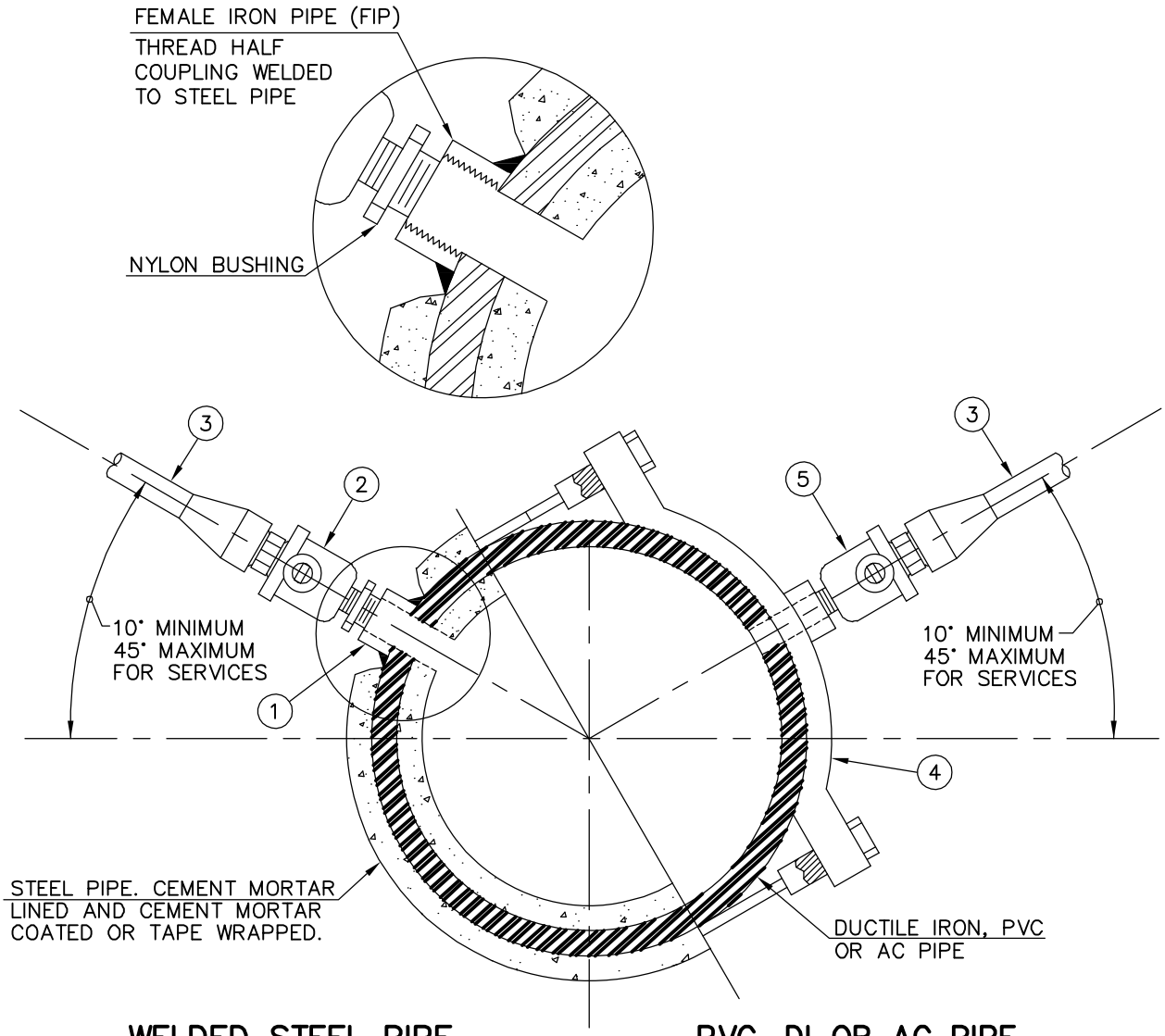
ITEM	QTY.	PARTS LIST
A	1	1" STRAIGHT COUPLING, FIP X PE–IPS, LEAD FREE, MUELLER H–15456N, FORD C16–44NL, A.Y. MCDONALD 74754–33
B	1	1/4" OD 304 STAINLESS STEEL TUBE, GRAINGER COIL–TUBING 3ADC8 (OR APPROVED EQUAL)
C	1	1/2" X 1/4" REDUCER, MPT X CTS COMPRESSION FITTING
D	1	VINYL CAP, MCMASTER–CARR #9531K21 (OR APPROVED EQUAL)

WATER QUALITY SAMPLING STATION ASSEMBLY SUPPLIED BY STEEL SOURCE CONSTRUCTION MODEL SDMX–H FBE (1001) W PLUS 10" WITH OVERALL HEIGHT OF 56" WITH COPPER/LEAD–FREE BRASS PLUMBING PACKAGE		
ITEM	QTY.	DESCRIPTION
E	1	STAINLESS STEEL HOUSING, 4" DIAMETER
F	1	1/2" OD COPPER TUBE
G	1	1/2" LEAD–FREE BRASS BALL VALVE, FPT
H	2	1/2" LEAD–FREE BRASS COMPRESSION FITTING X MPT
I	1	1" X 1/2" REDUCER, MPT X FPT, LEAD FREE

NOTE

1. ALL PIPE FITTINGS IN CONTACT WITH POTABLE WATER SHALL BE LEAD FREE AND COMPLIANT TO NSF–61/SECTION 8.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL 2–13
Daniel J. Brooks ENGINEERING & INFRASTRUCTURE MANAGER	01/03/2023 DATE	WATER SAMPLING STATION	2 OF 2



WELDED STEEL PIPE **PVC, DI OR AC PIPE**

ITEM	QTY.	DESCRIPTION
1	1	EXTRA–HEAVY THREADED HALF COUPLING WELDED TO STEEL WATERLINE WITH NYLON BUSHING.
2	1	CORPORATION STOP WITH MALE IRON PIPE (MIP) THREAD INLET WITH NYLON BUSHING AND FLARED OUTLET. ALL THREADED JOINTS SHALL INCLUDE JOINT COMPOUND.
3	VARIES AS REQ'D.	TYPE "K" SOFT COPPER TUBING. 2" PIPE SHALL BE HARD COPPER.
4	1	BRONZE SERVICE SADDLE WITH FIP THREAD. STRAP SHALL BE USED FOR AC PIPE.
5	1	CORPORATION STOP WITH MIP THREADED INLET AND FLARED OUTLET. ALL THREAD JOINTS SHALL INCLUDE JOINT COMPOUND. OPERATING VALVE SHALL FACE UPWARD.

NOTE

1. SEE GWD APPROVED MATERIALS LIST.
2. SERVICE AND OTHER TAPS SHALL NOT BE MADE CLOSER THAN 2 FEET TO THE EDGE OF A BELL, COUPLING, JOINT, FITTING, OR OTHER SERVICE.
3. CEMENT MORTAR COATING SHALL BE PATCHED AFTER HALF COUPLING IS WELDED TO STEEL PIPE.
4. BRASS AND COPPER COMPRESSION FITTINGS SHALL BE INSTALLED USING SMOOTH JAWED PIPE WRENCH. A PIPE WRENCH WITH SERRATED TEETH SHALL NOT BE USED.

APPROVED:

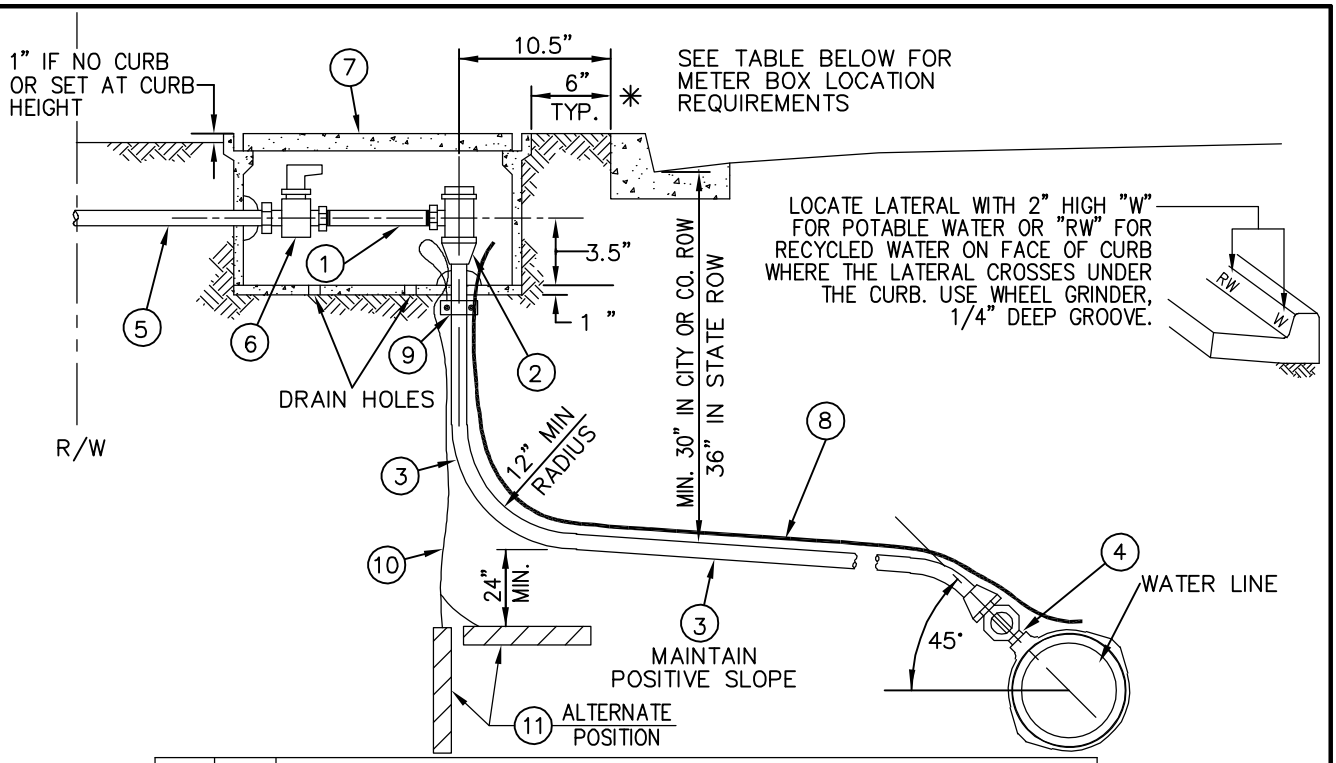
Daniel J. Brooks
CHIEF ENGINEER

6/30/2020
DATE

GOLETA WATER DISTRICT

2" AND SMALLER SERVICE CONNECTION

STD. DETAIL 3-01



ITEM	QTY.	DESCRIPTION
1	1	PVC JUMPER NIPPLE, (1" x 7 3/4" FOR 3/4" MTR) AND (1 1/4" x 11" FOR 1" MTR)
2	1	ANGLED BALL METER STOP WITH 360° TEE HEAD ROTATION, FLARED x SWIVEL METER COUPLING NUT
3	VAR	1" TYPE "K" SOFT COPPER TUBING
4	1	SERVICE CONNECTION INSTALLED PER STANDARD DETAIL 3-01
5	VAR	1" TYPE K COPPER TUBING HARD TEMPERED, OR 1" SCHEDULE 80 PVC, 10' LENGTH MINIMUM WITH MIP THREADED ADAPTER
6	1	CURB STOP – SWIVEL METER COUPLING NUT x FIP THREAD
7	1	METER BOX INSTALLED PER STD. DETAIL 3-05
8	1	INSULATED 12 GAGE SOFT COPPER LOCATOR WIRE FROM MAIN SHALL BE RUN TO INTERIOR OF METER BOX WITH MIN. 6" TAIL SECURED TO SERVICE LINE EVERY 8' MIN. WITH 10 MIL PIPE TAPE.
9	1	WIRE CLAMP, SEE NOTE 9.
10	1	AWG NO. 8 STRANDED COPPER ANODE LEAD WIRE, LEAVE 18" OF COILED WIRE IN METER BOX.
11	1	ZINC ANODE (SEE TABLE HEREON FOR SIZE OF ANODE) AND LEAD WIRE. ANODE TO BE PLACED VERTICALLY OR HORIZONTALLY AT A MIN. SEPARATION OF 24" FROM THE COPPER SERVICE.

METER BOX LOCATIONS		
CASE NO.	CONDITIONS	METER BOX LOCATION
*1	GRASS PARKWAY BETWEEN CURB AND SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)
2	SIDEWALK DIRECTLY BEHIND CURB AND R/W EXTENDS MIN. OF 4' BEHIND SIDEWALK.	DIRECTLY BEHIND SIDEWALK.
3	SIDEWALK DIRECTLY BEHIND CURB AND R/W ENDS NEAR BACK OF SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)

ZINC ANODE SIZES FOR COPPER SERVICES

COPPER PIPE LENGTH (FEET)	ZINC ANODE SIZE (INCHES)	ZINC ANODE WEIGHT (LBS)
0 TO 45	1.4 X 1.4 X 30	15
45 TO 90	2.0 X 2.0 X 30	30

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. PIPE THREADS SHALL BE CLEAN AND SHARP AND WATER TIGHT SEALED WITH APPROVED JOINT COMPOUND.
3. WHERE REQUIRED, CUSTOMER BALL VALVE SHALL BE UPSTREAM OF BACKFLOW PREVENTION DEVICE.
4. ALL COPPER TUBING SHALL BE LAID STRAIGHT AND AT RIGHT ANGLES TO THE WATER MAIN.
5. FOR SERVICE RUNS LONGER THAN 50', SERVICE LINE SIZE SHALL BE UPGRADED TO 1-1/2". REFER TO STANDARD DETAIL 3-03.
6. JUMPER NIPPLE SHALL BE ON CENTER WITH METER BOX READING LID.
7. METERS SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, ADA RAMPS, TOP OF "X", DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.
8. ATTACH THE SERVICE TRACING WIRE TO THE MAINLINE TRACER WIRE USING DISTRICT APPROVED GEL CAPS.
9. ANODE LEAD WIRE SHALL BE CLAMPED TO COPPER TUBING. CLAMP SHALL BE DIRECT BURIAL TYPE RED BRASS WITH BRASS SCREWS AND SHALL BE TESTED PER GWD. SEE TABLE HEREON FOR ZINC ANODE SIZES (SPLICES NOT ALLOWED).
10. BRASS AND COPPER COMPRESSION FITTINGS SHALL BE INSTALLED USING SMOOTH JAWED PIPE WRENCH. A PIPE WRENCH WITH SERRATED TEETH SHALL NOT BE USED.

