TECHNICAL SPECIFICATIONS

RESERVOIR 6 AND ALMOND ST WATERLINE REPLACEMENT

CP23026

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TECHNICAL SPECIFICATIONS

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SECTION 01000 – GENERAL REQUIREMENTS

PART 1. GENERAL

1.01 DEFINITIONS

A. Whenever the following terms are used in these Technical Specifications or in any other related documents, the intent and meanings shall be interpreted as follows:

1. **"Approved Plans"** shall mean the official plans, profiles, typical cross-sections, working drawings, detail drawings, or exact reproductions thereof, approved by the District and other appropriate government agencies, which show the locations, character, dimensions, and details of the work required to construct the specified public improvements.

2. **"Board"** shall mean the Board of Directors of the Cucamonga Valley Water District.

3. "**Calendar Days**" shall mean a 24-hour period from 12:00am to 11:59pm and includes weekdays, weekends, and holidays.

4. "**Contract Documents**" shall refer to the contract and all documents, plans, exhibits, and/or attachments referenced therein.

5. **"Contractor"** shall mean the independent person, firm, corporation or partnership with whom the District contracts for the performance of the work or any part thereof covered by the Approved Plans and these Technical Specifications. Instructions or information given by the District to the Contractor's superintendent or agent on the Project shall be considered as having been given to the Contractor.

6. "**Days**" shall refer to "**Calendar Days**" where not specifically indicated as "**Working Days**" or "**Calendar Days**"

7. **"District"** shall mean the Cucamonga Valley Water District.

   For the unique purpose of these Technical Specifications, District shall also refer to the District's representative(s) acting within the scope of the particular duties entrusted to them.

   The District shall resolve any and all issues which may arise with regard to the quality or acceptability of approved materials furnished or work performed, to the manner of performance and rate of progress of the work and shall answer all questions relating to the interpretation of the Standard Drawings, the Approved Plans, the job specifications, if any, and these Technical Specifications as well as the acceptable fulfillment of the Contract on the part of the Contractor.

8. **"District Engineer"** or **"Engineer"** shall mean the District's Design and Construction Manager, or the District's assigned staff engineer, acting either directly or through properly authorized agents such agents within the scope of the particular duties entrusted to them.

9. **"Inspector"** shall mean the District's authorized agent whose duties shall include those defined elsewhere within these Technical Specifications, but who shall not direct the work being performed.

10. **"Engineer of Work"** or **"Consulting Engineer"** shall mean a Civil Engineer or Structural Engineer registered or licensed in California who is qualified to act as an agent of the Contractor in preparing plans for facilities to be approved and accepted by the District and incorporated thereafter into the District's system.

11. **"Project"** or the **"Work"** shall mean the public improvement to be constructed in whole or part within the boundaries of the District.

12. "**Request for Proposals**" or the "**RFP**" shall refer to the formal or informal procurement documents for this project and all attachments, exhibits, and appendices therein.

13. **"Standard Drawings"** shall mean the standard details issued by the District for construction of the District's Potable Water, Recycled Water, and Sewer Facilities.

14. **"Technical Specifications"** shall mean the current version of the District's Technical Specifications for construction of the District's Potable Water, Recycled Water and Sewer Facilities.

15. "**Working Days**" shall be calendar days which normal hours of work may be performed and do not include weekends or District Recognized Holidays. The details of normal hours of work are specified in subsection 1.27 HOURS OF WORK.

1.02 RELATED WORK – NOT USED

1.03 LICENSE

A. The Contractor installing any new facilities or performing work on existing facilities within the District shall possess, prior to the start of the Project, a License, defined by the latest edition of the California Contractor's License Law and Reference Book, as:

1. Class A or C-34 for water pipeline installations.

2. Class A or C-42 for sewer pipeline installations.

3. Class A for major water and sewer facilities such as pump stations, reservoirs and treatment plants.

4. Relevant Class C license as specified in the RFP or any referenced documents to the RFP.

B. Any Contractor possessing a license other than specified above must receive written approval from the District prior to initiating the work.

1.04 OPERATIONS IN PUBLIC RIGHT-OF-WAY

A. Work in public right-of-way shall be done in accordance with the requirements of the permit issued by the public agency in whose right-of-way the work is located, in addition to the requirements of the Approved Plans and Technical Specifications. If a permit is not required, the work shall conform to the standards of the public agency involved in addition to conforming to the Approved Plans and Technical Specifications.

1.05 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS

A. The Contractor shall abide by the conditions of the Regional Water Quality Control Board, General Construction Activity Storm Water Permit and the project Storm Water Pollution Prevention Plan (SWPPP).

1.06 REFERENCE STANDARDS

A. The reference standards of the organizations listed below form a part of these Technical Specifications to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise stated.

AASHTO	American Association of State Highway and Transportation Officials
ACI	America Concrete Institute
AI	The Asphalt Institute
AIA	American Institute of Architects

AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society of Quality Control
ASTM	American Society of Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CAL/OSHA	State of California Occupational Safety and Health Administration
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CLFMI	Chain Link Fence Manufacture's Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
CSLB	Contractors State License Board
DIPRA	Ductile Iron Pipe Research Association
ETL	Electrical Testing Laboratories
EPA	Environmental Protection Agency
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
MIL	Military Standards (DoD)
NACE	National Association of Corrosion Engineers
NCPI	National Clay Pipe Institute
NEC	National Electrical Code
NEMA	National Electrical Manufacture's Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
PCA	Portland Cement Association
PPI	Plastic Pipe Institute
RMA	Rubber Manufacturers Association
SSPWC	Standard Specifications for Public Works Construction
SSPC	Steel Structures Painting Council
UBC	Uniform Building Code
UNI-B	Uni-Bell PVC Pipe Association
UPC	Uniform Plumbing Code
USC	University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research
UL	Underwriters Laboratories, Inc.
WRI	Wire Reinforcement Institute, Inc.

1.07 ORDER OF PRECEDENCE

A. The Approved Plans, together with Technical Specifications, shall govern the work to be done. Anything indicated in the Technical Specifications but not shown on the Approved Plans, or shown on the Approved Plans but not indicated in the Technical Specifications, shall be of like effect as though shown or indicated in both. In resolving inconsistencies between the Approved Plans and the various sections of the Technical Specifications, the order of precedence shall be as follows:

1. Technical Specifications

2. Appendices to the Technical Specifications or Reference Standards

3. Geotechnical Report, if applicable

4. Standard Drawings

5. Approved Plans

6. Scope of Work, if a separate document from the documents above.

7. All attached appendices, exhibits, and/or attachments to the RFP or documents above.

B. Figure dimensions on drawings shall take precedence over scale dimensions. Detailed drawings shall take precedence over general drawings. The Contractor shall immediately notify District if any conflict, inconsistency, omission, error, or ambiguity is discovered between the Approved Plans and the various sections of the Technical Specifications.

1.08 EXAMINATION OF APPROVED PLANS, SPECIFICATIONS, AND SITE

A. The Contractor shall carefully examine the site of the proposed work, the Approved Drawings, the Specifications, and all other pertinent documents. Contractor shall be satisfied as to the character, quality and quantities of work to be furnished, and as to the requirements of the Approved Plans and these Technical Specifications. The District will not be liable for any loss sustained by the Contractor as a result of any variance between conditions as shown on the Approved Plans and the actual conditions revealed during the progress of the work or otherwise.

1.09 QUALITY OF WORK AND MATERIALS

A. The work shall be performed in a thorough, worker-like manner in accordance with the Approved Plans and these Technical Specifications. All work shall conform to the lines and grades shown on said plans.

B. At least one member of the Contractor's workforce who is thoroughly familiar with the specified requirements of work and who is completely trained and experienced in the construction skills necessary for satisfactory completion of the work shall be present at the site, directing the work, at all times.

C. Adequate number of skilled workers and sufficient and appropriate equipment shall be present at the site prior to commencing daily construction operations.

D. The Engineer shall inform the Contractor if any person in the employ of the Contractor fails to or refuses to comply with the requirements of these Technical Specifications, or appears to the Engineer to be incompetent or unfit, or acts in a disorderly, improper or unsafe manner. It shall be the Contractor's responsibility to dismiss any such person from the work site or take any other action deemed appropriate by the Contractor.

E. All equipment, materials, and supplies to be incorporated in the work shall be new. All equipment, materials and supplies shall be produced in a good and worker-like manner. Materials to be used within the scope of work on the project shall be those listed in the Contract Documents. When the quality of a material, process, or article is not specifically set forth in the Contract Documents, the Approved Plans, or the Technical Specifications, the best available quality of the material, process, or article shall be provided.

F. The Contractor may offer as substitution any material, process, or article substantially equal or better in every respect to that so indicated or specified; provided, however, that if the material, process, or article offered by the Contractor is not, in the opinion of the District, substantially equal or better in every respect to that specified, then the Contractor must furnish the material, process, or article specified or one that in the opinion of the District is substantially equal or better in every respect.

1.10 SUBMITTALS AND SHOP DRAWING PROCEDURES

A. Unless amended by Technical Specifications, Contractor shall submit by email or file transfer protocol (FTP) or other proposed electronic file system acceptable to the District, at no expense to the District, an electronic copy of all shop drawings, submittals, and manufacturer's cut sheets detailing the methods and materials intended for use on the project.

B. Submittals shall be numbered by specification number, consecutively numbered for each material or method, and a revision number (if applicable). It shall also be accompanied by a transmittal letter marked with the number and title (or brief description) of the submittal, name of the project, reference specification number and/or drawing sheet number if applicable, name and address of the Contractor and supplier, along with contact persons for same, and shall be checked by and marked with the approval of the Contractor.

C. Any submittals that deviate from the requirements of the Contract shall be clearly noted and explained in the transmittal letter. All substitute products must show sufficient detail to demonstrate it meets or exceeds all parameters of the specified product as detailed in the Contract Documents. District Engineer and/or District's Consulting Engineer may reject any submittal which does not sufficiently detail.

D. District's Engineer and/or District's Consultant Engineer will review the submittals so provided, and will return the submittals marked to indicate that submittals are approved or must be returned for revision. The District's Engineer will review and designate the submittals as follows:

   a. No Exceptions Taken (NET): The submittal is approved and no further submittal action is necessary. Contractor may proceed with work.
   b. Make Corrections Noted (MCN) or Approved as Note: Means that the Engineer has noted a minor exception and has provided comments for the Contractor to address the exception. In this case the submittal is approved on the condition that the comment(s) is addressed before or at time of construction. Resubmittal is not required before proceeding with work. A resubmittal may be submitted later for records only.
   c. Amend and Resubmit (A&R or AR) or Revise and Resubmit (R&R): Means that the Engineer has taken major exceptions with the submittal, has provided comments, and require the Contractor to resubmit documentation per the comments.
   d. Reject (R) or Reject and Resubmit: Means that the submittal is rejected completely. Engineer will provide comments as to why the submittal was rejected and may provide guidance for an acceptable submittal.

E. Unless amended by job specifications, Contractor shall allow the District a minimum of ten (10) working days for the review of each submittal and each revision. Submittals returned for revision must be corrected as noted and contractor must re-submit shop drawings as noted above until approved by District. Review and approval of shop drawings by District shall not relieve contractor of the responsibility for executing the work in accordance with these Technical Specifications, using proper methods of construction, nor from furnishing materials or work required but not indicated on the submittals.

F. Construction shall not begin on relevant portions of the work until shop drawing submittals have been approved by District. Shop drawings shall be submitted in a timely manner so as not to delay construction of the work. The Contractor shall be responsible for accounting in his schedule all time associated with shop drawing development, submittal, District review including allotted time, resubmittal and further review time, and constructing the project per the contract times.

1.11 MATERIALS

A. All materials shall be new and unused, of the quality defined in these Technical Specifications and approved by the Engineer. All materials to be used within a specific project and intended for equivalent uses shall be identical as to manufacturer and model number. Materials not identical as to manufacturer and model number to those approved by the Engineer, materials that are damaged, or materials that are otherwise unacceptable to the Engineer shall be rejected and immediately removed from the job site.

1. All materials shall be of the makes and models tested and approved for use. It is the Contractor's responsibility to verify that materials received for the job conform to the Contract Documents.

2. Products in the Contract Documents may be disqualified at any time if the quality of the product is no longer judged as acceptable by the Engineer or if a higher-quality product becomes available.

3. Job-specific approval of materials not shown in the Contract Documents is solely at the discretion of the Engineer, and materials so approved shall not be construed as approved for general use. For job-specific consideration of materials not shown in the Contract Documents, the shop drawing procedures outlined within this Section Requirements shall be followed.

1.12 PRE-CONSTRUCTION AND PROGRESS MEETINGS

A. The Contractor shall schedule a Pre-Construction Meeting with the Project Manager at least seven (7) calendar days prior to beginning any work in the field. As a minimum, the attendees at this meeting shall include:

1. The District Project Manager.

2. The District Inspector.

3. The Contractor's Project Manager

4. The Contractor's Superintendent.

5. Contractor's Competent Person.

6. The Soils Technician who is to verify backfill compaction, if required in the Contract Documents.

B. In addition, the following persons shall be invited to the Pre-Construction Meeting upon request of the District:

1. Representative(s) of the Agencies of Jurisdiction.

2. Representative(s) of other utility companies.

C. The purpose of this meeting is to review the plans for the project relative to the requirements of the District's Technical Specifications, and the Approved Plans. The Contractor shall be prepared to discuss, in detail, the project schedule, and shall provide the District with any schedules, submittals, lists, permits, or other information required by the Engineer, by these Technical Specifications.

D. Progress meetings shall be scheduled by the Contractor and held regularly on-site at least bi-weekly, at the request of the District, or as required by the progress of the Work. The Contractor, Engineer, Inspectors, and all sub-contractors active on the site must attend each meeting.

E. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the Contractor is required to present any issues which may impact their work, with a view to resolve these issues expeditiously.

1.13 INSPECTION

A. All work and materials furnished shall be subject to inspection for compliance with these Technical Specifications, Plans, Standard Drawings and all other appropriate specifications and contract documents.

B. The Contractor shall make application to the District for inspection at least 48 hours in advance of starting any work. The District's Inspectors shall be recognized as authorized agents of the District, and their duties shall be to evaluate materials used and work performed. Instructions given by the Inspector shall be respected and executed by the Contractor. Instructions by the Inspector may not alter any written terms of the contract without written approval by the Engineer.

C. The District shall at all times have access to the work wherever it is in preparation or progress and the Contractor shall provide proper facilities for such access and for inspection. The Contractor shall provide adequate safe means by which to inspect the work. Failure or oversight of any Inspector to condemn defective materials at the time of use, or to condemn improper work at the time it is performed, shall not diminish the Contractor's obligations to meet the requirements of the Approved Plans and these Technical Specifications. The Contractor shall remove and replace any faulty materials and work at no additional cost to the District upon discovery of the defects or upon receipt of notice from the District to do so.

D. Defective work or material may be rejected prior to the date of acceptance of the work notwithstanding that such defective work or material may have been previously inspected. Acceptance shall not constitute approval of latent defects or waiver of maintenance requirements.

E. Any work covered up or otherwise rendered inaccessible without approval or consent of the District must, if required by the District, be uncovered for examination at the Contractor's expense. Any work done in the absence of the Inspector without written permission shall be subject to rejection.

1.14 TESTING LABORATORY SERVICES

A. The Contractor shall engage testing firms to provide the various testing required for the project. Soils testing is typically required for projects, but concrete testing or other types of testing may additionally be required if specified in the bid schedule, respective concrete technical specifications, or in the plans. The testing firm shall provide a competent, onsite Soils Technician to perform the various compaction testing required for the project. All tests shall be performed at the direction of the Soils Technician and in a manner acceptable to the District. Soils testing shall be performed in accordance with the Geotechnical report or Earthwork technical specification, if applicable.

B. Prior to the District's acceptance of the project, a report of all soils tests taken shall be submitted to the District in accordance with the Geotechnical report or Earthwork technical specification, if applicable.

1.15 CONSTRUCTION STAKING AND PRESERVATION OF MONUMENTS

A. Staking of the various public improvements required shall be performed by the Contractor's surveyor. Generally, stakes for alignment and grade shall be set at 25 foot intervals. The survey shall conform to the lines, grades, and dimensions shown on the Approved Plans. The District shall give an account of the adequacy, readability, and frequency of the stakes provided and shall comment on any remedies required.

B. The Contractor shall preserve all monuments, benchmarks, survey marks, and stakes. In case of their removal or destruction by Contractor or its employees, agents or subcontractors, the Contractor shall be liable for the cost of their replacement, and the processing, fees, and filing of any documentation, corner record, or record of survey as required by the Agencies of Jurisdiction.

1.16 ENVIRONMENTAL CONTROL

A. The Contractor shall abide by all applicable local, state and federal regulations, and by the conditions of the Regional Water Quality Control Board.

B. The Contractor shall provide effective measures where necessary to prevent operations from producing dust in an amount damaging to property or causing a nuisance as determined by the District. The Contractor shall be responsible for any damage due to dust originating from its operations.

C. The Contractor shall anticipate and correct any erosion problem arising from its operations.

1.17 PUBLIC SAFETY AND TRAFFIC CONTROL

A. The Contractor shall at all times conduct operations in a manner causing the minimum obstruction and inconvenience to public traffic. The Contractor shall not interfere with the normal operation of public transit vehicles unless otherwise authorized. Open trenches and excavations shall be provided with adequate barricades in accordance with the approved traffic control plan or the requirements of the agency of jurisdiction. At night, lights shall mark all open work and obstructions. The Contractor shall install and maintain all signs, lights, flares, barricades, fencing, traffic plates, railings, runways, stairs, bridges and other equipment necessary to safeguard the public. Safety instructions received from governmental authorities shall be followed, but compliance with such instructions shall not diminish the Contractor's responsibility or liability for accidents to workers or damage or injury to persons or property.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work, and the Contractor shall fully comply with all state, federal, and other laws, rules, regulations, and orders relating to the safety of workers and others.

C. The right of the District to conduct construction review or observation of the Contractor's performance does not include review or observation of the adequacy of the Contractor's safety measures in, on, or near the construction site.

D. The Contractor shall take immediate action to correct any condition adversely affecting public safety.

E. The Contractor shall submit a traffic control plan to the agency having jurisdiction and shall obtain approval prior to starting the work.

1.18 PROTECTION OF EXISTING FACILITIES

A. The Contractor's attention is directed to the possible existence of pipe and other underground improvements that may or may not be shown on the Approved Plans. Once discovered, the Contractor shall preserve and protect all such improvements whether shown on the Approved Plans or not. The Contractor shall provide and install suitable safeguards, and shall be responsible for the care and protection of all existing sewer and water pipe, electrical and telephone conduits, gas mains, culverts, or other above-ground or below-ground facilities or structures which may be encountered in or near the area of work. It shall be the responsibility of the Contractor to notify each agency of jurisdiction and utility company and to make arrangements for location of facilities prior to beginning construction. In the event of damage to existing facilities during the progress of the work, such facilities shall be replaced or restored to original condition, as determined by District, at the Contractor's expense.

B. The Contractor shall be responsible for determining in advance the location, elevation, alignment and pipe type and size of all existing pipelines to which connections are to be made. Potholing to determine location will be allowed only after providing the District with three (3) working day's advance notice.

C. The Contractor is required to contact Underground Service Alert (USA) at 811 for mark-out of all utilities in the area of the work.

D. If the Contractor, either before commencing work or during the course of the work, finds any discrepancy between specifications or drawings and the physical conditions at the site of the work, Contractor shall promptly notify the District in writing of such discrepancy.

1.19 PROTECTION OF LANDSCAPING

A. The Contractor shall be responsible for the protection of all trees, shrubs, fences, and other landscape items adjacent to or within the work area, unless specific removals are indicated on the Approved Plans.

B. In the event of damage to landscape items, including the thickness of topsoil, the Contractor shall replace the damaged items in kind, in a manner satisfactory to the District.

C. When pipelines are proposed within planted or otherwise improved areas in public or private easements, the Contractor shall restore such areas to original condition after completion of the work.

D. When pipelines are proposed within unimproved areas, the ground surface shall be dressed smooth to the contour of the original ground and left in a neat, presentable condition, free of cleared vegetation, rubbish and other construction wastes. Rocks and clumps that cannot be readily covered by spreading shall be hauled away and disposed of by the Contractor.

