TO: BOARD OF DIRECTORS

REVIEWED: RAY DIENZO, P.E. RD
GENERAL MANAGER

FROM: PETER V. SEVCIK, P.E.
DIRECTOR OF
ENGINEERING & OPERATIONS

DATE: DECEMBER 4, 2025

AGENDA ITEM
D-11
DECEMBER 10, 2025

ADOPT REVISIONS TO STANDARD SPECIFICATIONS FOR WATER AND SEWER SYSTEM IMPROVEMENTS

ITEM

Consider adoption of 2025 revisions to Standard Specifications for Water and Sewer System Improvements [RECOMMEND ADOPT RESOLUTION].

BACKGROUND

State statute and District Code require that public water system and wastewater system improvements be designed by California Registered Civil Engineers. To ensure that water and wastewater system improvements that will be dedicated to the District are uniformly and consistently designed, the District previously adopted Standard Specifications for Water and Sewer System Improvements that clearly define the District's expectations for installation of District works by contractors and third parties. The Director of Engineering and Operations, acting as the District Engineer, is responsible for preparing the Standard Specifications.

The current Standard Specifications were adopted in August 2019. Several minor issues have arisen during the last several years that are not addressed clearly enough in the current Standard Specifications. In addition, staff found several changes that needed to be made:

- Corrected minor inconsistencies
- Updated American Water Works Standard references
- Reformatted Specifications to Construction Standards Institute format
- Added 12 new water detail sheets
- Added 7 new sewer detail sheets
- Developed Approved Materials List

Attached are the updated 2025 Standard Specifications. Also attached is a Resolution which would rescind the old 2019 Standard Specifications and adopt the new 2025 Standard Specifications.

FISCAL IMPACT

Budgeted staff time was used to prepare the update.

RECOMMENDATION

Staff recommends that the Board adopt Resolution 2025-17XX Adopting Revised Standard Specifications.

ATTACHMENTS

A. Standard Specifications Dated December 10, 2025
B. Resolution 2025-17XX Adopting Revised Standard Specifications

DECEMBER 10, 2025

ITEM D-11

ATTACHMENT A

STANDARD SPECIFICATIONS FOR WATER AND SEWER SYSTEM IMPROVEMENTS

Nipomo Community Services District

Revised December 2025

STANDARD SPECIFICATIONS FOR WATER AND SEWER SYSTEM IMPROVEMENTS

Nipomo Community Services District

Adopted by the Board of Directors:

Resolution No. XXXX-XXXX
December 2025

Approved:

_____
Ray Dienzo
General Manager

Recommended for Approval:

Peter V. Sevcik
Peter V. Sevcik, P.E.
Director of Engineering and Operations

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General Conditions

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GENERAL CONDITIONS

1.0 DEFINITIONS, TERMS, AND ABBREVIATIONS

1.1 DEFINITIONS

Whenever the following terms or abbreviations occur in these specifications, the meaning shall be interpreted as follows:

ACCEPTANCE – That formal action by the Board accepting the Project as completed by the General Manager.

AWWA Standard – The latest version of the standard adopted by the American Water Works Association.

BOARD OF DIRECTORS OR BOARD – The Board of Directors of the Nipomo Community Services District.

CONTRACT – The Plan Check and Inspection Agreement executed between the Owner and the District covering the water, sewer, and/or other system improvements to be constructed and to become a part of the District's facilities.

CONTRACTOR – The person, firm or corporation constructing the water, sewer, and/or other system improvements for the Owner, or the District.

DAYS – When used to designate a period of time, shall be in reference to consecutive calendar days.

DISTRICT – Nipomo Community Services District, San Luis Obispo County, California. Where the word "District" is used in a sense requiring action, such as, approving, inspecting, decision making, etc., the "DISTRICT ENGINEER" shall be understood as the person having the authority to take the required action.

DISTRICT ENGINEER – The Engineer employed by the District to oversee design and construction of improvements.

DISTRICT INSPECTOR – The Inspector employed by the District to perform inspection during construction of the work undertaken by the Owner.

GENERAL MANAGER – The Manager of Nipomo Community Services District, the Manager's authorized representative, or other such person as may be designated by the District.

IMPROVEMENTS OR WORK – Facilities to be constructed by the Owner and dedicated to the District including water, sewer and other facilities; sometimes referred to as, the Project, or the facilities.

LABORATORY – The laboratory approved by the District to test materials and work involved in the Contract.

LEGAL ADDRESS OF OWNER – The address shown as the Owner's in Article IX of the Contract as the place to which all notices, letters or other communications to the OWNER shall be mailed or delivered.

NOTICE TO PROCEED – Authorization by the District in writing allowing the Owner to begin work on the specified project.

OWNER – Any person or persons, firm, partnership or corporation making application for District services and/or constructing improvements that will become a part of the District's infrastructure. Alternatively, Owner may be the Nipomo Community Services District on District funded projects.

OWNER'S ENGINEER – Any person or persons, firm, partnership or corporation legally authorized and licensed to practice Civil Engineering in the State of California, who prepares or submits improvement plans and specifications on behalf of the Owner. The Owner's Engineer shall also be responsible for inspection and certification of the work. The Owner's Engineer is sometimes referred to as the Project Engineer.

OWNER'S INSPECTOR – The Inspector employed by the Owner's Engineer and/or Owner to assure the improvements are constructed in accordance with the District Standards and the approved plans and specifications.

PLANS – The Owner's Engineer's plans, profiles, typical cross-sections, working drawings, detail drawings and supplemental drawings, or exact reproduction thereof, approved by the District, which show the locations, character, dimensions and details of the work to be done.

PROJECT – The improvements to be constructed pursuant to the Contract.

RULES AND REGULATIONS – Nipomo Community Services District General Resolutions and Ordinances adopted by the District and as amended from time to time.

SPECIFICATIONS – The directions, provisions, and requirements of the District, pertaining to the method and manner of performing the work shown on the Plans. The Specifications include these Standard Specifications for Water and Sewer Improvements.

STATE SPECIFICATIONS – The Standard Specifications, State of California, Department of Transportation, latest edition.

SUBCONTRACTOR – A person, firm or corporation supplying labor, or labor and materials for the Project as a part of the Construction Contractor's obligation to the Owner.

SURETY – The party or parties who guarantee the completion of the Project or a portion of the Project, by bonds, and whose signatures are attached to the bond.

1.2 TERMS

Whenever in the Specifications or upon the Plans the words directed, required, permitted, ordered, designated, prescribed or terms of like import are used, it shall be understood that the requirements, permission, order, designations, or prescription of the District is intended. Similarly, the terms approved, acceptable, satisfactory, or equal, or terms of like import, shall mean approved by, acceptable to or satisfactory to the District, unless otherwise expressly stated. The word "provide" shall be understood to mean furnish and install.

1.3 ABBREVIATIONS

Wherever the following abbreviations are used, they shall have the meanings indicated:

ACI	American Concrete Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
NASSCO	National Association of Sewer Service Companies
PACP	NASSCO's Pipeline Assessment and Certification Program

1.4 APPLICABILITY

In those cases when, in the opinion of the District Engineer, circumstances require the design and construction of any water and/or sewer system improvements not adequately covered by these specifications, the District Engineer may set different design criteria, require use of other materials, and/or special construction techniques.

2.0 PLAN PREPARATION AND EASEMENTS

2.1 PRELIMINARY INVESTIGATION

The Owner shall meet with the District at the earliest possible date to determine whether the property to be developed is within the District boundaries. At that time, the availability of existing water and/or sewer lines can also be reviewed. In some areas, a preliminary feasibility investigation and report may be necessary to establish that the District can serve the proposed development. All costs for such an investigation and report shall be borne solely by the Owner. Advance deposits in amounts to be determined by the District may be required.

2.2 PLAN PREPARATION

2.2.1 Improvement Plans

Complete plans and specifications for all proposed improvements, as defined herein, which are not initiated by the District, shall conform to the requirements of these Standard Specifications. Improvement plans and specifications shall be submitted to the District for approval and must receive approval prior to construction of such improvements.

2.2.2 Plan Requirements

A. The Plans must be prepared under the direct supervision of a registered civil engineer licensed to practice in the State of California.

B. The Plans will be prepared in the latest version of AutoCAD and 2 sets on bond paper (24" x 36") shall be submitted for each review.

C. Plans must include plan and profile drawings. The density of the grid on profiles shall be such that the Plans shall be easily interpreted.

D. The minimum scale shall be 1-inch equals 50 feet, with a plan to profile scale ratio of 5 to 1. Any deviation from these scale requirements shall be approved by the District.

E. Elevations shall be shown using the North American Vertical Datum of 1988 (NAVD 88) for vertical control.

F. The Plans shall have sufficient detail so that it can be easily determined that there will be adequate cover over pipelines and services and that where water system improvements cross other improvements, such as sewer, storm drains, etc., there will be no conflicts. Elevations for all improvements including hydrants, valve boxes, meter boxes, blow-offs, air/vacuum release valves, and manhole covers shall be shown on the plans. All plans that propose improvements to the District Water facilities shall contain the District's Standard Water Notes (Standard Drawing W-1). All plans that propose improvements to the District Sewer facilities shall contain the District's Standard Sewer Notes (Standard Drawing S-1).

G. All non-standard details shall be shown on the plans. The following note is required to be shown on the plans, when standard details are shown:

   THE WORK SHALL BE PERFORMED IN COMPLETE CONFORMANCE WITH THE CURRENT NCSD STANDARD SPECIFICATIONS FOR WATER AND SEWER SYSTEM IMPROVEMENTS. THE OMISSION OF ANY CURRENT STANDARD DETAIL DOES NOT RELIEVE THE CONTRACTOR FROM THIS REQUIREMENT.

2.2.2 District Plan Check

The Owner/Owner's Engineer shall submit plans and supporting documents as requested for District review. A review letter will be returned to the Owner/Owner's Engineer indicating required corrections. A Plan Preparation Checklist is attached to these Standard Specifications (Appendix

D) to assist in the process. The checklist does not contain all requirements for an approved project and is provided as a courtesy by the District. The plans shall be signed by Cal Fire prior to final review and approval by the District.

2.3 RECORD DRAWINGS

During construction of the improvements, the Owner's Engineer shall note District Approved deviations from the Plans on a set of the Plans specifically set aside for this purpose at the Project site. Any changes shall be made on the originals of the Plans with a suitable note on each sheet stating that the originals are the "Record Drawings". The record drawings shall be filed with and become the property of the District prior to Acceptance by the District of the Project. Record Drawings shall be submitted in both AutoCAD and PDF electronic format.

(NOTE: Two sets of "original" record drawings will be required in many cases; one set for the County and one set for the District. A PDF copy shall also be provided to the District.)

2.4 EASEMENTS

Easements shall be avoided where a reasonable alternate solution is available as determined by the District. If an easement(s) or other right of way document is required for construction and/or maintenance of water and/or sewer improvements, the minimum width shall be 20 feet unless otherwise agreed to in writing by the District. However, there may be instances where easements of a greater width are required as determined by the District. Easements shall be granted and executed prior to District approval of the plans. The form of the grant of easement, or other right of way document to be used shall be approved by the District. The District Board shall accept the easement before it is recorded. Easements and Rights of Way shall be shown on the Plans.

2.5 SECURITY (BONDING)

2.5.1 Required Security

Security (also referred to as "bonding") must be posted with most subdivision projects, to ensure completion of the public improvements that are required as conditions of approval. Following approval of the improvement plans, the District will review an Engineer's Estimate of the cost of construction that is to be secured. Please note that the cost estimate must be based on unit costs that would be experienced if the District were to claim the bonds and construct the improvements under public agency contracting rules. Unit costs shall be at least those shown in the current edition of the San Luis Obispo County Approved Unit Costs for Bonding Purposes table adjusted by the current Caltrans Price Index.

Once the District has approved the estimate of construction cost, the following factors must be added:

Construction cost	Contingency	Inflation	Administrative costs
<$75,000	10%	10%	40%
$75,000 - $200,000	10%	10%	30%
>$200,000	10%	10%	20%

(Construction cost) + (Contingency) + (Inflation) + (Administrative costs) = Bonding Amount

2.5.2 Items to be Secured

There are three different items to be secured during the bonding period:

Performance = 100% of the bonding amount. Once all the required public improvements have been accepted and a Guarantee Bond posted, the Performance Bond will be exonerated. Note that acceptance includes the completion of the improvements and the preparation of "as-built" plans, submittal of required reports, submittal of offer of dedication and the engineer's certification.

Payment and Materials = 50% of the bonding amount. The Payment and Materials Bond will be held for 90 days after acceptance of the improvements.

Guarantee = 10% of the bonding amount. The Guarantee Bond will be held for one year from date of completion and acceptance of improvements.

Types of security. The types of security accepted the District are listed below. Note that all forms of security must be made payable to the Nipomo Community Services District.

Cash. Submit 100% of the bonding amount. A certified check may also be submitted in this amount. Because we pay you interest, a Taxpayer Identification Number is required with cash bonds. You will need to fill out an IRS form W-9 and return it to the District with your check. The form may be obtained at: http://www.irs.gov/pub/irs-pdf/fw9.pdf

Certificate of Deposit. Submit three separate certificates – 1 @ 50%, 1 @ 40%, 1 @ 10% of the bonding amount.

Letters of Credit. Submit three separate letters of credit – 1@ 100%, 1@ 50%, 1 @ 10% of the bonding amount. The Guarantee letter of credit (10%) may be submitted at the time of acceptance of improvements. Important - any Letters of Credit with expiration dates need to include an automatic extension and notice provision.

Surety Bonds. Submit two separate bonds – 1 @ 100%, 1 @ 50% of the bonding amount. The Performance bond (100%) will be reduced to 10%, to become the Guarantee bond, at the time of acceptance of improvements.

3.0 CONSTRUCTION AND INSPECTION

3.1 GENERAL

The Owner is required to enter a Plan Check and Inspection Agreement and provide a deposit. For new subdivisions improvements shall be constructed to the ends of all streets. The Owner and/or Contractor shall provide all transportation, materials, equipment, labor and supplies to complete excavation, backfill, street repairing and other work incidental to the construction of the Project.

3.2 GOVERNING SPECIFICATIONS

All improvements to be dedicated to the District shall be constructed in accordance with the Standard Specifications and the Rules and Regulations of the District. The Rules and Regulations, as adopted from time to time, are hereby made a part of these specifications.

3.3 EXCAVATION PLANS FOR WORKER PROTECTION

The Owner shall submit to the District, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches 5 feet or more in depth. The plan shall be prepared by a registered civil or structural engineer. As a part of the plan, a note shall be included certifying that the plan complies with the CAL/OSHA Construction Safety Orders, or that the registered civil or structural engineer certifies that the plan is not less effective than the shoring, bracing, sloping, or other provisions of the Safety Orders.

The detailed plan showing the design of shoring, etc., shall include surcharge loads for nearby embankments and structures, for spoil banks, and for construction equipment and other construction loadings. The plan shall indicate for all trench conditions the minimum horizontal distances from the side of the trench at its top to the near side of the surcharge loads.

Nothing contained in this article shall be construed as relieving the Owner of the full responsibility for providing shoring, bracing, sloping, or other provisions which are adequate for worker protection.

3.4 NOTICE TO PROCEED

The Owner shall not commence construction until the Notice to Proceed is issued by the District. The Notice to Proceed shall not be issued until after approval by the District of the Plans and Specifications, bond and insurance forms, grant of easement(s), if any, and until after payment of the initial deposit of estimated capacity fees, if any.

3.5 CONNECTION TO EXISTING FACILITIES

No connection shall be made to existing facilities of the District without prior approval and inspection by the District Inspector.

3.6 NOTICE OF BEGINNING CONSTRUCTION

Notice shall be given to the District at least seven (7) working days in advance of commencement of work, and a preconstruction meeting shall be scheduled at that time. The Owner shall be responsible for scheduling and leading the pre-construction meeting. At a minimum, the Owner, Owner's Engineer, District Inspector, Contractor, County Inspector, and other utilities affected by the work shall attend. Prior to any excavation, the Owner shall notify all owners of existing utilities and facilities in the proposed project area, and Underground Service Alert.

3.7 OTHER PERMITS

Prior to commencing construction, the Owner shall secure all permits, including an encroachment permit, secured all licenses, pay all charges and fees, and give all notices as necessary and required for the Project by other agencies having jurisdiction. These shall be made available to the District upon demand.

3.8 CONSTRUCTION WATER

Water used for construction, testing and dust control shall be arranged for and furnished by the Owner and/or Contractor at the expense of the Owner and/or Contractor. The Owner shall comply with all regulations of the District relative to connection to fire hydrants or standpipes and secure prior written permission from the District if water from a District owned source is to be used.

3.9 INSPECTION BY THE DISTRICT

All work shall be subject to inspection by the District. Owner or Owner's representative shall provide the District with a minimum of 48-hours' notice prior to backfill. When requested by the District the improvements shall be left open and uncovered until the installation is inspected by the District. District inspections will occur during normal working hours. Normal working hours for the purposes of inspection are between the hours of 7:00 a.m. and 3:30 p.m. each day except Saturdays, Sundays and District holidays.

The District shall at all times have access to the work during construction and shall be furnished with every reasonable facility for ascertaining full knowledge respecting the progress, workmanship and character of materials used and employed in the work.

The inspection of the work by District shall not relieve the Owner, the Owner's Engineer, and/or Owner's Contractor of any obligations to construct and inspect the Improvements as prescribed by the District's Specifications and Agreements. Defective work shall be made good, and unsuitable

materials may be rejected notwithstanding the fact that such defective work and unsuitable materials have been previously overlooked by the District. The installation and inspection of unsuitable improvements shall not be construed as acceptance and modification to these specifications.

The Owner shall bear the costs of District inspections.

3.10 INSPECTION BY THE OWNER'S ENGINEER

The Owner's Engineer shall have the responsibility for performing regular inspection during the construction of all work. The Owner's Engineer shall be responsible for inspecting the work on a regular basis and shall be present for testing of improvements. The Owner or Owner's Engineer shall be responsible for compaction testing and inspection of trench bedding and backfill. Results of compaction testing shall be made available to the District. The Owner's Engineer shall be present for the following items:

- Preconstruction Meeting
- All Improvements, including pipe fittings, which are to be backfilled
- Final Inspection
- Additional inspections may be required as determined by the District.

The Owner and/or Owner's Contractor shall give due notice in advance of backfilling to the District so that the District Inspector may have opportunity to inspect the Improvements in accordance with Section 3-9.

The Owner's Engineer shall certify that the improvements have been constructed in accordance with the approved plans and specifications. Any deviations from the plans shall be pre-approved by the District Engineer in writing prior to installation of the improvements. Any work installed which is not in accordance with the approved plans shall be deemed defective and will be subject to rejection.

4.0 CONTROL OF MATERIAL

4.1 QUALITY OF MATERIALS

All equipment, materials and supplies to be incorporated in the Project shall be new unless otherwise specified and shall conform to the requirements stated in the Plans and Specifications approved by the District.

4.2 DEFECTIVE MATERIALS

All materials not conforming to the requirements of the approved Plans and Specifications shall be considered as defective and all such materials, whether in place or not, shall be rejected and shall be removed immediately from the site of the work unless otherwise permitted in writing by the District. No rejected material, the defects of which have been subsequently corrected, shall be used unless approved in writing by the District. Upon failure on the part of the Owner to comply with any order of the District made under the provisions of this article, the District shall have authority to remove and replace defective material at the expense of the Owner and/or Contractor.

4.3 STORAGE OF MATERIALS

All materials for use in the Project shall be stored by the Owner and/or Contractor in such a manner as to prevent damage from exposure to the elements, admixture of foreign materials, or from any other cause. The Owner and/or Contractor shall be fully responsible for any damage incurred to the materials for the Project while being stored, including damage resulting from storing of material in public right-of-way and District acquired easements. The Owner and/or Contractor shall also be fully responsible for the preservation of public and private property while storing materials for the Project.

5.0 LEGAL RELATIONS AND RESPONSIBILITIES

5.1 OBSERVING LAWS AND ORDINANCES

The Owner and/or Contractor shall keep themselves fully informed of all laws, ordinances and regulations which in any manner affect those engaged or employed in the work or the materials used in the Project or which in any way affect the conduct of the work and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over same.

The Owner and/or Contractor shall at all times observe and comply with and shall cause all of the Owner's agents, employees, Contractor, subcontractors, and suppliers to observe and comply with all laws, ordinances, regulations, orders and decrees, and shall hold harmless, indemnify and defend the District, the District's Engineer, and their consultants, and each of their directors, officers, employees and agents from and against all claims, damages, losses, expenses, and other costs, including costs of defense and attorneys' fees, arising out of or resulting from the violation of any such law, ordinance, regulation, order or decree by the Owner, Contractor, employees, agents, subcontractors, or suppliers.

5.2 PERMITS AND LICENSES

The Owner and/or Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work.

5.3 INVENTIONS, PATENTS, AND COPYRIGHTS

The Owner shall pay all royalties and assume all costs arising from the use of any invention, design, process, materials, equipment, product or device which is the subject of patent rights or copyrights.

The Owner and/or Contractor shall hold harmless, indemnify and defend the District, the District's Engineer, and their consultants, and each of their directors, officers, employees and agents from and against all claims, damages, losses, expenses and other costs, including costs of defense and attorney's fees, arising out of any infringement of patent rights or copyrights incident to the use in the performance of the work or resulting from the incorporation in the Project of any invention, design, process, materials, equipment, product or device and shall defend all such claims in connection with any alleged infringement of such rights.

5.4 PUBLIC CONVENIENCE AND SAFETY

The Owner and/or Contractor shall so perform construction as to offer the least possible obstruction and inconvenience to the public, and the Contractor shall have under construction no greater length or amount of work than can be prosecuted properly with due regard to the rights of the public.

Convenient access to driveways, houses and buildings along the line of work shall be maintained and temporary crossings shall be provided and maintained in good condition. Not more than one crossing or intersecting street or road shall be closed at any one time.

The Owner and/or Contractor shall provide and maintain such fences, barriers, directional signs, lights and flagmen as are necessary to give adequate warning to the public at all times of any dangerous conditions to be encountered as a result of the construction work and to give directions to the public.

All construction shall be performed in compliance with the standards as established by the Occupational Health and Safety Act (OSHA) and appropriate State of California regulations.

All work in the County right-of-way shall comply with the San Luis Obispo County Public Improvement Standards for Traffic Control.

The Owner shall also bear the cost of traffic regulations lawfully exacted by the Federal Government, the State of California, or County or during the time of performing work affecting the property of said Government, State, or County.

5.5 RESPONSIBILITY FOR LOSS, DAMAGE OR INJURIES

The Owner and/or Contractor shall be responsible for all claims, demands, or liability from any cause arising out of or resulting from or in connection with the performance of the work, excepting only those as may be caused solely and exclusively by the fault or negligence of the District, the

District's Engineer, or their consultants, or their directors, officers, employees and agents. Such responsibility shall extend to claims, demands, or liability for loss, damage or injuries occurring after completion of the Project as well as during the progress of the work.

5.6 OWNER'S RESPONSIBILITY FOR THE PROJECT

Until acceptance of the project, the Owner shall have the responsible charge and care of the Project and of the materials to be used therein (including materials which have been furnished by the District) and shall bear the risk of injury, loss or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the Project.

The Owner shall rebuild, repair, restore and make good all injuries, losses or damages to any portion of the Project or the materials occasioned by any cause before its completion and acceptance and shall bear the expense thereof. Where necessary to protect the Project or materials from damage, the Owner shall bear the expense of providing suitable drainage and erecting such temporary structures as are necessary to protect the Project or materials from damage. The suspension of the work or the granting of an extension of time from any cause whatever shall not relieve the Owner of responsibility for the work and materials as herein specified.

5.7 PRESERVATION OF PROPERTY

The Owner shall exercise due care to avoid injury to existing improvements or facilities, utilities, adjacent property, and trees and shrubbery that are not to be removed.

All trees, shrubbery and landscaping that are not to be removed, and pole lines, fences, signs, survey markers and monuments, buildings and structures, conduits, pipelines under or above ground, sewer and waterlines, all highway or street facilities, and any other improvements or facilities within or adjacent to the Project shall be protected from injury or damage, and the Owner and/or Contractor shall provide and install suitable safeguards to protect such objects from injury or damage. If such objects are injured or damaged by reason of the Owner's operation, they shall be replaced or restored at the Owner's expense to a condition as good as required by the Plans and Specifications if any such objects are a part of the work being performed.

The fact that any such pipe or other underground facility is not shown on the Plans shall not relieve the Owner of responsibility under this article.

In addition to any requirements imposed by law, the Owner shall shore up, brace, underpin, and protect as may be necessary, all foundations and other parts of all existing structures adjacent to and adjoining the site of the work which are in any way affected by the excavations or other operations connected with the performance of the work. Whenever any notice is required to be given by the Owner to any adjacent or adjoining landowner or other party before commencement of any work, such notice shall be given by the Owner.

5.8 SAFETY

The Owner and/or Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the work, and the Owner and the Contractor shall fully comply with all state, federal and other laws, rules, regulations and orders relating to safety of the public and workers.

The right of the District to conduct construction review or observation of the work will not include review or observation of the adequacy of the Owner's and/or Contractor's safety measures in, on or near the construction site.

6.0 FINAL ACCEPTANCE OF THE PROJECT BY THE DISTRICT

6.1 FINAL INSPECTION

Final Inspection shall be conducted in the presence of the District upon reasonable notice.

6.2 CERTIFICATION OF THE WORK BY THE OWNER'S ENGINEER

The work shall be subject to final inspection and testing under the supervision and in the presence of Owner's Engineer. If, in the Owner's Engineer's judgment, the work has been duly inspected during construction and has satisfactorily passed final inspection and testing and is ready for acceptance the Owner's Engineer shall certify the same to the Board on a form approved by the District.

6.3 WARRANTY

All work shall be warrantied by Owner against defective workmanship and materials for a period of 1 year from the date the work is accepted by the District. Owner, at Owner's expense, shall replace or repair any such defective work in a manner satisfactory to the Owner's Engineer and the District.

Water & Sewer System Design Criteria

1.0 WATER SYSTEM

1.1 CONFORMANCE WITH APPLICABLE STANDARDS AND CODES

All work shall be performed in accordance with the following standards:

- Nipomo CSD Standards and Specifications for Water and Sewer System Improvements (District Standards)
- Nipomo Community Services District Code (District Code)
- California Waterworks Standards (Waterworks Standards)
- Standards of the American Water Works Association (AWWA), latest amended (AWWA Standards)

In case of conflict between the District Standards, District Code, Waterworks Standards, or AWWA Standards, the more restrictive Standard shall apply.

1.2 WATER DEMANDS

Water systems shall be designed to meet the Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Demand (PHD) estimated using the information provided below:

1.2.1 Demand Rates

Land Use Category	ADD per acre (gallons per day per acre)	Annual Demand Factor* (acre-feet per year per acre)
Commercial Retail	1,326	1.49
Commercial Service	446	0.50
Multi-Land Use Category	137	0.15
Office and Professional	620	0.69
Open Space	1,050	1.18
Public Facility	357	0.40
Recreation	709	0.79
Rural Lands	87	0.10
Residential Multi-Family	2,205	2.47
Residential Rural	162	0.18
Residential Suburban	551	0.62

Land Use Category	ADD per acre (gallons per day per acre)	Annual Demand Factor* (acre-feet per year per acre)
Residential Single Family	1,250	1.40
**Demand factors were calculated based on annual production data as reported in the District's annual Department of Water Resources (DWR) form and represent 10-year production average from 2011-2020*		

1.2.2 Peaking Factors

Maximum Daily Demand (MDD)	1.70 x ADD
Peak Hourly Demand (PHD)	3.78 x ADD
(Source: Water and Sewer Master Plan Update 2007, page 2, Table ES-1.)	

1.2.3 Fire Flow

Fire flow requirements shall be as follows:

- Residential Use: 1,500 gpm
- Commercial Use: 2,500 gpm

1.3 DISTRIBUTION SYSTEM

1.3.1 Operating Pressure

The distribution system shall be able to provide a minimum operating pressure in the water main at the user service line connection throughout the distribution system of not less than 20 pounds per square inch at all times, and not less than 40 pounds per square inch at all times excluding fire flow.

Design of pressurized water pipelines shall take into consideration the maximum anticipated working pressure, maximum anticipated occasional surge pressure, and recurring surge pressures, as defined in AWWA C900 for PVC or AWWA C150 for ductile iron. In all cases the maximum anticipated working pressure cannot exceed the pipe's pressure class times the temperature coefficient, occasional surge pressure capacity cannot exceed the short-term pressure rating times the temperature coefficient, and recurring surge pressure capacity cannot exceed the pipe's pressure class times the temperature coefficient.

For PVC pipelines, the type of pipe embedment should be selected so as to prevent a vertical cross-section long-term ring deflection of more than 7.5 percent as estimated using the design information provided in AWWA Manual M23.

1.3.2 Size of Water Mains

The minimum pipe size for water mains shall be 8-inches in diameter. All line sizing shall be based on maximum day demand plus fire flow demand or peak hour demand, whichever is greater. Water velocities in mains shall not exceed 5 feet per second under all system demand conditions, including fire flow

demand during peak hour demand. Pipeline pressure losses will be calculated using the Hazen-Williams formula with C=130.

1.3.3 Alignment and Layout of Water Mains

Minimum cover over the top of pipe shall be 3 feet below finish grade for piping 10 inches in diameter and less and 4 feet of minimum cover for pipe diameters 12 inches or greater. The District may require more than this minimum cover if, in the opinion of the District, additional protection is required.

Dead-end water mains can present a public-health hazard. California Waterworks Standards require the construction of blow-offs on dead-end mains, and also require periodic flushing of dead-end mains, thereby increasing system operating costs. Therefore, the District requires that water system improvements shall have at least two connections to waterlines in different streets to form a looped water system.

One water service per parcel shall be provided and except for connections serving a single-family residence, a separate service connection with backflow prevention device shall be provided to each parcel of property for landscape irrigation per District Ordinance.

Fire hydrants, meter boxes, and blowoffs shall be located no closer than 5 feet from any beginning of curb return, driveway, or other utility.

1.3.4 Separation of Water Mains and Other Fluid Pipelines

Separation between waterlines and other fluid pipelines must comply with the requirements of the California Waterworks Standards (Title 22 California Code of Regulations, Division 4 Environmental Health, Chapter 16, Article 4, Section 64572.). Installations of new water mains in existing developed areas must comply with current regulations. Where minimum separation cannot be achieved, a variance per the California Waterworks Standards (Title 22 California Code of Regulations, Division 4 Environmental Health, Chapter 16, Section 64551) will be required. If a variance is needed, the designer shall coordinate the request for exemption with the District.

1.3.5 Valves

As a general rule, there shall be three valves on tees and four valves on crosses. On long blocks, intermediate valves should be installed so that not more than 500 feet of line will have to be shut off at any one time. Valves shall be joined to fittings by flanges. When water mains are in easements outside traveled streets, a valve shall be located at each end of the easement. The final determination of the number of valves and their locations shall be approved by the District.

1.3.6 Air Release and Vacuum Valves

Combination air release and vacuum valves shall be installed at all high points in a line, in areas of potential negative pressure, on pipelines with constant ascending or descending slopes in excess of 1,000 feet, or as directed by the District Engineer. The inlet to each valve shall be provided with a gate valve or corporation stop to provide a positive closure between the main pipeline and the air and vacuum release

valve. The air release and vacuum valve vent shall be installed above ground in such a manner as to preclude backflow (see Standard Detail W-15) and shall be installed outside of the "clear zone" as defined in SLO County Public Improvement Standards.

1.3.7 Hydrants

The system shall be provided with valves and hydrants so that no point on any lot at the street right-of-way shall be more than one and one-half times the maximum hydrant spacing from a working hydrant as a result of any single break or shutdown for repairs, except where impractical as determined by Cal Fire.

A hydrant shall be placed at each intersection except where this would provide excessive hydrant coverage as determined by Cal Fire. Fire hydrant spacing shall be computed separately for each side of roadways with a right-of-way greater than 60 feet.

In locations where no curb is installed, hydrants shall be installed outside of the "clear zone" as defined in SLO County Public Improvement Standards. Bollards shall be installed where required by Cal Fire or as directed by the District. Fire hydrant bollards/barricades shall not obstruct the outlets and shall be consistent with Standard Detail W-7.

Final approval of hydrant locations and spacing to be provided by Cal Fire.

1.3.8 Blowoffs

Blowoffs shall be provided at localized low points along pipelines as directed by the District Engineer. Where dead ends on new mains are allowed, they shall be closed with plugs or caps that are suitably restrained to prevent blowing off under test pressure. If a blowoff valve precedes the plug or cap, it too shall be restrained against blowing off. All dead ends shall be equipped with suitable blowoff or venting devices.

1.3.9 Sampling Stations

Sampling stations may be required. The number and location of sampling stations shall be as directed by the District. Coordinate the location of the sampling station(s) with the District prior to approval of construction plans.

1.3.10 Materials

The water distribution system shall not use any chemical, material, lubricant, or product in the production, treatment, or distribution of drinking water that will result in its contact with the drinking water including process media (carbon, sand), protective materials (coatings, linings, liners), joining and sealing materials (solvent cements, welding materials, gaskets, lubricating oils), pipes and related products (pipes, tanks, fittings), and mechanical devices used in treatment/transmission/distribution systems (valves, chlorinators, separation membranes) that has not been tested and certified as meeting the specifications of NSF International/American National Standard Institute (NSF/ANSI) 61-2024 / NSF/ANSI 60-2024, and NSF/ANSI 600-24), which is hereby incorporated by reference. This requirement shall be met under

testing conducted by a product certification organization accredited for this purpose by the American National Standards Institute.

Water pipelines shall be constructed of PVC pipe or, with the District's approval, ductile iron pipe. Fittings shall be ductile iron conforming to AWWA C-110 and cement mortar lined per AWWA C-104 unless noted otherwise in Standards.

See Appendix C for an approved list of materials for use within the District's system.

1.4 CROSS CONNECTIONS

1.4.1 Backflow Prevention Required

A. Backflow prevention devices shall be installed on all service connections that pose a potential threat to health and safety of the community. At a minimum the following service connections shall require backflow prevention:

1. Landscape Irrigation
2. Medical and health care facilities
3. Areas serviced by private wells
4. Restaurants and other food-preparation facilities
5. Private fire-protection lines including fire sprinkler systems
6. Laboratories
7. Commercial and industrial facilities that use water for other than domestic purposes.

1.4.2 Backflow Prevention Devices

The type of backflow prevention device shall be in accordance with the California Department Health Services regulations relating to cross-connections (Cross Connection Control Policy Handbook Published by the State Water Board, most recent amendment) and the District Cross Connection Control Plan. The type of device and method of installation shall also be subject to review and approval by the District and County Department of Public Health/Environmental Services.

1.4.3 Location of Backflow Prevention Devices

Backflow prevention devices shall be located as close as practical to the service meter with a maximum distance of 10 feet. In addition, backflow devices shall be located in accordance with the Cross Connection Control Policy Handbook Published by the State Water Board, most recent amendment and the District's Cross Connection Control Plan.

1.4.4 Connections of Private Sprinkler Systems

Any connection between a residential single-family or residential-duplex fire sprinkler system shall be via a fire sprinkler connection installed immediately downstream of the meter and shall include a backflow prevention device. A dedicated service from the water main is required for fire sprinkler systems serving multi-family residential units and commercial buildings.

1.4.5 Ownership and Maintenance

The property owner where any service connection requiring a backflow device is located shall be responsible for operations, maintenance, and testing of said device. The District shall not be responsible for operation, maintenance and testing of these devices.

1.5 POTABLE WATER BOOSTER STATIONS

1.5.1 General Design Requirements

Design requirements for potable water booster stations will vary from project to project depending on the size and nature of the facilities. Projects that anticipate the need for these facilities are required to have a pre-design conference with the District to determine design parameters. The following requirements are to be used as a general guide and will be defined during the pre-design conference.

1.5.1.1 Preliminary Design Report

The Preliminary Design Report will include, at a minimum, the design criteria to be utilized, preliminary flow and pressure computations, design calculations, hydraulic transient analysis, identification of easements, geotechnical investigation, and cost estimate. In addition, the following design elements shall be discussed:

- Site Development
- Structural Design
- Architectural Design
- Hydraulic Analysis
- Mechanical Equipment
- Materials
- Coatings
- Electrical Design
- Instrumentation and Process Control
- Communications
- Emergency Power
- Noise Control

The Preliminary Design Report is to be submitted to the District for review and approval.

1.5.1.2 Final Design Documents

The final design may be completed after approval of the Preliminary Design Report, incorporating any comments received. The final design documents will include construction drawings on 24 inch x 36 inch paper and technical specifications for the work and equipment. The final design documents shall contain the design criteria including pump flow rates and total dynamic head and shall be submitted to the District for approval.

1.5.1.3 Commissioning and Acceptance

Prior to acceptance of the facility by the District, the Contractor shall perform operational checks of each component, perform hydrostatic tests, and successfully pass performance testing. The Owner's Engineer shall submit a proposed start-up procedure and check list to the District for review and approval prior to completion of construction. Start-up testing shall include, at a minimum, the following:

- Confirmation of design pressures and flows
- Confirmation of alarms and SCADA functionality
- Calibration of instrumentation
- Confirmation of operation under auxiliary power

Following start-up testing performance acceptance testing shall be performed. The performance test shall be performed continuously for a period of seven (7) days, 24 hours per day. The intent is for the contractor to demonstrate to the District that the facility will function as a complete and operable system under normal as well as emergency operating conditions and is ready for acceptance. During the performance test period the facilities shall be operated in a manner to test alarms, controls, interlocks, and all auxiliary and sub-systems. Repair or replace equipment that does not respond to the interlocks, alarms, and controls designed and re-start the test period.

District personnel shall receive training from factory authorized representatives of the major equipment. Training shall be performed prior to acceptance of the facility by the District.

Prior to acceptance of the facility the contractor shall deliver to the District facility keys (or entry tools) and digital copies of the following:

- Facility record drawings
- As-built control schematics
- As-built wiring schematics
- Equipment test data and O&M manuals.
- Mechanical and electrical component lists
- Contact information for all warranties

1.5.2 Access

Two vehicular access points shall be provided. Where two access points cannot be provided include a turn around space meeting Cal Fire requirements. Access to the following items shall be considered and discussed with the District during design;

- Crane access to pumps
- Re-fueling access to emergency generator
- Chemical deliveries to disinfection storage containers

1.5.3 Water Service

Potable water service shall be provided onsite for a hose bibb emergency shower (if required), landscape irrigation (if required), and fire protection (if required). Services shall be metered and include a backflow prevention assembly.

1.5.4 Sanitary Sewer Service

A sanitary sewer service connection is required for all onsite waste streams including, but not limited to, pump room floor drains, air conditioning condensate, chlorine analyzer discharge, emergency shower/eyewash discharge, and disinfection storage containment sumps. On-site rock drainage pits will not be permitted for these discharges where existing sewer collection systems are in proximity to the site as determined by the District.

1.5.5 Signage

Site address, facility number, phone number, warning signage, and no trespassing signs shall be posted outside the front of the site after construction completion. Warning and no trespassing signs shall also be posted on the outside of the side and back walls.

1.5.6 Noise

Pump sites shall not cause noise that exceeds a fifteen-minute average sound level of 45 decibels in residential areas and 60 decibels in commercial areas. An average sound level will be determined from 15 measurements performed with an ANSI-S1.4-2014 Type 1 or Type 2 Sounds Level Meter using the A-weighting network. The instrument response shall be "slow" and measurements shall be made when wind velocity is less than five miles per hour. The location for measuring exterior sound levels shall be at the property line of the pump station facility, four to five feet (4' to 5') above ground level and at least four feet (4') from walls and other reflective surfaces.

1.5.7 Pumps & Motors

Pumps shall be vertical turbine, solid shaft type, suitable for pumping potable water. Each pump shall comply with the latest edition of the Hydraulic Institute Standards. All pumping systems shall be fully redundant, including one duty and one standby pump.

1.5.7.1 Booster Sizing

Pump station flow rate and pressure shall be designed to meet domestic and fire protection supply. Sizing shall be based on average day demand, peak hour demand, and maximum day demand plus fire flow as

established by the District. The total pumping capacity shall meet the largest of either peak hour or maximum day plus fire flow with the largest pump out of service.

1.5.7.2 Booster Drives

Pump motors shall be driven by Variable Frequency Drives (VFD) unless otherwise approved by the District. All VFDs shall include air conditioning cooling. Soft starters may be allowed by the District for certain fire flow applications.

1.5.7.3 Booster Discharge Accessories

Pumps shall include a globe style silent check valve or a pump control valve. The District may require an alternate valve style for certain high pressure applications. All pump discharges shall also include a combination air release valve, drain port, flexible coupling, pressure gauge and switch, and isolation valve.

1.5.7.4 Booster Discharge Head

The discharge head shall be manufactured by the pump manufacturer and shall be a fabricated steel fitting that mounts to the pump can flange. Cast iron discharge heads are not allowed. The discharge flange shall match the pressure rating of the booster station piping. Prior to machining, the discharge head shall be stress relieved by a thermal process. A flanged four piece adjustable spacer type coupling shall be provided with a coupling guard for seal removal. An air release valve shall be provided on the discharge head base to relieve air in the suction barrel. Provide taps and penetrations on the discharge head required for the mechanical seal drain and air release valve. The discharge head and flanges shall be rated for the maximum pressure on the pump curve and transient pressures.

1.5.8 Piping

1.5.8.1 Above Ground Pipe Sizing

The discharge manifold and discharge piping should be sized such that the inside diameter of the piping maintains a velocity equal to or less than 5 ft/s. The discharge manifold shall be a constant size.

Pipe shall be Epoxy lined and coated welded steel pipe. Provide polyurethane finish coat on piping located within vaults and outdoors. Provide flange isolation gaskets between all dissimilar metals.

1.5.8.2 Below Ground Pipe Sizing

The suction manifold and suction piping should be sized such that the inside diameter of the piping maintains a velocity equal to or less than 3 ft/s. Higher velocities that are less than 5 ft/s in the header and less than 4 ft/s in the individual pump supplies may be considered by the District when supported by NPSH requirements. The yard piping should be sized such that the inside diameter of the piping maintains a velocity equal to or less than 5 ft/s.

Pipe shall be Epoxy lined, cement mortar coated welded steel pipe. Provide flange isolation gaskets between all dissimilar metals.

1.5.9 Pressure Relief Valves

A ductile iron pressure relief valve shall be provided on the pump station discharge header that allows water to recirculate to the suction header in high pressure situations such as a pump stuck in the "on" position. The pressure relief valve shall be installed upstream of the station's flow meter to avoid recording flows that are recirculated to the pump header. Surge anticipation valves are not allowed. The pressure relief valve shall be a hydraulic diaphragm type valve with V-port plug, position indicator, limit switch, and stainless steel control lines and accessories. The pressure relief valve shall have a pressure rating greater than or equal to the pipeline it is connected to.

1.5.10 Flow Meters

Magnetic flow meters with digital totalizers and solid state transmitters shall be provided at pump station discharges. The flow meter shall have 4-20 mA outputs, prevention from memory loss during battery change out, one year battery life, and empty pipe detection that uses no external devices. The flow meter shall be sized for both low and high flow ranges per manufacturer recommendations. A minimum of 5 times the diameter upstream and 2 times the diameter downstream of straight pipe shall be provided on each side of the flow meter with any bends or obstructions. The flow meter shall have a pressure rating greater or equal to the pipeline it is connected to.

1.5.11 Hydropneumatic Tanks

A welded steel hydropneumatic tank shall be provided on the booster pump station discharge piping. The hydraulic evaluation and modeling shall include a surge analysis for sizing the tank. The tank shall be rated at pressure that exceeds the high operational and transient pressures anticipated at the facility's discharge. Surge analysis and design calculations shall be submitted to the District for review.

1.5.12 Enclosures

1.5.12.1 General

Booster pumps, disinfection, and electrical equipment shall be housed in pre-fabricated steel or masonry block construction enclosures. Pre-fabricated enclosures shall not have an integral floor and shall be installed over cast-in-place concrete foundations. Electrical, pump, and disinfection equipment shall be located in separate rooms or separate enclosures. All enclosures shall be provided with temperature transmitters. Enclosure drawings shall be sealed by a California Registered Structural Engineer.

1.5.12.2 Sizing & Layout

The enclosures shall be sized to accommodate equipment and provide enough space for required clearances and maintenance activities. The height of the ceiling in the enclosures shall provide sufficient vertical clearances from the top of all equipment. The layout of the equipment inside the enclosures shall be designed to provide enough space to walk around the equipment, open equipment doors, if applicable, and perform required maintenance.

1.5.12.3 Booster Pump Enclosure

Booster pump enclosures shall be provided with roof hatches to allow for the removal of the pumps during maintenance or replacement. Hatches shall be centered over each pump and shall be sized to provide enough space to pass the pump, motor and discharge head. Provide a trench drain to collect all nuisance leaks from the pumps. The pump enclosures shall be cooled and ventilated for comfort.

1.5.12.4 Electrical Enclosure

Electrical equipment shall be housed in a separate enclosure or room and shall be ventilated. Electrical enclosures shall be equipped with doors large enough to remove the largest piece of equipment in its installed position. All equipment shall be mounted on 3" raised concrete pads or as specified by the utility provider.

1.5.13 SCADA Integration

All facilities shall be equipped and capable of interfacing with the District's existing SCADA system. Final requirements for the SCADA system shall be determined in coordination with the District during the design phase. Typical minimum requirements are listed below:

1. Inlet/suction pressure
2. Flow Rate
3. Pump Status (on/off/hand)
4. Alarms: seal failure, high temp, phase, circuit trip, high pressure, low pressure, lag pump call, intrusion
5. Run time in hours for each pump
6. Amperage draw
7. Magnetic flow meter with a flow totalizer and rate of flow in gallons per minute.

2.0 SEWER SYSTEM

2.1 CONFORMANCE WITH APPLICABLE STANDARDS AND CODES

All work shall be performed in accordance with the following standards:

- Nipomo Community Services District Standards and Specifications for Water and Sewer System Improvements (District Standards)
- Nipomo Community Services District Code (District Code)

2.2 ACCEPTABLE FLOWS

All new uses or new construction in the District with one or more interior plumbing fixtures, including an ADU or JADU, shall apply for water and sewer service and, upon approval, connect to the sewage collection system. Any flows other than domestic sewage are considered prohibited discharges and are not accepted in the District's sewage collection system. District Ordinances list prohibited waste flows, which include but are not limited to:

- Solid or viscous wastes in amounts which will, or may, obstruct the flow in the District sewer or wastewater treatment facility
- Any wastewater having a pH less than 6.5, or more than 8.5
- Any wastewater containing toxic pollutants in sufficient quantity to injure or interfere with any wastewater treatment process, constitute a hazard to humans or animal, or create a toxic effect in the receiving waters of the water treatment facility
- Discharges from water softening
- Draining of swimming pools and spas
- Oils and grease in excess of one hundred mg/L
- Rain, storm water, surface water, groundwater, seepage, roof runoff, street or yard drainage, or subsurface drainage

Written permission from the District is necessary to discharge anything other than domestic sewage into the District's sewage collection system.

2.3 SEWER DEMANDS

2.3.1 Residential Sewer Flow Rates

Minimum sewer flow rates from residential developments shall be the greater of (a) an average of 3.2 persons per single family residential unit at an average disposal rate of 60 gallons per person per day, or (b) the rates determined using the following table.

Land Use Category	Sewer Flow Rate (gallons per day per acre)
Residential Single Family	750
Residential Suburban	276
Residential Multi-Family	1985

2.3.2 Non-Residential Sewer Flow Rates

Minimum sewer flow rates from non-residential developments shall be determined using the following table.

Land Use Category	Sewer Flow Rate (gallons per day per acre)
Commercial Retail	1,193
Commercial Service	401
Office and Professional	558
Public Facility	232

For land uses not shown in the above table (e.g., commercial and industrial), the District shall determine flows based on the proposed project.

2.3.3 Peaking Factor

Peaking factors for sewer design shall be not less than 3.0 and shall be approved by the District.

2.4 COLLECTION SYSTEM

2.4.1 General

Pipeline design shall be based on peak flows and on Manning's formula. Use a coefficient of "n" = 0.011 for plastic pipe and “n” = 0.013 for all other pipes.

Design peak flows in pipelines 12 inches in diameter and smaller shall be limited to an approximate liquid depth to pipe diameter ratio (d/D) of 0.50. Design Peak flows in pipelines larger than 12 inches in diameter shall be limited to an approximate liquid depth to pipe diameter ratio (d/D) of 0.75.

Minimum pipeline diameter of sewer mains shall be 8 inches.

2.4.2 Slope and Alignment

Minimum pipeline grades shall be as follows:

Pipe Diameter (inch)	Minimum Slope (ft/ft)
8	0.0035
10	0.0025
12	0.0020
15	0.0015
18	0.0012
21	0.0010

As a general rule, sewers shall run in a straight line between manholes. All sewer alignments shall be approved by the District. Minimum pipeline grades are discouraged and must be preapproved in writing by the District and will only be approved in the District Engineer's discretion upon a finding of physical site constraints.

2.4.3 Location Requirements for Sewers within Streets and Roads

Minimum depth from finish street grade to top of sewer main pipe shall be six (6) feet. All sanitary sewers and appurtenant structures shall be a minimum of five (5) feet from the roadway center line. In no case shall a sanitary sewer line be located closer than two (2) feet from an existing or proposed gutter lip.

2.4.4 Areas of Conflict between Sewer and Existing Utilities

The entire sanitary system shall be located as mentioned above and shall be designed to clear below all other existing or proposed utilities by a minimum of twelve (12) inches. Special structures, such as pump stations and pressure lines, etc. shall be subject to the approval of the District.

All crossings of water mains and sanitary sewers shall conform to the requirements of the California Waterworks Standards (Section 64572, Title 22 CCR, included in these standards in Appendix B).

2.4.5 Laterals

There will be no shared sewer laterals; all connections to the sewer system shall be separate and independent per District Ordinance.

Connection of laterals to the sewer main at a manhole is only allowed when (a) the manhole is a terminal manhole at the end of a cul-de-sac, (b) no more than three (3) laterals are installed, (c) all of the laterals are installed to the property line(s), and (d) cleanouts are installed on the unconnected laterals at the property line(s)

2.5 SEWER MANHOLES

2.5.1 General

Manholes shall have the flow direction of the inlet(s) and outlet inscribed into their concrete collars.

No change of flow direction within a manhole shall exceed 90 degrees.

Allowable head losses in manholes shall be 0.20 foot loss for straight through runs.

2.5.2 Manhole Spacing

Sewer manholes are required at:

1. Changes of direction of sewers.
2. Changes in slope of sewers.
3. Junctions of sewers.
4. Junction of sewer and lateral if lateral is same size as sewer.
5. Termination of sewer with a run greater than 100-ft.
6. Change of pipe size in sewers.
7. Other locations specified by the District.

Maximum manhole spacing shall be 400 feet.

2.5.3 Manhole Pipe Elevations

Plans shall show the invert elevation(s) at the projection of the inside wall of the manhole "IN" and the direction(s), N, S, E, or W, and invert elevation "OUT" and the direction. Should a pipeline be joining a sewer of larger diameter, the smaller pipe shall have its crown elevation equal to or higher than the crown elevation of the larger sewer.

The flowline of the pipe flowing into the manhole shall be a minimum of 0.17 foot above the flowline of the pipe flowing from the manhole, or an amount necessary to match the inside crowns of the pipe, whichever is greater.

2.5.4 Drop Manholes

Whenever the vertical distance between the inverts of sewer line connections of a manhole exceeds thirty (30) inches, a standard Drop Manhole shall be constructed with the District's approval. Drop manholes are discouraged and must be preapproved in writing by the District and will only be approved in the District Engineer's discretion upon a finding of physical site constraints.

2.6 SEWAGE LIFT STATIONS

2.6.1 General

If the Project Engineer determines, and the District agrees, that a lift station is required for a project, the lift station shall meet the following minimum design criteria, and shall be subject to preapproval by the District. The District discourages construction of new sewage lift stations. Lift stations will only be allowed under certain specific circumstances. The items discussed in this section and depicted in the drawing are minimum requirements; the District may have additional requirements depending on the specific application.

Projects that will include a lift station are required to have a pre-design conference with the District to determine design parameters. The following requirements are to be used as a general guide and will be defined during the pre-design conference.

2.6.1.1 Preliminary Design Report

The Preliminary Design Report will include, at a minimum, the design criteria to be utilized, preliminary flow computations, design calculations, calculated system curves, hydraulic transient analysis, identification of easements, geotechnical investigation, and cost estimate. In addition, the following design elements shall be discussed:

- Site Development
- Structural Design
- Architectural Design
- Hydraulic Analysis
- Mechanical Design
- Materials
- Coatings
- Electrical Design
- Instrumentation and Process Control
- Communications
- Emergency Power
- Corrosion Control
- Odor Control
- Noise Control

The hydraulic analysis shall include calculation of the system curve. The system curve shall be plotted on the pump curve with the operating point identified. Every effort shall be made to select a pump that operates at its best efficiency point. Peak and average flows shall be considered when selecting the appropriate pump. Pump manufacturer data sheets shall also be included in the Preliminary Design Report.

Where multiple projects or multiple phases of a project will connect to a lift station over a period of time, the wet well, pumping, and storage and/or emergency generator capacities shall be reasonably staged. The staged installations shall be described in a Preliminary Design Report for the District to review and

approve. Parallel force mains may be required to meet minimum velocity requirements at lower pumping rates.

The Preliminary Design Report is to be submitted to the District for review and approval.

2.6.1.2 Final Design Documents

The final design may be completed after approval of the Preliminary Design Report, incorporating any comments received. The final design documents will include construction drawings on 24 inch x 36 inch paper and technical specifications for the work and equipment. The final design documents shall contain the design criteria including pump flow rates and total dynamic head and shall be submitted to the District for approval.

2.6.1.3 Commissioning and Acceptance

Prior to acceptance of the facility by the District, the Contractor shall perform operational checks of each component, perform hydrostatic tests, and successfully pass performance testing. The Owner's Engineer shall submit a proposed start-up procedure and check list to the District for review and approval prior to completion of construction. Start-up testing shall include, at a minimum, the following:

- Confirmation of design pressures and flows
- Confirmation of alarms and SCADA functionality
- Calibration of instrumentation
- Confirmation of operation under auxiliary power

Following start-up testing performance acceptance testing shall be performed. The performance test shall be performed continuously for a period of seven (7) days, 24 hours per day. The intent is for the contractor to demonstrate to the District that the facility will function as a complete and operable system under normal as well as emergency operating conditions and is ready for acceptance. During the performance test period the facilities shall be operated in a manner to test alarms, controls, interlocks, and all auxiliary and sub-systems. Repair or replace equipment that does not respond to the interlocks, alarms, and controls designed and re-start the test period.

District personnel shall receive training from factory authorized representatives of the major equipment. Training shall be performed prior to acceptance of the facility by the District.

Prior to acceptance of the facility the contractor shall deliver to the District keys (and/or entry tools) and digital copies of the following;

- Facility record drawings
- As-built control schematics
- As-built wiring schematics
- Equipment test data and O&M manuals.
- Mechanical and electrical component lists
- Contact information for all warranties

2.6.2 Capacity

The station design capacity and pumps shall be based on peak hour flow, as determined in accordance with Section 2.3, and other pump flows that may enter the system. Flow information and hydraulic design criteria, including future phases of expansion, are to be discussed in the Preliminary Design Report and shown on the plans.

2.6.3 Lift Station Configuration

Lift stations shall typically be of the duplex wet well submersible type with equipment and instrumentation as specified by the District. Where a three-pump lift station is required, there shall be two (2) duty pumps and one (1) standby pump. The standby pump shall have the same capacity as one duty pump. In addition, the following criteria are to be considered in the general design of the site:

A. Site Selection

   Site selection shall be reviewed with the District and include consideration for zoning and proximity to homes and businesses. Lift station sites shall be located outside of roadway right-of-ways. Each lift station shall be located on a separate lot dedicated to the District for this purpose and shall be a minimum of 50 feet wide by 60 feet deep.

B. Grading

   Grading of the site shall provide drainage away from the proposed structures. The lift station structures and electrical and mechanical equipment shall be protected from physical damage by flooding.

C. Accessibility and Security

   The lift station shall be readily accessible by maintenance vehicles during all weather conditions. Depending on the location of the station, a paved access and site may be required. If the lift station is not located near paved roads, a separate paved access is to be provided. Security fencing and lighting is required. Adequate working area within the site for large equipment vehicles is to be provided including space for maneuverability.

2.6.4 Operation

Typically, the station shall be of the duplex type (2 pumps) and have controls which will automatically alternate the pumps and can energize both pumps on an alarm for high water level. The number of on/off cycles per hour shall be as recommended by the pump manufacturer.

The system shall operate in accordance with the following wet well level indicators and shall be shown on the plans:

LEVEL	INDICATOR
1	Redundant off and low-level alarm
2	Pumps off
3	Lead pump on

4	Lag pump on
5	Redundant on and high-level alarm

2.6.5 Pumping Systems

A. Type of Pumps

Each pump shall be a submersible raw sewage pump designed to operate in a wet well under submerged conditions and shall be of the non-clog, single-suction, centrifugal type and shall be suitable for pumping unscreened raw sewage. Pumps shall be readily removeable and replaceable on guide rails without dewatering the wet well or disconnecting any piping within the wet well. The District standard raw sewage pump shall be manufactured by Xylem Flygt, or approved equivalent.

B. Pump Selection

Pumps and motors shall be selected by considering initial, interim, and ultimate conditions. Insofar as is practicable, stations shall be designed to deliver as uniform a flow as practicable in order to minimize hydraulic surges. The design flow shall be within 70% and 120% of the best efficiency point (BEP) of the pump. Pump motors shall operate on 480-volt, 3-phase, 60 Hz electrical service and at a speed no higher than 1780 rpm. If 480-volt service is not readily available, 240 volt 3-phase power may be considered by the District and will require written approval. The pump motor horsepower selected shall be sufficient to prevent motor overload over the entire range of the pump performance curve. Pumps and motors shall be suitable for continuous duty.

C. Pump Capacity

In a duplex system each pump shall have the capacity such that, with one pump out of service, the remaining pump will have capacity to handle the design peak hour flow. In a three-pump system the capacity of two pumps combined shall handle peak hour flow.

2.6.6 Discharge Piping and Valves

A. Discharge Piping

The discharge piping for each pump shall be the same size or larger as the pump outlet and be a minimum of four (4) inches. The discharge piping shall terminate in a common valve vault adjacent to the wet well as shown on the District's standard drawing. Piping shall be 316 stainless steel or high-density polyethylene (HDPE) within the wet well.

B. Valves

Each wastewater pump shall have isolation valves to permit the removal or maintenance of the pumps and check valves without affecting the operation of remaining pumps. Isolation valves shall be non-lubricated plug valves. Plug valves shall be 100% port opening. Plug valves 4 to 6 inch shall be quarter turn to open. Larger plug valves shall have geared operators with hand wheels. Plug valves shall be positioned so that when closed, the valve body is isolated from the actively flowing portion of the piping system. Plug valves, if installed horizontally, shall be positioned so that when the valve is opened, the valve plug shall be at the top of the body. Each pump shall have

a swing check valve with an external swing arm with a spring. Check valves must be installed horizontally.

C. Bypass Connection

Wastewater lift stations shall have additional pipe, valves, fittings and couplings as necessary to permit bypassing of the lift station including the wet well and pumps. Connection to include an isolation valve, check valve and quick connect cam lock fitting enabling a temporary pump to pump directly into the existing force main.

2.6.7 Wet Well

A. Structure

Whenever practical, wet wells shall be constructed of precast reinforced polymer concrete and shall be circular. Wet well size and depth shall be as required to accommodate the influent sewer, provide for adequate pump submergence as recommended by the pump manufacturer and provide adequate volume to prevent the excessive cycling of pumps.

The required wet well working volume shall be calculated to optimize pump operation to meet peak hour flow and minimum hour flow. Calculations shall be submitted to the District for review and approval with the Prelimianry Design Report. The design engineer shall consider the diurnal nature of wastewater flow as well as the pump manufacturer's recommendations regarding pump start frequency when determining the wet well volume. Every effort will be made to prevent wastewater in the wet well from becoming septic. The wet well shall contain adequate vertical room for level sensing adjustments above and below the design levels.

B. Size

Minimum inside diameter shall be 5 feet, however, retention time, pump configuration and access may require a larger structure.

C. Access

Wet well access shall be through a top slab opening with aluminum hatch cover and frame. The top slab access hatch shall be sufficiently large to remove all equipment from the wet well, but in no case smaller than 36 by 36 inches. All access hatches shall be spring assisted and all components shall be non-corrosive.

2.6.8 Approach Manhole

A 48-inch diameter minimum polymer concrete approach manhole shall be constructed upstream of all wet wells. Larger approach manholes maybe required by the District. The approach manhole shall be located within the site fencing of the lift station and shall serve as a common point of connection for all sewer pipes tributary to the pump station. A single pipe shall extend from the approach manhole to the wet well.

2.6.9 Water Service

A water service with a meter and backflow valve shall be provided at all installations. There shall be no physical connection between potable water supplies and the lift station wastewater piping.

2.6.10 Instrumentation

A. Level Measurement

A transducer and a backup float system shall be provided. Measurement devices should be located in the wet well as not to be damaged by routine maintenance activities. The float system shall consist of four (4) floats that are to be set at elevations as directed at the time of installation.

B. Flow Metering

A dedicated magnetic type flow meter that includes instantaneous rate of flow and totalization shall be provided on all wastewater lift stations. Flow metering shall be included in the SCADA system. Size and installation of the meter shall be as recommended by the meter manufacturer.

C. Monitoring

The lift station shall be equipped and capable of interfacing with the District's existing SCADA system, and shall monitor at a minimum the following items:

1. Wet Well Level
2. Flow Rate
3. Pump Status (on/off/hand)
4. Alarms: seal failure, high temp, phase, circuit trip, high water level, low water level, lag pump call, and intrusion
5. Run time in hours for each pump
6. Amperage draw
7. Magnetic flow meter with a flow totalizer and rate of flow in gallons per minute.

2.6.11 Control Panel

Control Panels shall be enclosed in a stainless steel NEMA 4X enclosure panels and shall include adequate space for mounting of instrumentation as required. All switches, breakers and wires shall be clearly marked or labeled.

Panel shall also include:

- 120-volt, 1 phase convenience receptacle
- Portable Generator Connection, designer to confirm with District for model and size.

2.7 Force Mains

2.7.1 General

Design of force mains shall consider operating and maintenance costs, surges, velocity, and friction losses. These conditions also influence the lift station design. Sewage force mains can generate gases during periods of non-flow, resulting in odors and corrosion and should be considered in the design approach.

2.7.2 Sizing

At design pumping rates, a minimum velocity of at least three (3) feet per second shall be maintained. The maximum pipe velocity shall not exceed eight (8) feet per second. The minimum force main diameter for raw wastewater shall not be less than four (4) inches.

2.7.3 Air and Vacuum Relief Valves

Ideally, the force main should be designed without intermediate high points, and with the top of the force main being below the hydraulic grade line at the minimum pumping rate so that air release valves will not be needed. If the elimination of high points is not feasible, or if the design includes long, relatively flat vertical alignments, the design may require air release and air and vacuum valves. Where air and vacuum valves are required, combination valves shall be used. Automatic valves are to be provided with back-flushing provisions.

2.7.4 Design Pressure

The force main shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater lift stations. Surge protection chambers should be evaluated. Surges generally do not require analysis if the TDH (Total Dynamic Head) is less than 40 feet. For TDH greater than 40 feet, the surge potential shall be evaluated and included in the Preliminary Design Report including the analysis and supporting calculations.

2.7.5 Design Friction Losses

Friction losses through force mains shall be based on the Hazen Williams formula with a "C" value of 145 for new force mains and 120 for existing mains in calculating pump and power requirements.

2.7.6 Pipe Materials

Pipe shall be either pressure rated polyvinyl chloride (PVC AWWA C900) or fused HDPE (AWWA PE 4710). The minimum pressure rating shall be 150 psi.

2.7.7 Waterline Crossings

All crossings of water mains shall conform to the requirements of the California Waterworks Standards. (Section 64572, Title 22 CCR, included in these standards in Appendix B.)

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SECTION 015800 TEMPORARY SEWAGE BYPASS PUMPING

PART 1 - GENERAL

1.01 DESCRIPTION

This specification covers work and equipment required for temporarily diverting sewage around work areas or interrupting flow for a short duration during tie-ins of sewer mains and laterals. Bypass pumping includes furnishing, installing, operating and maintaining all power, primary and standby pumps, appurtenances, bypass piping, and all the tools, labor, supervision, materials, and equipment necessary to maintain existing sewer flows and services conforming with the Contractor's submitted Bypass Pumping Plan and Spill Prevention Control and Countermeasure Plan. The Contractor shall schedule work to minimize service outages.

1.02 SUBMITTALS

Submit to the District for review and approval a Bypass Pumping Plan, Change Over Plan, and/or Short Duration Shutdown Plan depending on the Contractor's plan of action.

A. Bypass Pumping Plan

Submit a bypass pumping plan prepared by a licensed California Professional Engineer a minimum of ten (10) working days prior to any planned bypass. The District's permission shall be obtained prior to any bypass pumping. The bypass pumping plan shall consist of the following information, at a minimum, for each bypass pumping setup:

1. Sequence of sewage flow interruption, bypass and tie-ins.

2. Plans indicating the location of temporary sewer plugs and bypass discharge lines.

3. Drawings shall clearly indicate the proposed manhole-to-manhole pumping sequence and shall be coordinated with the Contractor's traffic control/regulation plans.

4. Capacities of pumps, prime movers, and standby equipment. A completely redundant bypass system is required including pumps and appurtenances.

5. Design calculations proving adequacy of the system and selected equipment. This is to include any flow metering data collected, method used to establish design flows, and design flows used for sewer bypass system sizing.

6. Pump make, model, pump curve, design head (TDH) calculations, horsepower requirement, and noise rating.

7. Sewage bypass pipe material, fitting types, and details on necessary appurtenances, including pipe plugs.

8. Method for securing plugs to prevent floating downstream.

9. Plans showing details of proposed method of temporary handling of sewage flow, routing of bypass lines, containment areas, equipment location, schematic of pump set-up and discharge, proposed sequencing, and public relations procedures.

10. Electrical, controls, and instrumentation.

11. Spill Prevention, control, and countermeasure plan.

B. Change-Over Plan

Submit a change-over plan to the District for review a minimum of 10 days prior to any work. The District's permission shall be obtained prior to any shutdowns. The change-over plan shall consist of the following information, at a minimum:

1. Sequence of flow interruption, short duration shutdowns, construction of tie-ins, construction of interference manhole, and abandonment or removal of existing piping and structures.

2. Plans indicating the location of temporary sewer plugs, standby pump(s), discharge lines and other standby equipment.

3. Capacities of pumps and standby equipment.

4. Checklist for equipment, material and manpower required to complete the change-over in a timely fashion in conformance with the plans and specifications. All equipment, material and manpower shall be on-site and ready prior to initiating the change-over. The Contractor shall also have backup equipment and material on hand and shall be prepared to pursue the completion of the change-over in an efficient diligent and timely manner.

5. Spill Prevention, control, and countermeasure plan.

C. Short Duration Shutdown Plan

Submit a short duration shutdown plan to the District for review a minimum of ten (10) working days prior to any planned shutdowns. The District's permission shall be obtained prior to any shutdowns. The short duration shutdown plan shall consist of the following information, at a minimum, for each setup:

1. Sequence of flow interruption and construction of tie-ins, including new piping and structures.

2. Location and duration of planned short duration shutdowns.

3. Plans indicating the location of temporary sewer plugs, standby pump(s), discharge lines and other standby equipment.

4. Capacities of pumps and standby equipment.

5. Checklist for equipment, material and manpower required to complete the tie-in in a timely fashion in conformance with the plans and specifications. All equipment, material and manpower shall be on-site and ready prior to initiating the sewer shutdown. The Contractor shall also have backup equipment and material on hand and shall be prepared to pursue the completion of the tie-in in an efficient diligent and timely manner.

6. Spill Prevention, control, and countermeasure plan.

1.03 JOB CONDITIONS

A. District to provide flow conditions for Engineer to use in bypass calculations.

B. Engineer/Contractor shall inspect existing structures and layout prior to development of bypass plan.

PART 2 - MATERIALS

2.01 PUMPING EQUIPMENT

Engines shall be muffled in such a manner that the maximum noise level will not exceed 80 dBA at a distance of eight feet from motors. Implement sound damping measures as required. Contractor is responsible for providing necessary power for standby pumps. A redundant power source is required so that there is no interruption of flow. Redundant standby pumping equipment shall be at the site continuously during bypass pumping or short duration shutdown to provide 100 percent redundant system. The standby pumps shall be connected to piping such that if the bypass duty pump fails or if interrupted sewage accumulates beyond an acceptable level, the standby pump can be online immediately. Provide manpower to continuously monitor the pumping equipment on a 24-hour basis while in operation and activate standby equipment. The District may allow remote monitoring of the bypass system and will be evaluated on a case-by-case basis.

2.02 BYPASS PIPING

Bypass piping shall be aluminum, galvanized steel, or fusion-welded solid wall HDPE.