APPROVED:

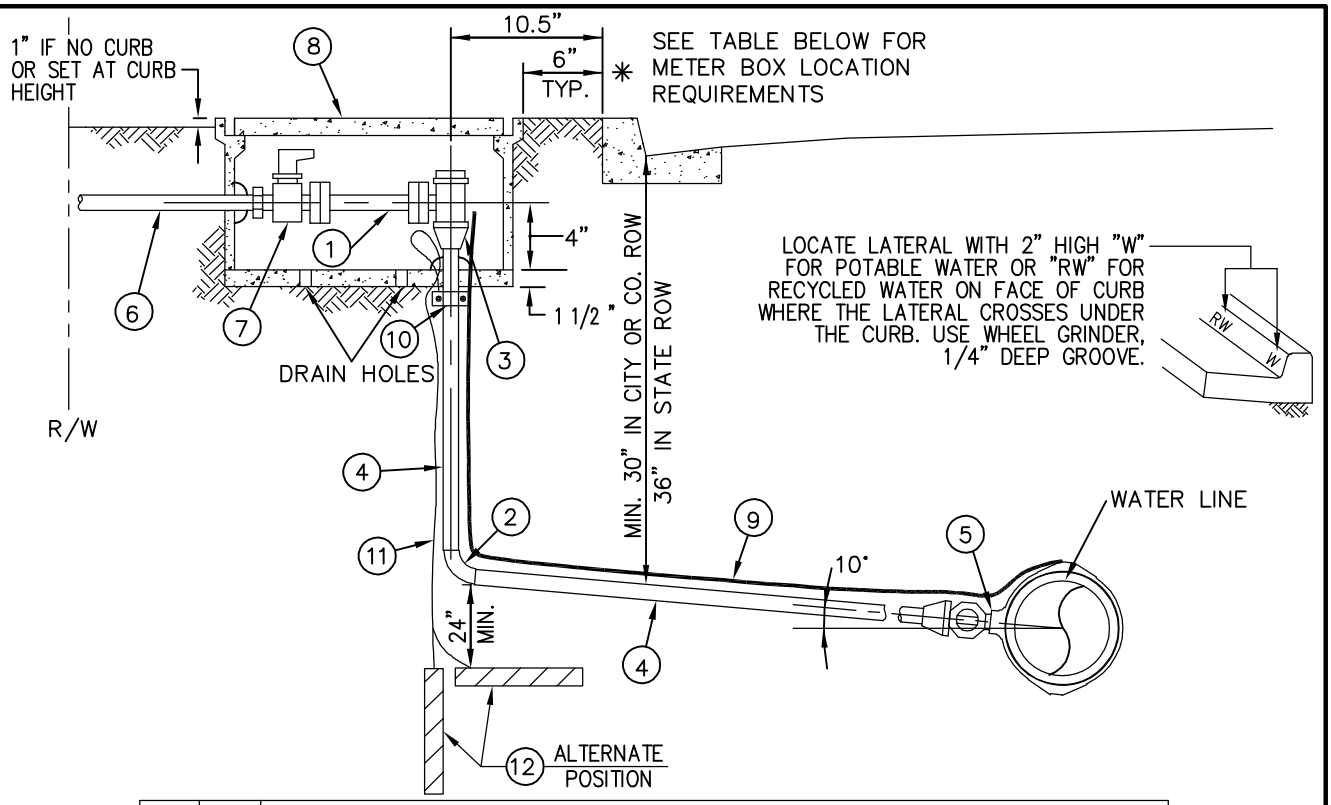
Daniel J. Brooks
CHIEF ENGINEER

6/30/2020
DATE

GOLETA WATER DISTRICT

1" WATER SERVICE (FOR 5/8", 3/4" & 1" METERS)

STD. DETAIL 3-02



ITEM	QTY.	DESCRIPTION
1	1	PVC JUMPER NIPPLE, (1-1/2" x 13-1/4" FOR 1-1/2" MTR) AND (2" x 17-1/4" FOR 2" MTR)
2	1	2" COPPER 90° ELBOW, SILVER SOLDERED
3	1	2" X 2" ANGLED BALL METER STOP WITH 360° TEE HEAD ROTATION, FLARED x METER FLANGE
4	VAR	2" TYPE K COPPER TUBING, HARD TEMPERED
5	1	SERVICE CONNECTION INSTALLED PER STD DETAIL 3-01
6	VAR	TYPE K COPPER TUBING, HARD TEMPERED, OR SCHEDULE 80 PVC, 10' LENGTH MINIMUM WITH MIP THREADED ADAPTER
7	1	1-1/2" OR 2" CURB STOP, METER FL x FIP THREAD
8	1	METER BOX INSTALLED PER STD. DETAIL 3-05
9	1	INSULATED 12 GAGE SOFT COPPER LOCATOR WIRE FROM MAIN SHALL BE RUN TO INTERIOR OF METER BOX WITH MIN. 6" TAIL SECURED TO SERVICE LINE EVERY 8' MIN. WITH 10 MIL PIPE TAPE.
10	1	WIRE CLAMP, SEE NOTE 9.
11	1	AWG NO. 8 STRANDED COPPER ANODE LEAD WIRE, LEAVE 18" OF COILED WIRE IN METER BOX.
12	1	ZINC ANODE (SEE TABLE HEREON FOR SIZE OF ANODE) AND LEAD WIRE. ANODE TO BE PLACED VERTICALLY OR HORIZONTALLY AT A MIN. SEPARATION OF 24" FROM THE COPPER SERVICE.

METER BOX LOCATIONS		
CASE NO.	CONDITIONS	METER BOX LOCATION
*1	GRASS PARKWAY BETWEEN CURB AND SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)
2	SIDEWALK DIRECTLY BEHIND CURB AND R/W EXTENDS MIN. OF 4' BEHIND SIDEWALK.	DIRECTLY BEHIND SIDEWALK.
3	SIDEWALK DIRECTLY BEHIND CURB AND R/W ENDS NEAR BACK OF SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)

ZINC ANODE SIZES FOR COPPER SERVICES

COPPER PIPE LENGTH (FEET)	ZINC ANODE SIZE (INCHES)	ZINC ANODE WEIGHT (LBS)
0 TO 45	1.4 X 1.4 X 30	15
45 TO 90	2.0 X 2.0 X 30	30

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. SIZE SERVICE AS INDICATED ON PROJECT PLANS.
3. PIPE THREADS SHALL BE CLEAN AND SHARP AND WATER TIGHT SEALED WITH APPROVED JOINT COMPOUND.
4. WHERE REQUIRED, CUSTOMER BALL VALVE SHALL BE UPSTREAM OF BACKFLOW PREVENTION DEVICE.
5. ALL COPPER TUBING SHALL BE LAID STRAIGHT AND AT RIGHT ANGLES TO THE WATER MAIN.
6. JUMPER NIPPLE SHALL BE ON CENTER WITH METER BOX READING LID.
7. METERS SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, ADA RAMPS, TOP OF "X", DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.
8. ATTACH THE SERVICE TRACING WIRE TO THE MAINLINE TRACER WIRE USING DISTRICT APPROVED GEL CAPS.
9. ANODE LEAD WIRE SHALL BE CLAMPED TO COPPER TUBING. CLAMP SHALL BE DIRECT BURIAL TYPE RED BRASS WITH BRASS SCREWS AND SHALL BE TESTED PER GWD. SEE TABLE HEREON FOR ZINC ANODE SIZES (SPLICES NOT ALLOWED).
10. BRASS AND COPPER COMPRESSION FITTINGS SHALL BE INSTALLED USING SMOOTH JAWED PIPE WRENCH. A PIPE WRENCH WITH SERRATED TEETH SHALL NOT BE USED.

APPROVED:

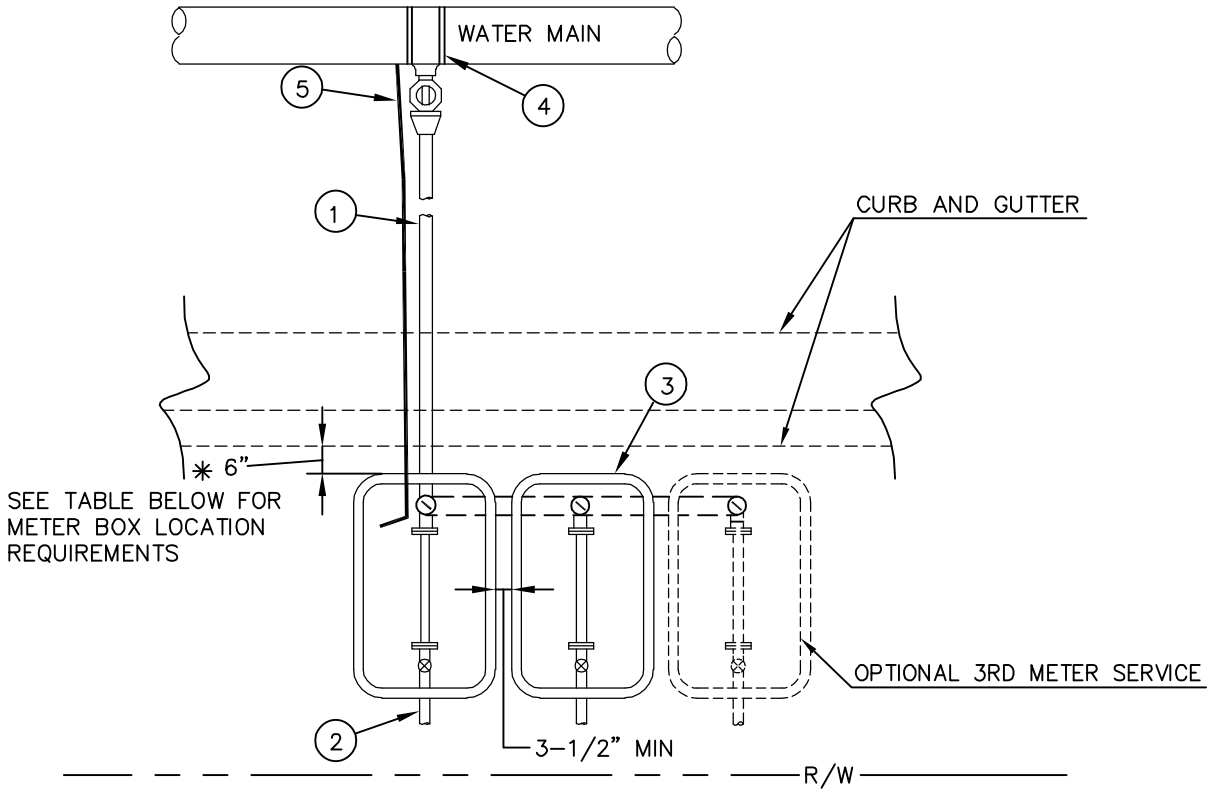
Daniel J. Brooks
CHIEF ENGINEER

6/30/2020
DATE

GOLETA WATER DISTRICT

2" WATER SERVICE

STD. DETAIL 3-03



ITEM	QTY.	DESCRIPTION
1	VAR	2" TYPE K SOFT COPPER TUBING
2	VAR	1" TYPE K SOFT COPPER TUBING (TYPICAL)
3	VAR	METER BOX INSTALLATION PER STD DETAIL 3-05
4	VAR	SERVICE CONNECTION INSTALLATION PER STD DETAIL 3-01
5	VAR	INSULATED 12 GAGE SOFT COPPER LOCATOR WIRE FROM MAIN SHALL BE RUN TO INTERIOR OF METER BOX WITH MIN. 6" TAIL SECURED TO SERVICE LINE EVERY 8' MIN. WITH 10 MIL PIPE TAPE.

METER BOX LOCATIONS		
CASE NO.	CONDITIONS	METER BOX LOCATION
*1	GRASS PARKWAY BETWEEN CURB AND SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)
2	SIDEWALK DIRECTLY BEHIND CURB AND R/W EXTENDS MIN. OF 4' BEHIND SIDEWALK.	DIRECTLY BEHIND SIDEWALK.
3	SIDEWALK DIRECTLY BEHIND CURB AND R/W ENDS NEAR BACK OF SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. SIZE SERVICE AS INDICATED ON PROJECT PLANS.
3. PIPE THREADS SHALL BE CLEAN AND SHARP AND WATER TIGHT SEALED WITH APPROVED JOINT COMPOUND.
4. CUSTOMER BALL VALVE SHALL BE IMMEDIATELY UPSTREAM OF BACK FLOW PREVENTER DEVICE.
5. ALL COPPER TUBING SHALL BE LAID STRAIGHT AND AT RIGHT ANGLES TO THE WATER MAIN.
6. JUMPER NIPPLE SHALL BE ON CENTER WITH METER BOX READING LID.
7. METERS SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, ADA RAMPS, TOP OF "X", DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.
8. ATTACH THE SERVICE TRACING WIRE TO THE MAINLINE TRACER WIRE USING DISTRICT APPROVED GEL CAPS.
9. SERVICE LINE MANIFOLD SHALL BE TEN FEET HORIZONTALLY CLEAR OF PARALLEL SEWER AND RECYCLED WATER PIPELINES.
10. BRASS AND COPPER COMPRESSION FITTINGS SHALL BE INSTALLED USING SMOOTH JAWED PIPE WRENCH. A PIPE WRENCH WITH SERRATED TEETH SHALL NOT BE USED.

APPROVED:

Daniel J. Brooks

CHIEF ENGINEER

6/23/2020

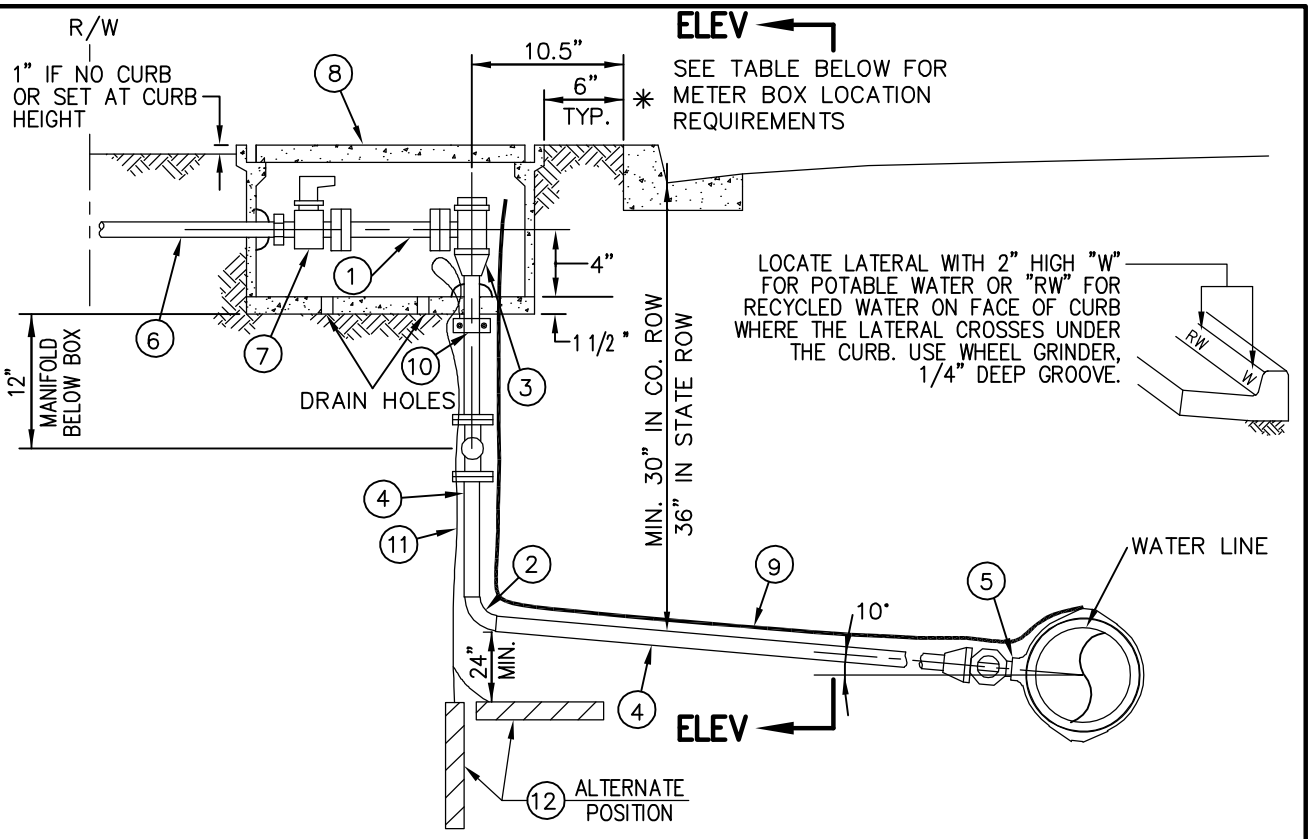
DATE

GOLETA WATER DISTRICT

WATER SERVICES WITH UP TO THREE METERS

STD. DETAIL 3-04

1 OF 3



ITEM	QTY.	DESCRIPTION
1	1	PVC JUMPER NIPPLE, (1-1/2" x 13-1/4" FOR 1-1/2" MTR) AND (2" x 17-1/4" FOR 2" MTR)
2	1	2" COPPER 90° ELBOW, SILVER SOLDERED
3	1	2" X 2" OR 2" X 1-1/2" ANGLED BALL METER STOP WITH 360° TEE HEAD ROTATION, FLARED x METER FLANGE
4	VAR	2" TYPE K COPPER TUBING, HARD TEMPERED
5	1	SERVICE CONNECTION INSTALLED PER STD DETAIL 3-01
6	VAR	TYPE K COPPER TUBING, HARD TEMPERED, OR SCHEDULE 80 PVC, 10' LENGTH MINIMUM WITH MIP THREADED ADAPTER
7	1	1-1/2" OR 2" CURB STOP, METER FL x FIP THREAD
8	1	METER BOX INSTALLED PER STD. DETAIL 3-05
9	1	INSULATED 12 GAGE SOFT COPPER LOCATOR WIRE FROM MAIN SHALL BE RUN TO INTERIOR OF METER BOX WITH MIN. 6" TAIL SECURED TO SERVICE LINE EVERY 8' MIN. WITH 10 MIL PIPE TAPE.
10	1	WIRE CLAMP, SEE NOTE 9.
11	1	AWG NO. 8 STRANDED COPPER ANODE LEAD WIRE, LEAVE 18" OF COILED WIRE IN METER BOX.
12	1	ZINC ANODE (SEE TABLE HEREON FOR SIZE OF ANODE) AND LEAD WIRE. ANODE TO BE PLACED VERTICALLY OR HORIZONTALLY AT A MIN. SEPARATION OF 24" FROM THE COPPER SERVICE.