1.20 PUBLIC UTILITIES

A. In case it should be necessary to relocate or temporarily maintain the property of any public utility or any other property, and it is understood that the cost of such relocation or temporary maintenance is not required to be borne by the owner of the utility or property, the Contractor shall bear all expenses incidental to the removal or temporary maintenance of such property in a manner satisfactory to said owner. It is understood that in such cases, the utility or property owner has the option of doing such work with his or her own forces, or permitting the work to be performed by the Contractor.

B. The right is reserved to the State, County, City, District or utility owners to enter at any time upon any street, alley, right of way or easement for the purpose of making changes for maintenance or repairs to their property necessitated by the Contractor's work.

1.21 UTILITIES CROSSING WATER, RECYCLED WATER OR SEWER FACILITIES

A. Wherever new utilities cross under or over water, recycled water or sewer facilities, the minimum vertical separation shall be 12-inches unless otherwise approved by the District Engineer or shown on Approved Plans. In such case, new utilities shall be installed in accordance with Standard Drawing 306-A and 306-B. All new utilities crossing under or over water, recycled water or sewer facilities shall remain exposed until inspected and approved by the District Engineer. Wherever new utilities cross under or over water, recycled water or sewer facilities, backfill and compaction within the limits of the water, recycled water, or sewer facility trench width shall be in strict conformance with the backfill and compaction requirements specified herein.

1.22 HORIZONTAL SEPARATION OF UTILITIES PARALLELING WATER, RECYCLED WATER OR SEWER FACILITIES

A. Wherever new utilities parallel water, recycled water or sewer facilities, the minimum horizontal separation shall be such that 36-inches of undisturbed soil separates adjacent trench edges, unless otherwise approved by the District Engineer or shown on Approved Plans. In such case, new utilities shall be installed in accordance with Standard Drawing 306-A and 306-B.

1.23 PROTECTION OF WORKERS IN TRENCH EXCAVATION

A. Whenever work involves trench excavation, the Contractor shall provide all necessary shoring, bracing, sloping, or other provisions to be made for worker protection from hazard of caving ground during the excavation. If such plan varies from the shoring system standards established by the Construction

Safety Orders of the Division of Industrial Safety, a Civil Engineer or Structural Engineer registered in the State of California shall prepare the plans. Contractor shall comply with the Safety Orders of California, Code of Regulations: Title 8, Section 1539 (Excavation, Trenches, Earthwork).

1.24 WORK WITHIN CONFINED SPACES

A. The Contractor shall comply with all Federal and State regulations for confined space entry. Work inside confined spaces as defined by the applicable regulations shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1910.146, and the Safety Orders of the California Code of Regulations Title 8 Article 108 Sections 5156 et seq. for confined space entry have been performed and the area is verified as safe to enter.

1.25 CONSTRUCTION EQUIPMENT

A. The Contractor shall furnish appropriate construction equipment to perform the work in accordance with the Approved Plans and Technical Specifications. Such equipment shall be in a good state of repair and shall be maintained in such state during the progress of the work. In no case shall the manufacturer's rating or capacity limitations for any equipment be exceeded.

1.26 STORAGE OF MATERIALS

A. All materials for use in the work shall be stored by the Contractor in such manner as to prevent damage from exposure to the elements, admixture of foreign materials, or from any other cause. The Contractor shall be entirely responsible for damage or loss by weather or other causes. The Material Safety Data Sheets (“MSDS” or “SDS”) for all products to be used in the work shall be kept on-site by the Contractor, and the material manufacturer's recommendations for proper storage of its products shall be strictly followed.

B. Materials shall not be stored on District property without the written permission of the Engineer. The Contractor shall be responsible to provide its own storage area or property. Materials for use on the work shall be stored on private property only as allowed by law and with the written permission of the property owner, and a copy of such permission shall be provided to the District. In addition, a release letter signed by said property owner and stating that materials are no longer stored on the property and that Contractor has restored the area to original condition is required prior to the filing of the Notice of Completion.

1.27 HOURS OF WORK

A. The normal hours of work shall be between the hours of 7:30 a.m. and 4:30 p.m., Monday through Thursday, excepting District-recognized holidays. Alternate work hours may be arranged with the District to accommodate time-restricting schedules imposed on the Contractor by other agencies. The District shall receive written notice five (5) days prior to any proposed change in work hours. In no case shall any work be performed outside of the normal working hours indicated above without prior approval by the District.

B. The District is closed or has half days on these holidays. No work shall be allowed on these days:

a.	Monday, February 15, 2021	President’s Day
b.	Friday, April 2, 2021	Good Friday (half day)
c.	Monday, May 31, 2021	Memorial Day
d.	Monday, July 5, 2021	Independence Day Holiday
e.	Monday, September 6, 2021	Labor Day
f.	Thursday, November 11, 2021	Veteran’s Day

1.28 WATER AND POWER FOR CONSTRUCTION PURPOSES

A. Water for construction purposes:

1. All water used on the project shall be obtained from District's sources using a construction meter.

2. The construction meter and service connection shall be obtained from the District. The Contractor shall make arrangements with the District for payment of the deposit and installation of the meter.

3. Damage caused to the meter will be charged to the Contractor.

4. Water for construction purposes outside the District's service area shall be obtained from the District within which the project lies.

B. Contractor shall make all arrangements for electrical power required during construction.

1.29 HOUSEKEEPING DURING CONSTRUCTION AND FINAL CLEAN-UP

A. The Contractor shall provide suitable drainage and shall erect such temporary structures as are necessary to protect the work or materials from damage. The Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the work or the materials occasioned by any cause before the acceptance of the work by District and shall bear the expense thereof.

B. The Contractor shall, at all times during the course of the work, maintain work areas and all adjacent properties and public access roads free from accumulations of waste, debris, rubbish or construction materials.

C. The Contractor shall comply with all applicable rules and regulations established by the State of California pertaining to sanitation. Attention is directed to Section 5416 of the California State Health and Safety Code regarding necessary toilet facilities. Toilet facilities must be equipped with hasps and during non-working hours must be padlocked. The District shall be provided a key.

D. The Contractor shall conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

E. Dry materials and rubbish shall be moistened to prevent blowing dust. Loads of excavated materials leaving the site or being imported to the site shall be covered or moistened to prevent blowing dust.

F. Upon completion of the work, and before making application for acceptance of the work, the Contractor shall clean all rights-of-way, streets, borrow pits, and all other grounds occupied in connection with the work. All rubbish, excess materials, temporary structures and equipment shall be removed. All parts of the work shall be left in a neat and presentable condition, as determined by the Engineer, prior to acceptance of the work by District.

1.30 HAZARDOUS WASTE AND UNKNOWN PHYSICAL CONDITIONS

A. If conditions listed below are found during construction, or if any other conditions are found during construction that may be detrimental to the District's facilities being constructed, or to the health and safety of the public, the Contractor shall promptly notify the District.

1. Material that the Contractor or Engineer believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code, and is thus required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law. If such material is discovered, Contractor shall immediately cease work and shall not disturb the job site except as required to protect public safety.

2. Subsurface or latent physical conditions at the site differing from those indicated.

3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided in the Contract.

B. The Contractor shall promptly inform the District of any such conditions found during construction. The District shall investigate the conditions, and if it finds that the conditions do materially differ from those shown or expected, or do involve material that may be hazardous waste, Contractor shall cease work in the impacted area. If material that may be hazardous waste is discovered, the Contractor shall insure that the appropriate government agencies are contacted prior to any further work being performed and that a solution is implemented.

1.31 WORK TO BE DONE

A. The work to be done consists of furnishing all materials, equipment, labor and all other items necessary for the construction and installation of a complete facility as shown on the Approved Plans and in accordance with these Technical Specifications. In some instances, the District may furnish certain materials and services, which will be expressly called out on the Approved Plans.

B. The District's approval of the plans prepared by a Private Engineer denotes agreement with the plans as prepared and is not an acceptance of responsibility as to accuracy. The Private Engineer shall be responsible for any errors, coordination with other agencies/utilities and interpretation of plans. The intent is that the completed Work shall be in general conformance with the Approved Plans and in accordance with the requirements of these Technical Specifications.

1.32 CHANGES TO THE WORK

A. If the District, due to conditions that change during the progress of the work, determines it impracticable for the Contractor to strictly comply with the Approved Plans or the Technical Specifications, the District may prescribe a modification of requirements. The District may at any time during the life of the project, by written order, make such changes as it may find necessary in the design, line, grade, form, location, dimensions, plan or material of any part of the work originally specified or shown on the Approved Plans.

B. If such changes increase the cost of material, or work to be performed, the difference in cost shall be borne by the District. If the changes result in a reduction, the difference shall be credited back to the District. The District shall provide written authorization for all changes to the work. The following procedure shall be followed for revisions or changes to the Approved Plans:

1. Prints showing proposed changes shall be submitted to the District for review and approval.

2. In no case shall any proposed work be performed without prior approval by the District in form of written change order unless a Work Change Directive is issued to the Contractor by the District Engineer.

1.33 RECORD DRAWINGS

A. During the course of the work, the Contractor shall keep accurate and updated records of the changes made to the work. The changes may be dictated by field conditions, unknown obstructions, design oversight, or other circumstances determined to be in the best interest of the District.

B. At the end of the project, the Contractor shall submit to the District one set of drawings with all changes redlined. All project changes shall be shown with accurate dimensions. In addition to the field changes, the correct location of all water and sewer services and driveway centerlines with stations shall be indicated. The District's field representative shall verify that all changes have been included. All revisions shall be incorporated. The District will not pay for this bid item until the record drawings are acceptable to the Engineer.

1.34 WARRANTY

A. The work shall be guaranteed against failure due to defective materials or workmanship for a period of one (1) year from the recording date of the Notice of Completion. The one-year warranty period shall not, in any way, affect the liability of any party for latent or patent defects allowed for under State law.

B. All repairs shall be made pursuant to the Agreement with the District and in accordance with the District's Rules and Regulations, State laws, and current Technical Specifications and Standard Details.

1.35 WARRANTY INSPECTION

A. The District may perform a warranty inspection prior to the expiration of the one-year warranty period. The Contractor will be notified in writing of any deficiencies revealed by this inspection. The performance bond will not be released until the required repairs are completed. If the performance inspection is satisfactory, the District will release the performance bond at the end of the one-year warranty period.

PART 2. MATERIALS (Not Used)

PART 3. EXECUTION (Not Used)

END OF SECTION

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SECTION 01045 - EXISTING FACILITIES

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes requirements for connection to and/or abandonment of existing water and sewer facilities.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 02223 – Trenching, Excavation, Backfilling, and Compacting
2. Section 15000 – General Piping Systems and Appurtenances
3. Section 15041 – Chlorination of Water Mains, Wells, and Reservoirs
4. Section 15042 – Hydrostatic Testing of Pressure Pipes

1.03 LOCATION

A. The Contractor shall be responsible for determining in advance the location and depth of all existing pipelines where critical crossings occur or to which connections are to be made.

PART 2. MATERIALS

A. All materials used in making the connections to or the removal of existing facilities from service shall conform to the applicable sections of these specifications,

PART 3. EXECUTION

3.01 CONNECTIONS TO EXISTING WATERLINES

A. The Contractor shall give notification a minimum of at least five (5) working days to the District and any active customers before the time of any proposed shutdown of existing mains or services. Unless otherwise directed by the Inspector, all shutdowns shall be coordinated with and performed by the District's personnel.

B. Connections shall be made only in the presence of the Inspector and no connection work shall proceed until the Inspector has given the 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, and 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. Where connections are made to existing valves, the Contractor shall furnish and install all temporary blocking, steel clamps, shackles, and anchors as required by the Approved Plans or the Inspector. Valve boxes and covers shall be replaced and adjusted to the proper grade in accordance with Section 15000.

E. The Contractor shall dewater existing mains, as required, only in the presence of the Inspector and not until the Inspector has given the notice to proceed.

F. If progress is inadequate during the connection operations to complete the connection in the time specified, the Inspector shall order necessary corrective measures. All costs for corrective measures shall be paid by the Contractor.

G. Tapping sleeves and valves shall be installed in accord with Section 15000.

H. Connections shall be made with as little change as possible in the grade of the existing main. If the grade of the existing pipe is below that of the new pipeline, a sufficient length of the new line shall be deepened so as to prevent the creation of any high spot or abrupt changes in grade of the new line. Where the grade of the existing pipe is above that of the new pipeline, the new line shall be laid at specified depth, except for the first joint adjacent to the connection, which shall be deflected as necessary to meet the grade of the existing pipe. If sufficient change in direction cannot be obtained by the limited deflection of the first joint, a fitting of the proper angle shall be installed. Where the connection creates a high or low spot in the line, a standard air release or blow-off assembly shall be installed as required by the Approved Plans or directed by the Inspector.

I. 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 accord with Sections 15041 and 15042.

3.02 REMOVAL FROM SERVICE OF EXISTING MAINS AND APPURTENANCES

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

B. Existing pipe and appurtenances may be filled with grout or drillers mud, or plugged with a water tight seal, or removed from the ground, in which case all backfill and repair of surface shall be in accordance with Section 02223. Where connections or stub-outs are abandoned, all valves shall be removed as necessary and the remaining flanged fitting shall be plugged using a blind-flange fitting.

C. Removed pipe and appurtenances may be temporarily stockpiled on the job in a location that will not disrupt traffic or be a safety hazard to the public prior to being disposed of by the Contractor at their expense. When called for in the Approved Plans or as directed by the Inspector, specific abandoned materials may be delivered to the District yard.

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 Inspector.

E. For any 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. When authorized by the Inspector, the horizontal portions of the service line may be abandoned in place by cutting and crimping the ends closed

F. Sewer laterals to be removed from service shall be cut and fitted with a watertight plug at the main.

END OF SECTION

SECTION 01505 – MOBILIZATION

PART 1. GENERAL

1.01 GENERAL

A. The Contractor shall mobilize as required for the proper performance and completion of the Work and in accordance with the Contract Documents.

B. Mobilization shall include at least the following items:

1. Moving onto the Project Site the Contractor's equipment and materials necessary for the first month of operations.

2. Installing temporary construction power, wiring, and/or lighting facilities.

3. Developing construction water supply, on-site sanitary facilities and potable water facilities.

4. Providing field offices for the Contractor complete with furnishings, equipment, and utility services.

5. Constructing and implementing security features.

6. Arranging for staging site(s) for the Contractor's equipment and materials required to complete the Work.

7. Establishing and implementing storm water protection and water quality measures.

8. Obtaining required permits.

9. Having CAL/OSHA required notices and establishing safety programs.

10. Having the Contractor's superintendent at the Project Site full time.

11. Submitting initial submittals.

1.02 PAYMENT FOR MOBILIZATION

A. The Contractor’s attention is directed to the condition that 2.5 percent of the Contract Price will be deducted from any money due the Contractor as progress payments until mobilization items listed above have been completed. The aforementioned amount will be retained by the District as the agreed, estimated value of completing the mobilization items listed. Any such retention of money for failure to complete such mobilization items shall be in addition to the retention from any payments due to the Contractor in accordance with Article 14 of the General Conditions.

PART 2. MATERIALS (Not Used)

PART 3. EXECUTION (Not Used)

END OF SECTION

SECTION 01710 - PROJECT CLOSEOUT

PART 1. GENERAL

1.01 FINAL CLEANUP

A. The Contractor shall promptly remove from the vicinity, at the completion of the Work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Any materials provided to the Contractor by the District for the Work that were not used shall be inventoried and returned to the District's yard. Final acceptance of and payment for the Work by the District will be withheld until the Contractor has satisfactorily performed the final cleanup of the Site and returned any unused materials provided by the District.

1.02 CLOSEOUT TIMETABLE

A. The Contractor shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than two weeks prior to beginning any of the foregoing items, to allow the District, the Engineer, and their authorized representatives sufficient time to schedule attendance at such activities.

1.03 FINAL INSPECTION

A. The Contractor shall notify the Engineer in written memorandum that the work has been completed and is ready for final inspection by the Inspector.

1.04 FINAL SUBMITTALS

A. The Contractor, prior to requesting final payment, shall obtain and submit the following items to the Engineer for transmittal to the District:

1. Written guarantees, where required.
2. Operation and Maintenance Manuals and instructions in electronic and paper form.
3. New permanent cylinders and key blanks for all locks.
4. Maintenance stock items; spare parts; special tools.
5. Completed record drawings.
6. Bonds for roofing, maintenance, etc., as required.
7. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
8. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.05 MAINTENANCE AND GUARANTEE

A. The Contractor shall comply with the maintenance and guarantee requirements contained in General Conditions.

B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the

Contractor which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the Contractor shall have obtained a statement in writing from the affected private District or public agency releasing the District from further responsibility in connection with such repair or resurfacing.

C. The Contractor shall make all repairs and replacements promptly upon receipt of order from the Inspector. If the Contractor fails to make such repairs or replacements promptly, the District reserves the right to do the Work and the Contractor and its surety shall be liable to the District for the cost thereof.

1.06 BOND

A. The Contractor shall provide a bond to guarantee performance of the provisions contained in Paragraph "Maintenance and Guarantee" above, and the General Conditions.

PART 2. MATERIALS (NOT USED)

PART 3. EXECUTION (NOT USED)

END OF SECTION

SECTION 02050 – DEMOLITION

PART 1. GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all materials, equipment and labor as required for the reconstruction of all or portions of existing improvements as specified herein and/or shown on the Approved Plans.

B. Demolition shall include, but shall not be limited to the following:

1. Removal

2. Removal and Salvage

3. Relocation

4. Abandonment in Place

5. Disposal

C. Demolition activities indicated in the Contract Documents shall not be considered all inclusive and the Contractor shall be responsible for performing demolition work not indicated which can be reasonably inferred from the Contact Documents as necessary for completion of the Project. Specifically, the Contract Documents identify major facilities that shall be removed, salvaged, relocated, and abandoned; however, auxiliary utility lines less than 2-inches in diameter (water, air, chemical, lubrication, fluid power, etc) electrical wiring, and instrumentation and controls that shall be removed may not be shown. These auxiliary utilities shall be removed at no additional cost the District.

D. The Contractor shall comply with Project constraints and sequencing requirements identified in these specifications as applicable to demolition activities.

E. The Approved Plans are based on available record drawings (as-builts) and above ground evidence of existing facilities. Prior to bidding, the Contractor shall examine the Site to verify the configuration of facilities identified on the Approved Plans for demolition, the scope of demolition work, and the extent of auxiliary utilities with respect to required demolition activities, if applicable.

F. The Contractor shall install and maintain fences, warning signs, barricades, and other devices required to protect the Contractor's employees, the District's personnel and the public, where applicable. The Contractor shall remove all protection when reconstruction activities are complete, or as work progresses, or as directed by the Engineer.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 01000 – General Requirements

2. Section 02200 – Earthwork

3. Section 03300 – Cast-In-Place Concrete

1.03 CONTRACTOR SUBMITTALS

A. A written plan for demolition activities and procedures shall be submitted (if required by the District's Engineer) to the District's Engineer for approval in accordance with Section 01000 for Shop Drawing Submittals. The demolition plan shall include the following:

1. Schedule of demolition activities,

2. Storage plan for items to be salvaged or relocated, as applicable,

3. Detailed description of methods and equipment to be used for each demolition operation and the sequence of operation.

B. The plan shall provide for safe conduct of the Work, careful removal and disposal of materials and equipment, protection of existing facilities which are to remain, and timely disconnection of utility services.

1.04 DEFINITIONS

A. **"Remove"** shall mean remove the item and dispose of it off site, unless indicated to be salvaged, relocated, or reinstalled.

B. **"Remove and Salvage"** shall mean remove, store and protect the item on site for retrieval by the District. Items to be salvaged shall be removed in a manner that maintains the item in a condition equal to its condition prior to being removed. The Contractor shall protect items to be salvaged against damage and theft until they are retrieved by the District. The Contractor shall coordinate with the District through the Inspector during construction with regard to items to be salvaged.

C. **"Relocate"** shall mean remove, store and protect the item, and reinstall the item at the location shown on the Approved Plans. Items to be relocated shall be removed in a manner that maintains the item in a condition equal to its condition prior to being removed. The Contractor shall protect items to be relocated against damage and theft until they are reinstalled at the new location.