PART 3 - EXECUTION

3.01 SEWER BYPASSING

A. Sewer bypassing shall be accomplished by pumping or diverting the upstream flow around the work.

B. Provide temporary pumps, galvanized steel, aluminum, or fusion welded solid wall HDPE bypass pipe, and other equipment to bypass the sewer flow. Furnish the necessary labor,

tool, equipment, and supervision to set up, operate, and monitor the pumping and bypass system. Pumps and bypass lines shall be of adequate capacity and size to handle projected flows. All bypassed flow shall be discharged into a downstream manhole. Pumps and entire bypass line shall have a sandbag berm to act as a temporary containment area.

C. Under no circumstances shall sewage or solids be deposited onto the ground surface, streets, or into unlined ditches, catch basins, storm drains or natural drainage ways. Sewage shall be handled in a manner so as not to create a public nuisance or health hazard. Storm drain inlets in the vicinity of the bypass shall be sandbagged prior to and during bypass pumping.

D. Maintain continuity of sanitary sewer service to the facility during the execution of the work. In the event that sewage backup occurs during Contractor bypass pumping and enters dwellings or other structures, the Contractor shall clean up, repair, pay property damage costs, pay fines imposed by jurisdictional authorities, and handle all claims arising therefrom. All spills shall be contained and returned to the sewer system.

E. Provide a designated employee(s) whose only role in the construction effort is to be responsible for continuously monitoring (24 hours a day) the bypassing operation, and all related equipment. The designated employee(s) will not be allowed to participate in any other unrelated undertaking, while the bypassing operation is in effect.

F. Complete a bypassing checklist prior to bypassing operation. The checklist will demonstrate the step-by-step inspection of the pumps, pipes, hold-down cables, plugs, and other equipment or appurtenances that will be used in the operation and sign the checklist.

3.02 STANDBY EQUIPMENT

Maintain sufficient equipment and materials on site to ensure continuous and successful operation of the bypass systems. Standby pumps shall be fueled and operational at all times. Maintain on site a sufficient number of valves, tees, elbows, connections, tools, sewer plugs, piping and other parts or system hardware to ensure immediate repair or modification of any part of the system as necessary.

3.03 SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

Prepare, submit, and carry out a spill prevention, control and countermeasure plan that incorporates the following:

A. Include or reference in the plan, materials provided as submittals per Part I.B herein.

B. Provide in the plan a description of all emergency equipment for bypassing flow, containment, cleanup, and repair of any damage. Specifics shall include as applicable, but are not limited to:

1. Pipe patch kits
2. Sandbags

3. Rubber matting

4. Bypass pipes, pumps, and other relevant equipment

5. Extra pumps

6. Secondary containment in trench or other surrounding land relief

C. Maintain equipment on site.

D. Provide the District with at least three (3) people who can be contacted 24 hours per day by phone to address on site emergencies. Provide the daily schedule with names, phone numbers, and hourly working schedules of persons that may be brought on site any time. Provide notification of any substitution in writing at least two days in advance. When bypassing flows, have at least one person on site 24 hours per day to monitor and maintain the bypass and implement the emergency procedures in case of an emergency. The District may allow remote monitoring of the bypass system and will be evaluated on a case-by-case basis.

E. Describe the method used to protect storm drains during construction on the plan. The description shall include where the storm drains are located (simple map of sewer pipe, storm drains, waterways, and any relief features) and information that would assist in containing the spill. The plan shall describe how storm drains will be blocked in the event of a spill (what material, who will do it, how long will it take). Describe any other response-related plans (bypass pumping set ups, etc.).

F. Coordinate the plan to protect water quality and respond to spills of sewage, groundwater, or fuels. Describe all spill prevention measures (e.g. monitoring of upstream manholes, monitoring in the trench).

G. In general, good housekeeping is required so no contamination reaches surface waters or storm drains when it rains. Some specifics include, but are not limited to:

1. Prior to start of bypassing, all storm drain catch basins that are within the vicinity of the work that could possibly take in sewage in the event of a spill, shall be isolated with sandbags or other approved means.

2. Oil pans should be under any engine that leaks oil.

3. Spill response as covered below.

H. The following spill procedures shall be incorporated into the plan in anticipation of the described failure mode, and the Contractor shall be prepared to act accordingly. If a spill is detected or a catastrophic pipe failure occurs, the immediate priority shall be to prevent any sewage from reaching surface waters and storm drains. Immediately protect all drains using rubber mats or sand bags (have sand bags on site).

1. When excavating and moderate leaks are discovered in the existing pipe, make coupling/clamp repairs as soon as possible to minimize sewage flow into the trench.

If the leak is too large to make fast coupling repair, start bypassing (see bypassing sequence below), then make repair.

a. In case of catastrophic leak, immediately start the bypassing sequence.

b. Plug upstream side of manhole upstream of a catastrophic leak.

c. Insert bypass pump into manhole upstream of plugged manhole. The pump shall be sized to handle peak flow of existing sewer. Provide spare pump or set up standby pump availability with rental yard.

d. Connect hose from pump to discharge point. (NOTE: Hose shall already be in place and connected to a downstream discharge point at all times when working near or with live sewers.)

e. In event of any spill, immediately and simultaneously with above activities, notify the District and request the District's staff to be dispatched. Give the best indication of the approximate size of the spill (<1,000 gallons is small; 1,000 gallons to 10,000 gallons is medium; and >10,000 gallons is large) to the District's staff so they can dispatch the appropriate response. District's staff will assist in the response and ensure that the spill is cleaned to the District's standards.

f. While awaiting the District's wastewater staff response, pond the water in an area that can be easily and fully recovered for discharge to the District's WWTP. This ponding activity should not impact any environmentally sensitive areas.

g. When District's staff and any other responding staff arrive onsite, a more permanent and planned response, repair, and cleanup will ensue. Cooperate with the District to the fullest extent possible in order to minimize the impacts and volume of the spill in the most efficient manner possible.

h. No form of disinfection is allowed. All wash water must be contained and recovered as the sewage is.

i. Clean up may require a sweeper truck or other equipment. All District costs, time and materials, and special equipment for spill cleaning will be deducted from the Contractor's progress payment.

j. In the event of a spill, be prepared to document the spill with a video camera and photographs. Plan on attending a debriefing immediately after the spill is contained and cleaned up.

I. Comply with the Regional Water Quality Control Board, San Luis Obispo County Health Department, and District Standards. Cooperate with District's staff and other regulators and environmental agencies.

3.04 DAMAGES

Repair any damage that may result from the installation, operation, maintenance, and removal of the sewer bypass pumping system or short duration shutdown system. This includes but is not limited to damages resulting from inadequate or improper installation, operation and maintenance of the bypass or interruption system components, mechanical failures, or electrical failures.

If District staff are called on to assist, the Contractor shall pay for all costs incurred by the District in assisting the Contractor.

END OF SECTION

SECTION 020120 PROTECTING EXISTING UNDERGROUND UTILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and procedures for protecting existing underground utilities.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Connections to Existing Buried Pipelines: 020130.

B. Trenching, Backfilling, and Compacting: 312316.

PART 2 - MATERIALS

2.01 REPLACEMENT IN KIND

Except as indicated below or as specifically authorized by the District, reconstruct utilities with new material of the same size, type, and quality as that removed.

PART 3 - EXECUTION

3.01 GENERAL

A. Replace in kind street improvements, such as curbs and gutters, barricades, traffic islands, signalization, fences, signs, etc., that are cut, removed, damaged, or otherwise disturbed by the construction. All work shall conform to the requirements of the County of San Luis Obispo, or Caltrans Encroachment Permit.

B. Determine the true location and depth of utilities and service connections which may be affected by or affect the work. Determine the type, material, and condition of these utilities. In order to provide sufficient lead-time to resolve unforeseen conflicts, order materials and take appropriate measures to ensure that there is no delay in work.

C. Determine the true location and depth of District facilities prior to planned connections or modifications.

3.02 PROCEDURES

A. Protect in Place: Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified in the drawings or in the specifications.

B. Cut and Plug Ends: Plug sewers with an 8-inch wall of brick and mortar. Cap waterlines with a cast-iron cap or install a 3-foot-long concrete plug. Dispose of the cut pipe as unsuitable material. Limits of removal to be approved by District prior to work.

C. Remove and Reconstruct: Where so indicated in the drawings or as required by the District , remove the utility and, after passage, reconstruct it with new materials. Provide temporary service for the disconnected utility.

3.03 COMPACTION

A. Utilities Protected in Place: Backfill and compact under and around the utility so that no voids are left.

B. Utilities Reconstructed: Prior to replacement of the utility, backfill the trench and compact to an elevation 1 foot above the top of the ends of the utility. Excavate a cross trench of the proper width for the utility and lay, backfill, and compact.

C. Alternative Construction - Sand-Cement Slurry: Sand-cement slurry consisting of two sacks (94 pounds each) of portland cement per cubic yard of sand and sufficient moisture for workability may be substituted for other backfill materials to aid in reducing compaction difficulties. Submit specific methods and procedures for the review of the District, prior to construction.

3.04 THRUST BLOCKS ON WATERLINES

A. Where work is performed adjacent or near existing waterlines Contractor shall protect thrust blocks in place or shore to resist the thrust by a means approved by the Engineer of Record and the District and reconstruct. If the thrust blocks are exposed or rendered to be ineffective in the opinion of the District, reconstruct them to bear against firm unexcavated or backfill material.

B. Provide firm support by backfilling that portion of the trench for a distance of 2 feet on each side of the thrust block to be reconstructed from the pipe bedding to the pavement subgrade, with either:

1. Sand-cement slurry (188 pounds of cement per cubic yard).

2. The native material compacted to a relative compaction of 95%.

C. Then excavate the backfill material for construction of the thrust block.

D. Test compaction of the backfill material before pouring any concrete thrust block. Use Class A concrete per Section 030500 for reconstruction.

END OF SECTION

SECTION 020130 CONNECTIONS TO EXISTING BURIED PIPELINES

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and installation of hot-tap connections to existing buried ductile-iron, asbestos cement, and PVC (cast-iron outside diameter) pipelines.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Protecting Existing Underground Utilities: 020120.

B. Painting and Coating: 099000.

C. Cold-Applied Wax Tape Coating: 099752.

D. Polyethylene Sheet Encasement: 099754.

E. Disinfection of Piping: 331300.

F. Pressure Testing of Piping: 400515.

G. Manual Valves: 400520.

1.03 SUBMITTALS

A. Submit manufacturer's catalog data for tapping sleeves. Include coatings.

PART 2 - MATERIALS

2.01 TAPPING SLEEVES FOR ASBESTOS CEMENT, DUCTILE-IRON, AND PVC (CAST-IRON OUTSIDE DIAMETER) PIPES

A. Tapping sleeves shall be stainless steel and subject to approval by the District.

B. Length of tapping sleeves shall be according to the table below.

Existing Water Main Size (inches)	Tapping Pipe Size (inches)										
		4	6	8	10	12	14	16	18	20	24
	4	X									
	6	15	X								
	8	15	15	X							
	10	15	15	20	X						
	12	15	15	20	20	X					
	14	15	15	20	20	24	X				
	16	16	16	20	20	24	24	X			
	18	16	16	20	20	24	24	32	X		
	20	16	16	20	20	24	24	32	36	X	
	24	16	16	20	20	24	24	32	36	40	
	L = Length of Tapping Sleeve										

2.02 COATING FOR TAPPING SLEEVES

Coat with polyethylene wrap per 099754.

2.03 TAPPING GATE VALVES

Tapping gate valves shall be per Section 400520.

PART 3 - EXECUTION

3.01 VERIFICATION OF PIPE LOCATION AND OUTSIDE DIAMETER PRIOR TO INSTALLATION

The Contractor shall be responsible for determining in advance of constructing the improvements the location of all existing pipelines to which connections are to be made. Excavate the points of connection prior to submittal of shop drawings. Verify outside diameter prior to ordering materials.

3.02 CONNECTION TO EXISITNG WATERLINES

A. The Contractor shall give the District a minimum of seven (7) calendar days' notice before the time of any proposed shutdown of existing mains or services.

B. Connections shall be made only in the presence of the District. Connection work shall not proceed until the District has given notice to proceed.

C. The Contractor shall furnish all pipe and materials including as may be required: labor and equipment necessary to make the connections, all required excavation, backfill, pavement replacement, lights, barricades, water truck, highline hose, and fittings for making the connections. In addition, the Contractor shall assist the District in alleviating any hardship incurred during the shutdown for connections.

D. The Contractor shall dewater existing mains, as required, in the presence of the District.

E. 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. The new pipeline shall not be connected to an existing facility until the new pipeline has successfully passed all pressure and water quality tests following disinfection in accordance with Sections 331300 and 400515.

3.03 WATERMAINS

Whenever the location of existing mains makes it necessary to use a gradual transition on the alignment of the proposed mains, the transition shall be made in the shortest practical distance with the maximum deflection per joint for curves not to exceed 5 degrees for pipes 12 inches or smaller, and 3 degrees for pipes larger than 12 inches if ductile iron pipe is used. If PVC pipe is used, ductile iron fittings will be required to make the transition. All tie-ins, taps, saddles and connections to existing District mains shall be made in the presence of an authorized District representative.

3.04 VALVES AND HYDRANTS

Installation of valves and hydrants to existing mains shall be made by use of tapping sleeves and valves or by cutting in fittings as determined by the District. Tapping sleeves and valves shall be subject to approval by the District.

3.05 CROSS-CONNECTION CONTROL REQUIREMENTS

A. Cross-connections shall comply with the Cross Connection Control Policy Handbook, most recent amendment published by the State Water Resources Control Boards (SWRCB) and the District's Cross Connection Control and Backflow Prevention Program.

B. Cross-connections of any type that permit a backflow condition from any source or system other than that of the District's potable water mains are prohibited. A connection constituting a potential or actual backflow hazard is not permissible unless a backflow device or air gap, which is approved by the SWRCB and complies with the Cross Connection Control Policy Handbook and District's Cross Connection Control and Backflow Prevention Program, is installed. Such an installation shall at all times be

subject to inspection and regulation by the District and San Luis Obispo County Public Health Department for the purpose of avoiding possibility of backflow.

C. The District will not provide any water service to any premises or continue to serve water unless the public water supply is protected as required by State and County regulations.

D. Connection to residential fire sprinkler systems shall require the use of a double check valve backflow device. Use of another type of backflow prevention device will require the approval of the District.

E. Backflow preventive devices shall be approved by the County and shall be installed, maintained, and tested at the expense of the water user. The County will test such devices. The owner of the property shall overhaul or replace backflow preventers if they are found defective.

F. Service of water to any premises may be discontinued by the District if a backflow prevention device required by the County is not installed; if any defect is found in an installed backflow prevention device; if a backflow prevention device has been removed or bypassed; or if unprotected cross-connections exist on the premises. Service will not be restored until such conditions or defect are corrected.

G. Water users which have multiple water systems shall abide by the requirements specified in Title 17 for marking safe and unsafe water lines, and have a designated water supervisor, if required by the District.

3.06 REMOVAL FROM SERVICE OF EXISTING MAINS AND APPURTENANCES

A. Existing mains and appurtenances shall be removed from service at the locations shown on the plans or as directed by the District.

B. Existing pipe shall be capped and abandoned per Section 020120. Where connections or stub-outs are abandoned, all valves shall be removed, and the remaining flanged fitting shall be closed/plugged using a blind-flange fitting.

C. Contractor to legally dispose of all removed pipe.

D. Prior to performing any work to replace existing pipes and/or services, the Contractor shall make proper provisions for the maintenance and continuation of service as directed by the District.

E. For a water service to be considered abandoned, all surface fittings, meter, meter box and customer service valve shall be removed. The service line and corporation stop shall be removed and the service saddle plugged with a brass plug. If there is no corporation stop on the service, the adapter shall be removed and a brass plug installed in the service saddle.

F. Sewer laterals to be removed from service shall be cut and plugged at the main.

G. For sewer manholes to be abandoned, the manhole cover, ring, grade rings and manhole cone shall be removed and properly disposed. All portions of the manhole to be abandoned shall be removed to a point 8-feet below finished ground surface. The remaining portions of the manhole shall be filled with Class C concrete.

3.07 WRAPPING TAPPING SLEEVES

After installation, wrap the entire sleeve and tapping valve with polyethylene sheet wrap per Section 099754.

END OF SECTION

SECTION 030500 CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials, installation, and testing of formwork, reinforcing steel, joints, concrete, and finishing and curing for general concrete construction.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Painting and Coating: 099000.

1.03 SUBMITTALS

A. Prepare concrete and mortar mix designs and laboratory 7-day and 28-day compressive tests or submit test reports of 7- and 28-day compressive tests of the mix where the same mix has been used on two previous projects. Submit mix design in writing for review by the District at least 15 working days before placing of any concrete.

B. Submit report from a testing laboratory verifying that aggregate material contains less than 0.25% asbestos by weight or volume.

C. Submit report from testing laboratory verifying aggregate material conforms to the specified gradations or characteristics.

D. Provide non-shrink grout manufacturer's certificate of compliance with these specifications and specific instructions for use.

1.04 PLANT QUALIFICATION

Meet requirements of the Check List for Certification of Ready Mixed Concrete Production facilities of the National Ready Mixed Concrete Association and ASTM C94.

PART 2 - MATERIALS

2.01 NONDOMESTIC CEMENT AND ADDITIVES

A. The use of nondomestic cement and additives in concrete may be permitted only after review of a written request to use such materials. The request to use nondomestic materials shall include a chemical analysis that indicates the material meets the project specifications. Certifications that state the nondomestic materials meet the project requirements will not be accepted.

B. Test reports for concrete materials shall be current within three months of inclusion into the project and shall be identifiable to the materials supplied.

2.02 FORMWORK

A. Design forms according to ACI 347.

B. Class I Forms: Use steel forms, ply form, or smooth-surface plywood 3/4-inch minimum thickness for straight surfaces and 1/2-inch minimum thickness for curved surfaces.

C. Class II Forms: Use plywood in good condition, metal, or smooth-planed boards free from large or loose knots with tongue and groove or ship lap joints.

D. Class II forms may be used for exterior concrete surfaces that are 1 foot or more below finished grade. Use Class I forms for all other surfaces.

E. Coat forms with form release agent.

2.03 BOND BREAKER

Bond breaker shall be a nonstaining type which will provide a positive bond prevention.

2.04 FORM RELEASE AGENT

A. Form release agent shall effectively prevent absorption of moisture and prevent bond with the concrete. Agent shall be nonstaining and nontoxic after 30 days.

B. For steel forms, release agent shall prevent discoloration of the concrete due to rust.

2.05 REINFORCING STEEL

A. Reinforcement shall conform to ASTM A615 or A706, Grade 60.

B. Fabricate reinforcing in accordance with the current edition of the Manual of Standard Practice, published by the Concrete Reinforcing Steel Institute. Bend reinforcing steel cold.

C. Deliver reinforcing steel to the site bundled and with identifying tags.

2.06 TIE WIRE

Tie wire shall be 16 gauge minimum, black, soft annealed.

2.07 BAR SUPPORTS

Bar supports in beams and slabs exposed to view after form stripping shall be galvanized and plastic coated. Use concrete supports for reinforcing in concrete placed on grade.

2.08 BAR COUPLERS

Reinforcing steel bar splicing couplers shall be a mechanical type. Use couplers that do not reduce tensile or ultimate strength of bars.

2.09 JOINT SEALANT FOR CONCRETE STRUCTURES

A. Joint sealant shall be a multipart, gray, nonstaining, non-sagging, gun grade polyurethane sealant, which cures at ambient temperature to a firm, flexible, resilient, tear-resistant rubber. Sealant shall comply with ASTM C920, Type M, Grade P, Class 25 for horizontal joints and Grade NS, Class 25 for vertical joints and be recommended by the manufacturer for continuous immersion in water.

Characteristic or Parameter	Technical Requirements
Pot life	1 to 3 hours
Hardness	35 Shore A, ±5, ASTM D2240
Elongation	650%, ASTM D412
Tensile strength	200 psi, ASTM D412
Peel strength on concrete	No adhesion loss at 25 pounds
Temperature service range	40°F to 167°F
Immersion in water	Continuous

B. Sealant shall be Tremco Vulkem 227 or Sikaflex-2c NS (for Grade NS, Class 25), Sikaflex-2c SL of Sika Corporation or Vulkem 245 (for Type M, Grade P, Class 25), or equal. Troweling of sealants into joints will not be permitted.

2.10 BACKING ROD FOR EXPANSION JOINTS

Backing rod shall be an extruded closed-cell polyethylene foam rod. The rod shall be 1/4 inch larger in diameter than the joint width. Where possible, provide full-length sections for the joint; minimize splices. Apply backup rod and bond breaker tape in expansion joints.

2.11 BOND BREAKER TAPE

Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape that will adhere to the pre-molded joint material or concrete surface. The tape shall be the same width as the joint. The tape shall be compatible with the sealant.

2.12 PREFORMED CONTROL JOINT

Preformed control joint shall be a one-piece, flexible, PVC joint former or a one-piece steel strip with preformed groove. Provide the preformed control joint material in full-length un-spliced pieces.

2.13 PREMOLDED JOINT FILLER

Joint filler shall be bituminous-type preformed expansion joint filler conforming to ASTM D994.

2.14 STEEL EXPANSION JOINT DOWELS

A. Steel expansion joint dowels shall conform to one of the following:

1. Steel bar dowels with a 12-mil-thick epoxy coating. Steel bar dowels shall conform to ASTM A36 or ASTM 615, plain rounds, Grade 40. Epoxy coating shall be in conformance with ASTM A775.

2. Stainless steel bar dowels conforming to ASTM A276, Type 302.

B. Exposed portion of expansion joint dowels shall be thoroughly greased prior to casting of adjoining wall or slab.

2.15 CEMENT

A. Use domestic portland cement that conforms to ASTM C150, Type II/V.

B. Use only one brand of cement in any individual structure. Use no cement that has become damaged, partially set, lumpy, or caked. Reject the entire contents of the sack or container that contains such cement. Use no salvaged or reclaimed cement.

C. Maximum tricalcium aluminate shall not exceed 8%. The maximum percent alkalies shall not exceed 0.6%.

2.16 AGGREGATES

Aggregates shall be natural rock, sand, or crushed natural rock and shall comply with ASTM C33 and shall contain less than 0.25% asbestos by weight or volume. Aggregates shall be free from any substances that will react with the cement alkalies, as determined by Appendix X-1 of ASTM C33.

2.17 COLOR ADDITIVE FOR EXTERIOR ELECTRICAL DUCT ENCASEMENT

For exterior electrical duct concrete encasements, use a color additive for identification purposes: sorrento red "Chromix G + L Admixtures C-36" as manufactured by L. M. Scofield Company, Los Angeles, California; or equal. Add the color additive while the concrete is being mixed using the quantity per cubic yard of concrete recommended by the manufacturer for the class of concrete indicated.

2.18 CONCRETE ADMIXTURES

A. Do not use any admixture that contains chlorides or other corrosive elements in any concrete. Admixtures shall be nontoxic after 30 days.

2.19 GROUT

A. Non-shrink grout shall conform to ASTM C1107 and to these specifications. Use a non-gas liberating type, cement base, premixed product requiring only the addition of water for the required consistency. Grout shall be UPCON High Flow, Master Flow 928, or equal. Components shall be inorganic.

B. Ordinary type grout (dry pack) shall consist of one-part portland cement to two parts sand (100% passing a No. 8 sieve). Add sufficient water to form a damp formable consistency.

C. Epoxy Grout:

1. Mix the two components of epoxy bonding compound in compliance with the manufacturer's instructions.

2. Use sand that is oven dry and meets the following gradation requirements for epoxy grout:

Sieve Size	**No. 8**	**No. 50**	**No. 100**
% Passing	100	30 ±15	5 ±5

2.20 GROUT BEDDING FOR HORIZONTAL JOINTS

The grout placed on horizontal construction joints shall be a mixture of cement, sand, and water in the same proportions and strength used in the overlayed concrete with coarse aggregate omitted.

2.21 REPAIR MORTAR

A. Mortar used for repair of concrete voids shall be made of the same materials as used for concrete, except that the coarse aggregate shall be omitted or the mortar shall consist of not more than one part cement to two and one-half parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing.

B. Materials for repair of major defects or cracks shall be in accordance with “Repair of Defects and Cracks” specified in Part 3.

2.22 CONCRETE MIX DESIGN

A. Conform to ASTM C94, except as modified by these specifications.

B. Air content as determined by ASTM C231 shall be 4% ±1%.

C. Maximum water-cement ratio for Class A concrete = 0.45 by weight.

D. Use classes of concrete as described in the following table:

Class	Type of Work	28-Day Compressive Strength (in psi)	Minimum Cement Content (in lbs per C.Y.)
A	Concrete for all structures and concrete not otherwise specified. Concrete fill at structure foundations and thrust blocks.	4,000	564
B	Pavement and concrete collars outside of roadway	3,000	470
C	Floor grout and miscellaneous unreinforced concrete.	2,000	376

E. Measure slump in accordance with ASTM C143. Slump shall be as follows:

Slab on grade or heavy sections wider (in plan view) than 3 feet	3 inches maximum
Footings and walls	4 inches maximum
Pavement	2 inches maximum

Proportion and produce the concrete to have a maximum slump as shown. A tolerance of up to 1 inch above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

F. Aggregate size shall be 3/4 inch maximum for slabs and sections 8 inches thick and less. Aggregate size shall be 1 inch maximum for slabs and sections greater than 8 inches and less than 17 inches. Aggregate size for floor grout shall be maximum 3/8 inch.

G. Mix design for pumped concrete shall produce a plastic and workable mix. The percentage of sand in the mix shall be based on the void content of the coarse aggregate.

2.23 SLURRY CEMENT BACKFILL

A. Slurry cement backfill shall consist of a fluid, workable mixture of aggregate, cement, and water.

B. Aggregate shall be either:

1. Material selected from excavation, imported material, or a combination thereof, free from organic matter and other deleterious materials and meeting the following gradation:

Sieve Sizes	Percentage Passing
1 1/2 inches	100
1 inch	80 to 100
3/4 inch	60 to 100
3/8 inch	50 to 100
No. 4	40 to 80
No. 100	10 to 40

2. Commercial quality concrete sand.

C. Proportion the aggregate, cement, and water by either weight or volume. Include at least 188 pounds of cement per cubic yard produced. The water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of the aggregate while being placed.

D. Thoroughly machine-mix the materials for the slurry cement backfill in pugmill, rotary drum, or other mixer. Continue the mixing until the cement and water are thoroughly dispersed throughout the material. Place slurry cement backfill within one hour after mixing.

PART 3 - EXECUTION

3.01 FORM TOLERANCES

A. Failure of the forms to produce the specified concrete surface and surface tolerance shall be grounds for rejection of the concrete work. Rejected work shall be repaired or replaced at no additional cost to the Owner.

B. The following table indicates tolerances or allowable variations from dimensions or positions of structural concrete work:

Location	Maximum Tolerance (inch)
Sleeves and inserts	+1/4 -1/4
Projected ends of anchors	+1/4 -0.0
Anchor bolt setting	+1/4 -1/4
Finished concrete, all locations	+1/4 -1/4 in 10 feet

The planes or axes from which the above tolerances are to be measured shall be as follows:

Sleeves and inserts:	Centerline of sleeve or insert.
Projected ends of anchors:	Plane perpendicular to the end of the anchor as located in the drawings.
Anchor bolt setting:	Centerline of anchor bolt.
Finish concrete:	The concrete surface as defined in the drawings.

Where equipment is to be installed, comply with manufacturer's tolerances if more restrictive than above.

3.02 FORM SURFACE PREPARATION

A. Clean form surfaces to be in contact with concrete of foreign material prior to installation.

B. Coat form surfaces in contact with concrete with a release agent prior to form installation.

3.03 FORM REUSE

Reuse only forms that provide a uniform surface texture on exposed concrete surfaces. Apply light sanding or other surface treatment between uses for uniform texture. Plug unused tie rod holes with corks, shave flush, and sand the concrete surface side. Do not patch forms other than filling tie rod holes, except in the case of Class II forms. Do not use metal patching discs on Class I forms.

3.04 REMOVAL OF FORMS

A. Forms and shoring for elevated structural slabs or beams shall remain in place until the concrete has reached a compressive strength equal to the specified 28-day compressive strength as determined by test cylinders. Do not remove supports and reshore. The following table indicates the minimum allowable time after the last cast concrete is placed before forms, shoring, or wall bracing may be removed:

Sides of footings and encasements	24 hours
Walls, and similar members not supporting loads	48 hours
Slabs	10 days (forms only)
Shoring for slabs	Until concrete strength reaches specified 28-day strength

B. Do not remove forms from concrete that has been placed with outside air temperature below 50°F without first determining if the concrete has properly set without regard for time. Do not apply heavy loading on green concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.

3.05 FORMED OPENINGS

Openings shall be of sufficient size to permit final alignment of pipes or other items without deflection or offsets of any kind. Allow space for packing where items pass through the wall to ensure watertightness. Provide openings with continuous keyways and water stops. Provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated in the typical structural details. Reinforcing shall be at least 2 inches clear from the opening surfaces and encased items.

3.06 EMBEDDED ITEMS

Set anchor bolts and other embedded items accurately and hold securely in position until the concrete is placed and set. Check all special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after concreting. Check nailing blocks, plugs, and strips necessary for the attachment of trim, finish, and similar work prior to placing concrete.

3.07 BEVELED EDGES (CHAMFER)

Form 3/4-inch beveled edges on exposed concrete edges and corners, beam soffit corners, and where indicated in the drawings. Reentrant corners in concrete members shall not have fillets, unless otherwise shown in the drawings. The top edges of slabs, walkways, beams, and walls may be beveled with an edging trowel in lieu of using chamfer strips.

3.08 EXPANSION JOINTS

Provide expansion joints with continuous edge reservoirs, which shall be filled with a joint sealant. Leave the material used for forming the reservoirs in place until immediately before the grooves are cleaned and filled with joint sealant. After removing edge forms from the reservoir, remove grout, loose concrete, and fins; then sandblast the

slots. Allow the reservoirs to become thoroughly dry; then blow out the reservoirs and immediately prime and fill with the expansion joint sealant and backup materials. The primer used shall be supplied by the same manufacturer supplying the joint sealant.

3.09 TIME BETWEEN POURS

At least two hours shall elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs supported thereon. Place beams, girders, brackets, column capitals, and haunches monolithically as part of the floor or roof system, unless otherwise indicated in the drawings.

3.10 INSTALLATION OF PREMOLDED JOINT FILLER

Install in joint accurately as shown. Attach to concrete with a bonding agent recommended by the joint sealant and joint filler manufacturer for compatibility.

3.11 INSTALLATION OF JOINT SEALANTS

A. Immediately before installing the joint sealant, clean the joint cavity by sandblasting or power wire brushing. Install bond breaker tape per manufacturer's instructions.

B. After the joints have been prepared as described above, apply the joint sealant. Apply the primer, if required, and joint sealant only with the equipment and methods recommended by the joint sealant manufacturer. Application criteria for the sealant materials, such as temperature and moisture requirements and primer cure time, shall be in accordance with the recommendations of the sealant manufacturer.

C. Apply masking tape along the edges of the exposed surface of the exposed joints. Trowel the joints smooth with a tuck pointing tool wiped with a solvent recommended by the sealant manufacturer.

D. After the sealant has been applied, remove the masking tape and any sealant spillage.

3.12 INSTALLATION OF STEEL EXPANSION JOINT DOWELS

A. Align dowels as indicated in the drawings. Secure tightly in forms with rigid ties. Orient dowels to permit joint movement.

3.13 PLACING REINFORCEMENT

A. Place reinforcing steel in accordance with the current edition of Recommended Practice for Placing Reinforcing Bars, published by the Concrete Reinforcing Steel Institute.

B. Place reinforcing in accordance with the following, unless otherwise indicated:

1. Reinforcement indicated in the drawings is continuous through the structure to the farthest extent possible. Terminate bars and hooks 2 inches clear from faces of concrete.

2. Splices may be used to provide continuity due to bar length limitations. Minimum length of bars spliced for this reason is 30 feet. Splicing of reinforcement that is detailed to be continuous in the drawings is not permitted.

C. Reinforcing steel shall be free from loose mill and rust scale and from any coatings that may destroy or reduce the bond before being set in position and just prior to placing concrete. Clean reinforcing steel by sandblasting or wire brushing and remove mortar, oil, or dirt to remove materials that may reduce the bond.

D. Do not straighten or re-bend reinforcing steel in the field.

E. Position reinforcing steel in accordance with the drawings and secure by using annealed wire ties or clips at intersections and support by concrete or metal supports, spacers, or metal hangers. Do not place metal clips or supports in contact with the forms. Bend tie wires away from the forms to provide the specified concrete coverage. Bars, in addition to those shown in the drawings, which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at his own expense.

F. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.

G. Secure reinforcing dowels in place prior to placing concrete. Do not press dowels into the concrete after the concrete has been placed.

H. Roll wire mesh used for reinforcement flat before placing concrete. Support and tie wire mesh to prevent movement during concrete placement.

I. Position dowels for masonry walls to occur at reinforced block cells.

3.14 SITE-MIXED CONCRETE

A. Conform to ACI 304.

3.15 READY-MIXED CONCRETE

A. Provide ready-mixed concrete conforming to ASTM C94 as modified by these specifications.

B. Convey concrete from the truck to the place of final deposit as rapidly as practicable by methods that will prevent segregation or loss of ingredients to maintain the quality of the concrete. Place no concrete more than 90 minutes after mixing has begun for that particular batch. If it is necessary to add water to obtain the specified slump, add water per ASTM C94, but do not exceed the water content of the reviewed design mix.

C. Keep a record showing time and place of each pour of concrete, together with transit-mix delivery slips certifying the contents of the pour.

3.16 PRIOR TO PLACING CONCRETE

A. Subgrade: Compact the subgrade and/or bedding. Remove all standing water, mud, and foreign matter before concrete is deposited.

B. Granular Base: When indicated in the drawings, install a granular base beneath the slab on grade or a structural foundation. Place the granular material on a compacted subgrade and compact the granular base to the same density as the subgrade.

3.17 PLACING CONCRETE

A. Placement shall conform to ACI 304 as modified by these specifications.

B. Coordinate in advance of concrete placement the sequence of placement to assure that construction joints will occur only as designed. Provide District with a copy of the sequence of placement in advance of placement.

C. Alternate sections of concrete walls and slabs may be cast simultaneously. Do not place adjacent sections of walls and slabs until seven days after placement of first placed concrete.

D. Notify the District of readiness, not just intention, to place concrete in any portion of the work. This notification shall be such time in advance of the operation as the Owner's Representative deems necessary to allow observation of the work at the location of the proposed concrete placing. Failure of sufficient advance notification will be cause for delay in placing until observations can be completed. Forms, steel, screeds, anchors, ties, inserts, and other embedded items shall be in place before the Contractor's notification of readiness is given.

E. Schedule sufficient equipment for continuous concrete placing. Provide for backup equipment and procedures to be taken in case of an interruption in placing. Provide backup concrete vibrators at the project site. Test concrete vibrators the day before placing concrete.

F. Do not place concrete until all free water has been removed or has been diverted by pipes or other means and carried out of the forms, clear of the work. Do not deposit concrete underwater, and do not allow free water to rise on any concrete until the concrete has attained its initial set. Do not permit free or storm water to flow over surfaces of concrete so as to injure the quality or surface finish.

G. Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing. Do not deposit concrete in large quantities in one place to be worked along the forms with a vibrator.

H. Use mechanical vibration in placing concrete to eliminate rock pockets and voids, to consolidate each layer with that previously placed, to completely embed reinforcing bars and fixtures, and to bring just enough fine material to exposed surfaces to produce a smooth, dense, and even texture. Vibrators shall be of the high-frequency internal type,

and the number in use shall be ample to consolidate the incoming concrete to a proper degree within 15 minutes after it is deposited in the forms. In all cases, at least two vibrators shall be available at the site. Use external vibrators for consolidating concrete when the concrete is otherwise inaccessible for adequate consolidating. Construct forms with sufficient strength to resist displacement or damage when external vibrators are used.

I. Do not place concrete during rainstorms. Protect concrete placed immediately before rainstorms to prevent rainwater from coming in contact with freshly placed or uncured concrete. Keep sufficient protective covering ready at all times for this purpose.

J. Elephant Trunks: Use hoppers and elephant trunks or drop chutes to prevent the free fall of concrete that results in separation of coarse particles.

K. Chutes: Use metal or metal-lined chutes with a slope not exceeding one vertical to two horizontal and not less than one vertical to three horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirement may be used only if they discharge into a hopper before distribution.

L. Deposit concrete continuously and in level layers of such thickness (not exceeding 2 feet in depth) so that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams, planes of weakness, or cold joints.

3.18 MAXIMUM HEIGHT OF CONCRETE POURS AND FREE FALL

A. Do not drop concrete feely into place from a heigh greater than 6 feet in unexposed work and 4 feet in exposed work. Use tremies or pumps where the drop exceeds these limits.

3.19 PUMPING CONCRETE

A. Conform to the recommendations of ACI 304.2R except as modified herein.

B. Base pump size on rate of concrete placement, length of delivery pipe or hose, aggregate size, mix proportions, vertical lift, and slump of concrete.

C. Minimum inside diameter of pipe or hose shall be based on the maximum aggregate size as follows:

1. 3/4-inch-maximum aggregate: 2 inches minimum inside diameter.

2. 1-1/2-inch-maximum aggregate: 4 inches minimum inside diameter.

D. Before pumping is started, prime the delivery pipe or hose by pumping mortar through the line using 5 gallons of mortar for each 50 feet of delivery line. Do not deposit mortar in the forms.

3.20 WEATHER REQUIREMENTS

A. Conform to ACI 305 for placing during hot weather.

B. Conform to ACI 306 for placing during cold weather.

3.21 BACKFILL AGAINST WALLS

A. Do not place backfill against walls until the concrete has obtained a compressive strength equal to the specified 28-day compressive strength. Where backfill is to be placed on both sides of the wall, place the backfill uniformly on both sides.

B. Do not backfill the walls of structures that are laterally restrained or supported by suspended slabs or slabs on grade until the slab is poured and the concrete has reached the specified compressive strength.

3.22 PLACING SLURRY CEMENT BACKFILL

Place slurry cement backfill in a uniform manner that will prevent voids in, or segregation of, the backfill. Remove foreign material that falls into the excavation or trench. Do not commence backfilling over or place any material over the slurry cement backfill until at least four hours after placing the slurry cement backfill, except that when concrete sand is used for the aggregate and the in-place material is free draining, backfilling may commence as soon as the surface water is gone.

3.23 CONCRETE FINISHES

A. Complete concrete surfaces in accordance with the following schedule:

Finish Designation	Area Applied
F-1	Beams, columns, and exterior walls not exposed to view.
F-3	Beams, columns, and walls of structures or buildings exposed to view. Underside of formed floors or slabs.
F-4	Exterior and interior surfaces to be coated.
S-1	Slabs and floors to be covered with concrete or grout.
S-4	Slabs and floors of structures or buildings exposed to view.
S-5	Slabs and floors at slopes greater than 10% and stairs.
E-1	Exposed edges. EXCEPTION: Edges normally covered with earth.
E-2	Top of walls, beams, and similar unformed surfaces.

B. Finish F-1: Repair defective concrete, fill depressions deeper than 1/2 inch, and fill tie holes.

Finish F-3: In addition to Finish F-1, remove fins, fill depressions 1/4 inch or deeper, fill depressions and airholes with mortar. Dampen surfaces and then spread a slurry consisting of one part cement and one and one-half parts sand by damp loose volume, over the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.

Finish F-4: Repair defective concrete, remove fins, fill depressions 1/16 inch or deeper, fill tie holes, remove mortar spatter, and remove bulges higher than 1/16 inch.

Finish S-1: Screed to grade without special finish.

Finish S-4: Steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.

Finish S-5: Steel trowel finish without local depressions or high points. Apply a stiff bristle broom finish. Leave broom lines parallel to the direction of slope drainage.

Finish E-1: Provide chamfer or beveled edges.

Finish E-2: Strike smooth and float to an F-3 or F-4 finish.

3.24 CURING CONCRETE

A. Conform to ACI 308.

B. It is the responsibility of the Contractor to select the appropriate curing method in response to climatical and/or site conditions occurring at the time of concrete placement. Take appropriate measures as described in ACI 305 and 306 for protecting and curing concrete during hot and cold weather.

3.25 REPAIR OF DEFECTS AND CRACKS

A. Do not repair defects until concrete has been evaluated by the Owner's Representative.

B. Repairs of defects will be at no cost to the District.

C. Surface Defects:

1. Repair surface defects that are smaller than 1 foot across in any direction and are less than 1/2 inch in depth.

2. Repair by removing the honeycombed and other defective concrete down to sound concrete, cut or grind edges perpendicular to the surface and at least 3/8 inch deep, abrasive clean and thoroughly dampen the surface, work into the surface an epoxy bonding agent, and fill the hole with one part cement to one-part fine sand. Match the finish on the adjacent concrete, and cure as specified.

D. Severe Defects:

1. Repair severe defects that are larger than surface defects but do not appear to affect the structural integrity of the structure.

2. Repair by removing the honeycombed and other defective concrete down to sound concrete, make edges of the repair area perpendicular to the surface, as required above, sandblast the sound concrete surface, coat the exposed surfaces with epoxy bonding compound, place non-shrink grout, match the finish on the adjacent concrete, and cure as specified.

E. Repair minor cracks in concrete structures that are wider than 1/10 inch by cutting out a square edged and uniformly aligned joint 3/8 inch wide by 3/4 inch deep, preparing exposed surfaces of the joint, priming the joint, and applying polyurethane joint sealant.

F. If the cracks are major or affect the hydraulic capacity or function of the element, the District may require the concrete to be repaired by epoxy injection.

G. Major Defects and Cracks: If the defects affect the structural integrity of the structure or if patching does not satisfactorily restore quality and appearance to the surface, the District may require the concrete to be removed and replaced atr no cost to the District, complete.

3.26 CONCRETE TESTS

A. Concrete quality testing will be performed on the concrete by the Contractor as follows:

1. Frequency of Sampling: Cast four concrete test cylinders from each 75 cubic yards, or fraction thereof, of each class of concrete placed in any one day. Sampling and curing of cylinders shall conform to ASTM C31.

2. Strength Testing: Test cylinders in accordance with ASTM C39. Test one cylinder at 7 days for information; test two cylinders at 28 days for acceptance; and hold one cylinder for verification. Strength acceptance will be based on the average of the strengths of the two cylinders tested at 28 days. If one cylinder of a 28-day test manifests evidence of improper sampling, molding, or testing, other than low strength, discard it and use the fourth cylinder for the test result.

3. Determine concrete slump by ASTM C143 with each strength test sampling and as required to establish consistency.

4. The average value of concrete strength tests shall be equal to or greater than the specified 28-day strength. No test shall be less than 90% of the specified 28-day strength.

5. If the 28-day strength tests fail to meet the specified minimum compressive strength, the concrete will be assumed to be defective and one set of three cores from each area may be taken by the Contractor as selected by the District and in accordance with ASTM C42. If the average compressive strength of the set of three concrete cores fails to equal 90% of the specified minimum compressive

strength or if any single core is less than 75% of the minimum compressive strength, the concrete will be considered defective. The District may require additional coring, nondestructive load testing, or repair of defective concrete. Costs of coring, testing of cores, load testing, and required repairing pertaining thereto shall be paid by the Contractor.

END OF SECTION

SECTION 034215 PRECAST CIRCULAR POLYMER CONCRETE MANHOLES

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes design, materials, testing, and installation of precast circular polymer concrete manholes.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: 312300

B. Trenching, Backfilling, and Compacting: 312316.

C. Leakage and Infiltration Testing: 330130.

D. PVC Gravity Sewer Pipe: 333112.

1.03 SUBMITTALS

A. Submit manufacturer's catalog data on precast concrete manholes, frames, pipe connections, joint sealing compound, and covers. Show lettering on manhole covers.

B. Submit summary of criteria used in manhole design including, as minimum, material properties, loadings, load combinations, and dimensions assumed. Include certification from manufacturer that acid resistant polymer manhole design meets or exceeds the load and strength requirements of ASTM C 478 and ASTM C 857.

C. Submit sealed drawings by a Professional Engineer registered in the State of California.

PART 2 - MATERIALS

2.01 PRECAST CIRCULAR POLYMER CONCRETE MANHOLES

A. Precast circular concrete manholes shall comply with ASTM C478, with allowable compositional and sizing differences required by a polymer product. Minimum manhole diameter shall be 48 inches. Design manholes for the depths shown in the drawings, assuming a soil density of 130 pounds per cubic foot.

B. Required wall thickness for all members will be that stated by polymer manhole manufacturer based upon loading conditions and material properties. The wall thickness of risers and conical tops shall be not less than that prescribed by the manufacturer’s design by more than 5%. A wall thickness greater than the prescribed design shall not be cause for rejection.

C. Precast top sections shall be eccentric cone, except where shown otherwise in the drawings.

D. Grade rings shall be per Standard No. S-4.

E. Design joints to be watertight per ASTM C443.

F. Each manhole component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. The internal diameter of manhole components shall not vary more than 1%. Variations in height of two opposite sides of risers and conical tops shall not be more the 5/8 inch. The under run in height of a riser or conical top shall not be more than 1/4in./ft of height with a maximum of ½ inch in any one section.

G. Construct invert channels to provide a smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts. Polymer bench and channel are to be constructed with all resin aggregate material – no alternative fill material is allowed. Extended base footer requirements for buoyancy concerns can be addressed with cementitious concrete material.

2.02 POLYMER CONCRETE DESIGN

A. Polymer Mixture - the mixture shall consist solely of thermosetting resin sand and aggregate. No cementitious materials shall be allowed as part of the mix design matrix. All sand and aggregate shall be nonreactive in an acid environment.

B. Thermosetting Resin - The resin shall have a minimum deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following ASTM D648. The resin content shall not be less than 7% of the weight of the sample as determined by ASTM D2584. Resin selection shall be suitable for applications in the corrosive conditions to which the structures will be exposed.

2.03 MANHOLE FRAMES AND COVERS

A. Manhole frames and covers shall be per Standard No. S-4

B. Sewer manhole covers shall have the word "SEWER" and the letters as indicated in the standards cast thereon. Do not apply any other lettering.

2.04 PIPE CONNECTIONS FOR SEWER MANHOLES

Provide resilient watertight connectors between the manhole and piping in accordance with ASTM C923. Connections shall consist of a chemically resistant neoprene EPDM flexible boot, locking ring, and pipe clamp(s). The locking ring shall be stainless steel and shall lock the boot into the preformed opening in the manhole. The pipe clamp shall

be stainless steel. Alternatively, cast the flexible boot in the manhole and eliminate the locking ring.

2.05 CRUSHED ROCK FOR MANHOLE BASE

Crushed rock shall comply with Section 312300.

PART 3 - EXECUTION

3.01 MANHOLE BASE

A. Excavate for the manhole and install a crushed rock base encased in filter fabric, 6 inches thick, per Section 312300. Crushed rock base material shall extend 18 inches beyond the outside edge of the manhole base. Compact to 90% relative density.

3.02 INSTALLING MANHOLES

Set each precast concrete manhole unit per manufactures recommendations. Backfill, compact, and replace pavement.

3.03 SEALING OF MANHOLE SECTIONS

Clean ends of precast sections of foreign materials. Place butyl rubber sealing compound around the groove of the lower section. Set next section in place. Completed manhole shall be rigid and watertight.

3.04 LEAKAGE TESTING OF SEWER MANHOLES

Test manholes for leakage by vacuum testing per ASTM C1244.

3.05 BACKFILL AROUND MANHOLES

Backfill and compact around the manholes per Section 312316 and the respective pipe specification.

END OF SECTION

SECTION 034220 PRECAST CONCRETE VAULTS

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials, design, and installation of precast concrete vaults and structures.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete: 030500.

B. Earthwork: 312300.

1.03 SUBMITTALS

A. Submit manufacturer's catalog data on precast concrete items. Include dimensions of vaults and thicknesses of walls, floors, and top slabs. Include reinforcing wire and steel. Include materials of construction by ASTM reference and grade.

B. Submit manufacturer's design calculations and certification that vault design and construction comply with the specified design load conditions and the referenced ASTM specifications (e.g., ASTM C857 and C858).

PART 2 - MATERIALS

2.01 MANUFACTURERS

Precast concrete vaults shall be manufactured by Mid State Concrete Products, Jensen Precast, Brooks Products Inc., or equal.

2.02 PRECAST CONCRETE VAULTS

A. Precast concrete vaults shall comply with ASTM C858 except as modified herein.

B. Design loads shall be in accordance with ASTM C857, except as modified herein. Traffic loads, unless otherwise stated, shall conform to Load Designation A-16 (HS20-44) per Table 1. Soil lateral loads shall be as determined by ASTM C857 or loadings specified in the project soils report, whichever is greater. Alternate design by the strength design method shall include a load factor of 1.7 times the lateral earth or hydrostatic pressures.

C. Include the following load conditions in the design:

1. Vault roof removed while structure is backfilled to grade and subject to live and dead loads.

2. Vault roof in place and walls subject to simultaneous vertical and horizontal application of all live, impact, and dead loads. Include the case of an A-16 designated load placed directly above the wall.

D. Design all vaults to receive the specified traffic loading.

E. Precast vault construction shall be in the form of monolithic walls or horizontal wall sections; do not use panel walls.

F. Design joints using a butyl rubber sealant per ASTM C990.

2.03 SEALANTS AND MORTAR

Butyl rubber sealing compound shall comply with ASTM C990. Mortar shall comply with ASTM C387, Type S.

2.04 LADDERS

Provide stainless steel ladders with extendable handrails.

2.05 ACCESS HATCHES

A. Provide aluminum access hatches where vaults are located outside of the roadway. Access hatches shall be double-Leaf, reinforced to support AASHTO HS20-44 wheel load of the sizes and configurations shown in the drawings. Aluminum doors shall be anodized. Latch and lifting mechanism assemblies, hold-open arms and guides, and all brackets, hinges, pins, and fasteners shall be 316 stainless steel.

B. Vaults located within the roadway or driveway shall be reinforced for AASHTO HS20-44 wheel loads for direct traffic applications and shall be of the size and configuration shown in the drawings. Latch and lifting mechanism assemblies, hold-open arms and guides, and brackets, hinges, pins, and fasteners shall be Type 316 stainless steel.

2.06 CRUSHED ROCK BASE

Crushed rock base material shall comply with Section 312300.

PART 3 - EXECUTION

3.01 VAULT BASE

A. Excavate for the vault and install a crushed rock base encased in filter fabric, 8 inches thick, per Section 312300. Crushed rock base material shall extend 18 inches beyond the outside edge of the vault base. Compact to 90% relative density.

3.02 SEALING AND GROUTING

Fill joints between precast sections with either a butyl rubber sealing compound or mortar.

3.03 INSTALLING VAULTS

A. After the excavation has been completed, level the area where the base section is to be installed. Fill and compact the base material and provide a level and solid foundation. Set the base such that water will drain toward the sumps.

B. Assemble the vault sections by lowering onto the preceding base or section. Set level and firmly position the base or preceding section before placing additional sections.

C. Set each precast concrete vault section plumb on a bed of sealant or cement mortar at least 1/2-inch thick to make a watertight joint with the concrete base and with the preceding unit. Remove foreign materials such as dirt, mud, and stones from joint surfaces. Apply grout or sealant such that no voids occur. Point the inside joint and wipe off the excess mortar or sealant.

D. If a misalignment of sections occurs during the installation, remove and reinstall the section. Do not reinstall damaged sections. If the sealing material is damaged, clean the joint surfaces before repairing or placing new sealing material.

3.04 BACKFILL AROUND VAULTS

Backfill and compact around the vaults using structural fill as specified in Section 312300.

END OF SECTION

SECTION 099000 PAINTING AND COATING

PART 1 - GENERAL

1.01 DESCRIPTION

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

Coating thicknesses specified herein are given as "dry-film thickness" in mils. Mil thicknesses specified are minimums.

1.02 SUBMITTALS

A. Submit manufacturer’s data sheets showing the following information:

A. Percent solids by volume.

B. Minimum and maximum recommended dry-film thickness per coat for prime, intermediate, and finish coats.

C. Recommended surface preparation.

D. Recommended thinners.

E. Statement verifying that the specified prime coat is recommended by the manufacturer for use with the specified intermediate and finish coats.

F. Application instructions including recommended equipment and temperature limitations.

G. Curing requirements and instructions.

H. Material safety data sheets for each coating.

1.03 PRE-SUBMITTAL MEETING

A pre-submittal meeting shall be conducted two weeks prior to the submittal of coating shop drawings, at the discretion of the District. The meeting shall be attended by the painting and coating Contractor/Subcontractor.

PART 2 - MATERIALS

2.01 PAINTING AND COATING SYSTEMS

The following table provides a summary of the coating systems and the various surfaces to be coated:

Application	Utility	System No.								
		A-1	B-1	B-2	C-1	C-2	D-1	E-1	F-1	F-2
Fire Hydrants	Potable	X								
Submerged Metal	Potable		X							
Submerged Metal	Raw Sewage			X						
Exposed Metal	All				X	X				
Buried Metal	All						X			
Metal in Contact with Concrete	All							X		
Valves	All								X	X

2.02 SPECIALTY ITEMS

A. Surfaces shall be coated as described below:

1. Buried Items: Buried flanges, nuts and bolts, flexible pipe couplings, exposed rebar from thrust blocks, and valve boxes shall be coated per System No. D-1 unless otherwise specified in the particular specifications for these items.

2. Above Ground Structural Steel and Structural Steel in Vaults: Above ground structural steel or structural steel located in vaults and steel structures shall be coated as described in the exposed metal coating system sections.

3. Pipe Supports: All non-galvanized and non-stainless steel pipe supports in vaults shall be coated the same as the adjacent piping. If pipe is PVC, pipe supports shall be coated per System No. C-1.

2.03 HYDRANT COATING SYSTEMS

A. System No. A-1 – Fire Hydrants

Type: Water-based low Volatile Organic Compound (VOC) acrylic coating. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 5 mils.

Surface preparation: Remove oil, grease and chalking. Abrade existing paint and visible rust areas. All prepared surfaces must be coated same day. Surface preparation shall conform to the Society for Protective Coatings (SSPC) specifications as follows:

SP 1: Solvent Tool Cleaning
SP 2: Hand Tool Cleaning
SP 3: Power Tool Cleaning

Color: See color schedule herein.

Prime Coat: Apply to a dry-film thickness of 2 to 3 mils. Primer shall be acrylic. Manufacturers for previously painted surfaces include: Carboline Sanitile 120, Sherwin Williams Pro Industrial Pro-cryl, Tnemec Series 1028 Enduratone, or approved equal.

Manufacturers for bare metal surfaces include: Carboline Carbocrylic 3359 DTM, Sherwin Williams Pro Industrial Pro-Cryl, Tnemec Series 94-H20 Hydro-zinc, or approved equal.

Finish Coat: Apply to a dry-film thickness of 3 to 4 mils. The finish coat shall be applied in the field just prior to final inspection. Manufacturers for finish coats include: Carboline Carbocrylic 3359 DTM, Sherwin Williams Pro Industrial Acrylic, Tnemec Series 1028 Enduratone, or approved equal.

2.04 SUBMERGED METAL AND CONCRETE COATING SYSTEMS

A. System No. B-1 – Submerged Metal, Potable Water

Type: Two-part low VOC epoxy-polyamide, or two-part amido-amine epoxy. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 15 mils. Coating shall be NSF 61 & NSF 600 approved.

Service Conditions: Shall be used on surfaces including, but not limited to, structural steel and piping exposed to potable water.

Surface Preparation: SSPC-SP 10

Prime Coat: Apply to a dry-film thickness of 5 mils. Manufacturers for prime coats include: Carboline Hydroplate 1080, Sherwin Williams Sherplate 600, Tnemec Series L140F Pota Pox, or approved equal.

Finish Coats: Apply two coats, each with a 5-mil dry-film thickness, to achieve the total dry-film thickness. The coating material shall be the same material as the prime coat.

B. System No. B-2 – Submerged Metal Raw Sewage

Type: 100% solids epoxy for metal surfaces. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 40 mils.

Service Conditions: Metal structures or pipes exposed to raw sewage.

Surface Preparation: Surface preparation shall be SSPC-SP 10 for steel surfaces. Surface preparation shall be NAPF 500-03-05 Clean No. 2 for ductile iron or cast iron surfaces.

Prime Coat: Apply to a dry-film thickness of 5 mils. Manufacturers for prime coats include: Carboline Plasite 4550, Sherwin Williams Dura-Plate UHS, Tnemec Series 435 Perma-Glaze, or approved equal.

Finish Coat: Apply one coat with a 35-mil dry-film thickness. The total dry-film thickness of this system shall be 40 mils. The coating material shall be the same material as the prime coat.

2.05 EXPOSED METAL COATING SYSTEMS

A. System No. C-1 – Exposed Metal, Severely Corrosive Environment

Type: Low VOC zinc-rich prime coat with low VOC epoxy-polyamide finish coat. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 12 mils.

Service Conditions: Shall be used on metal surfaces including, but not limited to, structures, piping, fittings, pumps, and appurtenances subjected to continuous water condensation, occasional immersion, or splashing. Below grade vaults shall be considered as severely corrosive environments.

Surface Preparation: Surface preparation shall be SSPC-SP 10 for steel surfaces. Surface preparation shall be NAPF 500-03-05 Clean No. 2 for ductile iron or cast iron surfaces.

Prime Coat: Apply to a dry-film thickness of 3 mils. For ductile iron surfaces, the ductile iron shall have an asphaltic free surface with a factory applied prime coat the same as the finish coat. For all other surfaces, a two-component inorganic zinc rich primer shall be used with a minimum zinc content of 14 pounds per gallon. Manufacturers for zinc-rich primers include: Carboline Carbozinc 11, Sherwin Williams Corothane I Galvapac 2K-100, Tnemec Series 94-H20 Hydro-Zinc, or approved equal.

Finish Coats: Apply two coats, each with a 4 to 5 mil dry-film thickness, to achieve the total dry-film thickness. Manufacturers include: Carboline Carboguard 890 VOC, Sherwin Williams Macropoxy 646-100, Tnemec Series L69 Hi-build Epoxoline II, or approved equal.

B. System No. C-2 – Exposed Metal, Atmospheric Weathering Environment

Type: Low VOC Aliphatic Polyurethane or low VOC Polysiloxane with low VOC epoxy-polyamide or amido-amine epoxy primer. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 8 mils.

Service Conditions: Shall be used on metal surfaces including, but not limited to, structures, piping, fittings, pumps, and appurtenances subjected to atmospheric elements and weathering.

Surface Preparation: Surface preparation shall be SSPC-SP 6 for steel surfaces. Surface preparation shall be NAPF 500-03-05 Clean No. 2 for ductile iron or cast iron surfaces. Surface preparation shall be SSPC-SP 1 for galvanized surfaces and shall be brush blasted or acid etched surface prior to application of prime coat.

Prime Coat: Apply one or two coats to a dry-film thickness of 5 mils. For ductile iron surfaces, the ductile iron shall have an asphaltic free surface with a factory applied prime coat the same as the finish coat. Manufacturers include: Carboline Carboguard 890 VOC, Sherwin Williams Macropoxy 646-100, Tnemec Series 135 Chembuild with low VOC thinner or L69 Epoxyline, or approved equal.

Finish Coat: Apply one coat to a dry-film thickness of 3 mils to achieve the total dry-film thickness. Manufacturers include: Carboline Carboguard 134 MC, Sherwin Williams Sher-Loxane 800, Tnemec Series 1095 Endura-shield, or approved equal.

2.06 BURIED METAL COATING SYSTEMS

A. System No. D-1 – Buried Metal

Type: Low VOC epoxy coating. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 24 mils.

Service Conditions: Shall be used to coat buried metal including, but not limited to, valves, flanges, bolts and nuts, fittings, flexible pipe couplings, and structural steel.

Surface Preparation: SSPC-SP 10.

Prime Coat: Apply to a dry-film thickness of 8 mils. Manufacturers include: Carboline Carboguard 890 VOC, Sherwin Williams Macropoxy 5500 LT, Tnemec Series L69F, or approved equal.

Finish Coat: Apply two coats, each with an 8-mil dry-film thickness, to achieve the total dry-film thickness. The coating material shall be the same material as the prime coat.

B. System No. E-1 – Aluminum and Galvanized Surface in Concrete:

Type: Low VOC epoxy coating. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 15 mils:

Service Conditions: Shall be used to coat areas including, but not limited to, gates, stairs, or structural members in contact with concrete.

Surface Preparation: Apply synthetic resin wash primer (phosphoric acid or vinyl butyral acid) to surface. Surface preparation shall comply with SSPC-SP 17.

Prime Coat: Apply to a dry-film thickness of 5 mils. Manufacturers include: Carboline Carboguard 890 VOC, Sherwin Williams Macropoxy 646-100, Tnemec Series L69F, or approved equal.

Finish Coat: Apply two coats, each with a 5-mil dry-film thickness, to achieve the total dry-film thickness. The coating shall be the same material as the prime coat.

2.07 VALVE COATING SYSTEM

A. System No. F-1 – Surface of Ferrous-Metal Valves

Type: Thermosetting powdered epoxy coating.

Service Conditions: Shall be used to coat interior surfaces of ferrous metal valves, excluding seating areas and bronze and stainless steel pieces.

Surface Preparation: Protuberances which may produce pinholes in the coating shall be removed. Sharp edges shall be rounded. Surface contaminants which may prevent bonding of the coating shall be removed. Surface preparation shall comply with SSPC-SP 5.

Coating: Apply to a total dry-film thickness of 12 mils in accordance with manufacturer's recommendation. Manufacturers include: 3M Scotchkote 134 or approved equal.

B. System No. F-2 – Surfaces of Ferrous-Metal Valves (Alternative)

General: This is an alternative to System No. G-1 when approved by the District.

Type: Two-part low VOC epoxy-polyamide coating. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 15 mils.

Service Conditions: Shall be used to coat interior surfaces of ferrous metal valves, excluding seating areas and bronze and stainless steel pieces.

Surface Preparation: Protuberances which may produce pinholes in the coating shall be removed. Sharp edges shall be rounded. Surface contaminants which may prevent bonding of the coating shall be removed. Surface preparation shall comply with SSPC-SP 17.

Prime Coat: Apply to a dry-film thickness of 5 mils in accordance with manufacturer's recommendations. Manufacturers include: Carboline Carboguard 890, Sherwin Williams Macropoxy 646-100, Tnemec Series L140F Pota Pox, or approved equal.

Finish Coat: Apply two coats, each with a 5-mil dry-film thickness, to achieve the total dry-film thickness. The coating material shall be the same material as the prime coat.

PART 3- EXECUTION

3.01 GENERAL

A. Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application, and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and acceptable professional standards and are approved by the District prior to construction.

B. Work accomplished in the absence of prescribed inspection may be required to be removed and replaced under proper inspection, and the entire cost of removal and replacement, including the cost of all materials shall be borne by the Contractor, regardless of whether the work removed is found to be defective or not. Work covered up without the authority of the District shall, upon order of the District, be uncovered to the extent required, and the Contractor shall similarly bear the entire cost of accomplishing all the work and furnishing all the materials necessary for the removal of the covering and its subsequent replacement, as directed and approved by the District.

C. The District will make, or have made, such tests as it deems necessary to assure the work is being accomplished in accordance with the requirements of the Contract Documents. Unless otherwise specified, the cost of such testing will be borne by the Owner. In the event such tests reveal non-compliance with the requirements of the Contract Documents, the Contractor shall bear the cost of such corrective measures deemed necessary by the District, as well as the cost of subsequent retesting and reinspection. Tests shall not constitute an acceptance of any portion of the work, nor relieve the Contractor from compliance with the terms of the Contract Documents.

D. Application: No coating shall be applied under the following conditions:

1. When the surrounding air temperature or the temperature of the surface to be coated or painted is below 55ºF for epoxy coatings, below 45ºF for low temperature curing epoxy coatings, or above 125ºF for all materials;

2. To wet or damp surfaces or in rain, snow, fog or mist;

3. When the air temperature is less than 5ºF above the dewpoint;

4. When it is expected the air temperature will drop below 55ºF for epoxy coating; or 45ºF for low temperature curing epoxy coatings or less than 5ºF above the dewpoint within two hours after application of coatings or paints.

a) Dewpoint shall be measured by use of an instrument such as a manual sling psychrometer or digital psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables or equivalent. If dehumidification is used, equipment must run as required to maintain the ambient environmental conditions required by the manufacturer and project specifications. If above conditions are prevalent, coating application shall be delayed or postponed until conditions are favorable. The day's application shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions

E. Overspray and Dust Control: The Contractor shall conduct all operations so as to confine abrasive blasting debris and coating and paint overspray to within the bounds of the site. The Contractor shall take all precautions necessary to prevent adverse off-site and on-site consequences of application operations. Any complaints received by the District relating to any such potential off-site problems will be immediately delivered to the Contractor. The Contractor shall immediately halt blast cleaning or application work and shall make corrective actions required to mitigate any such problems. All costs associated with protection of off-site properties and/or correction of damage to off-site or on-site property as a result of blast cleaning or application operations shall be borne directly by the Contractor at no additional expense to the District.

F. Inspection Devices: Contractor shall furnish, until final acceptance of coatings and paints, inspection devices in good working condition for detection of holidays and measurement of dry-film and wet-film thickness. Contractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates to test accuracy of thickness gauges. Dry film thickness gauges and holiday detectors shall be available at all times until final acceptance of application. Inspection devices shall be operated by, or in the presence of the District with location and frequency basis determined by the District. The District is not precluded from furnishing their own inspection devices and rendering decisions based solely upon their tests.

G. All surface preparation, coating and paint application shall conform to applicable standards of the Association for Materials Protection and Performance, the District, and the manufacturer's printed instructions. Material applied prior to District approval of the surface shall be removed and reapplied to the satisfaction of the District at the expense of the Contractor.

H. All work shall be accomplished by skilled craftsmen qualified to accomplish the required work in a manner comparable with the best standards of practice. Resumes of personnel to be used on the project shall be made available upon request. Continuity of personnel shall be maintained, and transfers of key personnel shall be coordinated with the District.

I. The Contractor shall provide a supervisor to be at the work site during cleaning and application operations. The supervisor shall have the authority to sign change orders, coordinate work and make other decisions pertaining to the fulfillment of the Contract Documents.

J. The Contractor's equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Blotter test shall be accomplished at each start-up period in accordance with ASTM D4285 and as deemed necessary by the District. Contractor's equipment shall be subject to approval of the District. This approval does not relieve the Contractor's responsibility for the safe operation of the equipment or its performance

K. Because of presence of moisture and possible contaminants in the atmosphere, care shall be taken to ensure previously coated or painted surfaces are protected or re-cleaned prior to application of subsequent coat(s). Methods of protection and re-cleaning shall be approved by the District.

1. The project is subject to intermittent shutdown if, in the opinion of the District, cleaning and application operations are creating a localized condition detrimental to ongoing facility activities, personnel or adjacent property.

2. In the event of emergency shutdown by the District, Contractor shall immediately correct deficiencies. All additional costs created by shutdown shall be borne by Contractor.

3. Contractor to recoat per manufacture guidelines including surface preparation requirements when recoating occurs outside to recoat window.

3.02 SURFACE PREPARATION

A. General: Abrasive blast or prepare only as much surface area as can be coated in one day. All sharp edges, burrs, and weld spatter shall be removed. Epoxy-coated pipe that has been factory coated shall not be abrasive blasted.

B. SSPC Specifications: Wherever the words "solvent cleaning", "hand tool cleaning", "wire brushing", "blast cleaning", or similar words are used in these specifications or in paint manufacturer's specifications, they shall be understood to refer to the applicable SSPC (Society for Protective Coatings, Surfaces Preparation Specifications) specifications listed below:

SP 1	Solvent Cleaning
SP 2	Hand Tool Cleaning
SP 3	Power Tool Cleaning
SP 5	White Metal Blast Cleaning
SP 6	Commercial Blast Cleaning
SP 7	Brush-Off Blast Cleaning
SP 8	Pickling
SP 10	Near White Blast Cleaning

C. The Contractor shall provide suitable enclosure, exhaust system, and bag house for abrasive blasting operations to prevent violations of applicable air quality requirements.

D. Surface preparation shall be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces", SSPC-Vis 1 and ASTM D2200. Anchor profile for prepared surfaces shall be measured by using a non-destructive instrument such as a Keane-Tator Surface Profile Comparator or Testex Press-O-Film System per NACE SP0287, latest revision. Temperature and dewpoint requirements shall apply to all surface preparation operations.

E. Dust, dirt, oil, grease or any foreign matter which will affect the adhesion or durability of the finish and shall be removed by washing with clean rags dipped in an approved commercial cleaning solution, rinsed with clean water and wiped dry with clean rags SSPC-SP 1. Abrasive blasting nozzles shall be equipped with "deadman" emergency shut-off nozzles. Blast nozzle pressure shall be a minimum of 95 psi and shall be verified by using an approved nozzle pressure gage at each start-up period or as directed by the District. Number of nozzles used during all blast cleaning operations must be sufficient to ensure timely completion of project, subject to designation and approval by the District.

F. Particle size of abrasives used in blast cleaning shall be that which will produce a minimum 2 mil and maximum 3.5 mil surface profile or in accordance with recommendations of the manufacturer of the specified coating system to be applied, subject to approval by the District.

G. Abrasive used in blast cleaning operations shall be new, washed, graded, and free of contaminants which would interfere with adhesion of coatings and shall not be recycled unless specifically approved by the District. Abrasives for unconfined blasting shall be certified pursuant to the California Administrative Code, Section 92530 of Subchapter 6, Title 17, and shall appear on the current listing of approved abrasives. Invoices or load sheets confirming above shall be submitted to the District upon request

H. During blast cleaning operations, caution shall be exercised to ensure existing coatings and paint are not exposed to abrasion from blast cleaning.