METER BOX LOCATIONS		
CASE NO.	CONDITIONS	METER BOX LOCATION
*1	GRASS PARKWAY BETWEEN CURB AND SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)
2	SIDEWALK DIRECTLY BEHIND CURB AND R/W EXTENDS MIN. OF 4' BEHIND SIDEWALK.	DIRECTLY BEHIND SIDEWALK.
3	SIDEWALK DIRECTLY BEHIND CURB AND R/W ENDS NEAR BACK OF SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)

ZINC ANODE SIZES FOR COPPER SERVICES

COPPER PIPE LENGTH (FEET)	ZINC ANODE SIZE (INCHES)	ZINC ANODE WEIGHT (LBS)
0 TO 45	1.4 X 1.4 X 30	15
45 TO 90	2.0 X 2.0 X 30	30

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. SIZE SERVICE AS INDICATED ON PROJECT PLANS.
3. PIPE THREADS SHALL BE CLEAN AND SHARP AND WATER TIGHT SEALED WITH APPROVED JOINT COMPOUND.
4. WHERE REQUIRED, CUSTOMER BALL VALVE SHALL BE UPSTREAM OF BACKFLOW PREVENTION DEVICE.
5. ALL COPPER TUBING SHALL BE LAID STRAIGHT AND AT RIGHT ANGLES TO THE WATER MAIN.
6. JUMPER NIPPLE SHALL BE ON CENTER WITH METER BOX READING LID.
7. METERS SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, ADA RAMPS, TOP OF "X", DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.
8. ATTACH THE SERVICE TRACING WIRE TO THE MAINLINE TRACER WIRE USING DISTRICT APPROVED GEL CAPS.
9. ANODE LEAD WIRE SHALL BE CLAMPED TO COPPER TUBING. CLAMP SHALL BE DIRECT BURIAL TYPE RED BRASS WITH BRASS SCREWS AND SHALL BE TESTED PER GWD. SEE TABLE HEREON FOR ZINC ANODE SIZES (SPLICES NOT ALLOWED).

APPROVED:

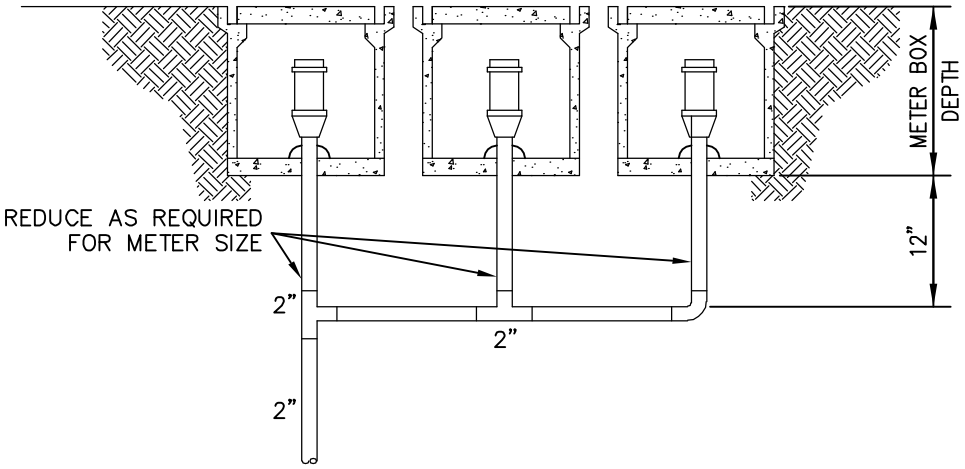
Daniel J. Brooks
CHIEF ENGINEER

6/23/2020
DATE

GOLETA WATER DISTRICT

WATER SERVICES WITH UP TO THREE METERS

STD. DETAIL 3-04



ELEVATION

APPROVED:

Daniel J. Brooks
CHIEF ENGINEER

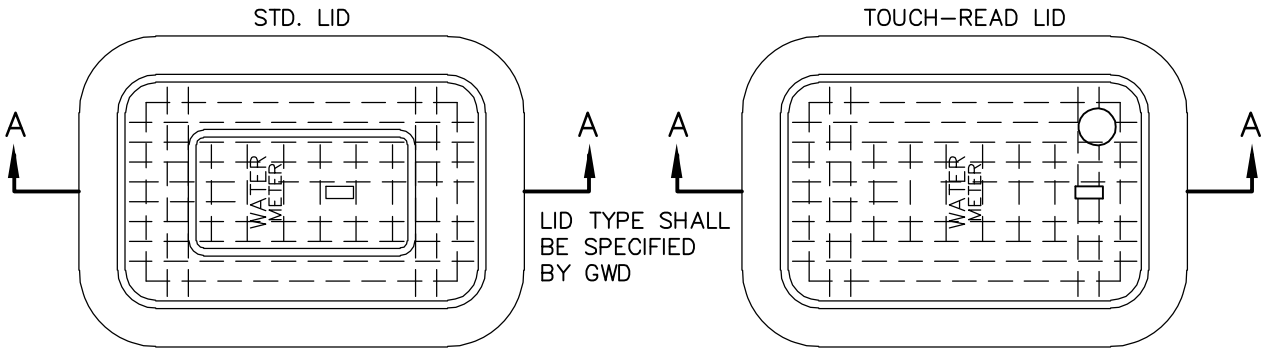
6/23/2020
DATE

GOLETA WATER DISTRICT

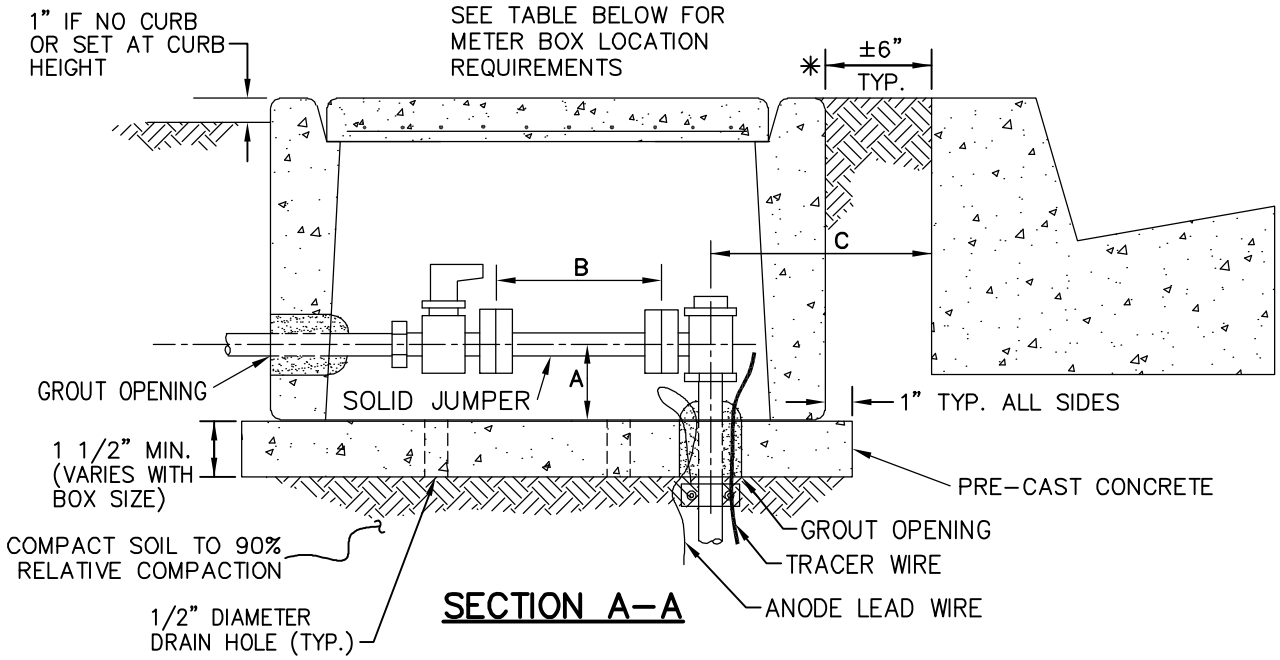
WATER SERVICES WITH UP TO THREE METERS

STD. DETAIL 3-04

3 OF 3



PLAN **PLAN**



SECTION A-A

METER SIZE	A	B	C
3/4"	3 1/2"	7 3/4"	10 1/2"
1"	3 1/2"	11"	9 3/4"
1 1/2"	4"	13 1/4"	13"
2"	4"	17 1/4"	11"

METER BOX LOCATIONS		
CASE NO.	CONDITIONS	METER BOX LOCATION
*1	GRASS PARKWAY BETWEEN CURB AND SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)
2	SIDEWALK DIRECTLY BEHIND CURB AND R/W EXTENDS MIN. OF 4' BEHIND SIDEWALK.	DIRECTLY BEHIND SIDEWALK.
3	SIDEWALK DIRECTLY BEHIND CURB AND R/W ENDS NEAR BACK OF SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN DETAIL ABOVE.)

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. METER BOX BASE SHALL BE PRE-CAST CONCRETE OR DISTRICT'S APPROVED MATERIAL LIST.
3. FOR BOXES IN AREA WHERE VEHICULAR TRAVEL IS ANTICIPATED, A TRAFFIC RATED LID (H-20) WITH READING LID SHALL BE USED.
4. ALL JOINTS BETWEEN BASE AND METER BOX AND OPENINGS AT METER BOX INLET & OUTLET SHALL BE MORTARED AS DIRECTED BY GWD INSPECTOR.
5. TRAFFIC RATED COVERS WITH READING LID ARE REQUIRED WHERE ROLLED CURB AND/OR NO CURBS HAVE BEEN INSTALLED ALONG EDGE OF PAVEMENT. WHERE NO CURBS EXIST, THE METER BOX SHALL BE LOCATED 15" BEHIND EDGE OF PAVEMENT.
6. METERS SHALL BE LOCATED A MINIMUM OF TEN FEET CLEAR ABOVE AND FIVE FEET CLEAR BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, CURB RETURNS, ADA RAMPS, TOP OF "X", DRIVEWAYS, STREET LIGHTS AND STREET SIGNS, AND TEN FEET CLEAR OF TREES AND BUSHES.

APPROVED:

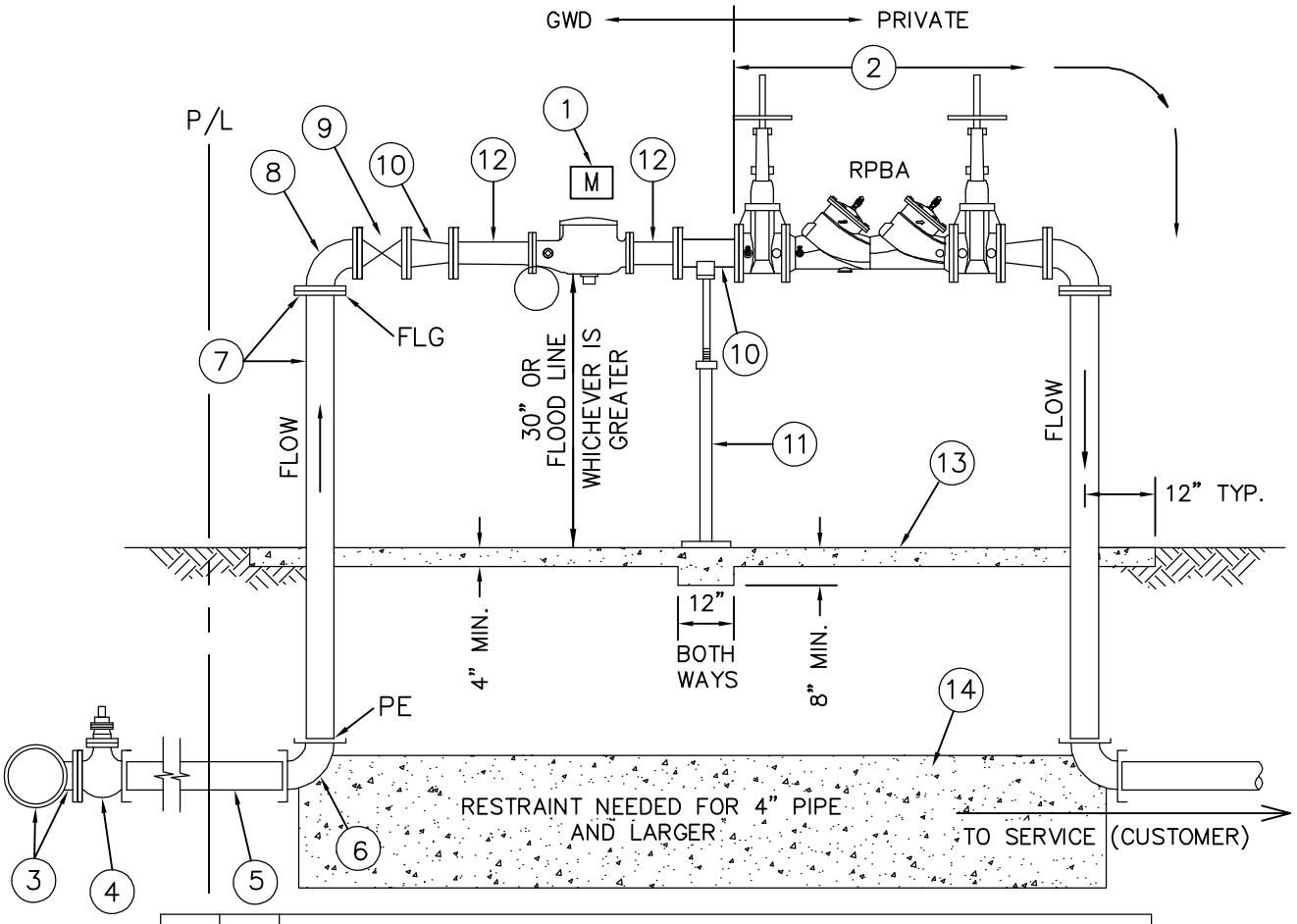
Daniel J. Brooks
CHIEF ENGINEER

5/14/2020
DATE

GOLETA WATER DISTRICT

METER BOX FOR METERS UP TO 2"

STD. DETAIL 3-05



ITEM	QTY.	DESCRIPTION
1	1	WATER METER
2	1	RPBA BACKFLOW ASSEMBLY PER GWD STD. DTL. 5-02 (PRIVATE)
3	1	TEE – MJ X FL FOR NEW PVC MAIN, TAPPING SLEEVE FOR EXIST. MAIN, 6" MIN.
4	1	GATE VALVE, FL X MJ WITH RETAINER GLAND, 6" MIN.
5	1	PVC SPOOL, LENGTH AS REQUIRED
6	2	DIP 90° BEND, MJ X MJ
7	1	DIP OR STEEL SPOOL, FL X PE, LENGTH AS REQUIRED
8	1	DIP 90° BEND, FL X FL
9	1	GATE VALVE, FL
10	1	REDUCER, FL (AS NECESSARY) OR SPOOL EQUIVALENT TO 2X THE DIAMETER OF PIPE/METER
11	1	3" ADJUSTABLE PIPE SUPPORT, GALVANIZED
12	1	DIP OR STEEL SPOOL, FL, 2X THE DIAMETER OF PIPE FOR LENGTH
13	1	4' WIDE CONCRETE PAD WITH #3 REBAR @ 12" O.C. OVER COMPACTED NATIVE SOIL
14	1	PROVIDE CONCRETE THRUST BLOCKING IN CONFORMANCE WITH GWD STD. DTL. 3-09

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. SIZE VALVE AND APPURTENANCES AS SHOWN ON PROJECT PLANS.
3. METER SHALL READ IN HUNDRED CUBIC FEET.
4. ALL BURIED FERROUS PIPE AND FITTINGS SHALL BE TAPE WRAPPED.
5. ALL EXPOSED METAL PIPE SHALL BE PAINTED PER GWD TECH. SPEC. 09800 – PROTECTIVE COATINGS.
6. ALL CUSTOMER CONNECTIONS SHALL BE DOWNSTREAM OF BACKFLOW PREVENTION ASSEMBLY.
7. USE AWWA STANDARD C153 DUCTILE IRON FITTINGS FOR ALL MECHANICAL JOINT FITTINGS.
8. CUSTOMER'S REGISTERED ENGINEER SHALL SUBMIT ALTERNATIVE DESIGN IF FLOOD ZONE EXCEEDS 36".
9. USE RP IF RECYCLED WATER IS ON SITE.