D. **"Abandon"** shall mean abandon the item or facility in place as specified herein and in accordance with the Approved Plans.

E. **"Dispose"** shall mean dispose of materials off site in compliance with applicable local, state, and federal codes and requirements.

PART 2. MATERIALS (Not Used)

PART 3. EXECUTION

3.01 GENERAL

A. Before proceeding with demolition activities, the Contractor shall verify with the District's Engineer that utilities connected to structures or equipment to be removed, relocated, or abandoned are: 1) inoperable, 2) to be abandoned, 3) to be replaced, or 4) to be reinstalled, temporarily or permanently bypassing the structure or equipment.

B. The Contractor shall be responsible for coordination of demolition work with the District's Engineer. Unless otherwise specified or shown, the Contractor shall be responsible for the sequence of demolition activities. Demolition shall be performed in accordance with applicable codes and safety regulations. The Contractor shall limit demolition activities to the extent specified herein or shown on

the Approved Plans. If demolition and reconstruction beyond what is specified or shown is required, the Contractor shall obtain written approval from the Engineer prior to commencing work.

C. Demolition activities shall be conducted not to interfere with roads, access drives, streets, walks, and other adjacent facilities without permission from the District's Engineer or authority having jurisdiction. Alternate routes and traffic control shall be provided around closed or obstructed pedestrian or vehicular traffic ways in accordance with the requirements of the District or authority having jurisdiction.

D. Explosives shall not be permitted for demolition.

3.02 PROTECTION OF EXISTING FACILITIES

A. Prior to demolition, the Contractor shall carefully survey existing facilities and examine the Specifications and Approved Plans to determine the extent of demolition and coordination required.

B. Damage to existing improvements not subject to demolition as a result of the demolition activities shall be repaired or replaced to pre-existing condition or better at no additional cost to the District.

C. The Contractor shall ensure that structural elements are not overloaded as a result of demolition work and shall be responsible for shoring and bracing, as required to provide adequate structural support. The Contractor shall remove temporary protection when the Work is complete or as requested by the District's Inspector.

3.03 PAVEMENT, CURB AND GUTTER REMOVAL

A. Asphalt and concrete pavement, curbs and gutters shall be removed as necessary to perform construction. The limits of removal shall be sawcut in neat clean lines. When the required improvements have been constructed, new asphalt and concrete pavement, curbs, and gutters shall be replaced to match the original and satisfy the authority having jurisdiction.

3.04 PIPE REMOVAL AND ABANDONMENT

A. Where existing abandoned piping is located within the proposed pipeline trench, the Contractor shall remove the existing piping within the trench limits, plug the open ends of the existing pipe and abandon the existing pipe as shown and specified below.

B. Existing piping to be abandoned shall be abandoned in place. The Contractor shall plug or cap open ends of the existing pipe. Unless otherwise shown, the ends of buried piping 4-inch diameter and greater to be abandoned shall be plugged with 2 feet of concrete after cleaning the interior of the pipe with a wire brush to remove foreign material. Concrete shall be in accordance with Section 03300.

C. When new piping is to be connected to existing piping, the existing piping shall be cut square and ends properly prepared for the connection shown on the Approved Plans. Any damage to the lining and coating of the existing piping shall be repaired. Dielectric insulating joints shall be installed at interconnections between new and existing metallic piping and where shown.

3.05 CONCRETE STRUCTURE DEMOLITION

A. Existing abandoned structures that interfere with the Work shall be removed to the minimum extents as shown on the Approved Plans or may be removed completely at the Contractor's discretion upon approval of the District's Engineer and at no additional cost to the District. Concrete structures shall be removed to a depth that will not interfere with new construction, but not less than two feet below existing ground surface or proposed ground surface, whichever is lower, unless otherwise specified.

B. Below-grade areas and voids resulting from demolition of structures shall be filled and compacted in accordance with Section 02200. After fill and compaction, surfaces shall be raised to finish grade and repaired with the same surface as adjacent areas.

C. Existing reinforcement to remain in place shall be protected, cleaned, and extended into new concrete.

D. Where new concrete joins existing concrete at the removal line, reinforcement shall be cut-off flush with the concrete surface at the removal line. Where the concrete surface at the removal line is the finished surface, the reinforcement shall be cut back 2 inches below the finished concrete surface, the ends painted with epoxy paint and the remaining holes patched with a cement mortar grout.

3.06 DISPOSAL

A. Removed items shall be disposed of off-site at the Contractor's expense. Burning at the project site for the disposal of refuse, debris, and waste materials resulting from demolition shall not be permitted.

3.07 OCCUPANCY AND POLLUTION CONTROL

A. Water sprinkling, temporary enclosures, chutes, and other suitable methods shall be used to limit dust and dirt rising and scattering in the area. Comply with applicable codes and regulations and Contract Document requirements pertaining to environmental protection. Water shall not be used when it creates hazardous or objectionable conditions such as ice, flooding, or pollution.

3.08 CLEANING

A. During and upon completion of demolition work, the Contractor shall promptly remove tools and equipment, surplus materials, rubbish, debris, and dust and shall leave work areas in a clean, approved condition. Adjacent structures shall be cleaned of dust, dirt, and debris caused by demolition, as directed by the District's Engineer or authorities having jurisdiction, and adjacent areas shall be returned to condition prior to start of work.

END OF SECTION

SECTION 02100 – SITE PREPARATION

PART 1. GENERAL

1.01 THE REQUIREMENT

A. The Work of this Section includes all measures required during the Contractor's initial move onto the site to protect existing improvements, pavement, and utilities within and adjacent to construction areas; clearing, grubbing and stripping; and re-grading of certain areas to receive embankment fill.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 02200 – Earthwork and

2. Section 02460 – Asphalt Concrete Pavement and Base

1.03 SITE INSPECTION

A. Prior to moving onto the project site, the Contractor shall visit and inspect the site conditions and review maps of the existing site and facilities delineating the property lines and right-of-way lines.

PART 2. MATERIALS (Not Used)

PART 3. EXECUTION

3.01 PRIMARY SITE ACCESS

A. The Contractor shall develop necessary access to the site, including barrier facilities to be installed at the beginning of construction in order to prohibit entry of unauthorized persons. Access restrictions to site areas located outside of public right of way are shown on the Approved Plans.

B. Utility Interference: Where existing utilities interfere with the work of this Section, the work shall be stopped and the District's Engineer notified of interferences before proceeding in accordance with the Contract Documents.

3.02 CLEARING, GRUBBING, AND STRIPPING

A. Construction areas shall be cleared of vegetation to a depth of at least twelve inches and cleared of structures, concrete or masonry debris, trees, logs, stumps, loose boulders, and any other material that would interfere with the performance or completion of the Work, create a hazard to safety, or impair the Work's subsequent usefulness or obstruct its operation. Trees and other vegetation outside of the designated construction limits and where indicated shall be protected from damage during construction, as directed by the District's Engineer.

B. Roadway clearing shall conform to the requirements of Section 15, "Existing Highway Facilities," and Section 16, "Clearing and Grubbing" of the State of California Department of Transportation Standard Specification except as modified herein. Included shall be the grading, to a relatively smooth final grade, of the area between the sidewalk and right-of-way line. All deleterious material, rocks, paper, and other objectionable material shall be removed. The Contractor for Work shall separate asphalt concrete or Portland cement concrete improvements that are to remain from those to be removed by sawcutting along the conform line.

C. Unless otherwise shown, trees larger than three inches in diameter at breast height shall not be removed without the District Engineer's approval. Removal of trees, shrubs or existing improvements outside of the construction limits as deemed necessary by the Contractor, shall be arranged with the District, and be removed and replaced, at no additional cost to the District.

3.03 POTHOLE EXISTING UTILITIES

A. The Contractor shall perform exploratory excavations to determine the actual location and depth of utilities shown on the Approved Plans or marked in the field that cross the proposed pipeline alignment or are shown to be located within four feet of the proposed alignment, including storm drains and sanitary sewers. The Contractor shall conduct exploratory excavations a minimum of two weeks prior to pipeline trench excavation to provide sufficient lead time to resolve utility conflicts.

B. Where a conflict between an existing utility and the proposed pipeline is found, the Contractor shall provide the District's Engineer with the following information for the existing utility:

1. Horizontal location as measured from two existing features shown on the Approved Plans
2. Depth to the top of utility from ground surface
3. Size (diameter)
4. Material
5. Type of utility
6. Pipeline station where the conflict is located

C. The Contractor shall secure all necessary permits prior to performing potholing.

D. The Contractor shall notify utility agencies owning facilities to be exposed a minimum of 48 hours before potholing.

E. The Contractor shall provide required traffic control for potholing work in accordance with the requirements of the authority having jurisdiction.

F. Exploratory excavations shall be backfilled, compacted, and patched with hot mix Asphalt Cement in accordance Sections 02200 and 02460. The area shall be re-opened to traffic immediately after the necessary data is obtained.

END OF SECTION

SECTION 02200 – EARTHWORK

PART 1. GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall perform all earthwork indicated and required for construction of the Work, complete and in place, in accordance with the Contract Documents.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 01000 – General Requirements

2. Section 02220 – Controlled Low Strength Material

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American Society for Testing and Materials (ASTM)

1. ASTM D422 – Method for Particle-Size Analysis of Soils

2. ASTM D1556 – Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

3. ASTM D1557 – Laboratory Compaction Characteristics of Soils Using Modified Effort for Embankment Fill Material, Crushed Aggregate Base Material, Pipe Zone Backfill Material, and Trench Zone Backfill Material

4. ASTM D2487 – Classification of Soils for Engineering Purposes

5. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place By Nuclear Methods (Shallow Depth)

6. ASTM D4253 – Test Methods for Maximum Index Density of Soils Using a Vibratory Table

7. ASTM D4254 – Test Methods for Maximum Index Density of Soils and Calculation of Relative Density, for Foundation Material

8. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity

9. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

10. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile

11. ASTM D4833 – Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

12. ASTM 6027 – Standard Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application

C. State of California Occupational Safety and Health Administration

D. California Labor Code (CLC)

1. CLC Section 6705 “Shoring and Bracing Drawings”

E. Standard Specifications for Public Works Construction (SSPWC)

1. SSPWC Section 202-.2.2 of the Greenbook

F. Inclusion of a specific manufacturer’s name in the Specifications does not mean that the specific manufacturer’s product will be acceptable. Specified manufacturer’s or other manufacturer’s standard product shall be modified as required to meet the Specifications.

1.04 CONTRACTOR SUBMITTALS

A. The Contractor shall prepare and submit information required herein in accordance with Section 01000 for Shop Drawing Submittals.

B. The Contractor's attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. The Contractor, prior to beginning any trench or structure excavation 5 feet deep or over shall submit and shall be in receipt of written acceptance of the Contractor's detailed plan showing design of all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative systems plans shall be prepared, stamped and signed by a civil or structural engineer licensed by the State of California.

C. The Contractor shall submit for review a dewatering plan for all excavations below the groundwater table, if applicable. Groundwater elevation data is provided in the geotechnical report prepared for the project for reference. The dewatering plan shall include contingency ground improvement plans for controlling potentially high groundwater inflows through the native or other granular backfill materials. The plan shall also identify proposed dewatering methods and operation to meet the criteria defined in this Section, and proposed equipment, standby equipment, and a monitoring plan.

D. The Contractor shall submit a copy of the excavation permit issued by the California Department of Industrial Safety.

E. The Contractor shall submit material data and test results for all fill and backfill materials, and geotextiles to ensure compliance with these Specifications.

1.05 REFERENCE REPORTS

A. In preparing these Contract Documents, the District’s Engineer has relied upon the following geotechnical work:

1. A copy of the draft Geotechnical Report was prepared for the project shall be provided to the Contractor as technical data and information, but is not a part of the Contract Documents.

PART 2. MATERIALS

2.01 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

A. Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from deleterious materials, grass, roots, brush, or other vegetation.

B. Fill and backfill materials to be placed within 6-inches of a structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3-inches.

C. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required by the District's Engineer or to meet the quantity requirements of the project, the Contractor shall provide the imported materials at no additional cost to the District.

D. The following types of suitable materials are defined:

1. Embankment Fill Material: Embankment Fill Material shall be imported or processed native material meeting the following gradation:

Sieve Size	Percentage Passing
6-Inch	100
3-Inch	90-100
3/4-Inch	60-100
No. 4	40-100
No. 200	0-40

2. Foundation Material: Foundation Material shall be clean, durable, natural crushed rock or angular gravel meeting the following gradation requirements:

Sieve Size	Percentage Passing
2-Inch	100
2-1/2-Inch	90-100
3/4-Inch	5-30
3/8-Inch	0-5
No. 200	0-2

E. Controlled Low Strength Material shall be in accordance with Section 02220. Trench plug material shall be CLSM.

2.02 UNSUITABLE MATERIAL

A. Unsuitable materials include the materials listed below

1. Recycled aggregate base and fill materials.

2. Soils, which when classified under ASTM D2487, fall in the classifications of Pt, OH, CH, MH, or OL.

3. Soils that cannot be compacted sufficiently to achieve the density specified for the intended use.

4. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

5. Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistivity or pH less than the existing on-site soils.

2.03 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

A. The Contractor shall use the types of materials as designated herein for fill, backfill, and embankment construction hereunder.

B. Where these Specifications conflict with the requirements of an agency having jurisdiction, the District's Engineer shall be notified before placement.

C. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of Embankment Fill Material.

2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" below, shall be Imported Granular Material for Water Pipe in accordance with Section 02223.

3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be Crushed Aggregate Base Material in accordance with Section 02223. Screened native material will be acceptable for trench zone backfill only if the Contractor can demonstrate it can achieve the proper moisture conditioning, required compaction, and meet gradation requirements under Crushed Aggregate Base Material in Section 02223 and only upon approval of the District's Engineer and the City of Rancho Cucamonga inspector.

4. Final backfill material for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill" shall be Crushed Aggregate Base Material. Final backfill in unpaved areas shall be the same material as that used for trench zone backfill. Final backfill in unpaved traveled areas shall be compacted to a firm and unyielding surface.

5. Base course under pavements shall be Crushed Aggregate Base Material.

6. Backfill around structures shall be Crushed Aggregate Base Material or CLSM

7. Backfill materials beneath structures shall be as follows:

    a. Where structure or pipe subgrade has been disturbed, or consists of loose sands or soft soils, the subgrade shall be over-excavated to undisturbed and stable soils then backfilled with a minimum 12-inch thick layer of Foundation Material. Foundation Material shall extend to the bottom of the pipe bedding layer.

    b. Under all other structures, a minimum 6-inch layer of Crushed Aggregate Base Material shall be installed.

8. Backfill used to replace pipeline trench over-excavation shall be a layer of Foundation Material for wet or unstable trench subgrade conditions.

9. Where required, geotextile filter fabric shall meet the following requirements:

Property	Test Value	Test Method
Grab tensile strength	200 lb. Min.	ASTM D4632
Elongation at break	50% Max.	ASTM D4632
Puncture strength	100 lb. Min	ASTM D4833
Apparent opening size	#100 Max	ASTM D4751
Permittivity	1.0 Sec^{-1} Min.	ASTM D4491

10. Geotextile filter fabric material shall be Mirafi 1100N or equal.

2.04 MATERIALS TESTING

A. If required by the District's Engineer, all soils testing of samples submitted by the Contractor will be performed by a testing laboratory of the District's choice and at the District's expense. At its discretion, the District's Engineer may request that the Contractor supply samples for testing of any material used in the work.

B. Particle size analysis of soils and aggregates will be performed using ASTM D422.

C. Determination of sand equivalent value will be performed using California Test Method 217.

D. Unified Soil Classification System: References in this Section to soil classification types and standards shall have the meanings and definitions indicated in ASTM D2487. The Contractor shall be bound by all applicable provisions of said ASTM D2487 in the interpretation of soil classifications.

PART 3. EXECUTION

3.01 EXCAVATION - GENERAL

A. Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the Work. The removal of said materials shall conform to the lines and grades indicated or ordered. Unless otherwise indicated, the area of construction shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The Contractor shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926)

1. Shoring Design Criteria: The Contractor is solely responsible for design and installation of shoring and bracing for excavations. The Contractor shall design shoring and bracing to meet the following minimum requirements:

2. Protect personnel entering and working in excavations.

3. Protect adjacent utilities, pipelines, structures, and improvements.

4. Install shoring in a manner that shall not cause settlement or heave of the ground surface nor produce construction vibrations that could damage adjacent utilities, structures, or improvements.

5. Prevent caving or lateral movement of excavation walls and associated loss of adjacent ground and adjacent ground surface settlement, even when subject to construction vibrations.

6. Prevent heave and/or piping (boiling) of excavation bottom.

7. Allow for the removal of shoring in a manner that does not: damage or cause settlement of the constructed facility; cause settlement or heave of the ground surface and produce construction vibrations that could damage adjacent utilities, structures, or improvements.

8. Resist hydrostatic pressures and lateral loads from vehicular traffic, construction equipment and spoils stockpiles.

B. Contractor shall remove and exclude water, including storm water, groundwater, irrigation water, and wastewater, from all excavations. Dewatering wells, well points, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level at least two feet below the bottom of excavations before the excavation work begins at each location. Water shall be removed and excluded until backfilling is complete and all field soil testing has been completed.

C. Contractor shall design its dewatering systems to meet the following minimum requirements:

1. Provide stable excavation walls and bottom.

2. Provide reasonably dry base of excavation.

3. Prevent boiling of the excavation bottom.

4. Filter surrounding native and fill soils and prevent loss or ground through erosion and dispersion.

5. Discharge of removed groundwater shall be in accordance with the Contractor's SWPPP and State and Federal regulations. At a minimum, water removed from excavations shall be discharged to a sedimentation tank(s) with a detention capacity of at least 4 hours. Groundwater shall be tested for contaminants prior to discharging to local storm drains or other drainages. All discharges shall be approved by the local and State jurisdiction.

D. Contractor shall be responsible for repairs and or replacement of existing pipelines, utilities, structures, and improvements damaged as a result of inadequate shoring and bracing of excavations. The repair and replacement shall be performed by the Contractor at no additional cost to the District.

E. Contractor shall be responsible for repairs and or replacement of existing pipelines, utilities, structures, and improvements damaged as a result of inadequate dewatering of excavations. The repair and replacement shall be performed by the Contractor at no additional cost to the District.

3.02 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

A. Excavation beneath structures and embankments, except where otherwise indicated for a particular structure or ordered by the District's Engineer, shall be carried to the grade of the bottom of the footing or slab. The Contractor shall over-excavate all existing fills below all structure foundations. Where indicated or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top 6-inches of native material and where such subgrade is sloped, the native material shall be benched. When such over-excavation is indicated, both over-excavation and subsequent backfill to the required grade shall be performed by the Contractor. When such over-excavation is not indicated but is ordered by the District's Engineer, such over-excavation and any resulting backfill will be paid for in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 90 percent of maximum density.

B. Excavation beneath paved areas to be paved shall extend to the bottom of the aggregate base course, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the top 6-inches of exposed surface shall be scarified, brought to

optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be re-graded to provide a self-draining subgrade.

C. Contractor shall notify the District's Engineer at least 3 working days in advance of completion of any structure excavation and shall allow the District's Engineer a review period of at least one working day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.03 PIPELINE AND UTILITY TRENCH EXCAVATION

A. Unless otherwise indicated or ordered, excavation for pipelines and utilities shall be open-cut trenches with widths as indicated in Standard Drawings.

B. The bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe bedding. Excavations for pipe bells and welding shall be made as required.

C. The maximum amount of open trench permitted in any one location shall be 300 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. Barricades and warning lights meeting safety requirements shall be provided and maintained.

D. Where trenches are indicated to be over-excavated, excavation shall be to the depth indicated, and Foundation Material shall be placed and compacted to the grade of the bottom of the pipe bedding.

E. When ordered by the District's Engineer, whether indicated on the Approved Plans or not, trenches shall be over-excavated beyond the depth and/or width shown. Such over-excavation shall be to the dimensions ordered. The trench shall then be backfilled to the grade of the bottom of the pipe bedding. Over-excavation less than 6-inches below the limits shown on the Approved Plans shall be done at no increase in cost to the District. When the over-excavation ordered by the District's Engineer is 6-inches or greater below the limits shown on the Approved Plans, or wider, extra cost for the work may be requested by the Contractor in a written request for change order form. Extra cost will be negotiated unless a separate unit price line item is included in the bid, in which case, said unit price line item shall be the basis for compensation.