I. Blast cleaning from rolling scaffolds shall only be accomplished within confines of the interior scaffold perimeter. Reaching beyond limits of perimeter will be allowed only if the blast nozzle is maintained in a position which will produce a profile acceptable to the District.

J. The Contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the prosecution of the work or the operation of the existing facilities. Spent abrasives and other debris shall be removed at the Contractor's expense as directed by the District.

K. Blast cleaned and coated/painted surfaces shall be cleaned prior to application of specified coatings/paints via a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as directed by the District and per the manufacturer's recommendations. Air hose for blowing shall be at least 1/2-inch in diameter and shall be equipped with a shut-off device. Tests on surfaces of abrasively blast cleaned steel shall be accomplished to detect oil, salts, and other contaminants which might be deposited on surfaces. This will include chemical tests or ultraviolet (black light) tests on soluble salts tests, as required.

3.03 APPLICATION

A. Multiple-component coatings shall be prepared using all the contents of each component container as packaged by the paint manufacturer. Partial batches shall not be used. Multiple-component coatings that have been mixed beyond their pot life shall not be used. Small quantity kits for touch-up painting and for painting other small areas shall be provided. Only the components specified and furnished by the paint manufacturer shall be mixed. For reasons of color or otherwise, additional components shall not be intermixed even within the same generic type of coating.

B. Application of the first coat shall follow immediately after surface preparation and cleaning within an eight-hour working day. Any cleaned areas not receiving first coat within an eight-hour period shall be re-cleaned and re-blasted as necessary prior to application of first coat.

C. Coating and paint application shall conform to the requirements of the Society for Protective Coating Paint Application Specification SSPC-PA 1, latest revision, for "Shop, Field and Maintenance Coating," the District, the manufacturer of the coating and paint materials printed literature and as specified herein.

D. All coating components shall be mixed in exact proportions specified by the manufacturer. Care shall be exercised to ensure all material is removed from containers during mixing and metering operations.

E. All coatings shall be thoroughly mixed, utilizing an approved slow-speed power mixer until all components are thoroughly combined and are of a smooth consistency.

F. Thinning shall only be permitted as recommended by the manufacturer and approved by the District and shall not exceed limits set by applicable regulatory agencies.

1. If the Contractor applies any materials which have been modified or thinned to such a degree as to cause them to exceed established VOC levels, the Contractor shall be responsible for any fines, costs, remedies, or legal action and costs that may result.

G. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs and with no evidence of poor workmanship. Care should be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

H. Protective coverings or drop cloths shall be used to protect floors, fixtures, equipment, prepared surface and applied coatings or paints. Care shall be exercised to prevent coating or paint from being spattered onto surfaces which are not to be coated or painted. Surfaces from which such material cannot be removed satisfactorily shall be refinished as required to produce a finish satisfactory to the District.

I. All welds and irregular surfaces specified by the District shall receive a stripe coat of the specified product prior to application of each complete coat. Coating shall be brushed in multiple directions to ensure penetration and coverage, as directed by the District. Care shall be exercised to ensure dry film thickness of coatings and paints do not exceed the maximum thickness allowed by the manufacture of the specific product being applied or NSF requirements for potable water applications.

J. At the conclusion of each day's blast cleaning and coating operations, a 6-inch-wide strip of blast cleaned substrate shall remain uncoated to facilitate locating point of origin for successive day's blast cleaning operations.

K. Epoxy coated surfaces or other multi-component materials exposed to excessive sunlight or an excessive time element beyond manufacturer’s recommended recoat cycle, shall be sacrificed by Brush-Off Blast Cleaning (SSPC-SP 7) or methods approved by the District Engineer, prior to application of additional coating or paint. Scarified coating or paint shall have sufficient depth to assure a mechanical bond of subsequent coat.

L. When two or more coats are specified, each coat shall contain sufficient approved color additive to act as an indicator of coverage. Coats shall be of contrasting color.

M. Care shall be exercised during spray operations to hold the spray nozzle perpendicular and sufficiently close to surfaces being coated, to avoid excessive evaporation of volatile constituents and loss of material into the air or the bridging of cracks and crevices. Reaching beyond limits of scaffold perimeter shall not be permitted. All overspray identified by the District shall be removed by hand or pole sanding prior to application of subsequent coat.

3.04 SURFACES NOT TO BE PAINTED

A. Unless noted otherwise, the following surfaces shall <u>not be painted</u> and shall be fully protected when adjacent areas are painted.

1. Mortar-coated pipe and fittings

2. Stainless Steel surfaces (excluding stainless steel bolts, nuts, and washers which shall be painted)

3. Aluminum guardrails and handrails

4. Galvanized pipe supports and ladders

5. Nameplates and grease fittings

6. Aluminum grating

7. Brass and copper pipe

3.05 PROTECTION OF SURFACES NOT TO BE PAINTED

A. Hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted shall be removed, masked, or otherwise protected. Drop cloths shall be provided to prevent paint materials from falling on or marring adjacent surfaces. Working parts of mechanical and electrical equipment shall be protected from damage during surface preparation and painting process. Openings in motors shall be safely masked to prevent paint and other materials from entering the motors. All masking materials shall be completely removed and surfaces cleaned at completion of painting operations.

3.06 COLOR SCHEDULE

A. Definitions

1. At Grade: Facilities that are flush with streets, sidewalks, parking lots, green belts or graded areas. This also includes pipelines and other facilities that are protruding through and are located above finished grade, outdoors and not enclosed by a shelter, cover, vault, or housing.

2. Enclosed: Pipeline and other facilities that are located above or below grade and are enclosed within a shelter, covers, or vaults

3. N/A: Not Applicable

4. I.D. Mark: System identification marker as described herein. The I.D. Mark shall identify the system of which the facility is a part.

B. Color Guidelines: Unless noted otherwise, surfaces that are to be coated and that require a color designation for any of the following uses, shall be coated to match the colors listed below. Final color selection shall be determined by District Representative.

C. Potable Water Systems:

Facility	**Enclosed**	**At Grade**
Airvac, Blow Off, & Bottom Drain Assemblies	Pismo Blue	Pismo Blue
Check Valves	Pismo Blue	Pismo Blue
Fire Hydrants*	N/A	Safety Yellow (Public) Red (Private)
Piping	Pismo Blue	Pismo Blue
Valves (all types)	Pismo Blue	Pismo Blue
*Note: Final color selection shall be determined by Cal Fire.		

D. Sewer Collection System:

Facility	Enclosed	At Grade
Airvac Assemblies	Safety Green	Olive Light w/I.D. Mark
Piping	Olive Light w/I.D. Mark	Olive Light w/I.D. Mark
Valves (all types)	Olive Light	Olive Light

3.07 FIELD TOUCH UP OF SHOP-APPLIED ZINC-RICH PRIME COATS

A. Organic Zinc Primer: Surfaces that are shop primed with inorganic zinc primers shall receive surface preparation and a field touchup of organic zinc primer to cover all scratches or abraded areas. Organic zinc primer system shall have a minimum zinc content of 14 lbs per gallon. Finish coats shall be in accordance with System No. C-1. Organic zinc primer shall be manufactured by the prime coat and finish coat manufacturer.

B. Other Surfaces: Other surfaces that are shop primed shall receive surface preparation and a field touchup of the same primer used in the original prime coat.

3.08 DRY-FILM THICKNESS TESTING

A. Coating Thickness Testing: Coating thickness specified herein is "dry-film thickness" in mils. Mil thicknesses specified are minimums. Coating thickness specified for steel surfaces shall be measured with a magnetic-type dry-film thickness gage. Dry-film thickness gauge shall be provided as manufactured by Elcometer, Mikrotest, Defelsko, or QNIX.

B. Mil thicknesses specified are minimums. Each coat shall be checked for the correct dry-film thickness. Measurement shall not be made until a minimum of eight hours after application of the coating for dry-film testing. Non-magnetic surfaces shall be checked for coating thickness by ultra sonic gauge measurement.

C. Holiday Testing: The finish coat (except zinc primer and galvanizing) shall be tested for holidays and discontinuities in accordance with NACE SP0188, most recent edition. Detector shall be as manufactured by Tinker and Rasor, Model AP/W or equal.

D. Repair: If a surface has an improper finish color, insufficient film thickness, or holidays, the surface shall be cleaned and top-coated with the specified paint material to obtain the specified color and coverage. Visible areas of chipped, peeled, or abraded paint shall be hand or power-sanded, feathering the edges. The areas shall then be primed and finish coated in accordance with the specifications. Work shall be free of runs, bridges, shiners, laps, or other imperfections.

END OF SECTION

SECTION 099720 CHEMICAL-RESISTANT COATINGS FOR CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and installation of chemical-resistant coatings for concrete subject to corrosive environments. Coatings are to be used on concrete structures or where approved by the District.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete: 030500.

B. Painting and Coating: 099000.

1.03 SUBMITTALS

A. Submit manufacturer's data sheets showing the following information:

1. Technical data sheet on each product used, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.

2. Number of coats required to achieve specified dry thickness.

3. Minimum recommended dry thickness per coat for prime, intermediate, and finish coats.

4. Recommended surface preparation.

5. Recommended surface tensile strength of the concrete surface.

6. Application instructions including recommended equipment and temperature limitation.

7. Curing requirements and instructions.

B. Applicator Qualifications:

1. Manufacturer certification that Applicator has been trained and approved in the handling, mixing and application of the products to be used. Certification letter shall be dated within six months of bid date.

2. The Applicator shall provide four (4) references which demonstrate previous successful projects completed for the specified structural protective coating system or comparable, during the last two (2) years.

3. Certification that the equipment to be used for applying the products has been manufactured or approved by the protective coating manufacturer and Applicator personnel have been trained and certified for proper use of the equipment. Certification letter shall be dated within six months of bid date.

4. Proof of any necessary federal, state or local permits or licenses necessary for the project.

C. Submit material safety data sheets for each coating.

1.04 SAFETY AND HEALTH REQUIREMENTS

A. In accordance with the requirements 29 CFR 1910.146, the Contractor shall provide and require the use of personal protective and lifesaving equipment for all persons working in confined spaces.

B. Head and face protection and respiratory devices shall include protective helmets conforming to the requirements of ANSI Z89.1 (most recent edition) which shall be worn by all persons at all times while in the vicinity of the work when coatings are being applied. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices meeting the requirements of ANSI Z87.1 (most recent addition) and a respirator with appropriate filter.

C. Where ventilation is used to control potential exposures to workers, as set forth in CFR 1910.94 of the OSHA Regulations for Construction, ventilation shall be adequate to reduce the concentration of the air contaminant to the degree that a hazard to the worker does not exist. Methods of ventilation shall meet the requirements set forth in ANSI Z9.2 (most recent edition).

D. Temporary ladders and scaffolding shall conform to the applicable requirements of 29 CFR 1926.1503 and 1926.457, respectively. The Contractor shall submit scaffolding plans to the Owner for review.

1.05 QUALITY ASSURANCE

A. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE, and SSPC standards and the protective coating manufacturer's recommendations.

1.06 WARRANTY

A. Applicator shall warrant all work against defects in materials and workmanship for a period of five (5) years, unless otherwise noted, from the date of final acceptance of the project. Applicator shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship which may develop during said five (5) years period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the Owner.

PART 2 - MATERIALS

2.01 100% SOLIDS EPOXY COATING

A. The coating shall be 100% solids, two-component epoxy with primer.

B. Service Conditions: Buried concrete and concrete submerged in raw wastewater and exposed to an atmosphere containing up to 800-ppm hydrogen sulfide, saturated with water vapor, and at a maximum temperature of 120°F.

C. Characteristics shall be as follows:

1. Solids by Volume: 100% per ASTM D2697

2. Compressive Strength: 16,000 psi (minimum) per ASTM D695

3. Adhesion Strength: Substrate failure per ASTM D4541.

D. Product: Tnemec Series 434 Perma-Shield H2S Epoxytel, CPP, PPG, Raven 405, Inc., or approved equal. Apply coating(s) to give a total dry coating thickness of at least 125 mils.

2.02 REPAIR MATERIALS

A. Repair materials shall be used to; fill voids, bugholes, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the engineer and protective coating applicator. Repair materials must be compatible with the specified coating and shall be applied in accordance with the manufacturer's recommendations.

B. The following products may be accepted and approved as compatible repair basecoat materials for approved topcoating for use within the specifications:

1. 100% solids, solvent-free grout specifically formulated for approved topcoating compatibility. The grout manufacturer shall provide instructions for trowel or spray application and for approved topcoating procedures.

2. Factory blended, rapid setting, high early strength, non-shrink cementitious or epoxy repair mortar that can be trowelled or pneumatically spray applied may be approved if specifically formulated to be suitable for approved topcoating. Such repair mortars should not be used unless their manufacturer provides information as to its suitability for topcoating with the approved topcoating. Project specific submittals should be provided including application, cure time and surface preparation procedures which permit optimum bond strength with the approved coating.

2.03 ABRASIVES FOR SURFACE PREPARATION OF CONCRETE

Abrasives used for preparation of concrete surfaces shall be 16 to 30 or 16 to 40 mesh non-silica sand.

PART 3 - EXECUTION

3.01 COATING SYSTEM

A. Materials including primer, intermediate, and finish coats shall be produced by the same manufacturer. Thinners, cleaners, driers, and other additives shall be as recommended by the coating manufacturer.

B. Deliver coatings to the jobsite in the original, unopened containers.

3.02 PROTECTION OF SURFACES NOT TO BE COATED

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

3.03 WEATHER CONDITIONS

A. Do not coat in the rain, wind, mist, and fog or when surface temperatures are less than 5°F above the dew point.

B. Temperature of the surface to be coated should be maintained between 70ºF and 110ºF during application or as recommend by the manufacturer. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated.

3.04 SURFACE PREPARATION

A. Remove all existing protective coatings where present unless indicated otherwise on the drawings.

B. Do not apply coating until concrete has cured at least 30 days. Finish concrete surfaces per Section 030500. In placing concrete floors, after the proper leveling of the concrete, it shall be wood float finished, followed by a single pass metal trowel finish to produce a relatively laitance-free substrate. Do not use lubricants or release agents on tools. Do not use curing compound on surfaces that are to be coated.

C. Concrete surfaces on which coating is to be applied shall be of even color, gray or gray-white. The surface shall have no pits, pockets, holes, or sharp changes of surface

elevation. The concrete surfaces shall also be free of fins, projections, bugholes, honeycombs, and loosely adhering concrete, dirt, and dust particles. Scrubbing with a stiff-bristle fiber brush shall produce no dusting or dislodging of cement or sand. Sprinkling water on the surface shall produce no water beads or standing droplets. Concrete shall be free of laitance and slick surfaces. The grain of the concrete surface to touch shall not be rougher than that of No. 10 mesh sand.

D. Repair existing deteriorated concrete per Section 030500, Finish F-4. Fill spalled areas with grout to provide a surface level with the surrounding area. Sand blast exposed rebar to remove rust prior to grout installation. Prior to grout application coat existing concrete structures with corrosion inhibitor such as Sika FerroGard or equal. Confirm with coating manufacture in writing for compatibility with Sika FerroGard.

Detergent water cleaning and hot water blasting may be necessary to remove oils, grease, or other hydrocarbon residues from the concrete. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound, clean, neutralized surface that is not excessively damaged.

E. Prior to coating new concrete, determine the presence of capillary moisture per ASTM D4263, except as modified below. Tape a 4-foot by 4-foot sheet of polyethylene plastic to the concrete surface to be coated. Allow the plastic sheet to remain in place at least 24 hours. After the specified time has elapsed, remove the plastic sheet and visually examine both the underside of the plastic sheet and the concrete surface beneath it. There shall be no indication of moisture on either surface. If moisture is indicated, allow additional curing time for the concrete and then retest. Provide one test sheet for every 500 square feet or portion thereof of concrete surface to be coated. For walls, provide one test sheet for each 10 feet of vertical rise in all elevations starting within 12 inches of the floor or base slab.

F. The area between the concrete structure and manhole ring, cover plate frame, expansion joint and any other penetration, shall be grouted with a flexible grout or gel. A termination groove "key" cut into the substrate between the bottom of the manhole frame and concrete is recommended for placement of the flexible grout or gel. The "key" shall be a minimum ¼"w x ¼"d, cut at a minimum 45º angle (60º maximum).

G. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound surface with profile to meet as a minimum ICRI CSP4 – CSP6 profile and porosity to provide a strong bond between the protective coating and the substrate. Use of a high pressure water cleaning using equipment capable of a minimum 4,000 psi at 3.5 gpm with a turbo head jet nozzle, high pressure water jetting (refer to SSPC-SP 13/NACE No.6), abrasive blasting, shotblasting, grinding, scarifying, or acid etching may be used.

H. Do not apply coatings to concrete when the concrete is outgassing. Apply coatings only when the concrete surface temperature is stable.

I. Surfaces to receive protective coating shall be dry to the touch and with no visible dampness. If required, drying may be accomplished by a minimum of 20 minutes of a

heated, forced air blower. The drying shall be to the specification dictated by the coating manufacturer and its trained applicator.

3.05 REPAIR MATERIALS APPLICATION

A. Repair materials shall meet the specifications herein. The materials shall be trowel or spray applied utilizing proper equipment on to specified surfaces. The material thickness shall be a minimum of ¼ inch thick.

B. If using approved cementitious repair materials, such shall be troweled to provide a smooth surface with an average profile equivalent to coarse 60 grit sandpaper to optimally receive the protective coating. No bug-holes or honeycomb surfaces should remain after the final trowel procedure of the repair mortar.

C. The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds should not be used unless approved for compatibility with the specified protective coating.

D. Application of the repair materials, if not performed by the coating Certified Applicator, should be inspected by the protective coating Certified Applicator to ensure proper finishing for suitability to receive the specified coating.

E. After abrasive blast is performed, all surfaces shall be inspected for remaining laitance prior to protective coating application. Any evidence of remaining contamination or laitance shall be removed by additional abrasive blast, shotblast or other approved method. If repair materials are used, refer to these specifications for surface preparation. Areas to be coated must also be prepared in accordance with these specifications after receiving a cementitious repair mortar and prior to application of the approved coating.

3.06 COATING APPLICATION

A. Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.

B. The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.

C. The protective coating material must be spray applied by a Certified Applicator of the protective coating manufacturer.

D. If necessary, subsequent topcoating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free and no later than the recoat window for the specified products per the manufacturer’s recommendations. Additional surface preparation procedures will be required if this recoat window is exceeded.

E. The entire coating shall be pinhole free.

F. See drawings for structures to which coating is to be applied

3.07 HOLIDAY (CONTINUITY) TESTING OF APPLIED COATING

After the protective coating has set hard to the touch it shall be inspected with high-voltage holiday detection equipment by the Contractor and witnessed by the District. Surface shall first be dried, an induced holiday shall then be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set in accordance with NACE SP0188 or ASTM D4787 Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates, latest revisions. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures shall follow the protective coating manufacturer's recommendations.

3.08 ADHESION TESTING

A. The adhesion tests shall be performed on each structure and for every 200 square feet of the structures. Adhesion testing shall be conducted by the Contractor after the lining or coating system has cured per manufacturer instruction and in accordance with ASTM D4541 (Steel) or ASTM 7234 (Concrete). A minimum of one 20 mm dolly shall be affixed to the lined surface of the structure at the upper section, mid-section and at the bottom, unless otherwise directed by the District.

B. Each testing location shall be identified by the District. The adhesive used to attach the dollies to the liner shall be a two part 100% solids epoxy adhesive with a tensile strength greater than the tensile strength of the lining system. Affix the 20 mm dollies to the lining surfaces and allow it to cure in accordance with the manufacturer’s instructions. The lining material and dollies shall be adequately prepared to receive the adhesive. Prior to pull test, the Contractor shall utilize a scoring device to cut through the coating until the substrate is reached. Extreme care shall be required while scoring to prevent micro cracking in the coating, since cracks may cause failures at diminished strengths. Failure due to improper dolly adhesive or scoring shall require retesting.

C. The pull tests in each area shall meet or exceed 200 psi. and shall include subbase adhered to the back of the dolly or no visual signs of coating material in the test hole. Pull tests with results between a minimum 150 psi and 200 psi shall be acceptable if more than 50% of the subsurface is adhered to the back of the dolly. A test result can be discarded, as determined by the District, if there is a valid nonstatistical reason for discarding the test results as directed by Sections 8.4 and 8.5 of ASTM D4541 and ASTM D7234. If any test fails, a minimum of three additional locations in the section of the failure shall be tested, as directed by the Engineer. If any of the retests fail, all loosely adhered or unadhered liner in the failed area, as determined by the Engineer, shall be removed and replaced at the Contractor’s expense. If a structure fails the adhesion test, one additional structure or 10% of the initial number of structures selected

for testing shall be tested at the discretion of the District. All touch-up/repair procedures shall follow the protective coating manufacturer's recommendations.

3.09 DRY-FILM THICKNESS TESTING

A. The mil thickness will be measured and confirmed with the scored and pulled test samples performed under Part 3.08.

END OF SECTION

SECTION 099752 COLD-APPLIED WAX TAPE COATING

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and application of a three-part, cold-applied wax tape coating system for buried ductile iron piping and fittings per NACE SP0375, Section 6, latest revision, except as modified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Polyethylene Sheet Encasement (AWWA C105): 099754.

B. Ductile-Iron Pipe: 402040.

PART 2 - MATERIALS

2.01 PRIMER

A. Primer shall be a blend of petrolatums, plasticizers, and corrosion inhibitors having a paste-like consistency. The primer shall comply with NACE SP0375, latest revision, and shall have the following properties:

1. Pour Point: 100°F to 110°F.

2. Flash Point: 350°F.

3. Coverage: 1 gallon per 100 square feet.

B. Primer shall be Trenton Wax Tape Primer, Denso Paste Primer, or equal.

2.02 WAX TAPE

A. Wax tape shall consist of a synthetic-fiber felt, saturated with a blend of microcrystalline wax, petrolatums, plasticizers, and corrosion inhibitors, forming a tape coating that is easily formable over irregular surfaces. The tape shall comply with NACE SP0375, latest revision, and shall have the following properties:

1. Saturant Pour Point: 115°F to 120°F.

2. Thickness: 50 to 70 mils.

3. Tape Width: 6 inches.

B. Wax tapes used for pipe soil-to-air transitions shall be UV light stable so as not to degrade in the presence of sunlight.

C. Wax tape shall be Trenton No. 1 Wax Tape, Denso "Densyl Tape," or equal.

2.03 PLASTIC WRAPPER

A. Wrapper shall be a polyvinylidene chloride plastic with three 50-gauge plies wound together as a single sheet. The wrapper shall have the following properties:

1. Color: Clear.

2. Thickness: 1.5 mils.

3. Tape Width: 6 inches.

B. Plastic wrapper shall be Trenton Poly-Ply, Denso Tape PVC Self-Adhesive, or equal.

2.04 POLYETHYLENE SHEET COATING

See Section 099754.

PART 3 - EXECUTION

3.01 WAX TAPE COATING APPLICATION

A. Surfaces shall be clean and free of dirt, grease, water, and other foreign material prior to the application of the primer and wax tape.

B. Apply primer by hand or brush to fitting surfaces. Work the primer into crevices and completely cover exposed metal surfaces.

C. Apply the wax tape immediately after the primer application. Work the tape into the crevices around fittings. Apply the wax tape by pressing and molding the tape into conformity with the surface so that it does not bridge over irregular surfaces configurations. Begin wrapping approximately 3 inches behind the area to be wrapped. If starting at a straight edge, wrap the tape spirally around the pipe while touching the end edge before starting the angle to begin the spiral. If the previous roll is headed in a downward direction, tuck the next roll under the previous roll. Stretch each roll tight as wrapping continues to avoid air bubbles.

D. Wrap the wax tape spirally around the pipe and across the fitting. Use a minimum overlap of 50% of the tape width. Apply tape to flanges, mechanical and restrained joint bolts, nuts and glands, and grooved-end couplings to 6 inches beyond each side of the item.

E. Work the tape into the crevices and contours of irregularly shaped surfaces and smooth out so that there is a continuous protective layer with no voids or spaces under the tape.

F. After application, seal the overlap seams of the tape by hand by tapering and pressing the seam, attempting to create a continuous surface. There shall be no air pockets underneath the tape. The tape shall have direct contact with the pipe surface in all locations.

G. On vertical sections of the piping, such as at pipe-to-soil transitions, wrap the pipe starting from the bottom and proceeding upward so that downward flowing water and backfill do not catch in a seam.

H. Overwrap the completed wax tape installation with the plastic wrapping material. Wrap spirally around the pipe and across the fitting. Use a minimum overlap of 55% of the tape width and apply two layers or applications of overwrap. Secure plastic wrapper to pipe with adhesive tape.

3.02 APPLICATION OF POLYETHYLENE SHEET COATING TO BURIED PIPING

Wrap completed wax tape coating system with polyethylene film per Section 099754 and secure around the adjacent pipe circumference with adhesive tape.

3.03 HANDLING AND INSTALLING WAX-TAPE COATED PIPE

A. Handle pipe in a manner to minimize damage to the coating. Equipment used for the handling of coated pipe shall be designed and constructed to avoid damaging the protective coating system. Inspect supported areas of the pipe prior to installation. Repair damaged areas before installation.

B. The pipeline trench shall be free of rocks, foreign matter, and projections that could damage the coating system.

END OF SECTION

SECTION 099754 POLYETHYLENE SHEET ENCASEMENT (AWWA C105)

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and installation of a polyethylene sheet encasement for ductile iron pipe, fittings, and valves.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Cold-Applied Wax Tape Coating: 099752.

B. Trenching, Backfilling, and Compacting: 312316.

C. General Piping Requirements: 400500.

D. Ductile-Iron Pipe: 402040.

E. PVC Distribution Pipe (AWWA C900): 402092.

1.03 SUBMITTALS

A. Submit manufacturer's catalog literature and product data sheets describing the physical, chemical, and electrical properties of the encasement material.

PART 2 - MATERIALS

2.01 POLYETHYLENE WRAP

A. The encasement shall consist of low-density polyethylene wrap of a minimum 8-mil thickness conforming to AWWA C105. Color: Black.

B. Polyethylene encasement for ductile-iron pipe shall be supplied as a flat tube meeting the dimensions of Table 1 in AWWA C105 and shall be supplied by the ductile-iron pipe manufacturer.

2.02 PLASTIC ADHESIVE TAPE

A. Tape shall consist of polyolefin backing and adhesive which bonds to common pipeline coatings including polyethylene.

B. Minimum Width: 2 inches.

C. Products: Canusa Wrapid Tape, Tapecoat H35, Polyken 934, AA Thread Seal Tape, Inc., or equal.

PART 3 - EXECUTION

3.01 APPLYING SHEET COATING TO BURIED PIPING AND FITTINGS

A. Apply wrapping per AWWA C105 as modified herein:

1. Apply a single wrapping.

2. Install the polyethylene to completely encase the pipe and fittings to provide a watertight corrosion barrier. Continuously secure overlaps and ends of sheet and tube with polyethylene tape. Make circumferential seams with two complete wraps, with no exposed edges. Tape longitudinal seams and longitudinal overlaps, extending tape beyond and beneath circumferential seams.

3. Wrap bell-spigot interfaces, restrained joint components, and other irregular surfaces with wax tape per Specification 099752 prior to placing polyethylene encasement.

4. Minimize voids beneath polyethylene. Place circumferential or spiral wraps of polyethylene tape at 2-foot intervals along the barrel of the pipe to minimize the space between the pipe and the polyethylene.

5. Overlap adjoining polyethylene tube coatings a minimum of 1 foot and wrap prior to placing concrete anchors, collars, supports, or thrust blocks. Hand wrap the polyethylene sheet, apply two complete wraps with no exposed edges to provide a watertight corrosion barrier, and secure in place with 2-inch-wide plastic adhesive tape.

3.02 APPLYING SHEET COATING TO BURIED VALVES

A. Wrap flanges and other irregular surfaces with wax tape or moldable sealant. Press tightly into place leaving no voids underneath and a smooth surface under coating for polyethylene sheet.

B. Wrap with a flat sheet of polyethylene. Place the sheet under the valve and the flanges or joints with the connecting pipe and fold in half. Extend the sheet to the valve stem and secure the sheet in place with 2-inch-wide plastic adhesive tape. Apply a second layer and secure with tape. Make two complete wraps, with no exposed edges, to provide a watertight corrosion barrier. Secure the sheets with tape around the valve stem below the operating nut and around the barrel of the connecting pipe to prevent the entrance of water and soil. Place concrete anchor and support blocks after the wrap has been installed.

3.03 APPLYING SHEET COATING TO BURIED FLEXIBLE PIPE COUPLINGS

A. Wrap irregular surfaces with wax tape per Specification 099752. Press tightly into place leaving no voids underneath and a smooth surface under coating for polyethylene sheet.

B. Apply two layers or wraps around the coupling. Overlap the adjoining pipe or fitting a minimum of 1 foot and secure in place with tape. Provide sufficient slack in polyethylene to allow backfill to be placed around fitting without tearing polyethylene. Apply tape around the entire circumference of the overlapped section on the adjoining pipe or fitting in two complete wraps, with no exposed edges, to provide a watertight corrosion barrier.

3.04 REPAIR OF POLYETHYLENE MATERIAL

Repair polyethylene material that is damaged during installation. Use polyethylene sheet, place over damaged or torn area, and secure in place with 2-inch-wide plastic adhesive tape.

3.05 APPLYING SHEET COATING TO EXISTING BURIED PIPING

When connecting polyethylene-encased pipe or fittings to existing pipe, expose existing pipe, thoroughly clean the surface, and securely tape the end of the polyethylene to the existing as specified above. When the existing pipe is polyethylene encased, wrap new polyethylene encasement over the existing, with overlap of at least 2 feet. Tape securely as specified above.

3.06 BACKFILL FOR POLYETHYLENE-WRAPPED PIPE, VALVES, AND FITTINGS

Place sand backfill within 1 foot of the pipe, valves, and fittings wrapped with polyethylene encasement per Section 312316.

END OF SECTION

SECTION 312300 EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials, testing, and installation of earthwork for excavations and fills for structures and sites.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Protecting Existing Underground Utilities: 020120.

B. Concrete: 030500.

C. Trenching, Backfilling, and Compacting: 312316.

1.03 SUBMITTALS

A. Provide reports from a testing laboratory verifying material used in this section meets these specifications.

B. Submit a report from a testing laboratory verifying that the material contains less than 0.25% asbestos by weight or volume.

1.04 COMPACTION

A. Compaction tests will be made by the testing laboratory designated by the Owner's Engineer. The number of tests, and their location and depth, shall be determined by the Owner's Engineer after consulting with the District. Relative compaction specified herein shall be a percentage of the maximum dry density as determined by ASTM D1557 (5 layer only). Compaction tests shall be taken in accordance with D1556 or as approved by the District.

B. Backfill of excavations, above the pipe zone, within the rights-of-way of County streets and State highways shall be performed in accordance with the requirements and to the satisfaction of the County Public Works Department or Caltrans. Where a conflict exists between the District's requirements and those of either the County or the State, the more stringent requirement shall apply.

C. The costs of compaction testing shall be borne by the Owner.

PART 2 - MATERIALS

2.01 STRUCTURAL FILL

Structural fill is material that is to be placed beneath structures. Material shall be excavated material that is free from organic matter, roots, debris, and rocks larger than 3 inches in the greatest dimension.

2.02 STRUCTURAL BACKFILL

A. Structural backfill is material that is to be placed adjacent to and around structures.

B. Excavated onsite material may be used for structural backfill provided it conforms to the above specifications for structural fill material.

2.03 FILL

Fill material is material that is to be placed in locations that are not to be constructed as structural fill or structural backfill. Fill material shall be native material.

2.04 SAND (INCLUDING IMPORTED SAND FOR PIPE ZONE AND PIPE BASE IN PIPE TRENCHES)

A. Granular material free from clay balls, organic matter, and other deleterious substances and conforming to the following gradations:

Sieve Size	Percent Passing By Weight
3/8 inch	100
No. 4	75 to 100
No. 30	12 to 50
No. 100	5 to 20
No. 200	0 to 10

B. Sand shall have a minimum sand equivalent of 30 per ASTM D2419.

2.05 SAND-CEMENT SLURRY BACKFILL

Sand-cement slurry backfill shall consist of two sack (188 pounds) of Type I or II portland cement added per cubic yard of imported sand and sufficient water for workability.

2.06 WATER FOR COMPACTION

A. District water to be used on projects. Provide temporary piping and valves to convey water from hydrant meter to the point of use. Aggregate Base

Aggregate base shall be imported material conforming to Section 26-1.02B of the California Department of Transportation Standard Specifications for Class 2 aggregate base.

2.07 CRUSHED ROCK

Crushed rock, shall consist of hard, durable particles of stone, crushed to the required gradation below per ASTM C136, washed, and shall be free from organic matter, lumps of clay, and other deleterious matter size:

Sieve Size	Percent Passing by Weight
1-1/2 inch	100
1 inch	86 to 100
No. 4	0 to 16
No. 8	0 to 6

2.08 FILTER FABRIC

A. Filter fabric shall conform to Section 96-1.02B of the California Department of Transportation Standard Specifications.

B. Filter fabric for encapsulating crushed rock shall be MIRAFI 140N, manufactured by Mirafi Inc. or equal.

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

A. The Contractor shall perform all required clearing and grubbing and the disposal of all trees, brush, roots and other perishable and objectionable materials.

B. The ground surface of all areas where material is to be excavated or where embankments, stockpiles, fills or structures are to be placed, shall be cleared of all vegetation and rubbish, and all brush, roots, and tree roots shall be grubbed and removed from such areas. All cleared and grubbed areas shall be maintained free from vegetable growth.

C. Organic material from clearing and grubbing operations will not be incorporated in pipe backfill

3.02 DEWATERING

A. There shall be provided and maintained at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the work. Dewatering shall be

accomplished by methods which will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Said methods may include well points, sump pumps, suitable rock or gravel placed below the required bedding for drainage and pumping purposes, temporary pipelines and other means, all subject to the approval of the District.

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. No concrete footings or floors shall be laid in water nor shall water be allowed to rise over them until the concrete or mortar has set at least eight hours. Water shall not be allowed to rise unequally against walls for a period of 28 days.

C. The water from the work shall be disposed of in a suitable manner without damage to adjacent property. No water shall be drained into work built or under construction without prior consent of the District. Water shall be disposed of in such a manner as not to be a menace to the public health.

3.03 EXCAVATION

A. Excavations shall have sloping, sheeting, shoring, and bracing conforming with 29 CFR 1926 Subpart P-Excavations, and CAL/OSHA requirements.

B. Excavation is unclassified. Perform excavation regardless of the type, nature, or condition of the material encountered to accomplish the construction. Do not operate excavation equipment within 5 feet of existing structures or newly completed construction. Excavate with hand tools in these areas.

C. After the required excavation has been completed, the Engineer of Record or Project Geotechnical Engineer shall observe the exposed subgrade to determine the need for any additional excavation. It is the intent that additional excavation is to be conducted in all areas within the influence of the structure where unacceptable subgrade materials exist at the exposed subgrade. Overexcavation shall include the removal of all such unacceptable material that exists directly beneath the structure or within a zone outside and below the structure defined by a line sloping at 1-horizontal to 1-vertical from 1 foot outside the edge of the footing. Refill the overexcavated areas with structural backfill material.

3.04 LIMITS OF FOUNDATION EXCAVATION

Excavate to the depths and widths needed to accomplish the construction. Allow for forms, working space, structural backfill, and site grading. Do not excavate for footings, slabs, or conduits below elevations indicated unless unacceptable material is encountered and overexcavation is authorized by the Owner. Backfill overexcavations with compacted structural backfill material.

3.05 PREPARATION OF FOUNDATION SUBGRADE

A. The finished subgrade shall be within a tolerance of ±0.08 feet of the grade and cross section indicated, shall be smooth and free from irregularities, and shall be at the specified relative compaction. The subgrade shall extend over the full width and extend 1 foot beyond the edge of the foundations.

B. Remove soft material encountered and replace with structural backfill. Fill holes and depressions to the required line, grade, and cross sections with structural backfill.

3.06 PREPARATION FOR PLACING FILL OR BACKFILL

A. After excavation of existing material or removal of unacceptable material at the exposed subgrade, scarify the final subgrade surface to a depth of 12 inches and compact to 90% relative compaction.

B. Remove foreign materials and trash from the excavation before placing any fill material. Obtain the specified compressive strength and finish of concrete work per Section 030500 before backfilling.

3.07 PLACING AND COMPACTING FILL AND STRUCTURAL FILL

A. Place in maximum 8-inch lifts and compact each lift to 90% relative compaction unless otherwise directed by the Engineer of Record or District.

B. Where fill is to be constructed on slopes steeper than 5:1, bench the fill into competent undisturbed materials as the fill progresses up the slope. Benches shall be sloped at least 2% into the slope and shall be of a width at least equal to the height of fill lift.

3.08 PLACING AND COMPACTING STRUCTURAL BACKFILL

A. Place structural backfill material around piping, structures, channels, and other areas, including authorized overexcavation areas, to the lines and grades shown or specified. Do not exceed loose lifts of 8 inches.

B. Compact each lift to 90% relative compaction, unless otherwise directed by the Owners Engineer or District.

C. Do not operate earthmoving equipment within 5 feet of walls of concrete structures. Place and compact backfill adjacent to concrete walls with hand-operated tampers or other equipment that will not damage the structure.

3.09 MOISTURE CONTROL

During the compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of the material. Maintain uniform moisture content throughout the lift. Insofar as practicable, add water to the material at the site of excavation. Supplement by sprinkling the material. At the time of compaction, the water

content of the material shall be at optimum water content or within 2 percentage points above optimum. Aerate material containing excessive moisture by blading, discing, or harrowing to hasten the drying process.

3.10 SITE GRADING

Perform earthwork to the lines and grades shown in the drawings. Shape, trim, and finish slopes of channels to conform to the lines, grades, and cross sections as shown. Remove exposed roots and loose rocks exceeding 3 inches in diameter. Round tops of banks to circular curves of not less than a 6-foot radius. Neatly and smoothly trim rounded surfaces. Do not overexcavate and backfill to achieve the proper grade.

END OF SECTION

SECTION 312316 TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials, testing, and installation for pipeline trench excavation, backfilling, and compacting.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Protecting Existing Underground Utilities: 020120.

B. Concrete: 030500.

C. Earthwork: 312300.

D. Pressure Testing of Piping: 400515.

E. Piping Identification: 400775.

1.03 SUBMITTALS

A. Submit report from a testing laboratory verifying that material contains less than 0.25% asbestos by weight or volume.

B. Submit report from a testing laboratory verifying that the material conforms to the specified gradations or characteristics for granular material, imported sand, rock refill for foundation stabilization, and water.

C. Submit method(s) of compaction including removal sequence of shoring where used.

1.04 TESTING FOR COMPACTION

A. Compaction tests will be made by the testing laboratory designated by the Owner's Engineer. The number of tests, and their location and depth, shall be determined by the Owner's Engineer after consulting with the District. Relative compaction specified herein shall be a percentage of the maximum dry density as determined by ASTM D1557 (5 layer only). Compaction tests shall be taken in accordance with D1556 or as approved by the District.

B. Backfill of excavations, above the pipe zone, within the rights-of-way of County streets and State highways shall be performed in accordance with the requirements and to the satisfaction of the County Public Works Department or Caltrans. Where a conflict exists between the District's requirements and those of either the County or the State, the more stringent requirement shall apply

C. The costs of compaction testing shall be borne by the owner.

1.05 STREET ZONE

The street zone is the top 30 inches of the trench immediately below the pavement zone in paved areas. Backfill requirements within the Street Zone shall be as required by County of San Luis Obispo Public Works or Caltrans.

1.06 TRENCH ZONE

The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the street zone in paved areas or to the existing surface in unpaved areas. If the resulting trench zone is less than 24 inches thick, the street zone shall extend to the top of the pipe zone and there shall be no separate trench zone.

1.07 PIPE ZONE

The pipe zone shall include the full width of trench from the bottom of the pipe or conduit to a horizontal level above the top of the pipe, as specified below. Where multiple pipes or conduits are placed in the same trench, the pipe zone shall extend from the bottom of the lowest pipe to a horizontal level above the top of the highest or topmost pipe. Thickness of pipe zone above the highest top of pipe shall be 12-inches.

1.08 PIPE BASE OR BEDDING

The pipe base or bedding shall be defined as a layer of material immediately below the bottom of the pipe or conduit and extending over the full trench width in which the pipe is bedded. Thickness of pipe base shall be 6-inches.

PART 2 - MATERIALS

2.01 TRENCH ZONE - NATIVE EARTH BACKFILL

A. Native earth backfill used above the pipe zone shall be excavated fine-grained materials free from roots, debris, rocks larger than 3 inches, asbestos, organic matter, clods, clay balls, broken pavement, and other deleterious materials.

B. Backfill materials that are obtained from trench excavated materials to the extent such material is available shall be either screened directly into the trench or screened during the trenching operation. If screened during trenching, the material shall be maintained free of unscreened material during the handling and backfilling process. Hand selecting of rocks from earth as it is placed into the trench will not be permitted in lieu of the specified screening. Backfill shall be moisture conditioned to within approximately 2% of the optimum moisture content prior to being placed in trench.

2.02 PIPE ZONE AND PIPE BASE - IMPORTED SAND

A. See Section 312300.

2.03 ROCK REFILL FOR FOUNDATION STABILIZATION

A. Rock refill shall be crushed rock as specified in Section 312300

2.04 CONCRETE FOR THRUST BLOCKS

A. Concrete for thrust blocks shall be Class A per Section 030500, unless otherwise shown in the drawings.

B. See the Standard No. W-4 for thrust block sizes.

C. Dimensions of thrust blocks for pipes smaller than 6 inches shall be the same as the dimensions shown for 6-inch pipe, unless specific dimensions are shown in the drawings.

2.05 WATER FOR COMPACTION

A. See Section 312300.

2.06 UNDERGROUND PLASTIC WARNING TAPE

A. See Section 400775.

2.07 TRACER WIRE

A. See Section 400775.

PART 3 - EXECUTION

3.01 SLOPING, SHEETING, SHORING, AND BRACING OF TRENCHES

Trenches shall have sloping, sheeting, shoring, and bracing conforming with 29 CFR 1926, Subpart P - Excavations, CAL/OSHA requirements.

3.02 TRENCH EXCAVATION

A. The overall trench width shall not be more than 16-inches nor less than 12-inches wider than the largest outside diameter of the pipe to be laid therein, measured at a point 12-inches above the top of the pipe. Excavating and retrenching shall be true to line so that a clear space of not more than 8-inches or less than 6-inches in width is provided on each side of the largest outside diameter of the pipe in place. For the purpose of this article, the largest outside diameter shall be the outside diameter of the bell, on bell and spigot pipe, and outside diameter of coupling for sleeve coupling pipe.

B. Where the trench width, measured at a point 6-inches above the top of the bell or sleeve of the pipe is wider than the maximum set forth above, the trench area around the pipe shall be reworked to restore a trench condition and provide load factor acceptable to the District. The reworking may result in one or more of the following operations, subject to the approval of the District: (1) Shaping the bottom of the trench to fit the pipe; (2) Placing sand around the pipe and to a point 6-inches above the top of the pipe; (3) Lowering the grade of the pipe until the trench condition can be met; (4) Installing a concrete cradle for the pipe; and (5) Providing concrete encasement for the pipe to a point 3-inches above the top of the pipe.

3.03 TRENCH EXCAVATION IN BACKFILL AND EMBANKMENT AREAS

A. Construct and compact the embankment to an elevation of 1-foot minimum over the top of the largest pipe or conduit to be installed.

B. Excavate trench in the compacted backfill or embankment.

3.04 LENGTH OF OPEN TRENCH

Trench excavation shall proceed in advance of pipe installation only so far as can be backfilled the same day. Except by special permission of the District, the maximum length of open trench shall not exceed 600 feet in the aggregate at any one location including excavation, construction, pipe laying and backfilling. In addition, at locations where access is limited and unnecessary rerouting of traffic may be required, the District may reduce the maximum length of open trench permitted.

3.05 DEWATERING

Provide and maintain means and devices to remove and dispose of water entering the trench excavation during the time the trench is being prepared for the pipe laying, during the laying of the pipe, and until the backfill at the pipe zone has been completed. These provisions shall apply during both working and non-working hours, including lunchtime, evenings, weekends, and holidays. Dispose of the water in a manner to prevent damage to adjacent property and in accordance with regulatory agency requirements. Do not drain trench water through the pipeline under construction.

3.06 FOUNDATION STABILIZATION

A. When excavation is in soft, unstable or excessively wet material which is unsuitable as a foundation for the pipe, such material shall be removed below the normal trench bottom to a minimum depth of one (1) foot, or as directed by the District and replaced with crushed rock and fully encased in filter fabric conforming to Section 96-1.02B of the California Department of Transportation Standard Specifications to provide a suitable foundation. The bedding material shall then be completed to the underside of the pipe using material that meets the requirements of these specifications.

3.07 INSTALLING BURIED PIPING

A. The trench bottom shall be graded to provide a smooth, firm foundation at every point throughout the length of the pipe to provide a suitable bedding for the pipe

B. The trench shall be excavated to the established grade line of the outside bottom of the pipe. The bottom of the trench shall then be scarified to a minimum depth of 6 inches below the bottom of the pipe and uniformly graded to produce a firm but yielding subgrade which will provide uniform support of the pipe along the full length of each section. The bedding material shall be prepared throughout a minimum depth of 6 inches shall meet the requirements of these specifications.

C. If it becomes necessary to excavate below the established grade line in order to remove boulders or other interfering objects, the voids shall be filled and densified with material meeting these specifications for bedding material.

D. Where excavation is in rock, hardpan, shale, or other similar hard and unyielding materials, the trench shall be excavated to a depth at least 6-inches below the established grade line of the outside bottom of the pipe and filled with material meeting these specifications for bedding material. The subgrade shall then be completed as previously stated. The material so placed shall be compacted to 90% relative compaction.

E. If the trench passes over a previous excavation, such as a sewer, the trench bottom shall be sufficiently compacted to provide support equal to that of the native soil or conform to other regulatory requirements in a manner that will prevent damage to the existing installation.

F. Inspect each pipe and fitting before lowering the buried pipe or fitting into the trench. Inspect the interior and exterior protective coatings. Patch damaged areas in the field with material recommended by the protective coating manufacturer and the respective project specification. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after installation.

G. Handle pipe in such a manner as to avoid damage to the pipe. Do not drop or dump pipe into trenches under any circumstances.

H. Compact each lift to the relative compaction specified herein.

I. Push the backfill material carefully onto the backfill previously placed in the pipe zone. Do not permit free-fall of the material until at least 2 feet of cover is provided over the top of the pipe. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipe. Do not operate heavy equipment or a sheepsfoot wheel mounted on a backhoe over the pipe until at least 3 feet or one-half of the internal diameter, whichever is greater, of backfill has been placed and compacted over the pipe.

J. When the pipe laying is not in progress, including the noon hours, close the open ends of pipe. Do not allow trench water, animals, or foreign material to enter the pipe.

K. Keep the trench dry until the pipe laying and jointing are completed.

3.08 BACKFILL COMPACTION

A. Unless otherwise shown in the drawings or otherwise described in the specifications for the particular type of pipe installed, relative compaction in pipe trenches shall be as follows:

1. Pipe Zone: 90% relative compaction.

2. Backfill in Trench Zone: 95% relative compaction. Compact backfill within embankment above the pipe zone to the same relative compaction as the adjacent embankment as specified in Section 312300.

3. Backfill in Street Zone in Paved Areas: Per San Luis Obispo County Public Works or Caltrans.

B. Compact trench backfill to the specified relative compaction. Compact by using mechanical compaction or hand tamping. Do not use high-impact hammer-type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.

C. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.

3.09 MATERIAL REPLACEMENT

Remove and replace any trenching and backfilling material that does not meet the specifications.

3.10 PLACING SAND-CEMENT SLURRY BACKFILL

Place sand-cement slurry backfill in a uniform manner that will prevent voids in or segregation of the material. Remove foreign material that falls into the excavation or trench. Do not commence backfilling over or place any material over the slurry cement backfill until at least four hours after placing the sand-cement slurry.

END OF SECTION

SECTION 317216 JACKED STEEL CASING

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and installation for tunneling by jacked steel casing method for highway crossings and other shallow depth tunnels.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Trenching, Backfilling, and Compacting: 312316.

1.03 SUBMITTALS

A. Submit diameter, thickness, and class of steel casing.

B. Submit materials list showing material of casing with ASTM reference and grade. Submit manufacturer's certification of compliance with referenced standards, e.g., ASTM A36, A139, and A283 and AWWA C200.

C. Submit certificates of welding consumables used for shop and field welding.

D. Submit welding procedure specifications (WPS) and procedure qualification records (PQR) for each welding process and welder qualification records (WQR) for each welder and welding operator. Submit bend and tensile test coupons concurrently with welder qualification and procedure qualification records. Welding procedures shall be required for welds for pipe cylinders, casing joint welds, and grout coupling connections.

E. Submit drawings showing the location of approach trench, jacking pit, tunnel and receiving pit, and joint type for both casing and carrier pipe. Include the details of all grout couplings and other attachments and appurtenances to the casing.

F. Submit schedule and method of tunnel construction. Include approach trench backfill and pipe installation and backfill.

G. Submit an engineered shoring plan for the bore-pit and receiving-pit. Shoring submittals shall be stamped by a California-licensed Civil or Structural Engineer.

1.04 CODES AND STANDARDS AND TUNNEL CLASSIFICATION

The Owner shall obtain from the California Division of Industrial Safety a classification for each bore if required. It shall be the Contractor's responsibility to post the classification at the site and see that the work is done in conformance with the state requirements. It shall also be the Contractor's responsibility to call the required safety meeting with representatives from the State Division of Industrial Safety prior to beginning of construction of each bore.

1.05 SCHEDULING

If the pipeline is not installed within the casing as a continuous operation following completion of jacking, then bulkhead the portals and backfill the approach trenches and later reopen them for pipe installation.

1.06 JURISDICTION

A. Comply with the applicable regulations of 29 CFR 1926, Subpart S, "Underground Construction, Caisson, Cofferdams, and Compressed Air" as amended.

B. For casing pipe crossing under roadways, railroads, or other installations comply with regulations and permit requirements of said authority.

C. State highway casing installations shall be as specified in the Caltrans Encroachment Permits Manual.

1.07 INSPECTION

Perform work in the presence of the District unless the District has granted prior approval to perform such work in its absence.

PART 2 - MATERIALS

2.01 STEEL CASING

A. Fabrication of casing shall be in accordance with AWWA C200, as modified below. Casing material shall conform to ASTM A283, Grade C; ASTM A139, Grade B; or ASTM A36. Obtain minimum diameter and wall thickness from drawings. The Contractor may select a greater thickness and diameter to accommodate the method of work, loadings involved, the site and possible interferences, but at no additional cost to Owner. Provide 2-inch grout connections in the form of threaded couplings welded to the steel shell regularly spaced at 4 feet on centers at the top and bottom of the casing.

B. Join casing sections by butt-welding in the field. Prepare ends of casings for welding in accordance with the submitted welding procedure.

2.02 CASING SPACERS

Casing spacers shall be bolt-on style with a shell made in two sections of Type 304 stainless steel. Connecting flanges shall be ribbed. The shell shall be lined with a PVC liner 0.090 inch thick with 85-90 durometer hardness. Nuts and bolts shall be stainless steel. Construct runners of ultra-high molecular weight polymer. Support runners by risers made of Type 304 stainless steel. Weld the supports to the shell and passivate the welds. Casing spacers shall be Cascade Waterworks Mfg. Co., CCI Pipeline Systems, APS, or equal.

2.03 CASING SEALS

Casing seals shall be 1/8-inch-thick synthetic rubber, designed to fit snugly around pipe and casing. Casing seals shall be one piece with no field seams. Bands and hardware for attachment to pipe and casing outside diameter shall be stainless steel. Products: ESC by CCI Pipeline Systems or equal.

2.04 GROUT

Lean grout shall consist of one-part portland cement, four parts sand, and sufficient water to produce a workable mixture. Sand for grout to be placed outside the casing shall be of such fineness that 100% will pass a No. 8 sieve and not less than 35% will pass a No. 50 sieve.

2.05 SAND BACKFILL

A. Sand shall be dry (water content not more than 6% or less than 3%), free from organic matter, and containing not over 5% by weight of deleterious substances. It shall be hard, dense, durable, clean, sharp, and graded evenly from fine to coarse as follows:

Sieve Size	**Percent By Weight**		
3/8 inch	100		
No. 4	97	to	100
No. 8	79	to	85
No. 16	60	to	78
No. 30	36	to	47
No. 50	10	to	20
No. 100	0	to	4

B. Sand shall have a fineness modulus per ASTM C136 of between 2.70 and 3.30, inclusive.

2.06 BENTONITE

Bentonite shall be a commercially processed powdered bentonite, Wyoming type, such as Big Horn Brand, Black Hills Bentonite or equal.

PART 3 - EXECUTION

3.01 FABRICATION, ASSEMBLY, AND ERECTION

A. Beveled ends for butt-welding shall conform to ASME B16.25. Remove slag by chipping or grinding. Surfaces shall be clean of paint, oil, rust, scale, slag, and other

material detrimental to welding. When welding the reverse side, chip out slag before welding.

B. The minimum number of passes for welded joints shall be as follows:

Steel Cylinder Thickness (inch)	Minimum Number of Passes for Welds
Less than 0.1875	1
0.1875 through 0.25	2
Greater than 0.25	3

C. Welds shall be full penetration, except that partial penetration butt-welds, where used, shall develop the full compressive and tensile strength of the mating plates.

D. Use the shielded metal arc welding (SMAW) submerged arc welding (SAW), flux-cored arc welding (FCAW), or gas-metal arc welding (GMAW) process for shop welding. Use the SMAW process for field welding.

E. Prepare edges of plate to be butt-welded. Butt-weld all joints.

F. Clean each layer of deposited weld metal prior to depositing the next layer of weld metal, including the final pass, by a power-driven wire brush.

G. Welding electrodes shall comply with AWS A5.1.

3.02 SECTIONAL SHIELD OR JACKING HEAD

Fit a sectional shield or steel jacking head to the leading section of the casing to extend around the outer surface of the upper two-thirds of the casing and project at least 18 inches beyond the driving end of the casing but do not protrude more than 1/2 inch outside of the outer casing surface. Anchor the head to prevent wobble or alignment variation during the jacking operation. To avoid causing a collapse of ground outside the casing, carry out excavation entirely within the jacking head and not in advance of the head.

3.03 JACKING PIT

A. Place in the approach trench or jacking pit and firmly bed on the required line and grade guide rails, structural steel, or concrete cradle of sufficient length to provide accurate control of jacking alignment. Provide space to permit the insertion of the lengths of casing to be jacked. Anchor the guide rails and structural steel sections to ensure action of the jacks in line with the axis of the casing. Interpose between the jacks and the end of the casing a bearing block consisting of a timber or structural steel framework constructed to provide uniform end bearing over the perimeter of the casing and distribute the jacking pressure evenly.

B. If utilities are required to be supported or relocated for construction of the jacking pits, include such cost in the bid.

3.04 CONTROL OF ALIGNMENT AND GRADE

Application of jacking pressure and excavation of material ahead of the casing as it advances shall be controlled to prevent the casing from becoming earthbound or deviating from the required line and grade shown on the Plans. 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 and boring operation. A maximum cumulative deviation shall not exceed 0.5 feet overall. Do not encroach upon the minimum annular space detailed. Contractor shall check line and grade at intervals not exceeding 40-feet to ensure compliance with plans.

3.05 EXTERIOR GROUTING

Immediately after completion of the jacking or boring operation, inject lean grout through the grout connections in such a manner as to completely fill all voids outside the casing pipe resulting from the jacking or boring operation. Control grout pressure to avoid deformation of the casing, avoid damaging or plugging of adjacent subdrains, and avoid movement of the surrounding ground. After completion of grouting, close the grout connections with malleable iron or cast-iron threaded plugs.

3.06 SAND BACKFILL

After placement of the pipe within the casing, construct a permanent bulkhead at each end of the casing or use casing seals and fill the intervening annular space between the pipe and the casing with sand, placed by a pneumatic gun. Refer to the drawings for locations of casings to be filled with sand.

3.07 CLOSING THE JACKING PIT

Seal the end of the casing with casing seals. After jacking equipment and muck from the tunnel have been removed from the approach trench or jacking pit, prepare the bottom of the jacking pit as a pipe foundation. Remove loose and disturbed material below pipe grade to undisturbed earth and recompact the material in accordance with Section 312316.

END OF SECTION

SECTION 330130 LEAKAGE AND INFILTRATION TESTING

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes testing of gravity sewers and manholes not intended to be pressurized in excess of 5 psi or 12 feet head of water. Leakage test is by internal air pressure or water. Infiltration test is by measurement of rate of flow of water. It is the intent of these specifications that the completed sewer pipes of all types, along with manholes and other appurtenances, shall be watertight.

1.02 RELATED WORK SPECIFIED ELSEWHERE

Sanitary Sewer System Television Inspection: 330131.

PART 2 - MATERIALS

2.01 TEST PLUGS

Inflatable and expandable type, braced to contain 5 psi over the pipe cross-section area.

2.02 PRESSURE RELIEF VALVE

Set to limit the internal pipe test pressure to 5 psi.

PART 3 - EXECUTION

3.01 GENERAL

A. Following the permanent placement and densification of backfill and prior to the placing of permanent pavement, each section of sewer between two successive manholes shall be tested for leakage and/or, at the option of the District, for infiltration. Where groundwater is encountered, the infiltration test shall be made.

3.02 SELECTION OF ALTERNATE TEST CRITERIA

A. When more than one pipe size is included in a test section, determine the test time by the criteria of ASTM F1417 for plastic pipe.

3.03 PREPARATION OF THE PIPELINE

A. Prior to testing, flush and clean the pipeline to wet the pipe surface and clean out debris.

B. Plug pipe outlets, including stoppers in laterals, to resist the leakage test pressure.

3.04 LEAKAGE TEST

A. Test for leakage or for infiltration by means of an air test or a water test. Test each section of pipe between manholes, along with the manholes. Use the air test where the difference in elevation between the invert of the upper structure and the invert of the lower structure is more than 10 feet.

B. Test each section of pipe subsequent to the last backfill compacting operation.

3.05 WATER TEST

A. Test each section of pipe between two successive structures by closing the lower end of the pipe to be tested and the inlet pipe of the upper structure with plugs or stoppers. Fill the pipe and structure with water to a point 4 feet above the invert of the open pipe in the upper structure or to a height of 10 feet above the invert of the sewer in the lower structure, whichever gives the least hydrostatic pressure on the lower structure.

B. The total leakage shall be the decrease in volume of water in the upper structure. The leakage shall not exceed 0.025 gpm per inch of nominal diameter of pipe per 1,000 feet of pipe being tested. Do not use the length of lateral connections in computing the length of pipe being tested.

C. If the leakage is greater than allowed, overhaul the pipe and, if necessary, replace and re-lay until the joints and pipe comply with this test. Complete tests before trench is paved.

3.06 AIR TEST

A. Conduct air tests per the following standards:

Pipe Material	Specification Section	ASTM Specification
PVC	333112	F1417, Table 1

B. Test each section of pipe between two successive manholes by plugging pipe outlets with test plugs. Add air slowly until the internal pressure is raised to 4.0 psig. The compressor used to add air to the pipe shall have a blowoff valve set at 5 psig so that the internal pressure in the pipe never exceeds 5 psig. Maintain the internal pressure of 4 psig for at least two minutes to allow the air temperature to stabilize, then disconnect the air supply and allow the pressure to decrease to 3.5 psig.

C. The time required for the internal air pressure to drop from 3.5 psig to 3.0 psig shall be measured and the results compared with the values calculated using the following formula:

T = KL, Where T = time in seconds,

L = distance between successive manholes in feet, and

K = appropriate value from the following table:

Pipe Diameter (inches)	Minimum Time (min:sec)	Length for Minimum Time	K Value
8	3:47	298	0.760
10	4:43	239	1.19
12	5:40	199	1.71
14	6:27	180	2.15
16	7:29	160	2.81
18	8:30	133	3.85
20	9:59	100	5.99
24	10:34	100	6.34

D. If the pressure drop from 3.5 psig to 3.0 psig occurs in less time than the calculated values, the pipe shall be overhauled and, if necessary, replaced, and re-laid until the joints and pipe shall hold satisfactorily under this test.

E. Guard against the sudden expulsion of a poorly installed plug or a plug that is partially deflated.

3.07 TEST FOR INFILTRATION

A. If, in the construction of a section of the sewer between structures, groundwater is encountered, the end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water and pumping of groundwater shall be discontinued for at least three days after which the section shall be tested for infiltration. The infiltration shall not exceed 1.6 gallons per 100 feet per 4-hour test per inch diameter of main line sewer being tested and does not include the length of house laterals entering that section. Where any infiltration in excess of this amount is discovered before completion and acceptance of the sewer, the sewer shall be immediately uncovered and the amount of infiltration reduced to a quantity within the specified amount of infiltration, before the sewer is accepted, at the expense of the Contractor. Where any individual infiltration leaks are observed before completion and acceptance of the sewer, the sewer shall be immediately uncovered and the individual infiltration leaks shall be stopped, before the sewer is accepted, at the expense of the Contractor. The Contractor shall furnish all labor and materials for making the tests required at his own expense. All tests must be completed before street or trench is resurfaced, unless otherwise determined by the District.

3.08 MANHOLE TEST

A. Watertightness of manholes may be tested in connection with hydrostatic tests of the pipeline or at the time the manhole is completed and backfilled. Repair any leakage as a result of testing.

B. Fill the manhole with water to an elevation 1 foot below the bottom of the cone section with a maximum water depth of 20 feet. Where the manholes are tested with the pipeline, no additional leakage will be allowed above that for the main line pipe.

C. Where a separate manhole leakage test is performed or requested by the Owner's Representative, plug inlets and outlets with stoppers or plugs and fill the manhole to the limits indicated above. The maximum allowable drop in the water surface shall be 1/2 inch for each 15-minute period of testing.

D. As an alternative to the hydrostatic testing, manholes may be tested per the vacuum method per ASTM C1244.

1. Test each manhole immediately after assembling the precast manhole segments together and prior to backfilling. If the manhole fails this initial test, make repairs to any cracks or other sources of leaks. Cracks longer than 2 inches shall be cause for rejection of the entire manhole segment or casting, and no patching shall be allowed in such segments.

2. Plug lift holes with grout. Do not place grout in the circumferential manhole joints containing the butyl rubber sealing compound before testing. Plug pipes entering the manholes, and securely brace the plugs from being drawn into the manhole.

3. Test each manhole a second time for final acceptance after backfilling in order to assure that the backfill operation did not damage the manhole. Retest any manholes that were damaged or moved during final grading and paving.

3.09 CORRECTION OF OBSERVED LEAKS

Even though the infiltration is less than the maximum acceptable, stop any individual leaks that may be observed.

3.10 INSPECTION FOR DAMAGED OR DEFECTIVE PIPE IN PLACE

A. Prior to the acceptance of any sewer line by the District, the Contractor shall clean all lines with a Wayne-type sewer cleaning ball. Any stoppage, sand, dirt or foreign matter shall be removed from the lines. All cleaning and testing of sewer lines shall take place after all construction work is completed, up to but not including, the paving

B. Following the permanent placement and densification of backfill and prior to the placing of permanent pavement, all main line pipe shall be cleaned to the District‘s satisfaction and then mandrel tested to measure for obstructions (deflections, joint offsets, and lateral pipe intrusions). A rigid mandrel shall be pulled through the pipe by hand. The mandrel

shall have a cross section equivalent to a circle having a diameter of at least 95% of the average inside diameter for PVC pipe. The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe.

C. After backfilling and pavement replacement is complete and upon completion of the air test or infiltration test, inspect the pipe for damage and other defects by means of closed-circuit television (CCTV). Television inspection shall be in accordance with Section 330131.

D. Even though a section may have previously passed the leakage or infiltration test, each section of sewer shall be tested subsequent to the last backfill compacting operation in connection therewith, wherein, in the opinion of the District or Engineer of Record, heavy compaction equipment used in any of the operations may have damaged or affected the required watertight integrity of the pipe, structure and appurtenances. The Owner or his Contractor shall furnish all material required for the tests and bear all costs in connection therewith. Tests shall be made in the presence of the Owner's Engineer.

E. Obstructions encountered by the mandrel shall be corrected by the Contractor.

F. Schedule the inspection in advance with the District.

G. If the CCTV inspection indicates any defects, excavate and repair or replace the faulty materials and construction and restore the work and the damage to work of others.

END OF SECTION

SECTION 330131 SANITARY SEWER SYSTEM TELEVISION INSPECTION

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes television inspection digital audio-visual recording and reports associated with inspection of sanitary sewers.

1.02 RELATED WORK DESCRIBED ELSEWHERE

A. PVC Gravity Sewer Pipe: 333112.

1.03 DEFINITIONS

A. Television Inspection: Operation necessary to complete a true-color audio-visual inspection for verification of existing internal sewer line conditions. Furnish labor, materials, equipment, tools, and other incidental services for CCTV inspection.

PART 2 - MATERIALS

2.01 GENERAL

A. Furnish the television inspection studio, television camera, audio-visual digital encoding equipment/software, and other necessary equipment, materials, electricity, labor, technicians, as may be needed to perform the television inspection.

2.02 TELEVISION INSPECTION EQUIPMENT

A. The television inspection equipment shall be capable of inspecting a minimum of 1,000 feet of sewer line, when entry into the sewer can be accessed from the upstream and downstream manholes. When entry is at one end only, the inspection equipment shall be capable of inspecting 750 feet by a self-propelled unit. The inspection equipment shall be capable of clearly televising the interior of a 6-inch-diameter sewer and larger sizes.

B. Transport the television equipment in a stable condition through the sewer line to be inspected. Throughout the inspection, position the camera equipment with the camera directed along the longitudinal axis of the sewer. When the television equipment is towed by winch and bond through the sewer line, the winches shall be stable with either locking or ratcheting drums. Winches shall be inherently stable under loaded conditions. The bonds shall be steel or of an equally nonelastic material to ensure the smooth and steady progress of the camera extension or traction through the sewer conduit. Prevent damage to the sewer conduit during the television inspection. In the case where the Contractor, for any reason, causes damage such as would be caused by incorrect deployment of bonds or retrieval of lodged equipment, the cost of repair or remedy shall be borne by the Contractor.

2.03 TELEVISION CAMERA

A. Use a television camera specifically designed and constructed for sewer pipeline inspection. The camera shall be waterproof and shall be operative in 100% humidity, and in any other conditions that may be encountered in the inspection environment. Provide a color pan and tilt camera to facilitate the inspection of service laterals and sewer line and manhole defects. The television camera shall be capable of 360-degree rotational scan indicating salient defects. The tilt arc shall not be less than 225 degrees unless otherwise approved by the District. The adjustment of focus and iris shall provide a minimum focal range of 3 inches in front of the camera's lens. Provide a visual size reference visible in front of the camera. The size reference must include sizes ¼"-2".

B. The distance along the sewer in focus from the initial point of observation shall be a minimum of twice the vertical height of the sewer.

C. The illumination shall be such as to allow an even distribution of the light shadowing.

D. The view seen by the television camera shall be transmitted to a monitor of not less than 11 inches in size. The television camera shall be capable of receiving and transmitting a picture having not less than a resolution 352(x) by 240(y). The travel speed of the television inspection camera (through the sewer) shall be uniform and shall not exceed the maximum speed directed by the District and shall be 6 inches per second under normal conditions.

E. Test the television inspection equipment to verify the picture quality. Use the Macroni Regulation Chart No.1 or the equipment manufacturer's recommendation to clearly differentiate between the following colors: white, yellow, cyan, green, magenta, red, blue, and black.

F. The television inspection equipment shall be of such quality as to enable the following to be achieved:

1. Color: With the monitor adjusted for correct saturation, the six colors plus black and white shall be clearly resolved with the primary and complementary colors in order of decreasing luminance.

2. Linearity: The background grid shall show squares of equal size, without convergence/divergence over the whole of the picture. The center circle shall appear round and have the correct height/width relationship (±5%).

3. Resolution: The live picture must be displayed on a digital or analog monitor capable of providing a clear, stable image free of electrical interference with minimum horizontal resolution not less than 352(x) by 240(y) lines.

4. Color Consistency: To ensure that the camera shall provide similar results when used with its own illumination source, the lighting shall be fixed in intensity prior to commencing the survey. In order to ensure color consistency, no variation illumination shall take place during the inspection.

5. The District may periodically check both the live and video picture color consistency against the color bar. Any differences will necessitate resurvey of the new length or lengths affected, at the Contractor's expense.

6. The CCTV monitor display shall incorporate an automatically updated record in feet and tenths of a foot of the distance along the line from the cable calibration point to the center point of the camera or center point of the transducer, whichever unit is being used. The relative positions of the two center points should also be noted. Use a metering device that enables the cable length to be accurately measured; this shall be accurate ±1% or 6 inches whichever is greater. The accuracy shall be satisfactory to the District. Demonstrate that the tolerance is being achieved by use of a walking meter, roll-a-tape, or other suitable device, between manholes on the surface. This taped measurement must be included on each television log both written and digital. Unless otherwise approved by the District, distance measurements shall begin at the centerline of the upstream manhole.

7. If the Contractor fails to meet the required standard of accuracy, the District will instruct the Contractor to provide a new device to measure the footage.