APPROVED:

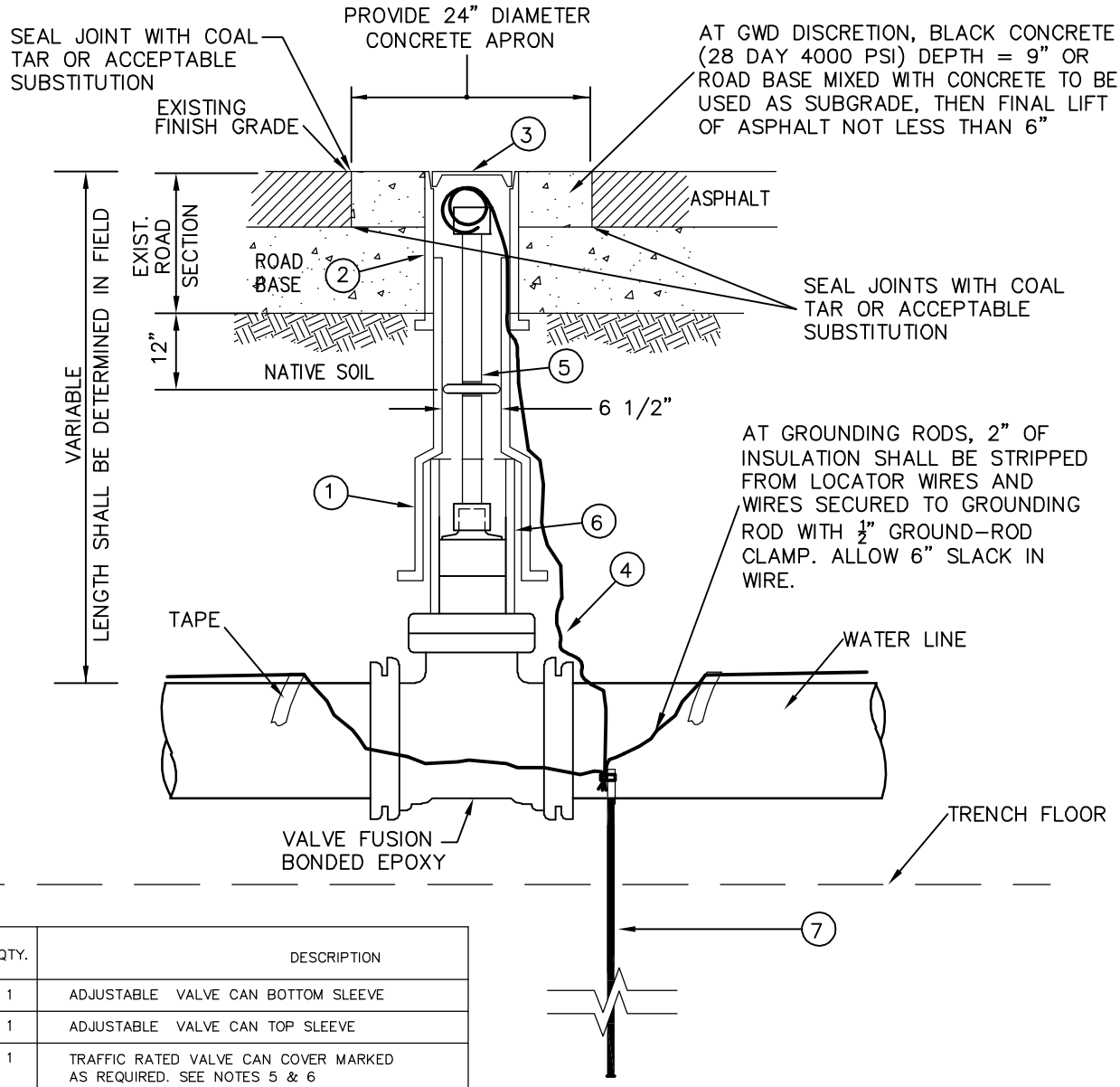
Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

LARGE METER

STD. DETAIL 3-06



ITEM	QTY.	DESCRIPTION
1	1	ADJUSTABLE VALVE CAN BOTTOM SLEEVE
2	1	ADJUSTABLE VALVE CAN TOP SLEEVE
3	1	TRAFFIC RATED VALVE CAN COVER MARKED AS REQUIRED. SEE NOTES 5 & 6
4	VAR.	12 GAGE INSULATED SOFT COPPER LOCATOR WIRE
5	1	SELF CENTERING VALVE STEM EXTENSION PER STD DETAIL 3-08, LENGTH AS REQUIRED
6	1	6" C900 PVC IF NECESSARY, LENGTH AS REQUIRED
7	1	32" LONG 1/2" DIAMETER COPPER GROUNDING ROD

LOCATOR WIRE TO BE CONNECTED USING THREE CLAMPS AT DISTRICT'S DISCRETION.

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. VALVE STEM EXTENSION, FITTED WITH SELF-CENTERING DEVICE AND ADAPTER SHALL BE INSTALLED WHEN COVER OVER VALVE NUT EXCEEDS 36". WHEN VALVE STEM EXTENSION IS REQUIRED, OPERATING NUT SHALL BE 12" BELOW TOP OF VALVE CAN.
3. FOR VALVE CAN EXTENSION, USE 6" CLASS 200 PVC LOCATED BELOW BOTTOM SLEEVE.
4. LOCATOR WIRE SHALL BE BROUGHT FROM OUTSIDE VALVE CAN TO TOP OF VALVE CAN AT EVERY VALVE LOCATION. AT A TEE WHERE MORE THAN ONE VALVE IS INSTALLED, THE LOCATOR WIRE ONLY NEEDS TO BE BROUGHT UP IN ONE CAN.
5. VALVE SLEEVE SHALL BE OF A DESIGN AS NOT TO TRANSMIT SHOCK TO THE VALVE.
6. LID SHALL BE LABELED "WATER" FOR POTABLE LINES.
7. LID SHALL BE LABELED "RW" AND PAINTED PURPLE FOR RECLAIMED WATER LINES.
8. IN UNPAVED AREAS, FIBERGLASS VALVE MARKERS SHALL BE INSTALLED ADJACENT TO VALVE CAN.

APPROVED:

Daniel J. Brooks
CHIEF ENGINEER

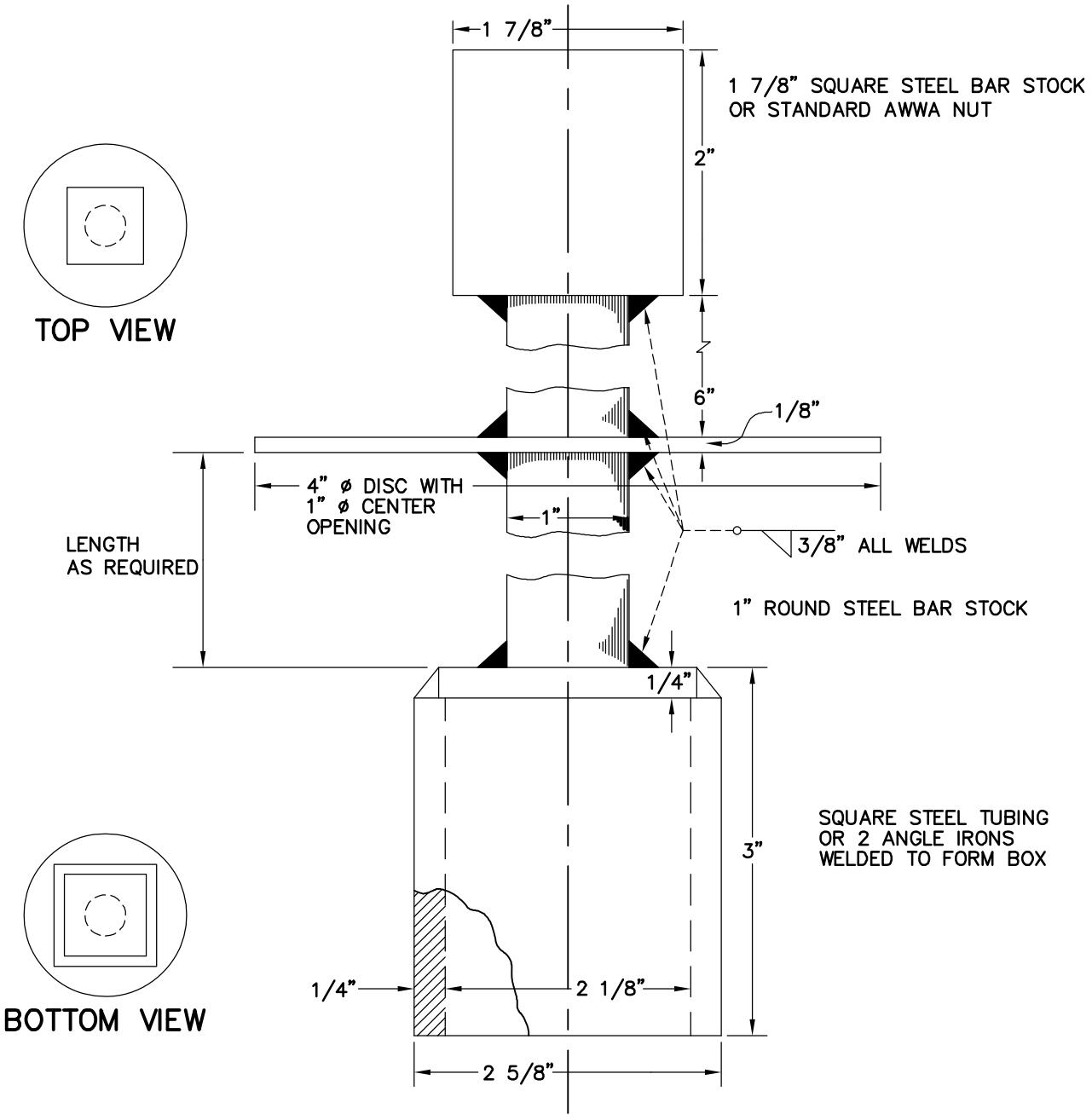
6/18/20
DATE

GOLETA WATER DISTRICT

ADJUSTABLE VALVE CAN

STD. DETAIL 3-07

FOR GATE VALVE

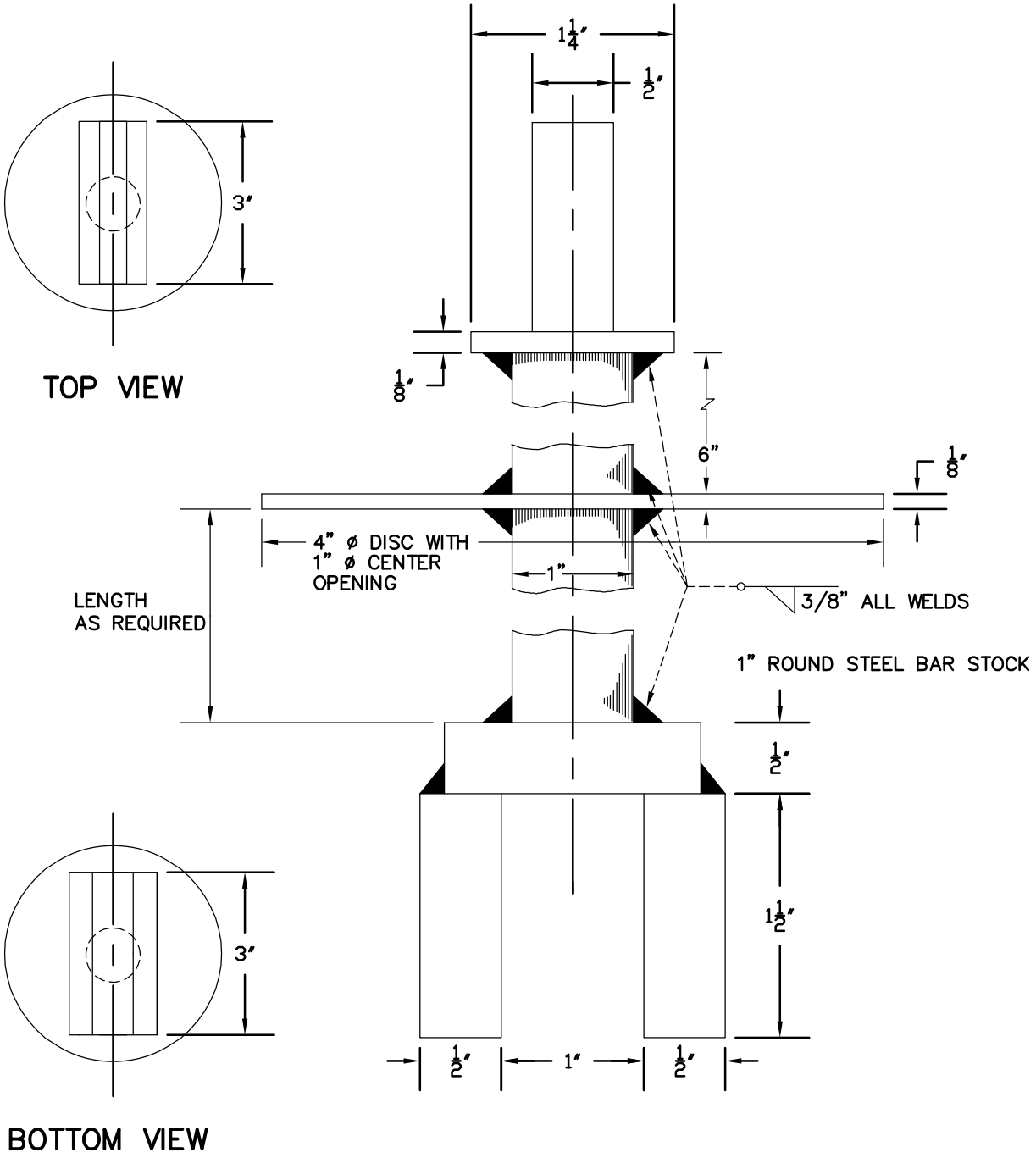


NOTES

1. STEEL VALVE STEM EXTENSIONS ARE REQUIRED. FIBERGLASS MAY ONLY MAY BE SUBSTITUTED FOR STEEL WITH PRIOR DISTRICT APPROVAL.
2. SEE GWD APPROVED MATERIALS LIST.
3. VALVE STEM EXTENSION, FITTED WITH SELF-CENTERING DEVICE AND ADAPTER SHALL BE INSTALLED WHEN COVER OVER VALVE NUT EXCEEDS 36". WHEN VALVE STEM EXTENSION IS REQUIRED, OPERATING NUT SHALL BE 12" BELOW TOP OF VALVE CAN.

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL 3-08
Daniel J. Brooks CHIEF ENGINEER	2/3/2020 DATE	VALVE STEM EXTENSION	1 OF 2

FOR BALL VALVE



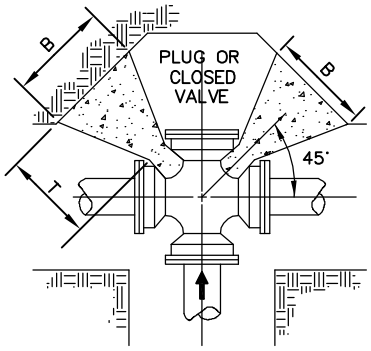
TOP VIEW

BOTTOM VIEW

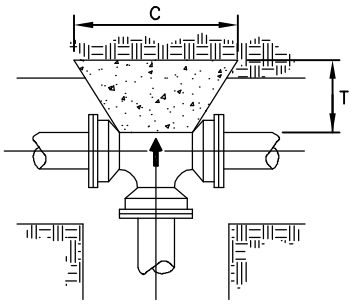
NOTES

1. STEEL VALVE STEM EXTENSIONS ARE REQUIRED. FIBERGLASS MAY ONLY MAY BE SUBSTITUTED FOR STEEL WITH PRIOR DISTRICT APPROVAL.
2. SEE GWD APPROVED MATERIALS LIST.
3. VALVE STEM EXTENSION, FITTED WITH SELF-CENTERING DEVICE AND ADAPTER SHALL BE INSTALLED WHEN COVER OVER VALVE NUT EXCEEDS 36". WHEN VALVE STEM EXTENSION IS REQUIRED, OPERATING NUT SHALL BE 12" BELOW TOP OF VALVE CAN.