F. Where pipelines are to be installed in embankments, fills, or structure backfills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

G. If a moveable trench shield is used during excavation operations, the trench width shall be wider than the shield so that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls. If the trench walls cave in or slough, the trench shall be excavated as an open excavation with sloped sidewalls or with trench shoring, both in accordance with the Contractor's excavation shoring and safety plan, as indicated and as required by the pipe structural design.

3.04 OVER-EXCAVATION NOT ORDERED OR INDICATED

A. Any over-excavation carried below the grade ordered or indicated, shall be backfilled to the required grade with the indicated material and compaction. Such work shall be performed by the Contractor at no additional cost to the District.

3.05 EXCAVATION IN VICINITY OF TREES

A. Except where indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2-inches in diameter shall be cut without permission of the District's Inspector.

3.06 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The Contractor shall remove and dispose of all excess excavated material in accordance with these specifications.

3.07 BACKFILL - GENERAL

A. Backfill shall not be placed on previously placed CLSM fill until the CLSM has passed the drop ball test as specified in ASTM D6024.

B. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

C. Except for drain-rock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation, and the trench sidewalls and bottom have been dried to a moisture content suitable for attaining the required compaction.

D. If a moveable trench shield is used during excavation, pipe installation, and backfill operations, the shield shall be moved by lifting the shield free of the trench bottom or backfill and then moving the shield horizontally. The Contractor shall not drag trench shields along the trench causing damage or displacement to the trench sidewalls, the pipe, or the bedding and backfill.

E. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have all loose sloughing, or caving soil and rock materials removed. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

3.08 PLACING AND SPREADING OF BACKFILL MATERIALS

A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment, the layers shall be evenly spread so that when compacted each layer shall not exceed 6-inches in thickness.

B. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted, the pipe zone backfill will provide uniform bearing and side support.

C. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is achieved.

D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

3.09 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

A. Each layer of soil material as defined herein, where the material is graded such that at least 10 percent passes a No. 4 sieve, shall be mechanically compacted to the indicated percentage of maximum dry density. Equipment that is consistently capable of achieving the required degree of

compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

B. Each layer of foundation material shall be compacted by means of at least two passes from a flat plate vibratory compactor.

C. Jetting of pipe zone and trench zone backfill is acceptable in lieu of mechanical compaction, only when a written permission is provided by the District's Engineer.

D. The Contractor shall be responsible for damage caused by compaction equipment and compaction operations. The Contractor shall limit the weight of equipment and manner of operating the equipment adjacent to structures and until at least two feet of compacted backfill have been installed over pipelines.

1. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

2. Backfill around and over pipelines that is mechanically compacted shall be compacted using light, hand operated, vibratory compactors and rollers. After completion of at least two feet of compacted backfill over the top of pipeline, compaction equipment weighing no more than 8,000 pounds may be used to complete the trench backfill.

Location of Use of Fill	% of Max. Dry Density
Pipe zone backfill for flexible pipe.	90
Pipe bedding and over-excavated zones under bedding for flexible pipe, including trench plugs.	90
Final backfill, beneath paved areas or Structures and on unpaved maintenance roadways.	95
Final backfill, not beneath paved areas or structures.	90
Trench zone backfill, beneath paved areas and structures, including trench plugs.	95
Trench zone backfill, not beneath paved areas or structures, including trench plugs.	90
Embankments and fills.	90
Embankments and fills beneath paved areas or structures	95
Backfill beneath structures and hydraulic structures.	95
Backfill and fill around structures.	90
Topsoil	80
Base course for pavement (aggregate base)	95

E. Compaction Requirements: The following compaction test requirements shall be in accordance with ASTM D1557, ASTM D4253 and D425l. Where agency or utility company requirements govern, the highest compaction standards shall apply.

3.10 PIPE AND UTILITY TRENCH BACKFILL

A. Bedding and Pipe Zone Backfill:

1. After compacting the bedding the Contractor shall perform a final trim using a string-line for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.

2. The pipe zone shall be backfilled with the indicated backfill material. The Contractor shall exercise care to prevent damage to the pipeline coating and the pipe itself during the installation and backfill operations.

3. If a moveable trench shield is used during backfill operations the shield shall be lifted to a location above each layer of backfill material prior to compaction of the layer. The Contractor shall not displace the pipe or backfill while the shield is being moved.

B. After the pipe embedment zone backfill has been placed, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 12-inches above the top of the pipe and a plane below the finished surface where final backfill begins, per the trench finish surface.

C. After trench zone backfill has been placed, final backfill may proceed. Final backfill is defined as all backfill above the trench zone backfill to finished surface for unpaved or landscaped areas, or if the trench is under pavement, all backfill above the trench zone backfill and below the pavement section. The depth of the final backfill shall be dependent upon the trench surface finish.

3.11 FILL AND EMBANKMENT CONSTRUCTION

A. The area where a fill or embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of 6 inches, brought to a uniform moisture content of 100 to 125 percent of optimum moisture content and rolled or otherwise mechanically compacted. Embankment fill material shall be placed and spread evenly in approximately horizontal layers, not exceeding a gradient of 20:1 (H:V). Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the District's Engineer, fill materials shall be placed in lifts not exceeding 8-inches in thickness. Each lift shall be watered or air dried to a uniform moisture content of 100 to 125 percent of optimum moisture content and rolled or otherwise mechanically compacted.

B. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 5:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment or fill to the underlying ground a minimum vertical dimension of one foot. Material thus cut shall be re-compacted along with the new material at no additional cost to the District. Hillside or fill slopes 5:1 or flatter shall be prepared in accordance with Paragraph A, above.

C. Where embankment or structure fills are constructed over pipelines, the first two feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least two feet of fill over the pipe has been completed.

D. Embankment and fill slopes shall be overbuilt a minimum of two horizontal feet and then trimmed back to expose compacted engineered fill. Compaction by track walking slopes is prohibited.

E. Fill slopes shall be constructed with a toe keyway having a minimum width of 15-feet and minimum embedment of 2-feet, as shown on the Approved Plans. The keyway shall extend into competent material as determined by the District's Engineer.

3.12 FIELD TESTING

A. All field soils testing will be done by a testing laboratory at the Contractor's expense unless indicated in the Contract Documents the District will hire a testing laboratory to perform soils testing. All field soil testing results shall be submitted to the District for review and approval.

B. Field density in-place tests will be performed in accordance with ASTM D1556 and ASTM D2922.

C. In case the test of the fill or backfill show non-compliance with the required density, the Contractor shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by the District and shall be at the Contractor's cost.

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SECTION 02223 – TRENCH, EXCAVATION, BACKFILLING, AND COMPACTION

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes materials, testing and installation for trench excavation, backfill, and compaction of piping, conduit, manholes and vaults.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 01000 – General Requirements

2. Section 02344 – Jacked Pipe Casing

3. Section 15042 – Hydrostatic Testing of Pressure Pipes

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American Society for Testing and Materials (ASTM)

1. ASTM D75 – Standard Practice for Sampling Aggregates

2. ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

3. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

4. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

5. ASTM D2419 – Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

6. ASTM D2992 – Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings

7. ASTM D3017 – Standard Specification for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

8. ASTM D4253 – Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

9. ASTM D4254 – Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

C. Inclusion of a specific manufacturer’s name in the Specifications does not mean that the specific manufacturer’s product will be acceptable. Specified manufacturer’s or other manufacturer’s standard product shall be modified as required to meet the Specifications.

1.04 GEOTECHNICAL TESTING

A. The Contractor shall engage the services of a geotechnical engineering firm or individual licensed in the State of California to monitor soil conditions during earthwork, trenching, bedding, backfill and compaction operations. Sampling and testing procedures shall be performed in accordance with these specifications and as follows:

1. The soils technician shall be present at the site during all backfill and compaction operations. Failure to have the soils technician present will subject such operations to rejection.

2. Density and optimum moisture content of soil shall be determined by the use of the sand cone method, ASTM D1556, or nuclear density gauge method, ASTM D2922 & D3017. Since the composition of the pipe and the walls of the trench have an effect on the nuclear density gauge output, a minimum of 25 percent of the density and optimum moisture tests shall be made using the sand cone method.

3. Determine laboratory moisture-density relations of existing soil by ASTM D1557, Method C and/or D (formerly ASTM D4253 and ASTM D4254).

4. Determine the relative density of cohesionless soils by ASTM D1557, Method C and/or D (formerly ASTM D4253 and ASTM D4254).

5. Sample backfill material by ASTM D75.

6. Express "relative compaction" as a percentage of the ratio of the in-place dry density to the laboratory maximum dry density.

B. A report of all soils tests performed shall be stamped and signed by the soils firm or individual and shall be submitted by the Contractor prior to the filing of the Notice of Completion by the District. The report shall document the sampling and testing of materials, the location and results of all tests performed, and shall certify that materials and work are in compliance with this specification.

1.05 PIPE ZONE

A. The pipe zone includes the full width of the trench from 6-inches below the bottom of the pipe to 12-inches above the top of the pipe and extends into manhole or vault excavations to the point of connection to or penetration of such structure.

1.06 TRENCH ZONE

A. The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the pavement zone in paved areas, or to the existing surface in unpaved areas, and extends into manhole or vault excavations above the pipe zone.

1.07 PAVEMENT ZONE

A. The pavement zone includes the concrete or asphalt concrete pavement and aggregate base section placed over the trench zone and extends into manhole or vault excavations above the trench zone.

1.08 PROTECTION OF EXISTING UTILITIES AND FACILITIES

A. The Contractor shall be responsible for the care and protection of all existing utilities, facilities and structures that may be encountered in or near the area of the work in accordance with Section 01000.

1.09 PROTECTION OF EXISTING LANDSCAPING

A. The Contractor shall be responsible for the protection of all trees, shrubs, fences, and other landscape items adjacent to or within the work area in accordance with Section 01000.

1.10 ACCESS

A. The Contractor shall provide continuous, unobstructed access to all driveways, water valves hydrants, or other property or facilities within or adjacent to the work areas.

1.11 SAFETY

A. Protection of workers within trenches shall be as required by the California Labor Code and in accordance with Section 01000. All excavations shall be performed in a safe manner and shall be protected and supported in accordance with CAL-OSHA regulations. Barriers and traffic delineators shall be placed in accordance with the requirements of the agency having jurisdiction.

1.12 BLASTING

A. Blasting for excavation shall not be performed without the written permission of the District. Procedures and methods of blasting shall conform to all Federal, State and local laws and ordinances.

1.13 PIPE JACKING

A. Pipe jacking may be permitted in accordance with Section 02344. District approval is required in advance of such operations.

1.14 EXCESS EXCAVATED MATERIAL

A. The Contractor shall remove and legally dispose of all excess excavated material and demolition debris.

B. It is the intent of these specifications that all surplus material shall be legally disposed of by the Contractor. Before acceptance of the work by District, the Contractor shall provide the District with written releases signed by all property owners with whom the Contractor has entered into agreements for disposing of excess excavated material, absolving the District from any liability connected therewith.

1.15 FILTER FABRIC

A. Filter fabric shall be used when excessively wet, soft, spongy, or similarly unstable material is encountered or in areas of suspected high groundwater in accordance with the soils technician’s recommendation and the approval of the District’s Engineer.

1.16 CHANGES IN LINE AND GRADE

A. In the event obstructions not shown on the plans are encountered during the progress of the work, and which will require alterations to the plans, the District’s Engineer shall have the authority to change the plans and order the necessary deviation from the line and grade, in accordance with Section 01000. The Contractor shall not deviate from the specified line and grade without prior written approval by the District’s Engineer.

1.17 HYDROSTATIC TESTING

A. Pre-testing of the piping system may be performed for the Contractor's convenience at any time. However, the final hydrostatic pressure test shall be as described in Section 15042.

PART 2. MATERIALS

2.01 GENERAL

A. The Contractor shall furnish backfill material as specified below. All materials used in and above the pipe zone shall be capable of attaining the required relative density.

2.02 IMPORTED GRANULAR MATERIAL – WATER PIPE ZONE

A. Imported Granular Material shall be used within the Pipe Zone for installations of all pressure pipe and tubing.

B. The Imported Granular Material shall be quarry waste (decomposed granite) free from organic matter. Material shall have a sand equivalent value of not less than 30 as determined using California Test Method 217, a coefficient of uniformity of 3 or greater, and shall conform to the following gradation:

U.S. Standard Sieve Size	Percent Passing By Weight
1-inch	100
3/4-inch	90-100
No. 4	50-95
No. 30	25-45
No. 200	3-15

C. Native materials may not be used in lieu of Imported Granular Material within the Pipe Zone unless such native materials meet all of the requirements specified above and specific written permission has been obtained from the District's Engineer.

2.03 CRUSHED ROCK – SEWER PIPE ZONE

A. Crushed Rock shall be used within the Pipe Zone for installations of all non-pressure pipe. Crushed rock shall be clean crushed stone free of organic matter. Crushed rock shall be certified to contain less than 1 percent asbestos by weight or volume and shall conform to the following gradation:

U.S. Standard Sieve Size	Percent Passing By Weight
1-inch	100
3/4-inch	90-100
1/2-inch	30-60
3/8-inch	0-20
No. 4	0-5
No. 8	-----

B. In addition, crushed rock for use within the pipe zone shall meet or exceed the following requirements for resistance to abrasion or impact as measured using ASTM Test Method C131, Test Sample Grading B:

1. 100 Revolutions: 15 percent Maximum Loss by Weight

2. 500 Revolutions: 52 percent Maximum Loss by Weight

2.04 CRUSHED AGGREGATE BASE MATERIAL - TRENCH ZONE

A. Crushed Aggregate Base Material shall be crushed rock such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. Crushed aggregate base shall meet the requirements of Section 202-.2.2 of the Greenbook, "Standard Specifications for Public Works Construction", latest edition. The sand equivalent value shall be not less than 35 as determined using California Test Method 217 and the minimum R-value shall be 78 as determined using California Test Method 301. The material shall meet the following gradation requirements:

Sieve Size	Percentage Passing
1-1/2-Inch	100
3/4-Inch	90-100
3/8-Inch	50-80
No. 4	35-55
No. 30	10-30
No. 200	2-9

B. Native materials may not be used in lieu of Crushed Aggregate Base Material within the Trench Zone unless such native materials meet all of the requirements specified above and specific written permission has been obtained from the District's Engineer.

2.05 SAND-CEMENT SLURRY

A. Sand-cement slurry shall consist of two sacks, 188 pounds of Portland cement per cubic yard of sand and sufficient moisture for workability. District approval is required for use of sand-cement slurry as a backfill material.

2.06 TRENCH PLUGS

A. Trench plugs consisting of compacted Imported Granular Material or sand-cement slurry shall be installed on piping systems that are backfilled with crushed rock.

PART 3. EXECUTION

3.01 CLEARING AND GRUBBING

A. Areas where work is to be performed shall be cleared of all trees, shrubs, rubbish, and other objectionable material of any kind, which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or would form obstructions therein.

B. Organic material from clearing and grubbing operations will not be incorporated in the trench backfill and shall be removed from the project.

3.02 PAVEMENT, CURB, AND SIDEWALK REMOVAL

A. Bituminous or concrete pavements, curbs, and sidewalks shall be removed and replaced in accordance with the requirements of the agency having jurisdiction.

3.03 DEWATERING

A. The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose of all water from any source entering excavations or other parts of the work. Dewatering shall be performed by methods that will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Dewatering methods may include well points, sump points, suitable rock or gravel placed as pipe bedding for drainage and pumping, temporary pipelines, or other means, all subject to the approval of the District's Engineer. The cost of all dewatering activities shall be borne by the Contractor.

B. Sewer systems shall not be used as drains for dewatering trenches or excavations, nor for disposal of collected or accumulated groundwater, without the approval of the agency of jurisdiction.

C. Concrete shall not be poured in water, nor shall water be allowed to rise around concrete or mortar until it has set at least four hours.

D. The Contractor is responsible for meeting all Federal, State, and local laws, rules and regulations regarding the treatment and disposal of water from dewatering operations at the construction site.

3.04 SHORING AND SHIELDING

A. The Contractor's design and installation of shoring shall be consistent with the rules, orders, and regulations of CAL-OSHA.

B. Excavations shall be shored, sheeted, and supported such that the walls of the excavation will not slide or settle and all existing improvements of any kind, either on public or private property, will be fully protected from damage.

C. The sheeting and shoring shall be arranged so as not to place any stress on portions of the completed work until the general construction has proceeded far enough to provide ample strength.

D. Care shall be exercised in the moving or removal of trench shields, sheeting, and shoring to prevent the caving or collapse of the excavation faces being supported.

3.05 CORRECTION OF OVEREXCAVATION

A. Over-excavations shall be corrected by backfilling with approved imported granular material or crushed rock, compacted to 90 percent relative compaction, as directed by the District's Engineer.

3.06 FOUNDATION STABILIZATION

A. When unsuitable soil materials are encountered, the unsuitable material shall be removed to the depth determined necessary in the field by the Soils Technician, and as acceptable to the District Engineer. The sub-grade shall be restored with compacted Imported Granular Material or crushed rock as recommended by the Soils Technician. Place the appropriate bedding or base material on this restored foundation.

B. When rock encroachment is encountered, the rock shall be removed to a point below the intended trench or excavation sub-grade as determined necessary in the field by the Soils Technician, and as acceptable to the District Engineer. The sub-grade shall be restored with compacted Imported Granular Material as recommended by the Soils Technician. Place the appropriate bedding or base material on this restored foundation.

C. When excessively wet, soft, spongy, or similarly unstable material is encountered at the surface upon which the bedding or base material is to be placed, the unsuitable material shall be removed to the depth determined necessary in the field by the Soils Technician, and as acceptable to the District Engineer. Restore the trench with crushed rock enclosed in filter fabric as directed by the District

Engineer. Larger size rocks, up to 3-inches, with appropriate gradation, may be used if recommended by the Soils Technician. Place the appropriate bedding or base material on this restored foundation.

3.07 TRENCH EXCAVATION AND PLACEMENT OF BEDDING

A. Excavate the trench to the lines and grades shown on the Approved Plans with allowance for 6-inches of pipe bedding material. The trench section shall be as shown on the Standard Drawings.

B. The maximum length of open trench shall be 300 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. The distance is the collective length at any location, including open excavation and pipe laying, which has not been backfilled to the elevation of the surrounding grade.

C. Trench walls shall be sloped or shored per the requirements of CAL-OSHA.

D. The trench bottom shall be graded to provide a smooth, firm, and stable foundation that is free from rocks and other obstructions.

E. Place the specified thickness of bedding material over the full width of the trench. Grade the top of the pipe base ahead of the pipe laying to provide a firm, uniform support along the full length of pipe.

F. Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

G. Trenches for main pipelines and all appurtenances shall be backfilled with the materials and methods as specified for the Pipe Zone, Trench Zone and Pavement Zone.

H. Trench widths shall be in accordance with the Standard Drawings.

I. Trench depth shall be as required to install pipelines in accordance with the Approved Plans. Unless shown otherwise on the Approved Plans, the minimum depth of cover for pipelines shall be as follows:

Pipeline Type	Minimum Cover Required
Potable Water (12-in and smaller)	36-inches
Potable Water (above 12-in)	48-inches
Recycled Water	48-inches
Sewer	60-inches

J. Final street sub-grade shall be established prior to the excavation of pipeline trenches. Minimum cover above pipe shall be 24-inches for hydro testing.

3.08 MANHOLE AND VAULTS

A. The Contractor shall prepare an excavation large enough to accommodate the structure and permit grouting of openings and backfilling operations. The walls of the excavation shall be sloped or shored per the requirements of CAL-OSHA.

B. Manholes and vaults shall be placed at the location and elevation shown on the Approved Plans, on undisturbed soils and 6-inches of compacted crushed rock base.

C. Manhole and vault excavations shall be backfilled with the materials and methods as specified for the Pipe Zone, Trench Zone and Pavement Zone.