8. Audio-visual recordings and collected data made during the television inspection shall become the property of the District. Submit to the District immediately upon completion of the television inspection.

PART 3 - EXECUTION

3.01 GENERAL

A. Closed circuited television (CCTV) inspection shall be performed to determine if the sanitary sewer was installed in accordance with District requirements. The inspection will be done one manhole section at a time and the flow in the section being inspected will be suitably controlled as specified in Technical Specifications for Connections to Existing Sewer Pipe. All CCTV inspections shall be performed in accordance with PACP Standards, unless specific exemptions from PACP Standards are obtained in advance from the District.

B. Video inspection shall also be performed after all installation has been completed, including backfilling, compacting, finished pavement and cleanup, and after all testing, balling, mandrel testing, and flushing has been completed. If deficiencies are observed, the Contractor will make the required corrections and re-video the pipeline prior to acceptance of the sewer system.

3.02 DIVERSION OF WASTEWATER FLOW

Divert wastewater flow in accordance with Section 015800.

3.03 TELEVISION INSPECTION

A. Inspect sewer pipelines with pan and tilt conventional television imagery so as to record relevant features and defects of the pipeline under inspection. Inspection of pipelines shall be carried out in a format reviewed by the District. Perform cleaning in accordance with the requirements of the contract documents. A skilled technician or supervisor who shall be located at the control panel in the mobile television studio shall control the operation of the television equipment.

B. If television inspection of an entire section cannot be successfully performed from one manhole, perform a reverse setup to obtain a complete television inspection.

C. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members of the crew.

D. Provide a complete television inspection of both the upstream and downstream manholes beginning at the top of each manhole and panning down to inspect the entire manhole.

E. Whenever prevailing conditions allow, position the camera head to reduce the risk of picture distortion. In circular sewers, position the camera lens centrally (i.e., in prime position) within the sewer. In noncircular sewers, picture orientation shall be taken at mid-height, unless otherwise agreed, and centered horizontally. Direct the camera lens along the longitudinal axis of the sewer when in prime position. A positioning tolerance of ±10% of the vertical sewer dimension shall be allowed when the camera is in prime position.

F. Perform television inspections during low flow conditions. The District will reject any television inspection that, because of high flow conditions or for any other reason, does not produce an effective survey of the sewer pipe. If the water level is greater than 25% of the pipe diameter, conventional television inspection shall not be attempted without prior approval from the District. The camera shall be moved through the line in the direction of flow, unless access restrictions require the use of a reverse set-up, and shall be moved at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case shall the camera be pulled at a speed greater than 30 feet per minute. In addition, if it is determined that effective conventional television inspection cannot be performed, notify the District in writing.

G. Do not pull a cleaning device in front of the television inspection camera during the taping of the sewer line.

3.04 DIGITAL AUDIO/VISUAL RECORDING

A. Take continuous digital video recordings of the inspection view as it appears on the television monitor. It is intended that a digital video recording will be made of the complete television inspection of the sewer lines constructed as part of this project. The recording shall also be used as a permanent record of defects. The recording shall be

MPEG file format. The digital video encoding shall include both sound and video information that can be reproduced with a video image equal or very close to the quality of the original picture on the television monitor. The video shall have a continuous graphic display of date, time, and footage in 0.1-foot increments. The replay of the recorded video information, when reviewed by Windows Media Player™, shall be free of electrical interference and shall produce a clear, stable image. The audio portion of the composite digital coding shall be sufficiently free of electrical interference background noise to produce an oral report that is clear and completely and easily discernible.

B. The audio portion of the inspection report shall include the location or identification of the section, the manhole-to-manhole direction of travel, and the distance traveled on the specific run encountered. The inspection camera equipment shall be on the specific run encountered. Continuously connect the inspection camera equipment to the television inspection or monitoring equipment. The recording and monitoring equipment shall have the built-in capability to allow the Owner's Representative to instantly review both the audio and video quality of the recordings during the television survey. Playback speed shall be continuously adjustable from one-third normal speed for slow-motion viewing to normal playback speed.

C. Create separate MPEG files for each sewer line segment. In case of a reverse setup, store such inspection in a separate MPEG file. MPEG files shall be written to USB flash drive for delivery to the Owner. Multiple MPEGs may exist on each flash drive. Each USB flash drive shall be labeled, at a minimum, with the following information: Owner, Engineering Firm, Project Name, Date of creation, ID number, Sewer Line Sections, and TVI Contractor's firm name.

D. Name the MPEG files according to the following file specification: [Start Manhole Number]_[End Manhole Number]_[Month]_[Day]_[Year].mpg

E. The District reserves the right to refuse an MPEG on the basis of poor image quality, excessive bit rates, inconsistent frame rates, or any other characteristics that may affect usability by the District.

3.05 TELEVISION INSPECTION REPORTS

A. Each video disk submitted shall be accompanied with written inspection reports. The written reports shall include, but are not necessary limited to:

1. Video File Name

2. Time and date of the inspection

3. Upstream manhole number

4. Downstream manhole number

5. Sewer size

6. Footage to the nearest 0.1 foot

7. Direction of televised inspection

8. Location of service connections (laterals) by feet from beginning manhole

9. Location of significant features such as grade breaks, pipe breaks, offset joints, cracking, change in pipe material, standing water, etc.

10. Each significant feature noted shall be evaluated and coded according to PACP standards

11. Include footage and description of beginning/ending of inspection

B. Report sewer defects in accordance with the National Association of Sewer Service Companies (NASSCO) program known as Pipeline Assessment and Certification Program (PACP). The District reserves the right to refuse any inspection report that does not comply with the PACP program.

C. Prior to beginning work, submit to the District certification in NASSCO's PACP. Do not commence work until such certification is provided.

3.06 QUALITY CONTROL

A. Operate a quality control system that will effectively gauge the accuracy of inspection reports produced by the operator.

B. The District shall be entitled to audit the control system and be present when assessments of the sewer integrity are being determined. When requested by the District in writing, forward to the District sufficient details and information for such audit assessment. Should any report fail to achieve a margin that the District deems satisfactory, the Contractor, without any additional compensation, shall recode and resubmit any data or reports that the District deems necessary.

END OF SECTION

SECTION 331300 DISINFECTION OF PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and procedures for disinfection of water mains by the continuous feed method. Disinfect piping in accordance with AWWA C651, except as modified below. Disinfection by the tablet method and slug method is not allowed.

1.02 RELATED WORK DESCRIBED ELSEWHERE

Pressure Testing of Piping: 400515.

1.03 JOB CONDITIONS

A. Discharge of chlorinated water into watercourses or surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES). Disposal of the chlorinated disinfection water and the flushing water is the Contractor's responsibility.

B. Determine allowable locations of discharges and provide to District for approval.

C. Use potable water for chlorination.

1.04 SUBMITTALS

A. Submit to the District for review and approval a disinfection plan a minimum of 10 working days prior to performing the work.

B. Disinfection plan shall include but not be limited to:

1. Schedule

2. Rate of flow

3. Injection location(s)

4. Testing location(s)

5. Residual test equipment

6. Dechlorination equipment

PART 2 - MATERIALS

2.01 GENERAL

All materials used in disinfection shall be NSF 60 certified.

2.02 LIQUID CHLORINE

Inject with a solution feed chlorinator and a water booster pump. Follow the instructions of the chlorinator manufacturer.

2.03 CALCIUM HYPOCHLORITE (DRY)

Dissolve in water to a known concentration in a drum and pump into the pipeline at a metered rate.

2.04 SODIUM HYPOCHLORITE (SOLUTION)

Further dilute in water to desired concentration and pump into the pipeline at a metered rate.

2.05 CHLORINE RESIDUAL TEST KIT

For measuring chlorine concentration, supply and use a medium range, drop count, DPD drop dilution method kit per AWWA C651, Appendix A.1. Maintain kits in good working order available for immediate test of residuals at point of sampling.

2.06 DECHLORINATION MATERIALS

If dechlorination is required and the Contractor elects to use a means of chemical dechlorination, use one of the chemicals described in AWWA C655.

PART 3 - EXECUTION

3.01 GENERAL

Unless specified otherwise or approved by the District, Contractor shall test against test plates or temporary bulkheads for all new pipelines per Standard No. W-20. Contractor shall not remove said test plates or connect to existing piping until pipelines have been pressure tested, disinfected, and accepted by the District. During the chlorination process, all valves and accessories shall be operated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal, chemically and bacteriologically, to those of the permanent supply.

3.02 CONTINUOUS FEED METHOD FOR PIPELINES

Introduce potable water into the pipeline at a constant measured rate. Feed the chlorine solution into the water at a measured rate. Check the concentration at points downstream during the filling to ascertain that sufficient chlorine is being added. Chlorine residual shall be determined in accordance with the method specified in the Appendix to AWWA C651 with amounts of chlorine sufficient to produce a dosage of 40-50 mg/L free chlorine and a residual of not less than 10 mg/L free chlorine after 24 hours. The Contractor shall provide and keep chlorine residual testing and indicating apparatus available on the site during the disinfection period.

3.03 DISINFECTION OF VALVES, BLIND FLANGES, AND APPURTENANCES

During the period that the chlorine solution is in the section of pipeline, open and close valves to obtain a chlorine residual at hydrants and other pipeline appurtenances. Swab exposed faces of valves and blind flanges prior to bolting flanges in place with a 1% sodium hypochlorite solution.

3.04 DISINFECTION OF CONNECTIONS TO EXISTING PIPELINES

Disinfect isolation valves, pipe, and appurtenances per AWWA C651, Section 4.7. Flush with potable water until discolored water, mud, and debris are eliminated. Swab interior of pipe and fittings with a minimum 1% sodium hypochlorite solution. After disinfection, flush with potable water again until water is free of chlorine odor.

3.05 DISINFECTION OF TAPPING SLEEVES AND LINE STOPPING

Flush exterior of pipe with potable water after removal of existing coating. Swab exterior of pipe with a minimum 1% sodium hypochlorite solution. Disinfect per AWWA C651, Section 4.8. After completion of tapping and line stopping, swab interior of pipe, valves, and faces of flanges to be connected to bypass piping with a minimum 1% sodium hypochlorite solution.

3.06 PIPELINE FLUSHING

After confirming the chlorine residual, flush the excess chlorine solution from the pipeline until the chlorine concentration in the water leaving the pipe is equal to the conditions in the distribution system.

3.07 SAMPLING AND BACTERIOLOGIC TESTING

A. There shall be no water in trenches up to the connection for sampling. The sampling location(s) shall be determined by the District. The sampling piping shall be clean, disinfected, and flushed prior to sampling.

B. The District shall retain a qualified laboratory to perform a bacteriological test. Such a test shall meet the California Department of Health Services requirements for domestic water purposes prior to acceptance by the District for integration and use in the system. The cost of the test(s) shall be borne by the Contractor.

C. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one set of samples shall be collected from every 1,200 feet (366 m) of the new water main, plus one set from the end of the line and at least one set from each branch. Samples from new mains shall be negative for coliform bacteria prior to the new main(s) being placed into service.

D. The new water main shall be kept physically disconnected from the active distribution system until satisfactory completion of the bacteriological test.

3.08 PIPING TEST FACILITY REMOVAL

After satisfactory disinfection, disinfect and replace air valves, restore the pipe coating, and complete the pipeline where temporary disinfection or test facilities were installed.

3.09 REPETITION OF PROCEDURE

If the initial chlorination fails to produce required residuals and bacteriologic tests, repeat the chlorination and retest until satisfactory results are obtained.

3.10 DECHLORINATION AND DISPOSAL

Dechlorinate per AWWA C655. Perform testing of residual chlorine before discharge of water into the environment. It shall be the Contractor's responsibility to determine the method of disposal, treatment (if any), obtain permission from the applicable agency, and comply with all federal, state, county, and local regulations regarding treatment and disposal of the chlorinated water.

END OF SECTION

SECTION 333112 PVC GRAVITY SEWER PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials, installation, and testing of Polyvinyl chloride (PVC) SDR 35 gravity sewer pipe conforming to ASTM D3034. PVC pipe may be used on residential tract sewers and residential house laterals only to sizes not exceeding 12-inches in diameter. Coordinate with District for larger pipe requirements.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Precast Circular Polymer Concrete Manholes: 034215.

B. Trenching, Backfilling, and Compacting: 312316.

C. Leakage and Infiltration Testing: 330130.

D. Sanitary Sewer System Television Inspection: 330131.

1.03 SUBMITTALS

A. Submit product data sheets including manufacturers joint joining instructions.

B. Submit reports on testing per ASTM D3034 (pipes 3 inches through 12 inches).

PART 2 - MATERIALS

2.01 PVC MATERIAL

Pipe shall be made of PVC plastic having a cell classification of 12454 as defined by ASTM D1784. The fittings shall be made of PVC plastic having a cell classification of 12454 per ASTM D1784.

2.02 PIPE

PVC pipe, fittings, couplings, and joints shall conform to the requirements of ASTM D3034, SDR 35, and shall have gasketed joints.

2.03 JOINTS

Provide elastomeric gasket joints of the push-on type, conforming to ASTM D3212.

2.04 GASKETS

Gaskets shall conform to ASTM F477 and ASTM D3212. A single rubber gasket shall be installed in each bell end of a joint of pipe or fitting.

2.05 FITTINGS

A. Fittings for pipe 4 through 12 inches shall conform to ASTM D3034 (SDR 35). PVC fittings shall include branches of every type and stoppers.

B. Branches shall be securely and completely fastened to the barrel of the fitting in the process of manufacture. Wye branches shall have their axes 45 degrees to the longitudinal axis of the pipe measured from the socket end. All branches shall terminate in sockets, and the barrel for the branch shall be of sufficient length to permit making a proper joint when the lateral pipe is inserted in the branch socket.

C. All joints for stoppers shall be adequate to withstand the internal pressure of the leakage and/or infiltration test; however, joints shall be made in such a manner that they may be removed without injury to the socket.

D. The material and quality of PVC fittings and the joints for fittings shall conform to the applicable provisions of these specifications.

2.06 MANDREL FOR FIELD TESTING OF PIPE DEFLECTION

A. The mandrel shall:

1. Be a rigid, nonadjustable, odd-numbering-leg (nine legs minimum) mandrel having an effective length not less than its nominal diameter.

2. Have a minimum diameter at any point along the full length as follows:

Pipe Material	Nominal Size (inches)	Minimum Mandrel Diameter (inches)
PVC-ASTM D3034 (SDR 35)	6	5.619
	8	7.524
	10	9.405
	12	11.191

3. Be fabricated of steel; be fitted with pulling rings at each end; be stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size, and mandrel outside diameter (e.g., PVC, D3034-8"-7.524"); and be furnished in a carrying case labeled with the same data as stamped or engraved on the mandrel.

PART 3 - EXECUTION

3.01 LABORATORY TESTING

A. Pipe, fittings, and couplings shall meet the requirements of the section titled "Requirements" of ASTM D3034. During production of the pipe, the manufacturer shall perform the specified tests for each pipe marking. A certification by the manufacturer indicating compliance with specification requirements shall be delivered with the pipe. The certification shall include the test result data.

B. Any pipe which does not comply with the Specifications, is out of round, and has been rejected by the District, shall be removed from the jobsite and disposed of by the Owner.

3.02 INSTALLING PVC SEWER PIPE

A. Install in accordance with Section 312316, ASTM D2321, and as described below.

1. Trenches shall be kept free of water during the laying operation. All pipe shall be laid without break, upgrade from structure to structure, with the bell ends of the pipe upgrade. Pipe shall be laid to the line and grade given so as to form a close concentric joint with the adjoining pipe and prevent sudden offsets of the flow line. The interior of the sewer pipe shall be cleaned of all dirt and superfluous materials of all description as the work progresses.

2. All pipes shall have a home mark on the spigot end to indicate proper penetration when the joint is made. The socket and spigot configurations for the fittings and couplings shall be compatible to those used for the pipe. Pipe shall be joined with elastomeric gasketed joints manufactured with a socket configuration which will preclude improper installation of the gasket and will ensure the gasket remains in place during the joining operation. The spigot end shall be inserted to the proper depth of the socket as indicated by the home mark.

3. The bedding and pipe zone material for PVC sewer pipe shall be placed from 12-inches below the bottom to 12-inches over the top of the pipe and shall be after joint assembly. Bedding material shall be imported sand per Section 312300. Place the bedding material on each side of the pipe. Tamp the bedding material into final position at pipe spring line and continue to the top of the pipe. Relative compaction shall be in conformance with Section 312316.

4. Place non-detectable warning tape per Standard No. W-2. Tape shall be three-inch (3") wide polyethylene, APWA uniform color coded green, permanently printed “CAUTION BURIED SEWER LINE BELOW”.

5. All installation of PVC pipe shall be in conformance with ASTM D2321 (latest edition). During the months of April through October, PVC pipe exposed to the sun prior to laying shall be shaded from direct sun for at least thirty (30) minutes before connection is made to manholes. Allowance shall also be made for the movement of pipe at house branch locations.

3.03 INSTALLING LATERALS

A. Wyes shall be installed for all sewer house connections including foreseeable future sewer house connections.

B. Each wye branch fitting shall have its barrel diameter equal to the diameter of the sanitary sewer main and the spur (or branch) diameter as indicated in the drawings. Do not place wye branches within 5 feet of any structure or other wye.

C. Trenching and backfilling for branches and laterals shall be in conformance with Section 312316.

D. Install wye fittings so that the outlet branch is inclined upward at an angle of 45 degrees. Plug wye branch fittings that are to be left unconnected with a stopper or plug. Join laterals to wye branch fittings at the sanitary sewer main by eighth bends. Eighth bends and quarter bends are a part of lateral sewer line.

E. End of the lateral shall be at least 4 feet below the existing or proposed grade of the ground at existing structure to be served or as called for in the drawings.

F. Where possible, laterals shall run perpendicular to the sewer main at a minimum grade of 2%.

G. Plug laterals with stopper in the socket of the last joint. Seal stopper in place so that it will withstand the internal pressure during the test for leakage and so that it may be removed without damage to the socket.

H. Mark the location of each lateral by chiseling a letter "S" 3 inches high on the top of the curb. If the terminal point of the lateral is more than 8 feet beyond the curb line or curb improvements do not exist, provide and install a 3-foot long metal T-post extending 2 inches above the ground and placed at the end of the connection.

3.04 INSTALLING PIPE AT MANHOLES AND STRUCTURES

A. Use one of the following methods:

1. Directly cast a coupling into the manhole base. Provide rubber-ring gasket in the coupling.

2. Stretch a rubber-ring gasket around the pipe to serve as a water stop when cast into the structure wall.

B. Do not cast pipe bells into manholes or structures. Cut off the bell so that no recess or offset appears on the exposed face from the inside wall of the pipe to the outside wall of the pipe. The pipe shall have a plain end, flush with the inside wall of the manhole or structure.

3.05 TESTING FOR DEFECTS OF INSTALLED PIPE

Following placement and compaction of backfill and prior to placing permanent pavement, ball and mandrel the pipe to measure for obstructions (excessive deflections, joint offsets, and lateral pipe intrusions).

3.06 FIELD TESTING FOR PIPE DEFLECTION

A. Test installed pipe to ensure that vertical deflections for plastic pipe do not exceed the maximum allowable deflection. Maximum allowable deflections shall be governed by the mandrel requirements stated herein and shall nominally be:

Nominal Pipe Size	Percentage
Up to and including 12 inches	5.0

B. The maximum average inside diameter shall be equal to the average outside diameter per applicable ASTM standard minus two minimum wall thicknesses per applicable ASTM standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.

C. Clean and inspect the pipe for offsets and obstructions prior to testing.

D. Pull a mandrel through the pipe by hand to verify that maximum allowable deflections have not been exceeded. Prior to use, the mandrel shall be certified by an independent testing laboratory. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate test. If the mandrel fails to pass, the pipe will be deemed to be overdeflected.

E. Uncover any overdeflected pipe and, if not damaged, reinstall. Remove damaged pipe from the site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any overdeflection, shall be uncovered, removed from the site, and replaced with new pipe.

3.07 LEAKAGE TEST

See Section 330130.

3.08 TESTING FOR ALIGNMENT AND GRADE

After the pipe has been installed, tested for leakage, backfilled to existing grade, and manholes raised to grade and resurfaced, "ball" the pipe from manhole to manhole with a sewer scrubbing ball. After balling the pipe, perform television inspection per Section 330131.

END OF SECTION

SECTION 400500 GENERAL PIPING REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

This section describes the general requirements for selecting bolts, nuts, and gaskets for flanges for various piping services; and miscellaneous piping items.

1.02 SUBMITTALS

A. Submit affidavit of compliance with referenced standards (e.g., AWWA, ANSI, ASTM, etc.).

B. Submit certified copies of mill test reports for bolts and nuts, including coatings if specified. Provide recertification by an independent domestic testing laboratory for materials originating outside of the United States.

C. Submit manufacturer's data sheet for gaskets supplied showing dimensions and bolting recommendations.

1.03 DEFINITIONS OF BURIED AND EXPOSED PIPING

A. Buried piping is piping buried in the soil, commencing at the wall or beneath the slab of a structure. Where a coating is specified, provide the coating up to the structure wall. Unless detailed otherwise, coating shall penetrate wall no less than 1 inch. Piping encased in concrete is considered to be buried. Do not coat encased pipe.

B. Exposed piping is piping in any of the following conditions or locations:

1. Above ground.

2. Inside buildings, vaults, or other structures.

3. In underground concrete trenches or galleries.

PART 2 - MATERIALS

2.01 THREAD FORMING FOR STAINLESS STEEL BOLTS

Form threads by means of rolling, not cutting or grinding.

2.02 BOLTS AND NUTS FOR FLANGES FOR DUCTILE-IRON PIPING

A. Bolts and nuts for Class 125 or 150 flanges (including AWWA C207, Class D) shall be Type 304 stainless steel conforming to ASTM A193 (Grade B8) for bolts and ASTM A194 (Grade 8) for nuts.

B. Fit shall be Classes 2A and 2B per ASME B1.1 when connecting to cast-iron valves having body bolt holes.

C. Provide washers for each nut. Washers shall be of the same material as the nuts.

2.03 BOLTS AND NUTS FOR FLANGES FOR STAINLESS STEEL

A. Bolts and nuts for flanges shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M Class 2 for bolts and ASTM A194, Grade 8M Class 2 for nuts.

B. Provide washer for each nut. Washers shall be of the same material as the nuts.

2.04 LUBRICANT FOR STAINLESS STEEL BOLTS AND NUTS

Lubricant shall be chloride free and shall be RAMCO TG-50, Anti-Seize by RAMCO, Specialty Lubricants Corporation Husky™ Lube O'Seal, or equal.

2.05 GASKETS FOR FLANGES FOR STAINLESS STEEL OR DUCTILE IRON PIPING IN RAW SEWAGE

Gaskets shall be full face, 1/8-inch thick, and shall be one of the following non-asbestos materials:

A. Buna-N having a Shore "A" hardness of 55 to 65 durometer. Gaskets shall be suitable for a water pressure of 200 psi at a temperature of 180°F. Products: Garlock Style 9122 or equal.

B. Acrylic or aramid fiber bound with nitrile. Products: Garlock "Bluegard," Klinger "Klingersil C4400," or equal. Gaskets shall be suitable for a water pressure of 500 psi at a temperature of 400°F.

2.06 GASKETS FOR FLANGES FOR DUCTILE-IRON PIPING AND FITTINGS IN WATER SERVICE

A. NSF-61 certified synthetic fiber gasket with rubber binder. Gaskets shall be suitable for a pressure of 500 psi at a temperature of 180°F. Products: Garlock Style 3760-U or equal

2.07 GASKETS FOR FLANGES FOR DUCTILE-IRON PIPING AND FITTINGS IN RAW SEWAGE, SLUDGE, AND SCUM SERVICE

Gaskets shall be full face, 1/8-inch thick, NSF-61 certified synthetic fiber gasket with rubber binder. Gaskets shall be suitable for a pressure of 500 psi at a temperature of 180°F. Products: Garlock Style 3760-U or equal.

A. Acrylic or aramid fiber bound with nitrile. Products: Garlock "Bluegard," Klinger "Klingersil C4400," or equal. Gaskets shall be suitable for a water pressure of 500 psi at a temperature of 400°F.

PART 3 - EXECUTION

3.01 RAISED FACE AND FLAT FACE FLANGES

Where a raised face flange connects to a flat-faced flange, remove the raised face of the flange.

3.02 INSTALLING ABOVEGROUND OR EXPOSED PIPING

A. Provide pipe supports as detailed in the drawings.

B. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment.

3.03 INSTALLING FLANGED PIPING

A. Set pipe with the flange bolt holes straddling the pipe horizontal and vertical centerline. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Before bolting up, align flange faces to the design plane within 1/16 inch per foot measured across any diameter. Align flange bolt holes within 1/8-inch maximum offset.

B. Inspect each gasket to verify that it is the correct size, material, and type for the specified service and that it is clean and undamaged. Examine bolts or studs, nuts, and washers for defects such as burrs or cracks and rust and replace as needed.

C. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate carbon steel bolts with oil and graphite, and tighten nuts uniformly and progressively.

D. Bolt lengths shall extend completely through their nuts. Any that fail to do so shall be considered acceptably engaged if the lack of complete engagement is not more than one thread.

E. Do not use more than one gasket between contact faces in assembling a flanged joint.

F. Tighten the bolts to the manufacturer's specifications, using the recommended cross bolt pattern in multiple steps of increasing torque, until the final torque requirements are achieved. Do not over torque.

G. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

3.04 INSTALLING BLIND FLANGES

A. At outlets not indicated to be connected to valves or to other pipes and to complete the installed pipeline hydrostatic test, provide blind flanges with bolts, nuts, and gaskets.

3.05 INSTALLATION OF STAINLESS STEEL BOLTS AND NUTS

Prior to assembly, coat threaded portions of stainless steel bolts and nuts with lubricant.

END OF SECTION

SECTION 400515 PRESSURE TESTING OF PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies the cleaning and hydrostatic leakage testing of pressure piping for water distribution and transmission mains and raw sewage force mains. PVC shall be hydrostatic tested in conformance with AWWA 605-21. Ductile Iron Pipe shall be hydrostatic tested in conformance with AWWA C600-23. HDPE Pipe shall be hydrostatic tested in conformance with AWWA C906-21.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Leakage and Infiltration Testing: 330130.

B. Disinfection of Piping: 331300.

C. Manual Valves: 400520.

1.03 SUBMITTALS

A. Submit test bulkhead locations and design calculations, pipe attachment details, and methods to prevent excessive pipe wall stresses.

B. Submit two copies of the test records to the District upon completion of the testing.

1.04 TEST PRESSURES

Test pressures for the various services and types of piping are shown in the subsection on “Test Pressure” in Part 3.

1.05 TESTING RECORDS

Provide records of each piping installation during the testing. These records shall include:

1. Date and times of test.

2. Identification of pipeline section tested or retested.

3. Identification of pipeline material.

4. Identification of pipe specification.

5. Test pressure at low point in pipeline or pipeline section.

6. Remarks: Leaks identified (type and location), types of repairs, or corrections made.

7. Certification by Contractor that the leakage rate measured conformed to the specifications.

PART 2 - MATERIALS

2.01 VENTS AND DRAINS FOR ABOVEGROUND PIPING

Install vents on the high points of aboveground piping, whether shown in the drawings or not. Install drains on low points of aboveground piping, whether shown in the drawings or not. Provide a valve at each vent or drain point. Valves shall be 3/4 inch for piping 3 inches and larger and 1/2 inch for piping smaller than 3 inches.

2.02 MANUAL AIR-RELEASE VALVES FOR BURIED PIPING

Provide temporary manual air-release valves for pipeline test where required. Construct the pipe outlet in the same manner as for a permanent air valve and after use, seal with a blind flange, pipe cap, or plug and coat the same as the adjacent pipe.

2.03 TEST BULKHEADS

Design and fabricate test bulkheads per Section VIII of the ASME Boiler and Pressure Vessel Code. Materials shall comply with Part UCS of said code. Design pressure shall be at least 2.0 times the specified test pressure for the section of pipe containing the bulkhead. Limit stresses to 70% of yield strength of the bulkhead material at the bulkhead design pressure. Include air-release and water drainage connections.

2.04 TESTING FLUID

A. Testing fluid shall be water.

B. For potable water pipelines, obtain and use only potable water for hydrostatic testing.

C. Submit request for use of water from waterlines from District 48 hours in advance.

2.05 TESTING EQUIPMENT

The Contractor shall provide suitable calibrated tanks for measurement of leakage and shall furnish the necessary bulkheads, piping, calibrated gauges, pumps, power, labor and other means, and shall do everything necessary for filling the pipeline and for obtaining and maintaining the required water pressure.

PART 3 - EXECUTION

3.01 TESTING PREPARATION

A. Pipes shall be in place, backfilled, and anchored before commencing pressure testing.

B. Conduct pressure tests on exposed and aboveground piping after the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters.

C. Provide any temporary piping needed to carry water to the piping that is to be tested. After the test has been completed and demonstrated to comply with the specifications, disconnect and remove temporary piping. Do not remove exposed vent and drain valves at the high and low points in the tested piping; remove any temporary buried valves and cap the associated outlets. Chlorine in water used for disinfection can corrode stainless steel piping if the water is allowed to stay in the piping for an extended time which requires that stainless steel piping be drained within five days after completing the pressure testing.

D. Provide temporary drain lines needed to carry water away from the pipe being tested. Remove such temporary drain lines after completing the pressure testing. Water pipelines shall remain full after testing.

E. Prior to starting the test, the Contractor shall notify the District.

3.02 CLEANING

A. Before conducting hydrostatic tests, flush pipes with water to remove dirt and debris. Maintain a flushing velocity of at least 3 fps for water testing Flush pipes for time period as given by the formula:

$$T = \frac{2L}{3}$$

in which:

T = flushing time (seconds)
L = pipe length (feet)

3.03 TESTING AND DISINFECTION SEQUENCE FOR POTABLE WATER PIPING

A. Perform required disinfection after hydrostatic testing.

B. Locate and install test bulkheads, valves, connections to existing pipelines, and other appurtenances in a manner to provide separation between existing potable water pipelines and the pipeline being tested.

3.04 INITIAL PIPELINE FILLING FOR HYDROSTATIC TESTING

Maximum rate of filling shall not cause water velocity in pipeline to exceed 1 fps. Filling may be facilitated by removing automatic air valves and releasing air manually.

3.05 TESTING NEW PIPE WHICH CONNECTS TO EXISTING PIPE

Prior to testing new pipelines that are to be connected to existing pipelines, isolate the new line from the existing line by means of test bulkheads, test plates, , or blind flanges. After successfully testing, disinfection, and acceptance by the District, remove test bulkheads, test plates or flanges and connect to the existing piping.

3.06 HYDROSTATIC TESTING OF ABOVEGROUND OR EXPOSED PIPING

A. Open vents at high points of the piping system to purge air while filling the pipe with water.

B. Subject the piping system to the test pressure specified. Maintain the test pressure for a minimum of four hours. Examine joints, fittings, valves, and connections for leaks. The piping system shall show zero leakage or weeping. Correct leaks and retest until zero leakage is obtained.

3.07 HYDROSTATIC TESTING OF BURIED PIPING

A. Where any section of the piping contains concrete thrust blocks or encasement, do not perform the pressure test until at least 10 days after placing the concrete. When testing mortar-lined or PVC piping, fill the pipe to be tested with water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.

B. Apply and maintain the test pressure by means of a positive displacement hydraulic force pump.

C. Perform hydrostatic testing for leakage on HDPE pipe in accordance with ASTM F2164. The test period and allowable leakage rate shall be as defined in ASTM F2164, Section 9.

D. Maintain the test pressure for the following duration by restoring it whenever it falls an amount of 5 psi.

E. After the test pressure is reached, use a meter to measure the additional water added to maintain the pressure. This amount of water is the loss due to leakage in the piping system. The allowable leakage volume is defined by the formula

$$L = \frac{HND(P)^{1/2}}{C}$$

in which:

L = allowable leakage (gallons)

H = specified test period (hours)

N = number of rubber-gasketed joints in the pipe tested

D = diameter of the pipe (inches)

P = specified test pressure (psig)

C = 7,400

F. The allowable leakage for buried piping having flanged fused, or welded (including solvent welded) joints shall be zero.

G. The Contractor, at his own expense, shall do all excavating necessary to locate and repair leaks or other defects which may develop under test, including removal of backfill already placed. The Contractor shall make all repairs necessary to secure the required water tightness and shall replace excavated material, following which the test shall be repeated until the pipe is found satisfactory.

H. Regardless of the rate of leakage, all detectable leaks shall be repaired.

3.08 TEST PRESSURE FOR PVC AND HDPE PIPE

A. The hydrostatic test pressure shall not be less than the greater of (a) 1.25 times the maximum anticipated sustained working pressure at the highest point along the test section, or (b) 150 psi, as measured at the low point of the pipeline, unless the pressure exceeds the design pressure limit for any pipe, thrust restraint, valve fitting, or other appurtenance of the test section. In no case shall the test pressure exceed the design pressure limit for any pipe, thrust restraint, valve, fitting, or other appurtenance of the test section.

3.09 TEST PRESSURE FOR DUCTILE IRON PIPE

A. The hydrostatic test pressure shall not be less than the greater of (a) 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section, (b) 1.5 times the stated working pressure measured at the lowest elevation of the test section, or (c) 150 psi measured at the low point of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less (as specified by the manufacturer).

END OF SECTION

SECTION 400520 MANUAL VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

This section describes materials, testing, and installation of manually operated valves and check valves.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Painting and Coating: 099000.

B. Cold-Applied Wax Tape Coating: 099752.

C. Polyethylene Sheet Encasement (AWWA C105): 099754.

D. Pressure Testing of Piping: 400515.

1.03 SUBMITTALS

A. Submit manufacturer's catalog data and detail construction sheets showing all valve parts. Describe each part by material of construction, specification (such as AISI, ASTM, SAE, or CDA), and grade or type.

B. Show valve dimensions including laying lengths. Show port sizes. Show dimensions and orientation of valve actuators, as installed on the valves. Show location of internal stops for gear actuators. State differential pressure and fluid velocity used to size actuators. For worm-gear actuators, state the radius of the gear sector in contact with the worm and state the handwheel diameter.

C. Show valve linings and coatings. Submit manufacturer's catalog data and descriptive literature.

D. Factory torque sheets minimally supplying actuator output and valve input torque requirements. Method for calculating input torque shall be the same as per AWWA Class 150B designation.

1.04 VALVE SELECTION CRITERIA

A. Valves in Water System: Selection of the type of valve for a given application within the District’s water distribution and transmission system shall follow the criteria defined below.

Selection Criteria			
Nominal Valve Diameter (inches)	**Normal System Static Pressure (0 to 100 psi)**	**Normal System Static Pressure (100 to 150 psi)**	**Normal System Static Pressure (150 to 250 psi)**
3 and smaller	Ball	Ball	Ball
4	Gate	Butterfly	CL 250 Butterfly
6	Gate	Butterfly	CL 250 Butterfly
8	Gate	Butterfly	CL 250 Butterfly
10	Gate	Butterfly	CL 250 Butterfly
12 and larger	Butterfly	Butterfly	CL 250 Butterfly

B. Valves in Sewer System: Valves used for sewer lift stations and force mains shall be plug type valves.

PART 2 - MATERIALS

2.01 GENERAL

A. Valves shall be provided complete with operating handwheels, levers, chain-wheels, extension stems, floor stands, worm gear actuators, operating nuts, chains, and wrenches as required for operation.

B. Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body or bonnet or shown on a permanently attached corrosion-resistant plate.

C. For buried locations, valves with mechanical joint ends may be substituted for the flanged ends specified provided the mechanical joint ends are compatible with the pipe ends.

2.02 VALVE ACTUATORS

A. Provide lever or wrench actuators for exposed valves 6 inches and smaller. For larger valves, provide handwheels.

B. Where manually operated valves (size 4 inches and larger) are installed with their centerlines more than 5 feet 9 inches above the floor, provide chainwheel and guide actuators.

C. Provide 2-inch AWWA operating nuts for buried and submerged valves.

D. Provide enclosed gear actuators on butterfly and plug valves 4-inches and larger. Gear actuators for butterfly valves 6 through 20 inches shall be of the traveling nut type. Gear actuators for plug valves shall be of the worm gear type.

E. Design gear actuators assuming that the differential pressure across the plug or disc is equal to the pressure rating of the valve and assuming a fluid velocity of 16 fps unless otherwise required in the detailed valve specifications. Size actuators using a minimum safety factor of 1.5 for valves in open/close service and 2.0 in modulating service.

F. Gear actuators shall be enclosed, oil lubricated, with seals provided on shafts to prevent entry of dirt and water into the actuator. Gear actuators for valves located above ground or in vaults and structures shall have handwheels. The actuators for valves in exposed service shall contain a dial indicating the position of the valve disc or plug. Gear actuators for buried or submerged valves shall have 2-inch-square AWWA operating nuts.

G. For buried or submerged service or valves installed in buried vaults, provide watertight shaft seals and watertight valve and actuator cover gaskets. Provide totally enclosed actuators designed for buried or submerged service.

H. Traveling nut and worm gear actuators shall be of the totally enclosed design so proportioned as to permit operation of the valve under full differential pressure rating of the valve with a maximum pull of 80 pounds on the handwheel or crank. Provide stop limiting devices in the actuators in the open and closed positions. Actuators shall be of the self-locking type to prevent the disc or plug from creeping. Design actuator components between the input and the stop-limiting devices to withstand without damage a pull of 200 pounds for handwheel or chainwheel actuators and an input torque of 300 foot-pounds for operating nuts when operating against the stops.

I. Handwheel diameters for traveling nut actuators shall not exceed 8 inches for valves 12 inches and smaller and shall not exceed 12 inches for valves 20 inches and smaller.

J. Self-locking worm gear shall be a one-piece design of gear bronze material (ASTM B427; or ASTM B84, Alloy C86200), accurately machine cut. Actuators for eccentric and lubricated plug valves may use ductile-iron gears provided the gearing is totally enclosed with spring-loaded rubber lip seals on the shafts. The worm shall be hardened alloy steel (ASTM A322, Grade G41500 or G41400; or ASTM A148, Grade 105-85), with thread ground and polished. Support worm gear shaft at each end by ball or tapered roller bearings. The reduction gearing shall run in a proper lubricant. The handwheel diameter shall be no more than twice the radius of the gear sector in contact with the worm. Worm gear actuators shall be Limitorque Model HBC, EIM Series W, or equal.

K. Design actuators on buried valves to produce the required torque on the operating nut with a maximum input of 150 foot-pounds.

L. Valve actuators, handwheels, or levers shall open by turning counterclockwise.

2.03 EXTENSION STEMS FOR BURIED AND SUBMERGED VALVE ACTUATORS

A. Where the depth of the valve is such that its centerline is more than 5 feet below grade, provide operating extension stems per Standard No. W-24.

2.04 BOLTS AND NUTS FOR FLANGED VALVES

Bolts and nuts for flanged valves shall be as described in Section 400500.

2.05 GASKETS FOR FLANGES

Gaskets for flanged end valves shall be as described in Section 400500.

2.06 PAINTING AND COATING

A. Exterior Coating:

1. Metal valves (except bronze and stainless steel valves) shall be coated in accordance with Section 099000, Painting and Coating, and shall be holiday free.

a. The specified prime coat shall be applied at the place of manufacture.

b. Finish coat shall match the color of the adjacent piping.

c. Exposed portions of the valve shaft shall not be coated.

B. Interior Lining:

1. Metal valves shall be lined on the interior metal parts, excluding seating areas and bronze and stainless steel pieces, per Section 099000, Painting and Coating, System No. G-1 or System No. G-2. Lining shall be factory applied by the valve manufacturer.

2.07 PACKING AND O-RINGS

Packing and O-rings shall be one of the following non-asbestos materials:

A. Teflon.

B. Kevlar aramid fiber.

C. Acrylic or aramid fiber bound by nitrile. Products: Garlock "Bluegard," Klinger "Klingersil C4400," or equal.

D. Buna-N (nitrile).

2.08 RUBBER SEATS

Rubber seats shall be made of a rubber compound that is resistant to free chlorine and monochloramine concentrations up to 10 mg/L in the fluid conveyed.

2.09 VALVES

A. Resilient Seated Gate Valves, 4-inch through 10-inch:

1. Valves shall have a wedge-type resilient seat with the gate fully encapsulated in peroxide-cured EPDM rubber.

2. Valves shall be designed for a minimum working pressure of 200 psi.

3. Valves shall comply with AWWA C509 and the following. Valves shall be of the bolted-bonnet type with non-rising stems. Valve stems shall be Type 304 or 316 stainless steel or cast, forged, or rolled bronze. Provide operating nut for buried valves. Provide handwheel for exposed valves. Stem nuts shall be made of solid bronze. Bronze for internal working parts, including stems, shall not contain more than 2% aluminum or more than 7% zinc. Bronze shall conform to ASTM B62 or ASTM B584 (Alloy C83600), except the stem bronze shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 30,000 psi, and a minimum of 10% elongation in 2 inches (ASTM B584 or B763, Alloy C87600 or C99500). Body bolts shall be Type 316 stainless steel.

4. Provide reduction thrust bearings above the stem collar. Stuffing boxes shall be O-ring seal type with two rings located in stem above thrust collar. Each valve shall have a smooth unobstructed waterway free from any sediment pockets.

5. Manufacturers: Mueller, Clow, or approved equal.

B. Butterfly Valves 4-inch and larger:

1. Butterfly valves shall be short body, flanged type, conforming to AWWA C504, Class 150B, except as modified herein.

2. Minimum working differential pressure across the valve disc shall be 150 psi. Flanged ends shall be Class 125, ASME B16.1.

3. Provide thrust bearings to hold the valve disc in the center of the valve seat. No bearings shall be mounted inside the valve body within the waterway. Do not use thrust bearings in which a metal bearing surface on the disc rubs in contact with an opposing metal surface on the inside of the body.

4. Bronze Components in Butterfly Valves:

   Bronze components in contact with water shall comply with the following requirements:

Constituent	Content
Zinc	7% maximum
Aluminum	2% maximum
Lead	Lead-Free in accordance with NSF/ANSI 372
Copper + Nickel + Silicon	83% minimum

5. Port Sizes for Butterfly Valves:

   For valves 24 inches and smaller, the actual port diameter shall be at least 93% of the nominal valve size. For valves larger than 24 inches, the port diameter shall not be more than 1.25 inches smaller than the nominal valve size. The dimension of the port diameter shall be the clear waterway diameter plus the thickness of the rubber seat.

6. Perform factory leakage tests per AWWA C504 on both sides of the seat.

7. Valve shafts shall be stub shaft or one-piece units extending completely through the valve disc. The rubber valve seats shall be secured to or retained in the valve body.

8. Materials of construction shall be as follows:

Component	Material	Specification
Body	Ductile Iron	ASTM A536, Grade 65-45-12
Exposed exterior body cap screws and bolts and nuts	Stainless Steel	ASTM A276, Type 316
Disc	Stainless Steel Ductile Iron	Type 316 ASTM A536, Grade 65-45
Shafts	Class 150 - Stainless Steel Class 250 – Stainless Steel	Type 304 or Type 316 Type 17-4
O-Rings	Synthetic Rubber	ASTM D2000
Seat material	EPDM	——

9. Products: Pratt, DeZurik, or approved equal.

C. Ball Valves 3-inch and Smaller:

1. Ball valves shall be used for non-buried valves 3-inch and smaller.

2. Ball valves for water service shall be the three-piece body style and shall be Type 316 stainless steel. Ball valves shall be NSF 61 certified. The minimum design operating pressure rating shall be 300 psi WOG at a temperature of 150° F.

3. Valves shall have plastic coated stainless steel lever actuators with a locking mechanism. Valves shall have full-bore ports, female iron pipe thread screwed ends, and non-blowout stems.

4. Seat and Seals shall be Teflon.

5. Valves shall be Apollo, Stockham, or equal.

D. Plug Valves for Sewer Service:

1. Eccentric plug valves shall comply with AWWA C517 and the following. Provide a 100% port area rectangular plug design, with an associated rectangular seat. Provide bidirectional seating design. The valve shall seat with the rated pressure both upstream and downstream of the closed plug. Provide geared actuators sized for bidirectional operation.

2. The metallic portion of the plug shall be one-piece design and shall be without external reinforcing ribs which result in there being a space between the rib and the main body of the plug through which water can pass. Valves shall be repackable without any disassembly of valve or actuator. The valve shall be capable of being repacked while under the design pressure in the open position. Nowhere in the valve or actuators shall the valve shaft be exposed to iron on iron contact. Sleeve bearings shall be stainless steel. Provide enclosed worm-gear actuators for valves 6 inches and larger.

3. Rubber compounds shall have less than 2% volume increase when tested in accordance with ASTM D471 after being immersed in distilled water at a temperature of 73.4°F ±2°F for 70 hours.

4. Eccentric plug valves, 4 through 12 inches, shall be nonlubricated type. Minimum pressure rating shall be 175 psi. Bodies shall be cast iron per ASTM A126, Class B. Ends shall be flanged, Class 125 per ASME B16.1. Plugs shall be cast iron (ASTM A126, Class B), or ductile iron (ASTM A536, Grade 65-45-12) with Buna-N facing. Valve body seats shall be Type 304 or 316 stainless steel or have a raised welded-in overlay at least 1/8-inch thick of not less than 90% nickel. Body cap screws and bolts and nuts shall be Type 316 stainless steel. Packing shall be butadiene-filled Teflon. Provide 100% port area.

5. Valves shall be DeZurik, Val-Matic, or approved equal.

E. Check Valves:

1. Swing check valves, 3 inches and larger, shall be iron body, bronze mounted complying with AWWA C508 with the following materials of construction:

Description	Material	Specification
Disc or clapper seat ring and valve body seat ring	Bronze or brass	ASTM B62 or B584 (Alloy C84400 or C87600)
Body and cap (bonnet)	Cast iron Ductile iron	ASTM A126, Class B ASTM A 536, Grade 65-45-12
Disc and hinge or arm (valves 4 inches and smaller)	Bronze	ASTM B62 or ASTM B584 (Alloy C84400)
Disc and hinge or arm (valves larger than 4 inches)	Cast iron or bronze	ASTM A126, Class B; ASTM B62.
Hinge pin	Stainless steel	Type 303, 304, or 410 stainless
Cover bolts and nuts	Stainless steel	ASTM A193, Grade B8M; ASTM A194, Grade 8M
Internal fasteners and accessories	Bronze or Type 304 or 316 stainless steel	

Bronze or brass components in contact with water shall comply with the following requirements:

Constituent	Content
Zinc	7% maximum
Aluminum	2% maximum
Lead	Lead Free in accordance with NSF/ANSI 372
Copper + Nickel + Silicon	83% minimum

2. Ends shall be flanged, Class 125, ASME B16.1. Minimum valve working pressure shall be 150 psi. Provide check valves with outside lever and spring.

3. Valves shall be M&H Style 259, Clow 1106, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLING VALVES—GENERAL

A. Remove covers over flanged openings and plugs from threaded openings, after valves have been placed at the point to which the valves will be connected to the adjacent piping. Do not remove valves from storage cartons or boxes until they are ready to be installed.

B. Handle valves carefully when positioning, avoiding contact or impact with other equipment, vault or building walls, or trench walls.

C. Clean valve interiors and adjacent piping of foreign material prior to making up valve to pipe joint connection. Prepare pipe ends and install valves in accordance with the pipe manufacturer's instructions for the joint used. Do not deflect pipe-valve joint. Do not use a valve as a jack to pull pipe into alignment. The installation procedure shall not result in bending of the valve/pipe connection with pipe loading.

D. Make sure valve ends and seats are clean. Check exposed bolting for loosening in transit and handling and tighten to manufacturer's recommendations. Open and close the valve to make sure it operates properly and that stops or limit switches are correctly set so that the vane, ball, gate, needle, diaphragm, disc, plug, or other seating element seats fully. Close the valve before installing. Check coatings for damage and repair. Handle valves carefully when positioning, avoiding contact or impact with other equipment or structures.

E. Prior to assembly, coat threaded portions of stainless steel bolts and nuts with lubricant.

3.02 INSTALLING EXPOSED VALVES

A. Unless otherwise indicated in the drawings, install valves in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above the floor with their operating stems vertical. Install valves in horizontal runs of pipe having centerline elevations above 4 feet 6 inches above the floor with their operating stems horizontal.

B. Install valves on vertical runs of pipe that are next to walls with their stems horizontal, away from the wall. Valves on vertical runs of pipe that are not located next to walls shall be installed with their stems horizontal, oriented to facilitate valve operation.

3.03 INSTALLING BURIED VALVES

A. Connect the valve, coat the flanges, apply tape wrapping or polyethylene encasement, and place and compact the backfill to the height of the valve stem.

B. Place block pads under the extension pipe to maintain the valve box vertical during backfilling and repaving and to prevent the extension pipe from contacting the valve bonnet.

C. Mount the upper slip pipe of the extension in mid-position and secure with backfill around the extension pipe. Pour the concrete ring allowing a depression so the valve box cap will be flush with the pavement surface.

3.04 INSTALLING ECCENTRIC PLUG VALVES

A. Unload, store, and install in accordance with AWWA C517, Appendix A and the following. Unload valves carefully to the ground without dropping. On valves larger than 12 inches, use forklifts or slings under skids. On smaller valves, do not lift valves with slings or chain around actuator or through waterway. Lift these valves with eyebolts or rods through flange holes or chain hooks at the ends of valve parts. If it is not practical to store the valve indoors, protect the valve and actuators from weather and the accumulation of dirt, rocks, and debris.

B. Install such that the rotation of the plug is about a horizontal axis. Install such that the plug stores in the top when the valve is open.

C. Orient the valve such that the seat is opposite the high-pressure side.

3.05 ASSEMBLING JOINTS

A. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseat or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

B. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.

C. Install lug-type valves with separate hex head machine bolts at each bolt hole and each flange (two bolts per valve bolt hole).

3.06 MOUNTING GEAR ACTUATORS

The valve manufacturer shall select and mount the gear actuator and accessories on each valve and stroke the valve from fully open to fully closed prior to shipment.

3.07 FIELD INSTALLATION OF GEAR ACTUATOR

Provide the actuator manufacturer's recommended lubricating oil in each actuator before commencing the field testing.

3.08 VALVE FIELD TESTING

A. Test valves for leakage at the same time that the connecting pipelines are hydrostatically tested. See Section 400515 for pressure testing requirements. Protect or isolate any parts

of valves, actuators, or control and instrumentation systems whose pressure rating is less than the pressure test. Valves shall show zero leakage. Repair or replace any leaking valves and retest, as required.

B. Operate manual valves through three full cycles of opening and closing. Valves shall operate from full open to full close without sticking or binding. Do not backfill buried valves until after verifying that valves operate from full open to full closed. If valves stick or bind, or do not operate from full open to full closed, repair or replace the valve and repeat the tests.

C. Gear actuators shall operate valves from full open to full close through three cycles without binding or sticking. The pull required to operate handwheel operated valves shall not exceed 80 pounds. The torque required to operate valves having 2-inch AWWA nuts shall not exceed 150 ft-lbs. If actuators stick or bind or if pulling forces and torques exceed the values stated previously, repair or replace the actuators and repeat the tests. Operators shall be fully lubricated in accordance with the manufacturer's recommendations prior to operating.

END OF SECTION

SECTION 400775 PIPING IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and installation of markers and for tracer wire.

1.02 SUBMITTALS

A. Submit manufacturer's catalog data and descriptive literature describing materials, colors, letter size, and size of underground warning tape.

B. Submit manufacturer's catalog data and descriptive literature describing materials, gauge, grounds, connectors and related items of tracer wire system.

PART 2 - MATERIALS

2.01 UNDERGROUND NON-DETECTABLE WARNING TAPE - WATER SERVICE

Provide permanent, bright-colored, continuous-printed tape, intended for direct burial service. The tape shall be three-inch (3") wide polyethylene, APWA uniform color coded blue, permanently printed “CAUTION BURIED WATER LINE BELOW”.

2.02 UNDERGROUND NON-DETECTABLE WARNING TAPE - SEWER SERVICE

Provide permanent, bright-colored, continuous-printed tape, intended for direct burial service. The tape shall be three-inch (3") wide polyethylene, APWA uniform color coded green, permanently printed “CAUTION BURIED SEWER LINE BELOW”.

2.03 TRACER WIRE FOR OPEN-TRENCH INSTALLATION

Tracer wire shall be direct burial #12 AWG Solid (0.0808” diameter), steel core soft drawn tracer wire, 250# average tensile break load, 30 mil high molecular-high density polyethylene jacket complying with ASTM-D-1248, 30-volt rating. Color shall be “green” for sewer installations and “blue” for water installations. Wire shall be manufactured by Copperhead Industries part number 1230-SF or approved equal.

2.04 TRACER WIRE FOR DIRECTIONAL BORE

Tracer wire shall be direct burial #12 AWG Solid (0.0808” diameter), steel core hard drawn extra high strength horizontal directional drill tracer wire, 1150# average tensile break load, 45 mil high molecular-high density polyethylene jacket complying with ASTM-D-1248, 30-volt rating. Color shall be “green” for sewer installations and “blue” for water installations. Wire shall be manufactured by Copperhead Industries part number 1245-EHS or approved equal.

2.05 TRACER WIRE CONNECTORS

A. Splices along the continuous run of tracer wire for repair of a wire break or replacement of failed segment of wire shall use 3M Brand DBR Direct Bury Splice Kit or approved equal. Approved alternatives must securely connect two or more wires, effectively moisture seal by means of a dielectric non-hardening silicone sealant, manufacturer approved for direct burial and rated for a minimum of 50V.

B. Branch connections for laterals, turnouts, services and appurtenances shall use DryConn Direct Bury Lug Aqua or approved equal. Approved alternatives must securely connect one or two wires to the main tracer wire without cutting the main tracer wire, effectively moisture seal by means of a dielectric non-hardening silicone sealant, manufacturer approved for direct burial and rated for a minimum of 50V.

2.06 TRACER WIRE GROUNDING

Tracer wire shall be properly grounded at all dead ends and stubs. Grounding of tracer wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20 feet of #14 HDPE copper clad wire connected to anode (minimum weight of 1.0 pound) specifically manufactured for this purpose and buried at the same elevation as the utility. The grounding rod shall be Copperhead 1 Lb., Drive-In Magnesium anode (Part #ANO-1005 with Part #SCB-01SR Connector), or equal.

PART 3 - EXECUTION

3.01 INSTALLING UNDERGROUND NON-DETECTABLE PIPE WARNING TAPE

A. Install tape 12 inches above and directly over buried pipelines.

3.02 INSTALLING TRACER WIRE

A. Tracer wire shall be installed in the same trench and inside bored holes with pipe during pipe installation. It shall be secured to the pipe as required to ensure that the wire remains adjacent to the pipe. The tracer wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all tracer wire access points.

B. Except for approved spliced-in repair or replacement connections, tracer wire shall be continuous and without splices from each tracer wire access point.

C. The tracer wire system shall be installed as a continuous single wire. No looping or coiling of wire is allowed.

D. Prior to backfill, install tracer wire on top of pipe and secure in place with ties or hitches at maximum 10-foot intervals. Run tracer wire continuously along pipe and terminate in access points as shown on the drawings. Only adjacent valve boxes or test locations are

acceptable access points. Where buried splices occur, use an electrical splicing kit 3M Brand DBR Direct Bury Splice Kit, or approved equal. Provide no less than 24 inches of coiled wire at access points for attachment of pipe locating equipment. Each installed run of pipe shall be capable of being located using the tracer wire. Protect wire insulation from damage during installation and backfilling. Wire insulation that is broken, cut, or damaged shall be replaced.

E. Tracer wire shall be laid flat and securely affixed to the pipe at the three o'clock position. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted.

F. At the termination of waterline or force mains the end of the tracer wire shall be spliced to the wire of a six-pound zinc anode and is to be buried at the same elevations as the pipeline. The tracer wire from the end cap shall be brought into a surface test station box within the public right-of-way for future access.

G. Branch connection tracer wire shall be a single tracer wire properly spliced to the main line tracer wire. DryConn Direct Bury Lug Aqua watertight connectors, or approved equal, shall be used to provide electrical continuity.

H. For directional boring installations, two #12 tracer wires, listed above, shall be installed with the pipe and connected to the tracer wire at both ends, or cad welded to the existing iron pipe at both ends. The two tracer wires shall be laid flat and securely affixed to the top and three o'clock side of the pipeline at five-foot (5') intervals to ensure its placement during the boring operation.

3.03 TRACER WIRE TESTING

After all of the trench backfill operations are successfully completed, and prior to the final paving, the Contractor shall perform continuity and trace tests on all tracer wire in the presence of the District. If the tracer wire is found to be not continuous after testing, the segment of wire shall be repaired or replaced.

END OF SECTION

SECTION 402040 DUCTILE-IRON PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

This section describes materials, testing, and installation of ductile-iron pipe and fittings 24 inches and smaller.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Painting and Coating: 099000.

B. Cold-Applied Wax Tape Coating: 099752.

C. Polyethylene Sheet Encasement (AWWA C105): 099754.

D. Trenching, Backfilling, and Compacting: 312316.

E. Disinfection of Piping: 331300.

F. General Piping Requirements: 400500.

G. Pressure Testing of Piping: 400515.

H. Piping Identification: 400775.

1.03 SUBMITTALS

A. Provide an affidavit of compliance with standards referenced in this specification, e.g., AWWA C151. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in AWWA C153, Section 5.5 is met.

B. Provide the following information:

1. Mortar lining thickness.

2. Wall thickness.

3. Show deflections at push-on and mechanical joints.

4. Submit joint and fitting details and manufacturer’s data sheets.

C. Submit certificate that cement for mortar lining complies with ASTM C150, designating type.

D. Submit test report on physical properties of rubber compound used in the gaskets.

E. Submit drawing or manufacturer's data sheet showing flange facing, including design of facing serrations.

PART 2 - MATERIALS

2.01 PIPE

Pipe shall be cast ductile (nodular) iron, conforming to AWWA C151.

2.02 PIPE MARKING

A. Each joint of DIP shall be clearly marked with the following information by the pipe manufacturer:

1. Weight.
2. Class (per AWWA C150) or nominal thickness.
3. Casting period.
4. Manufacturer’s mark.
5. Country where cast.
6. Year cast.
7. The letters “DI” or “DUCTILE”

B. Mark the spigot end of restrained joint pipe to show clearly the required depth of insertion into the bell

2.03 PIPE WALL THICKNESS

A. Minimum wall thickness for pipe having push-on or mechanical joints, restrained joints, plain ends, or cast flange ends shall be determined by the procedures outlined in AWWA C150. Minimum internal design pressure shall be 150 psi plus an “anticipated surge pressure” of 100 psi. Owner’s Engineer to submit calculations to District for approval.

2.04 FITTINGS

A. Fittings 24 inches and smaller shall conform to AWWA C110 with a minimum pressure rating of 350 psi. Flanges shall be flat faced.

B. Mechanical joint fittings conforming to AWWA C153 may be used in lieu of AWWA C110 fittings.

C. Material for fittings with welded-on bosses shall have a Charpy notch impact value of minimum 10 ft-lbs under the conditions defined in AWWA C151. Test completed welds by the liquid penetrant method per ASTM E165.

2.05 FLANGES

A. Flanges shall be solid back, Class 125 per AWWA C115. Flanges on pipe shall be either cast or threaded. Material shall be ductile iron.

B. Flanged pipe and fittings shall be shop fabricated, not field fabricated. Threaded flanges shall comply with AWWA C115. Flanges shall be individually fitted and machine tightened in the shop, then machined flat and perpendicular to the pipe barrel. Flanges shall be back-faced parallel to the face of flange. Prior to assembly of the flange onto the pipe, apply a thread compound to the threads to provide a leak-free connection. There shall be zero leakage through the threads at a hydrostatic test pressure of 250 psi without the use of the gasket.

2.06 PIPE LINING - CEMENT MORTAR

A. Line pipe interior and fittings for water service with cement-mortar per AWWA C104.

B. Cement mortar for pointing inferior joints shall consist of one part cement to one- and one-half parts of washed plaster sand conforming to ASTM C35 mix with the minimum amount of water which will permit placing the mortar.

C. Maintain a moist environment inside the lined pipe and fittings by sealing the ends with polyethylene sheet.

D. Loose areas of cement-mortar lining are not acceptable. Remove and reconstruct lining in areas where quality is defective, such as sand pockets, voids over sanded areas, blisters, drummy areas, cracked areas, and thin spots. Repair longitudinal cracks in excess of 1/32 inch in width or where crack extends to metal with epoxy. Repair all cracks larger than 1/16 inch with epoxy.

2.07 PIPE LINING - SEWER SERVICE

Pipe lining for use in sewer service such as sewage pump stations and force mains shall be a ceramic epoxy system. System shall be Protecto 401 by Induron Protective Coatings or approved equal.

2.08 GASKETS FOR FLANGES

See Section 400500.

2.09 GASKETS FOR MECHANICAL, PUSH-ON, AND RESTRAINED JOINTS

Gaskets for mechanical joints shall conform to the requirements of AWWA C111 with duck tips and backs.

2.10 BOLTS AND NUTS FOR FLANGES

See Section 400500.

2.11 JOINTS

A. Joints in aboveground or submerged piping or piping located in vaults and structures shall be flanged unless otherwise shown.

B. Joints in buried piping shall be of the push-on or mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment. Provide unrestrained buried joints except where restrained joints are specifically shown in the drawings or Standard Details.

C. Restrained joints for piping 6 inches and larger shall be American Cast Iron Pipe "Lok-Ring" or "Flex-Ring," U.S. Pipe "TR-Flex," or equal. Weldments for restrained joints shall be tested by the liquid penetrant method per ASTM E165. Restrained joints for field closures shall be “Megalug” by EBAA Iron.

2.12 MECHANICAL JOINT RESTRAINT SYSTEM USING FOLLOWER RING AND WEDGES

The restraining mechanism shall consist of a follower gland having a seal gasket and individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The system manufacturer shall provide all the components (follower ring, wedges, and gaskets) for the restraining device. The device shall be capable of full mechanical joint deflection during assembly, and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be constructed of ductile iron conforming to ASTM A536, Grade 60-42-10. The wedges shall be ductile iron, heat-treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with mechanical joint bells conforming to AWWA C111 and AWWA C153. The design shall use torque limiting twist-off nuts to provide actuation of the restraining wedges. The mechanical joint restraint shall be available in the size range of 3 through 24 inches. Minimum rated pressure shall be 350 psi for sizes 16 inches and smaller and 250 psi in sizes 18 inches and larger. Products: Megalug Series 1100 as manufactured by EBAA Iron, Inc., or equal.

PART 3 - EXECUTION

3.01 DELIVERY, UNLOADING, AND TEMPORARY STORAGE OF PIPE AT SITE

A. Use unloading and installation procedures that avoid cracking of the lining. If necessary, use plastic sheet bulkheads to close pipe ends and keep cement-mortar lining moist.

B. Deliver the pipe alongside the pipelaying access road over which the pipe trailer-tractors can travel under their own power. Place the pipe in the order in which it is to be installed and secure it from rolling.

C. Do not move pipe by inserting any devices or pieces of equipment into the pipe barrel. Field repair linings damaged by unloading or installation procedures.

3.02 SANITATION OF PIPE INTERIOR

A. During laying operations, do not place tools, clothing, or other materials in the pipe.

B. When pipelaying is not in progress, close the ends of the installed pipe.

3.03 INSTALLING FLANGED PIPE AND FITTINGS

Install in accordance with Section 400500. Cut the bore of the gaskets such that the gaskets do not protrude into the pipe when the flange bolts are tightened.

3.04 INSTALLING GROOVED-END PIPE AND FITTINGS

See Section 400500.

3.05 INSTALLING BURIED PIPING

A. Install in accordance with AWWA C600, Section 312316, and as follows.

B. Thrust restraint may be provided by the use of concrete thrust blocks or restrained joints. Acceptable joint restraint devices include special joint designs that are standard products of domestic manufacturers. If restrained joints are to be used, the Owner shall submit to the District for review and approval information of the type of joint proposed along with calculations for the number of joints to be restrained on each side of a fitting or valve. The type of joint and number of joints of to be restrained at each location shall be shown on the Plans.

C. If concrete thrust blocks are to be used, they shall be called out on the Plans at each point needed. Thrust blocks shall be constructed of concrete containing six sacks of cement per cubic yard and placed between the fitting to be anchored and undisturbed earth. The bearing area against undisturbed earth shall be called out on the Plans at each location a thrust block is required. The concrete shall be placed so that pipe joints and fittings will be accessible for repairs.

D. For all field cut-to-fit joints, do not stress or deflect the pipe when mating pipe ends.

3.06 JOINT DEFLECTIONS FOR BURIED PIPE

A. Do not exceed the following deflection angles for unrestrained buried pipe joints:

Pipe Size (inches)	Maximum Deflection (degrees)	
	Push-On Joint	Mechanical Joint
4	4	6 1/2
6	4	5 1/2
8	4	4
10	4	4
12	4	4
14	2 1/2	3
16	2 1/2	3
18	2 1/2	2 1/2
20	2 1/2	2 1/2
24	2 1/2	2

B. For restrained joints, do not exceed 80% of the manufacturer's recommended maximum deflections.

C. Curved alignments are allowable without the need for fittings provided the maximum deflection at a pipe joint does not exceed 5 degrees for pipe equal to or less than 12-inches in diameter or 3 degrees for pipe 14 through 18 inches in diameter (in no case shall deflections at pipe joints exceed manufacturer's recommendations). Deflecting pipe joints is allowable only for push-on or mechanical jointed pipe.

D. Assemble joints in accordance with AWWA C600 and the manufacturer's recommendations.

3.07 INSTALLING ABOVEGROUND OR EXPOSED PIPING

See Section 400500.

3.08 PAINTING AND COATING

A. Furnish exposed pipe located above ground and in vaults and structures without standard asphaltic coating. Exposed pipe shall be shipped to site with factory primer compatible with finish coating system. Applying coatings over asphaltic coatings is not allowed.

B. Coat pipe located above ground and in vaults and structures per Section 099000.

C. Provide asphaltic coating on buried pipe per AWWA C151.

3.09 WRAPPING BURIED PIPE AND FITTINGS

Wrap buried pipe and fittings with wax tape per Section 099752 and polyethylene per Section 099754.

3.10 CLEANING PIPE

After interior joints have been pointed and mortar has hardened, sweep pipe clean of all dirt and debris. If hardened mud exists in the pipe, remove with the use of pressurized water hoses.

3.11 FIELD HYDROSTATIC TESTING

Test in accordance with Section 400515.

3.12 BURIED WARNING AND IDENTIFICATION TAPE

Provide warning tape per Section 400775.

END OF SECTION

SECTION 402092 PVC DISTRIBUTION PIPE (AWWA C900)

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials, installation, and testing of AWWA C900 polyvinyl chloride (PVC) pipe (rubber-ring gasket bell end or plain end with elastomeric gasket coupling) manufactured for use in potable water service for pipe up to 12-inches in diameter. If larger diameter pipe is required, PVC pipe may be used if approved in writing by the District.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Painting and Coating: 099000.

B. Cold-Applied Wax Tape Coating: 099752.

C. Polyethylene Sheet Encasement (AWWA C105): 099754.

D. Trenching, Backfilling, and Compacting: 312316.

E. Disinfection of Piping: 331300.

F. General Piping Requirements: 400500.

G. Pressure Testing of Piping: 400515.

1.03 SUBMITTALS

A. Submit affidavit of compliance with AWWA C900.

B. Submit certification that the PVC compounds and products have been tested by an accredited testing agency acceptable to the District for chemical extractants and are suitable for potable-water service. The basis of certification shall be the requirements specified in NSF/ANSI 61.

C. Submit manufacturer's instruction for joining of pipe.

PART 2 - MATERIALS

2.01 PIPE

A. Polyvinyl chloride (PVC) pipe manufactured for use in potable water service which conforms to Class 235 (minimum) as described in AWWA C900 for pipe up to 12-inches diameter. The class of pipe used shall be determined by the procedures

outlined in AWWA C900 with a working pressure of 150 psi and an occasional surge pressure of 100 psi.

B. Only elastomeric gasket jointed PVC pipe shall be used. Either the integral bell design or the separate sleeve-type coupling joint may be used. Gaskets shall meet the requirement of AWWA C900. Oil resistant gaskets may be required in some instances by the District. PVC pipe may not be used in areas subject to contamination by petroleum distillates

2.02 FITTINGS

A. Fittings shall conform to AWWA C110 with a minimum pressure rating of 350 psi. Size bells specifically for outside diameter of cast-iron equivalent PVC pipe including rubber-ring retaining groove.

B. Ductile iron fittings conforming to AWWA C153 ("compact fittings") may be used where restrained joint fittings and pipe are used to resist thrust instead of concrete thrust blocks and is subject to approval by the District. "Compact fittings", if used, shall be cement mortar lined in accordance with AWWA C104 for water service.

C. Fittings shall be rubber ring, hub end, suitable for direct connection to the mating PVC pipe except when connecting to a valve. Valves and fittings shall be flanged together.

D. Flanges shall conform to the bolt circle and bolt hole dimensions for flanges in AWWA C110.

E. Mechanical joint fittings conforming to AWWA C153 may be used in lieu of AWWA C110 fittings.

2.03 LINING AND COATING FOR FITTINGS

A. For water service provide cement-mortar lined fittings per AWWA C104.

B. For sewer service pipe lining shall be a ceramic epoxy system. System shall be Protecto 401 by Induron Protective Coatings or approved equal.