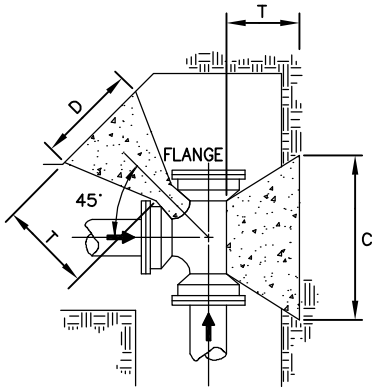
APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL 3-08
Daniel J. Brooks CHIEF ENGINEER — 2/3/2020 DATE	VALVE STEM EXTENSION	2 OF 2



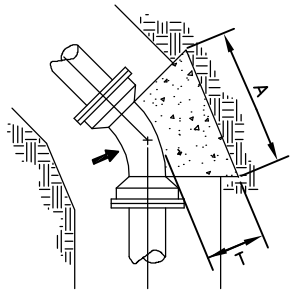
CROSS
(ONE END PLUGGED)
TABLE 1, SHEET 2



TEE
TABLE 1, SHEET 2

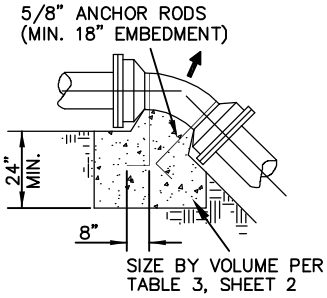


TEE
(ONE END PLUGGED)
TABLE 1, SHEET 2

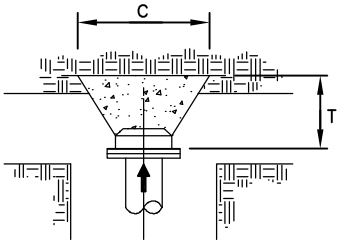


* SEE SHEET 2
HORIZONTAL BEND TABLES 1 & 2

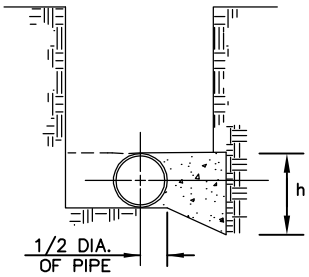
HORIZONTAL BEND



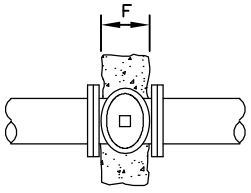
VERTICAL BEND
ANCHOR BLOCK



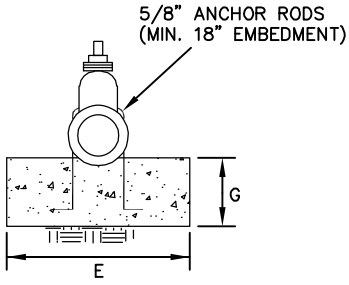
DEAD END
TABLE 1, SHEET 2



THRUST BLOCK
(TYPICAL SECTION)



VALVES
PLAN



VALVES
SECTION

APPROVED:

Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

CONCRETE THRUST BLOCKS

STD. DETAIL 3-09

THRUST BLOCK DIMENSIONS

TABLE 1

PIPE SIZE (IN.)	CROSSES, TEES, DEAD ENDS AND VALVES DIMENSION ARE IN FEET								90 & 45 DEGREE HORIZ. BENDS DIMENSION ARE IN FEET	
	T	h	B	C	D	E	F	G	A (90°)	A (45°)
4	3.00	2.00	1.25	1.50	2.25	2.00	1.50	1.50	2.25	1.25
6	4.00	2.50	2.25	3.00	4.00	2.00	1.50	1.50	4.00	2.25
8	5.00	3.00	3.25	4.50	5.75	2.00	2.00	1.50	6.00	3.25
10	6.00	3.50	4.00	5.50	7.00	2.50	2.00	1.50	8.00	4.25
12	7.00	4.00	5.00	7.00	8.75	3.00	2.50	2.00	10.00	5.50
14	8.00	4.50	6.00	8.50	10.50	3.00	2.50	2.00	12.00	6.50

BLOCK SIZED BASED ON 250 PSI TEST PRESSURE
AND 1000 PSF SOIL BEARING CAPACITY

TABLE 2

PIPE SIZE (IN.)	22 1/2 & 11 1/4 DEGREE HORIZONTAL BENDS DIMENSION ARE IN FEET			
	T	h	A(22 1/2°)	A(11 1/4°)
4	2.00	1.50	1.50	1.50
6	2.50	1.50	2.00	1.50
8	3.00	2.00	2.50	1.50
10	3.50	2.00	4.00	2.00
12	3.50	2.00	5.50	2.75
14	4.00	2.50	6.00	3.00

BLOCK SIZED BASED ON 250 PSI TEST PRESSURE
AND 1000 PSF SOIL BEARING CAPACITY

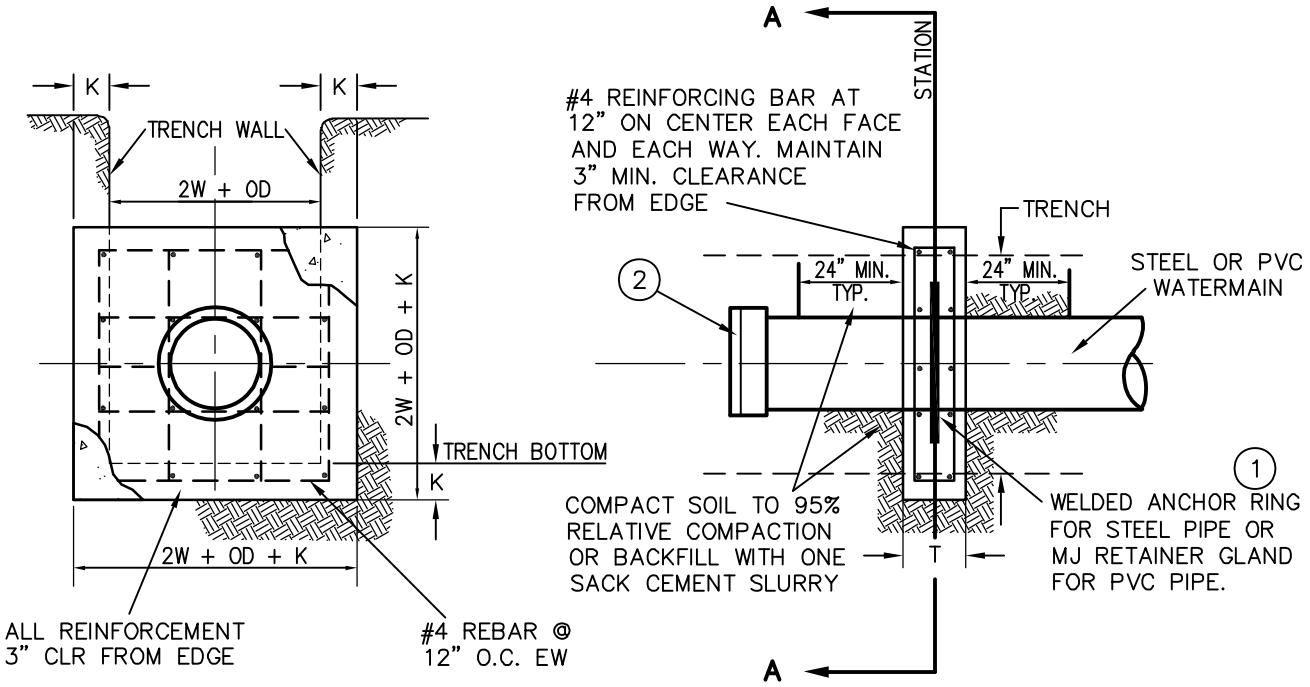
TABLE 3

PIPE SIZE (IN.)	VERTICAL BENDS REQUIRED VOLUME IN CUBIC FEET		
	45°	22 1/2°	11 1/4°
4	16	8	4
6	36	18	9
8	64	32	16
10	100	51	25
12	144	73	37
14	196	100	50

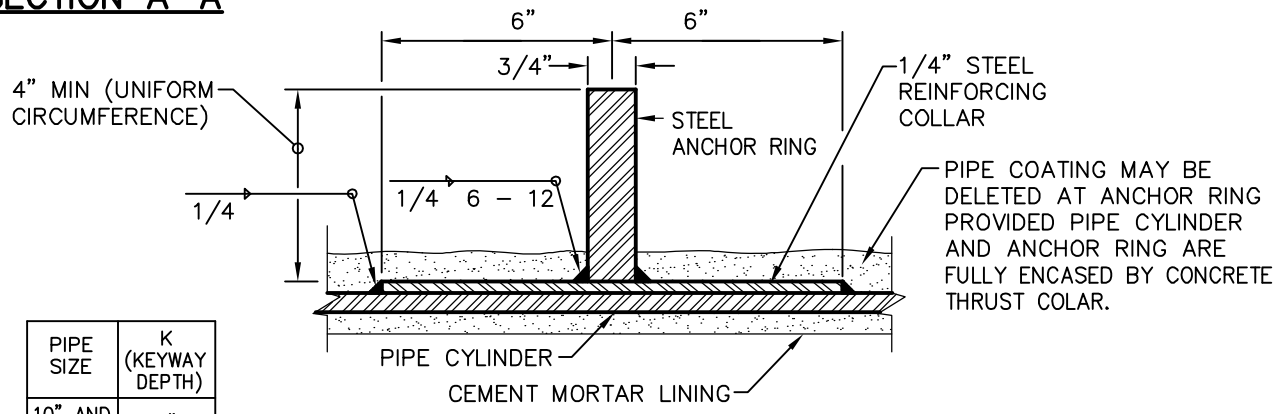
NOTES

1. THE VALUES IN TABLE 1 ABOVE FOR SIZE OF THRUST BLOCK ARE BASED ON A TEST PRESSURE OF 250 PSI AND SOIL BEARING CAPACITY OF 1000 PSF. A HIGHER SOIL BEARING PRESSURE MAY BE USED, IF THE PROJECT ENGINEER SUBMITS TO THE DISTRICT A REPORT PREPARED BY A LICENSED GEOTECHNICAL ENGINEER INDICATING THAT THE NATIVE SOILS AT THE PROJECT SITE HAVE A HIGHER SOIL BEARING PRESSURE.
2. THE PROJECT ENGINEER SHALL SUBMIT CALCULATIONS FOR THRUST BLOCK SIZES OTHER THAN THOSE RECOMMENDED ABOVE. DIMENSIONS OF THRUST BLOCKS SHALL BE SHOWN ON THE PLANS.
3. CONCRETE MIX SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 2500 PSI.
4. THRUST BLOCKS SHALL BE INSTALLED TO THE DIMENSIONS AND CONFIGURATIONS AS SHOWN.
5. THRUST BLOCKS SHALL BE POURED SOLIDLY AGAINST FIRM UNDISTURBED NATIVE SOIL.
6. CONCRETE POURED AGAINST THE PIPE FITTING SHALL NOT EXTEND BEYOND THE JOINTS, AND A MIN. 3" CLEARANCE SHALL BE MAINTAINED FROM BOLTS.
7. JOINTS SHALL BE WRAPPED WITH TRENTON #1 WAX TAPE BEFORE POURING CONCRETE.
8. UNLESS APPROVED OTHERWISE BY THE GWD INSPECTOR, WOOD FORMS SHALL BE USED FOR FORMING THRUST BLOCKS EXCEPT ON BEARING FACE OF BLOCKS.
9. ANCHOR RODS AT VALVES AND VERTICAL BENDS SHALL BE EPOXY COATED.
10. DIMENSIONS OF ALL THRUST BLOCKS SHALL BE SHOWN ON DESIGN DRAWING.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL 3-09
Daniel J. Brooks CHIEF ENGINEER — 2/3/2020 DATE	CONCRETE THRUST BLOCKS	2 OF 2



SECTION A–A



TYPICAL ANCHOR RING DETAIL

PIPE SIZE	K (KEYWAY DEPTH)
10" AND UNDER	6"
12"–18"	9"
20"–24"	12"
OVER 24"	BY DESIGN

ITEM	QTY.	DESCRIPTION
1	1	WELDED ANCHOR RING, OR MJ RETAINER GLAND.
2	1	BLIND FLANGE, DISHED HEAD, OR MJ END CAP WITH RETAINER GLAND.

NOTES

1. CONCRETE SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 2500 PSI.
2. CONCRETE SHALL BE FORMED WITH TRIMMED EARTH AND OR LUMBER TO ACHIEVE REQUIRED CONFIGURATION.
3. ALL LUMBER FORMS SHALL BE REMOVED PRIOR TO BACKFILLING.
4. WHERE CONCRETE IS FORMED USING LUMBER, CONTRACTOR SHALL BACKFILL AND COMPACT EARTH FOR A DISTANCE OF 24" ALL AROUND THRUST COLLAR.
5. BLOCK BEARING AREA SHALL BE CALCULATED OR DETERMINED USING GWD STANDARD DETAIL 2–03 AND DEAD END CASE ON GWD STANDARD DETAILS 3–09.
6. THRUST COLLAR THICKNESS (T) SHALL BE 12" MINIMUM FOR W UP TO 6 FEET. IF W IS LARGER THAN 6 FEET, STRUCTURAL CALCULATIONS PREPARED BY A REGISTERED ENGINEER SHALL BE REQUIRED.

APPROVED:

Daniel J. Brooks

ENGINEERING & INFRASTRUCTURE MANAGER

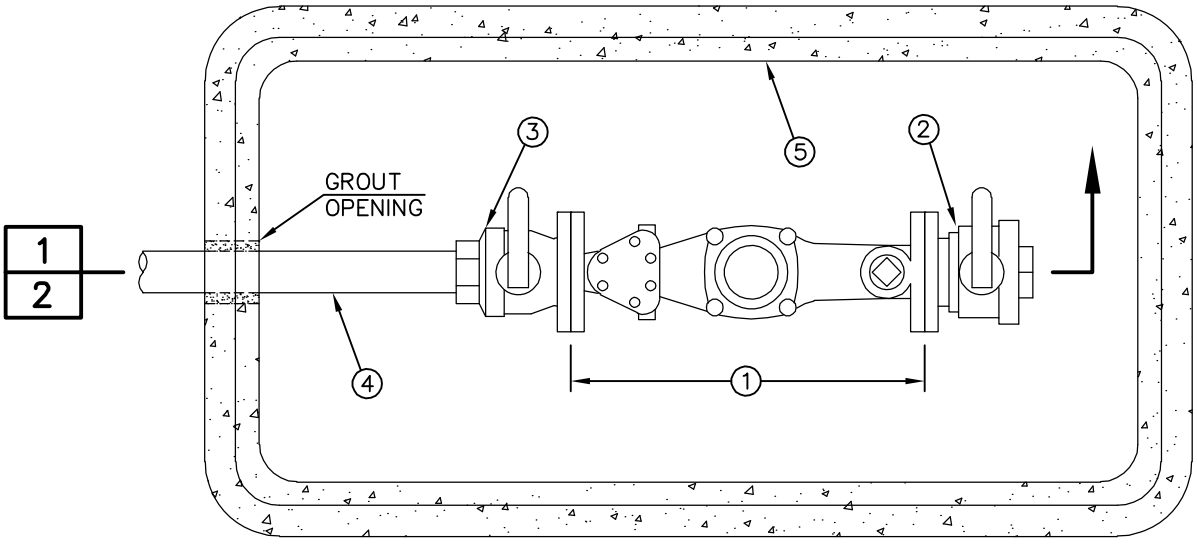
01/03/2023

DATE

GOLETA WATER DISTRICT

CONCRETE THRUST COLLAR

STD. DETAIL 3–10



PLAN
NTS

ITEM	QTY.	DESCRIPTION
1	1	2" METER
2	1	2" ANGLE METER STOP
3	1	2" CURB STOP BALL VALVE
4	VAR.	2" TYPE K SOFT COPPER TUBING
5	1	CHRISTY B44 CONCRETE UTILITY BOX, 20-1/4" X 42-1/4"
6	1	CHRISTY B44X8 8" REINFORCED CONCRETE UTILITY BOX EXTENSION
7	1	CHRISTY B44D2 2 PIECE REINFORCED CONCRETE LID
8	1	SOLID JUMPER

METER BOX LOCATIONS		
CASE NO.	CONDITIONS	METER BOX LOCATION
✱1	GRASS PARKWAY BETWEEN CURB AND SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN SECTION 1.)
2	SIDEWALK DIRECTLY BEHIND CURB AND R/W EXTENDS MIN. OF 4' BEHIND SIDEWALK.	DIRECTLY BEHIND SIDEWALK.
3	SIDEWALK DIRECTLY BEHIND CURB AND R/W ENDS NEAR BACK OF SIDEWALK.	6" BEHIND BACK OF CURB (AS SHOWN IN SECTION 1.)