3.09 COMPACTION REQUIREMENTS

A. Compaction shall be accomplished by mechanical means. Consolidation by water settling methods such as jetting or flooding is prohibited, unless a written permission is provided by the District's Engineer.

B. If the backfill fails to meet the specified relative compaction requirements; the backfill shall be reworked until the requirements are met. All necessary excavations for density tests shall be made as directed by the Soils Technician, and as acceptable to the District's Engineer. The requirements of the Agency having jurisdiction shall prevail on all public roads.

C. Compaction tests shall be performed at random depths, and at random intervals not to exceed 150 feet, as directed by the Soils Technician or District's Engineer.

D. Relative compaction shall be determined by the impact or field compaction test made in accordance with ASTM D1557 Procedure C.

E. Unless otherwise shown on the Approved Plans 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 – 95 percent relative compaction.

2. Trench zone – 95 percent relative compaction.

3. Structural section in paved areas - per agency requirements, 95 percent minimum.

F. Imported Granular Material for over excavation or foundation stabilization – 90 percent relative density.

G. All excavations are subject to compaction tests.

3.10 TRENCH PLUGS

A. Trench plugs shall be installed at 200 foot intervals along the entire length of piping systems. Trench plugs shall be 10 feet in length and shall encompass the entire pipe zone. Additional trench plugs may be required as directed by the District's Engineer.

3.11 PIPE ZONE BACKFILL

A. Care shall be taken in placing the imported granular backfill material simultaneously around the main pipeline and appurtenance pipes so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe or on the sides of the pipe. Care shall be taken to place material simultaneously on both sides of the pipe to prevent lateral movement. This area shall be mechanically compacted to attain 95 percent relative density. Care shall be taken when compacting appurtenance laterals 2-inches and smaller to prevent the crushing or denting of the copper lateral. Additional lifts of 12-inches or less thickness may be required on 16-inches or larger diameter pipe to attain complete support of the haunch area. Soils tests may be taken on this layer of backfill.

B. After the spring line backfill has been approved by the Soils Technician, backfill of the remainder of the Pipe Zone may proceed. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipe.

C. Place and compact the imported granular material at a maximum of 12-inches lifts. Compact all material placed in the Pipe Zone by mechanical methods. Sand cone tests shall be taken on this layer of backfill.

D. The use of a backhoe-mounted compaction wheel is prohibited within the pipe zone to 12-inches above the top of the pipe.

E. Under no circumstances shall consolidation by water settling or water-setting methods (i.e. jetting, diking, etc.) be permitted, unless a written permission is provided by the District's Engineer.

3.12 TRENCH ZONE BACKFILL

A. After the Pipe Zone material has been placed, compacted, approved by the Soil Technician and accepted by the District's Engineer, backfill in the Trench Zone may proceed.

B. Compaction using vibratory equipment, tamping rollers, pneumatic tire rollers, or other mechanical tampers shall be performed with the type and size of equipment necessary to accomplish the work. The backfill shall be placed in horizontal layers of such depths as are considered proper for the type of compacting equipment being used in relation to the backfill material being placed. Each layer shall be evenly spread, properly moistened, and compacted to the specified relative density. The Contractor shall repair or replace any pipe, fitting, manhole, or structure damaged by the installation operations as directed by the District's Engineer.

3.13 PAVEMENT ZONE BACKFILL AND RESTORATION

A. After the Trench Zone material has been placed, compacted, approved by the Soil Technician, and accepted by the District's Engineer; backfill in the Pavement Zone may proceed as necessary in accordance with the requirements of the agency having jurisdiction.

B. Replace bituminous and concrete pavement, curbs, and sidewalks removed or damaged during construction in accordance with the requirements of the agency having jurisdiction.

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SECTION 15000 – GENERAL PIPING SYSTENS AND APPURTENANCES

PART 1. GENERAL

1.01 DESCRIPTION

A. This section describes the requirements and procedures for piping systems (pressure pipe and gravity sewer pipe) and appurtenances that apply to a number of other complimentary Specification Sections. The items are listed in this section to avoid repetition in sections elsewhere. This section includes, but is not limited to, temporary pipelines, wet taps, flexible pipe couplings, grooved and shouldered end couplings, joint restraint systems, field touch up, bolts, nuts, polyethylene wrap, warning/identification tape, tracer wire, gate well and extension stems, meter boxes, abandonment and removal of existing facilities, salvage, and disposal.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Related Work Specified Elsewhere:

1. Section 01000 – General Requirements
2. Section 02223 – Trenching, Excavation, Backfilling, and Compaction
3. Section 03300 – Cast-In-Place Concrete
4. Section 09920 – Shop-Applied Fusion-Bonded Polyester Coatings
5. Section 15005 – Piping Identification Systems
6. Section 15041 – Disinfection of Water Mains, Wells, and Reservoirs

B. Cucamonga Valley Water District Standard Drawings

1.03 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American National Standards Institute (ANSI)

1. ANSI B1.1– Unified Inch Screw Threads
2. ANSI B1.2 – Gages and Gauging for Unified Inch Screw Threads

C. American Society of Testing and Materials (ASTM)

1. ASTM A36/A36M – Standard Specification for Carbon Structural Steel
2. ASTM A47/A47M – Standard Specification for Ferritic Malleable Iron Castings
3. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc- Coated Welded and Seamless
4. ASTM A108 – Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality

5. ASTM A183 – Standard Specification for Carbon Steel Track Bolts and Nuts

6. ASTM A283/A283M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars

7. ASTM A307– Standard Specification for Carbon Steel Bolts and Studs

8. ASTM A325/A325M – Standard Specification for High-Strength Bolts for Structural Steel Joints

9. ASTM A510/A510M – Standard Specification for General Requirements for Wire Rods and Course Round Wire, Carbon Steel

10. ASTM A512 – Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing

11. ASTM A536 – Standard Specification for Ductile Iron Castings

12. ASTM A568/A568M – Standard Specification for Steel, Sheet and Strip, Carbon, Hot- Rolled, Structural Quality and Cold Rolled

13. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications

14. ASTM F593 – Specifications for Stainless Steel Bolts, Hex Cap Screws, and Studs

15. ASTM F594 – Specification for Stainless Steel Nuts

D. American Water Works Association (AWWA)

1. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems

2. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

3. AWWA C200 – Steel Water Pipe – 6 In. (150mm) and Larger

4. AWWA C203 – Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot-Applied

5. AWWA C213 – Fusion-Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines

6. AWWA C217 – Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines

7. AWWA C606 – Grooved and Shouldered Joints

8. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100mm Through 300mm), for Water Transmission and Distribution

9. AWWA M11 – Steel Pipe - A Guide for Design and Installation

10. AWWA – Guidelines for Distribution of Non-Potable Water

E. National Sanitation Foundation (NSF)

F. Standard Specifications for Public Works Construction (SSPWC) "Greenbook"

G. California Administrative Code, Title 22

H. Inclusion of a specific manufacturer's name in the Specifications does not mean that the specific manufacturer's product will be acceptable. Specified manufacturer's or other manufacturer's standard product shall be modified as required to meet the Specifications.

1.04 LINING CONTAMINATION PREVENTION

A. Volatile organic compounds present in the linings of items in contact with potable water or recycled water shall not exceed concentrations allowed by the latest requirements of the State Office of Drinking Water and Department of Health Services. Some products and materials may also require proof of NSF certification on the lining materials to be used.

1.05 TEMPORARY PIPELINES

A. Temporary pipelines, where shown on the Approved Plans or required by the District Engineer, provide temporary service to customers during construction.

1.06 PIPE TAPPING (WET TAP)

A. All pipe tap (wet tap) connections to existing pipelines, whether for mainline extension or service laterals, shall not be performed without the District's prior approval and in the presence of the District personnel. The Contractor shall provide materials and labor to excavate, pour thrust block, backfill, compact, and repair pavement. Wet taps shall be performed in accordance with the District's Standard Drawing 123.

1.07 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall be used for all ferrous metal materials not otherwise protectively coated.

1. Polyethylene wrap shall be used for the protection of buried valves.

2. Polyethylene sleeves shall be used for the protection of bare recycled water laterals.

3. Purple-colored polyethylene wrap or sleeves with marked "Recycled Water" shall be installed around buried recycled water facility for identification.

1.08 WARNING/IDENTIFICATION TAPE

A. Warning/identification tape shall be installed to identify recycled water main and to act as a warning against accidental connections with potable water main. Warning/identification tape shall be used on all recycled water mains, recycled water irrigation systems, and all related appurtenances.

1.09 TRACER WIRE

A. Tracer wire shall be installed on all buried non-ferrous metal pipe for the purpose of providing a continuous signal path used to determine pipe alignment after installation. Tracer wire is not required in installation of sewer mains.

1.10 VALVE CANS

A. Valve cans shall be used for buried valves 4-inch and larger. Valve can lids shall be used on all valve cans.

1.11 VALVE STEM EXTENSIONS

A. Valves 4-inch and larger require valve stem extensions to be installed when the valve-operating nut is more than 5 feet below grade.

1.12 METER BOXES

A. Meter boxes shall be used for 1-inch and 2-inch water meters and other appurtenances as shown on the Standard Drawings. Meter boxes shall be supplied by the District.

1.13 RECYCLED WATER IDENTIFICATION

A. Facilities installed for the use of recycled water shall be identified with purple color coating, identification labels, or signs in accordance with Section 15005.

1.14 CURB IDENTIFICATION MARK FOR SERVICES

A. The Contractor shall mark the location of sewer laterals at the curb crossing by stamping the face of the curb in 2-inch high letters as described below:

1. Sewer laterals be stamped with a letter “S”.

1.15 FIELD REPAIR OF DAMAGED COATINGS

A. All surfaces of metallic appurtenances in contact with potable water and not protected from corrosion by another system shall be shop-coated by the manufacturer. Appurtenances with damaged coatings shall be repaired or replaced as directed by the District Engineer. Touch-up of damaged surfaces, when allowed by the District Engineer, shall be performed in accordance with the manufacturer’s recommendations.

PART 2. MATERIALS

2.01 TEMPORARY PIPELINES

A. Temporary piping layout, materials and appurtenances shall be as indicated on the approved submittal.

2.02 FLEXIBLE PIPE COUPLINGS

A. Flexible pipe couplings shall be in accordance with the Approved Materials List and as described below:

1. Steel Couplings shall have middle rings made of steel conforming to ASTM A36/A 36M, A53 (Type E or S), or A512 having a minimum yield strength of 30,000 psi. Follower rings shall be ductile-iron per ASTM A536, or steel per ASTM A108, Grade 1018 or ASTM A510, Grade 1018. Minimum middle ring length shall be 7-inhces for pipe sized 6-inch through 24-inch.
2. Sleeve bolts shall be made of stainless steel per ASTM A193 and shall have a minimum yield strength of 40,000 psi, an ultimate yield strength of 60,000 psi, and shall conform to AWWA C111.

2.03 BOLTS AND NUTS

A. Bolts and nuts shall be as indicated below and shall be selected from the Approved Materials List.

1. Bolts and nuts shall be carbon steel conforming to ASTM A307, Grade A, unless otherwise indicated on the approved drawings. Bolts and nuts shall be Zinc-plated and shall have standard ANSI B1.1, Class 2A coarse threads.

2. All bolt heads and nuts shall be hexagonal, except where special shapes are required. Bolts shall be of such length that not less than 1/4-inch or more than 1/2-inch shall project past the nut in tightened position.

2.04 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall be as indicated below and shall be selected from the Approved Materials List. Polyethylene materials shall be kept out of direct sunlight exposure.

1. Polyethylene sleeves shall be a minimum 12 mil thick polyethylene plastic in accordance with AWWA C105.

2. Polyethylene wrap shall be a minimum 8 mil thick polyethylene plastic in accordance with AWWA C105.

3. Polyethylene wrap and sleeves shall be clear for use with potable water and purple for use with recycled water.

4. Polyethylene or vinyl adhesive tape a minimum of 2-inch wide or plastic tie straps shall be used to secure polyethylene encasement.

2.05 WARNING/IDENTIFICATION TAPE

A. Warning/identification tape shall be as indicated below and in accordance with the Approved Materials List.

1. Tape shall be an inert, non-metallic plastic film formulated for prolonged underground use that will not degrade when exposed to alkalis, acids and other destructive substances commonly found in soil.

2. Tape shall be puncture-resistant and shall have an elongation of two times its original length before parting.

3. Tape shall be colored to identify the type of utility intended for identification. Printed message and tape color shall be as follows:

Printed message	Tape color
Caution: Recycled Waterline Buried Below	Purple

Note: Ink used to print messages shall be permanently fixed to tape and shall be black in color with message printed continuously throughout.

4. Tape shall be minimum 4 mil thick x 6-inch wide with a printed message on one side. Tape used with the installation of onsite recycled water irrigation systems shall be a minimum of 3-inches wide.

2.06 TRACER WIRE

A. Tracer wire shall be as indicated below and shall be selected from the Approved Materials List.

1. Tracer wire shall be #14 AWG solid copper UF type wire with cross-linked polyethylene insulation. The insulation shall be white or yellow in color.

2. Wire splices (at pipe tees, crosses and laterals) shall be accomplished using a direct bury silicone-filled capsule tube with standard wire nut or silicone-filled wire nut connectors of the appropriate size selected from the Approved Materials List.

2.07 VALVE CANS

A. Valve cans shall be 8-inch diameter SDR-35 PVC sewer pipe selected from the Approved Materials List.

B. Valve cans for use in potable water system applications shall be white or blue. Valve cans for use in recycled water system applications shall be purple or shall otherwise be identified in approved drawings.

C. Valve can lids shall be circular ductile-iron selected from the Approved Materials List and shall include a slip can for a close fit inside the upper portion of the valve can. Lids shall be cast with the District's name and the word "WATER" for use on potable water systems or the word "RECYCLED" for use on recycled water systems.

1. Valve can shall be 8-inch diameter with 12-inch long slip can.

2.08 VALVE STEM EXTENSIONS

A. Stem extensions shall be complete with 2-inch square operating nut, 7-1/2-inch by 1/2-inch, and lower socket to fit valve-operating nuts. The configuration of the extension stem socket shall match that of the valve it operates.

2.09 METER BOXES

A. Meter boxes shall be supplied by the District.

1. Meter box sizes shall be as follows:

Meter size (inches)	Meter box size (inches)
3/4 to 1	13w x 24d x 12h
1-1/2 to 2	17w x 30d x 12h
3 to 4	24w x 36d x 18h
6 and greater	As indicated on Plans

2. Meter box lids for use in potable water system applications shall be gray.

3. Meter box lids for use in recycled water system applications shall be purple.

2.10 RECYCLED WATER IDENTIFICATION

A. Pipe and appurtenances used for recycled water shall be manufactured in purple color or shall otherwise be identified in accordance with Section 15005.

PART 3. EXECUTION

3.01 TEMPORARY PIPELINES

A. All temporary piping, fittings, and service connections shall be furnished, installed, and maintained by the Contractor, and the Contractor shall make connections to a water source designated by the District Engineer.

B. All pipe, valves, fittings, hose and connections furnished by the Contractor shall be of good quality, clean, and suitable for conveying potable water in the opinion of the District Engineer.

C. The temporary pipe shall be installed in such a manner that it will not present a hazard to traffic and will not interfere with access to homes and driveways along its route.

D. Valves shall be installed at 200 foot intervals or as directed by the District Engineer. The use of pressure reducing valves (PRV) may be required as directed by the District Engineer.

E. The Contractor shall be responsible for disinfecting all pipe, connections, flushing, and assisting the District in taking water samples for bacteriological testing in accordance with Section 15041.

F. Following disinfection and acceptance of the temporary pipe as a potable water system, the Contractor shall maintain continuous service through the temporary piping to all consumers normally served both directly and indirectly by the pipeline.

G. Upon completion of the work, the Contractor shall remove the temporary piping and appurtenances and shall restore all surfaces to the satisfaction of the District Engineer.

H. If repairs to temporary piping are necessary, Contractor shall make such repairs in a timely manner as directed by the District Engineer. If progress in making repairs is inadequate, or in the event of emergency, the District Engineer may take immediate corrective measures, which may include the performance of repair work by District forces or another contractor. All costs for corrective measures shall be borne by the Contractor.

3.02 CONNECTION TO EXISTING FACILITIES (WET TAPS AND CUT-IN INSTALLATIONS)

A. All connections to existing facilities, including wet taps on active pipelines and cut-in installations, shall not be performed without the District's approval and in the absence of the District personnel. In addition, wet taps shall be performed in accordance with the District's Standard Drawing 123. The District Engineer must approve all work performed by Contractor prior to allowing access to the work site by District personnel.

B. The Contractor shall furnish the tapping sleeve or tee, valves and all other materials as called for in the approved drawings in accordance with the Approved Materials List. The Contractor shall provide all equipment and labor required for the excavation and installation of the connection including but not limited to thrust blocks, backfill and pavement replacement. In certain circumstances the Contractor may be required to provide a water truck or temporary piping as part of the equipment for making the connections. In addition, the Contractor shall assist the District in alleviating any hardship incurred during a shutdown for connections. Emergency standby equipment or materials may be required of the Contractor by the District Engineer.

C. Wet taps or cut-in tee and valve installations shall be performed as follows:

1. Prior to construction, Contractor shall pothole the existing pipe at the location of the proposed connection. The District Engineer shall inspect the pothole prior to Contractor's repair of trench. Refer to Section 01000, for protection of existing facilities. Contractor shall record the following information on as-built drawings:

a. Pipe size, outside diameter.

b. Pipe type such as ACP, PVC, Ductile-Iron or Steel.

c. Pipe class and/or pressure rating.

d. Elevation, grade, and alignment.

e. Location of collars, pipe bells, fittings or couplings, if found.

f. Potential conflicts with existing utilities.

2. To facilitate the proposed connection and allow for slight adjustments in alignment, the Contractor shall leave a minimum 10 foot gap between the new pipe installation and the proposed connection point at the existing water main. The Contractor shall leave a gap longer than 10 feet if conditions warrant, or if directed by the District Engineer.

3. The new pipeline shall have successfully passed pressure testing in accordance with Section 15044, and disinfection and bacteriological testing in accordance with Section 15041, prior to proceeding with the connection to the existing pipeline.

4. After the District Engineer has given approval to proceed with the connection, the Contractor shall schedule with the District Engineer for the wet tap or cut-in installation.

   a. Shutdowns will be scheduled at the convenience of the District. Shutdowns may be scheduled for nights or weekends if required.

   b. The Contractor shall give the District Engineer a minimum of five (5) working days notice prior to any proposed excavation or shutdown of existing mains or services. Scheduling shall be subject to approval by the District Engineer.

   c. The District Engineer may postpone or reschedule any shutdown operation if, for any reason, the District Engineer believes that the Contractor is improperly prepared with competent personnel, equipment, or materials to proceed with the connection.
   d. If progress in completing the connection within the time specified is inadequate, the District Engineer may order necessary corrective measures. Corrective measures may consist of directing District personnel or another contractor to complete the work. All costs for corrective measures shall be borne by the Contractor.

5. Contractor may proceed with excavation only when pothole has been completed, materials have been approved and delivered, wet tap or cut-in installation has been scheduled and a copy of the approved traffic control plan has been supplied to the District Engineer.

   a. The Contractor shall saw-cut pavement, excavate and provide and install shoring and steel plating, when necessary, one day prior to the wet tap or cut-in installation.

   b. The Contractor shall provide lights, barricades and traffic control in accordance with the agency of jurisdiction and as deemed necessary for the excavation by the District Engineer.

   c. The Contractor shall de-water existing mains where cut-in installations are required in the presence of the District Engineer and in accordance with Sections 15041 and 02223. The Contractor shall be prepared to deal with leaking valves and water from those valves to complete the shutdown. Only District personnel are authorized to operate existing valves. The Contractor shall be responsible for any and all damage resulting from unauthorized operation of existing District facilities.
   d. The Contractor shall complete the installation as shown on the Approved Plans including, but not limited to:

1) Disinfecting and installing the pipe section(s) necessary to make the closure to the new system.

2) Installing and setting the valve can(s) in accordance with the Standard Drawings.

3) Installing thrust and anchor blocks in accordance with Section 03300.

4) Completing all backfill and compaction of the trench in accordance with Section 02223.