2.04 FLANGES

Flanges on outlets of fittings shall be Class 125 per ASME B16.1. Flanges shall conform to the bolt circle and bolt hole dimensions for flanges in AWWA C110.

2.05 GASKETS FOR FLANGES

See Section 400500.

2.06 BOLTS AND NUTS FOR FLANGES

See Section 400500.

2.07 RESTRAINED JOINTS

Provide restrained joints where indicated in the drawings or Standard Details. Restrained joints shall be provided by restraining systems that incorporate a series of machined serrations on the inside diameter of a restraint ring to provide positive restraint. Restraining systems shall meet or exceed the requirements of UNI-B-13-94 and ASTM F1674 and the following:

A. Restraint devices for bell-and-spigot joints shall consist of a split restraint ring installed on the spigot, connected to a solid backup ring seated behind the bell.

B. Restraint devices for connection to ductile-iron mechanical joints shall consist of a split restraint ring installed behind the ductile-iron fitting follower gland and gasket and shall retain the full deflection capability of the joint.

C. The split restraint ring shall be machined to match the outside diameter of the pipe, provide full 360-degree support around the barrel of the pipe, and shall incorporate a series of machined serrations for gripping the outside surface of the pipe. The serrations shall be uniform and extend the full circumference of the clamp. The ring shall also incorporate a positive means of avoiding applying excessive clamping force to the pipe.

D. Materials used in the restraint device shall be ductile iron conforming to ASTM A536, Grade 60-42-12 or 65-45-12.

E. T-bolts, studs, and connecting hardware shall be high-strength, low alloy material in accordance with AWWA C111.

F. Design restraining devices to have a 2:1 safety factor based on the design strength of the pipe.

G. Restraining devices shall be UNI-Flange Block Buster Series 1300 or 1500, EBAA Iron Series 1600, or equal.

PART 3 - EXECUTION

3.01 PRODUCT MARKING

Each standard length of PVC, pipe and coupling if separate sleeve-type couplings are used, shall be marked at intervals of not more than 5-feet with the nominal diameter, the OD base (cast iron pipe OD base is required), the material code (PVC), the dimension ratio (DR) number, AWWA pressure class (for example, PC 165), test pressure for hydrotested pipe (for example, T330) or if not tested, “NOT HYDROSTATIC PROOF TESTED.”, AWWA Standard (i.e., ANSI/AWWA C900), the manufacturer’s name or trademark and production run record or lot code, and seal (mark) of the testing agency that verified the suitability of the pipe material for potable water service.

3.02 DELIVERY AND TEMPORARY STORAGE OF PIPE

A. Ship, store, and place pipe at the installation site, supporting the pipe uniformly. Avoid scratching the pipe surface. Do not stack higher than 4 feet or with weight on bells. Cover to protect from sunlight.

B. PVC pipe with noticeable color changes resulting from exposure to ultraviolet light may be rejected at the discretion of the District.

C. Do not install pipe that is gouged or scratched forming a clear depression.

3.03 PIPE LAYOUT FOR CURVED ALIGNMENT

Unless a separate sleeve-type coupling jointed pipe is used, the manufacturer of which recommends deflecting pipe at the joints to follow a curved alignment, deviations from a straight pipeline alignment shall be made only by use of cast iron fittings, or pipe couplings with District approval. Bending of PVC pipe will not be permitted. Joining of pipe shall be in accordance with the manufacturer's printed instructions, which shall be furnished to the District. Fittings shall be supported independently of the pipe. Five-foot lengths of pipe shall be used in and out of each fitting and valve and wherever pipe passes through a rigid structure

3.04 HANDLING PIPE

Hoist pipe with mechanical equipment using a cloth belt sling or a continuous fiber rope that avoids scratching the pipe. Do not use a chain. Pipes up to 12 inches in diameter may be lowered by rolling on two ropes controlled by snubbing. Pipes up to 6 inches in diameter may be lifted by hand.

3.05 INSTALLING BURIED PIPING

A. Install in accordance with AWWA C605, Section 312316, and as follows.

1. Backfill materials in the pipe zone shall be imported sand per Section 312316.

2. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.

3. Compact trench backfill to the specified relative compaction. Do not float pipe. Do not use high-impact hammer-type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.

4. Insulated tracer wire shall be placed immediately above all PVC pipe and service laterals per Section 400775.

5. In addition to the tracer wire, non-detectable warning tape shall be placed above the pipe and tracer wire per Section 400775.

6. At times when pipe laying is not in progress, the open end of pipes shall be sealed temporarily to prevent the entry of water, debris, small animals, and similar types of contamination.

3.06 ASSEMBLY OF PIPE JOINT

A. The spigot and bell or bell coupling shall be dirt free and slide together without displacing the rubber ring. Lay the pipe section with the bell coupling facing the direction of laying.

B. Insert the rubber ring into the groove in the bell in the trench just before joining the pipes. First clean the groove. Observe the correct direction of the shaped ring. Feel that the ring is completely seated.

C. Lubricate the spigot over the taper and up to the full insertion mark with the lubricant supplied by the pipe manufacturer. If the lubricated pipe end touches dirt, clean the pipe end and reapply lubricant.

D. Insert the spigot into the bell and force it slowly into position.

E. Check that the rubber ring has not left the groove during assembly by passing a feeler gauge around the completed joint.

3.07 WRAPPING FITTINGS AND RESTRAINED JOINT DEVICES

Wrap buried cast-iron fittings and restrained joint devices with wax tape per Section 099752 and polyethylene per Section 099754.

3.08 FIELD HYDROSTATIC TESTING

Test in accordance with Section 400515.

3.09 DISINFECTION

See Section 331300.

END OF SECTION

SECTION 402097 HDPE PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials and testing of PE4710 high-density, very high molecular weight polyethylene pipe and fittings of size 12 inches and smaller for use in piping having a hydrostatic design basis of 1,600 psi and having a maximum operating temperature of 74°F. If larger diameter pipe is required, PVC pipe may be used if approved in writing by the District.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Trenching, Backfilling, and Compacting: 312316.

B. Painting and Coating: 099000.

C. Polyethylene Sheet Encasement (AWWA C105): 099754.

D. General Piping Requirements: 400500.

E. Piping Identification: 400775.

F. Manual Valves: 400520.

G. Pressure Testing of Piping: 400515.

1.03 SUBMITTALS

A. Submit materials list for review. Submit manufacturer's recommended method of installing pipe including methods for butt-fusing joints.

B. Provide certification that the material is listed by the Plastics Pipe Institute in PPI TR-4 with a 73°F hydrostatic design stress rating of 800 psi and a 140°F hydrostatic design stress rating of 400 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D2837 and PPI TR-3 testing and validation of samples of the pipe manufacturer's production pipe.

C. The manufacturer’s certification shall state that the pipe was manufactured from one specific resin in compliance with these specifications. The certificate shall state the specific resin used, its source, and list its compliance to these specifications.

D. Submit certified lab data to verify specified physical properties. Certify that tests are representative of pipe supplied for this project.

E. Submit affidavit of compliance with referenced standards (e.g., AWWA C901, C906, ASTM F714, etc.).

F. Submit recommended locations of flanged joints, unions, shop-fabricated fittings, and connections to other pipe materials. Submit detailed drawings of fittings.

G. Submit installation methods for pipes to be installed in casings.

H. Submit qualification certificates for operators of heat fusion equipment.

I. Submit schedule for placement of and removal of test bulkheads.

PART 2 - MATERIALS

2.01 PIPE

A. Pipe and fittings 4 inches through 12 inches shall conform to AWWA C906 and the following requirements.

B. Pipe shall have a nominal IPS outside diameter.

C. The minimum wall thickness (inches) for pipe 4 inches through 12 inches shall be in accordance with Table 5 of AWWA C906, for the SDR shown in the drawings. If no SDR is shown in the drawings, use an SDR of 11.

D. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index, and other physical properties throughout.

E. Pipe shall have a minimum hydrostatic design basis (HDB) of 1,600 psi, as determined in accordance with ASTM D2837.

F. Pipe Material:

1. Materials used for the manufacture of polyethylene pipe and fittings shall be very high molecular weight, high-density ethylene/hexene copolymer PE 4710 resin meeting the physical property and pipe performance requirements listed below.

Property	Specification	Units	Minimum Values
Material Designation	PPI/ASTM	---	PE4710
Cell Classification	ASTM D3350	---	445574C
Hardness	ASTM D2240	Shore "D"	64
Compressive Strength (Yield)	ASTM D695	psi	1, 150

Property	Specification	Units	Minimum Values
Tensile Strength @ Yield (Type IV Spec.)	ASTM D638 (2"/min)	psi	3,400
Tensile Strength @ Break (Type IV Spec.)	ASTM D638	psi	3,500 psi
Elongation @ Break	ASTM D638	%, min.	700
Brittleness Temp.	ASTM D746	°F	<-103°F
Vicat Soft. Temp.	ASTM D1525	°F	255
NSF Listing	Standard 14	---	"Listed"
*Standard deviation 0.01.			

2. The pipe shall be extruded from pre-compounded resin. In-plant blending of resin is unacceptable.

G. Pipe Identification

The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 5-feet:

1. Name and/or trademark of the pipe manufacturer.

2. Nominal pipe size.

3. Dimension ratio.

4. The letters PE followed by the polyethylene grade in accordance with ASTM D3350.

5. Manufacturing standard reference, e.g. ASTM F714 or D-3035, as required.

6. A production code from which the date and place of manufacture can be determined.

7. Color identification, either striped blue, by co-extruding longitudinal identifiable markings or shall be in solid color.

2.02 FITTINGS

Minimum radius of fabricated elbows shall be 2.5 diameters. The fittings shall be fully pressure rated by the manufacturer to provide a working pressure equal to the pipe for 50 years of service at 73°F with an included 2:1 safety factor. Manufacture the fittings from the same resin type, grade, and cell classification as the pipe. Fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects. The fittings shall be as uniform as practicable in color, opacity, density

and other physical properties. The minimum "quick-burst" strength of the fittings shall not be less than that of the pipe with which the fitting is to be used.

2.03 JOINTS

A. Join sections of polyethylene pipe into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method performed in accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer requirements of 500°F, alignment, and 150-psi interfacial fusion pressure.

B. Butt fusion joining shall result in a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used. Extrusion welding or hot gas welding of HDPE shall not be used. Flanges, unions, grooved-couplers, transition fittings, and some mechanical couplers may be used to connect HDPE pipe mechanically without butt fusion where shown in the drawings and at elbows and tees.

2.04 FLANGES

Flanges shall be steel, conforming to the dimensions of ASME B16.5, Class 150.

2.05 BOLTS, NUTS, AND GASKETS FOR FLANGES

See Section 400500.

2.06 LUBRICANT FOR STAINLESS STEEL BOLTS AND NUTS

See Section 400500.

2.07 TRENCH BEDDING AND BACKFILL MATERIALS

Bedding and backfill materials shall be per Section 312316.

PART 3 - EXECUTION

3.01 SHIPPING, STORAGE, AND HANDLING

A. Limit onsite pipe storage to a maximum of one week.

B. Transport pipe larger than 3 inches to the jobsite on padded bunks with nylon tie-down straps or padded bonding to protect the pipe. Protect the pipe from sharp objects. Anchor pipe securely to prevent slippage.

C. Store pipe larger than 3 inches on earth berms or timber cradles adjacent to the trench. Stack the heaviest series of pipe at the bottom. Do not stack pipe in excess of the following limits:

ALLOWABLE STACKING HEIGHTS FOR STORAGE OF HDPE PIPE		
Nominal Pipe Size (inches)	**Number of Rows High**	
	SDR Above 17	**SDR 17 and Below**
4	15	12
5	6	12
10	6	10
8	8	6
10	6	5
12	5	4

D. When the pipe is received, visually inspect to verify that the correct product was received. Check for damage that may have occurred during transit. Examine for fractures, kinking, deep gouges, or cuts. Remove pipe with gouges or cuts in excess of 10% of the pipe wall thickness.

E. Cover pipe 100% with protective coverings or tarpaulins to prevent deposition of road salts, diesel smoke, fuel residue, and other contaminants in transit.

F. Hook lifting equipment, such as cranes, extension boom cranes, and side boom tractors, to wide web choker slings that are secured around the load or to lifting lugs on the component. Use only wide web slings. Do not use wire rope slings and chains which can damage components. Use spreader bars when lifting pipe or components longer than 20 feet.

G. Unload large fabrications using a wide web choker sling and lifting equipment such as an extension boom crane, crane, or lifting boom. Do not use stub outs, outlets, or fittings as lifting points, and avoid placing slings where they will bear against outlets or fittings.

H. Protect the pipe from stones and sharp objects.

I. Store fittings in their original cartons.

3.02 HANDLING PIPE DURING INSTALLATION

A. Lift pipes with handling beams or wide belt slings near the middle of joints as recommended by the pipe manufacturer. Do not use cable slings, chains, or hooks.

B. Before installation, check pipe and fittings for cuts or scratches exceeding 10% of the pipe wall thickness, gouges, buckling, kinking, or splitting. Remove such defective pipe.

3.03 SANITATION OF PIPE INTERIOR

A. During fusion operations and laying operations, do not place tools, clothing, or other materials in the pipe.

B. When pipelaying is not in progress, including the noon hour, close the ends of the pipe.

3.04 QUALIFICATION OF FUSION OPERATORS

Each operator performing fusion joining shall be qualified in the use of the manufacturer's recommended fusion procedure(s) by the following:

A. Appropriate training or experience in the use of the fusion procedure.

B. Making a sample joint according to the procedure that passes the following inspections and tests:

1. The joint shall be visually examined during and after joining and found to have the same appearance as a photograph or sample of an acceptable joint that was joined in accordance with the procedure; and

2. Test or examine the joint by one of the following methods:

a. Pressure and tensile test as described in 49 CFR 192.283;

b. Ultrasonic inspection and found to be free of flaws that would cause failure; or

c. Cut into at least three longitudinal straps, each of which is:

(a) Visually examined and found to be free of voids or unbonded areas on the cut surface of the joint, and

(b) Deformed by bending, torque, or impact and if failure occurs, it must not initiate in the joint area.

3. Each operator shall be requalified under the procedure, if, during any 12-month period he:

a. Does not make any joints under the procedure; or

b. Has three joints or three percent of the joints he has made, whichever is greater, that are found unacceptable by testing under 49 CFR 192.513.

3.05 HEAT FUSION

A. Comply with ASTM F2620, except as modified below.

B. Use fusion equipment specially designed for heat fusion of HDPE such as offered by McElroy Manufacturing, Inc., or equal. The equipment utilized shall be regulated for the different melt strength materials. Compatibility fusion techniques shall be used when polyethylene of different melt indexes are fused together.

C. Maintain the proper temperature of the heater plate as recommended by the pipe manufacturer. Check it with a tempilstik or pyrometer for correct surface temperature.

D. Clean pipe ends inside and outside with a clean cotton cloth to remove dirt, water, grease, and other foreign materials.

E. Square (face) the pipe ends using facing tool of the fusion machine. Remove burrs, chips, and filings before joining pipe or fittings.

F. Check line-up of pipe ends in fusion machine to see that pipe ends meet squarely and completely over the entire surface to be fused. Make sure the clamps are tight so that the pipe does not slip during the fusion process.

G. Insert clean heater plate between aligned ends and bring ends firmly in contact with plate but do not apply pressure while achieving melt pattern. Allow pipe ends to heat and soften. Approximate softening depths are as follows:

Pipe Size (inches)	**Approximate Melt Bead (inches)**
2 and below	1/16
3 to 5	1/8
6 to 12	3/16

H. Carefully move the pipe ends away from the heater plate and remove the plate (if the softened material sticks to the heater plate, discontinue the joint, clean heater plate, re-square pipe ends, and start over).

I. Bring melted ends together rapidly. Do not slam. Apply enough pressure to form a double roll-back bead to the body of the pipe around the entire circumference of the pipe about 1/8- to 3/16-inch wide. Pressure is necessary to cause the heated material to flow together.

J. Allow the joint to cool and solidify properly. Remove the pipe from the clamps and inspect the joint appearance.

3.06 OPEN TRENCH INSTALLATION

A. Control water in trench per Section 312316.

B. Lay pipes uphill if the grade exceeds 30%.

C. Install in accordance with ASTM F1668, except as modified herein.

1. Excavate to a minimum of 12 inches below the subgrade. Complete excavation to a uniform foundation free of protruding rocks. Complete stabilization of foundation, per Section 312316, then place material specified for the bedding in Section 312316 to bring the trench bottom to grade. Trench bottom shall be continuous, smooth, and free from rocks.

2. Place a minimum 12-inch-thick layer of bedding material in the trench. Compact base to 90% relative compaction.

3. When the pipe is laid in rock cut or shale, excavate the trench at least 6 inches below pipe bottom grade and bring back to grade with compacted bedding per Section 312316. Remove boulders and large stones to avoid point contats and to provide a uniform bed for the pipe.

4. Cut a depression to permit removal of the pipe handling slings. After the pipe has been butt-fused and the joints have set, snake the pipe into the trench per the pipe manufacturer's recommendations in order to allow for thermal expansion and contraction of the pipe.

5. Lower the fused pipe onto the bedding and install it to line and grade along its full length on firm bearing except at the sling depressions. Do not handle pipe at fabricated fittings. Tolerances on grade are 1/4 inch.

6. Consider pull-out forces caused by circumferential as well as longitudinal thermal contraction when flanged and mechanical joints are used. Make provisions for sealing as well as restraining to compensate for the axial loading due to expansion or contraction and/or pipe settlement.

7. Backfill pipe zone immediately after pipe has been bedded and joined. Prevent movement of pipe while backfilling. Carefully place the material around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe or in between stiffening ribs. Backfill material placed under the haunches shall be shovel sliced. Use particular care in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling. Limit un-backfilled, installed pipe to five sections maximum. Avoid extended exposure to sun.

8. Add bedding and backfill material up to the top of the pipe in lifts not exceeding 8 inches at a time. Compact each lift to 90% relative compaction by mechanical or hand tamping. Do not use water flooding or jetting. Do not allow any void spaces beneath or around the pipe.

9. Add a 12-inch layer of bedding and backfill material above the top of the pipe in two 6-inch lifts. Compact each lift to 90% relative compaction.

10. Fill the remainder of the trench in maximum lifts of 12 inches. Compact each layer to 95% relative compaction. Material shall be as specified in Section 312316.

11. Compact by means of vibratory equipment or by hand tamping. Do not add successive layers unless the previous layer is compacted to the specified relative compaction. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.

12. Provide sufficient space along each side of the pipe and the trench wall to observe that the embedment material fills all spaces below pipe spring line under the pipe haunches. Do not allow pipe to float out of position.

3.07 COLD-BENDING OF CURVED SEGMENTS

HDPE may be cold-bent to a minimum radius of no less than 30 times the pipe diameter as it is installed along curved alignment. The minimum bending radius that can be applied to the pipe without kinking it varies with the diameter and wall thickness of the pipe and shall not exceed the recommendations of the manufacturer. If adequate space is not available for the required radius, fuse a fitting of the required angle into the piping system to obtain the necessary change in direction.

3.08 STATIC ELECTRICITY DISCHARGING

A. Static electricity charges are generated on polyethylene pipe by friction, particularly during the handling of pipe in storage, shipping, and installation. The flow of air or gas containing dust or scale will also build up significant static charges, as will the flow of dry materials through the pipe. These charges are a safety hazard, particularly in areas where there is leaking gas or an explosive atmosphere.

B. Plastic pipe is a nonconductor of electricity and the static charge will remain in place until some grounding device comes close enough to allow it to discharge.

C. The discharge of these static electric charges is the responsibility of the Contractor.

D. Do not drag HDPE pipe over the ground, drop it onto the ground, or drop objects on it.

3.09 OPERATIONS INCIDENTAL TO JOINT COMPLETION

A. Install tracer wire per Section 400775.

B. Install metallic warning tape 12-inches above the pipe and per Specification 400775 if installed by open trench method.

C. Plan joint completion to accommodate temporary test bulkheads for hydrostatic testing.

3.10 FLANGED CONNECTIONS

A. Accomplish mechanical joining to other piping materials (fittings, valves, tanks, pumps, etc.) with factory-made flange adapters and steel or ductile-iron backup flanges. Use flanges to connect lengths of HDPE together when heat fusion is impractical.

B. Flange adapters shall be pressure rated the same as the pipe. Flange adapters shall be heat fused to the pipe as outlined in the heat fusion section.

C. Use gaskets between the polyethylene flange adapters when recommended by the HDPE pipe manufacturer. Apply sufficient torque evenly to the bolts to prevent leaks. After initial installation and tightening of flanged connections, allow the connections to set for a few hours. Then conduct a final tightening of the bolts.

D. Lubricate nuts and bolts with oil or graphite prior to installation.

E. Wrap buried flanges, bolts, and metal with the sheet polyethylene film or tape specified for the valves and equipment per Specification 099754. Extend the wrap or tape over the flanges and bolts and secure it around the adjacent pipe circumference with tape.

F. Check operation of valves connected to molded stub end flange adapters. Insert polyethylene spacer if recommended by pipe manufacturer for clearance.

3.11 PLACEMENT OF PIPE IN CASINGS

A. Fuse each section of pipe prior to insertion in casing. Do not injure pipe by dragging or sliding on concrete or asphalt. Use pipeline casing insulators or dollies to move pipe through casing.

B. Block each section of pipe to prevent uplift and to ensure required line and grade. Do not obstruct between rails, where used, and between casing floor to permit filling of all spaces.

3.12 HYDROSTATIC TESTING

A. Prior to hydrostatic testing, all pipelines shall be flushed or blown out using a flushing ball or pig as appropriate. The Contractor shall test all pipelines either in sections or as a unit. No section of the pipeline shall be testing until all field placed concrete or motor has attained an age of 10 days.

B. Perform hydrostatic testing for leakage in accordance with ASTM F2164 and Section 400515. The test period and allowable leakage rate shall be as defined in ASTM F2164, Section 9.

C. Examine exposed pipe or fittings carefully during the leak test for damage. Repair any damaged or defective pipe, fittings, valves, or hydrants discovered during the leak test and repeat the test. During the test period, add makeup water to keep the pressure constant.

D. The total time for initial pressurization and test pressure shall not exceed eight hours at 1.5 times the system pressure rating. If the test is not completed because of leakage, equipment failure, or any other reason within this total time, depressurize the test section and allow the pipe to “relax” for at least eight hours before starting the next testing sequence.

E. Allow the water, pipe, and soil to thermally stabilize. Fill the pipeline, vent the air, and allow the filled pipeline to sit overnight (in above freezing weather) to thermally stabilize.

END OF SECTION

Standard Drawings

TABLE OF CONTENTS
Water Standard Drawings

WATER NOTES

1. THE WATER FACILITIES TO BE DEDICATED TO THE NCSD (DISTRICT) SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT NCSD STANDARD SPECIFICATIONS FOR WATER AND SEWER SYSTEM IMPROVEMENTS. THE OMISSION OF ANY CURRENT STANDARD DETAIL DOES NOT RELIEVE THE CONTRACTOR FROM THIS REQUIREMENT.
2. THE DISTRICT SHALL BE NOTIFIED AT LEAST SEVEN (7) WORKING DAYS PRIOR TO START OF CONSTRUCTION. TELEPHONE (805) 929-1133. CONSTRUCTION WILL NOT TAKE PLACE ON WEEKENDS UNLESS SPECIFICALLY APPROVED BY DISTRICT. A PRECONSTRUCTION MEETING IS REQUIRED IN ACCORDANCE WITH DISTRICT STANDARDS GENERAL CONDITIONS SECTION 3.6.
3. THE CONSTRUCTION PLANS MUST BE APPROVED BY THE DISTRICT PRIOR TO THE START OF ANY WATER FACILITIES CONSTRUCTION. TWO (2) SETS OF APPROVED PLANS SHALL BE FURNISHED TO THE DISTRICT. PRIOR TO DISTRICT APPROVAL, THE PLANS MUST BE SIGNED BY A CALIFORNIA REGISTERED CIVIL ENGINEER. ALL UTILITIES SHALL APPROVE PLANS PRIOR TO NCSD.
4. ALL PIPE, FITTINGS, MATERIALS, AND INSTALLATION SHALL CONFORM TO THE LATEST EDITIONS OF THE AWWA SPECIFICATIONS.
5. PRIOR TO ACCEPTANCE OF THE WATER FACILITIES, ALL NECESSARY EASEMENT DOCUMENTS SHALL BE PROPERLY EXECUTED AND FURNISHED TO THE DISTRICT FOR BOARD APPROVAL PRIOR TO RECORDING.
6. WATER MAINS SHALL BE INSTALLED 5-FEET FROM THE FACE OF CURB UNLESS OTHERWISE INDICATED ON THE PLANS.
7. ALL WATER SERVICES SHALL BE METERED. DISTRICT EMPLOYEES WILL INSTALL METERS.
8. CONTRACTORS WILL COORDINATE ALL TIE-INS OF NEW WATER MAINS TO EXISTING WATER MAINS WITH THE DISTRICT TO MINIMIZE SERVICE INTERRUPTIONS. PROVIDE AT LEAST 2 WORKING DAYS NOTICE PRIOR TO THE TIE-IN. TIE-INS SHALL BE CONDUCTED MONDAY – THURSDAY FROM 10 PM TO 2 AM.
9. THE WATER SYSTEM, INCLUDING LATERALS, SHALL BE HYDROSTATICALLY TESTED PRIOR TO PLACING STREET PAVEMENT, SEE SPECIFICATION SECTION 400515.
10. VALVES SHALL BE FLANGE CONNECTED TO FITTINGS WHEN LOCATED ADJACENT TO FITTINGS.
11. WATER LINES SHALL HAVE A MINIMUM COVER OF 36 INCHES.
12. FITTINGS SHALL BE FLANGED OR MECHANICAL JOINTS.
13. CONTRACTOR SHALL ADJUST VALVE BOXES, FIRE HYDRANT BREAK-OFF FLANGES, METER BOXES, ETC. TO SUBDIVISION FINISH GRADES AFTER CURBS AND GUTTERS, SIDEWALKS, AND STREETS HAVE BEEN CONSTRUCTED AT NO COST TO DISTRICT.
14. WHERE FIRE HYDRANTS ARE INSTALLED OR UPGRADED, THE CONTRACTOR SHALL INSTALL REFLECTORIZED, RAISED PAVEMENT MARKERS (STIMSONITE HYDRANT MARKERS), ALSO COMMONLY CALLED "BLUE DOTS". A TWO PART EPOXY ADHESIVE SHALL BE USED TO INSTALL THE MARKERS.

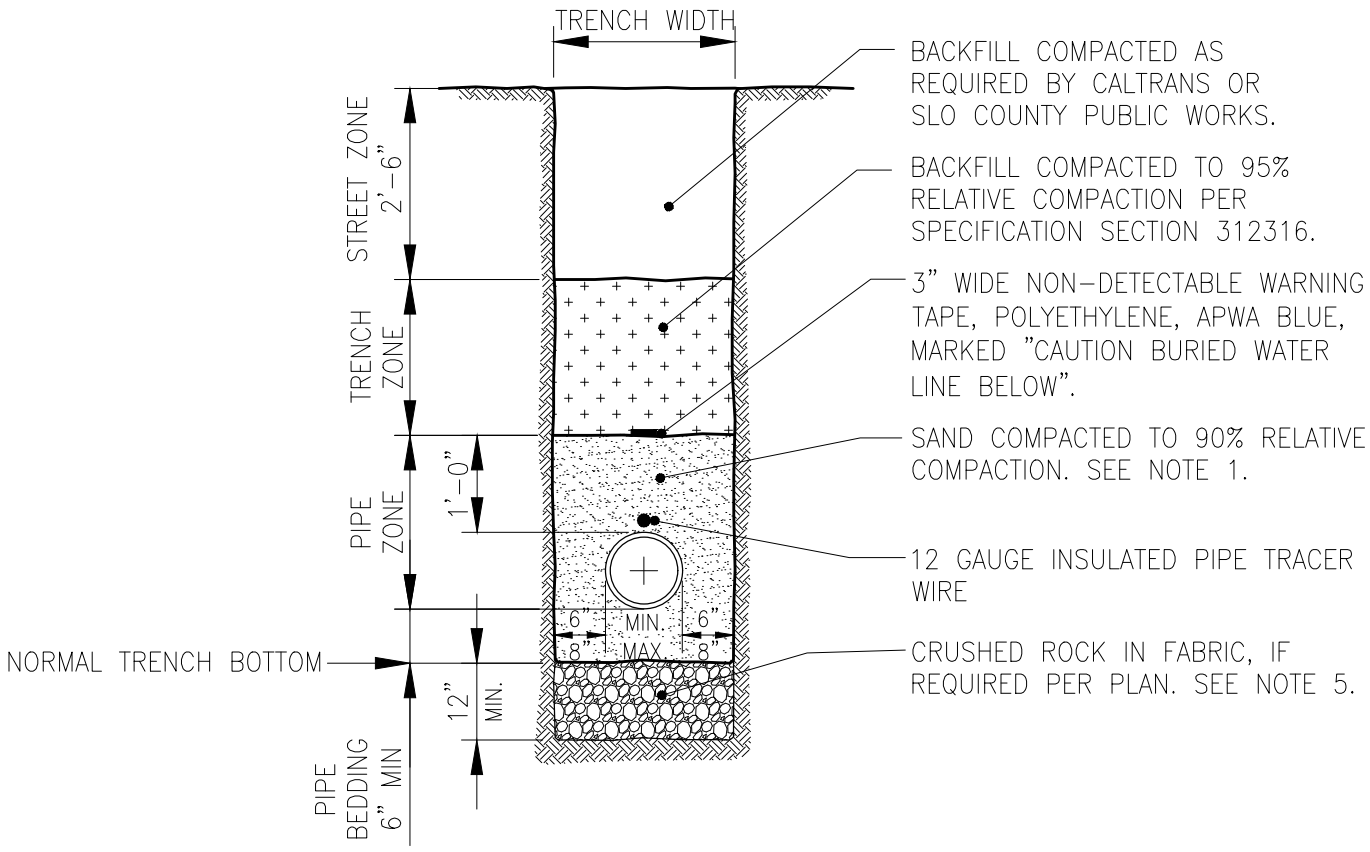
    ONE MARKER SHALL BE INSTALLED PERPENDICULARLY OPPOSITE EACH FIRE HYDRANT, APPROXIMATELY 6-INCHES OFFSET FROM THE CENTERLINE OF THE STREET ON THE HYDRANT SIDE OF THE STREET.
15. SEE DISTRICT'S APPROVED MATERIALS LIST FOR SPECIFIC PARTS.
16. FIRE HYDRANTS, METER BOXES AND BLOWOFFS SHALL BE LOCATED NO CLOSER THAN 5-FEET FROM BEGINNING OF CURB RETURN, DRIVEWAY OR ANY OTHER UTILITY.
17. DURING CONSTRUCTION OF THE IMPROVEMENTS, THE OWNER'S ENGINEER SHALL NOTE DEVIATIONS FROM THE PLANS ON A SET OF PLANS SPECIFICALLY SET ASIDE FOR THIS PURPOSE. ANY CHANGES SHALL BE APPROVED BY THE DISTRICT IN ADVANCE OF THE WORK AND MADE ON THE ORIGINALS OF THE PLANS WITH A SUITABLE NOTE ON EACH SHEET STATING THAT THE ORIGINALS ARE THE "RECORD DRAWINGS".
18. UPON COMPLETION OF CONSTRUCTION, ONE COMPLETE SET OF RECORD DRAWINGS, ALONG WITH ELECTRONIC (AUTOCAD DWG. AND PDF) FILES SHALL BE FURNISHED TO THE DISTRICT.
19. WORK SHALL BE DONE IN ACCORDANCE WITH THE APPROPRIATE ENCROACHMENT PERMITS.
20. DISINFECT PIPELINES PER DISTRICT STANDARDS – DO NOT USE TABLETS, SEE SPECIFICATION SECTION 331300 FOR DISINFECTION OF PIPE.

DATE	REVISION
12/25	MODIFY NOTES #8, 15, 18, AND 20
08/19	MODIFY NOTE #2
05/11	MODIFY NOTE #1

NIPOMO COMMUNITY SERVICES DISTRICT

STANDARD WATER NOTES

DATE DRAWN	STD. NO.
MAY 2011	W-1
	SHEET 1 of 1



NOTES:

1. SAND SHALL BE PER STANDARD SPECIFICATION SECTION 312316.
2. SEE STANDARD SPECIFICATION SECTION 312316 IF TRENCH WIDTH EXCEEDS THE MAXIMUM SHOWN ON THIS DRAWING.
3. SEE STREET IMPROVEMENT PLANS (IF APPLICABLE) FOR PAVING REQUIREMENTS.
4. MINIMUM COVER OVER ALL DISTRIBUTION MAINS TO BE 3'-0" AS MEASURED FROM THE FINISHED GRADE.
5. IF REQUIRED DUE TO UNSUITABLE SUBGRADE MATERIAL, PLACE AT LEAST 12" OF CRUSHED OR NATURAL ROCK PER SPECIFICATION SECTION 312316, COMPACTED TO 95% RELATIVE COMPACTION, FULLY ENCASED IN POLYPROPYLENE, NEEDLE-PUNCHED, NON-WOVEN GEOTEXTILE FABIC.

DATE	REVISION
12/25	REVISED TEXT
08/19	REVISE TEXT
05/11	REVISE BACKFILL REQUIREMENTS

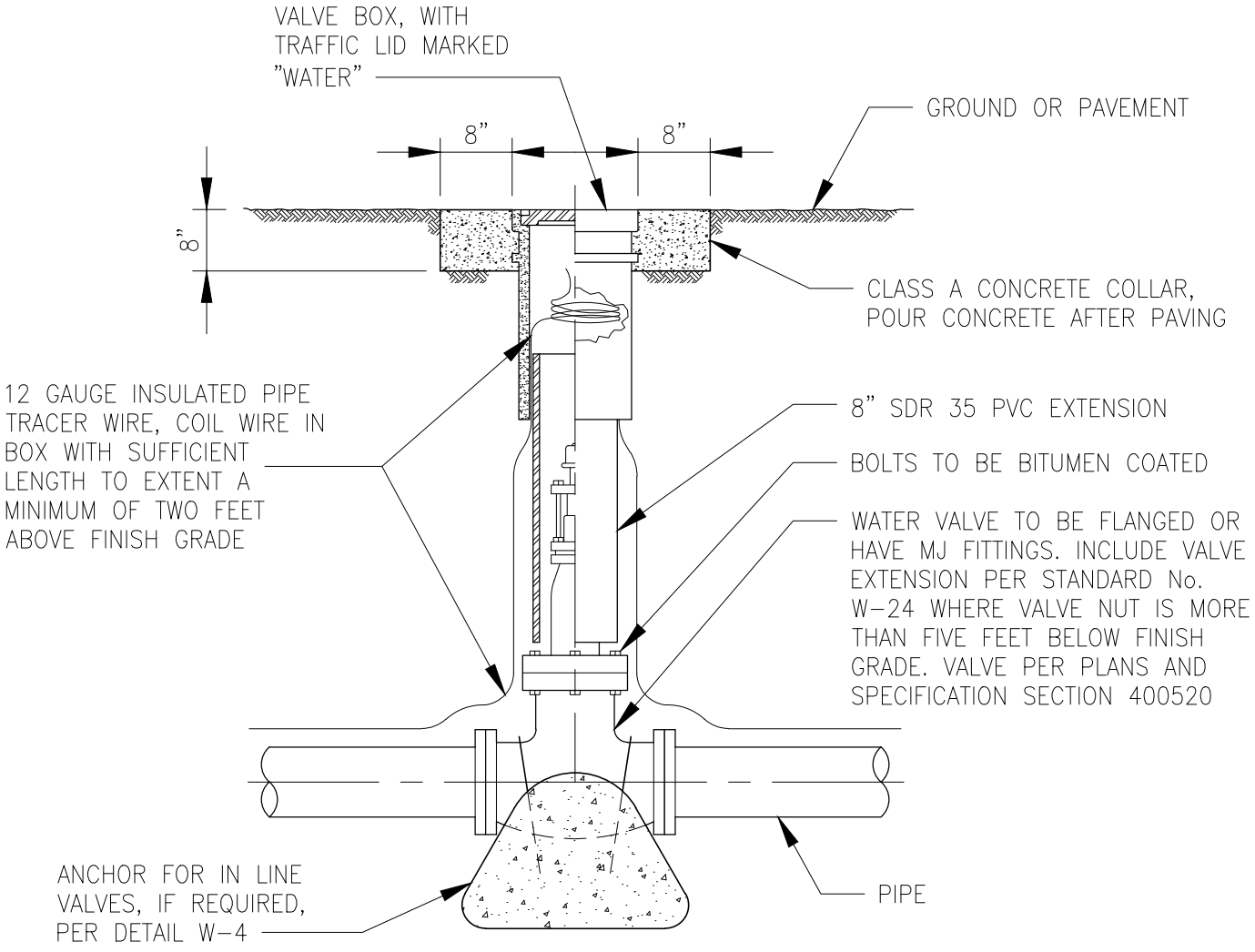
NIPOMO COMMUNITY SERVICES DISTRICT

WATER PIPE BEDDING AND BACKFILL DETAILS

DATE DRAWN: MAY 2011

STD. NO.: W-2

SHEET 1 of 1



SECTION – ELEVATION

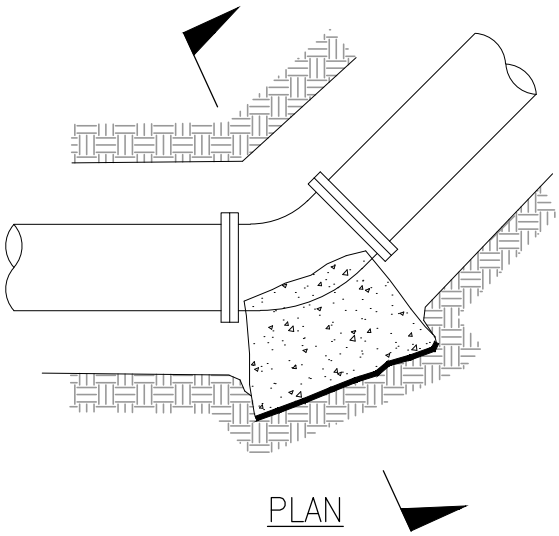
** SEE APPROVED MATERIALS LIST

12/25	REVISED TEXT
07/24	REVISED TEXT AND TRACE WIRE LOCATION
08/19	REVISE TEXT
DATE	REVISION

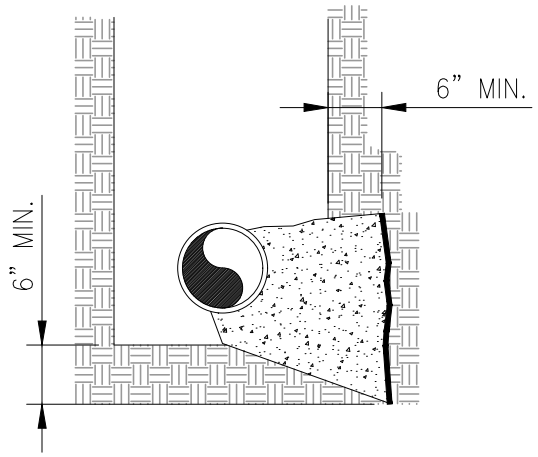
NIPOMO COMMUNITY SERVICES DISTRICT

VALVE BOX ASSEMBLY

DATE DRAWN	STD. NO.
MAY 2011	W-3
	SHEET 1 of 1

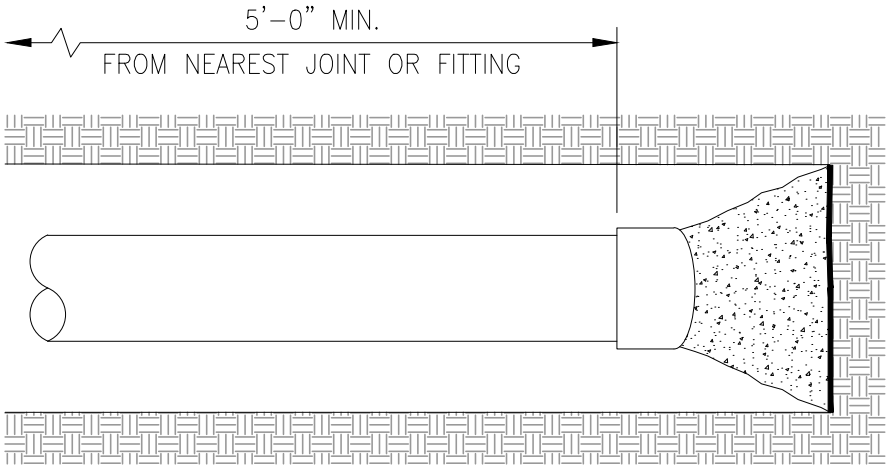


PLAN



SECTION

HORIZONTAL BEND

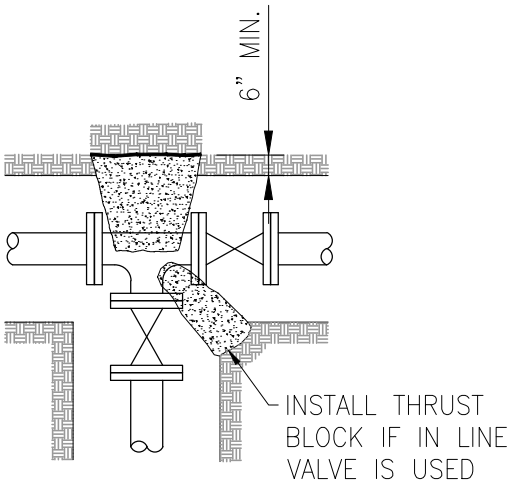


END OF LINE

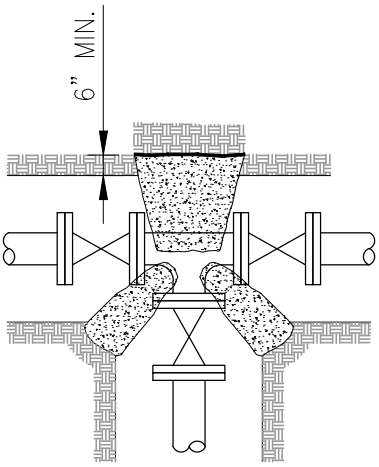
HORIZONTAL BEND THRUST BLOCK										
PIPE SIZE (IN)	11¼° BEND		22½° BEND		45° BEND		90° BEND		END OF LINE	
	AREA (FT^2)	THRUST (LBS)	AREA (FT^2)	THRUST (LBS)	AREA (FT^2)	THRUST (LBS)	AREA (FT^2)	THRUST (LBS)	AREA (FT^2)	THRUST (LBS)
6	1	1,109	2	2,206	4	4,328	8	7,997	61	5,655
8	2	1,971	4	3923	8	7,694	14	14,217	0	10,053
10	3	3,079	6	6,129	12	12,022	22	22,214	16	15,708
12	4	4,434	9	8,826	17	17,312	32	31,989	23	22,620

**NOTE: FOR PIPING SMALLER THAN 6" USE 6" VALUES

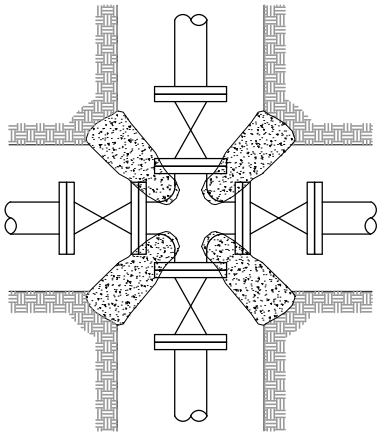
		NIPOMO COMMUNITY SERVICES DISTRICT		
		TYPICAL THRUST BLOCK DETAILS		
DATE	REVISION		DATE DRAWN: DEC. 2025	STD. NO.: W-4 SHEET 1 of 5



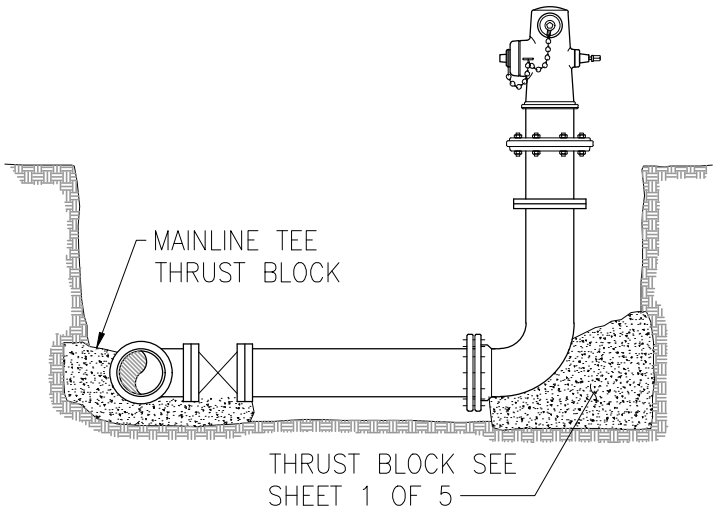
OUTLET OR FIRE HYDRANT



MAINLINE TEE



MAINLINE CROSS

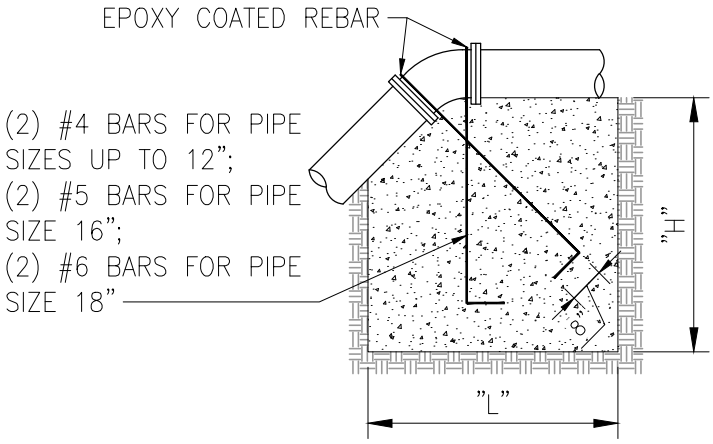


FIRE HYDRANT

TEE OR CROSS THRUST BLOCK						
PIPE SIZE (IN)	OUTLET OR FIRE HYDRANT		MAINLINE TEE		MAINLINE CROSS	
	AREA (FT^2)	THRUST (LBS)	AREA (FT^2)	THRUST (LBS)	AREA (FT^2)	THRUST (LBS)
6	61	7,997	8	5,655	8	5,655
8	0	14,217	14	10,053	14	10,053
10	16	22,214	22	15,708	22	15,708
12	23	31,989	32	22,620	32	22,620

**NOTE: FOR PIPING SMALLER THAN 6" USE 6" VALUES

		NIPOMO COMMUNITY SERVICES DISTRICT		
		TYPICAL THRUST BLOCK DETAILS		
DATE	REVISION		DATE DRAWN: DEC. 2025	STD. NO.: W-4 SHEET 2 of 5

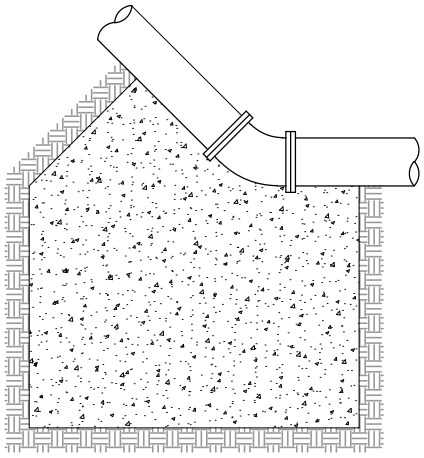


SECTION

UPPER VERTICAL BEND ANCHOR

VERTICAL BEND ANCHOR BLOCK*						
PIPE SIZE (IN)	22 1/2° BEND			45° BEND		
	L,H,W (IN)	VOLUME (YD^2)	THRUST (LBS)	L,H,W (IN)	VOLUME (YD^2)	THRUST (LBS)
6	34	0.8	2,206	42	1.6	2,206
8	41	1.5	3,923	51	2.8	3,923
10	47	2.3	6,129	59	4.4	6,129
12	53	3.3	8,826	67	6.4	8,826

*FOR DUCTILE IRON PIPE, ALL VERTICAL BENDS SHALL BE MECHANICALLY RESTRAINED. SEE NOTE 14 ON SHEET 5 OF 5.

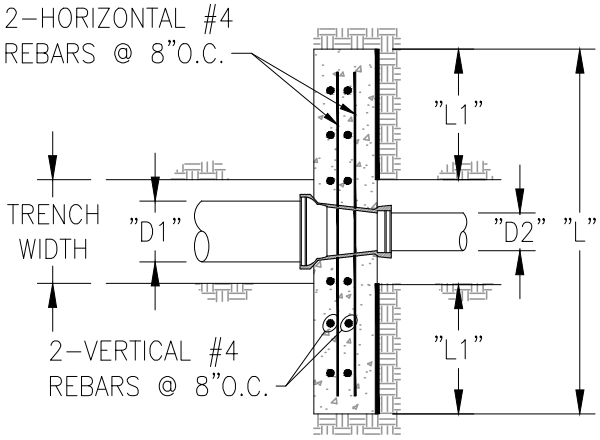


* LOWER VERTICAL BEND THRUST BLOCK TO BE SAME SIZE AS HORIZONTAL BENDS, SEE SHEET 1 OF 5

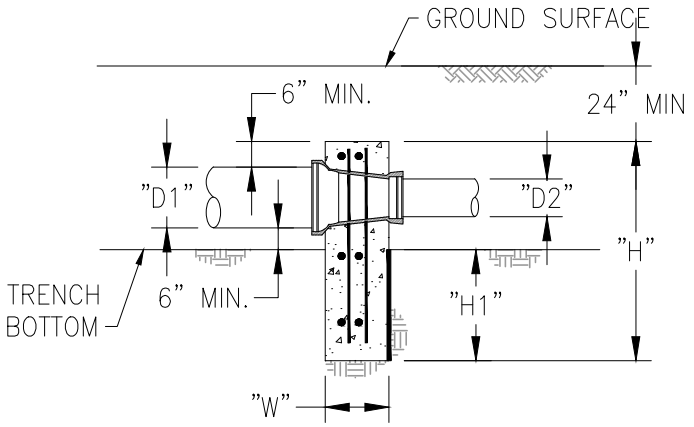
SECTION

LOWER VERTICAL BEND THRUST BLOCK

		NIPOMO COMMUNITY SERVICES DISTRICT		
		TYPICAL THRUST BLOCK DETAILS		
DATE	REVISION		DATE DRAWN: DEC. 2025	STD. NO.: W-4 SHEET 3 of 5



PLAN



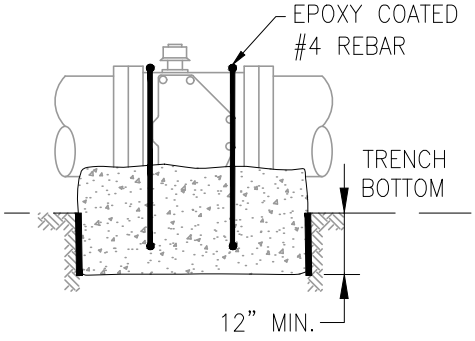
SECTION

THRUST COLLAR									
D1xD2 (IN)	TRENCH WIDTH** (IN)	"L" (IN)	"H" (IN)	"H1" (IN)	"L1" (IN)	"W" (IN)	TOTAL AREA INCLD. TRENCH (FT^2)	MIN. BEARING AREA*** (FT^2)	THRUST (LBS)
6x6	24	38	25	5	7	8	7	6	5,655
8x8	24	48	32	10	12	8	11	10	10,053
10x10	30	62	41	15	16	12	18	16	15,708
12x12	30	72	48	22	21	10	24	23	22,619
12x10	30	52	34	8	11	12	12	7	6,912
12x8	30	62	41	15	16	12	18	13	12,566
12x6	30	68	45	19	19	12	21	17	16,965
12x4	30	72	48	22	21	10	24	20	20,106
10x8	30	48	32	8	9	10	11	6	5,655
10x6	30	56	37	13	13	10	14	10	10,053
10x4	30	62	41	17	16	10	18	13	13,195
8x6	24	42	28	6	9	10	8	4	4,398
8x4	24	48	32	10	12	8	11	8	7,540
6x4	24	38	25	5	7	8	7	3	3,142

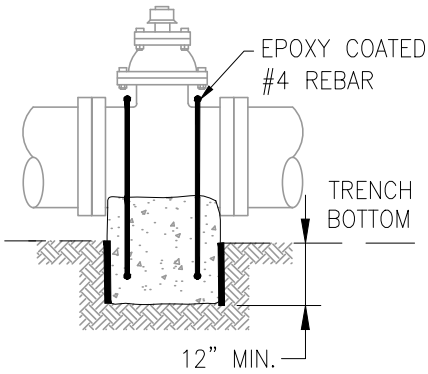
**IF DIFFERENT TRENCH WIDTH IS USED THE THRUST BLOCK SHALL MAINTAIN THE MIN. BEARING AREA SHOWN.
***BEARING AREA REQUIRED ON UNDISTURBED SOIL OUTSIDE OF TRENCH.

		NIPOMO COMMUNITY SERVICES DISTRICT		
		TYPICAL THRUST BLOCK DETAILS		
			DATE DRAWN	STD. NO.
DATE	REVISION		DEC. 2025	W-4
				SHEET 4 of 5

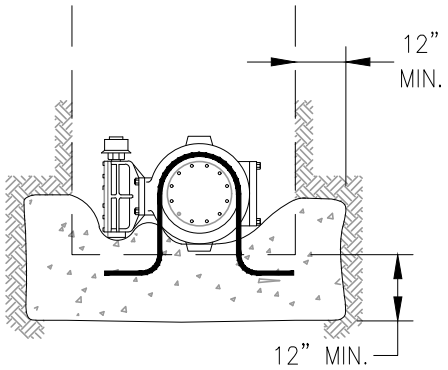
IN LINE VALVES



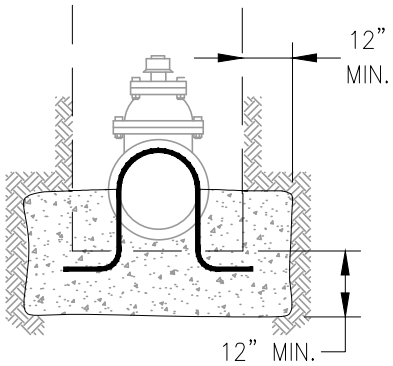
ELEVATION



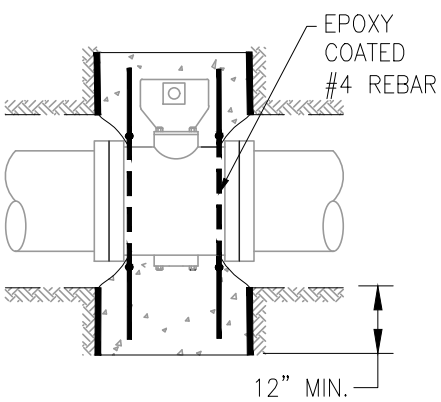
ELEVATION



SECTION

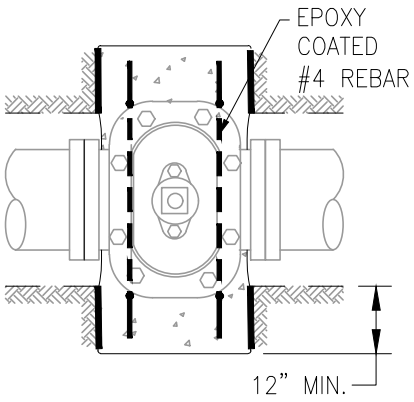


SECTION



PLAN

BUTTERFLY VALVES



PLAN

GATE VALVES

GENERAL THRUST BLOCK NOTES:

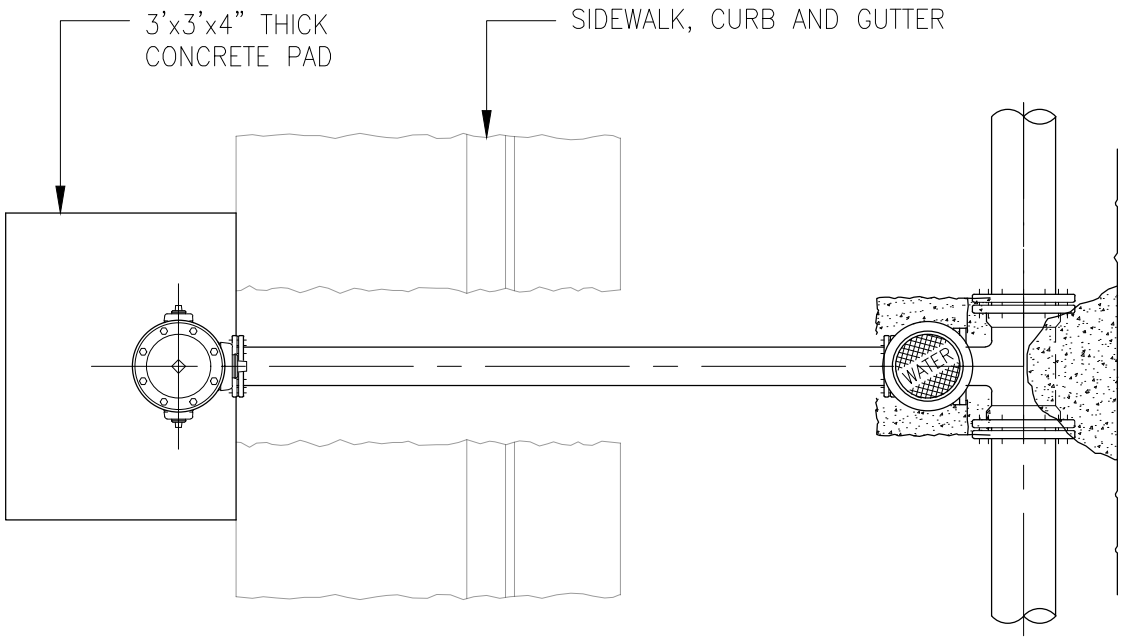
1. THRUST BLOCK BEARING AREA BASED ON ALLOWABLE SOIL BEARING VALUE OF 1500 PSF PRESSURE, 200 PSI LINE PRESSURE WITH 3'–0" COVER MIN., AND A MIN. SAFETY FACTOR OF 1.5. SIZING TO BE ADJUSTED BY PROJECT ENGINEER FOR DIFFERING CONDITIONS.
2. ALL THRUST BLOCKS SHALL BE CLASS A CONCRETE PER SPECIFICATION SECTION 030500 AND PLACED AGAINST UNDISTURBED SOIL.
3. THRUST BLOCKS ON REDUCERS SHALL BE KEYED INTO THE TRENCH BOTTOM AS SHOWN.
4. CONCRETE SHALL NOT EXTEND ONTO FLANGE OR ADJOINING PIPE.
5. DO NOT COVER FITTING BOLTS WITH CONCRETE.
6. WHEN VALVES ARE FLANGED TO FITTINGS, AVOID PLACING CONCRETE ON ANY PART OF THE VALVE BONNET OR VALVE OPERATOR.
7. EPOXY COATED REBAR. WRAP EXTERIOR OF VALVE, ACTUATOR AND REBAR WITH 8 MIL POLYETHYLENE SHEETING AND TAPE.
8. MIN. CONCRETE COVER OVER REBAR SHALL BE 3".
9. NO CONCRETE SHALL BE POURED ON VALVE OR PIPE JOINT.
10. YIELD STRENGTH OF STEEL BARS IS ASSUMED TO BE 36 KSI.
11. FOR PIPELINES LARGER THAN 12" IN DIA., ENGINEER SHALL CALCULATE THRUST BLOCK SIZE BASED ON PROJECT SPECIFIC SOIL CONDITIONS AND SHALL SUBMIT THE CALCULATIONS TO THE DISTRICT FOR APPROVAL.
12. MECHANICAL THRUST RESTRAINTS SHALL BE PROVIDED IN LIEU OF THRUST OR ANCHOR BLOCKS IF THE BEARING FACE OF THE THRUST OR ANCHOR BLOCK MAY BE DISTURBED AT ANY POINT AFTER CONSTRUCTION OR DURING CONSTRUCTION OF OTHER FACILITIES.
13. WHERE MECHANICAL THRUST RESTRAINTS ARE PROVIDED, THE ENGINEER SHALL CALCULATE THE REQUIRED LENGTH OF THRUST RESTRAINT ALONG THE PIPELINE ALIGNMENT AND SHALL SUBMIT THE CALCULATIONS TO THE DISTRICT FOR APPROVAL.
14. DUCTILE IRON PIPE JOINT FITTINGS SHALL BE MECHANICALLY RESTRAINED AT ALL VERTICAL BENDS. VERTICAL BEND ANCHOR BLOCKS SHALL ONLY BE PROVIDED WHERE APPROVED BY DISTRICT.

DATE	REVISION

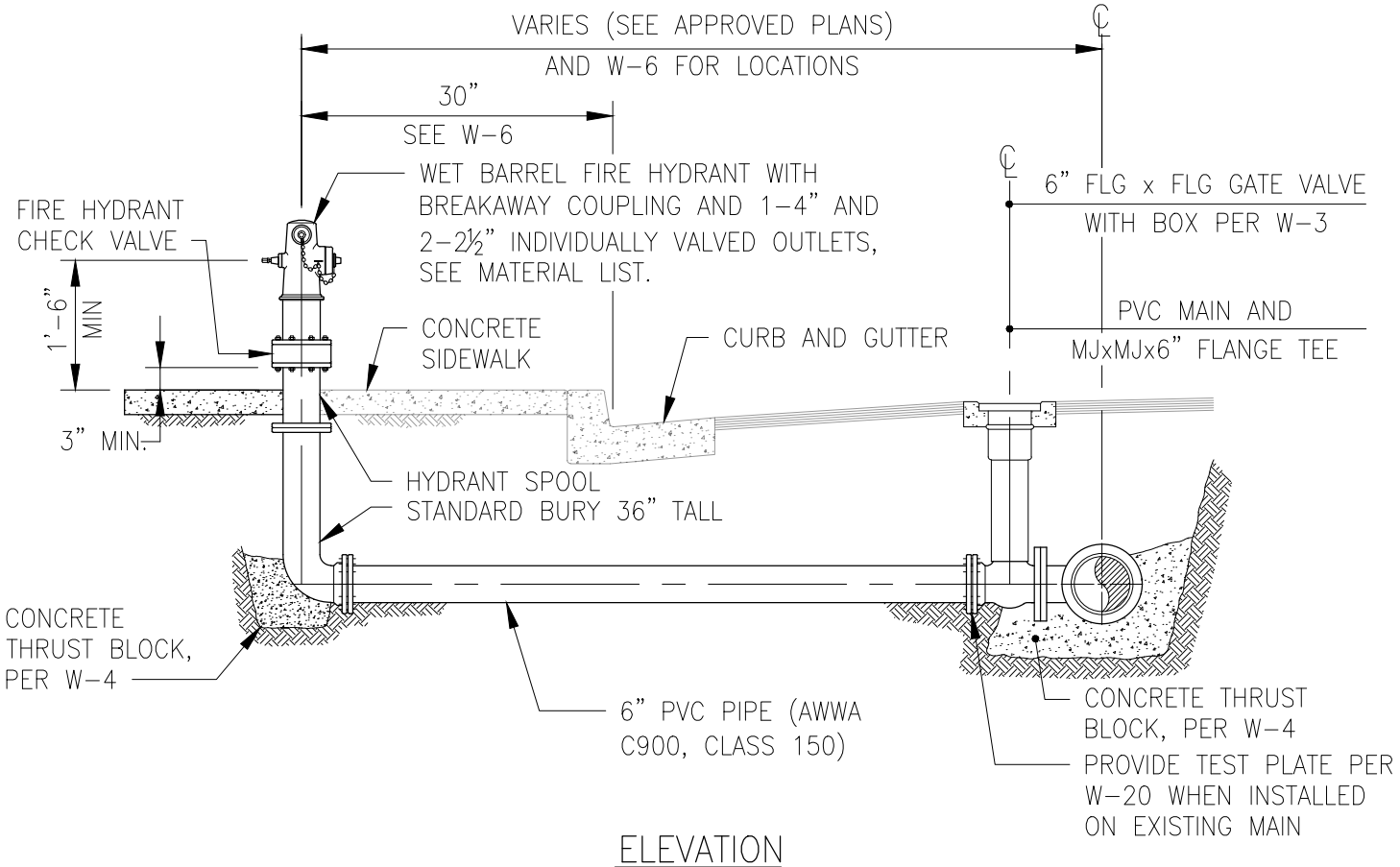
NIPOMO COMMUNITY SERVICES DISTRICT

TYPICAL THRUST BLOCK DETAILS

DATE DRAWN	STD. NO.
DEC. 2025	W-4
	SHEET 5 of 5



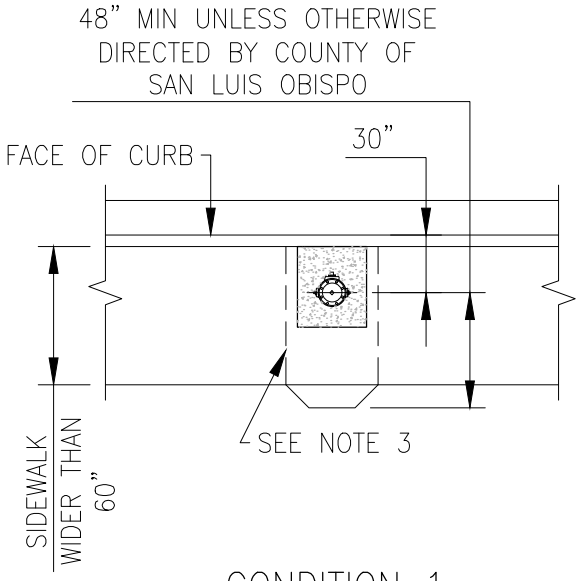
PLAN



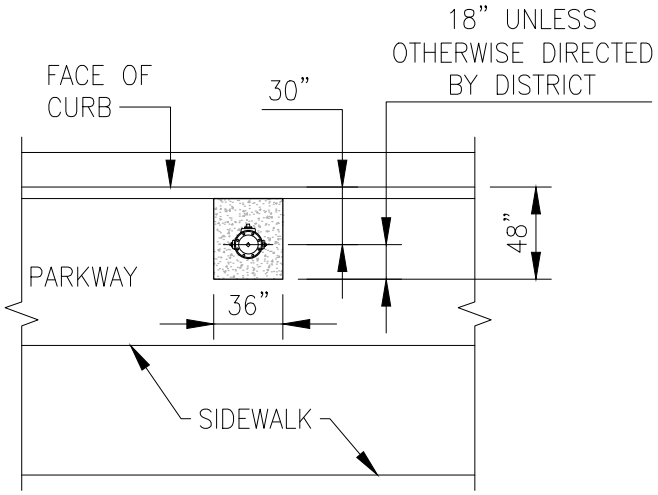
ELEVATION

** SEE APPROVED MATERIALS LIST

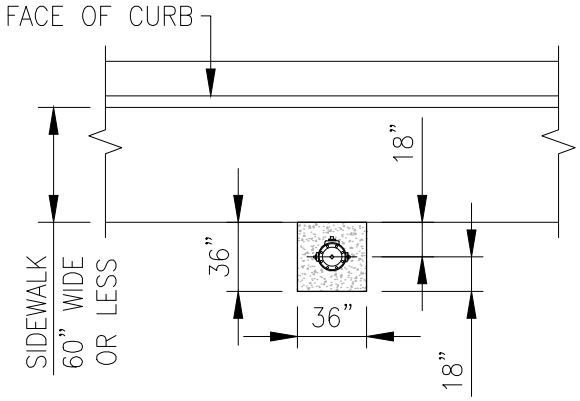
		NIPOMO COMMUNITY SERVICES DISTRICT		
		FIRE HYDRANT ASSEMBLY		
12/25	REVISED TEXT		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	W-5 SHEET 1 of 1



CONDITION 1



CONDITION 3



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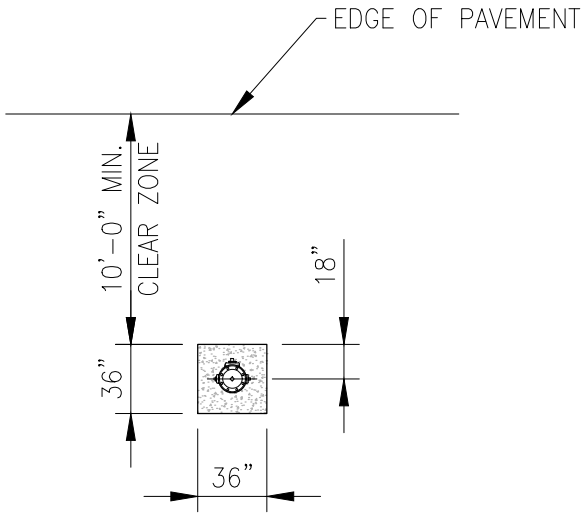
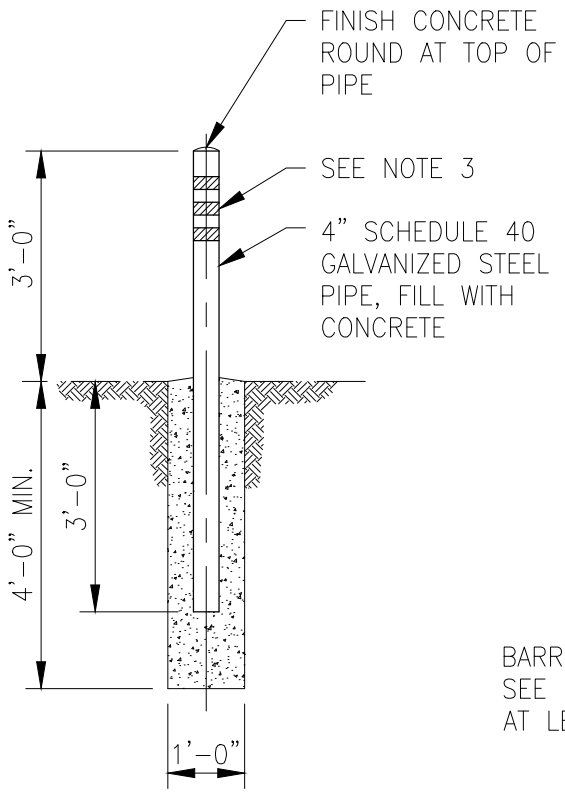


CONDITION 4

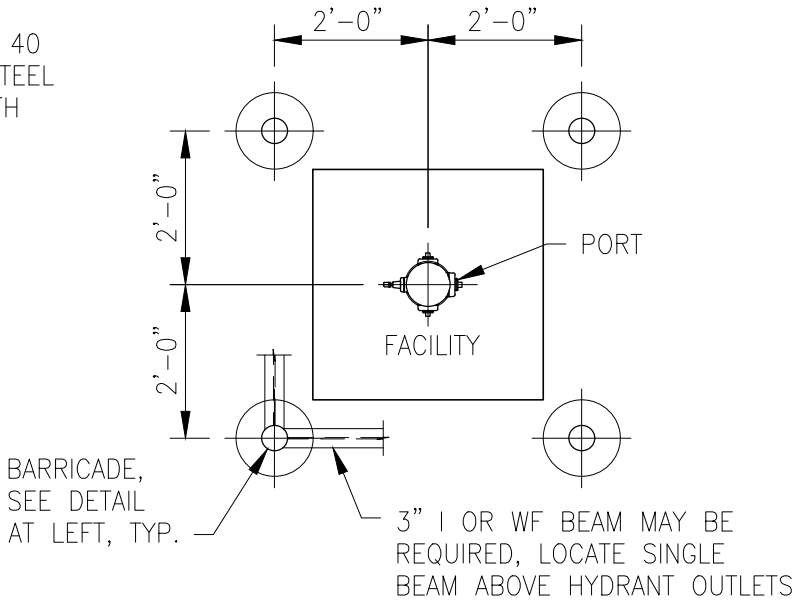
NOTES:

1. HYDRANTS SHALL BE PAINTED PER STANDARD SPECIFICATION SECTION 099000.
2. LOCATE 4" OUTLET PERPENDICULAR TO CURB LINE.
3. HYDRANT TO BE CENTERED ON SIDEWALK PANEL. REMOVE AND REPLACE ENTIRE SIDEWALK PANEL IF INSTALLED ON EXISTING SIDEWALK.