SEE NOTES ON PAGE 2

APPROVED:

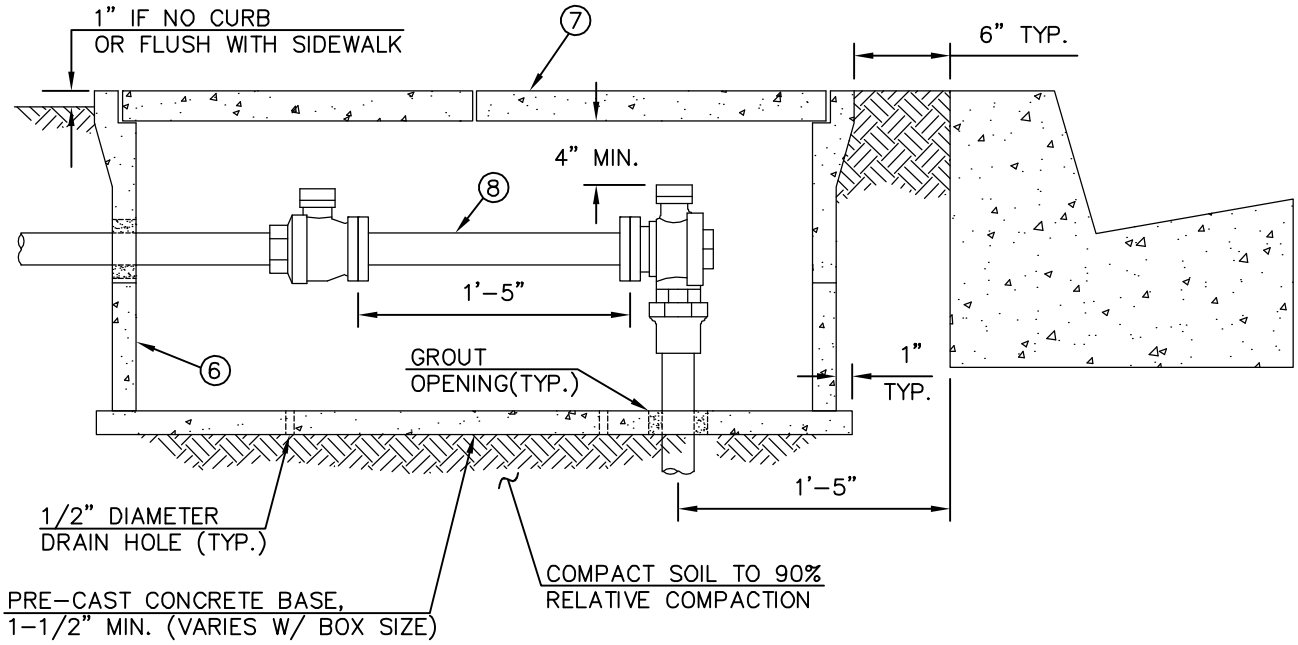
Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

2" METER

STD. DETAIL 3-11

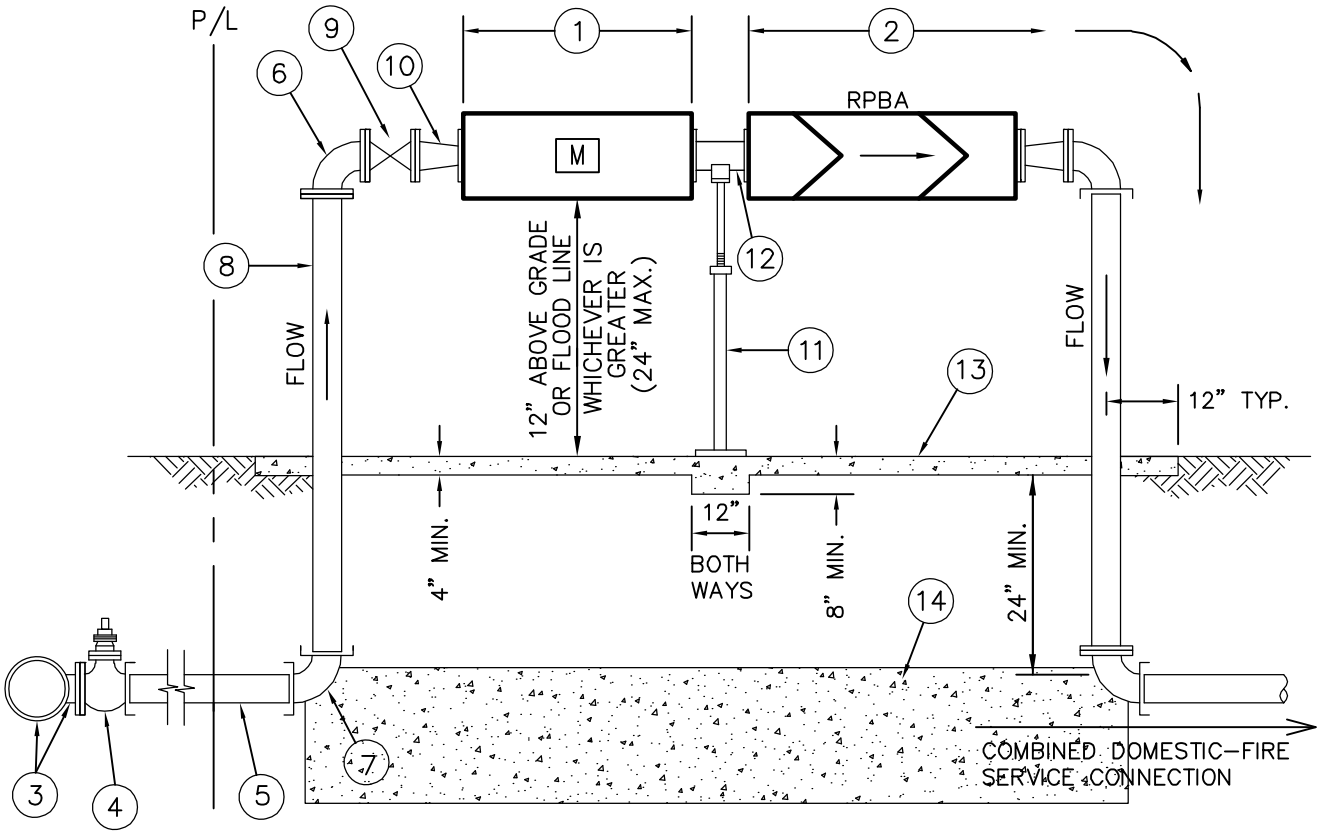


SECTION	1
NTS	1

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. METER BOX BASE SHALL BE PRE-CAST CONCRETE.
3. FOR BOXES IN AREA WHERE VEHICULAR TRAVEL IS ANTICIPATED, A TRAFFIC RATED LID (H-20) WITH READING LID SHALL BE USED.
4. TRAFFIC RATED COVERS WITH READING LID ARE REQUIRED WHERE ROLLED CURB AND/OR NO CURBS HAVE BEEN INSTALLED ALONG EDGE OF PAVEMENT. WHERE NO CURBS EXIST, THE METER BOX SHALL BE LOCATED 15" BEHIND EDGE OF PAVEMENT.
5. ALL JOINTS BETWEEN BASE AND METER BOX AND OPENINGS AT METER BOX INLET & OUTLET SHALL BE MORTARED AS DIRECTED BY GWD INSPECTOR.
6. METERS SHALL BE LOCATED A MINIMUM OF FIVE FEET CLEAR OF ABOVE AND BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES, AND DRIVEWAYS, AND TEN FEET CLEAR OF TREES AND BUSHES.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL 3-11
Daniel J. Brooks — CHIEF ENGINEER; 2/3/2020 — DATE	2" METER	2 OF 2



ITEM	QTY.	DESCRIPTION
1	1	FIRE SERVICE METER ASSEMBLY WITH TEST PORT, 4" X 1-1/2", 6" X 2", OR 8" X 2"
2	1	RPBA BACKFLOW ASSEMBLY PER GWD STD. DTL. 5-02
3	1	TEE – MJ X FL FOR NEW PVC MAIN, TAPPING SLEEVE FOR EXIST. MAIN, 6" MIN.
4	1	GATE VALVE, FL X MJ WITH RETAINER GLAND, 6" MIN.
5	1	PVC SPOOL, LENGTH AS REQUIRED
6	1	DIP 90° BEND, FL X FL WITH RETAINER GLAND
7	1	DIP 90° BEND, MJ X MJ
8	1	DIP OR STEEL SPOOL, FL X PE, LENGTH AS REQUIRED
9	1	GATE VALVE, FL
10	1	REDUCER, FL (AS NECESSARY)
11	1	3" ADJUSTABLE PIPE SUPPORT, GALVANIZED
12	1	DIP OR STEEL SPOOL, FL, 12" LONG MIN., 36" LONG MAX.
13	1	4' WIDE CONCRETE PAD OVER COMPACTED NATIVE SOIL
14	1	PROVIDE CONCRETE THRUST BLOCKING IN CONFORMANCE WITH GWD STD. DTL. 3-09

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. SIZE VALVE AND APPURTENANCES AS SHOWN ON PROJECT PLANS.
3. METER SHALL READ IN HUNDRED CUBIC FEET.
4. ALL BURIED FERROUS PIPE AND FITTINGS SHALL BE TAPE WRAPPED.
5. ALL EXPOSED METAL PIPE SHALL BE PAINTED PER GWD TECH. SPEC. 09800 – PROTECTIVE COATINGS.
6. ALL CUSTOMER CONNECTIONS SHALL BE DOWNSTREAM OF BACKFLOW PREVENTION ASSEMBLY.
7. USE AWWA STANDARD C153 DUCTILE IRON FITTINGS FOR ALL MECHANICAL JOINT FITTINGS.
8. USE RP IF RECYCLED WATER IS ON SITE.

APPROVED:

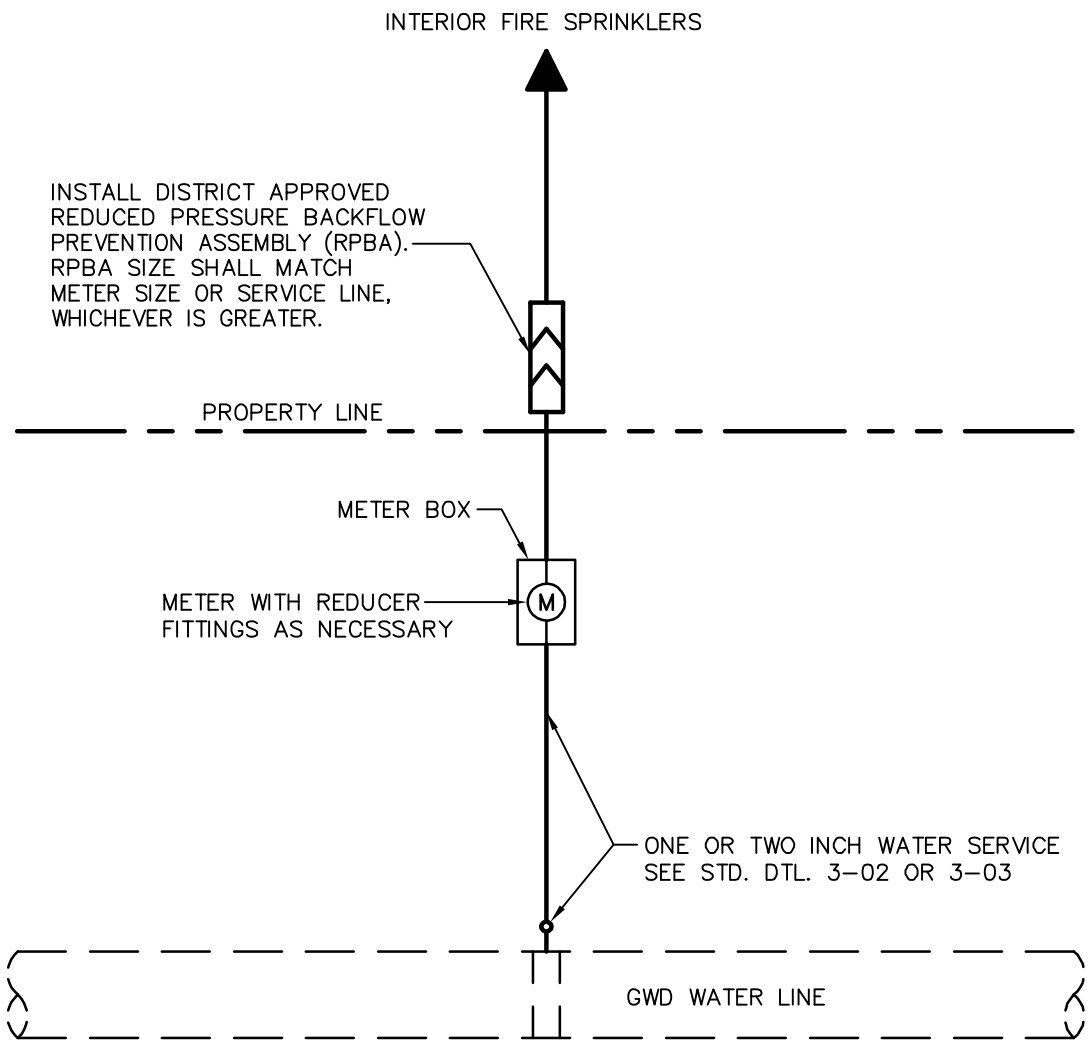
Daniel J. Brooks
CHIEF ENGINEER

2/3/2020
DATE

GOLETA WATER DISTRICT

3", 4", 6" AND 8" FIRE SERVICE METER ASSEMBLY INSTALLATION

STD. DETAIL 3-12



SERVICES AND METERS SIZES BASED ON FLOW

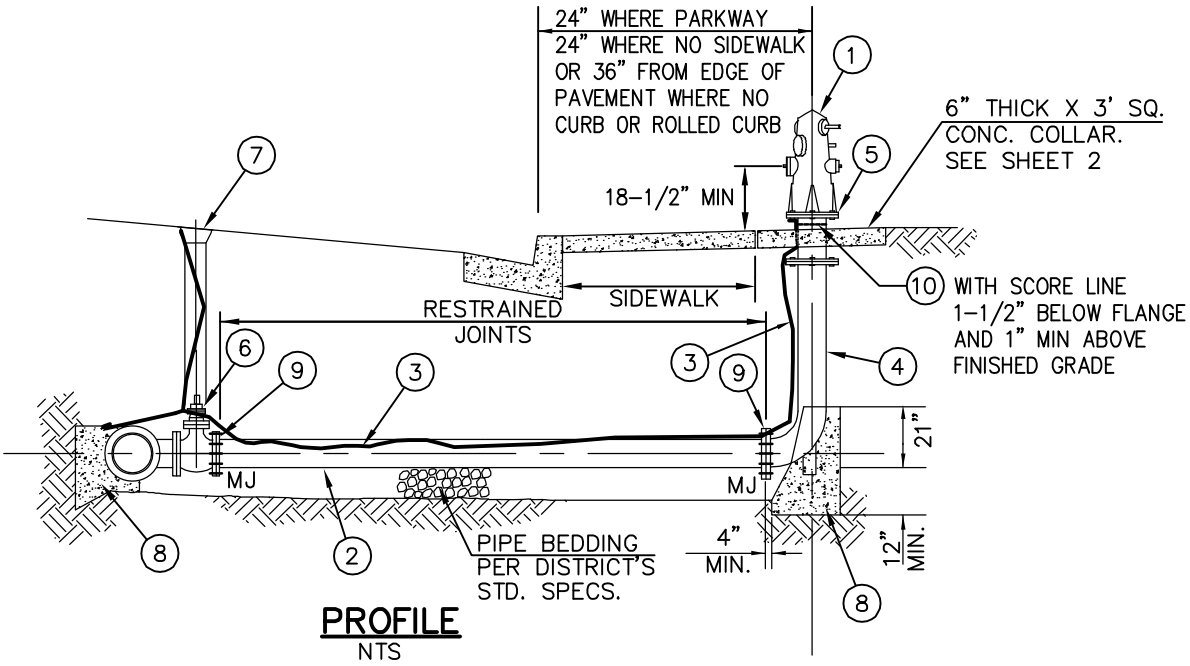
FLOW RATE (GPM)*	SERVICE	METER SIZE
20 – 30	1"	3/4"
30 – 50	1"	1"
50 – 100	2"	1 1/2"
100 – 160	2"	2"

* FLOW RATE (GPM) SHALL BE DETERMINED FROM NUMBER OF FIXTURE UNITS PER UNIFORM PLUMBING CODE OR PEAK FIRE SPRINKLER FLOW PLUS 5 GPM.