5) Repairing or replacing pavement as necessary in accordance with City of Rancho Cucamonga Standard Drawing 120.

3.03 FLEXIBLE PIPE COUPLINGS

A. Flexible pipe couplings shall be installed in accordance with the manufacturers recommendations and as described below:

1. Use plain-end pipe with flexible couplings per AWWA C200. Provide joint harnesses per AWWA M11 for above ground applications or where indicated on the Approved Plans.

2. Flexible couplings may be used only where indicated on the drawings

3. Clean oil, scale, rust, and dirt from the pipe ends and touch up the epoxy coating and allow time for curing before installing the coupling. Clean the gaskets before installing.

4. Follow the manufacturer's recommendations for installation and bolt torque using a properly calibrated torque wrench.

5. Lubricate the bolt threads with graphite prior to installation.

3.04 BOLTS AND NUTS

A. All bolts and nuts shall be new and unused. Bolts shall not be reused once tightened. Used bolts and nuts shall be discarded and removed from the job site.

B. Bolts and nuts shall be cleaned, if needed, by wire brushing and shall be lubricated prior to assembly.

C. Tighten nuts uniformly and progressively in a “star” pattern.

D. Buried bolts and nuts shall receive a heavy coat of protective grease selected from the Approved Materials List prior to being wrapped with polyethylene.

3.05 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall completely encase and cover all metal surfaces.

1. All bare recycled water piping shall be encased with polyethylene sleeves in accordance with Standard Drawings.

2. Valves shall be wrapped such that only the stem and operating nut are exposed and the wrap shall be attached so that valve operation will not disturb the wrapping or break the seal.

B. Polyethylene sleeves shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps at the ends and quarter points along the sleeve in a manner that will hold the sleeve securely in place

during backfill. Polyethylene wrap shall be secured with polyethylene or vinyl adhesive tape in a manner that will hold the wrap securely in place during backfill.

3.06 WARNING/IDENTIFICATION TAPE

A. Warning/Identification Tape shall be installed as described below.

B. Tape shall be placed at the top of the pipe zone 12-inches above and centered over the utility intended for identification. Tape used for recycled water irrigation systems shall be installed at 6-inches above the pipe.

C. Tape shall be installed with the printed side up and run continuously along the entire length of the utility intended for identification. Tape shall be installed on the main piping and all appurtenant laterals, including blow-offs, air valve assemblies, fire hydrants, and services. Tape splices shall overlap a minimum of 24-inches for continuous coverage.

D. Tape shall be installed prior to placement of the Trench Zone Backfill.

3.07 TRACER WIRE

A. Tracer wire shall be installed as described below.

B. Tracer wire shall be installed with all non-ferrous materials..

C. Wire shall be placed on the top centerline of the pipeline and shall run continuously along the entire length of pipe prior to placement of trench backfill. Wire shall be mechanically and electrically continuous throughout the pipeline, including within pipe casings.

D. Tracer wire shall be secured to the pipe at 6 foot intervals with plastic adhesive tape, duct tape or plastic tie straps. The wire may alternately be secured to the pipe by looping the tracer wire around itself such that tracer wire remains continuous atop the pipe during backfill operations.

E. Tracer wire access ports shall be installed in accordance with the Approved Drawings. In addition, tracer wire may terminate within meter boxes, blow off boxes, CP test boxes or air valve enclosures as shown on the Approved Drawings or as directed by the District Engineer at intervals of not more than 1,000 feet. Locations of all tracer wire access ports installed shall be noted on the field record drawings.

F. Wire shall extend into the access port and shall terminate with a coiled 24-inch length of wire. All tracer wire not attached to piping shall be installed, without splices, within a conduit at a minimum depth of 24-inches in accordance with the Approved Drawings..

G. Splices shall be installed only when necessary and shall be made using wire connectors selected from the Approved Materials List.

H. The Contractor shall test tracer wire for electrical continuity in the presence of the District Engineer prior to the installation of any paving over atop pipelines or appurtenances. Testing shall be accomplished using a device capable of detecting improper connections or ground fault interruptions.

3.08 VALVE CANS

A. Valve cans shall be installed as shown on the Standard Drawings and as described below.

B. Valve cans shall be installed with lids flush with the final surface. No more than two 1-inch adjustment rings shall be used. Valve cans and adjustment rings shall be accurately cut perpendicular to the length of the piping used.

C. Valve cans shall be color-coded to identify the type and use of the valve installed.

1. The inside portion of the valve can lid and interior portion of PVC valve can shall be identified with a minimum 2-inch diameter painted identification marking. Paint color shall be as follows:

Gate Well Lid and Riser	Color
Normally closed system valve	Red
Resilient wedge gate valves	White
Butterfly valves	Green

2. The top exterior portion of the valve can lid and ring shall be coated in accordance with Section 09910.

3.09 VALVE STEM EXTENSIONS

A. Valves 4-inch and larger require valve stem extensions to be fabricated and installed in accordance with the Standard Drawings when the valve-operating nut is more than 5 feet below grade. Stem extensions shall be of sufficient length to bring the operating nut to a point between 12-inches and 18-inches below the valve can lid.

3.10 METER BOX INSTALLATIONS

A. Meter boxes shall be installed at the elevations and locations shown on the Approved Plans and in accordance with the Standard Drawings. Near the completion of the project, a final meter box adjustment to finish grade may be required. Water meters shall not be installed until final adjustments are made to the meter box and are approved by the District Engineer.

3.11 PERMANENT ABANDONMENT OF PIPELINES AND APPURTENANCES

A. When indicated on the Approved Plans or when directed by the District Engineer, existing pipelines to be abandoned shall be disconnected from all source pipelines and shall remain in place in accordance with the modifications and instructions listed below:

1. All above-ground appurtenances connected to pipelines to be abandoned shall be removed and disposed.

2. All piping and appurtenances buried at a depth of 24-inches or less and connected to pipelines to be abandoned shall be removed and disposed. Remaining pipe ends, valve cans and other appurtenances cut at a depth of 24-inches shall be removed entirely or filled with concrete. Excavated areas shall be replaced with compacted backfill and pavement shall be repaired in accordance with City of Rancho Cucamonga Standard Drawing 120.

3. Sewer main to be abandoned shall be cut, plugged with concrete, and entirely filled by pressure-grouting or by blown sand.

4. Ends of all pipe segments to be abandoned shall be filled with concrete in accordance with the Approved Drawings.

5. All valves on pipelines to be abandoned shall be turned to the closed position.
6. Water services to be abandoned that are connected to pipelines that will remain in service shall be abandoned in-place. Existing corporation stop shall be removed and a threaded steel plug shall be installed. Cut-end shall be crimped. No work shall be performed in the absence of the

District personnel. Coordination with the District personnel is required prior to beginning of work for shutdown.

7. Sewer laterals shall be cut and plugged with concrete at the main as directed by the District Engineer for the specific circumstance and material type identified.

8. Sewer manholes shall have the cover and frame, concrete ring, grade rings and cone section removed. Inlet and outlet piping shall be plugged with concrete, manhole void shall be filled with sand, and a 12-inch thick reinforced concrete slab shall be poured over the top of remaining manhole. The Contractor shall backfill hole to ground surface with compacted select fill.

3.12 REMOVAL OF PIPELINES AND APPURTENANCES

A. Existing pipe and appurtenances shall be completely removed when indicated on the Approved Plans or as directed by the District Engineer. All materials removed during construction operations shall be disposed or salvaged to the District in accordance with the Approved Drawings.

B. When fittings, appurtenances, or pipe segments are removed from pipelines that are to remain in service, the removed portions shall be replaced with straight segments of pipe and appropriate couplings selected from the Approved Materials List.

C. Contractor shall provide measures that allow for the removal of existing sewer mains and appurtenances with no leakage of raw sewage. Transportation of sewer mains and appurtenances removed from service shall be in waterproof trucks to prevent raw sewage from leaking on public streets.

D. Removal of asbestos-cement pipe (ACP) and sewer mains and appurtenances shall be in accordance with all applicable State and Federal requirements, and disposal shall be in accordance with the requirements of this Section.

E. Backfill, compaction, and surface repair of all excavations for removal of pipe and appurtenances shall be made in accordance with the Approved Plans and in accordance with the City of Rancho Cucamonga Standard Drawings 120.

3.13 RECONNECTIONS

A. Existing service laterals or appurtenances shall be connected to new pipelines as shown on the Approved Plans or as directed by the District Engineer. Contractor may encounter unused service laterals or piping appurtenant to an existing pipeline being replaced. Laterals and appurtenant piping that will not be connected to new pipelines shall be abandoned in accordance with the requirements of this Section.

3.14 SALVAGE

A. When the Contractor is required to remove existing pipe and appurtenances, such materials may, when shown on the Approved Plans or directed by the District Engineer, be considered salvage. All materials identified as salvage are considered property of the District. The Contractor shall temporarily stockpile all material identified as salvage in a location that will not disrupt traffic or otherwise create an unsafe condition and shall deliver such materials as directed by the District Engineer.

3.15 DISPOSAL

A. All materials removed during construction operations and not identified by the District Engineer as salvage shall be legally disposed of in accordance with all applicable Local, State, and Federal requirements.

B. Disposal of asbestos-cement pipe requires special handling and attention, including but not limited to, encapsulation within airtight packaging, submittal of certification letters and/or waste profile statements, and the use of a Cal-OSHA registered asbestos abatement contractor to transport and dispose of such wastes. Contractor shall comply with all applicable regulations and all requirements of the disposal site. Contractor is responsible for all costs associated with disposal of materials, specifically including any materials that may contain asbestos.

END OF SECTION

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SECTION 15041 – DISINFECTION OF WATER MAINS, WELLS, AND RESERVOIRS

PART 1. GENERAL

1.01 DESCRIPTION

A. This section describes requirements for disinfection by chlorination of potable and recycled water mains, services, pipe appurtenances and connections.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 15000 – General Piping Systems and Appurtenances

2. Section 15042 – Hydrostatic Testing of Pressure Pipes

1.03 REFERENCED STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American Water Works Association (AWWA)

1. AWWA B300 – Standard for Hypochlorites

2. AWWA B301 – Standard for Liquid Chlorine

3. AWWA C651 – Disinfecting Water Mains

4. AWWA C652 – Disinfection of Water-Storage Facilities

5. AWWAC653 – Disinfection of Water Treatment Plants

6. AWWAC654 – Disinfection of Wells

C. Code of Federal Regulations (CFR)

1. CFR 49 – Hazardous Materials Regulations

2. CFR 1910 – Hazardous Waste Operations

D. California Code of Regulations (CCR)

1. CCR Title 8, Section 5194 – General Industry Safety Orders

E. NSF/ ANSI 60, Drink Water Treatment Chemical

F. Inclusion of a specific manufacturer's name in the Specifications does not mean that the specific manufacturer's product will be acceptable. Specified manufacturer's or other manufacturer's standard product shall be modified as required to meet the Specifications.

1.04 SERVICE APPLICATION

A. All water mains and appurtenances taken out of service for inspection, repairs, or other activity that might lead to contamination shall be disinfected before they are returned to service.

B. All new water mains and temporary pipelines shall be disinfected prior to connection to the District's existing system.

C. All components incorporated into a connection to the District's existing system shall be disinfected prior to installation.

1.05 SUBMITTALS

A. A written disinfection and dechlorination plan, including all methods and equipment to be used, shall be signed by the person responsible for performing the work and shall be submitted to the District Engineer for approval prior to starting disinfection operations.

1.06 DELIVERY, STORAGE AND HANDLING

A. Chlorination and dechlorination shall be performed by competent individuals knowledgeable and experienced in the operation of the necessary application and safety equipment in accordance with applicable Federal, State and Local laws and regulations. The transport, storage and handling of these materials shall be performed in accordance with CFR 1910.120, CFR 49.172, and CCR Title 8, Section 5194.

1.07 CONCURRENT DISINFECTION AND HYDROSTATIC TESTING

A. The specified disinfection of the pipelines may not be performed concurrently with the hydrostatic testing in accordance with Section 15042, herein.

1.08 CONNECTION TO EXISTING MAINS

A. Prior to connection to existing mains, disinfection and bacteriological testing shall be performed in accordance with this specification, and hydrostatic testing shall be performed per Section 15042. District authorization for connection to the existing system shall be given only on the basis of acceptable hydrostatic, disinfection and bacteriological test results. Connection to existing mains shall be performed in accordance with Section 15000.

PART 2. MATERIALS

2.01 LIQUID CHLORINE (GAS)

A. Liquid chlorine contains 100 percent available chlorine and is packaged in steel containers in net weights of 150-lb. or 1-ton.

B. Liquid chlorine shall be used with appropriate gas flow chlorinators, heaters, and injectors to provide a controlled, high-concentration solution feed to the water. The chlorinators and injectors shall be the vacuum-operated type.

2.02 SODIUM HYPOCHLORITE (LIQUID)

A. Sodium hypochlorite is a clear, light-yellow liquid containing from 100-g/L to 200-g/L available chlorine and not more than 0.15 percent insoluble matter by weight.

2.03 CALCIUM HYPOCHLORITE (GRANULAR POWDER)

A. Calcium hypochlorite is a white or yellowish-white granular powder containing from 65 percent to 70 percent available chlorine by weight. The bulk density of the granular powder is about 32 lb/ft^3 – 50 lb/ft^3.Calcium hypochlorite granular powder shall be substantially free of lumps. Not more than 10 percent of the powder shall pass a 100 mesh screen. It shall not contain any dirt or other foreign material. Calcium hypochlorite tablet shall not be used at any time.

2.04 PRODUCTION CERTIFICATION

A. Hypochlorites are direct additives used in the treatment of potable water and wastewater. This material should be certified as suitable for contact with or treatment of drinking water by an accredited certification organization in accordance with NSF/ ANSI 60, Drinking Water Treatment Chemicals. Evaluation shall be accomplished in accordance with requirements that are no less restrictive than those listed in NSF/ ANSI 60. Certification shall be performed by a certification organization accredited by the American National Standard Institute. All hypochlorites used in water disinfection are required to be registered with USEPA under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

PART 3. EXECUTION

3.01 GENERAL

A. Disinfection of pipelines shall not proceed until all appurtenances and any necessary sample ports have been installed and the Engineer provides authorization.

B. Every effort shall be made to keep the water main and its appurtenances clean and dry during the installation process.

C. All piping, valves, fittings, and appurtenances which become contaminated during installation shall be cleaned, rinsed with potable water, and then sprayed or swabbed with a 5 percent sodium hypochlorite disinfecting solution prior to installation.

D. Water mains under construction that become flooded by storm water, runoff, or ground water shall be cleaned by draining and flushing with metered potable water until clear water is evident. Upon completion, the entire main shall be disinfected using a method approved by the Engineer.

3.02 METHODS

A. Liquid Chorine (Gas)

1. Only vacuum-operated equipment shall be used. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be permitted. The equipment shall incorporate a backflow prevention device at the point of connection to the potable water source used to fill the line being tested.

2. The chlorinating agent shall be applied at the beginning of the system to be chlorinated and shall be injected through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected.

3. Only a certified, licensed chlorination and testing contractor shall perform gas chlorination work. The chlorination contractor must also possess a Grade II Treatment Plant Operator Certification from the State of California if required by the Engineer.

B. Sodium Hypochlorite Solution (Liquid)

1. Sodium hypochlorite solution shall be used for cleaning and swabbing piping and appurtenances immediately prior to installation and for disinfecting all components of connections to the District's existing system.

2. Sodium hypochlorite solution may be used for the initial disinfection of newly installed water mains. The solution shall be applied at a terminus of the system to be chlorinated using an injector which can adjust the amount of solution being injected into the piping system. The solution shall be injected in the appropriate concentration to achieve the specified concentration range of chlorine throughout the entire piping system. Where pumping equipment is used in conjunction with an injector, an integral backflow prevention device shall be installed and connected to the potable water supply.

3. Water trucks, pumping equipment, piping, appurtenances and all other equipment in contact with potable water shall be disinfected prior to use.

4. Sodium hypochlorite solution may also be used to increase the total chlorine residual if the concentration from the initial chlorination of the system is found to be low. The solution shall be added to the system in sufficient amounts at appropriate locations to insure that the disinfecting solution is present at a concentration within the specified range throughout the piping system.

C. Calcium Hypochlorite (Granular Powder)

1. Calcium hypochlorite granular powder may be used for initial disinfection of newly installed water mains.

3.03 PROCEDURE FOR DISINFECTING WATER MAINS AND APPURTENANCES

A. Chlorination of water mains shall be performed in accordance with ANSI/ AWWA C-651.

B. When installation has been completed, the main shall be filled at a rate not to exceed a velocity of 1 fps and flushed to insure a chlorine concentration is evenly distributed throughout the system to be disinfected. (Note: the limitations for discharge of chlorinated water outlined below.)

C. All valves shall be operated with the disinfection solution present in the pipeline. All appurtenances such as air-vacuum relief valves, blow-offs, hydrants, backflow prevention devices, and water service laterals shall be flushed with the treated water a sufficient length of time to insure a chlorine concentration within the specified range in all components of each appurtenance. (Note the limitations for discharge of chlorinated water outlined below.)

D. The Engineer will verify the presence of the disinfection solution throughout the system by sampling and testing for acceptable chlorine concentrations at the various appurtenances and/or at the test ports provided by the Contractor. Areas of the system found to be below the specified chlorine concentration level shall receive additional flushing as noted above and/or additional disinfection solution as necessary. (Note the limitations for discharge of chlorinated water outlined below.) Addition of disinfection solution after the initial charging of the line shall be made by either the liquid chlorine (gas) method, or the sodium hypochlorite method as directed by the Engineer.

E. The chlorinated water shall be retained in the system for a minimum of 24 hours. The District Engineer will test the total chlorine residual. The system shall contain a total chlorine residual of not less than 80 percent of the initial total chlorine residual before the 24- hour soaking period began. If the total chlorine residual has decreased more than 20 percent, the system shall be soaked for an additional 24-hour period. If the total chlorine residual has not decreased after this additional 24-hour period, the system shall be flushed in accordance with the procedure detailed herein. If the total chlorine residual has decreased, the system shall be flushed in accordance with the procedure detailed herein, and shall be re-disinfected.

F. Following a successful retention period as determined by the District Engineer, the chlorinated water shall be flushed from the system at its extremities and at each appurtenance, using potable water from a source designated by the District Engineer. The minimum water velocity during flushing shall be 3 fps or as directed by the Engineer. Flushing shall continue until the replacement water in the new system is equal in chlorine residual to the potable source of supply and the turbidity level is 0.5 NTU's or less as verified by the District. (Note the limitations for discharge of chlorinated water outlined below.)

G. The District will perform bacteriological sampling and testing as specified herein.

3.04 PROCEDURE FOR DISINFECTING WELLS, WELL-HEADS AND PUMP STATIONS

A. The well and well head piping shall be disinfected as a complete unit. Adequate bracing shall be provided to resist thrust.

B. The well shall be disinfected to its full depth. A double capped, perforated pipe container filled with granular chlorine compound shall be moved up and down the entire water-filled casing and screen section until all the chlorine compound has dissolved.

C. The pump column shall be washed with a chlorine solution, containing at least 12 percent chlorine, as the pump column is lowered into the well or pump can.

D. After the well pump has been placed into position, it shall be turned on and off several times so as to thoroughly mix the disinfectant with the water in the well. The flow control valve shall be set at a pumping rate of 2 cfs. The pump shall be run until the water discharged has the odor of chlorine. This procedure shall be repeated several times at one-hour intervals. After mixing, the well shall be allowed to stand without pumping for 24 hours.

E. Well water shall be pumped to waste until the presence of chlorine is no longer detectable, as determined by testing for available chlorine residual using a test kit. Allow the well to stand without pumping for 24 hours. (Note; the limitations for discharge of chlorinated water outlined below.)

F. On two consecutive days, bacteriological samples shall be taken and submitted to the District's laboratory for examination, Samples shall be tested by the District's laboratory for coliform bacteria and heterotrophic plate count. All coliform test results must be negative and heterotrophic plate counts must be less than 500 colonies/tnL prior to placing the well into service.

3.05 PROCEDURE FOR DISINFECTING RESERVOIRS

A. The Contractor shall make all necessary provisions for conveying water from the District designated supply source to the points of use.