		NIPOMO COMMUNITY SERVICES DISTRICT		
		FIRE HYDRANT LOCATIONS		
DATE	REVISION		DATE DRAWN: DEC. 2025	STD. NO.: W-6 SHEET 1 of 1



BOLLARD/BARRICADE DETAIL

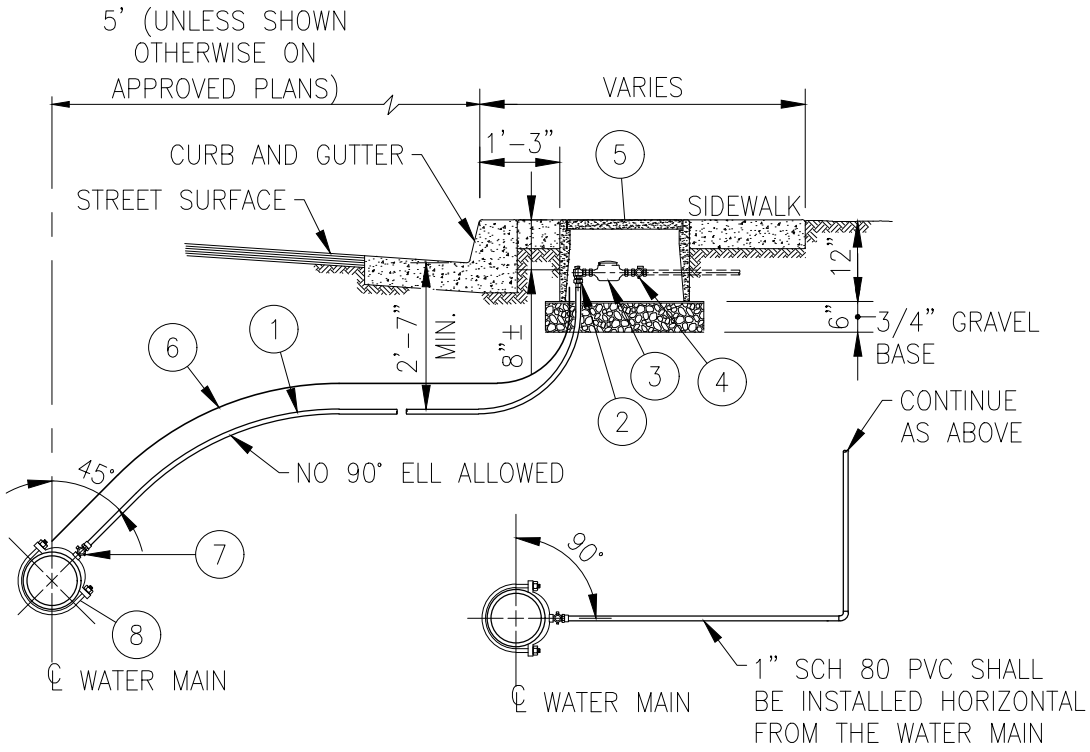


BOLLARD/BARRICADE PLAN

NOTES:

1. EXACT LOCATION OF BARRICADES MAY BE CHANGED BY THE DISTRICT IN THE FIELD.
2. SEE APPROVED PLANS FOR NUMBER OF BARRICADES TO BE USED AND FOR BRACES, IF REQUIRED.
3. THE EXTERIOR OF THE ABOVE GROUND PORTION OF THE BARRICADE SHALL BE WRAPPED WITH 3 STRIPES OF REFLECTIVE COATING APPROVED BY DISTRICT.
4. FOR SAFETY, BARRICADES SHALL NOT BE INSTALLED INSIDE THE CLEAR ZONE OF A ROADWAY AS DEFINED BY CALTRANS.
5. SPACE IN FRONT OF FACILITY PORTS TO REMAIN CLEAR AND NOT BE BLOCKED BY BARRICADE.

		NIPOMO COMMUNITY SERVICES DISTRICT		
		BOLLARD/BARRICADES		
12/25	REVISED TEXT		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	W-7 SHEET 1 of 1



ITEM	DESCRIPTION
1	1" COPPER OR SCH 80 PVC SERVICE LINE
2	ANGLE METER STOP WITH FIP SWIVEL NUT x COMPRESSION FITTING CONNECTION [BALL TYPE]
3	METER AS DIRECTED BY DISTRICT
4	CUSTOMER VALVE
5	METER BOX
6	WARNING TAPE 12" ABOVE SERVICE LINE, SEE NOTE 7
7	BRONZE CORPORATION VALVE WITH COMPRESSION FITTING CONNECTION [BALL TYPE]
8	BRONZE DOUBLE STRAP SERVICE SADDLE

**SEE APPROVED MATERIALS LIST

GENERAL NOTES:

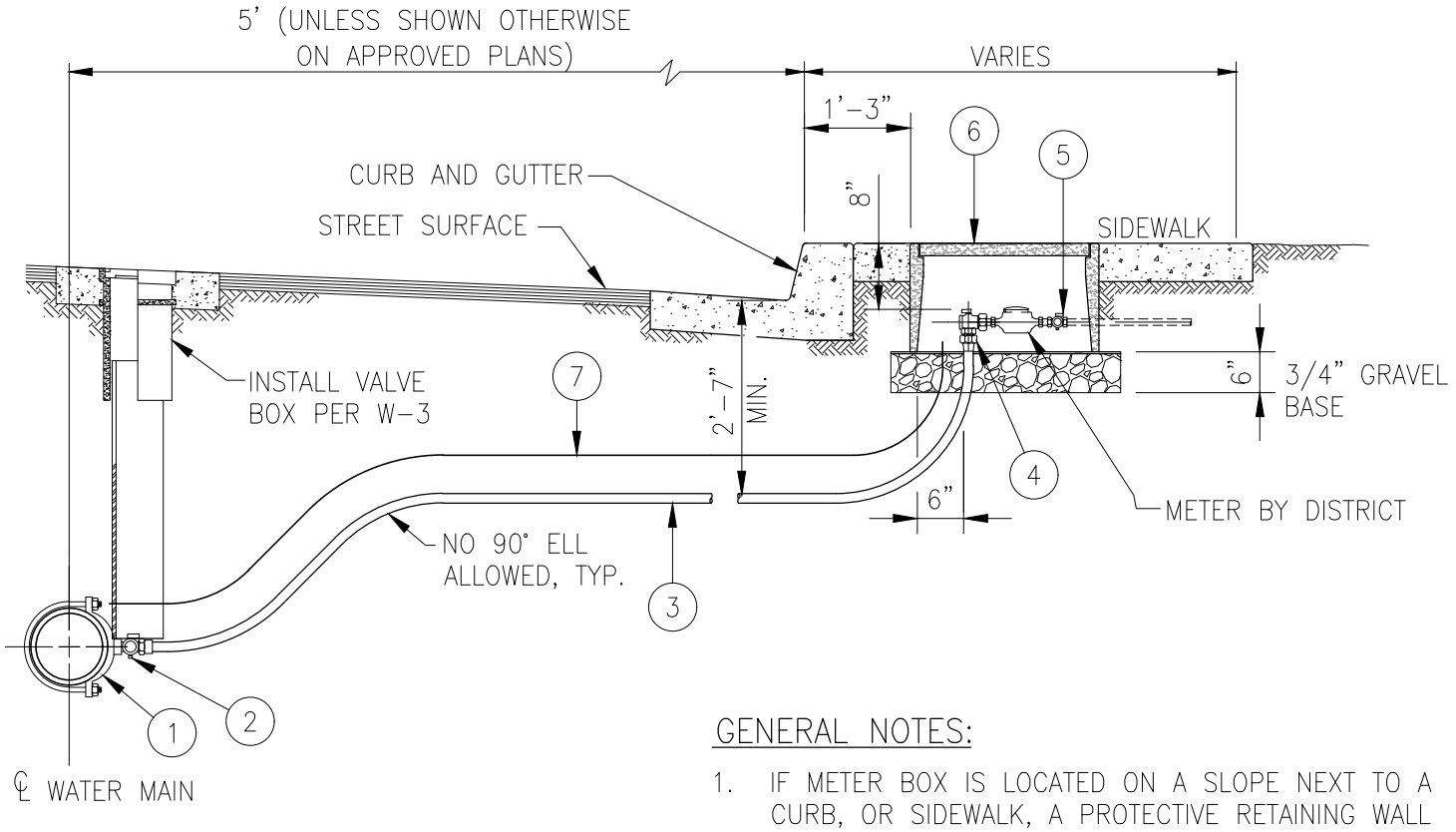
1. SIZE OF THE SERVICE MUST BE APPROVED BY THE DISTRICT, MINIMUM SHALL BE 1-INCH SERVICE.
2. THE WATER SERVICE SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE METER STOP.
3. METER BOXES SHALL BE CONSTRUCTED IMMEDIATELY BEHIND THE SIDEWALK WHERE SIDEWALKS ARE ADJACENT TO CURB.
4. IF METER BOX IS LOCATED ON A SLOPE NEXT TO A CURB OR SIDEWALK, A PROTECTIVE RETAINING WALL SHALL BE CONSTRUCTED.
5. CORPORATION VALVE TAP SHALL HAVE A SERVICE SADDLE AND SHALL BE MADE AS SPECIFIED BY THE PIPE MANUFACTURER'S INSTALLATION GUIDE. ALL DRY TAPS SHALL BE MADE WITH MACHINE WITH GUIDE OR PILOT FOR TAP. (DIRECT TAPS WILL NOT BE ALLOWED)
6. PROVIDE 12 GAUGE INSULATED TRACER WIRE ALONG EACH SERVICE OF SUFFICIENT LENGTH TO EXTEND INTO METER BOX AND A MINIMUM OF 24-INCHES ABOVE FINISH GRADE. COIL NEATLY INSIDE BOX.
7. WARNING TAPE PER SPECIFICATION SECTION 400775, NON-DETECTABLE
8. ALL FITTINGS SHALL BE LEAD FREE.

DATE	REVISION
12/25	REVISED NOTES
08/19	REVISE MODEL NUMBERS
05/11	ADD MODEL NUMBERS

NIPOMO COMMUNITY SERVICES DISTRICT

1" STANDARD WATER SERVICES

DATE DRAWN	STD. NO.
MAY 2011	W-8
	SHEET 1 of 1



ITEM	DESCRIPTION
1	BRONZE DOUBLE STRAP SERVICE SADDLE.
2	2" BRONZE CORPORATION VALVE–WITH COMPRESSION FITTING CONNECTION [BALL–TYPE].
3	2–INCH COPPER COMPRESSION OR SCH 80 PVC, SAME SIZE AS SERVICE.
4	2" BRONZE FULL PORT ANGLE BALL VALVE WITH F.I.P. SWIVEL NUT x COMPRESSION FITTING CONNECTION.
5	CUSTOMER VALVE.
6	METER BOX
7	INSTALL WARNING TAPER 12" ABOVE SERVICE LINE, SEE NOTE 7.

** SEE APPROVED MATERIALS LIST

GENERAL NOTES:

1. IF METER BOX IS LOCATED ON A SLOPE NEXT TO A CURB, OR SIDEWALK, A PROTECTIVE RETAINING WALL SHALL BE CONSTRUCTED.
2. CORPORATION VALVE TAP SHALL BE MADE AS SPECIFIED BY THE PIPE MANUFACTURER'S INSTALLATION GUIDE. ALL DRY TAPS SHALL BE MADE WITH MACHINE WITH GUIDE OR PILOT FOR TAP.
3. SIZE OF THE SERVICE MUST BE APPROVED BY THE DISTRICT.
4. THE WATER SERVICE SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE METER STOP.
5. PROVIDE 12 GAUGE INSULATED TRACER WIRE ALONG EACH SERVICE OF SUFFICIENT LENGTH TO EXTEND INTO METER BOX AND A MINIMUM OF 24–INCHES ABOVE FINISH GRADE. COIL NEATLY INSIDE BOX.
6. WARNING TAPE PER SPECIFICATION SPECIFICATION 400775, NON–DETECTABLE.
7. ALL FITTINGS SHALL BE LEAD FREE.

DATE	REVISION
12/25	REVISED NOTES
08/19	REVISE MODE NUMBERS
5/11	REVISE MODEL NUMBERS

NIPOMO COMMUNITY SERVICES DISTRICT

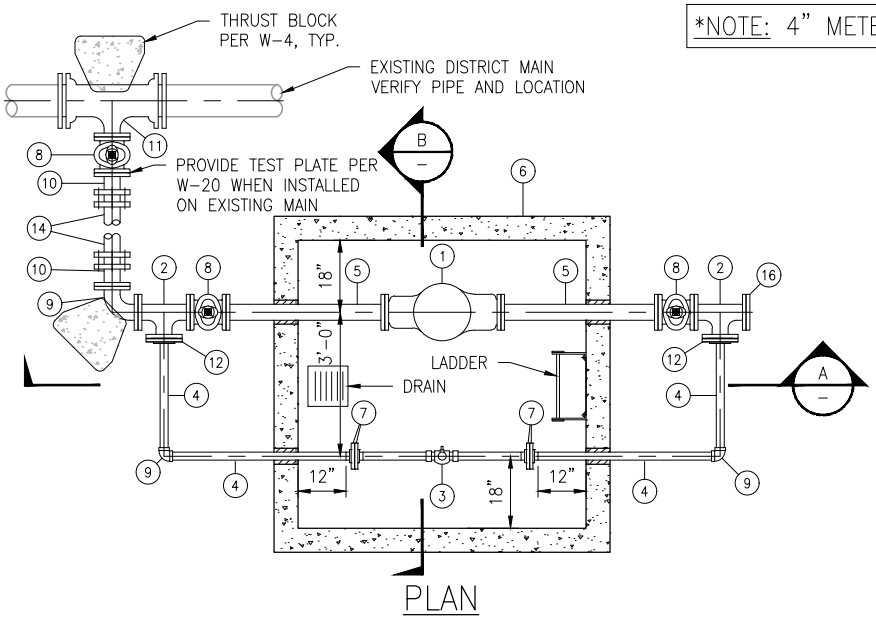
1-1/2" & 2" STANDARD WATER SERVICES

DATE DRAWN: MAY 2011

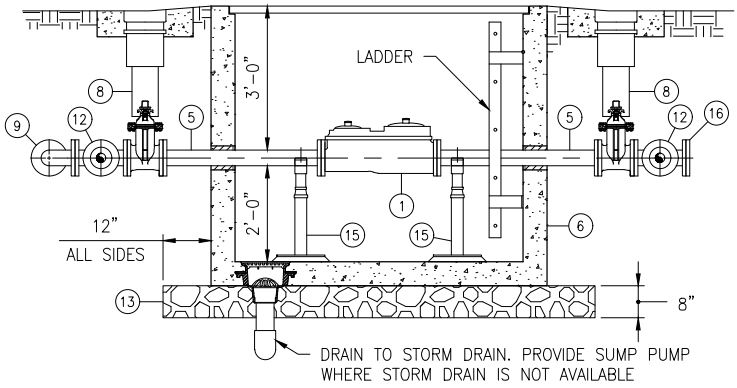
STD. NO. W-9

SHEET 1 of 1

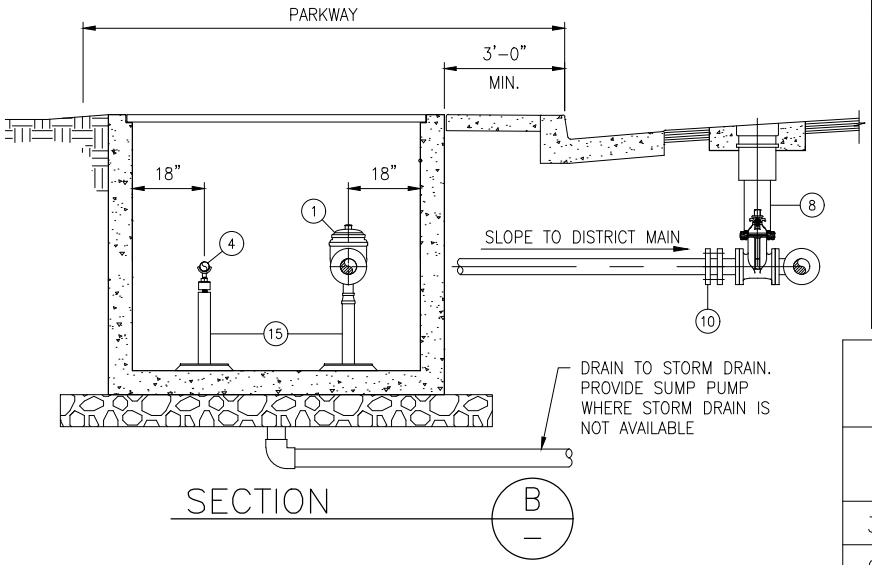
*NOTE: 4" METER INSTALLATION IS ILLUSTRATED ON THIS SHEET



PLAN



SECTION A



SECTION B

** SEE APPROVED MATERIALS LIST

MATERIALS

1	METER AS DETERMINED BY DISTRICT
2	DUCTILE IRON PIPE TEE, FLG x FLG x FLG
3	FOR 2" BYPASS LINE: TEFLON SEATED BRASS BALL VALVE WITH LOCKING WING & 2" WROT COPPER ADAPTER FOR 4" BYPASS LINE: 4" GATE VALVE WITH LOCKING CAP, F.E. x F.E.
4	BYPASS LINE SEE SCHEDULE TABLE
5	DUCTILE IRON PIPE, FLGxFLG
6	PRECAST CONCRETE VAULT WITH SPRING-ASSIST OPEN HATCH. PROVIDE DIAMOND PLATE ALUMINUM ACCESS DOORS WITH RECESSED PADLOCK HASP FOR #5 LOCK (ON OPPOSITE END OF VAULT FROM LADDER) AND VAULT HATCH CHANNEL DRAIN (PLUMB TO CRUSHED ROCK).
7	FOR 2" BYPASS LINE: CL150 THREADED BRONZE COMPANION FLANGE WITH 316 SS HARDWARE & 2" WROT COPPER ADAPTERS, MIPT x SLIP FOR 4" BYPASS LINE: 4" G.E. COUPLER, HEAVY DUTY STYLE 77 WITH 316 SS HARDWARE.
8	GATE VALVE, FLG x FLG
9	90° ELBOW
10	RESTRAINED FLANGE COUPLING ADAPTER
11	DUCTILE IRON TEE WITH FLANGED OUTLET
12	FOR 2" BYPASS LINE: 4"x2" BRASS COMPANION FLANGE WITH F.I.P.T. OUTLET.
13	CRUSHED ROCK WRAPPED IN FILTER FABRIC PER SPECIFICATION SECTION 034220
14	POLYVINYL CHLORIDE PIPE (PVC), AWWA C900 OR DUCTILE IRON PIPE
15	ADJUSTABLE PIPE SUPPORT
16	BLIND FLANGE

SCHEDULE – METER & BYPASS SIZES

METER SIZE	VAULT SIZE	BYPASS SIZE	BYPASS MATERIAL
3" OR 4"	6'-0" x 6'-0"	2"	COPPER
6" OR 8"	6'-0" x 8'-0"	4"	DUCTILE IRON

DATE	REVISION

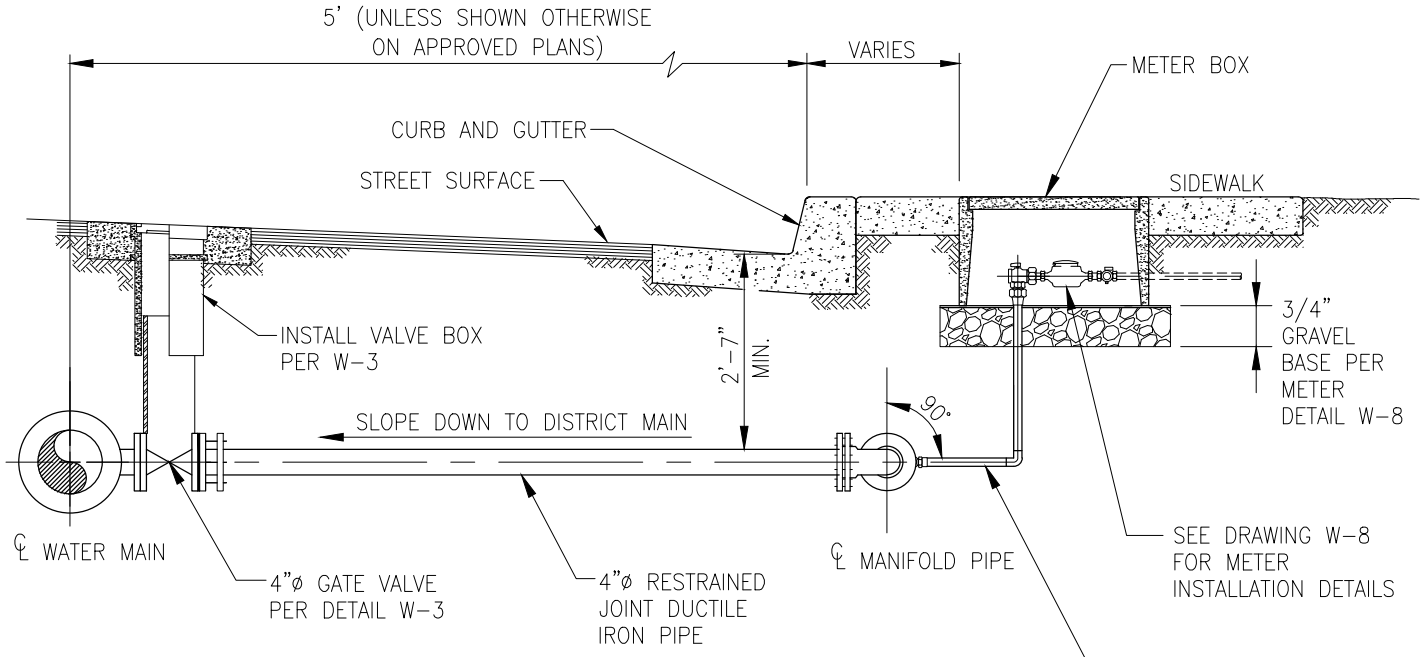
NIPOMO COMMUNITY SERVICES DISTRICT

STANDARD LARGE DIAMETER WATER METER

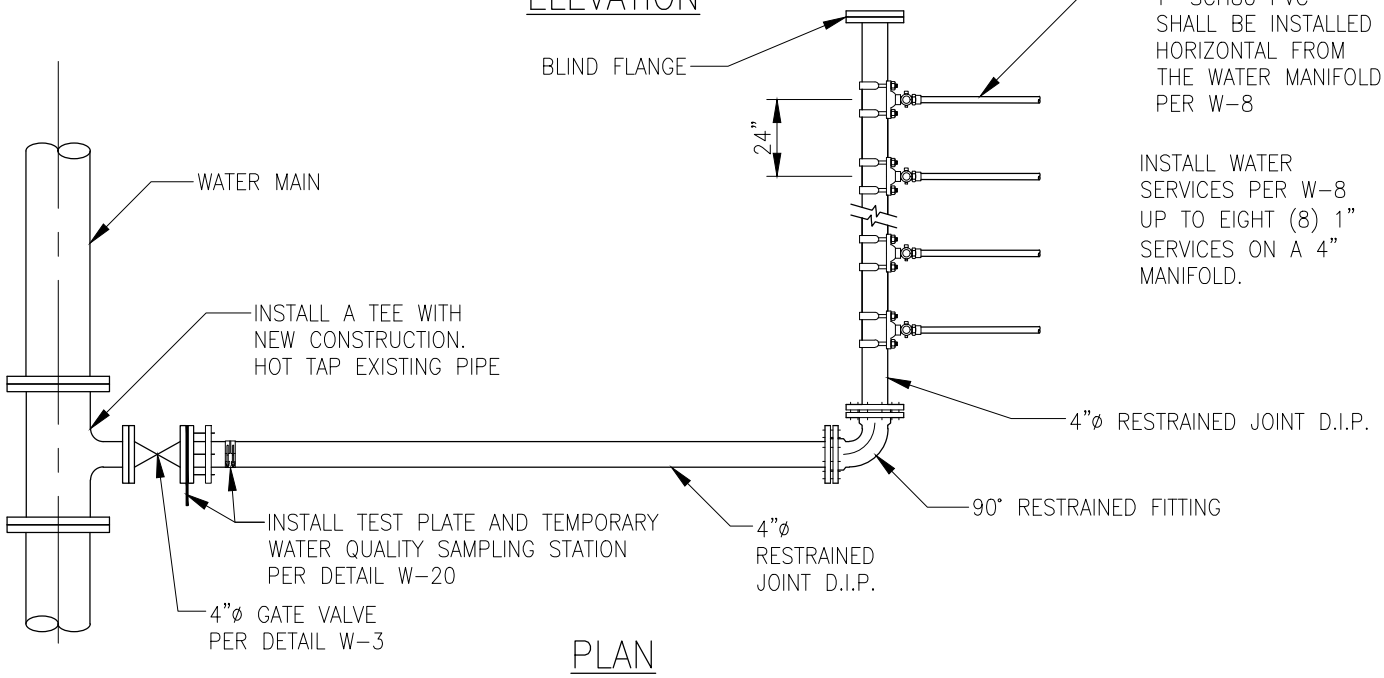
DATE DRAWN: DEC. 2025

STD. NO.: W-10

SHEET 1 of 1



ELEVATION



PLAN

GENERAL NOTES:

1. IF METER BOX IS LOCATED ON A SLOPE NEXT TO A CURB, OR SIDEWALK, A PROTECTIVE RETAINING WALL SHALL BE CONSTRUCTED.
2. SIZE OF THE SERVICE MUST BE APPROVED BY THE DISTRICT.
3. THE WATER MANIFOLD SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE ELBOW AND SHALL HAVE TAPE MARKED "CAUTION WATER LINE BELOW". TAPE TO BE 15-INCHES ABOVE THE PIPE.
4. PROVIDE 12 GAUGE INSULATED TRACER WIRE ALONG EACH SERVICE OF SUFFICIENT LENGTH TO EXTEND INTO METER BOX AND A MINIMUM OF 24-INCHES ABOVE FINISH GRADE. COIL NEATLY INSIDE BOX.

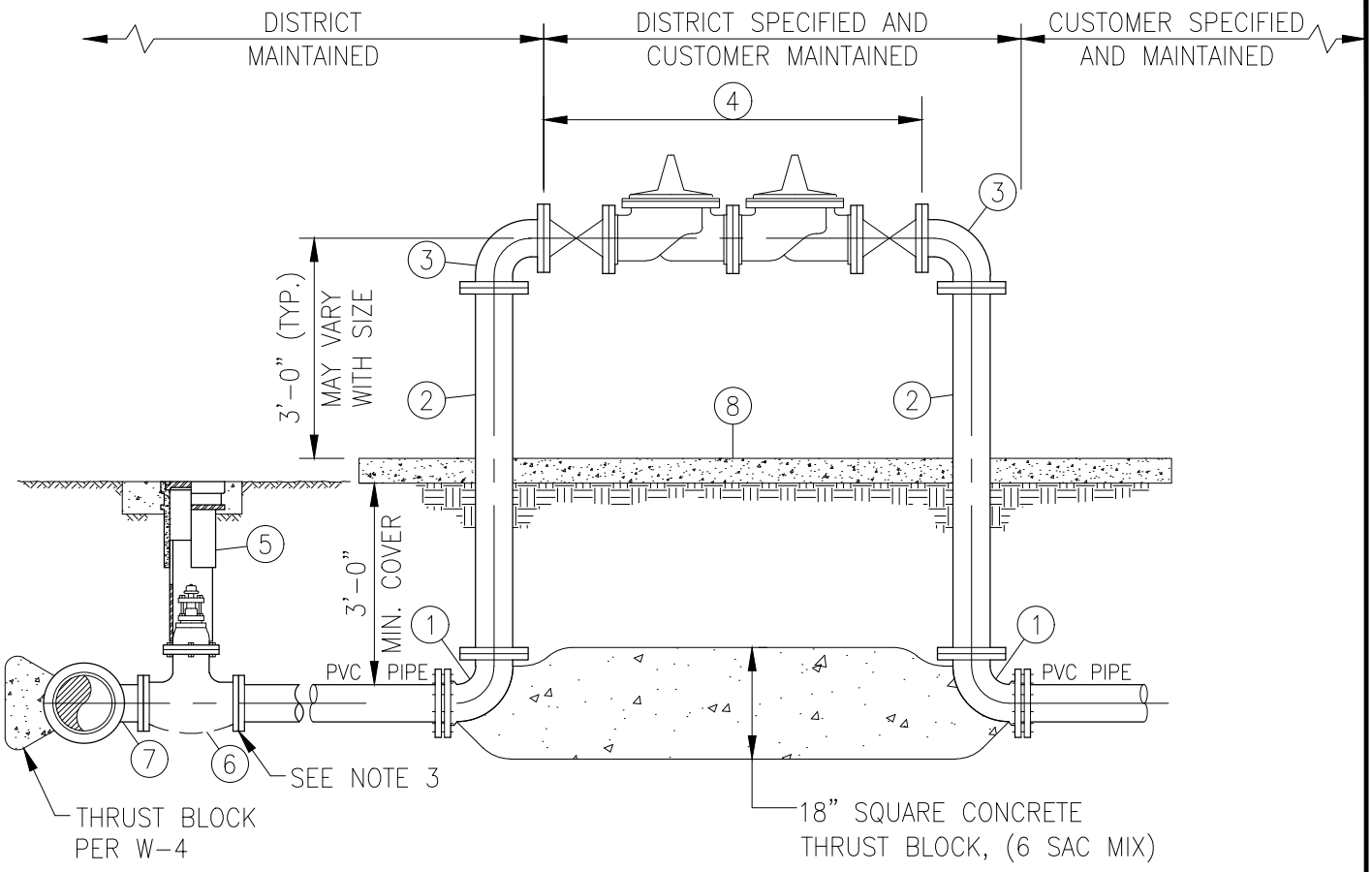
** SEE APPROVED MATERIALS LIST

DATE	REVISION
12/25	REVISED TEXT AND PIPING
08/19	REVISE TEXT
05/11	REVISE TEXT

NIPOMO COMMUNITY SERVICES DISTRICT

4" MANIFOLD WATER SERVICE

DATE DRAWN	STD. NO.
MAY 2011	W-11
	SHEET 1 of 1



MATERIALS LIST

1. 90° D.I. ELBOW, FLG X MJ
2. D.I. SPOOL, FLG X FLG, (CLASS 53 MIN)
3. 90° D.I. ELBOW, FLG X FLG
4. DOUBLE CHECK DETECTOR BACKFLOW PREVENTER AND FLANGED GATE VALVE ASSEMBLY, PER SAN LUIS OBISPO COUNTY APPROVED BACKFLOW DEVICE LIST
5. VALVE BOX INSTALLATION PER W-3
6. GATE VALVE, FE X MJ OR TAPPING VALVE, FE
7. TEE, MJ X FE OR TAPPING SLEEVE, FE
8. CLASS A PCC PAD WITH W1.4 WWM, 6" THICK, 12" MINIMUM SURROUNDING BACKFLOW PREVENTER, ON 4" CLASS II AGGREGATE BASE

NOTE:

1. DUCTILE IRON PIPE (D.I.P.) AND FITTINGS SHALL BE CEMENT MORTAR LINED PER AWWA C104.
2. ALTERNATIVE MATERIAL IS FUSION BONDED EPOXY LINED AND COATED STEEL PIPE AND FITTINGS.
3. PROVIDE TEST PLATE PER W-20 WHERE INSTALLED ON EXISTING WATER MAIN.

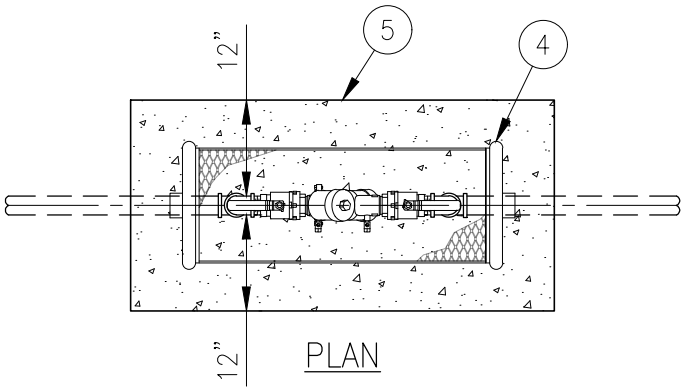
** SEE APPROVED MATERIALS LIST

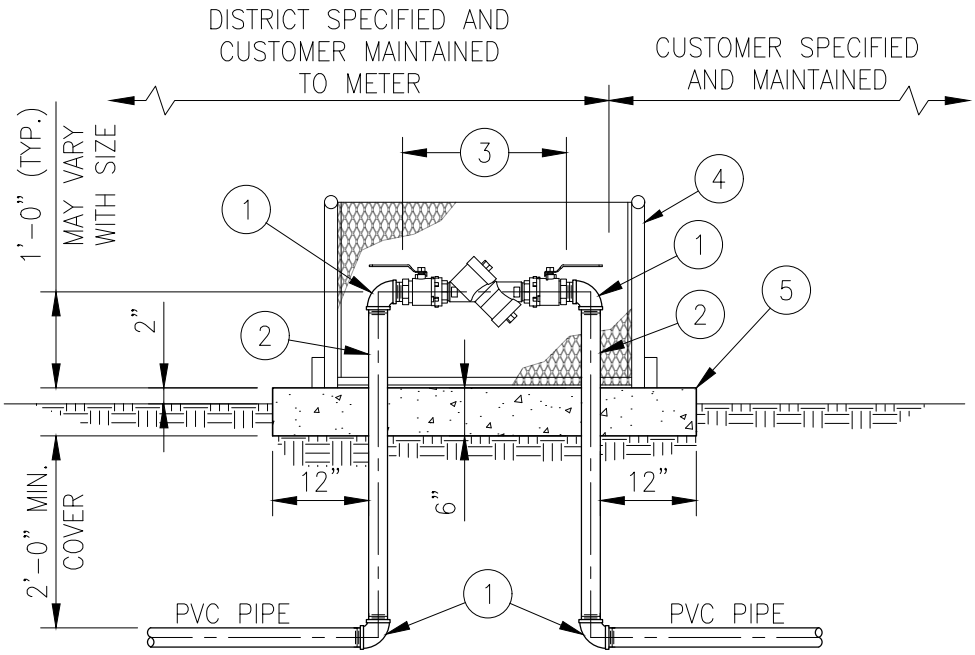
DATE	REVISION
12/25	REVISED NOTES
08/19	ADD VALVE BOX, MAIN AND CONCRETE SLAB

NIPOMO COMMUNITY SERVICES DISTRICT

DOUBLE CHECK DETECTOR BACKFLOW PREVENTER - 4" THRU 12"

DATE DRAWN	STD. NO.
MAY 2011	W-12
	SHEET 1 of 1





ELEVATION

MATERIALS LIST

1. 90° ELBOW
2. COPPER OR BRASS SPOOL
3. DOUBLE CHECK VALVE BACKFLOW PREVENTER, PER SAN LUIS OBISPO COUNTY APPROVED BACKFLOW DEVICE LIST
4. INSTALL BACKFLOW DEVICE ENCLOSURE WHEN LOCATED WITHIN RIGHT-OF-WAY
5. CLASS A CONCRETE PAD WITH W1.4 WWM, 4" THICK, 12" MINIMUM SURROUNDING BACKFLOW PREVENTER ON 4" CLASS II AGGREGATE BASE, SEE SPECIFICATION SECTION 030500 FOR CONCRETE AND SPECIFICATION SECTION 312300 FOR AGGREGATE BASE.

NOTES:

1. FITTINGS SHALL BE THREADED FOR BRASS PIPE OR SOLDERED FOR COPPER PIPE.
2. BACKFLOW PREVENTER TO BE PLACED AS CLOSE AS POSSIBLE TO METER AND NOT MORE THAN 10'.

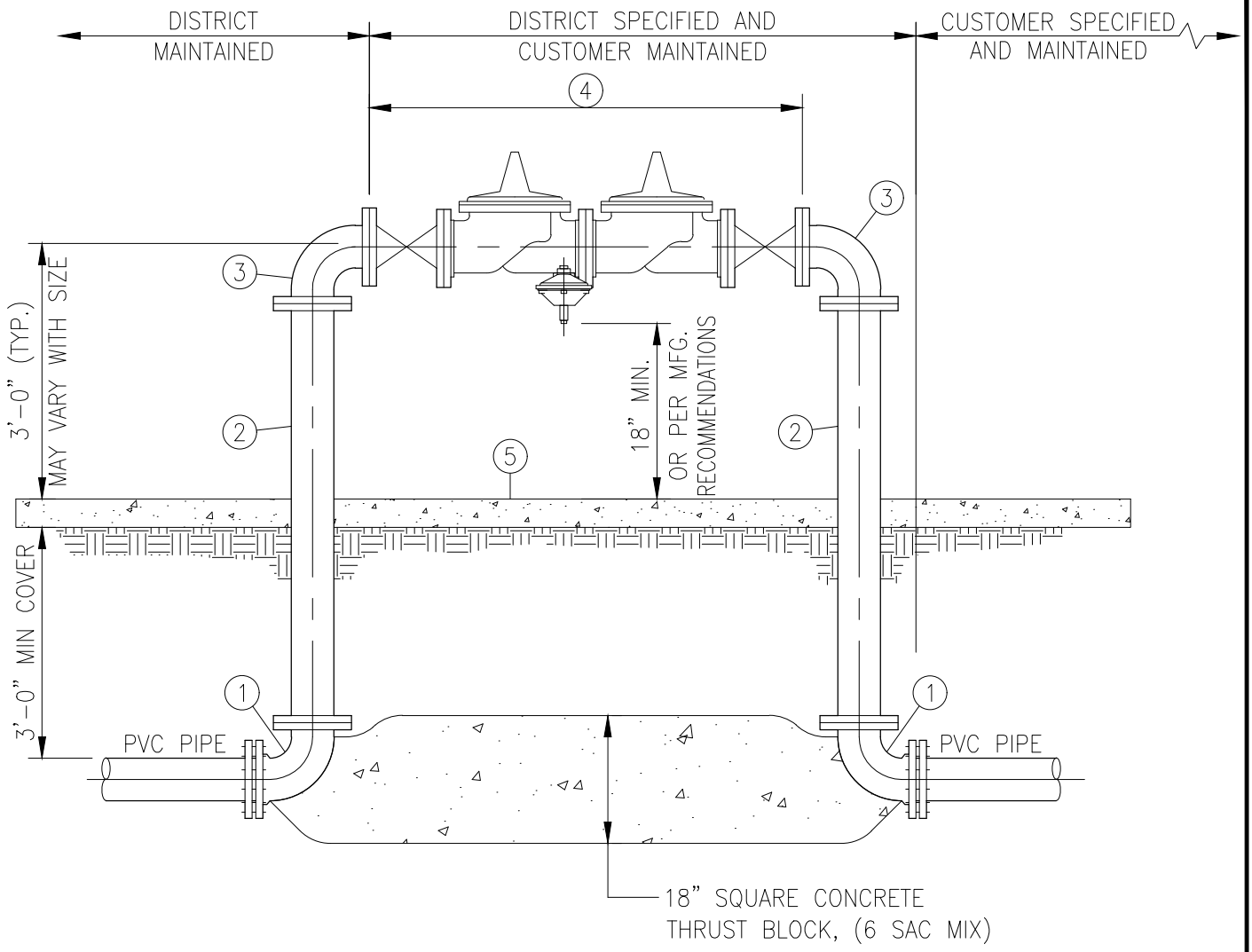
** SEE APPROVED MATERIALS LIST

DATE	REVISION
12/25	ADDED ENCLOSURE, REVISED NOTES
08/19	REVISE MATERIALS AND ADD CONCRETE SLAB

NIPOMO COMMUNITY SERVICES DISTRICT

DOUBLE CHECK VALVE BACKFLOW PREVENTER, LESS THAN 4"

DATE DRAWN	STD. NO.
MAY 2011	W-12A
	SHEET 1 of 1



MATERIALS LIST

1. 90° D.I. ELBOW, FLG X MJ
2. D.I. SPOOL, FLG X FLG, (CLASS 53 MIN)
3. 90° D.I. ELBOW, FLG X FLG
4. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER AND FLANGED GATE VALVE ASSEMBLY, PER SAN LUIS OBISPO COUNTY APPROVED BACKFLOW DEVICE LIST
5. CLASS A CONCRETE PAD WITH W1.4 WWM, 6" THICK, 12" MINIMUM SURROUNDING BACKFLOW PREVENTER, ON 4" CLASS II AGGREGATE BASE, SEE SPECIFICATION SECTION 030500 FOR CONCRETE PAD AND SPECIFICATION SECTION 312300 FOR AGGREGATE BASE.

NOTES:

1. DUCTILE IRON PIPE (D.I.P.) AND FITTINGS SHALL BE CEMENT MORTAR LINED PER AWWA C104.
2. ALTERNATIVE MATERIAL IS FUSION BONDED EPOXY LINED AND COATED STEEL PIPE AND FITTINGS.

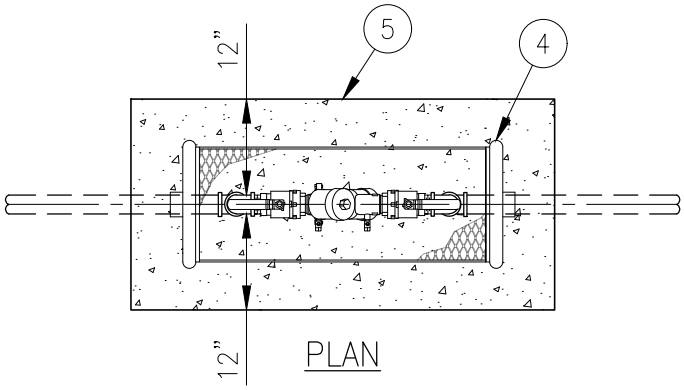
** SEE APPROVED MATERIALS LIST

DATE	REVISION
12/25	REVISED NOTES
08/19	REVISE MATERIALS AND ADD CONCRETE SLAB

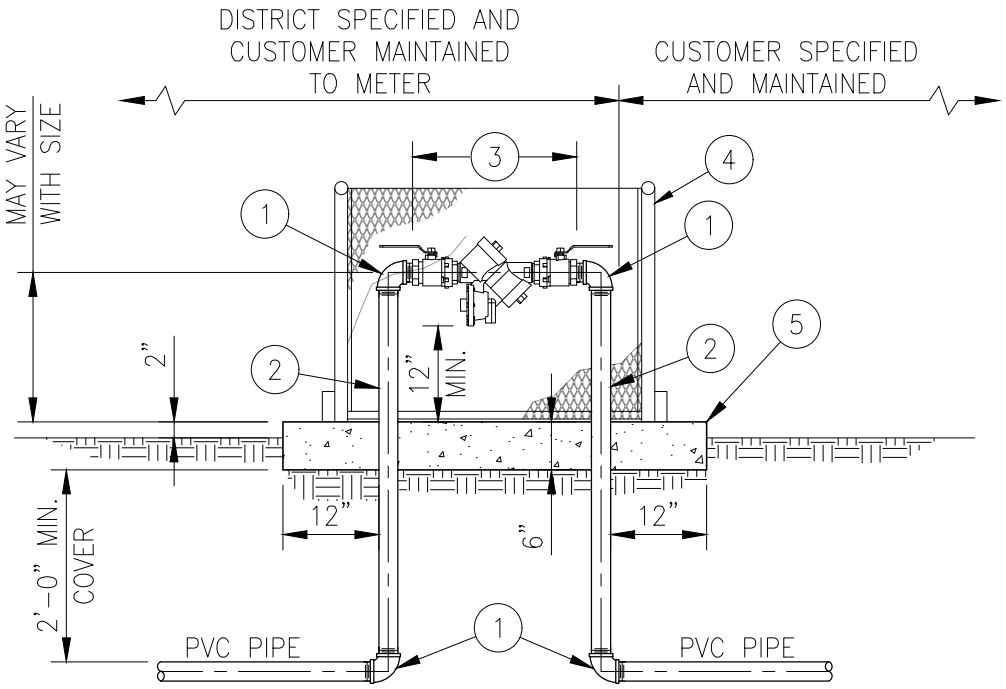
NIPOMO COMMUNITY SERVICES DISTRICT

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER, 4" THRU 12"

DATE DRAWN	STD. NO.
MAY 2011	W-13
	SHEET 1 of 1



PLAN



ELEVATION

MATERIALS LIST

1. 90° ELBOW
2. COPPER OR BRASS SPOOL
3. DOUBLE CHECK VALVE BACKFLOW PREVENTER, PER SAN LUIS OBISPO COUNTY APPROVED BACKFLOW DEVICE LIST
4. INSTALL BACKFLOW DEVICE ENCLOSURE WHEN LOCATED WITHIN RIGHT-OF-WAY
5. CLASS A CONCRETE PAD WITH W1.4 WWM, 4" THICK, 12" MINIMUM SURROUNDING BACKFLOW PREVENTER ON 4" CLASS II AGGREGATE BASE, SEE SPECIFICATION SECTION 030500 FOR CONCRETE AND SPECIFICATION SECTION 312300 FOR AGGREGATE BASE.

NOTES:

1. FITTINGS SHALL BE THREADED FOR BRASS PIPE OR SOLDERED FOR COPPER PIPE.
2. BACKFLOW PREVENTER TO BE PLACED AS CLOSE AS POSSIBLE TO METER AND NOT MORE THAN 10'.

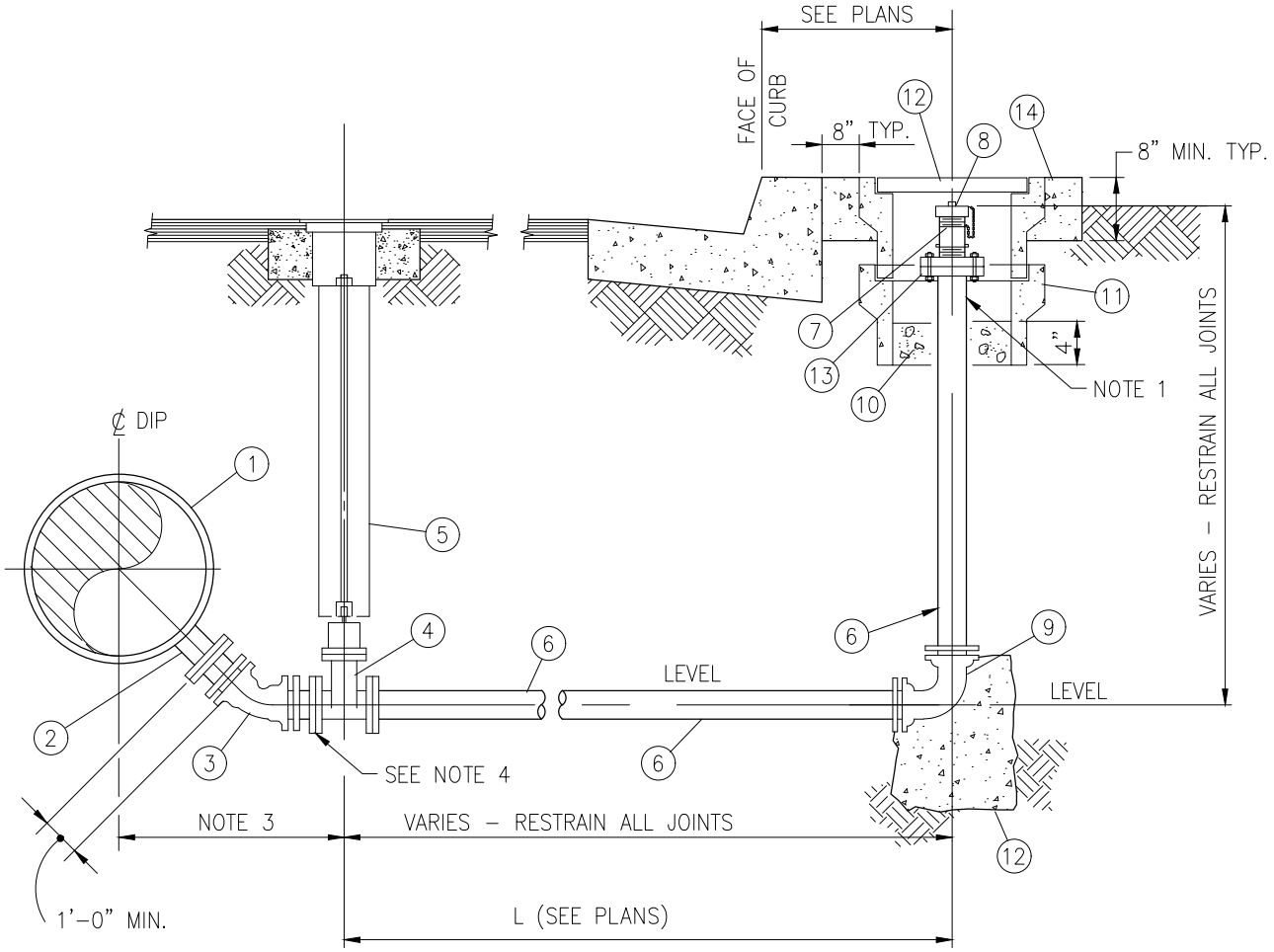
** SEE APPROVED MATERIALS LIST

DATE	REVISION
12/25	ADDED ENCLOSURE, REVISED NOTES
08/19	REVISE MATERIALS AND ADD CONCRETE SLAB

NIPOMO COMMUNITY SERVICES DISTRICT

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER, LESS THAN 4"

DATE DRAWN	STD. NO.
MAY 2011	W-13A
	SHEET 1 of 1



ITEM DESCRIPTION

(1)	WATER MAIN
(2)	FLANGED OUTLET
(3)	DIP MJ 45° ELBOW WITH RESTRAINED JOINTS
(4)	GATE VALVE, RESILIENT WEDGE
(5)	VALVE BOX INSTALLATION FOR BURIED VALVES PER W–3
(6)	CLASS 350 DIP
(7)	BRONZE NIPPLE, REGULAR WALL, IPT x FIRE HOSE THREAD.
(8)	PVC PIPE CAP
(9)	DIP MJ 90° ELBOW WITH RESTRAINED JOINTS
(10)	3/4" GRAVEL
(11)	H–20 TRAFFIC RATED PRECAST VALVE BOX, W/ TRAFFIC LID MARKED "WATER".
(12)	CONCRETE THRUST BLOCK, SEE W–4.
(13)	4" CLASS 150 FLANGES, TAPPED COMPANION FLANGE TO MATCH ITEM 8.
(14)	8" SQ. CONCRETE COLLAR, CLASS A, PER SPECIFICATION SECTION 030500.

NOTES:

1. WATER MAINS WITH A DIAMETER GREATER THAN 12" SHALL USE A 6" OUTLET FROM THE MAIN WITH A 6" LATERAL AND VALVE AND A 4" BRONZE NIPPLE.
2. MINIMIZE DISTANCE BETWEEN OUTLET AND VALVE TO CLEAR PIPE BY 6".
3. LENGTH L IS APPROXIMATE HORIZONTAL LENGTH OF BLOWOFF PIPING BETWEEN MAIN PIPE AND BLOWOFF BOX.
4. PROVIDE TEST PLATE PER W–20 IF INSTALLED ON EXISTING MAIN.

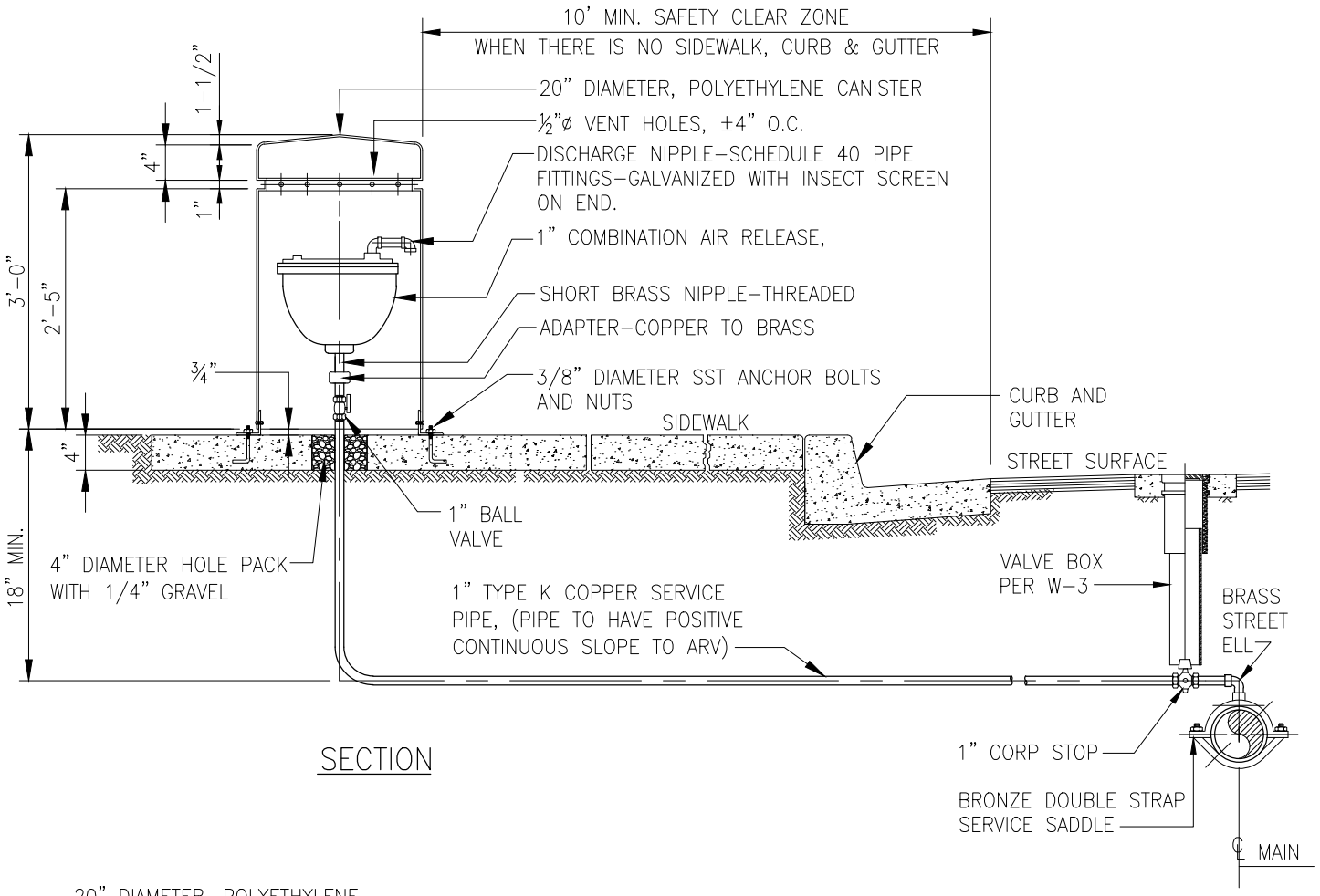
** SEE APPROVED MATERIALS LIST

DATE	REVISION
12/25	REVISED COLLAR, REVISED NOTES
08/19	NO REVISIONS

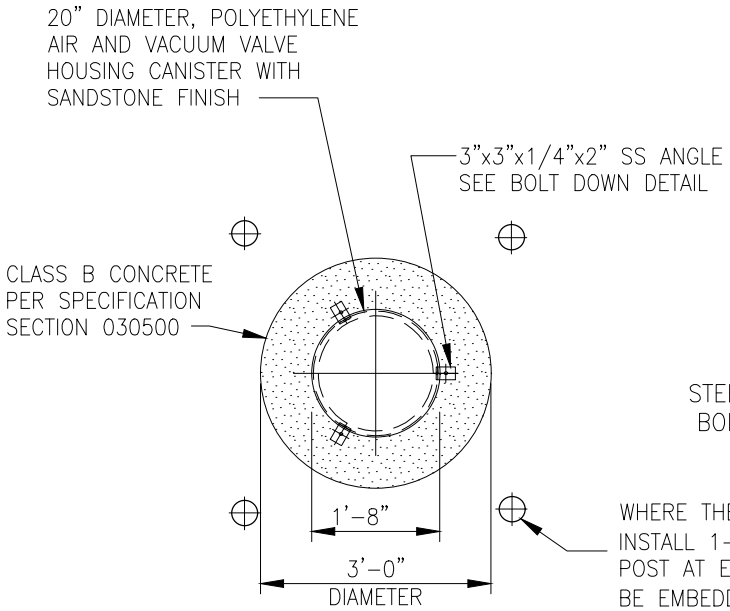
NIPOMO COMMUNITY SERVICES DISTRICT

BLOWOFF ASSEMBLY

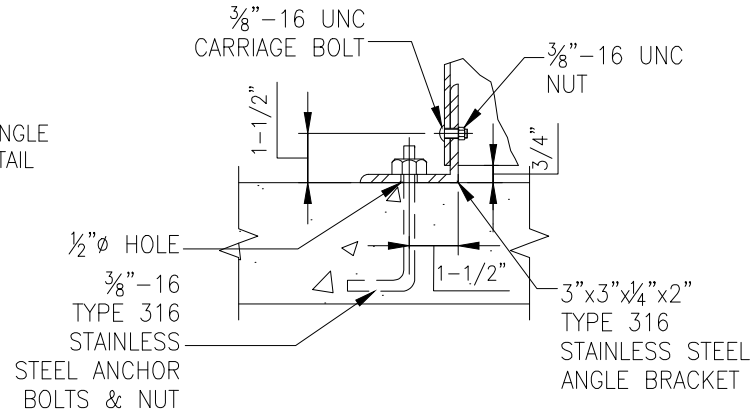
DATE DRAWN	STD. NO.
MAY 2011	W-14
	SHEET 1 of 1



SECTION



PLAN



BOLTDOWN DETAIL

WHERE THERE IS NO CURB AND GUTTER, INSTALL 1–4" DIAMETER GALVANIZED STEEL POST AT EACH CORNER OF PAD. POSTS SHALL BE EMBEDDED IN 2' OF CONCRETE AND SHALL EXTEND 3' ABOVE GROUND, (SEE W–7)

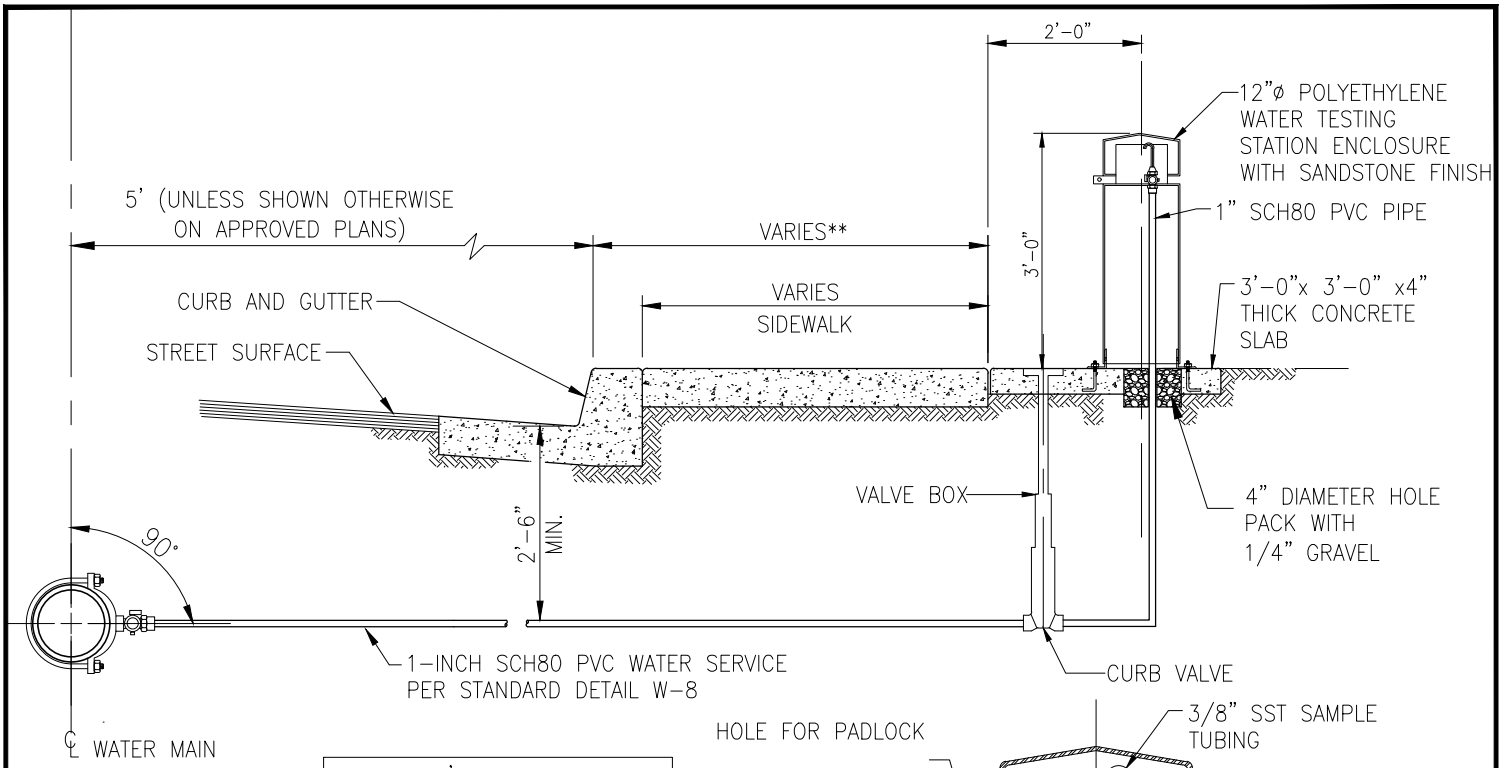
** SEE APPROVED MATERIALS LIST

DATE	REVISION
12/25	REVISED COLLAR, REVISED NOTES
08/19	REVISE TEXT AND MATERIALS

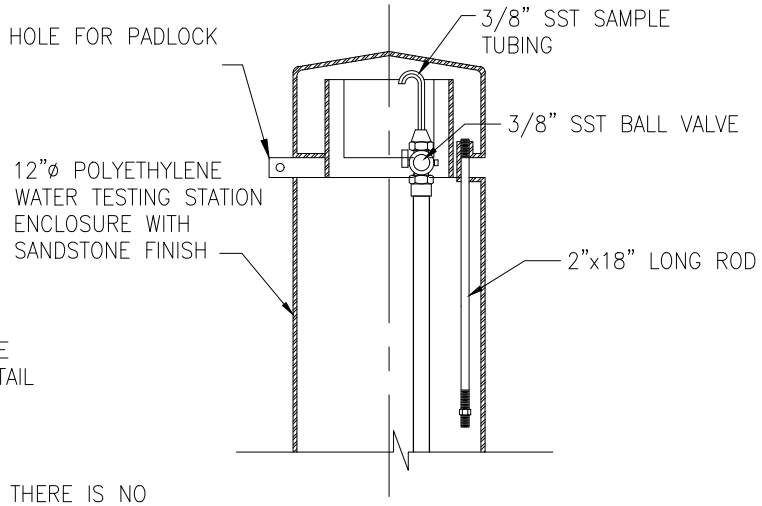
NIPOMO COMMUNITY SERVICES DISTRICT

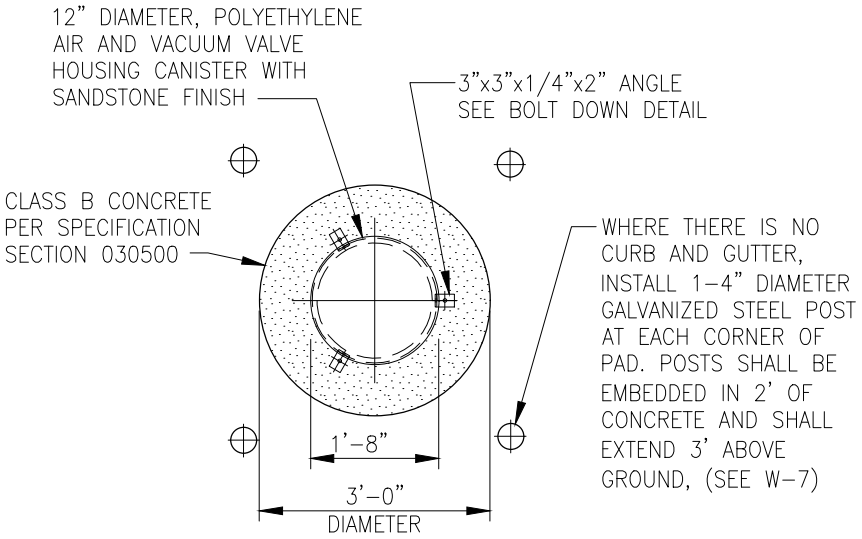
COMBINATION AIR RELEASE VALVE ASSEMBLY

DATE DRAWN	STD. NO.
MAY 2011	W-15
	SHEET 1 of 1

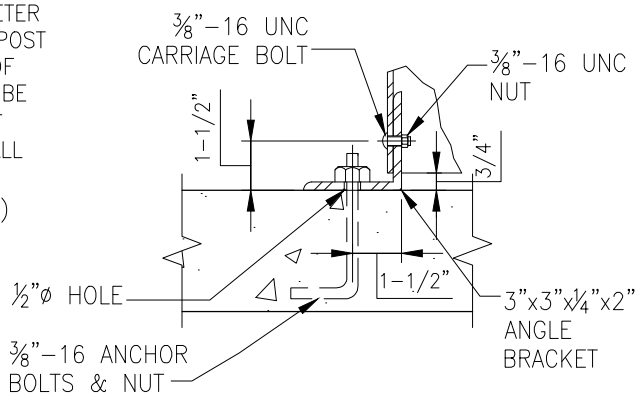


**NOTE: 10' FROM EDGE OF PAVEMENT WHERE THERE IS NO SIDEWALK, CURB, GUTTER





PLAN



*ALL MATERIAL TO BE 316 STAINLESS STEEL FOR SAMPLING STATION AND ANCHORING.