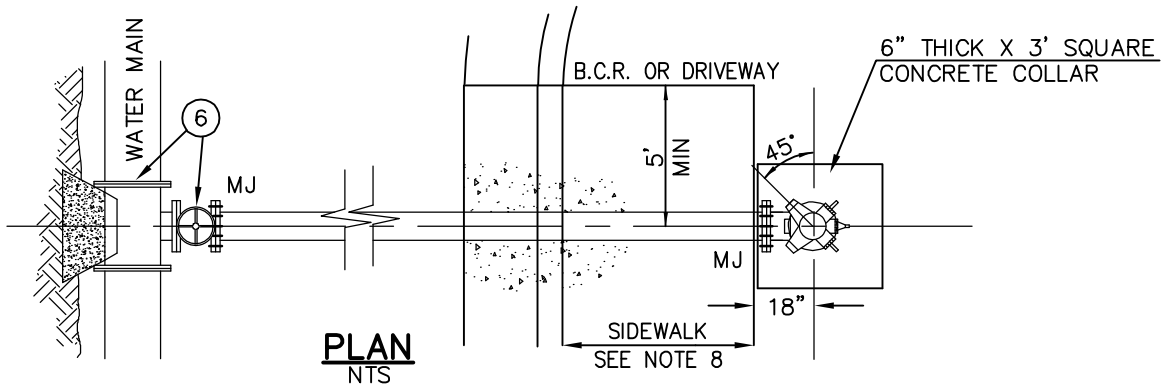
NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. THIS STANDARD APPLIES TO SINGLE FAMILY RESIDENCES ONLY.
3. IT SHALL BE THE RESPONSIBILITY OF THE FIRE SPRINKLER DESIGNER TO DETERMINE THE REQUIRED OPERATING PRESSURE FOR THE FIRE SPRINKLER SYSTEM AND TO VERIFY THAT THE DISTRICT'S DISTRIBUTION SYSTEM PRESSURE IS ADEQUATE TO SERVE THE FIRE SPRINKLER SYSTEM.
4. FOR HOUSES WITH GREATER THAN 5,000 SF, CUSTOMER'S REGISTERED ENGINEER OR FIRE SPRINKLER CONTRACTOR SHALL SUBMIT CALCULATIONS FOR: 1) FIRE SPRINKLER FLOW RATE, 2) SIZE OF SERVICE LINE, AND 3) RECOMMENDED METER SIZE. IN NO CASE SHALL SIZES OF METER AND SERVICE LINE BE LESS THAN SHOWN ABOVE.
5. ALL CUSTOMER CONNECTIONS SHALL BE DOWNSTREAM OF BACKFLOW PREVENTION ASSEMBLY.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL
Daniel J. Brooks CHIEF ENGINEER 6/15/2020 DATE	COMBINED USE OR METERED FIRE SERVICE 1" OR 2"	3–13



PROFILE
NTS



PLAN
NTS

ITEM	QUANTITY	DESCRIPTION
1	1	WET BARREL BRONZE FIRE HYDRANT WITH BRONZE CAPS
2	VARIES	6" DIAMETER CLASS 200 PVC PIPE PER AWWA STD. C900
3	VARIES	COPPER TRACER WIRE, #12 AWG, ATTACH ALONG TOP OF PIPE WITH BLACK 10 MIL PIPE WRAP TAPE
4	1	6" DUCTILE IRON BURY WITH 90° BEND MJ X FL, LENGTH AS REQUIRED (18" TYP)
5	6	HOLLOW BOLTS ON TOP FLANGE (TIPS UP WITH SILICONE IN HOLLOW BOLT)
6	1	TEE OR TAPPING SLEEVE WITH 6" FL X MJ GATE VALVE
7	1	ADJUSTABLE VALVE CAN PER STANDARD DETAIL 3-07
8	2	CONCRETE THRUST BLOCKS CONSTRUCTED WITH A MINIMUM 18 SF OF BEARING AREA
9	2	MECHANICAL JOINT WITH RETAINER GLAND
10	1	6" DUCTILE IRON FLANGED BREAK-OFF SPOOL WITH SCORE LINE, AND 6-HOLE BOLT PATTERN FOR TOP FLANGE, LENGTH AS REQUIRED (12" MIN)

SEE NOTES ON PAGE 2

APPROVED:

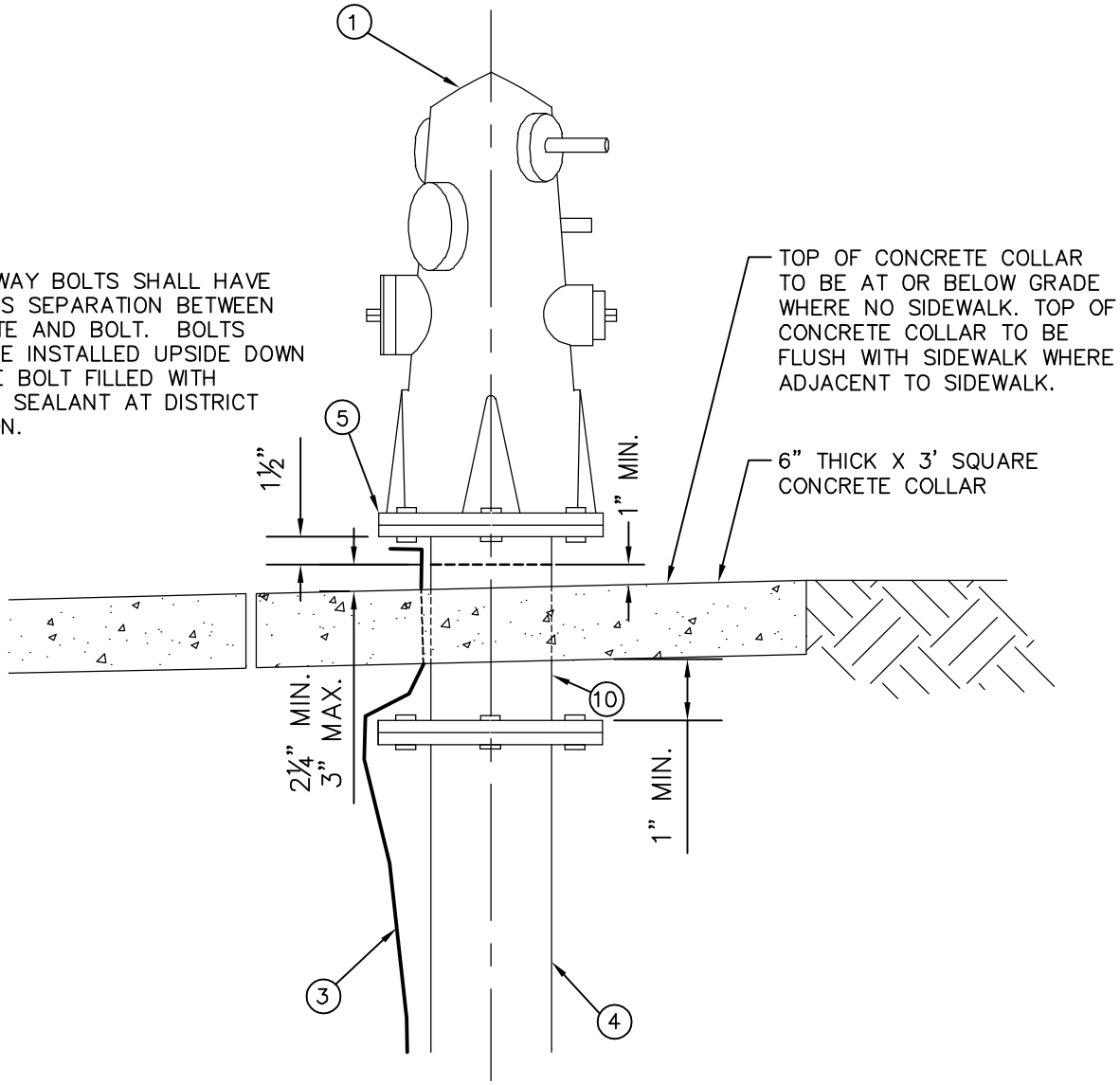
ENGINEERING & INFRASTRUCTURE MANAGER

01/03/2023
DATE

GOLETA WATER DISTRICT

FIRE HYDRANT INSTALLATION

STD. DETAIL 4-01



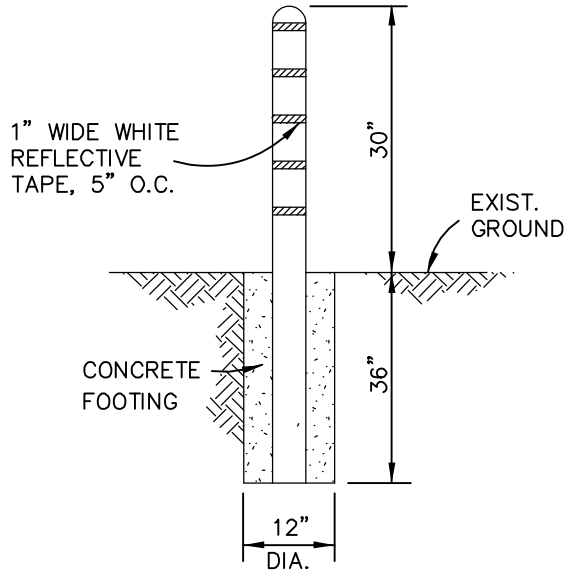
BREAK OFF SPOOL/CONCRETE COLLAR DETAIL

NOTES

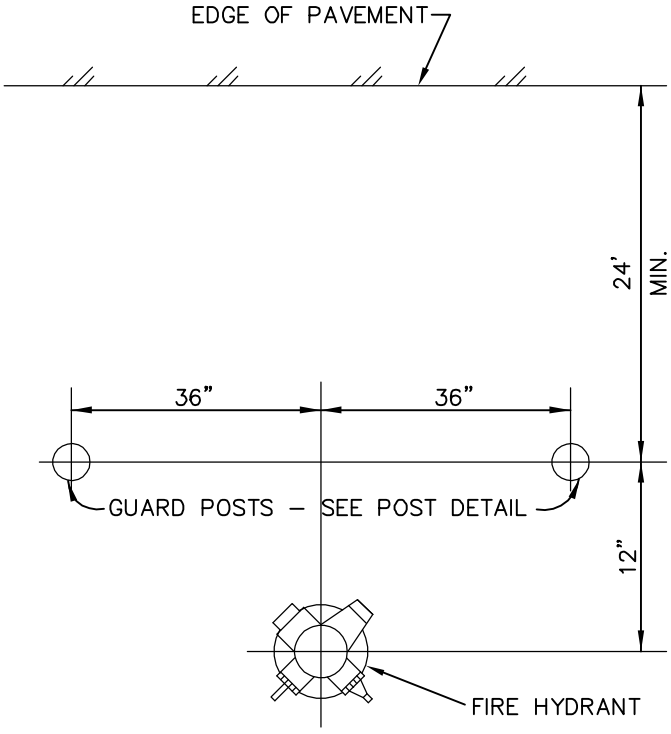
1. SEE GWD APPROVED MATERIALS LIST.
2. CONCRETE THRUST BLOCKS SHALL BE CONSTRUCTED IN CONFORMANCE WITH STANDARD DETAIL NO. 3–09.
3. BREAK–OFF SPOOL SHALL BE EPOXY COATED, AND FIRE HYDRANT SHALL BE PAINTED PER GWD TECHNICAL SPECIFICATION 09800 – PROTECTIVE COATINGS. PUBLIC FIRE HYDRANT SHALL BE PAINTED WITH YELLOW FINISH COAT AND PRIVATE FIRE HYDRANT SHALL BE PAINTED WITH RED FINISH COAT.
4. FIRE HYDRANT SPACING AND LOCATION SHALL BE IN ACCORDANCE WITH GWD AND SANTA BARBARA COUNTY FIRE DEPARTMENT REQUIREMENTS.
5. IF HYDRANT IS NOT PROTECTED BY CURB OR IF ROLLED CURB IS USED, GUARD POSTS SHALL BE PLACED TO PROTECT HYDRANT PER DETAIL 4–03.
6. FIRE HYDRANT SHALL BE INSTALLED PLUMB.
7. WHERE APPROVED BY GWD, S.B. COUNTY, AND/OR CITY OF GOLETA, HYDRANT MAY BE LOCATED IN SIDEWALK. SIDEWALK SHALL COMPLY WITH A.D.A. REQUIREMENTS. FIRE HYDRANTS SHALL BE LOCATED A MINIMUM OF TEN FEET CLEAR ABOVE AND FIVE FEET CLEAR BELOW GROUND OBSTRUCTIONS SUCH AS VAULTS, UTILITIES AND DRIVEWAYS, AND TEN FEET CLEAR OF TREES AND BUSHES.
8. BRONZE CAPS SHALL BE CHAINED TO HYDRANT AND SHALL HAVE 1/8" DIAMETER WEEP HOLE DRILLED ADJACENT TO OPERATING NUT.
9. TRACER WIRE ABOVE CONCRETE COLLAR SHOULD BE NO SHORTER THAN 6" AND NO LONGER THAN 12".

APPROVED:		GOLETA WATER DISTRICT	STD. DETAIL
Daniel J. Brooks	01/03/2023	FIRE HYDRANT INSTALLATION	4–01
ENGINEERING & INFRASTRUCTURE MANAGER	DATE		2 OF 2

4" DIA. STANDARD WEIGHT STEEL PIPE, CONCRETE FILLED, PAINTED PER GWD TECHNICAL SPECIFICATIONS FOR PROTECTIVE COATINGS WITH SAFETY YELLOW FINISH COAT.



POST DETAIL
NTS

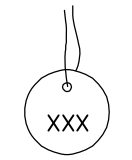


PLAN
NTS

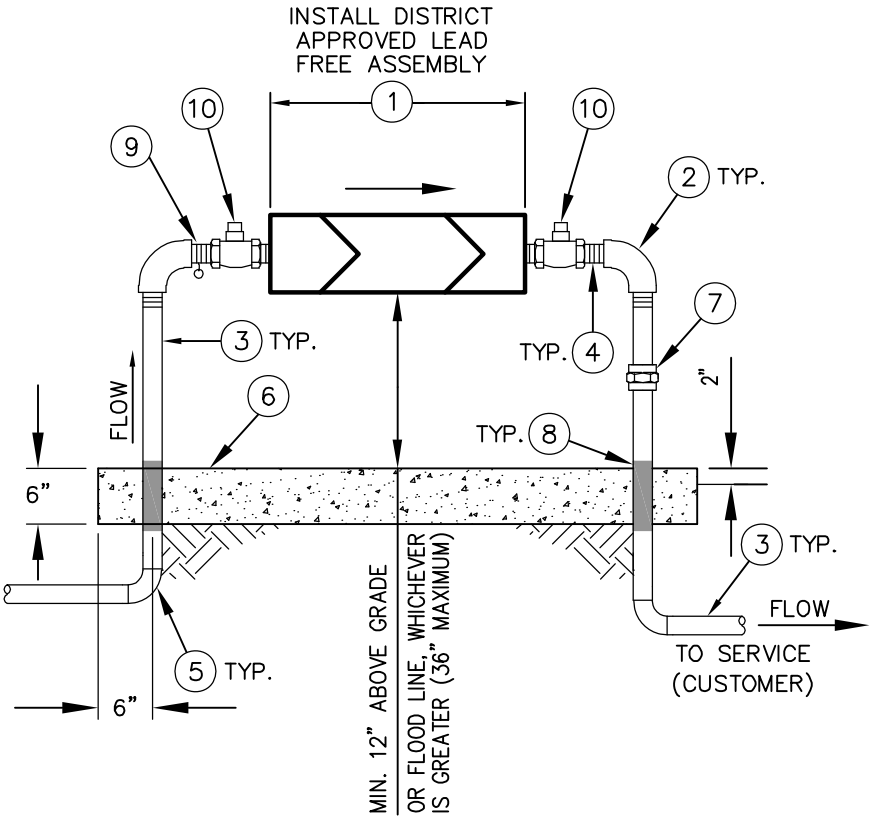
NOTES:

1. SEE GWD TECHNICAL SPECIFICATIONS FOR PROTECTIVE COATING INFORMATION.
2. GUARD POSTS SHALL BE INSTALLED PLUMB.
3. CONCRETE SHALL BE PLACED AGAINST FIRM UNDISTURBED NATIVE SOIL AND SHALL BE THOROUGHLY CONSOLIDATED.
4. CONCRETE SHALL HAVE 28 DAY COMPRESSIVE STRENGTH OF 2500 PSI.
5. ANY VARIANCE TO GUARD POST LAYOUT REQUIRES EXPLICIT GWD WRITTEN APPROVAL.
6. WHERE NATIVE SOIL IS NOT WELL COMPACTED, CONTRACTOR SHALL COMPACT AREA BEFORE INSTALLING POSTS.