B. All hydraulic structures and appurtenant pressure piping shall be tested; those for potable water shall also be disinfected. In the case of a reservoir, testing and disinfecting operations shall be combined. Disinfection shall be accomplished by chlorination. All chlorinating and testing operations shall be done in the presence of the District Representative.

C. Disinfection operations shall be scheduled by the Contractor as late as possible during the contract time period so as to assure the maximum degree of sterility of the facilities at the time the work is accepted by the District.

D. Bacteriological testing shall be performed by the District's laboratory. Results of the bacteriological testing shall be satisfactory to the State Department of Health or other appropriate regulatory agency. Passing tests on two consecutive days for heterotrophic plate count (<500 cfu/mL) and absence from coliform bacteria must be achieved prior to placing the reservoir into service.

E. Release of disinfected water from structures, after testing and disinfecting have been completed, shall be acceptable to the District. (Note: the limitations for discharge of chlorinated water outlined below.)

F. Prior to both testing and disinfecting, all hydraulic structures shall be cleaned by thoroughly hosing down all surfaces with a high pressure hose and nozzle of sufficient size to deliver a minimum flow of 50 gpm. All water, dirt, and foreign material accumulated in this cleaning operation shall be discharged from the structure or otherwise removed.

G. All hydraulic structures and appurtenant pipelines which store or convey potable water shall be disinfected by chlorination. Chlorination of hydraulic structures shall be performed in accord with the requirements of ANSI/AWWA C-652.

1. A strong chlorine solution (about 200 mg/L) shall be sprayed on all interior surfaces of the structure. Following this, the structure shall be partially filled with water to a depth of approximately one foot. During the partial filling operation, a chlorine-water mixture shall be injected by means of a solution feed chlorinating device in such a way as to give a uniform chlorine concentration during the entire filling operation. The point of application shall be such that the chlorine solution will mix readily with the in-flowing water.

2. The dosage applied to the water shall be sufficient to provide a chlorine residual of at least 50 mg/L upon completion of the partial filling operation. Precaution shall be taken to prevent the strong chlorine solution from flowing back into the lines supplying the water. After the partial filling has been completed, sufficient water shall be drained from the lower ends of appurtenant piping to ensure filling the lines with the heavily chlorinated water.

3. Chlorinated water shall be retained in the partially filled structure and appurtenant piping long enough to destroy all non-spore forming bacteria, and in any event, for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual in the structure and appurtenant piping shall be at least 25 mg/L. All valves shall be operated while the lines are filled with the heavily chlorinated water.

4. After the free chlorine residual has been checked, and has been found to satisfy the above requirement, the water level in the structure shall be raised to final elevation by addition of potable water. Before final filling is commenced, the concentration of heavily-chlorinated water remaining in the structure and piping shall, unless otherwise acceptable to the District's representative, be sufficient to produce a free chlorine residual of between 1 and 2 mgIL when the water level is raised to its final elevation. After the structures have been filled, the strength of the chlorinated water shall be determined. If the free chlorine residual is less than 1 mgIL, an additional dosage shall be applied to the water in the structure. If the free chlorine residual is greater than 2 mg/L, the structure shall be partially emptied and additional potable water added. In no case shall water be released prior to the expiration of the required retention period. (Note: the limitations for discharge of chlorinated water outlined below.)

3.06 BACTERIOLOGICAL TESTING

A. The District will perform bacteriological sampling and testing of all new system installations. The testing methodology employed by the District shall be as set forth in "Standard Methods for the Examination of Water and Waste Water" (current edition). Testing requirements are as set forth in the California Domestic Water Quality and Monitoring Regulations and commensurate with current requirements for surface water testing. The District will analyze the samples for the presence of coliform bacteria and heterotrophic-type bacteria (heterotrophic plate count). The evaluation criteria employed by the District for a passing test sample is as follows:

1. No positive sample coliform bacteria, and

2. Heterotrophic plate count (HPC) of 500 colony forming units/ml or less. (The requirement for HPC testing may be waived at the sole discretion of the Engineer)

3.07 REDISINFECTION

A. If the initial disinfection fails to produce satisfactory bacteriological test results, the system shall be re-flushed and re-sampled in accordance with the procedures outlined herein. If the second set of samples does not produce satisfactory results, the system shall be re-chlorinated, flushed, and re-sampled in accordance with the procedures outlined herein. The chlorination, flushing, and sampling procedure shall continue until satisfactory results are obtained. Redisinfection and retesting shall be at the Contractor's expense.

3.08 DISINFECTING TIE-INS AND CONNECTIONS

A. Pipes, fittings, valves and all other components incorporated into connections with the District's existing system shall be spray disinfected or swabbed with a liquid chlorine solution in accordance with AWWA C651 and as specified herein. Upon connection to the main, the line shall be flushed as directed by the District Engineer. Disinfection by this method is generally limited to assemblies of 20 feet or less in length. Alternate methods such as "predisinfection" prior to installation in accordance with AWWA C651 may be required at the discretion of the District Engineer.

3.09 DISCHARGE OF CHLORINATED WATER

A. Indiscriminate onsite disposal or discharge to sewer systems, storm drains, drainage courses or surface waters is prohibited. It shall be the responsibility of the Contractor to file a Notice of Intent and obtain a General Waste Discharge Requirements Permit for Discharges of Hydrostatic Test Water and Potable Water to Surface Waters, Storm Drains or Other Conveyance Systems, Santa Ana Region (Hydrostatic Test Permit) for any discharge of hydrostatic test water or other potable water. The Contractor shall be solely responsible to evaluate, obtain and comply with the provisions of the Hydrostatic Test Permit, including any monitoring and reporting as may be required. The Contractor shall comply with all requirements of the State Water Resources Control Board and the Santa Ana Regional Water Quality Control Board. The Contractor shall provide copies of all reports and monitoring information to the District.

B. Failure to comply with the Hydrostatic Test Permit is a violation of federal and state law. The Contractor hereby agrees to indemnify and hold harmless the District, its Board members, officers, agents, employees and authorized volunteers from and against any and all claims, demands, losses or liabilities of any kind or nature which District, its Board members, officers, agents, employees and authorized volunteers may sustain or incur for noncompliance with the Hydrostatic Test Permit arising out of or in connection with the Project.

C. The environment to which the chlorinated water is to be discharged shall be examined by the Contractor and the Engineer. Where necessary, federal, state and local regulatory agencies should be contacted to determine special provisions for the disposal of chlorinated water. Any indication that the discharge of chlorinated water may cause damage to the environment shall require the neutralizing of the chlorine residual by means of a reducing agent in accordance with AWWA C651 and the requirements of this specification.

D. In locations where chlorine neutralization is required, the reducing agent shall be applied to the water as it exits the piping system. The Contractor shall monitor the chlorine residual during the discharge operations. Total residual chlorine limits in these locations, and for the discharge of chlorinated water from the testing of pipelines to surface waters of the Santa Ana Region are as follows:

Total Residual Chlorine Effluent Limitations	
30-Day Average	0.002 mg/l
Average Day Maximum	0.008 mg/l
Instantaneous Maximum	0.02 mg/l

E. The various methods of dechlorination available can remove residual chlorine to concentrations below standard analytical methods of detection, 0.02 mg/l, which will assure compliance with the effluent limit. The Contractor will perform all necessary tests to ensure that the total residual chlorine effluent limitations listed above are met.

END OF SECTION

SECTION 15042 – HYDROSTATIC TESTING OF PRESSURE PIPELINES

PART 1. GENERAL

1.01 DESCRIPTION

A. This section describes the requirements and procedures for pressure and leakage testing of all pressure mains.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 03300 – Cast-In-Place Concrete
2. Section 15250 – Backflow Devices
3. Section 15000 – General Piping Systems and Appurtenances
4. Section15041 – Chlorination of Water Mains, Wells, and Reservoirs

1.03 REQUIREMENTS PRIOR TO TESTING

A. All piping, valves, fire hydrants, services, and related appurtenances shall be installed.

B. The pipe trench shall have trench zone backfill placed and compacted with a minimum of 24-inches of material over the pipe.

C. If shown on Approved Plans, all concrete thrust block and anchor blocks shall be allowed to cure in accordance with Section 03300.

D. Pressure tests on exposed and aboveground piping shall be conducted only after the entire piping system has been installed and attached to pipe supports, hangers or anchors as shown on the Approved Plans.

E. Steel pipelines shall not be tested before the mortar lining and coating on all pipe lengths within the line have been in place for a minimum of 14 days. Cement-mortar lined pipe shall not be filled with water until a minimum of eight hours has elapsed after the last joint has been mortared.

1.04 HYDROSTATIC TESTING AND DISINFECTION OF PIPELINES

A. Hydrostatic testing of pipelines shall be performed prior to disinfection operations in accordance with Section 15041. In the event repairs are necessary, as indicated by the hydrostatic test, the District Engineer may require additional flushing in accordance with Section 15041.

1.05 CONNECTION TO EXISTING MAINS

A. Hydrostatic testing shall be performed prior to connections to existing mains. District authorization for connection to the existing system shall be given only on the basis of acceptable hydrostatic, disinfection and bacteriological test results. Connection to existing mains shall be performed in accordance with Section 15000.

PART 2. MATERIALS

2.01 WATER

A. Potable water shall be used for hydrostatic testing of potable and recycled water mains.

B. Potable water shall be supplied by a District-approved source. Make-up water for testing shall also be potable water.

C. Well water shall not be used for hydrostatic testing or any other purposes in new or existing pipelines.

2.02 CONNECTIONS

A. Testing water shall be supplied through a metered connection equipped with a backflow prevention device in accordance with Section 15250, at the point of connection to the potable water source used.

B. The Contractor shall provide any temporary piping needed to deliver potable water to the piping that is to be tested. Temporary piping shall be in accordance with Section 15000.

PART 3. EXECUTION

3.01 GENERAL

A. The Contractor shall provide the District Engineer with a minimum of 48 hours' notice prior to the requested date and time for hydrostatic tests.

B. The Contractor shall furnish all labor, materials, tools, and equipment for testing.

C. Temporary blocking during the tests will be permitted only at temporary plugs, caps or where otherwise directed by the District Engineer.

D. All valves and appurtenances shall be operated during the test period. The test shall be conducted with valves in the open position.

E. At the onset of testing, all valves, air vacuum assemblies, blow-offs, and services shall be monitored for possible leakage and repairs made, if necessary, before the test proceeds. The appurtenances shall be monitored through the duration of the testing.

F. For pipe with porous lining, such as cement mortar, the pipe shall be filled with water and placed under a slight pressure for a minimum of 48 hours prior to the actual hydrostatic test.

3.02 FIELD TEST PROCEDURE

A. Before applying the specified test pressure, care shall be taken to release all air within the pipe and appurtenances to be tested. Air shall be released through services, fire hydrants, air release valves, or other approved locations.

B. A 5 hour hydrostatic pressure test shall be performed after the pipe and all appurtenances have been installed and after any trench backfill compaction with heavy-duty compaction equipment has been completed. The hydrostatic test pressure shall be 1.5 times the system pressure, 175 psi minimum, or as otherwise directed by the District Engineer, at the lowest point in the section of pipe being tested. The hydrostatic test pressure at the highest point in the section of pipe being tested shall be within 50 psi of the hydrostatic test pressure at the lowest point in the section of pipe being tested.

C. The test pressure shall be applied and continuously maintained by pumping for a period of 4 hours. During the pumping phase of the test, the test pressure shall be maintained at not less than 95 percent of the specified test pressure at all times.

D. At the end of the 4th hour, the pressure shall meet the requirements stated above. Pumping shall then be discontinued for one hour and the drop in pressure shall be recorded. Pumping shall then be

resumed to restore the initial test pressure, and the quantity of water pumped into the line shall be accurately measured. The quantity thus measured is the amount of pipe leakage, which shall not exceed the following limits:

1. The allowable leakage for flanged or welded steel pipe or for flanged ductile-iron pipe shall be zero.

2. The allowable leakage for steel pipe or ductile-iron pipe with rubber joints or for polyvinyl chloride (PVC) pipe shall be calculated using the following formula:

$$\frac{\text{5 gallons x nominal diameter of pipe (in) x length of pipe (ft)}}{\text{24 (hrs) x 5,280 (ft)}}$$

E. If the leakage exceeds the allowable loss, the leak points shall be located and repaired as required by the District Engineer. All defective pipe, fittings, valves and other appurtenances discovered shall be removed and replaced with sound material. Additional disinfection shall be performed as necessary per Section 15041. The hydrostatic test shall be repeated until the leakage does not exceed the rate specified above. All visible leaks shall be similarly repaired.

END OF SECTION

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SECTION 15050 – INSTALLATION OF PRESSURE PIPE

PART 1. GENERAL

1.01 REQUIREMENT

A. This section describes the installation of pressure pipelines fabricated of polyvinyl chloride, ductile iron, and welded steel, including pipeline closures and connections and pipeline encasement.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 01000 – General Requirements
2. Section 02223 – Trenching, Excavation, Backfilling, and Compacting
3. Section 03300 – Cast-in-Place Concrete
4. Section 09820 – Field Painting and Coatings
5. Section 15041 – Chlorination of Water Mains, Wells and Reservoirs
6. Section 15042 – Hydrostatic Testing of Pressure Pipeline
7. Section 15051 – Cement-Mortar Lined and Coated (CWL&W) Steel Pipe and Specials
8. Section 15052 – Jacked Pipe Casing
9. Section 15054 – Polyvinyl Chloride (PVC) Pressure Pipe
10. Section 15055 – Copper Pipe and Fittings
11. Section 15100 – Valves, General
12. Section 15110 – Resilient Wedge (RW) Gate Valves
13. Section 15120 – Butterfly Valves (BFV)
14. Section 15140 – Blow-off Assemblies
15. Section 15150 – Air Release, Air and Vacuum, Combination, and Manuel Valves

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American Water Works Association (AWWA)

1. AWWA C151 – American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
2. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In.-12 In. (100 mm-300 mm), for Water Transmission and Distribution

3. AWWA C905 – Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. through 36 In.

C. Inclusion of a specific manufacturer's name in the Specifications does not mean that the specific manufacturer's product will be acceptable. Specified manufacturer's or other manufacturer's standard product shall be modified as required to meet the Specifications.

1.04 SUBMITTALS

A. The Contractor submittals shall be in accordance with Section 01000 and shall include, but not be limited to, the following:

1. The following items shall be submitted to the District for review and approval prior to fabrication of steel pipe and specials:

   a. An affidavit of compliance with AWWA Standards for pipe materials and fittings.

   b. Tabulated layout schedule including:

      1) Order of installation and closures.

      2) Elements of curves and bends, both in horizontal and vertical alignment.

      3) Pipe internal diameter, wall thickness, and internal design pressure.

      4) Locations of bulkheads for field hydrostatic testing. (Testing against valves shall not be permitted).

      5) Locations of closures, including cut-to-fit allowances, for length adjustment and for construction convenience.

      6) Locations of valves, flanges, appurtenances and other mechanical equipment.

   c. Details of all specials, and of the lining and coating.

   d. Calculations supporting the sizing of reinforcing collar plates, wrapper plates or crotch plates.

   e. Calculations supporting selected wall thickness of pipe and specials.

   f. Calculations supporting welded joint design and joint welding details.

   g. Current shop welder and field welder certifications.

   h. Mill test reports on each heat from which steel is rolled, at the discretion of the District Engineer.

   i. Certification of dye-penetrate shop-weld testing.

2. Welder qualification certificates shall be submitted.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling of the pipe and specials shall be in accordance with Sections 15051, 15052, 15053, 15054, and 15055.

1.06 HYDRAULIC CHARACTERISTICS

A. To prevent excessive scouring and maintain proper water circulation, pipelines should be designed such that pipe velocities should maintain flows ranging from 2fps to 6fps under normal operating conditions.

1.07 RADIUS REQUIREMENT

A. Construction of curved reaches of pipe may be accomplished by deflecting joints such that the minimum radius achieved does not exceed the following:

Pipe Size (inches)	40' Length (feet)	20' Length (feet)	10' Length* (feet)	5' Length* (feet)
8 and below	460	230	115	80
10	540	270	135	90
12	660	330	165	110
14	770	385	195	130
16 to 18	920	460	230	155
20	1020	510	255	170
21 to 27	1150	575	290	195
30 to 33	1330	665	335	225
36 to 39	1530	765	385	255
42 and larger	1840	920	-	-

Note: *PVC pipe only

PART 2. MATERIALS

2.01 PIPE AND SPECIALS

A. Contractor shall refer to Sections 15051, 15052, 15053, 15054 and 15055 for material requirements. Unless noted otherwise on the plans or in the specifications, pipe shall be furnished in accordance with the following materials schedule:

Diameter (inches)	Potable Water	Recycled Water	Sewer Force Main
2 and below	Copper	Copper in purple PVC sleeve	-
4 and larger	CML&C C200 fully welded	CML&C C200 purple sleeve	DIP C151 w/victaulic couplings PVC C900, Class 200 HDEP

PART 3. EXECUTION

3.01 PIPE HANDLING AND STORAGE

A. Pipes, fittings and accessories shall be lifted with handling beams or wide belt slings as recommended by the pipe manufacturer, Cable slings shall not be used. Pipe, fittings and accessories shall be handled in a manner to avoid damage to the pipe. Pipe, fittings and accessories shall not be dropped or dumped from trucks or into trenches under any circumstances.

B. The pipe, fittings and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged or unsound pipe, fittings and accessories shall be repaired if possible. If damaged material is beyond repair, it shall be removes from the job site and replaced at the Contractor's expense.

C. Internal braces placed in steel pipes by the manufacturer shall be maintained until pipe is ready to be lowered into position in the trench.

D. Plastic caps placed over the ends of all pipe and fittings to prevent foreign matter or dirt from coming in contact with the interior of the pipe and fittings, and shall not be removed until pipe and fittings are ready to be lowered into position in the trench.

E. In no event shall the sewers be used as drains for removing water which has infiltrated into the construction trenches.

F. Onsite pipe storage shall be limited to a maximum of one week, unless exception is approved by District

3.02 PIPE PLACEMENT

A. All pipe and fittings shall be placed in accordance with established survey stakes set by the Contractor's hired surveyor based of the Approved Plans. From the survey stakes the Contractor shall utilize a gradeliner or laser measuring unit to establish the alignment and grade of the bottom of trench and invert of the pipe and fittings.

B. Dewatering, excavation, shoring, sheeting, bracing, backfilling material placement, material compaction, compaction testing, and pipe laying requirements and limitations shall be in accord with Section 02223.

C. Pipe shall be installed without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Precautions shall be taken to prevent pipe from being displaced by water entering trench. Damaged or displaced pipe shall be replaced or returned to specified condition and grade.

D. Depressions shall be dug into pipe base material to accommodate the pipe bell and external joint filler form ("diapers), and to permit removal of the pipe handling slings.

E. During laying operations, tools, clothing, or other materials shall not be placed in the pipe.

F. When pipe laying is not in progress, including lunch- hour, the ends of the pipe shall be closed using plugs constructed in a manner to prevent entry by any debris, animal or vermin.

G. Pipes shall be laid uphill with the bell or collared joints on the uphill end of each pipe length, whenever the grade exceeds five (5) percent.

H. The radius of curvature of the trench shall be determined by the maximum length of pipe section that can be used without exceeding the allowable deflection at each pipe joint and without causing deviation from the District's trench width requirements. Refer to the various referenced sections on

pipe by type for allowable deflection. The deflection at any flexible joint shall not exceed that prescribed by the manufacturer of the pipe. The manufacturers printed installation guide outlining the radius of curvature that can be negotiated with pipe sections of various lengths shall be followed.

I. Proper implements, tools and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be provided and used by the Contractor for safe and efficient execution of the work. All pipe, fittings, valves, and accessories shall be carefully lowered into the trench using suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

J. Cutting and machining of the pipe shall be accomplished in accord with the pipe manufacturer's standard procedures for this operation. Pipe shall not be cut with a cold chisel, standard iron pipe cutter, nor any other method that may fracture the pipe or produce ragged, uneven edges.