BOLTDOWN DETAIL

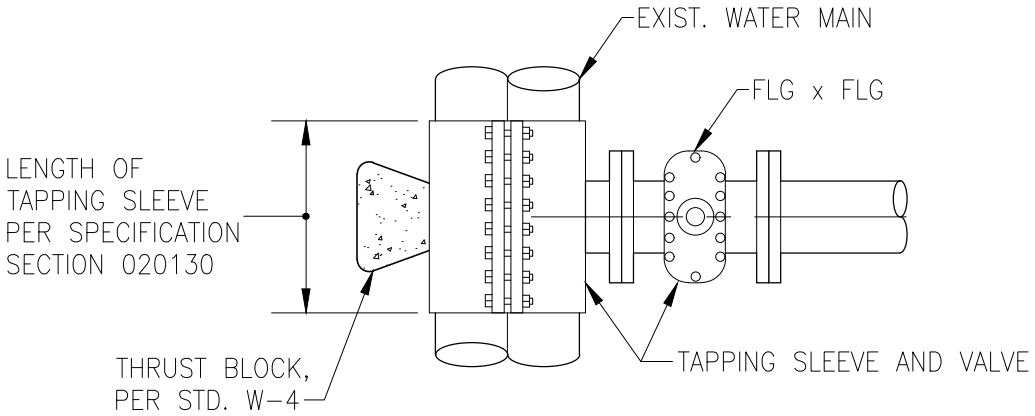
** SEE APPROVED MATERIALS LIST

DATE	REVISION
12/25	REVISED COLLAR, REVISED NOTES
08/19	REVISE TEXT

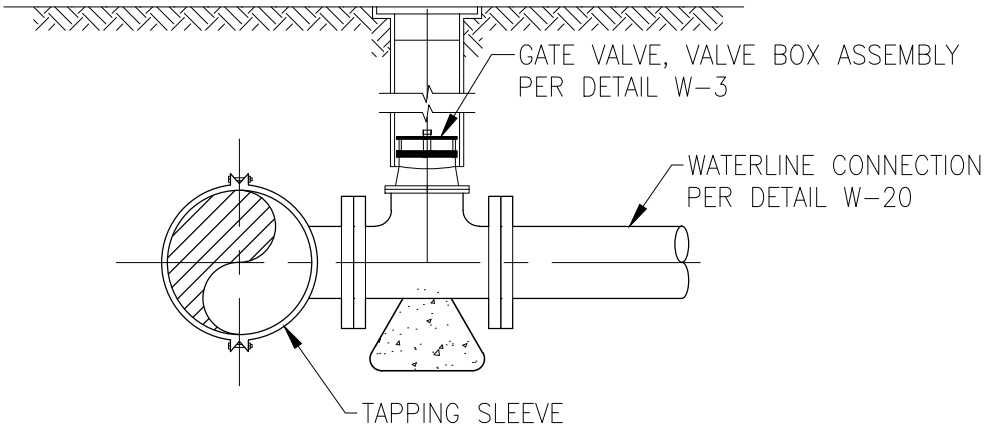
NIPOMO COMMUNITY SERVICES DISTRICT

SAMPLE STATION

DATE DRAWN	STD. NO.
MAY 2011	W-16
	SHEET 1 of 1



PLAN



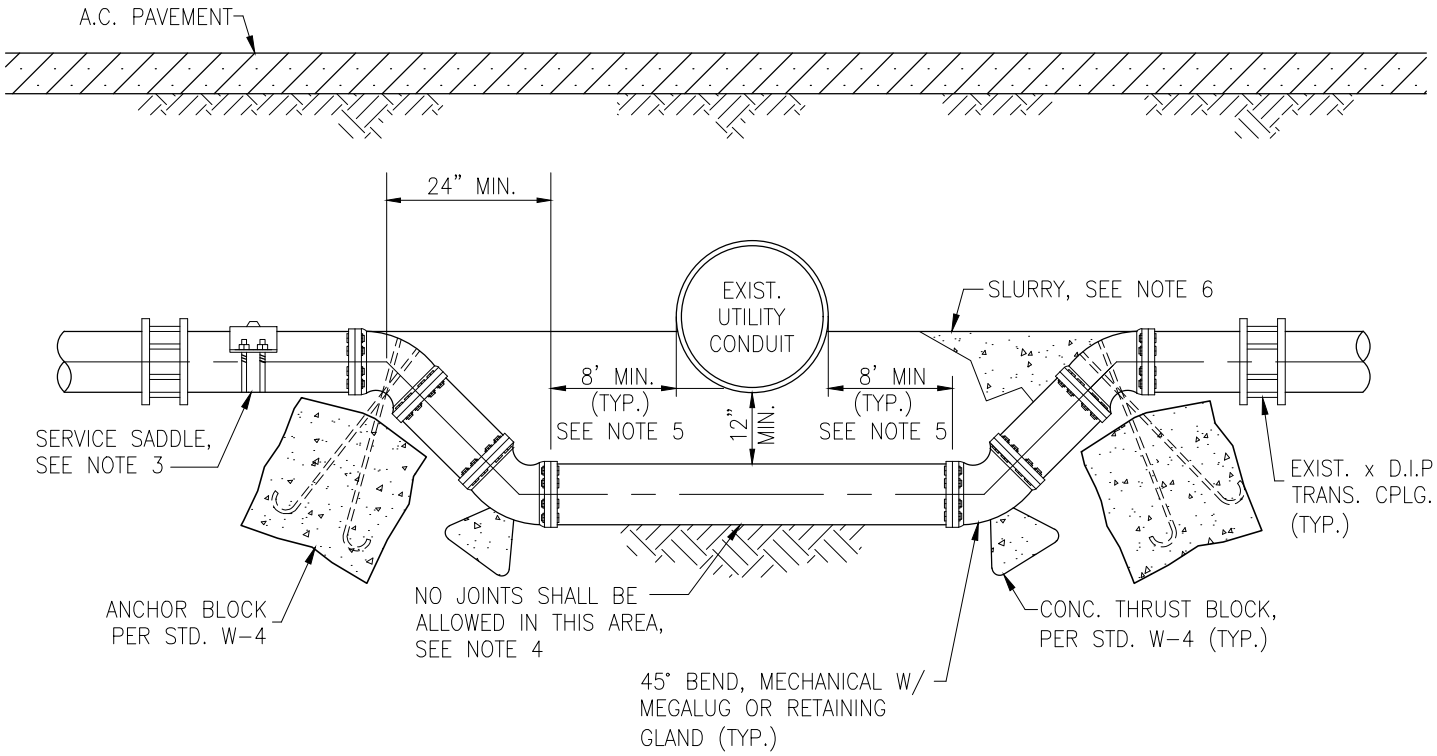
ELEVATION

NOTES:

1. TAPPING SLEEVE TO BE STAINLESS STEEL PER APPROVED MATERIALS LIST.
2. TAPPING SLEEVE AND VALVE ARE TO BE COMPLETELY WRAPPED WITH 8 MIL POLYETHYLENE ENCASEMENT.
3. AFTER INSTALLATION AND BEFORE HOT TAP IS COMPLETE, THE TAPPING SLEEVE SHALL BE TESTED AT SYSTEM PRESSURE, FOR A MINIMUM OF 15 MINUTES WITH NO VISIBLE LEAKAGE AND OBSERVED BY DISTRICT. PROVIDE 24 HOUR NOTIFICATION OF TEST.
4. TAPPING SLEEVE SHALL HAVE A FULL LENGTH AND WIDTH GASKET. O-RING GASKETS ARE NOT ACCEPTABLE.
5. DIAMETER OF THE HOT TAP SHALL BE ONE PIPE SIZE SMALLER THAN THE MAIN LINE DIAMETER.
6. TAPPING VALVE SHALL HAVE A FLANGE INSULATION KIT BETWEEN DUCTILE IRON VALVE AND STAINLESS STEEL TAPPING SLEEVE.
7. NO DIRECT TAP SHALL BE MADE CLOSER THAN 2 FEET FROM THE ENDS OF THE PIPE.
8. SEE SPECIFICATION SECTION 331300 FOR DISINFECTION OF PIPING.

** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT		
		TAPPING SLEEVE AND VALVE		
12/25	REVISED NOTES AND VALVE		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	W-17 SHEET 1 of 1



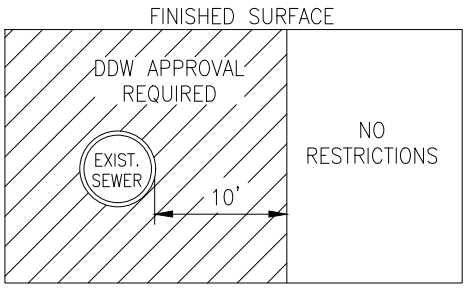
NOTES:

1. ALL PIPE JOINTS AT 45° BENDS SHALL BE MECHANICAL JOINT WITH MEGALUG OR RETAINING GLAND. FLANGED JOINTS MAY BE USED WHERE CONDITIONS WARRANT.
2. INSTALLATION SHALL BE ENCASED IN POLYETHYLENE PER AWWA STANDARD C105, SEE SPECIFICATION SECTION 099754.
3. SERVICE SADDLE AND COMBINATION AIR RELEASE VACUUM RELIEF VALVE SHALL BE INSTALLED ON THE HIGH POINTS OF THE OFFSET AS SHOWN ON THE PLANS. SERVICE SADDLE SHALL BE 1" ON 8" AND SMALLER EXISTING MAINS AND 2" ON LARGER EXISTING MAINS LOCATION TO BE APPROVED BY DISTRICT.
4. IF BOTTOM SPOOL PIECE EXCEEDS 18 FEET, CONNECT PIPE SECTIONS WITH DISTRICT APPROVED JOINT RESTRAINTS.
5. IF UTILITY CONDUIT IS NON-POTABLE, MINIMUM DIMENSION SHALL COMPLY WITH DDW WATERWORKS STANDARDS AND DISTRICT STD. W-19.
6. BEDDING SHALL BE AS SHOWN ON STD. W-2 AND TRENCH BACKFILL ABOVE PIPE ZONE AS REQUIRED BY SLO COUNTY. PIPE ZONE SHALL BE 1 SACK SLURRY PLACED AS SHOWN, PER SPECIFICATION SECTION 312316.
7. FOR CONTINUITY, TRACER WIRE, PER SPECIFICATION SECTION 400775, SHALL BE CONTINUED ACROSS D.I.P. CROSSING.

** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT		
		45-DEGREE MECHANICAL JOINT D.I.P. UTILITY CROSSING		
12/25	REVISED NOTES		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	W-18 SHEET 1 of 1

CASE A

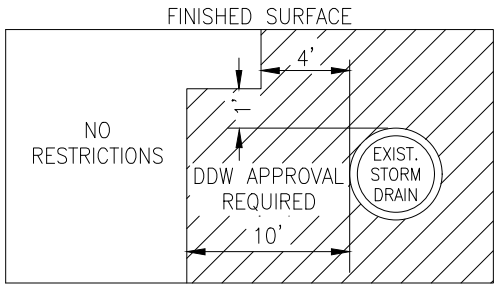


PARALLEL CONSTRUCTION REQUIREMENTS NEAR SEWERS

NOTES:

1. NEW WATER MAINS SHALL NOT BE INSTALLED IN THE SAME TRENCH AND SHALL BE AT LEAST 10 FEET HORIZONTALLY FROM AND 1 FOOT VERTICALLY ABOVE ANY PARALLEL PIPELINE CONVEYING:
   - ① UNTREATED SEWAGE
   - ② PRIMARY OR SECONDARY TREATED SEWAGE
   - ③ DISINFECTED SECONDARY–2.2 OR SECONDARY–23 RECYCLED WATER
   - ④ HAZARDOUS FLUIDS SUCH AS FUELS AND WASTEWATER SLUDGE

CASE B

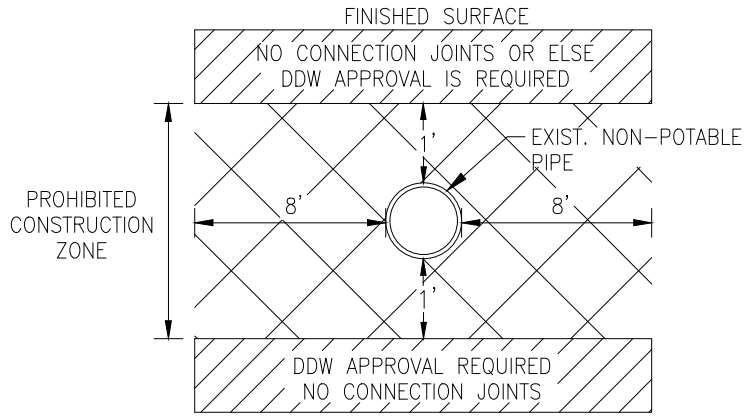


PARALLEL CONSTRUCTION REQUIREMENTS NEAR STORM DRAINS

NOTES:

1. NEW WATER MAINS SHALL NOT BE INSTALLED IN THE SAME TRENCH AND SHALL BE AT LEAST 4 FEET HORIZONTALLY FROM AND 1 FOOT VERTICALLY ABOVE ANY PARALLEL PIPELINE CONVEYING:
   - ① STORM DRAINAGE
   - ② DISINFECTED TERTIARY RECYCLED WATER
2. THE VERTICAL SEPARATION IN CASE B IS REQUIRED WHEN THE HORIZONTAL SEPARATION IS LESS THAN 10 FEET.

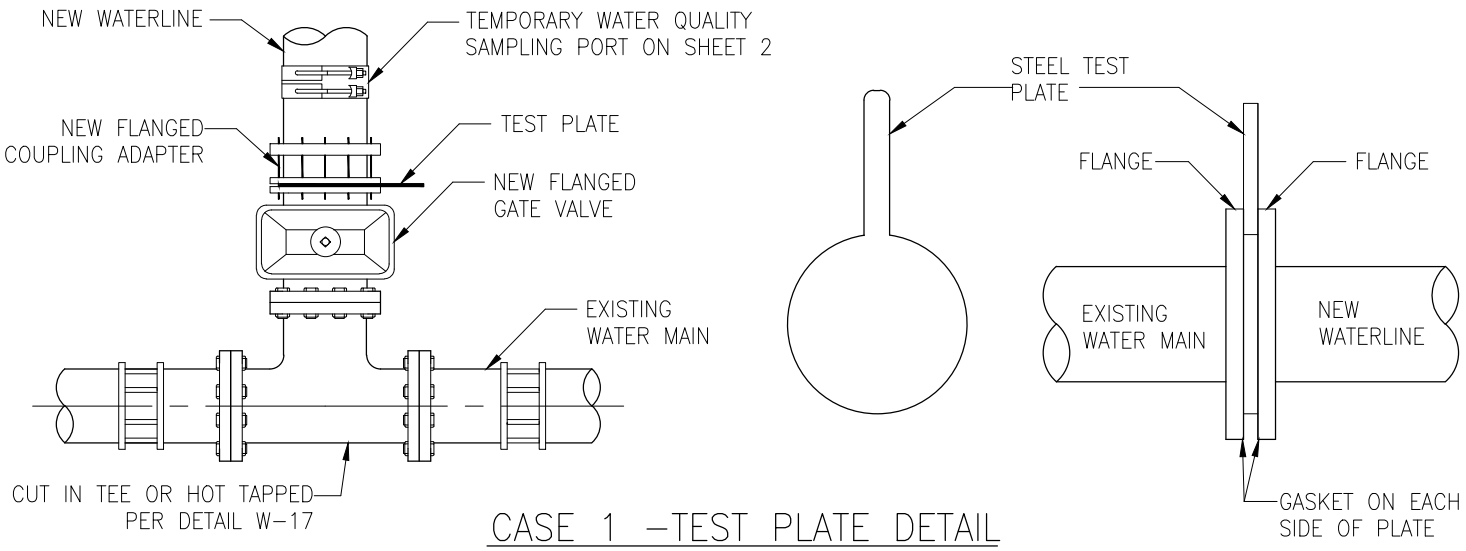
CASE C



CROSSING CONSTRUCTION REQUIREMENTS NEAR NON–POTABLE PIPELINES

1. A DDW WAIVER IS NOT REQUIRED IF THE ANGLE OF THE CROSSING IS GREATER THAN 45–DEGREES AND THE WATER MAIN IS AT LEAST 1 FOOT ABOVE THE PIPE BEING CROSSED.
2. NO CONNECTION JOINTS SHALL BE MADE IN THE WATERLINE WITHIN 8 FEET HORIZONTAL MEASURED ON EITHER SIDE OF THE NON–POTABLE FLUID PIPELINE (WALL TO WALL MEASUREMENT).
3. ENGINEER OF RECORD SHALL BE RESPONSIBLE FOR PREPARATION OF DDW WAIVER, IF REQUIRED, FOR DISTRICT SIGNATURE.

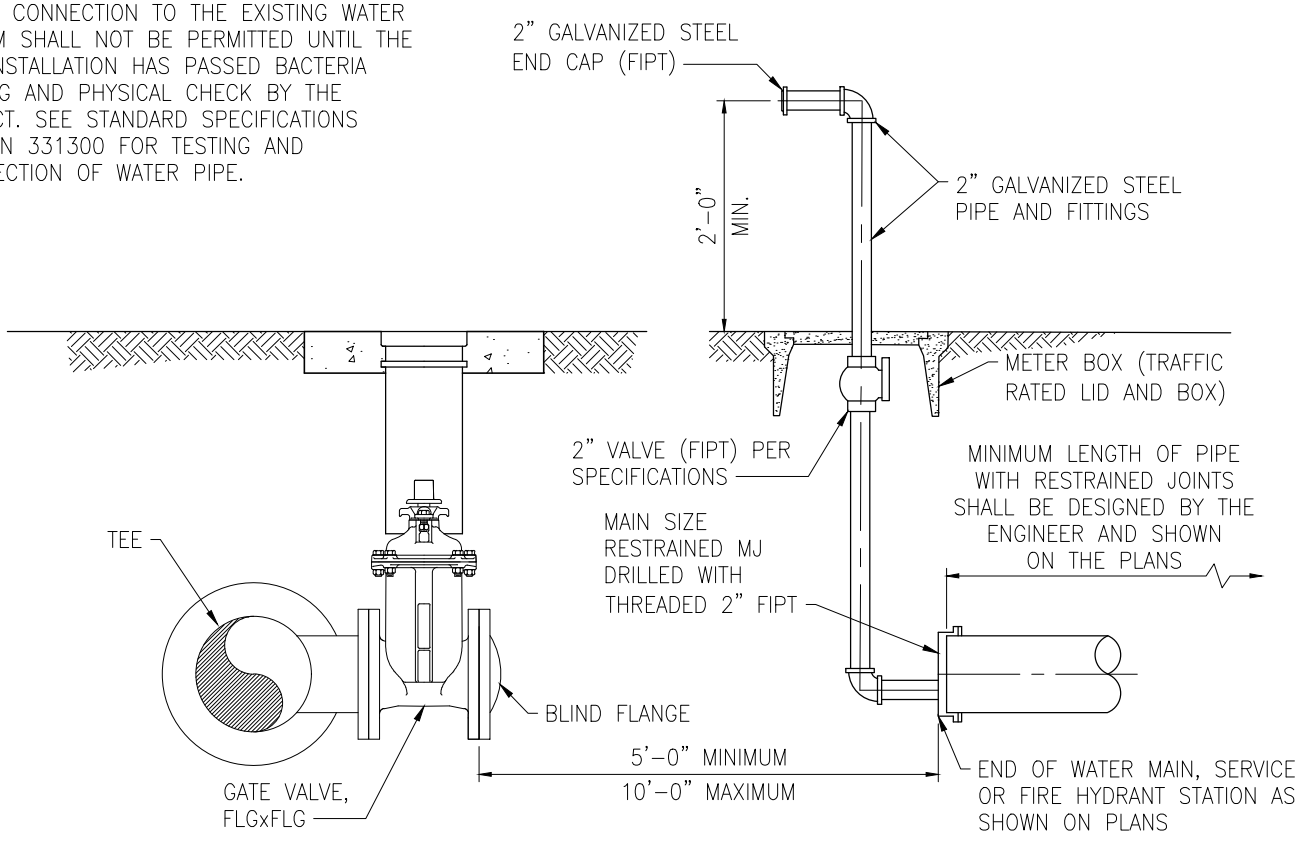
		NIPOMO COMMUNITY SERVICES DISTRICT		
		PIPELINE SEPARATION REQUIREMENTS		
12/25	REVISED NOTES		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	W-19
				SHEET 1 of 1



CASE 1 –TEST PLATE DETAIL

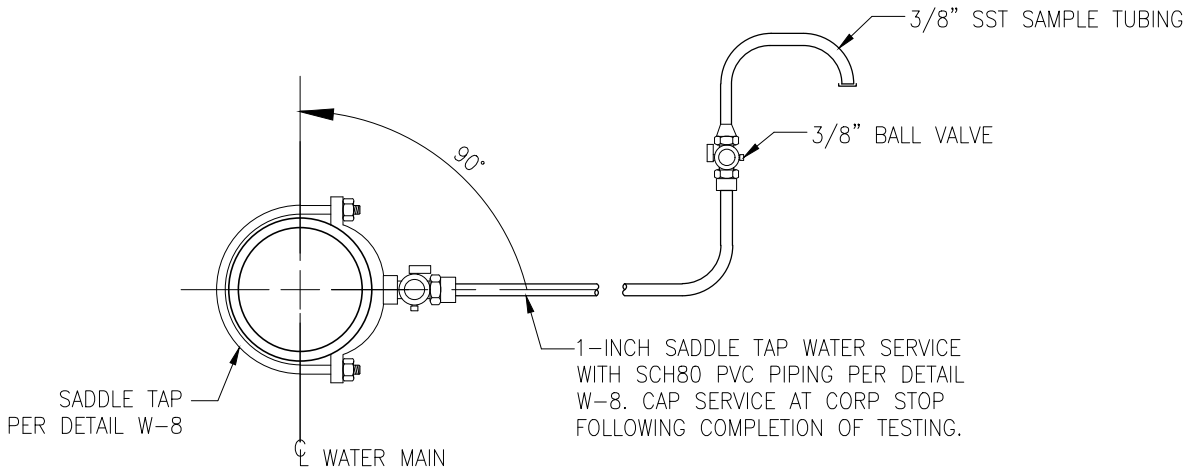
GENERAL NOTE:

1. DIRECT CONNECTION TO THE EXISTING WATER SYSTEM SHALL NOT BE PERMITTED UNTIL THE NEW INSTALLATION HAS PASSED BACTERIA TESTING AND PHYSICAL CHECK BY THE DISTRICT. SEE STANDARD SPECIFICATIONS SECTION 331300 FOR TESTING AND DISINFECTION OF WATER PIPE.



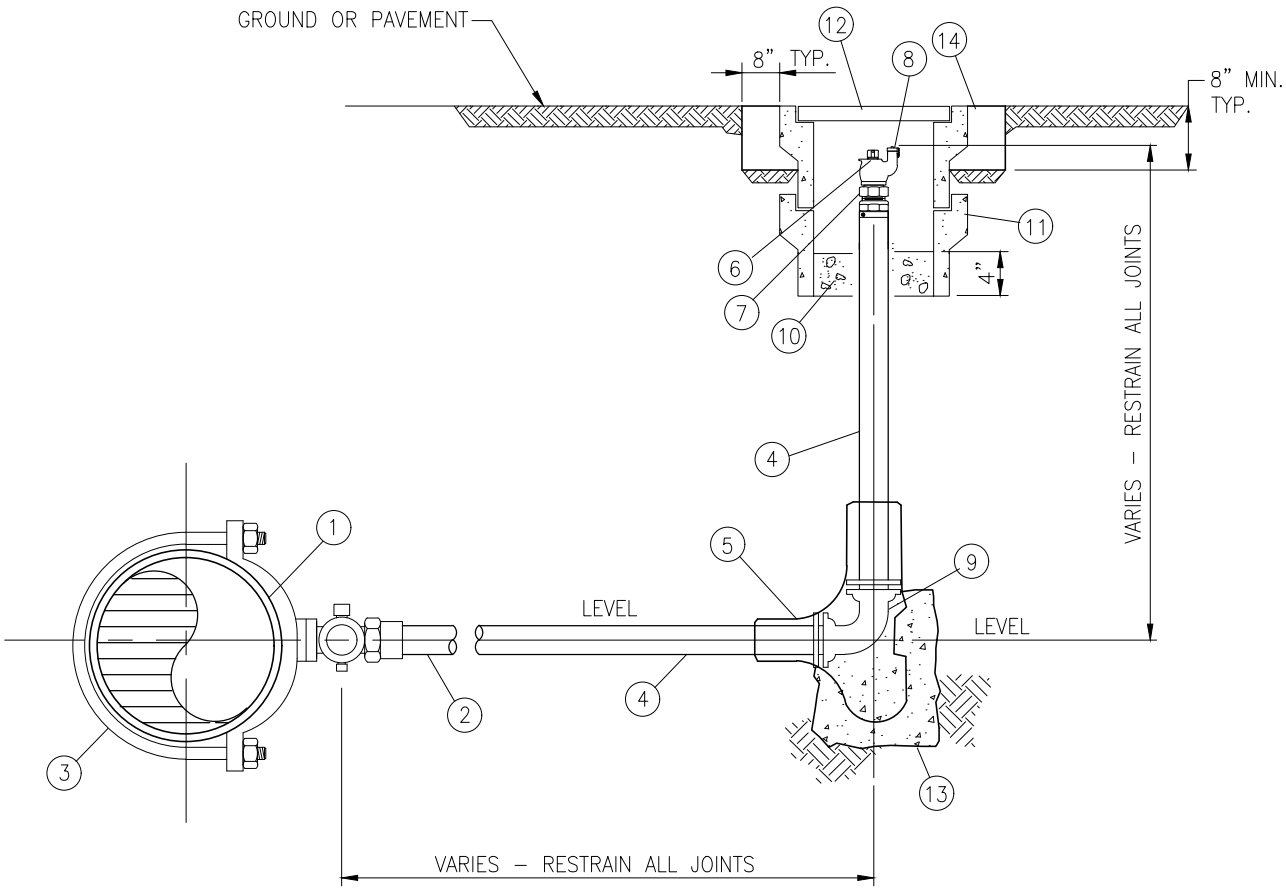
CASE 2 – TEMPORARY PHYSICAL SEPARATION AND 2" BLOW OFF DETAIL

		NIPOMO COMMUNITY SERVICES DISTRICT		
		NEW WATERLINE CONNECTION DETAILS		
12/25	SEPARATION DETAIL ADDED		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	W-20 SHEET 1 of 2



TEMPORARY WATER QUALITY SAMPLING PORT DETAIL

		NIPOMO COMMUNITY SERVICES DISTRICT		
		NEW WATERLINE CONNECTION DETAILS		
12/25	ADDED DETAIL		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	W-20 SHEET 2 of 2



ITEM	DESCRIPTION
1	WATERMAIN
2	2–INCH SADDLE TAP WATER SERVICE WITH SCH 80 PVC PIPING PER W–9
3	SADDLE TAP PER W–9
4	2" SCH 80 PVC
5	POLYETHYLENE ENCASING
6	BLOW–OFF BALL VALVE
7	PACK JOINT COUPLING
8	2" PVC PIPE CAP
9	2" SCH 80 90° ELBOW WITH RESTRAINED JOINTS
10	3/4" GRAVEL
11	H–20 TRAFFIC RATED PRECAST VALVE BOX,
12	HS–20 TRAFFIC RATED, BOLTED, GALVANIZED STEEL LID HATCH
13	CONCRETE ANCHOR BLOCK, 6 SQ.FT. MIN.
14	8" CONCRETE COLLAR

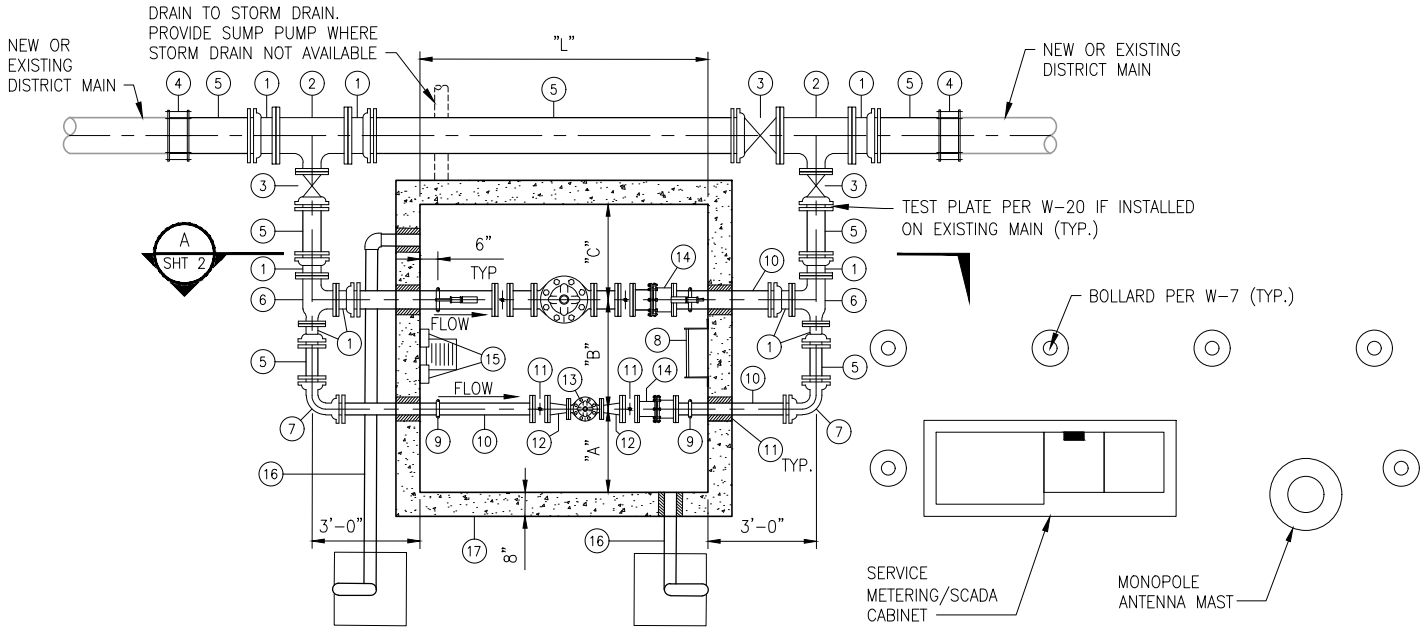
** SEE APPROVED MATERIALS LIST

12/25	REVISED COLLAR AND NOTES
DATE	REVISION

NIPOMO COMMUNITY SERVICES DISTRICT

END OF LINE BLOWOFF ASSEMBLY, LESS THAN 10"

DATE DRAWN	STD. NO.
MAY 2011	W-21
	SHEET 1 of 1



PLAN

FOR PRV NOTES: SEE W-22, SHEET 2

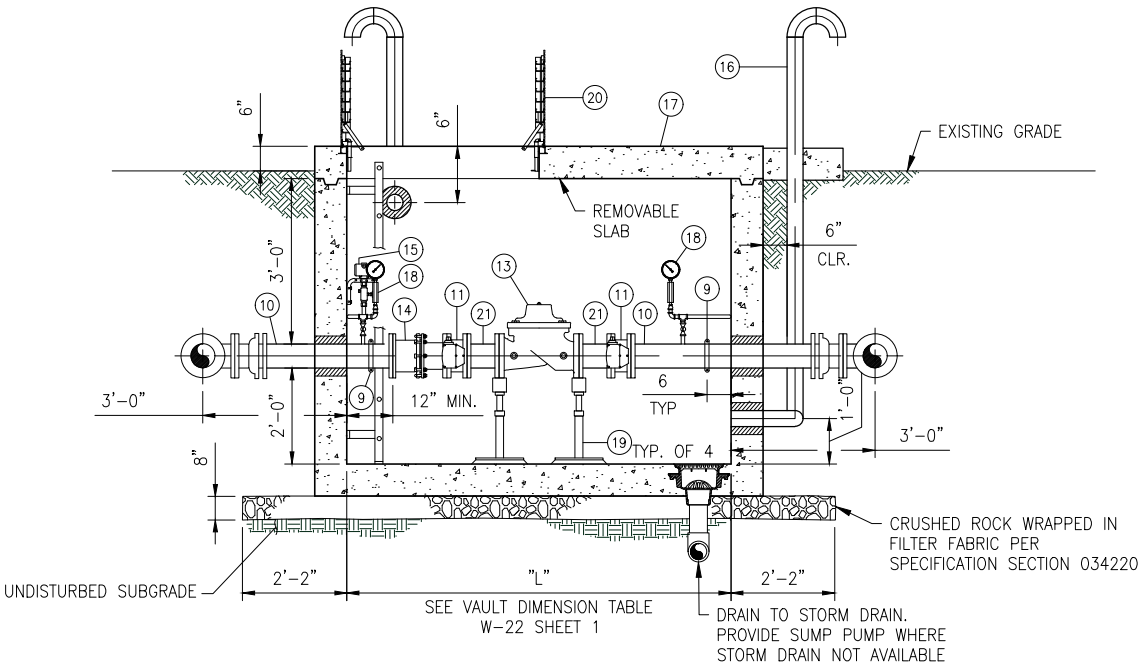
MATERIALS	
1	FLANGE ADAPTER
2	D.I. TEE, FLG'D. SEE STANDARD DETAIL W-20 FOR CONNECTION TO EXISTING MAIN.
3	RESILIENT WEDGE GATE VALVE, FLGxMJ
4	TRANSITION COUPLING
5	D.I.P. SPOOL, PExPE
6	D.I. REDUCING ON RUN TEE, FLG'D
7	D.I. 90° ELBOW
8	LADDER
9	GROOVED END COUPLING, SIZE TO MATCH PIPE
10	D.I.P. SPOOL, FLGXPE
11	BUTTERFLY VALVE, FLGxFLG
12	D.I. REDUCER, FLGxFLG
13	PRESSURE REDUCING VALVE,
14	ROMAC DJ405 DISMANTLING JOINT

MATERIALS	
15	WALL MOUNTED PRESSURE TRANSMITTERS
16	4"ø AIR VENT
17	PRECAST CONCRETE VAULT

MIN. VAULT DIMENSIONS				
PRV SIZE (in)	"A"	"B"	"C"	"L" (MIN.)
3 (MIN.)	24	36	24	72
4	24	36	24	72
6	24	36	24	72
8	36	36	36	84
10	36	36	36	84
12	38	48	36	96

** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT		
		PRESSURE REDUCING VALVE VAULT PLAN AND SECTION		
DATE	REVISION		DATE DRAWN: DEC. 2025	STD. NO.: W-22 SHEET 1 of 2



SECTION VIEW A

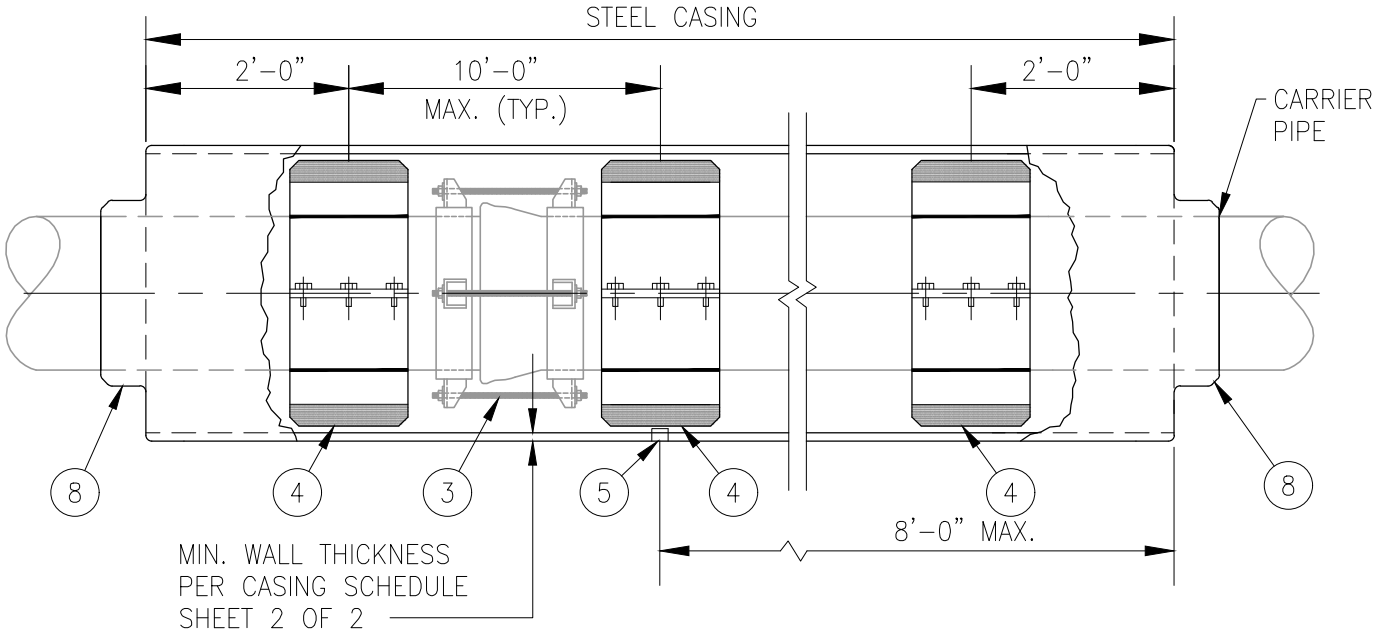
MATERIALS	
(9)	GROOVED END COUPLING, SIZE TO MATCH PIPE
(10)	D.I.P. SPOOL, FLGXPE
(11)	GATE VALVE, FLGxFLG
(13)	PRESSURE REDUCING VALVE
(14)	DISMANTLING JOINT
(15)	WALL MOUNTED PRESSURE TRANSMITTERS
(16)	4"ø AIR VENT
(17)	PRECAST CONCRETE VAULT
(18)	4½" PRESSURE GAUGE AND TRANSMITTER
(19)	ADJUSTABLE PIPE SUPPORT
(20)	4'-0" x 4'-0" DOUBLE LEAF ALUMINUM ACCESS HATCH
(21)	D.I.P. SPOOL, FLGXPE

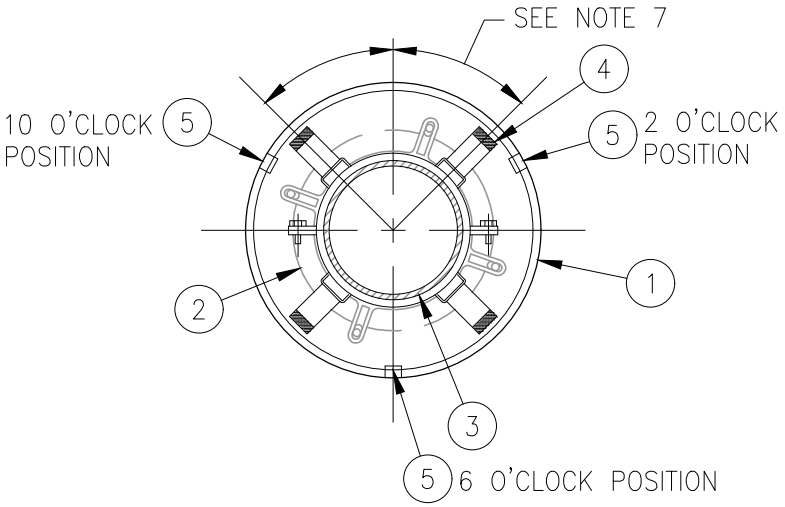
NOTES:

1. ALL PIPE JOINTS AND FITTINGS TO BE RESTRAINED.
2. PIPING AND VALVES TO BE SIZED BY ENGINEER. PLAN AND CALCULATIONS TO BE SUBMITTED TO DISTRICT FOR APPROVAL.
3. THIS IS A TEMPLATE – THE ACTUAL SIZES OF THE COMPONENTS PRV'S REQUIRED FOR SPECIFIC LOCATION NEED TO BE SHOWN ON THE PLAN ALONG WITH THEIR SETTINGS.
4. WHERE VAULTS ARE CONSTRUCTED WITHIN ANY VEHICLE TRAVEL LANE, ACCESS HATCHES SHALL BE STEEL AND RATED FOR CONTINUOUS H-20 TRAFFIC LOADING.
5. VAULTS SHALL BE CONSTRUCTED A MINIMUM OF 24" AWAY FROM CURB OR SIDEWALK, LEVEL, AND DESIGNED BY THE ENGINEER OF RECORD TO ACCOUNT FOR NUISANCE WATER AND THE SAFETY OF THE TRAVELING PUBLIC.
6. AT NO POINT SHALL ANY PART OF THE PRESSURE REDUCING VALVE VAULT BE CLOSER THAN 36" AWAY FROM ANY STRUCTURE OR LANDSCAPING.
7. PIPING FOR 3" PRV ASSEMBLIES SHALL BE 4" DIAMETER. PROVIDE 3"x4" REDUCER AT PRV.

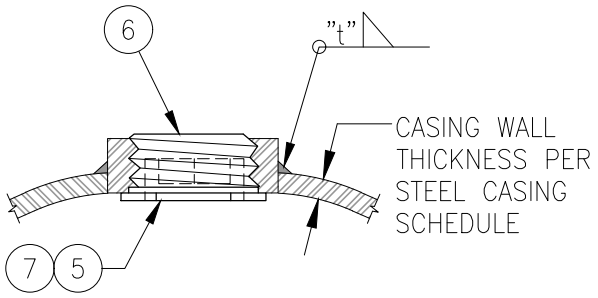
** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT		
		PRESSURE REDUCING VALVE VAULT PLAN AND SECTION		
DATE	REVISION		DATE DRAWN: DEC. 2025	STD. NO.: W-22 SHEET 2 of 2





CROSS-SECTION



GROUT FITTING DETAIL

ITEM	MATERIALS
1	STEEL CASING PER STD. SPECIFICATION SECTION 317216
2	CARRIER PIPE JOINT BELL, BEYOND
3	CARRIER PIPE WITH ALL JOINTS RESTRAINED
4	STAINLESS STEEL CASING SPACERS WITH UHMW POLYETHYLENE RUNNERS PER STD. SPECIFICATION SECTION 317216
5	GROUT FITTINGS @ 8' O.C. PER DETAIL HEREON. FOR ALL CASINGS 30" IN DIA. AND LARGER, INSTALL ONE COUPLING IN 6 O'CLOCK POSITION @ 8' O.C.; STAGGER COUPLINGS BETWEEN 10 O'CLOCK AND 2 O'CLOCK POSITIONS EVERY 4 LINEAR FEET ALONG CASING AXIS.
6	2" NPT THREAD STEEL PLUG
7	2" NPT STANDARD WEIGHT STEEL PIPE HALF COUPLING
8	EPDM CASING END SEAL PER SPECIFICATION SECTION 317216 WITH STAINLESS STEEL WORM-SCREW BAND CLAMPS.

DATE	REVISION

NIPOMO COMMUNITY SERVICES DISTRICT

STEEL CASING FOR WATER PIPE

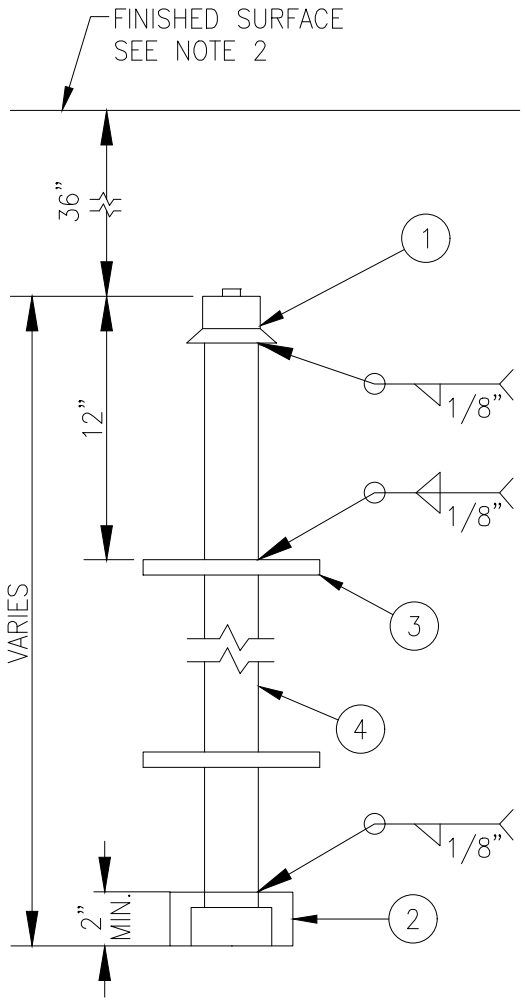
DATE DRAWN	STD. NO.
DEC. 2025	W-23
	SHEET 1 of 2

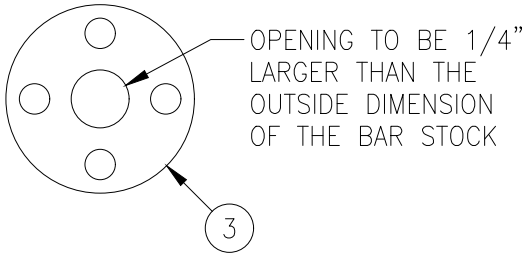
NOTES:

1. CASING SHALL BE INSTALLED BY THE BORE, JACK AND/OR TUNNEL METHOD, OR OPEN TRENCH. SEE STD. SPECIFICATION SECTION 317216. BEDDING MATERIAL FOR OPEN TRENCH CASING INSTALLATION SHALL CONSIST OF 6" OF 3/4" CRUSHED ROCK.
2. SIZE AND THICKNESS OF CASING SHALL BE AS SHOWN IN STEEL CASING SCHEDULE HEREON. FOR LONG BORES OR SPECIAL SITUATIONS GREATER WALL THICKNESS THAN SHOWN IN SCHEDULE MAY BE REQUIRED.
3. ALL STEEL CASING PIPE FIELD JOINTS SHALL BE WELDED FULL–CIRCUMFERENCE.
4. CARRIER PIPE SHALL BE PRESSURE TESTED PRIOR TO SEALING ENDS OF CASING.
5. EACH END OF CASING SHALL BE SEALED WITH APPROVED RUBBER CASING END SEALS.
6. BACKFILL FOR CASING IN OPEN CUT SHALL BE PER STD. DWG. W–2.
7. NUMBER AND PLACEMENT OF SPACERS ON CARRIER PIPE PER MANUFACTURER'S SPECIFICATIONS.
8. ALL CARRIER PIPE JOINTS INSIDE THE STEEL CASING AND A MIN. 5' OUTSIDE THE STEEL CASING SHALL BE RESTRAINED

STEEL CASING SCHEDULE		
NOMINAL CARRIER PIPE SIZE	MINIMUM CASING SIZE (NOMINAL)	MINIMUM WALL THICKNESS
4"	12"	1/4"
6"	16"	5/16"
8"	18"	5/16"
10"	20"	5/16"
12"	24"	3/8"
14"	27"	3/8"
16"	30"	3/8"
18"	30"	1/2"
20"	36"	1/2"
24"	42"	1/2"

		NIPOMO COMMUNITY SERVICES DISTRICT		
		STEEL CASING FOR WATER PIPE		
DATE	REVISION		DATE DRAWN DEC. 2025	STD. NO. W-23 SHEET 2 of 2





ITEM	MATERIALS
1	A.W.W.A 2" SQUARE OPERATING NUT.
2	A.W.W.A. SOCKET FOR 2" SQUARE OPERATING NUT.
3	6½" DIA. x 3/16" SPACER PLATE
4	1¼" SOLID, ROUND OR SQUARE, STEEL BAR STOCK (PINNED COUPLERS ARE NOT ALLOWED, HOLLOW TUBE OR PIPE ARE NOT ALLOWED).

NOTES:

1. PROVIDE VALVE STEM EXTENSION WHEN DEPTH TO OPERATING NUT EXCEEDS 60" (FABRICATE EXTENSION TO FIELD MEASUREMENT, SEE NOTE 2).
2. TERMINATE EXTENSION 36" FROM FINISHED SURFACE.
3. PROVIDE ADDITIONAL SPACER PLATE(S) WHEN DISTANCE TO BOTTOM SOCKET EXCEEDS 60" BEYOND LOWEST PLATE.

DATE	REVISION

NIPOMO COMMUNITY SERVICES DISTRICT

VALVE STEM EXTENSION

DATE DRAWN	STD. NO.
DEC. 2025	W-24
	SHEET 1 of 1

TABLE OF CONTENTS
Sewer Standard Drawings

SEWER NOTES

1. THE SEWER FACILITIES TO BE DEDICATED TO THE NCSD (DISTRICT) SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT NCSD STANDARD SPECIFICATIONS FOR WATER AND SEWER IMPROVEMENTS. THE OMISSION OF ANY CURRENT STANDARD DETAIL DOES NOT RELIEVE THE CONTRACTOR FROM THIS REQUIREMENT.

2. THE DISTRICT SHALL BE NOTIFIED AT LEAST SEVEN (7) WORKING DAYS PRIOR TO START OF CONSTRUCTION. TELEPHONE (805) 929–1133. CONSTRUCTION WILL NOT TAKE PLACE ON WEEKENDS UNLESS SPECIFICALLY APPROVED BY THE DISTRICT. A PRECONSTRUCTION MEETING IS REQUIRED IN ACCORDANCE WITH DISTRICT STANDARDS GENERAL CONDITIONS SECTION 3.6.

3. THE CONSTRUCTION PLANS MUST BE APPROVED BY THE DISTRICT PRIOR TO THE START OF ANY SEWER CONSTRUCTION. TWO (2) SETS OF APPROVED PLANS SHALL BE FURNISHED TO THE DISTRICT. PRIOR TO DISTRICT APPROVAL, THE PLANS MUST BE SIGNED BY A CALIFORNIA REGISTERED CIVIL ENGINEER. ALL UTILITIES SHALL APPROVE PLANS PRIOR TO NCSD.

4. PRIOR TO ACCEPTANCE OF THE SEWER FACILITIES, ALL NECESSARY EASEMENT DOCUMENTS SHALL BE PROPERLY EXECUTED AND FURNISHED TO DISTRICT FOR BOARD APPROVAL PRIOR TO RECORDING.

5. PRIOR TO THE ACCEPTANCE OF THE SEWER FACILITIES, ALL PIPING SHALL BE MANDREL INSPECTED, AND TESTED FOR LEAKAGE AND INFILTRATION. ALL PIPING SHALL BE TELEVISION INSPECTED. ALL PIPING SHALL BE CLEANED PER DISTRICT STANDARDS, IN CONFORMANCE WITH THE TECHNICAL SPECIFICATIONS FOR CLEAN–UP. SEE SPECIFICATION SECTIONS 333112 AND 330130.

6. THE MANHOLE FRAME AND COVER AND CONCRETE SUPPORT FOR MANHOLES SHALL BE RAISED AND CONSTRUCTED TO FINISHED PAVED GRADE AFTER PAVING IS COMPLETED. THE RING SECTION SHALL NOT BE MORE THAN 18" FROM THE CONE. THE SEWER SYSTEM SHALL BE CLEANED PRIOR TO ACCEPTANCE.

7. WORK SHALL BE DONE IN ACCORDANCE WITH THE APPROPRIATE ENCROACHMENT PERMITS.

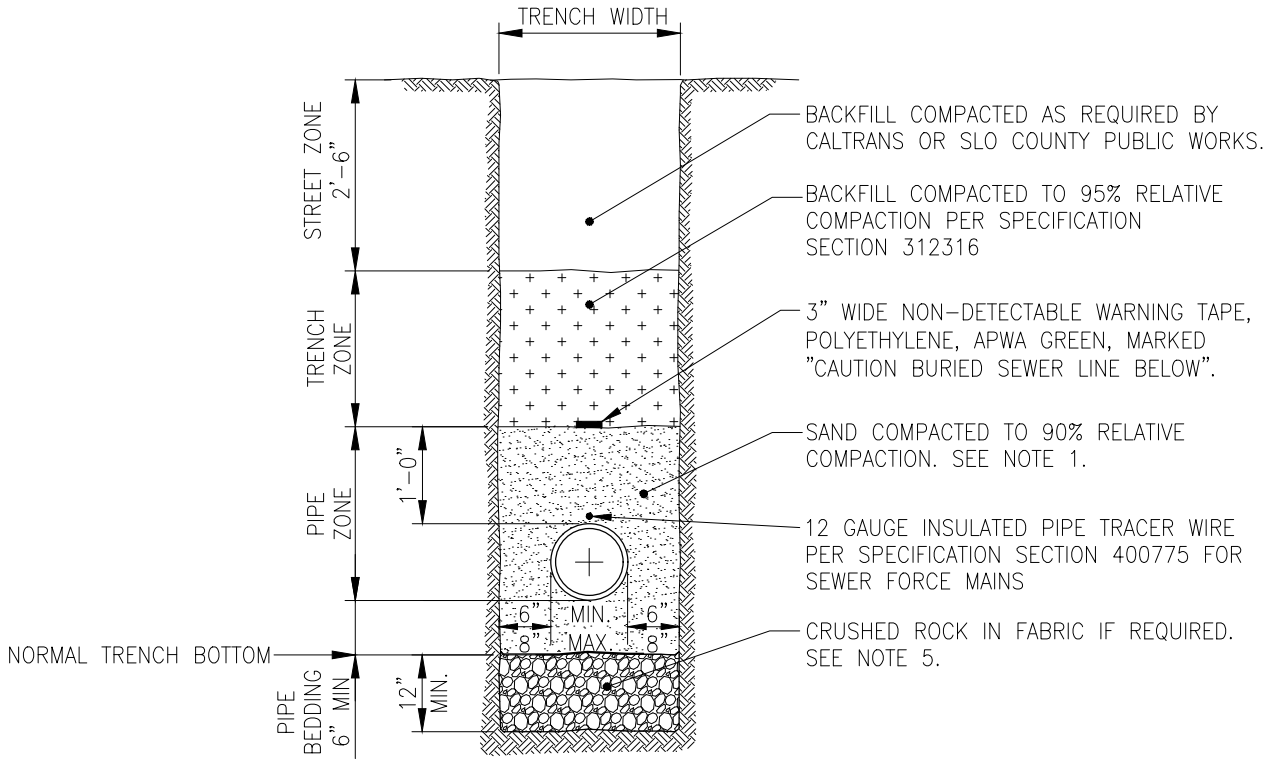
8. THE SEWER SYSTEM, INCLUDING LATERALS, SHALL BE HYDROSTATIC OR AIR TESTED, AFTER ALL UNDERGROUND UTILITIES ARE CONSTRUCTED, AND PRIOR TO PLACING STREET PAVEMENT. SEE SPECIFICATION SECTION 330130.

9. EXISTING SEWER LOCATIONS AND FLOWLINE ELEVATIONS SHALL BE VERIFIED BY THE CONTRACTOR BEFORE START OF CONSTRUCTION. THE DISTRICT SHALL BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES.

10. UPON COMPLETION OF CONSTRUCTION, ONE COMPLETE SET OF DRAWINGS, ALONG WITH ELECTRONIC (AUTOCAD DWG) FILES SHALL BE FURNISHED TO THE DISTRICT.

11. SEE DISTRICT'S APPROVED MATERIALS LIST FOR SPECIFIC PARTS.

		NIPOMO COMMUNITY SERVICES DISTRICT		
		STANDARD SEWER NOTES		
12/25	REVISED TEXT			
05/11	REVISED TEXT		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	S-1 SHEET 1 of 1



NOTES:

1. SAND SHALL BE PER SPECIFICATION SECTION 312316 FOR TRENCHING, BACKFILLING AND COMPACTING.
2. SEE SPECIFICATION SECTION 312316 FOR EARTHWORK IF TRENCH WIDTH EXCEEDS THE MAXIMUM SHOWN ON THIS DRAWING.
3. SEE STREET IMPROVEMENT PLANS (IF APPLICABLE) FOR PAVING REQUIREMENTS.
4. MINIMUM COVER OVER ALL SEWER MAINS TO BE 6'-0" AS MEASURED FROM THE FINISHED GRADE.
5. IF REQUIRED DUE TO UNSUITABLE SUBGRADE MATERIAL, PLACE AT LEAST 12" CRUSHED OR NATURAL ROCK PER SPECIFICATION SECTION 312316. COMPACTED TO 95% RELATIVE COMPACTION FULLY ENCASED IN POLYPROPYLENE, NEEDLE-PUNCHED, NON-WOVEN GEOTEXTILE FABRIC.

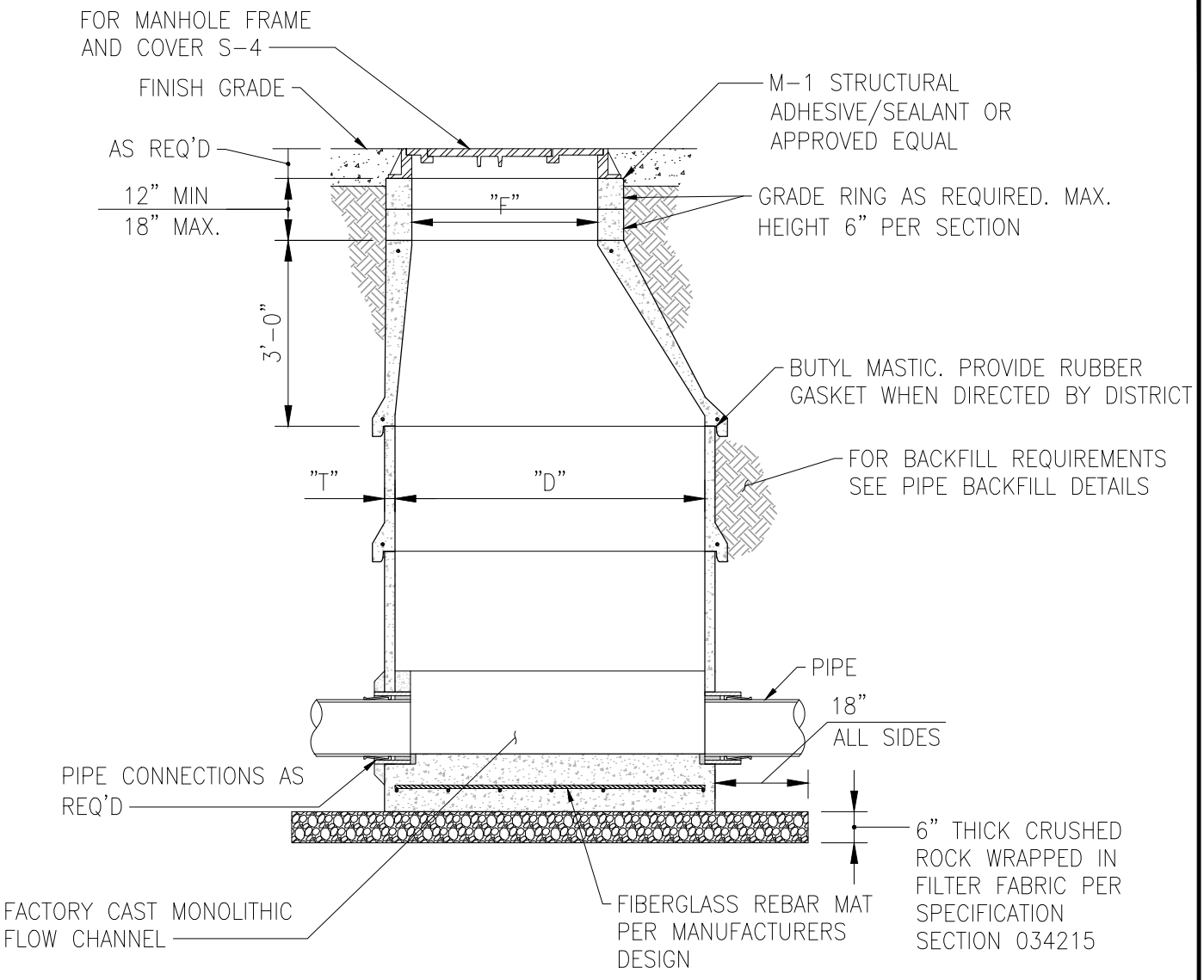
** SEE APPROVED MATERIALS LIST

12/25	REVISED TEXT
05/11	REVISED BACKFILL REQUIREMENTS
DATE	REVISION

NIPOMO COMMUNITY SERVICES DISTRICT

SEWER PIPE BEDDING AND BACKFILL DETAILS

DATE DRAWN	STD. NO.
MAY 2011	S-2
	SHEET 1 of 1



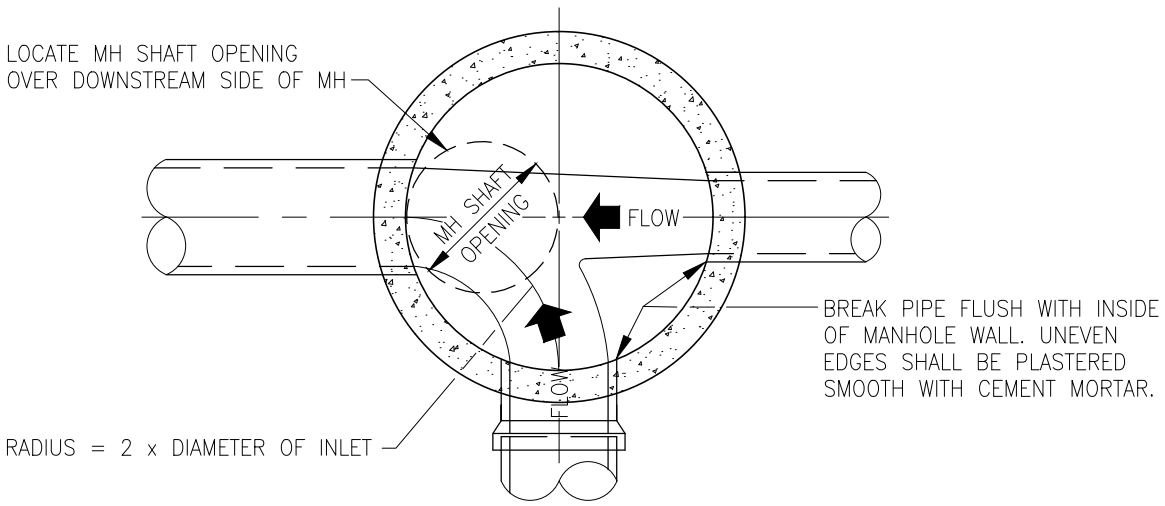
D (IN.)	T MIN. (IN.)	F (IN.)
48	2	24
60	2	36

NOTES:

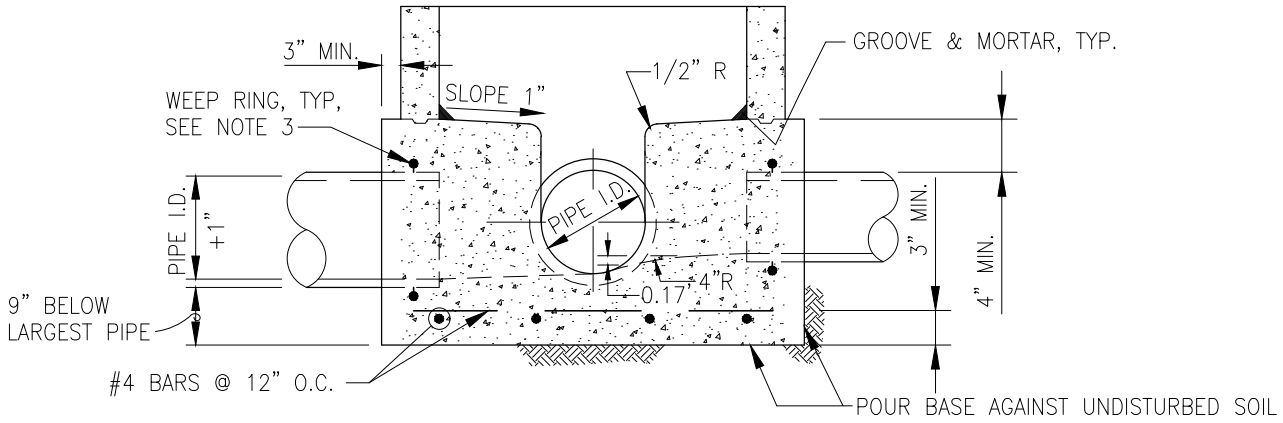
1. MANHOLE RINGS, CONES AND SECTIONS SHALL BE PER SPECIFICATION SECTION 034215.
2. PROVIDE PIPE TO MANHOLE FLEXIBLE CONNECTOR ON PRECAST MANHOLE BASE.
3. FOR NEW MANHOLE INSTALLED ON EXISTING SEWER MAIN POURED IN PLACE BASE SHALL BE INSTALLED PER S-3A.
4. ALL MATERIALS NEED FOR GROUTING AND PATCHING TO BE PROVIDED BY MANHOLE MANUFACTURER.

** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT		
		SEWER MANHOLE DETAIL		
12/25	REVISED MATERIALS AND TEXT		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	S-3 SHEET 1 of 1



PLAN

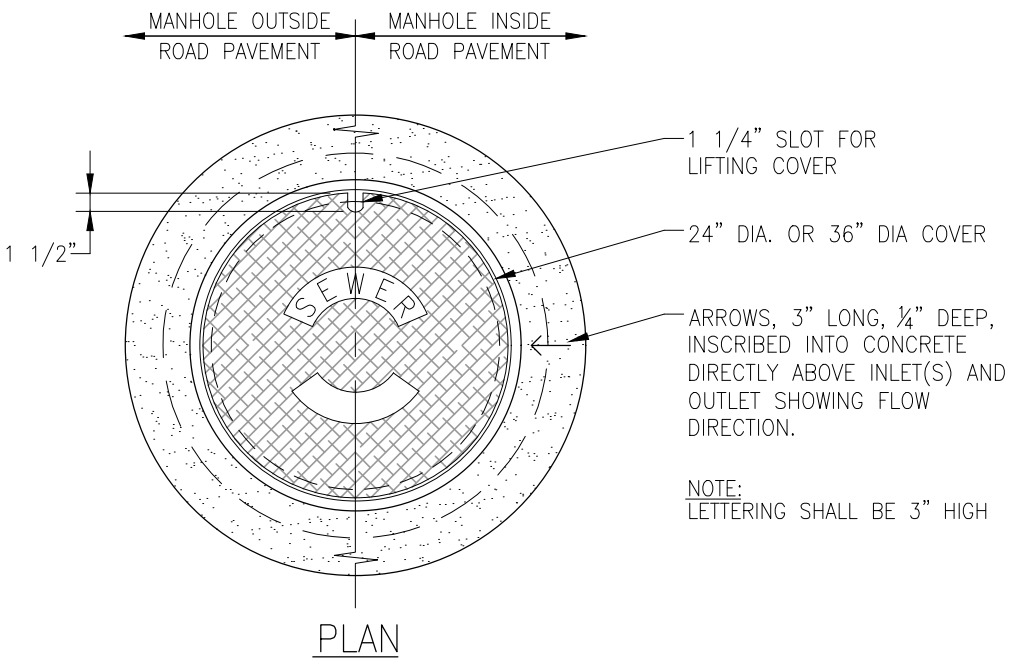


ELEVATION

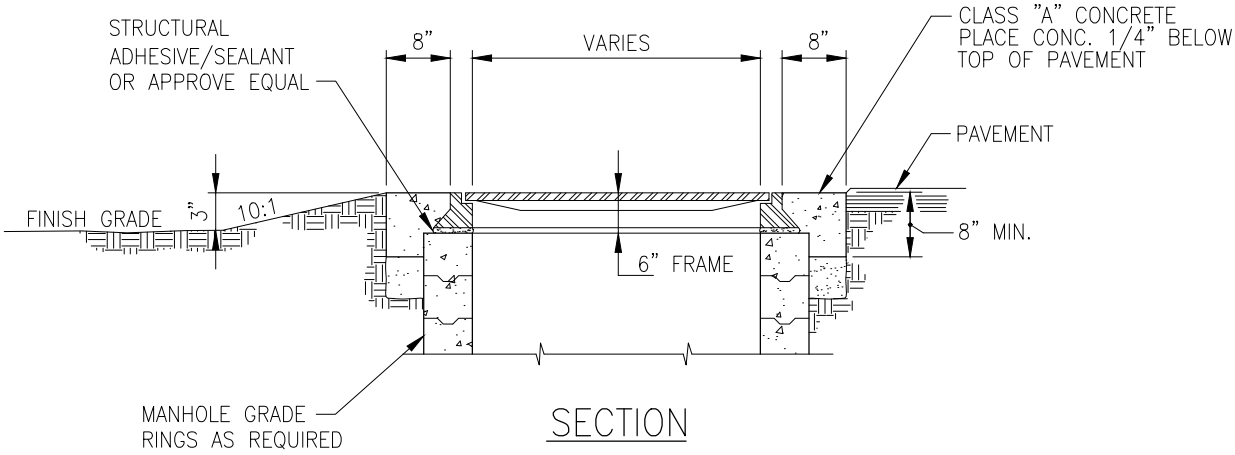
NOTES:

1. MANHOLE RINGS, CONES AND SECTIONS PER DETAIL S-3.
2. MORTAR SHALL BE: 1 PART CEMENT TO 4 PARTS SAND.
3. RUBBER WEEP RING ON PER ASTM C923.