APPROVED:	GOLETA WATER DISTRICT	STD. DETAIL
Daniel J. Brooks CHIEF ENGINEER 2/3/2020 DATE	FIRE HYDRANT GUARD POSTS	4-03



DETAIL A
NTS



SEE STD. DTL. FOR WATER SERVICE AND METER

ITEM	QTY.	DESCRIPTION
1	1	USC APPROVED LEAD FREE ASSEMBLY
2	2	BRASS 90° BEND, THREADED
3	VAR	TYPE K COPPER TUBING, HARD TEMPERED WITH SLIP X THREADED ADAPTORS AS NECESSARY OR BRASS
4	2	THREADED BRASS NIPPLE
5	2	90° BEND, SOLDERED COPPER, THREADED BRASS, OR COMPRESSION BRASS
6	2	6" THICK CONCRETE PAD
7	1	BRASS UNION FITTING
8	VAR	PIPE WRAP TAPE (TO PREVENT CONTACT OF COPPER PIPE TO CONCRETE)
9	1	BRASS TAG WITH SERVICE ADDRESS AND TYPE OF SERVICE. SEE DETAIL A
10	2	BALL VALVE, FIP

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. THE ASSEMBLY SHALL BE TESTED AND APPROVED BY A CERTIFIED TESTER PRIOR TO ACCEPTANCE BY GWD.
3. SIZE/DIAMETER OF ASSEMBLY AND PIPING AS REQUIRED BY GWD.
4. PIPE SUPPORTS ARE RECOMMENDED BUT NOT REQUIRED.
5. ALL CUSTOMER CONNECTIONS SHALL BE DOWNSTREAM OF BACKFLOW PREVENTION ASSEMBLY INCLUDING PRESSURE REGULATORS.
6. CONCRETE SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 2,500 PSI.
7. BACKFLOW ASSEMBLY TO BE INSTALLED AS CLOSE AS PRACTICAL TO METER, WITHIN 2 FEET. DISTANCES GREATER THAN 2 FEET REQUIRES DISTRICT APPROVAL BEFORE INSTALLATION. BACKFLOWS IN THE CITY OF GOLETA TO BE AT LEAST 12 INCHES FROM PUBLIC RIGHT OF WAY.
8. CUSTOMER'S REGISTERED ENGINEER SHALL SUBMIT ALTERNATIVE DESIGN IF FLOOD ZONE EXCEEDS 36".
9. USE RP IF RECYCLED WATER IS ON SITE.
10. PROVIDE MINIMUM 12–INCH HORIZONTAL CLEARANCE IN ALL DIRECTIONS.

APPROVED:

ENGINEERING & INFRASTRUCTURE MANAGER

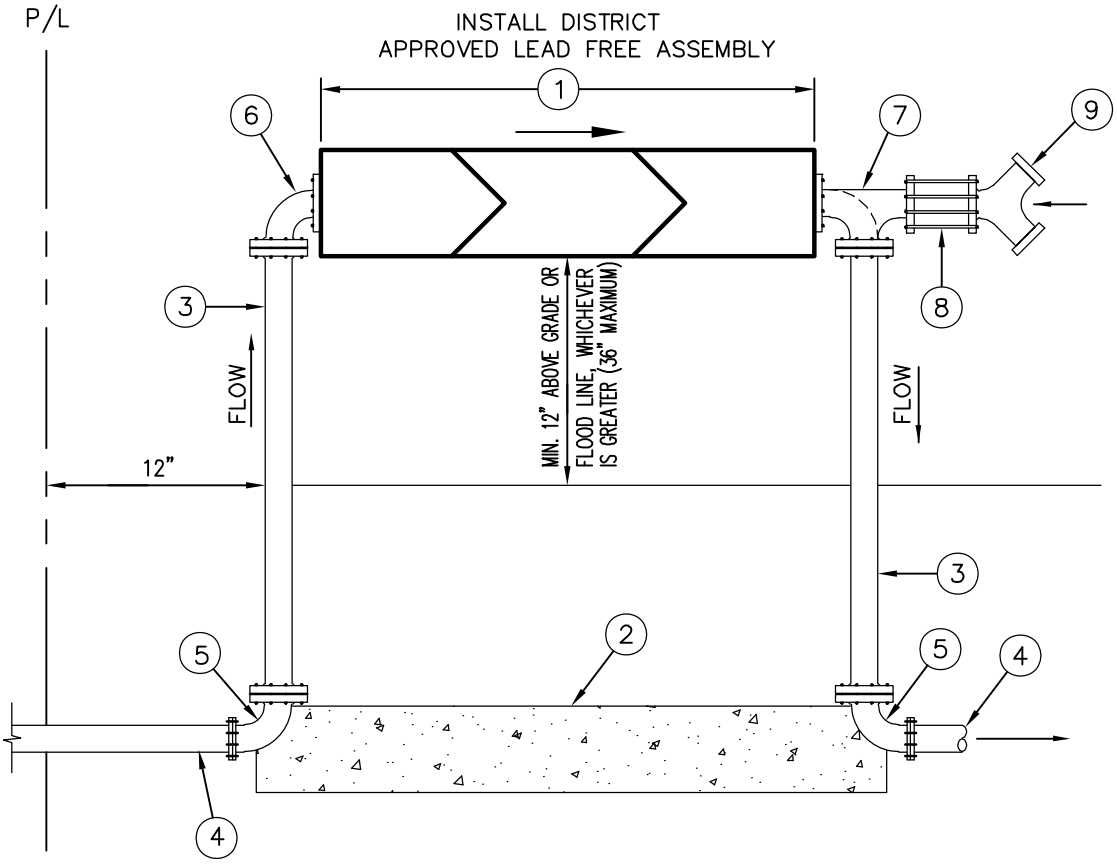
01/03/2023
DATE

GOLETA WATER DISTRICT

2" AND SMALLER BACKFLOW ASSEMBLY REDUCED PRESSURE OR DOUBLE CHECK

STD. DETAIL 5–01

INSTALL USC FOUNDATION FOR CROSS CONNECTION CONTROL AND HYDRAULIC RESEARCH AND DISTRICT APPROVED BACKFLOW ASSEMBLY



ITEM	QTY.	DESCRIPTION
1	1	USC APPROVED LEAD FREE ASSEMBLY
2	1	THRUST BLOCK, H x W = 3D x 3D, D = PIPE DIAMETER
3	2	DIP OR STEEL FLANGED SPOOL
4	VAR	CL 305 PVC PIPE, AWWA C900, WITH JOINT HARNESSES, STEEL OR DIP
5	2	90 DEGREE BEND, MJ X FL, WITH RETAINER GLAND
6	2	90 DEGREE BEND, FL X FL
7	1	90 DEGREE BEND, FL X FL (OR TEE, FL X FL WHERE FIRE CONNECTION REQUIRED)
8	1	(WAFER STYLE, SILENT CHECK VALVE, OR APPROVED EQUAL WHERE FIRE CONNECTION REQUIRED)
9	1	HOSE CONNECTION AS REQUIRED BY SANTA BARBARA COUNTY FIRE DEPARTMENT

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. THE ASSEMBLY SHALL BE TESTED AND APPROVED BY A CERTIFIED TESTER PRIOR TO ACCEPTANCE BY GWD.
3. ALL BURIED FERROUS PIPE AND FITTINGS SHALL BE TAPE WRAPPED.
4. ALL EXPOSED METAL PIPE SHALL BE PAINTED PER GWD TECH. SPEC. 09800 – PROTECTIVE COATINGS OR GWD DIRECTION.
5. ALL CUSTOMER CONNECTIONS SHALL BE DOWNSTREAM OF BACKFLOW PREVENTION ASSEMBLY.
6. 2" GALVANIZED PIPE SUPPORT(S) WITH 18" X 18" X 6" THICK CONCRETE PAD(S) ARE OPTIONAL.
7. CUSTOMER'S REGISTERED ENGINEER SHALL SUBMIT ALTERNATIVE DESIGN IF FLOOD ZONE EXCEEDS 36".
8. USE RP IF RECYCLED WATER IS ON SITE.

APPROVED:

Daniel J. Brooks

ENGINEERING & INFRASTRUCTURE MANAGER

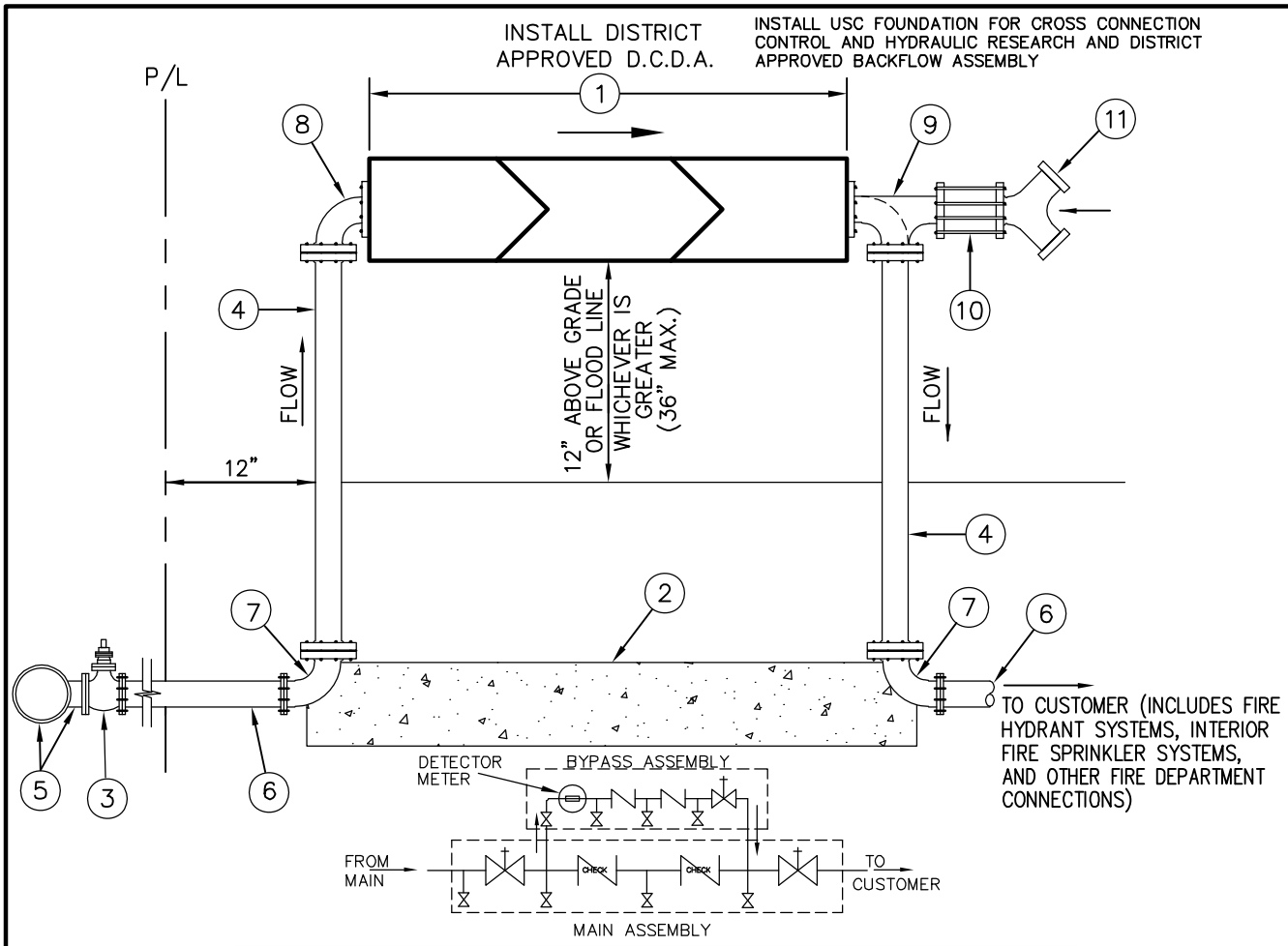
01/03/2023

DATE

GOLETA WATER DISTRICT

OVER 2" BACKFLOW ASSEMBLY
REDUCED PRESSURE, DOUBLE CHECK, REDUCED PRESSURE DETECTOR ASSEMBLY OR DOUBLE CHECK DETECTOR ASSEMBLY WITH OR WITHOUT FIRE CONNECTION

STD. DETAIL 5-02



ITEM	QTY.	DESCRIPTION
1	1	USC APPROVED LEAD FREE ASSEMBLY
2	1	THRUST BLOCK, H x W = 3D x 3D, D = PIPE DIAMETER
3	1	GATE VALVE, FL X MJ, WITH RETAINER GLAND, 6" MIN.
4	2	DIP OR STEEL FLANGED SPOOL
5	1	TEE – MJ X FL FOR NEW PVC MAIN, TAPPING SLEEVE FOR EXIST. MAIN, 6" MIN.
6	VAR	CL 305 PVC PIPE, AWWA C900, WITH JOINT HARNESSES
7	2	90 DEGREE BEND, MJ X FL, WITH RETAINER GLAND
8	2	90 DEGREE BEND, FL X FL
9	1	90 DEGREE BEND, FL X FL (OR TEE, FL X FL WHERE FIRE CONNECTION REQUIRED)
10	1	(WAFER STYLE, SILENT CHECK VALVE, OR APPROVED EQUAL WHERE FIRE CONNECTION REQUIRED)
11	1	SIAMESE HOSE CONNECTION WITH NST THREADS AS REQUIRED BY SANTA BARBARA COUNTY FIRE DEPARTMENT

NOTES

1. SEE GWD APPROVED MATERIALS LIST.
2. THE DCDA SHALL BE TESTED AND APPROVED BY A CERTIFIED TESTER PRIOR TO ACCEPTANCE BY GWD.
3. ALL TEST COCKS SHALL BE 1/4" DIAMETER.
4. ALL BURIED FERROUS PIPE AND FITTINGS SHALL BE TAPE WRAPPED.
5. ALL EXPOSED METAL PIPE SHALL BE PAINTED PER GWD TECH. SPEC. 09800 – PROTECTIVE COATINGS OR GWD DIRECTION.
6. ALL CUSTOMER CONNECTIONS SHALL BE DOWNSTREAM OF BACKFLOW ASSEMBLY.
7. HANDLES OF METER ISOLATION BALL VALVES SHALL BE REMOVED AND DELIVERED TO GWD INSPECTOR.
8. 2" GALVANIZED PIPE SUPPORT(S) WITH 18" X 18" X 6" THICK CONCRETE PAD(S) ARE OPTIONAL.
9. CUSTOMER'S REGISTERED ENGINEER SHALL SUBMIT ALTERNATIVE DESIGN IF FLOOD ZONE EXCEEDS 36".
10. USE RP IF RECYCLED WATER IS ON SITE.

APPROVED:

Daniel J. Brooks

ENGINEERING & INFRASTRUCTURE MANAGER

01/03/2023

DATE

GOLETA WATER DISTRICT

4" AND LARGER DOUBLE CHECK DETECTOR ASSEMBLY (WITH FIRE CONNECTION)

STD. DETAIL 5-03