		NIPOMO COMMUNITY SERVICES DISTRICT		
		CAST IN PLACE MANHOLE BASE		
			DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	S-3A
				SHEET 1 of 1



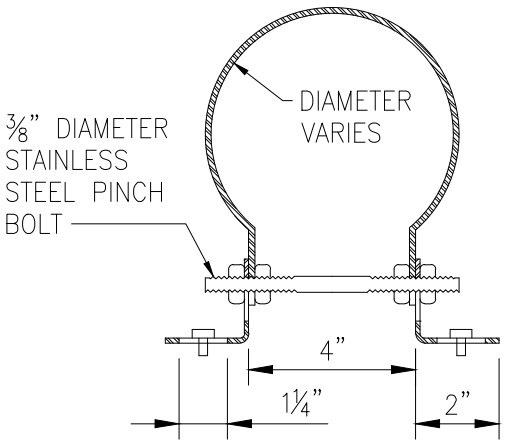
PLAN



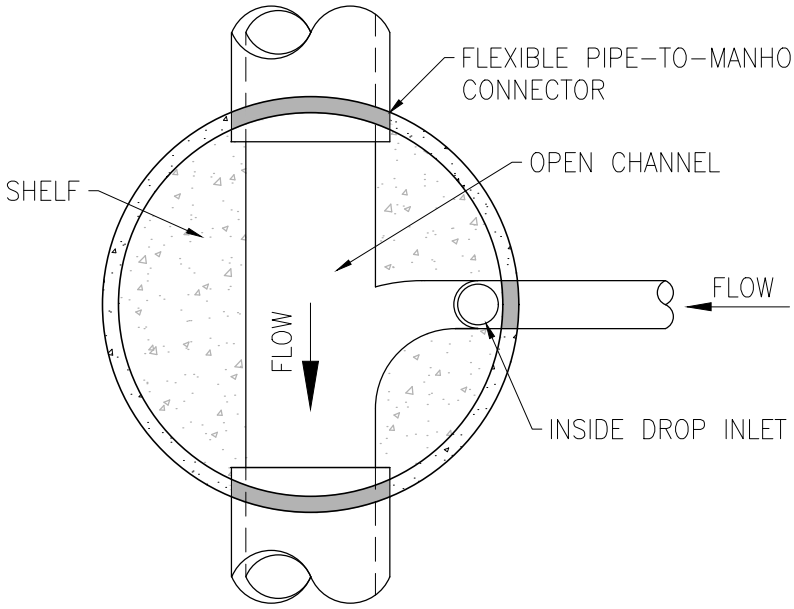
SECTION

** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT		
		MANHOLE FRAME AND COVER		
05/11	CONCRETE COLLAR		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	S-4 SHEET 1 of 1



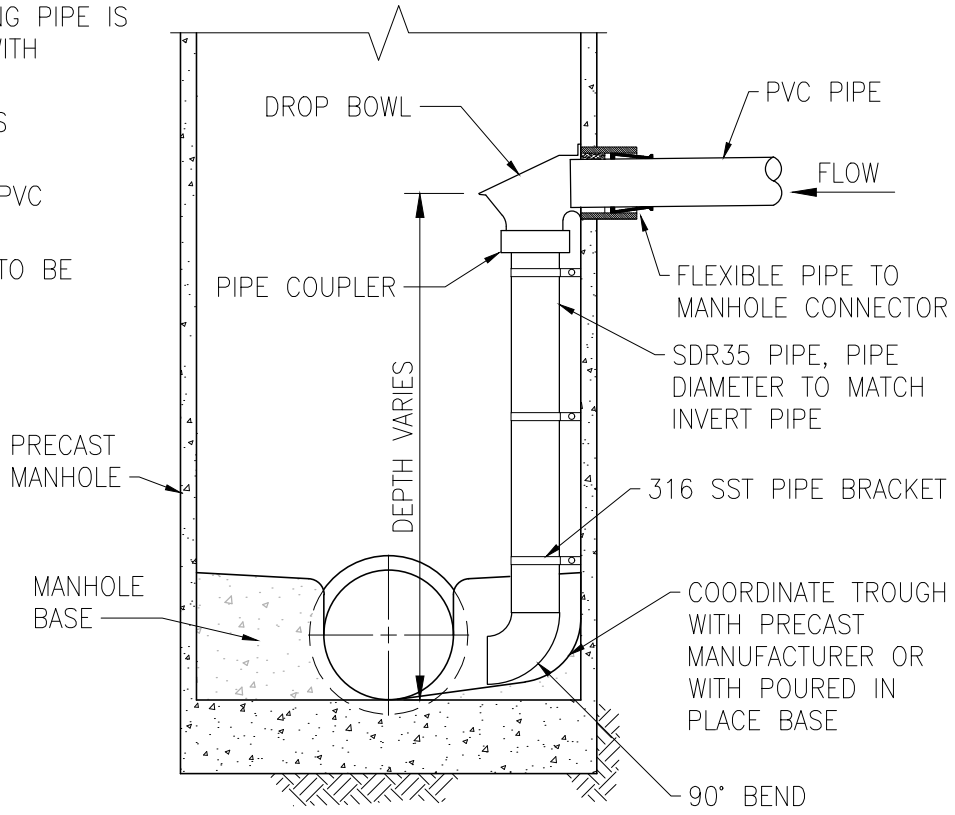
PIPE BRACKET



PLAN

NOTES:

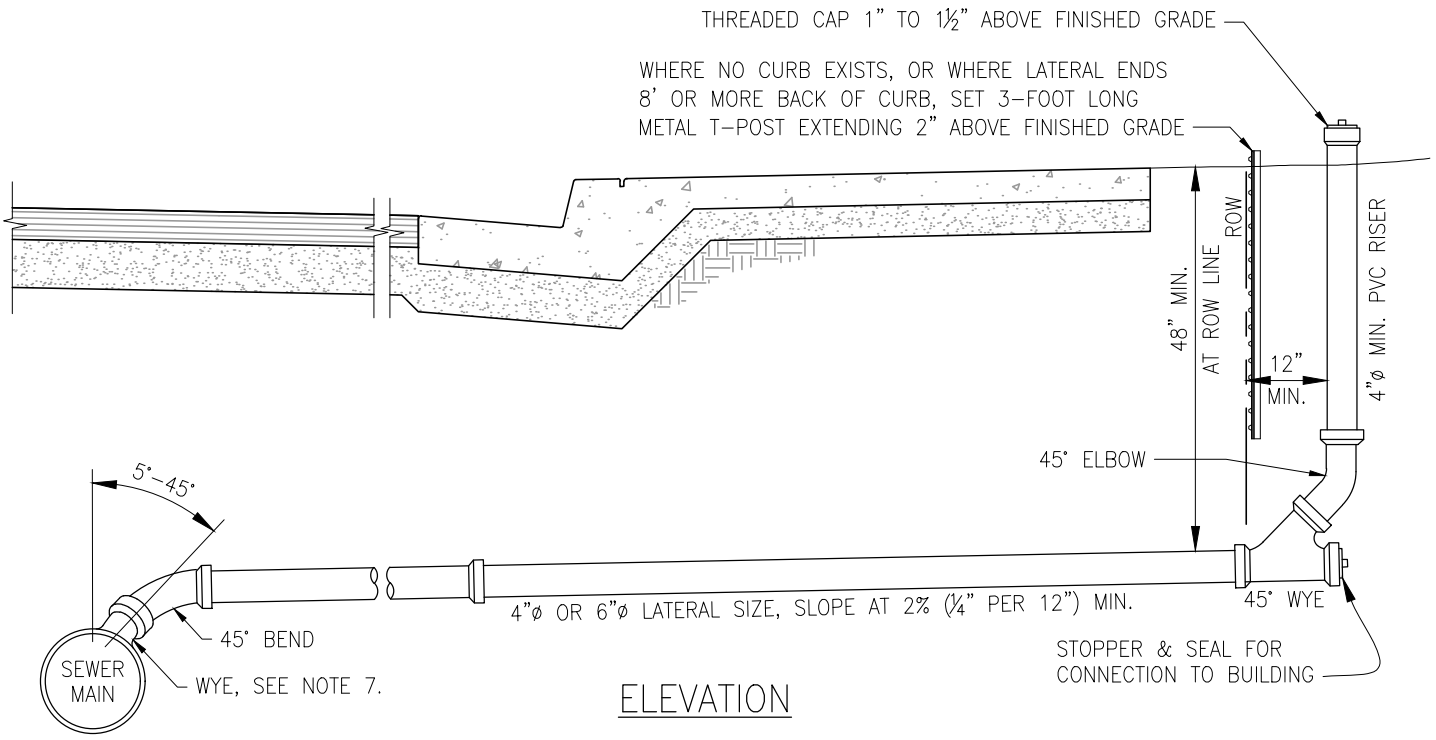
1. USE DROP CONNECTION WHERE DIFFERENCE IN INVERT ELEVATION BETWEEN MAIN AND INTERSECTING PIPE IS GREATER THAN 2.5 FEET AND WITH DISTRICT APPROVAL.
2. DROP TO BE SAME DIAMETER AS INCOMING PIPE.
3. ALL PIPE AND FITTINGS TO BE PVC SDR35.
4. ALL MECHANICAL COMPONENTS TO BE 315 STAINLESS STEEL.



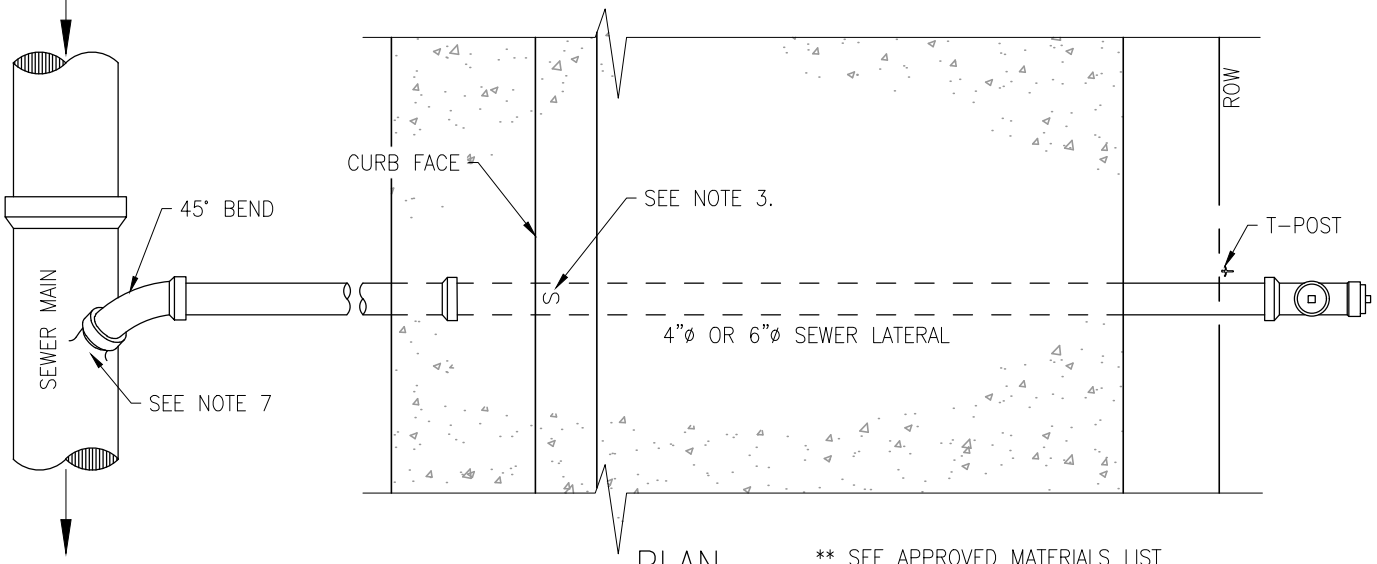
PROFILE

** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT		
		INSIDE DROP INLET		
DATE	REVISION		DATE DRAWN: DEC. 2025	STD. NO.: S-5 SHEET 1 of 1



ELEVATION



PLAN

** SEE APPROVED MATERIALS LIST

NOTES:

1. MINIMUM 5-FEET SPACING BETWEEN LATERAL CONNECTION UNLESS APPROVED BY DISTRICT.
2. SEWER LATERAL SHALL BE 4"ø OR 6"ø DIAMETER PVC PIPE AND SHALL MEET ASTM STANDARD D 3034, SDR 35.
3. AN "S" SHALL BE STAMPED OR CHISELED ON THE CURB OVER THE SEWER LATERAL WHEN CURB AND GUTTER IS EITHER CONSTRUCTED OR EXISTING. THE "S" SHALL BE A MINIMUM OF 3" HIGH x 2" WIDE x 3/16" DEEP.
4. MAINTAIN A 5-FEET MINIMUM SEPARATION BETWEEN WATER AND SEWER SERVICE LATERALS.
5. SEWER LATERALS SHALL NOT BE LOCATED UNDER DRIVEWAYS.
6. SADDLE CONNECTIONS ARE NOT PERMITTED ON NEW SEWER MAINS.
7. FACTORY-FABRICATED WYE IN SEWER MAIN WITH 45-DEGREE BEND. BEND SHALL POINT DOWNSTREAM AND ENTER MAIN AT A VERTICAL ANGLE OF NOT LESS THAN 5-DEGREES OR MORE THAN 45-DEGREES. FOR SEWER LATERALS CONNECTING ONTO EXISTING SEWER MAIN SEE SHEET S-7.

		NIPOMO COMMUNITY SERVICES DISTRICT		
		TYPICAL SEWER LATERAL		
12/25	REVISED TEXT		DATE DRAWN	STD. NO.
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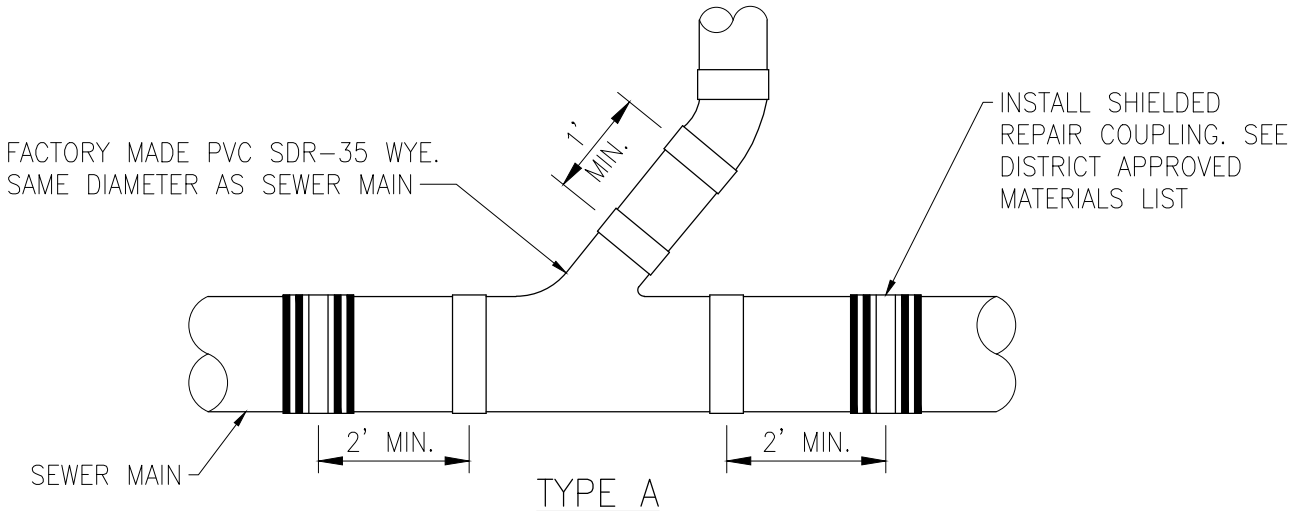
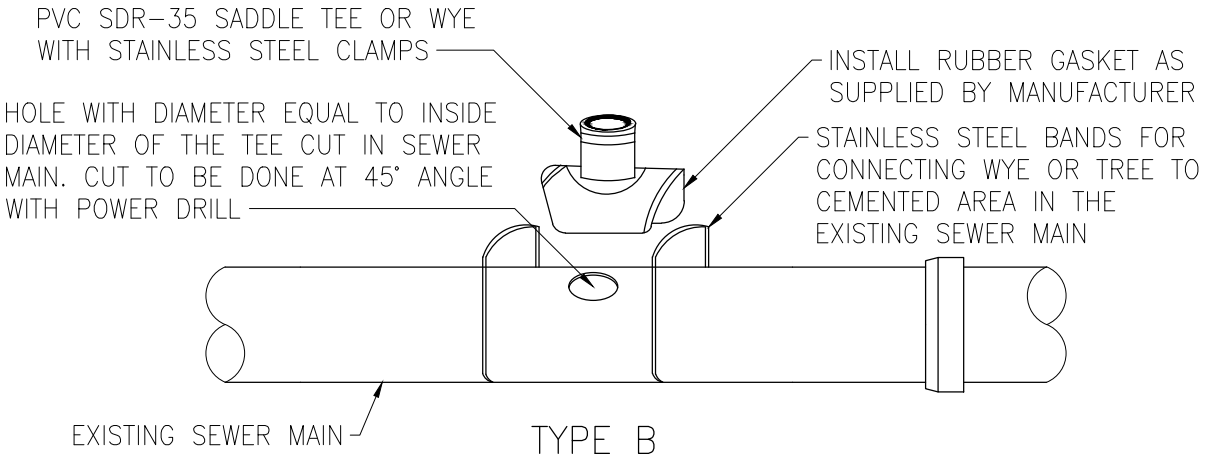


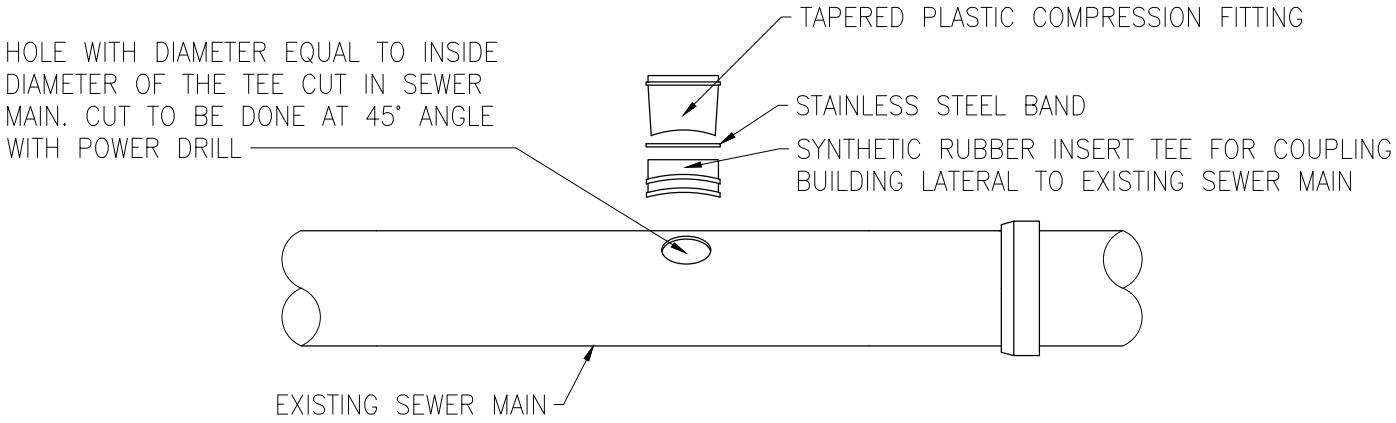
TYPE A

INSERTION OF FACTORY MADE WYE



TYPE B

SADDLE TEE OR WYE

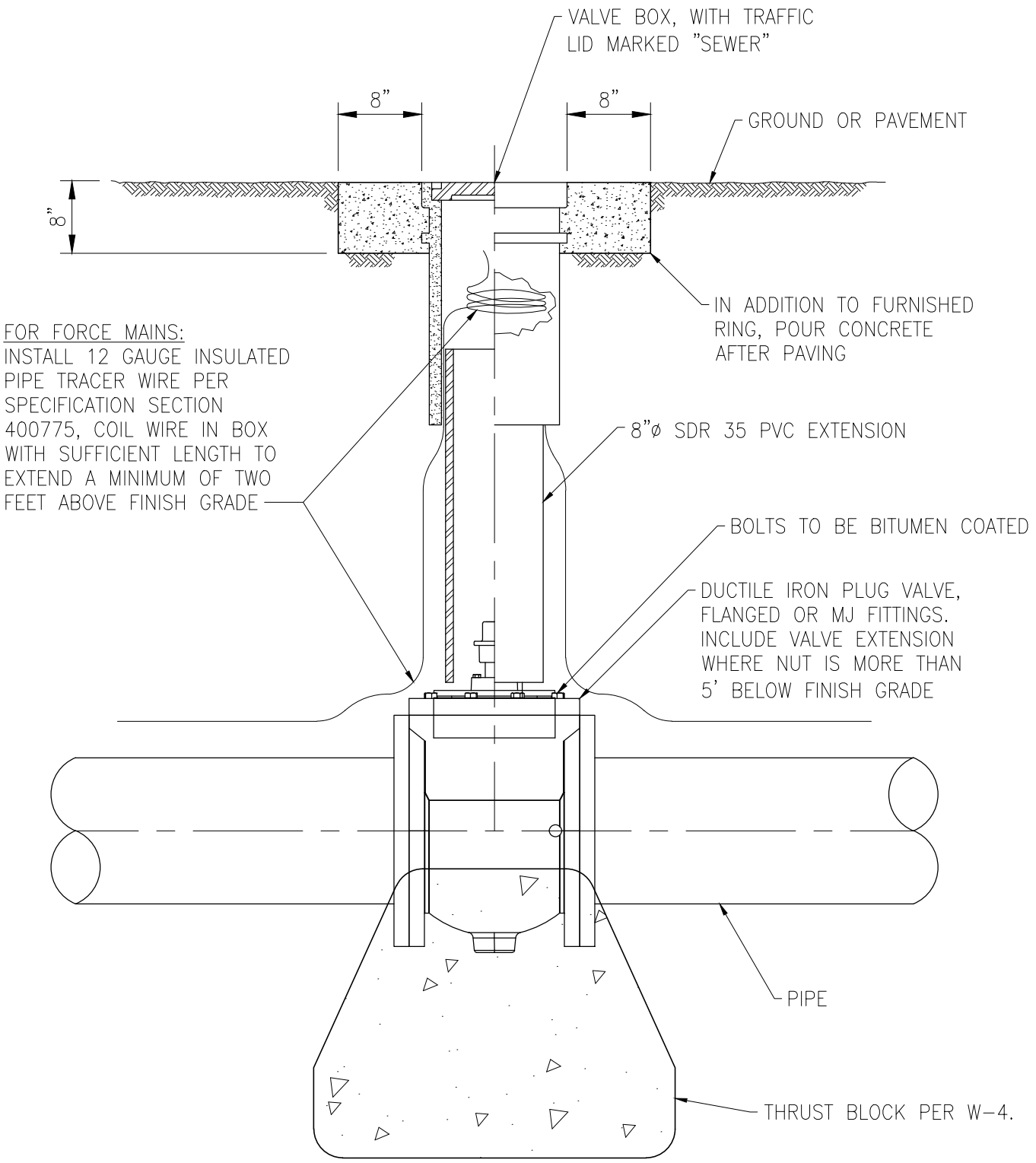


TYPE C

SYNTHETIC RUBBER WEDGED INSERT TEE (TAP TITE)

** SEE APPROVED MATERIALS LIST

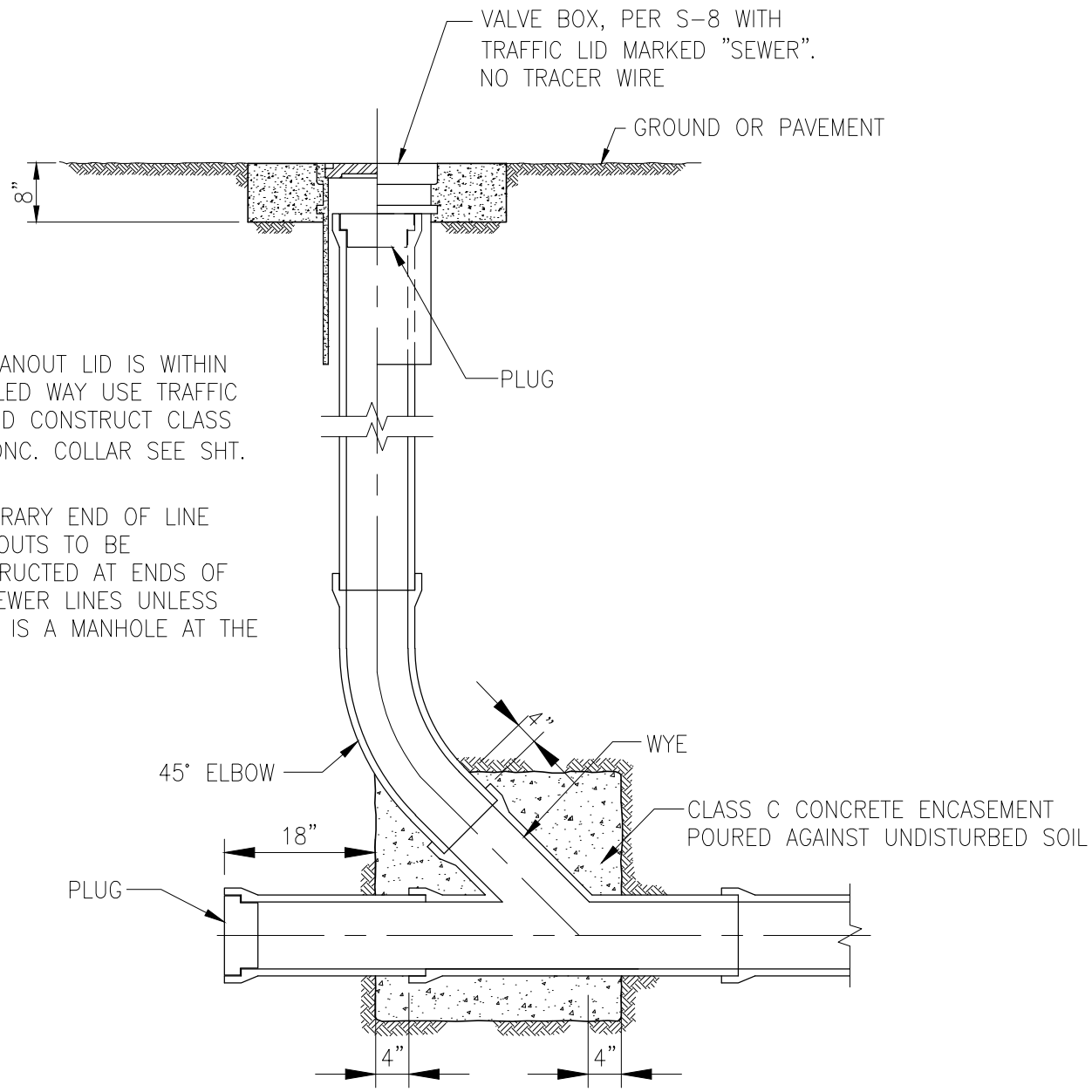
		NIPOMO COMMUNITY SERVICES DISTRICT		
		EXISTING SEWER MAIN LATERAL CONNECTION		
12/25	REVISED TEXT		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	S-7 SHEET 1 of 1



SECTION – ELEVATION

** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT		
		SEWER VALVE BOX ASSEMBLY		
DATE	REVISION		DATE DRAWN: DEC. 2025	STD. NO.: S-8 SHEET 1 of 1



NOTE:

1. IF CLEANOUT LID IS WITHIN TRAVELED WAY USE TRAFFIC LID AND CONSTRUCT CLASS "A" CONC. COLLAR SEE SHT. S-8.
2. TEMPORARY END OF LINE CLEANOUTS TO BE CONSTRUCTED AT ENDS OF ALL SEWER LINES UNLESS THERE IS A MANHOLE AT THE END.

SECTION

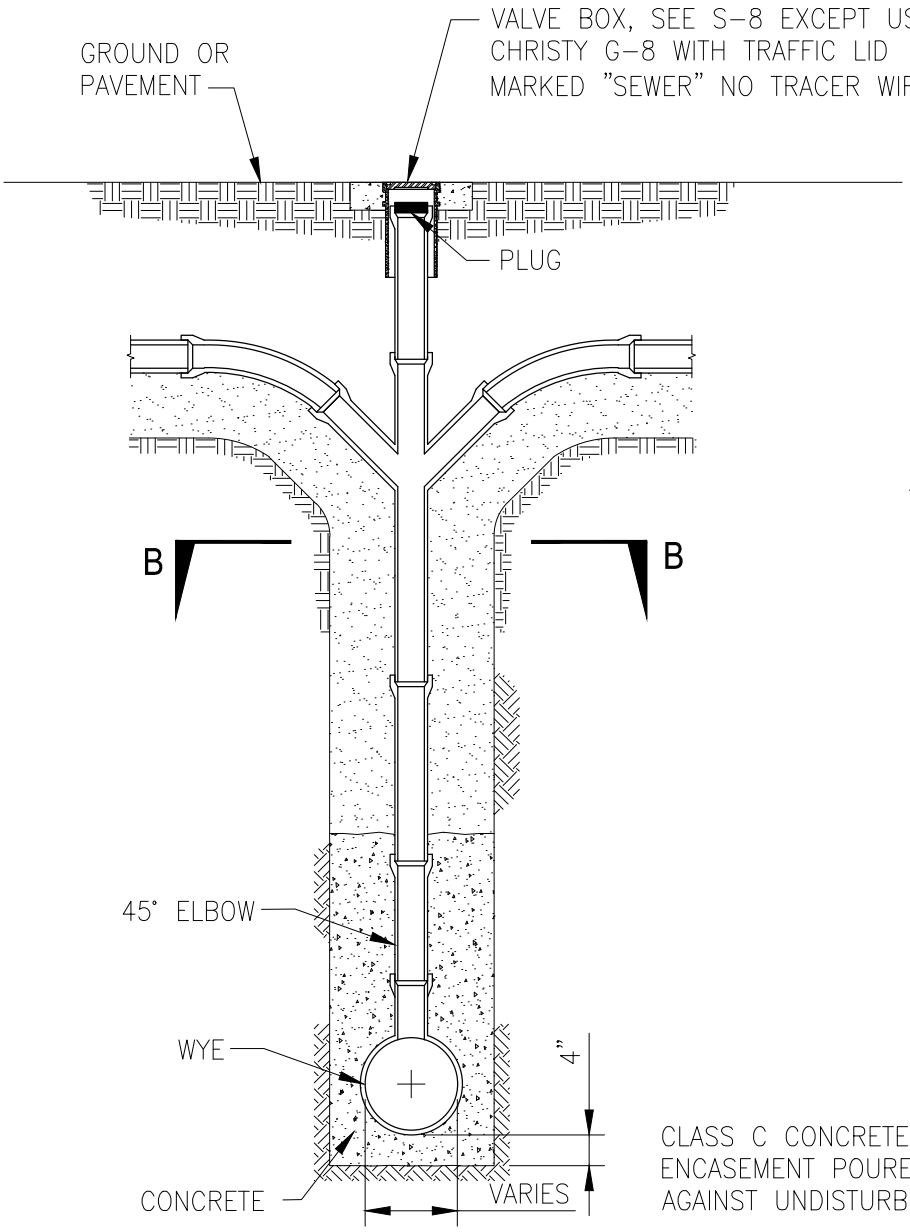
** SEE APPROVED MATERIALS LIST

DATE	REVISION
12/25	EXTENDED PLUG AND REVISED TEXT
05/11	ADDED WYE AND PLUG

NIPOMO COMMUNITY SERVICES DISTRICT

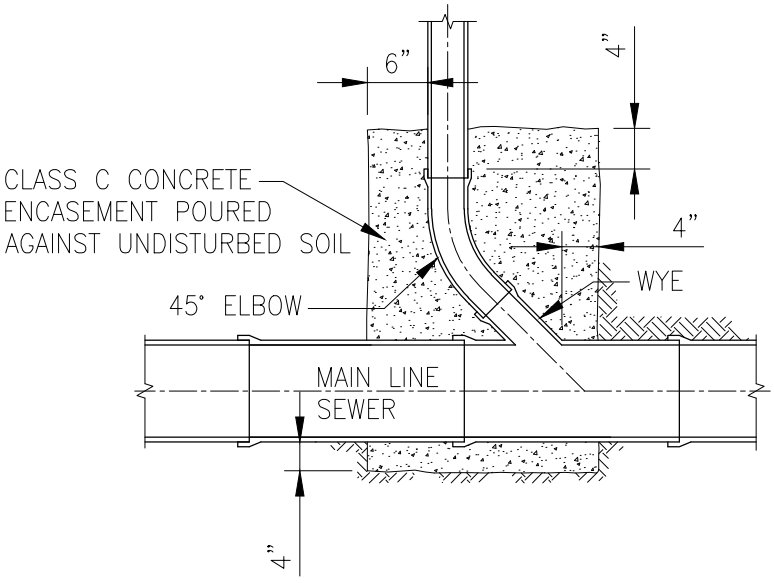
TEMPORARY END OF LINE CLEANOUT

DATE DRAWN	STD. NO.
MAY 2011	S-9
	SHEET 1 of 1



NOTE:

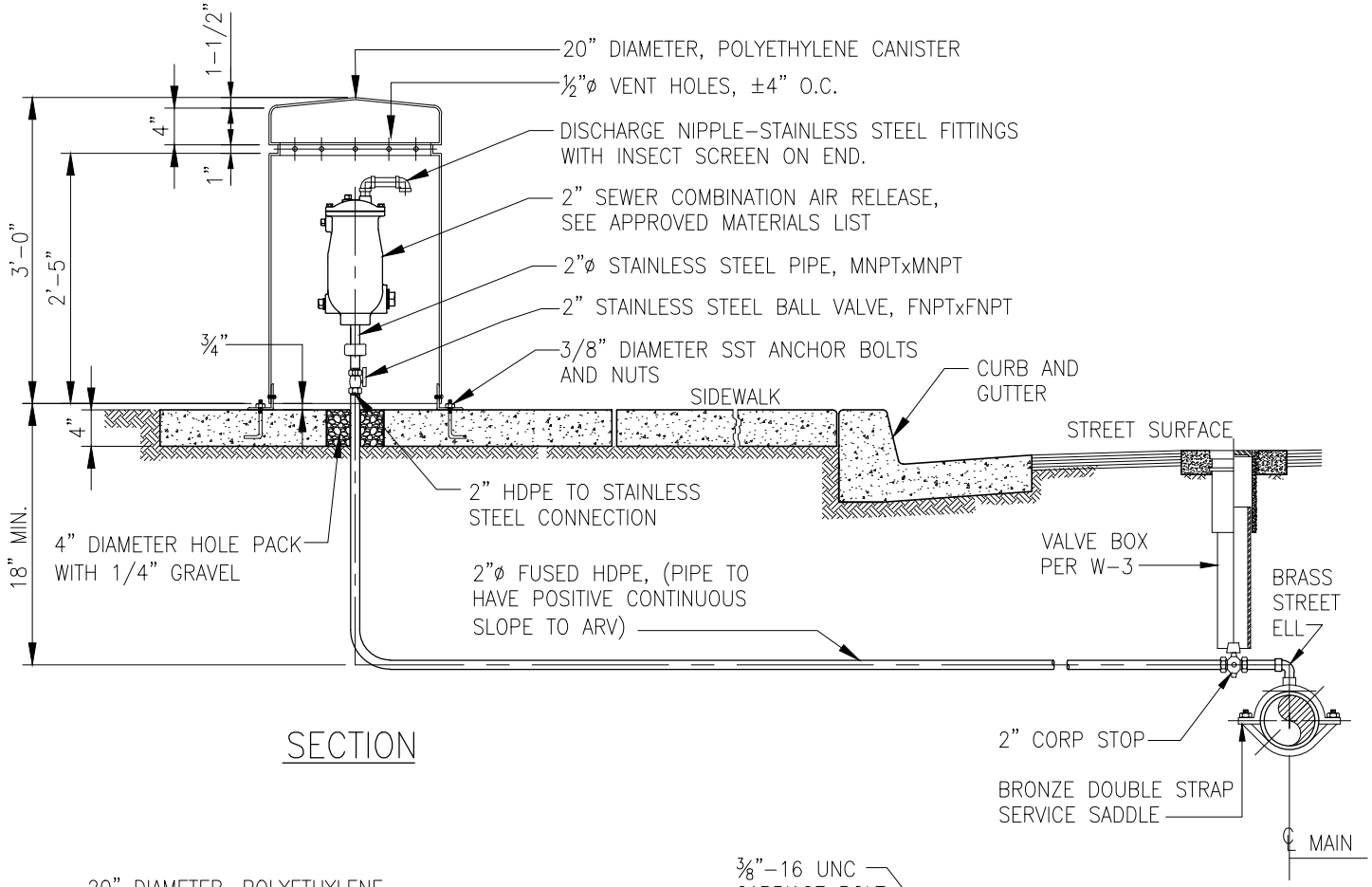
SEWER LATERAL CHIMNEYS MAY ONLY BE USED ON DEEP SEWERS AND ONLY WITH THE PERMISSION OF THE DISTRICT.



** SEE APPROVED MATERIALS LIST

SECTION B-B

		NIPOMO COMMUNITY SERVICES DISTRICT		
		SEWER LATERAL CHIMNEYS		
12/25	REVISED NOTES		DATE DRAWN	STD. NO.
DATE	REVISION		MAY 2011	S-10 SHEET 1 of 1



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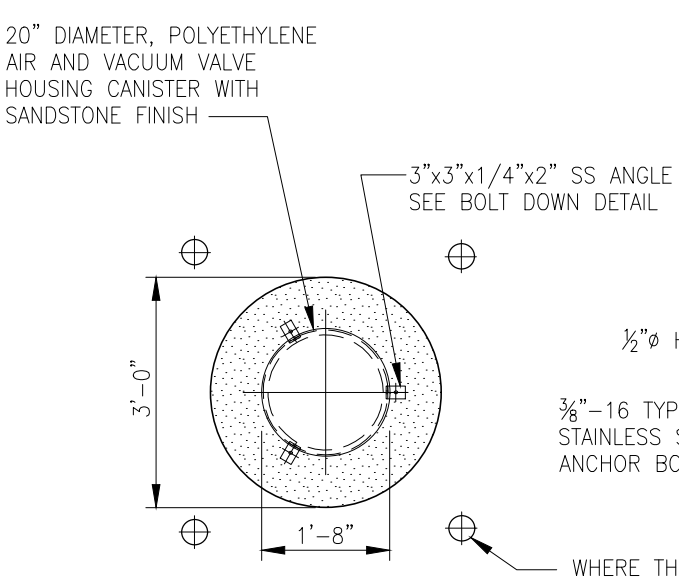

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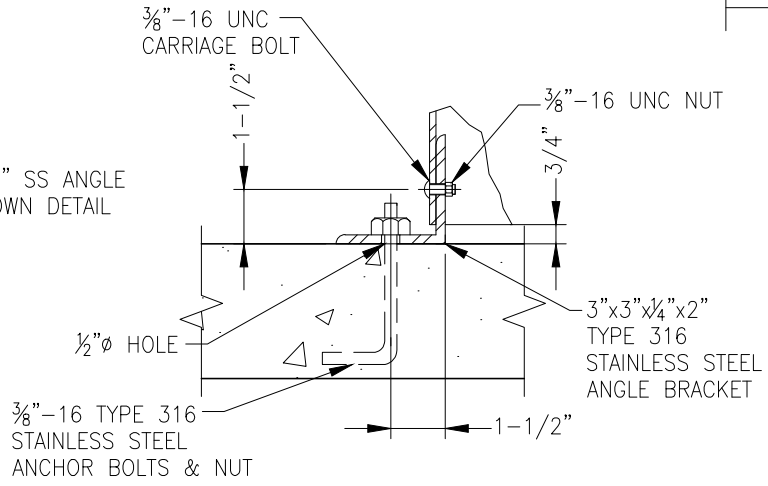
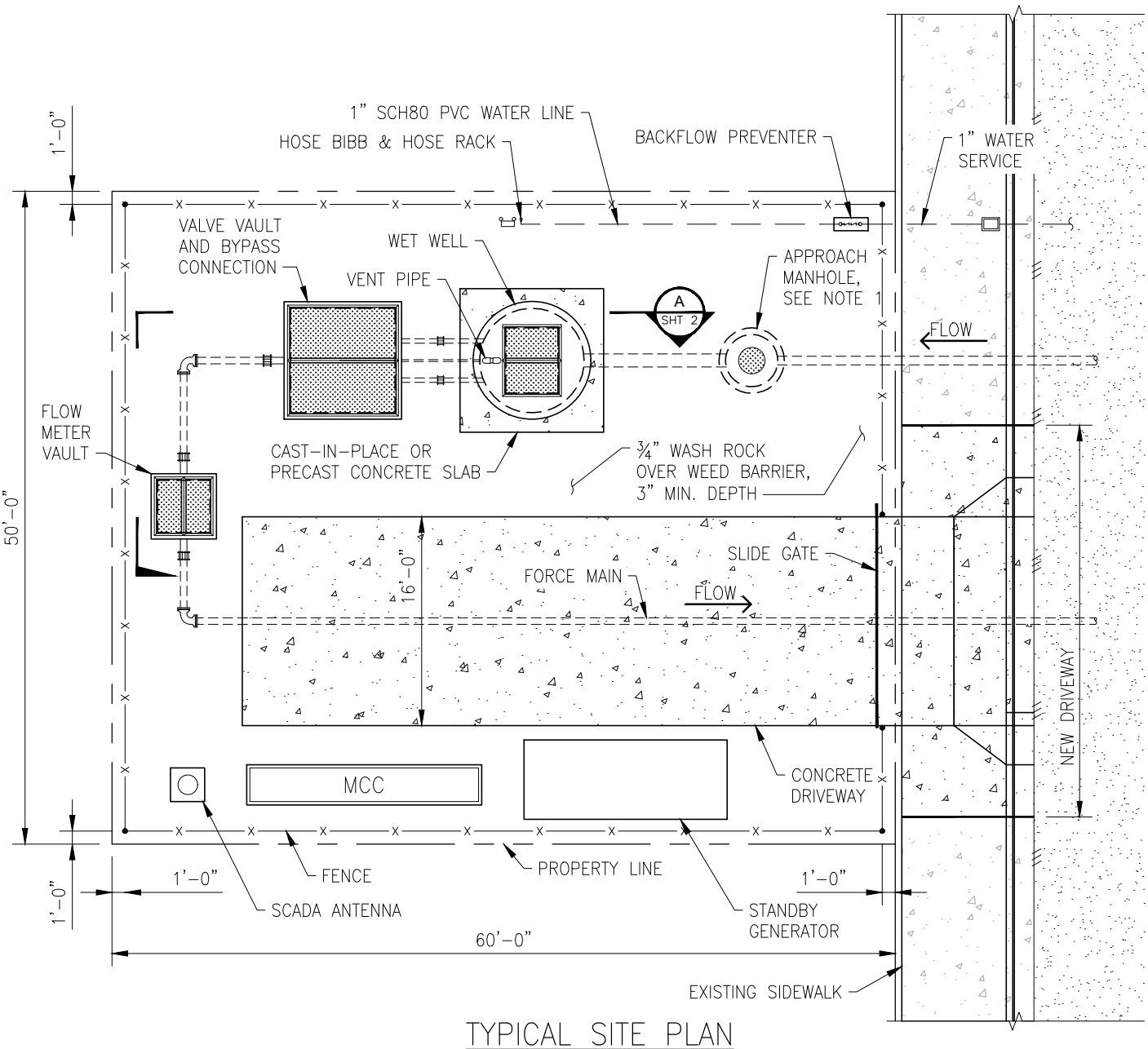


BOLTDOWN DETAIL

WHERE THERE IS NO CURB AND GUTTER, INSTALL 1-4" DIAMETER GALVANIZED STEEL POST AT EACH CORNER OF PAD. POSTS SHALL BE EMBEDDED IN 2' OF CONCRETE AND SHALL EXTEND 3' ABOVE GROUND, (SEE W-16)

** SEE APPROVED MATERIALS LIST

		NIPOMO COMMUNITY SERVICES DISTRICT	
		COMBINATION SEWER AIR RELEASE VALVE ASSEMBLY	
DATE	REVISION	DATE DRAWN: DEC. 2025	STD. NO.: S-11 SHEET 1 of 1



TYPICAL SITE PLAN

NTS

NOTES

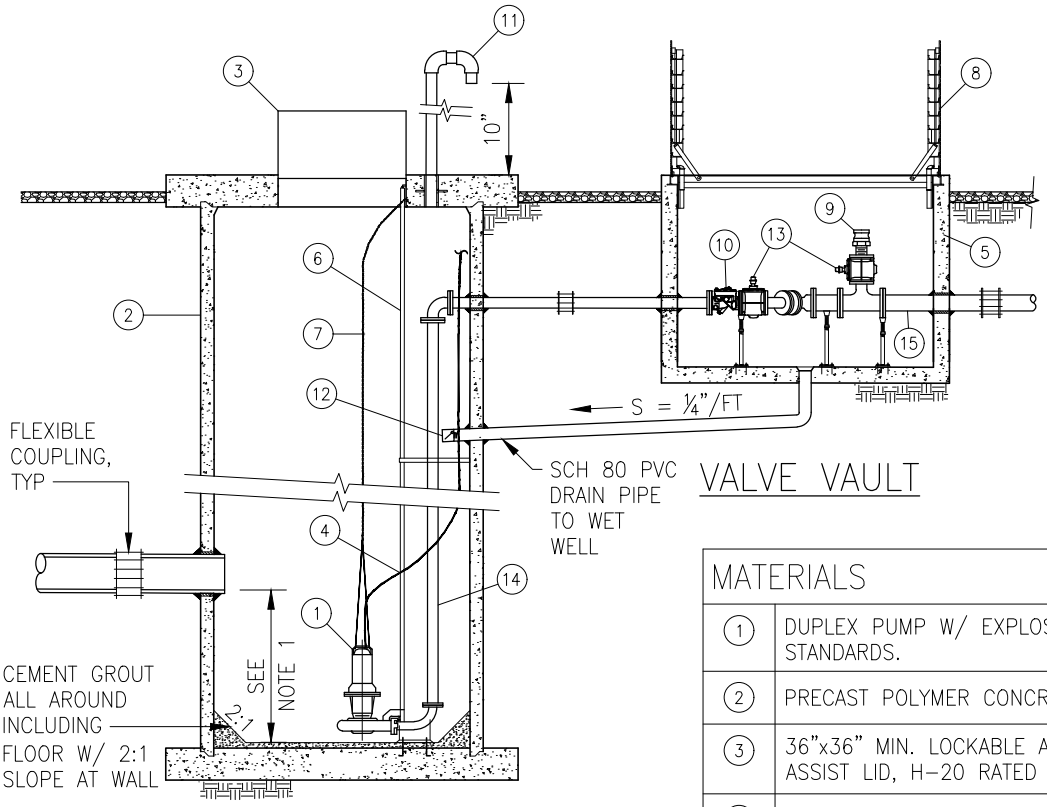
1. APPROACH MANHOLE SHALL BE INSTALLED WITHIN PUMP STATION EASEMENT AS SHOWN UNLESS DIRECT OTHERWISE BY THE DISTRICT.
2. FINISH GRADE ELEVATION FOR WETWELL AND VALVE VAULT SHALL BE A MINIMUM OF ONE FOOT ABOVE THE ADJACENT SIDEWALK ELEVATION OR NOT LOWER THAN CROWN OF ROAD.
3. DRIVEWAY SHALL BE A MINIMUM 6-INCH THICK CONCRETE WITH REINFORCEMENT, UNLESS OTHERWISE DIRECTED BY THE DISTRICT.
4. THIS SITE LAYOUT IS GENERAL IN NATURE AND SHOULD BE MODIFIED AS REQUIRED FOR EACH INDIVIDUAL LIFT STATION. THE DISTRICT RESERVES THE RIGHT TO MODIFY PROPOSED LAYOUT TO MEET OPERATIONAL NEEDS.

DATE	REVISION
12/25	REVISED LAYOUT AND NOTES

NIPOMO COMMUNITY SERVICES DISTRICT

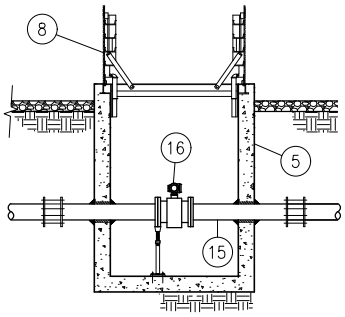
TYPICAL DUPLEX SEWER LIFT STATION
TYPICAL SITE PLAN

DATE DRAWN	STD. NO.
DEC. 2025	S-12



VALVE VAULT

WET WELL



METER VAULT

GENERAL NOTES:

1. DEPTH FROM INLET TO FLOOR OF WET WELL SHALL BE DETERMINED BY ENGINEER BASED ON SPECIFIC PROJECT REQUIREMENTS. WET WELL VOLUME REQUIREMENTS SHALL BE DETERMINED IN COORDINATION WITH THE DISTRICT.
2. PREPARE BASE AND SUBGRADE FOR VAULTS AND WET WELL IN CONFORMANCE WITH RECOMMENDATIONS FROM PROJECT SOILS REPORT.
3. LIFT STATION LEVEL CONTROL TO BE PROVIDED BY SUBMERSIBLE TRANSDUCER WITH FLOAT BACKUP PER DISTRICT STANDARDS.

MATERIALS	
1	DUPLEX PUMP W/ EXPLOSION PROOF MOTOR PER DISTRICT STANDARDS.
2	PRECAST POLYMER CONCRETE WET WELL
3	36"x36" MIN. LOCKABLE ALUMINUM HATCH COVER, SPRING ASSIST LID, H-20 RATED
4	ELECTRICAL CABLE PROVIDED W/ PUMP, PROVIDE UNSPLICED LENGTH TO ELECTRICAL CABINET W/ EXPLOSION PROOF SEAL
5	PRECAST CONCRETE VAULT W/ CAST IN PLACE OR PRECAST CONCRETE FLOOR
6	TYPE 316 SST PIPE SUBMERSIBLE SPARK PROOF GUIDE RAIL SYSTEM COMPLETE W/ GUIDE BRACKET
7	SST LIFTING CHAIN, SIZE PER MFGS RECOMMENDATION
8	DOUBLE DOOR LOCKABLE ALUMINUM HATCH COVER W/ GASKETED SEAL AND SPRING ASSIST LID, RATED H-20
9	BYPASS CONNECTION
10	CHECK VALVE, WITH SPRING ASSIST
11	4"ø MIN. SCREENED STAINLESS STEEL VENT PIPE
12	4" PVC FLAP VALVE, RUBBER SEATED THREADED 6" FROM WET WELL ID
13	PLUG VALVE, FLGxFLG
14	SST OR HDPE DISCHARGE PIPE WITHIN WET WELL
15	D.I. PIPE WITHIN VALVE VAULT TO FORCE MAIN CONNECTION
16	MAGNETIC FLOW METER, SIZED PER MANUFACTURER FOR ANTICIPATED FLOW CONDITIONS

** SEE APPROVED MATERIALS LIST

12/25	REVISED NOTES AND MATERIALS
DATE	REVISION

NIPOMO COMMUNITY SERVICES DISTRICT

TYPICAL DUPLEX SEWER LIFT STATION SECTION VIEW

DATE DRAWN	STD. NO.
MAY 2011	S-12
	SHEET 2 of 2

Appendix A

Forms

ENGINEER'S IMPROVEMENT CERTIFICATION FORM

OFFER OF DEDICATION FORM

ENGINEER OF WORK AGREEMENT

NIPOMO COMMUNITY SERVICES DISTRICT

148 SOUTH WILSON STREET
POST OFFICE BOX 326 NIPOMO, CA 93444 - 0326
(805) 929-1133
Web address: ncsd.ca.gov

ENGINEER'S IMPROVEMENT CERTIFICATION

I, _____R.C.E.No. _____, hereby certify that:

A. I have regularly inspected, during construction, the water and sewer improvements ("Improvements") as shown on the Improvement Plans prepared by me and approved by the Nipomo Community Services District ("District") on _____, and with those approved changes shown
(Date)

on the record drawings prepared by me on _____.
(Date)

B. That said Improvements have been constructed at the horizontal and vertical alignment and in substantial conformance with the above referenced Improvement Plans.

C. That said Improvements have been tested and meet District requirements, Standards and Specifications.

_____
Signed

_____
Print Name

Seal:

NIPOMO COMMUNITY SERVICES DISTRICT

148 SOUTH WILSON STREET
POST OFFICE BOX 326 NIPOMO, CA 93444 - 0326
(805) 929-1133
Web address: ncsd.ca.gov

OFFER OF DEDICATION

TO: NIPOMO COMMUNITY SERVICES DISTRICT
P O BOX 326
NIPOMO, CA 93444

The undersigned Owner(s) of _____
(Tract or Project No.)

in the County of San Luis Obispo, hereby offers, and DEDICATES to the Nipomo Community Services District absolute and unencumbered ownership of the water and sewer improvements shown on the improvement plans for Tract/Project No.:

_____ approved by Nipomo Community Services District on _____.
(Tract or Project No.) (Date)

(Owner/s)

By: _____
(Name and Title)

_____
(Print Name)

_____
(Name and Title)

_____
(Print Name)

_____
(Date)

[Document requires notarization]

NIPOMO COMMUNITY SERVICES DISTRICT

148 SOUTH WILSON STREET
POST OFFICE BOX 326 NIPOMO, CA 93444 - 0326
(805) 929-1133
Web address: ncsd.ca.gov

ENGINEER OF WORK AGREEMENT

I, _____, have retained _____
(Developer) (Engineer)

as the "Engineer of Work" for the design and construction of improvements for

_____ on _____.
(PM, TM or APN No.) (date)

The Engineer of Work will be responsible for preparation of improvement plans, all inspection during construction, all requests for changes in plans, preparation of Record Drawings, and the certification of the work at the conclusion of the project.

I will immediately notify the Nipomo Community Services District of any changes in this relationship.

Developer:

_____
Signature

_____
Printed Name

Engineer of Work:

_____
Signature

_____
Printed Name

_____
CA License Number

Appendix B

Water Main Separation Requirements

Appendix B

Water Main Separation Requirements

Water Main Separation Requirements in the California Waterworks Standards, Title 22, Division 4, Chapter 16, CCR.

§64572. Water Main Separation.

(a) New water mains and new supply lines shall not be installed in the same trench as, and shall be at least 10 feet horizontally from and one foot vertically above, any parallel pipeline conveying:

(1) Untreated sewage,
(2) Primary or secondary treated sewage,
(3) Disinfected secondary-2.2 recycled water (defined in section 60301.220),
(4) Disinfected secondary-23 recycled water (defined in section 60301.225), and
(5) Hazardous fluids such as fuels, industrial wastes, and wastewater sludge.

(b) New water mains and new supply lines shall be installed at least 4 feet horizontally from, and one foot vertically above, any parallel pipeline conveying:

Disinfected tertiary recycled water (defined in section 60301.230), and
Storm drainage.

(c) New supply lines conveying raw water to be treated for drinking purposes shall be installed at least 4 feet horizontally from, and one foot vertically below, any water main.

(d) If crossing a pipeline conveying a fluid listed in subsection (a) or (b), a new water main shall be constructed no less than 45-degrees to and at least one foot above that pipeline. No connection joints shall be made in the water main within eight horizontal feet of the fluid pipeline.

(e) The vertical separation specified in subsections (a), (b), and (c) is required only when the horizontal distance between a water main and pipeline is less than ten feet.

(f) New water mains shall not be installed within 100 horizontal feet of the nearest edge of any sanitary landfill, wastewater disposal pond, or hazardous waste disposal site, or within 25 horizontal feet of the nearest edge of any cesspool, septic tank, sewage leach field, seepage pit, underground hazardous material storage tank, or groundwater recharge project site.

(g) The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.

(h) With Department approval, newly installed water mains may be exempt from the separation distances in this section, except subsection (f), if the newly installed main is:

less than 1320 linear feet,
replacing an existing main, installed in the same location, and has a diameter no greater than six inches more than the diameter of the main it is replacing, and
installed in a manner that minimizes the potential for contamination, including, but not limited to:

sleeving the newly installed main, or
(B) utilizing upgraded piping material.

Appendix C

Plan Review Checklist

Plan Preparation Checklist
for Proposed Water and Sewer Improvement Plans
for Nipomo Community Services District

The following checklist is provided as a courtesy by the District to assist project proponents in preparing improvement plans. The items shown on this list are common “mistakes” that have resulted in many plans being returned with a request for revision. This list does not contain all the requirements for an approved project. Those can only be determined by a thorough examination of current District Ordinances and Standard Specifications, and in some cases, through consultation with District staff.

General Items:

1. Plans shall be signed and sealed by a California State Registered Civil Engineer. In accordance with section 6735 (a) of the 2007 Professional Engineers Act:

   All civil (including structural and geotechnical) engineering plans, calculations, specifications, and reports (hereinafter referred to as "documents") shall be prepared by, or under the responsible charge of, a registered civil engineer and shall include his or her name and license number. Interim documents shall include a notation as to the intended purpose of the document, such as "preliminary," "not for construction," "for plan check only," or "for review only."

2. All plan preparation shall conform to the General Conditions of the standards.

3. All non-standard details shall be shown on the plans. The following note is required to be shown on the plans, when standard details are shown:

   THE WORK SHALL BE PERFORMED IN COMPLETE CONFORMANCE WITH THE CURRENT NCSD STANDARD SPECIFICATIONS FOR WATER AND SEWER SYSTEM IMPROVEMENTS. THE OMISSION OF ANY CURRENT STANDARD DETAIL DOES NOT RELIEVE THE CONTRACTOR FROM THIS REQUIREMENT.

4. A cover sheet with an index of drawings is required if the plan set consist of two or more sheets.

5. All plans shall be 1"=50' (horizontal) or greater with plan to profile scale ratio 5 to 1 or greater, unless approved by the District.

6. An additional 1"=100' scale overall utility plan is required if an individual proposed public utility requires two or more sheets.

7. All existing and proposed easements shall be shown on plans. Existing utility easements shall be labeled with the Liber and Page of the recorded easement.

8. Each plan sheet shall be orientated such that the north arrow shall point toward the top of the page or to the left.

9. Street names, lot lines, and lot numbers shall be shown on all plan sheets.

10. Benchmark locations and elevations shall be indicated on the plans as well as listing the benchmark(s) used in establishing the vertical datum. Vertical datum shall be referenced to NAVD 88 datum.

11. Provide existing and proposed grade lines. Profile grades should match plan view.

Water System Items:

12. All pipe shall be 8" minimum diameter. Water pipelines shall be constructed of AWWA C900 PVC pipe or, with the District's approval, ductile iron pipe. Fittings shall be ductile iron conforming to AWWA C-100 and cement mortar lined per AWWA C-104.

13. The class of PVC pipe used shall be determined by the procedures outlined in AWWA C900 with a working pressure of 150 psi and an occasional surge pressure of 100 psi.

14. Proper trench detail shall be specified on plans per Drawing W-2 and the Technical Specifications for Earthwork of NCSD's standard specifications.

15. Specify use of thrust blocks as needed. Reference appropriate District Standard Detail.

16. A minimum horizontal clearance of 10' for sanitary & storm sewers and 6' for all other utilities shall be maintained.

17. All utility crossings must be shown on the profile. A minimum vertical clearance of 18" above sewer mains is preferred. The minimum acceptable clearance is 12" for sewer and all other utilities. Note that separation criteria apply from the outside surface of the pertinent facilities. Water main bell shall not be located at point of crossing. Water mains crossings shall conform to California Waterworks Standards. If an exemption from the Waterworks Standards separation distance requirements will be requested, the applicant should coordinate this exemption request with the District early in the design process.

18. All fittings shall be labeled and stationed on the plan and profile sheets.

19. In unimproved areas, finished grade elevation shall be shown for all proposed fire hydrants and proposed rim elevations shall be shown for all valve boxes meter boxes, blow-offs, air/vacuum release valves, and manhole covers.

20. Lengths between all fittings shall be shown in the profile.

21. Fire hydrant locations should be reviewed by Cal Fire (as required). Prior to receiving final approval from the District the developer should submit written approval for the project from Cal Fire.

22. Hydrants locations and details shall conform to the General Conditions, the Fire Hydrants section of the Water System Design Criteria, and to standard drawings W-1 and W-6.

    a. Hydrants shall conform to AWWA C-503 (wet barrel) with frangible section near ground, with two 2-1/2-inch and one 4-inch national standard threaded connections, and be painted safety yellow. Fire hydrants shall be James Jones 4060C or AVK Series 2490.

    b. Bury for hydrant shall conform to AWWA standard specifications C-503, height shall be 36-inches. Bury to be coated with coal tar enamel or coal tar epoxy (see Standard Detail W-6).

23. Fire lanes and hydrants shall be accessible at all times to emergency vehicles.

24. On private property outside County right of way water mains shall be centered in a 20' wide easement free from all structures (i.e. buildings, decks, carports). If a main must be next to a structure with foundation, casing pipe, or river crossing pipe, is required. With casing pipe, a minimum 15' wide easement will be needed with the main 5' offset from the center of the easement.

25. As a general rule, there shall be three valves on tees and four valves on crosses.

26. In-line valves shall be installed so that in any single case of accident, breakage, or repair, no more than 500 feet of water main will be removed from service per NCSD's Water System Design Criteria.

27. Minimum cover over the top of pipe shall be three feet below finish grade. The District may require more than this minimum cover if, in the opinion of the District, three feet is insufficient.

28. Service connections shall conform to the latest standards and specifications.

29. Connection to residential fire sprinkler systems shall require the use of a double check valve backflow device. Use of another type of backflow prevention device will requires the approval of the District.

30. Valves shall be located at the property line when transitioning from public right-of-way to an easement.

31. Air relief valve(s) is needed in areas of severe grade changes, at high points in the system, and at the end of up-sloping dead end lines. Reference District Standard Detail W-15.

32. Gate valves shall conform to the Technical Specifications for Resilient Wedge Gate Valves and be installed per NCSD's standard specifications. See Standard Drawing W-3.

33. Check for transmission main shutdowns that would be required when the improvements are connected. The District must approve any shutdown, and requires minimum 48 hour notice prior to actual shutdown.

34. Water system improvements shall have at least two connections to waterlines in different streets to form a looped water system. Non-looped systems will be permitted only with the written permission of the District.

35. Pipe deflection shall conform to the allowable standards stated in the Technical Specifications for Connection to Domestic Water System. Deviations from a straight pipeline alignment shall be made only by use of cast iron fittings, or pipe couplings with District approval. Bending of PVC pipe will not be permitted.

36. Provide stub(s) for future extension(s). Extend improvements to property line. Place valve at property line.

37. For tapping sleeves and valves, refer to Technical Specifications for Connection to Domestic Water System. Tapping sleeves shall be stainless steel.

38. Blowoffs shall be installed at ends of down-sloping dead end mains and low points. Reference appropriate District Standard Detail.

39. Vertical bend fittings require restrained push-on joints. Restrained joints are preferable to the use of anchor blocks. Calculations showing minimum number of joints to be restrained shall be submitted with construction plans.

40. Show all valve locations. Verify the proposed valves are not located in the curb or gutter pan, nor closer than 5 feet from the beginning of curb returns, driveways, or any other utility.

41. Fire hydrants, meter boxes and blowoffs shall be located no closer than 5 feet from beginning of curb return, driveway or any other utility.

42. As a minimum, a hydrant shall be placed at each intersection, except where this would provide excessive hydrant coverage as determined by CDF.

43. Any connection between a building's fire sprinkler system and the District's mains shall be via a dedicated fire sprinkler connection and shall be protected from backflow in accordance with the District Standards (refer to Technical Specification for Connections to Domestic Water Systems).

44. Except for connection to a single-family residence, a separate service connection with backflow prevention device shall be provided to each parcel of property for landscape irrigation. (NCSD Code 3.04.030.)

Sewer System Items:

45. Run lengths shall agree with sewer stationing and sewer grades shall agree with invert elevations.

46. A 10' minimum horizontal clearance is required between any sanitary sewer and a water main. Note that separation criteria apply from the outside surface of the pertinent facilities. Sewer and water separation distances shall conform to California Waterworks Standards, Title 22, Division 4, Chapter 16, CCR, Section 64572. If an exemption from the Waterworks Standards separation distance requirements will be requested, the applicant should coordinate this exemption request with the District early in the design process.

47. There shall be a minimum of 0.10-foot fall through a manhole where the sewer has a horizontal deflection of up to 30 degrees. For manholes where the sewer has a horizontal deflection from 30 degrees to 90 degrees, there shall be a minimum of 0.20 foot fall. There shall be no more than 90 degrees of horizontal deflection through a manhole. Should a pipeline be joining a sewer of larger diameter, the smaller pipe shall have its crown elevation equal to or higher than the crown elevation of the larger sewer.

48. Outside drop manhole connections shall be used whenever a sewer enters a manhole at an invert elevation of more than 24 inches above the manhole invert elevation. Inside drop connections will not be permitted (includes sanitary sewer laterals as well as main line connections). Drop manholes will only be allowed under special conditions.

49. Proper trench detail shall be specified on plans per standard drawing S-2. Minimum depth from finish street grade to top of sewer main pipe shall be six (6) feet.

50. Minimum cover for sewer laterals is 4 feet at the property line per standard drawing S-3. Show proposed laterals in plan and profile views. Note proposed invert elevations at crossings and at property line.

51. Check depth of sewer for special bedding requirements, i.e. class x concrete encasement, crushed stone encasement etc. Sewer mains designed with greater than 15-ft of cover require calculations for pipe strength and bedding requirements.

52. Curved sewers are not allowed.

53. All manholes shall be located such that they will be directly accessible by vehicular maintenance equipment. All surfaces to be utilized for manhole access shall be designed to support a 16 kip dual wheel load (the weight of a fully loaded Vactor truck).

54. Proposed sewer shall extend the full length of road frontage. Stub(s) shall be extended to property line if required for future connections. Verify the required capacity, sizing and depth of upstream sewer.

55. Easement is required for all public sewers on private property outside of County right of way. Minimum Width = 2 * (depth)+10', 20' minimum. Sewer shall be offset 5' from centerline of easement.

56. Sanitary sewers up to 12" in size shall be SDR 35 PVC pipe. Coordinate with District for larger pipe requirements.

57. All utility crossings must be shown in profile. A minimum vertical clearance of 18" below water mains is preferred. The minimum acceptable clearance is 12" for water and all other utilities. Note that separation criteria apply from the outside surface of the pertinent facilities. Water main bell shall not be located at point of crossing. Water mains crossing sewer pipes shall conform to California Waterworks Standards. If an exemption from the Waterworks Standards separation distance requirements will be requested, the applicant should coordinate this exemption request with the District early in the design process.

58. Service laterals are required at all lots/buildings. Reference District Standard Detail S-6.

59. Check invert of lateral at main.

60. Check length and grade of lateral per standard drawing S-3.

61. Provide cleanouts on laterals every 100' and at all bends over 45°.

62. Lateral material shall be PVC. Reference District Standard Detail S-3.

63. Minimum pipeline grades shall only be used when a steeper pipeline cannot be installed due to physical site constraints. The District shall have the right to determine if sewers can be installed steeper than minimum.

64. Not more than three sewer service laterals may be designed to be tapped into a terminal manhole. All other laterals are to be at wyes or tees at the sewer main. Connection of laterals to the sewer main at a manhole is only allowed when (a) the manhole is a terminal manhole at the end of a cul-de-sac, (b) no more than three (3) laterals are installed, (c) all of the laterals are installed to the property line(s), and (d) cleanouts are installed on the unconnected laterals at the property line(s).

65. Minimum grade for service lateral is 1.0% for a 6" lateral and 2.0% for a 4" lateral.

66. A sampling manhole is required for sewers which carry industrial and research wastes. Connection to be approved by the District.

67. The District may require traps, interceptors, pretreatment or other devices on all outlets which may discharge grease, oil, sand or waste material of any kind of a composition or quality deemed harmful by the District.

68. The maximum distance between manholes shall be 400 feet. Sewer manholes are required at: changes of direction of sewers; changes in slope of sewers; junctions of sewers; junction of sewer and lateral if lateral is same size as sewer; termination of sewer with a run greater than 100-ft; change of pipe size in sewers; other locations specified by the District.

69. Manholes shall not be located in areas subject to flooding. If such locations cannot be avoided and are approved, watertight manhole covers and castings are required. In no case shall a sanitary sewer line be located closer than two (2) feet from an existing or proposed gutter lip.

70. Minimum grade for sewer in casing pipe is 1%.

71. Clearly label all privately maintained sewers.

-o-

DECEMBER 10, 2025

ITEM D-11

ATTACHMENT B

NIPOMO COMMUNITY SERVICES DISTRICT
RESOLUTION NO. 2025-17XX

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE NIPOMO COMMUNITY SERVICES DISTRICT REVISING THE DISTRICT'S STANDARD SPECIFICATIONS FOR WATER AND SEWER SYSTEM IMPROVEMENTS

WHEREAS, the District desires to adopt uniform and consistent Standard Specifications for Water and Sewer System Improvements that clearly define the District's expectations for installation of District works by contractors and third parties; and

WHEREAS, in August 2019, the District adopted Resolution 2019-1522 and thereby approved the current version of the District's Standard Specifications; and

WHEREAS, District staff has prepared the update of the Standard Specifications attached hereto and incorporated by reference; and

WHEREAS, the District Board considered this item at a regularly scheduled public Board Meeting.

NOW, THEREFORE, BE IT RESOLVED, DETERMINED AND ORDERED BY THE BOARD OF DIRECTORS OF THE NIPOMO COMMUNITY SERVICES DISTRICT AS FOLLOWS:

1. The attached edition of the District's Standard Specifications dated December 10, 2025 for Water and Sewer System Improvements is hereby adopted,

2. Resolution 2019-1522 is rescinded, and

3. Staff is directed to use the attached 2025 Standard Specifications for all District works.

On the motion by Director _____, seconded by Director _____ and on the following roll call vote, to wit:

AYES:
NOES:
ABSENT:
ABSTAIN:

The foregoing resolution is hereby adopted this 10th day of December 2025.

_____
ED EBY
President, Board of Directors

ATTEST:

_____
RAY DIENZO
General Manager and Secretary to the Board

APPROVED AS TO FORM AND LEGAL EFFECT:

_____
CRAIG A. STEELE
District Legal Counsel

NIPOMO COMMUNITY SERVICES DISTRICT
RESOLUTION NO. 2025-17XX

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE NIPOMO COMMUNITY SERVICES DISTRICT REVISING THE DISTRICT'S STANDARD SPECIFICATIONS FOR WATER AND SEWER SYSTEM IMPROVEMENTS

Exhibit "A" attached