3.03 FLANGED CONNECTIONS

A. Pipe shall be set with flange boltholes straddling the pipe horizontal and vertical centerlines.

B. Nuts and bolts shall be lubricated with anti-seize prior to installation.

C. Flanges which connect with buried valves or other equipment shall be wrapped with sheet polyethylene film as specified for the valves and equipment. The wrap shall be extended over the flanges and bolts and secured around the adjacent pipe circumference with tape.

3.04 INSTALLATION OF BENDS, TEES, CROSSES, REDUCERS, AND VALVES

A. Fittings shall be installed utilizing standard installation procedures. Fittings shall be lowered into trench by means of rope, cable, chain, or other acceptable means without damage to the fittings. Cable, rope, or other devices used for lowering fitting into trench, shall be attached around exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the fittings interior for handling. Fittings shall be carefully connected to pipe or other facility, and joint shall be checked to insure a sound and proper joint.

B. Valves shall be installed in accordance with Sections 15100, 15110, and 15120.

3.05 INTERIOR JOINTS FOR MORTAR-LINED PIPE 20-INCHES AND SMALLER

A. A tight-fitting swab or squeegee shall be inserted in the joint end of the pipe to be joined.

B. When ready to insert the spigot, the face of the cement mortar lining at the bell shall be coated with a sufficient amount of stiff cement mortar to fill the space between adjacent mortar linings of the two pipes to be joined.

C. Immediately after joining the pipes, the swab or squeegee shall be drawn through the pipe to remove all excess mortar and expel it from the open pipe end.

3.06 INTERIOR JOINTS FOR MORTAR-LINED PIPE 24-INCHES AND LARGER

A. The trench shall be backfilled, compacted, and meet compaction requirements before applying mortar at joints.

B. Working inside the pipe, foreign substances which adhere to the steel joint rings shall be removed, the surface cleaned, and stiff cement mortar packed into each joint. The mortar shall be finished with a steel trowel to match the lining in the adjoining pipes.

C. Excess mortar and other construction debris shall be removed from the pipe interior,

3.07 PIPELINE CLOSURE ASSEMBLIES

A. Pipeline closure assemblies shall be employed to unite sections of pipeline laid from opposite directions; to adjust the field length of the pipeline to meet structures, other pipelines, and points established by design stations; and to close areas left open to accommodate temporary test bulkheads for hydrostatic testing. Either follower ring design or butt strap design shall be used. Follower ring closures shall be installed as recommended by the pipe manufacturer.

B. As shown in the District Standard Drawings, shaped steel butt straps a minimum of 10-inches in width shall be centered over the ends of the pipe sections they are to join. On pipes 39 inches in diameter and smaller, butt straps shall be welded to the outside of the pipes with complete circumferential fillet welds equal in size to the thinnest part being joined. The details shown on the drawings shall be referred to when joining larger pipes.

C. Closure assemblies shall be cement-mortar lined to a mortar thickness at least equal to the adjoining standard pipe sections. The steel shall be cleaned with wire brushes and a cement and water wash coat applied prior to applying the cement mortar. Where more than a 4-inch joint strip of mortar is required, welded wire mesh reinforcement having a 2-inch by 4-inch pattern of No, 13 gage shall be placed over the exposed steel. The mesh shall be installed so that the wires on the 2-inch spacing run circumferentially around the pipe. The wires on the 4-inch spacing shall be crimped to support the mesh 3/8 inch from the metal surface. The interior mortar shall have a steel-trowled finish to match adjoining mortar lined pipe sections.

D. As shown in the District Standard Drawings, butt straps with 5-inch diameter hand holes shall be provided for lining of closure assemblies on pipelines 20-inches in diameter and smaller.

E. The exterior of closure assemblies shall be reinforced with wire mesh as described in Paragraph C above. The surface shall be coated with mortar, or a poured concrete encasement to cover all steel to a minimum thickness of 1/2 inches. Exterior mortar shall be protected to retard drying while curing. Concrete shall be poured and vibrated on one side of the closure assembly only, until mortar is visible on the opposite side, after which the coating can be completed over the top of the assembly.

3.08 WELDED JOINTS

A. Welded joints shall be provided in every location.

B. Welding shall be in accord with AWWA C206. Welder's qualification shall be in accord with Section IX of the ASME Boiler and Pressure Vessel Code. Current certifications shall be provided for all welders.

C. Interior joints shall not be welded before backfilling, compaction, and compaction testing are successfully completed.

D. Joint rings (buff-straps or weld collars) that are rusted or pitted where weld metal is to be deposited shall be cleaned by brushing or sand blasting.

E. Concrete or other coating adjacent to the joint rings shall not be heated.

F. Each layer of deposited weld metal shall be cleaned using a power-driven wire brush or grinder prior to depositing the next layer of weld metal.

3.09 EXTERIOR PIPE JOINT FOR CEMENT-MOTAR COATED PIPE

A. Outside joint recess shall be filled with cement-mortar grout using a fabric form (joint diaper) placed around the joint and secured with steel straps. Grout shall be poured and rodded from one side only until it is visible on the opposite side. After approximately one hour, the joint shall be topped off with additional grout.

3.10 THRUST RESTRAINTS AND ANCHOR BLOCKS

A. Thrust restraint and anchor blocks shall be installed as shown on the Approved Plans.

B. Thrust restraint and anchor blocks shall be of not less than 3,000 psi concrete (Class C); and shall provide a thrust bearing area to resist horizontal or downward thrust; and shall be of sufficient gross weight and area to give bearing against undisturbed vertical earth banks sufficient to absorb the thrust, allowing an earth bearing of 1500 pounds per square foot maximum.

C. Thrust restraint elements, where not called for on the Approved Plans, shall be sized for 150 percent of operating pipeline pressure or the pipeline test pressure, whichever is greater. Prior to construction, thrust and anchor block sizing shall be submitted to the District for approval.

D. Concrete shall be placed against wetted and undisturbed soil, and the exterior of the fitting shall be cleaned and wetted to provide a good bond with the concrete. The concrete interface with the fitting shall be an area of not less than the projected area of the fitting normal to the thrust resultant and centered on the resultant.

E. Unless otherwise directed by the District, thrust restraint and anchor blocks shall be placed so that the pipe and fitting joints are accessible for repair. Placement shall include isolation of adjacent utilities and shall ensure that bearing is against undisturbed soil.

F. Metal harness or tie-rods and pipe clamps shall be used to prevent movement if shown on the Approved Plans or directed by the District. The rods and clamp harnessing arrangement shall be installed utilizing flanged harness hold-downs or lugged fittings and pipe with saddle clamps placed (where feasible and practical) to bear against the pipe bells. Saddle clamps around the barrel of the pipe, which depend on friction to prevent sliding of the clamp, are acceptable. However, restraints with pointed set-screws which bear into the pipe wall, are not acceptable and shall not be used. All surfaces of exposed and buried steel rods, reinforcing steel, bolts, clamps, and other metal work shall be coated prior to backfilling, arid touched up after assembly as specified in Section 09900 .

3.11 BLOW-OFF ASSEMBLIES

A. In-line type or end-of-line type blow-off assemblies shall be installed in accord with the Approved Plans at locations noted, and at such additional locations as required by the District for removing water or sediment from the pipeline.

B. The assembly shall be installed in a level section of pipe. The tap for blow-off in the line shall be no closer than 18 inches to a valve, coupling, joint, or fitting unless it is at the end of the main. No tap will be permitted in any machined section of asbestos cement pipe.

C. Blow-offs shall not be connected to any sewer, submerged in any stream, or installed in any manner that will potentially allow back siphoning into the distribution system.

3.12 COMBINATION AIR AND VACUUM RELEASE VALVES

A. Air release valve assemblies and combination air and vacuum valves shall be installed at each point in the pipeline as shown on the drawings or as specified by the District, and in accord with Section 15150.

B. The tap for the air valves shall be made in a level section of pipe no closer than 18-inches to a bell, coupling, joint, or fitting. No tap shall be permitted in any machined section of asbestos cement pipe.

3.13 ABOVE-GROUND PIPING INSTALLATIONS AND SUPPORTS

A. Installation of aboveground pipeline materials and appurtenances include requirements for buried pipeline materials and appurtenances as applicable.

B. All exposed pipe shall be adequately supported with devices of appropriate design. Where details are shown, the supports shall conform thereto and shall be placed as indicated; provided, that the support for all piping shall be complete and adequate as herein specified, whether or not supporting devices are specifically called for.

3.14 DISINFECTION

A. All potable water pipelines shall be disinfected in accord with Section 15041.

3.15 TESTING

A. All piping shall be hydrostatically pressure tested in accord with Section 15042.

END OF SECTION

SECTION 15051 – CEMENT-MORTAR LINED AND COATED STEEL PIPE AND SPECIALS

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes materials, design, fabrication, and installation of cement-mortar lined and coated steel pipe and specials.

1.02 RELATED WORK

A. Related Work Specified Elsewhere:

1. Section 01000 – General Requirements
2. Section 02223 – Trenching, Excavation, Backfilling, and Compaction
3. Section 03330 – Cast-In-Place Concrete
4. Section 09820 – Field Painting and Coatings
5. Section 09920 – Shop-Applied Fusion-Bonded Polyester Coatings
6. Section 15000 – General Piping Systems and Appurtenances
7. Section 15041 – Chlorination of Water Mains, Wells, and Reservoirs
8. Section 15042 – Hydrostatic Testing of Pressure Pipes
9. Section 15043 – Leakage and Infiltration of Non-Pressure Pipes

1.03 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American National Standards Institute (ANSI)

1. ANSI B1.1 – Unified Inch Screw Threads
2. ANSI B1.2 – Gages and Gaging for Unified Inch Screw Threads
3. ANSI B1.20.1 – Pipe Threads, General Purpose (inches)

C. American Society of Mechanical Engineers (ASME)

1. ASME B16.1 – Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250

D. American Society of Testing and Materials (ASTM)

1. ASTM A47/A47M – Standard Specification for Ferric Malleable Iron Castings
2. ASTM A36/A36M – Standard Specification for Carbon Structural Steel

3. ASTM A53 – Standard Specification for Pipe, Steel, Black & Hot Dipped,Zinc-Coated, Welded, and Seamless

4. ASTM A105 – Standard Specification for Carbon Steel Forgings for Piping Applications

5. ASTM C150 – Standard Specification for Portland Cement

6. ASTM A183 – Standard Specification for Carbon Steel Track Bolts and Nuts

7. ASTM A216 – Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding for High Temperature Service

8. ASTM A283/A283M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

9. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs

10. ASTM A536 – Standard Specification for Ductile Iron Castings

11. ASTM A568/A568M – Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality and Cold Rolled

12. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

13. ASTM D2000 – Standard Classification System for Rubber Products

E. American Welding Society (AWS)

1. AWS B2.1 – Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 through 3/4" Thick, E6010 (Vertical Uphill), As-Welded Condition, Primarily Pipe Applications

2. AWS B2.1 – Standard WPS for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 through 1 1/2" Thick, E7018, As-Welded or PWHT Condition, Primarily Pipe Applications

F. American Water Works Association (AWWA)

1. AWWA C200 – Steel Water Pipe – 6” and Larger

2. AWWA C205 – Cement-Mortar Lining and Coating for Steel Water Pipe 4-inches and larger Shop Applied

3. AWWA C206 – Field Welding of Steel Water Pipe

4. AWWA C207 – Steel Pipe Flanges for Waterworks Service 4-inches and larger

5. AWWA C208 – Dimensions for Fabricated Steel Pipe Fittings

6. AWWA C217 – Cold-applied Petroleum Tape Coatings

7. AWWA M11 – Steel Pipe-Guide for Design and Installation

G. Steel Structures Painting Council (SSPC)

1. SSPC-SP10 – Joint Surface Preparation Standard: Near-White Metal Blast Cleaning

H. California Code of Regulations (CCR)

1. CCR Title 8, Section 5159 – General Industry Safety Orders

I. Code of Federal Regulations (CFR)

1. CFR 1910.6 – Code of Federal Regulations - Title 29 Part 1910.1000 - 1910 END: Labor

J. Inclusion of a specific manufacturer's name in the Specifications does not mean that the specific manufacturer's product will be acceptable. Specified manufacturer's or other manufacturer's standard product shall be modified as required to meet the Specifications.

1.04 SERVICE APPLICATION

A. Cement-mortar lined and coated steel pipe and specials shall be used for water mains of 4-inches or larger.

1.05 SPECIALS

A. A special is defined as any piece of pipe other than a normal full length of straight pipe. This includes, but is not limited to, elbows, short pieces, reducers, tees, crosses, spools, sections with outlets, beveled sections and manholes.

1.06 DESIGN REQUIREMENTS

A. All steel used for pipe or specials shall have a 36,000 psi minimum yield point unless otherwise directed by the Engineer. See material information concerning steel designation below.

B. Design stress in steel cylinders shall not exceed 50 percent of the specified minimum yield strength of the steel used. The internal operating pressure used for design shall be a minimum of 150 psi or as called for on the Approved Plans, whichever is greater. If no specific surge analysis has been performed, the internal operating pressure used in circumferential stress calculations shall include at least a 10 percent increase for surge conditions. No allowance shall be made for the tensile strength of the cement mortar lining and coating.

C. Specials shall be designed per AWWA M11 and as a minimum shall conform to the pressure rating, grade of steel and cylinder thickness of the adjoining standard pipe sections. Fitting dimensions shall conform to AWWA C208. Reinforcing collars, wrappers, crotch plates, and anchor rings shall be designed and fabricated per AWWA M11.

1. Outlets may be built into the wall of the pipe or may be fabricated as steel plate specials. Outlets to be installed on straight pipe lengths shall be welded to the steel cylinder of the pipe prior to application of mortar coating to the cylinder. Outlets of size 2-inches and smaller in piping 4-inches and larger shall be of the threadolet type or shall be extra-heavy half couplings to fit the pipe in accordance with AWWA M11. Outlets shall be 3,000 lb. WOG forged steel per ASTM A105. Threads shall comply with ANSI B1.20.1. Outlets larger than 2-inches shall use a tee or nozzle with a flanged outlet. All outlets larger than 2-inches in diameter shall be provided with steel reinforcing collars, wrapper plates, or crotch plates per AWWA M11. At the option of the manufacturer, wrappers may be used in place of collars, and crotch plates may be used in place of collars or wrappers.

2. On 2-inches and smaller outlets where nylon insulation bushings are to be used, the outlet shall be increased in size to accept the bushing.
3. Tees, wyes, and crosses shall be dimensioned in accordance with AWWA C208, Table 1, or as modified on the Approved Drawings.

4. Bends shall have a minimum radius of not less than 2-1/2 times the pipe diameter unless otherwise approved by the District Engineer. The maximum deflection at mitered girth seams shall be 22-1/2E. At the option of the Contractor, a bend may be welded to the adjacent pipe section.

5. All specials shall be marked at both ends of the fitting with “Field Top” indicators.

D. Minimum cylinder thickness for pipe and specials shall be as indicated on Approved Plans. The wall thickness tolerances for steel pipe 12-inches in diameter and larger shall be governed by the requirements of the ASTM specifications to which the plates or sheets are ordered, but in no case shall the thickness be less than as indicated on Approved Plans.

E. Standard pipe sections shall not be less than 20 feet nor more than 40 feet in length, except where shorter lengths are required to fit horizontal and vertical alignment or are otherwise shown on the Approved Plans.

F. Pipe ends shall be as follows:

1. For lap welded joints use expanded bell with matching spigot end.

2. Flanges for use in construction of Steel Pipe shall be as described below:

   a. AWWA C207, Class D flanges (matching ANSI/ASME B16.1, Class 125 flanges for bolt hole size and drilling) shall be used for pressures up to 150 psi.

   b. AWWA C207, Class E flanges (matching ANSI/ASME B16.1, Class 125 flanges for bolt hole size and drilling) shall be used for pressures between 150 psi and 250 psi.

   c. AWWA C207, Class F flanges (matching ANSI/ASME B16.1, Class 250 flanges for bolt hole size and drilling) shall be used for pressures between 250 psi and 300 psi or when Class 250 butterfly valves or other appurtenances using flanges corresponding to AWWA C207 Class F are required.

   d. Flanges shall be flat-faced type only. Segmented flanges shall not be used.

3. Use two-piece rolled steel butt straps with thickness matching cylinder pipe, and a minimum width of 10-inches. Straps shall be fabricated to snugly fit over the plain pipe ends, and shall be centered over the ends of the pipe sections to be joined. Weld one or more standard 5-inches, 3000 lb. threaded half-couplings to the butt strap section as shown on the Approved Plans. Provide a threaded steel plug for each half-coupling.

4. Use plain-end pipe with flexible pipe couplings per AWWA C200. Provide joint harnesses per AWWA M11 where indicated on the Approved Plans.

G. Minor changes of direction in the grade or alignment may be made by a deflection in the joint up to a maximum of 3/4-inch on one side of the joint. For greater angular deflections, pipe with ends beveled up to a maximum of 5 degrees measured from a plane perpendicular to the pipe’s axis may be used. The short point on the bevel shall be so marked on the pipe. Pipe length shorter than 20 feet may be used on curves. In cases where curves that have a shorter radius than can be accommodated by beveled pipe, or where indicated on the Approved Plans, special short-radius bends shall be provided.

H. Mortar coatings and linings shall conforming to AWWA C205, except as noted below. All exterior metal surfaces intended for direct buried service shall be coated.

Minimum Coating Thickness (inches)	
Coating Thickness	**Tolerance**
3/4	-1/16, +1/8

Minimum Lining Thickness (inches)		
Pipe Sizes	**Lining Thickness**	**Tolerance**
4 - 12	1/4	-1/16, +1/8
12 - 24	5/16	-1/16, +1/8
24 - 36	3/8	-1/16, +1/8
over 36	1/2	-1/16, +3/16

I. The exterior surfaces of areas of pipes and fittings that are not mortar coated, such as flanges, grooved ends, or plain ends for butt-straps or flexible couplings, shall be sandblasted in accordance with SSPC-SP10 - Near White Blast Cleaning, and coated in accordance with Section 15000.

J. The term "diameter of pipe" as used in these specifications or as shown on the Approved Plans shall mean the net inside diameter of the mortar lining.

1.07 QUALITY ASSURANCE

A. In addition to the shop hydrostatic testing performed on pipe cylinders required per AWWA C200, all welds of specials and attachments (i.e. joint rings and nozzles) shall be tested by a dye-penetrate process. Certification of such testing shall be submitted to the District.

B. Field welders shall be certified under Section IX, Part A of the ASME Boiler and Pressure Vessel Code or in accordance with AWWA C206, Section 3. Welders shall present a copy of their certification to the District prior to performing any field welding. Certifications shall be dated within three (3) years of the job to be performed.

C. Plainly mark each length of straight pipe and each special at the bell end to identify the proper location of the pipe item by reference to the layout schedule.

D. The top of all pipe and specials shall be clearly identified by marking the top with “T.O.P.” for easy identification in the field.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling of the pipe and specials shall be as follows:

1. Pipe and fittings shall be carefully handled and shall be protected against damage to linings and coatings due to impact shocks. Pipe shall not be placed directly on rough ground but shall be supported in a manner which will protect the pipe against injury whenever stored at the site or elsewhere. Pipe shall be handled and stored per these requirements and in accordance with the Manufacturer’s recommendations.

2. Temporary internal bracing shall be installed in all pipe 16-inches and larger prior to shipment to the job site. Temporary internal bracing shall be 4-inch x 4-inch wooden struts installed in both

the horizontal and vertical directions. Each set of struts shall be nailed together as a unit. Wooden wedges may be used to maintain the proper tight fit of the internal bracing. The bracing shall be located 12-inches in from each end of the pipe section for all pipe, and additionally at the mid-point for piping 24-inches and larger. Maintain internal bracing as specified under Pipe Installation.

3. Transport pipe to the job site on padded bunks with nylon tie-down straps or padded bonding to protect the pipe.

4. Pipes and specials shall only be handled with appropriate spreader bars and wide nylon slings. Chains or wire rope slings shall not be used. Under no circumstances shall pipe or specials be pushed or dragged along the ground. All pipe sections over 20- feet in length shall be lifted at the quarter points from each end.

5. Store pipe on earth berms or timber cradles adjacent to the trench in the numerical order of installation. Place the supports at about the one-quarter point from the pipe ends.

6. Maintain plastic end caps on all pipe and specials in good condition until the pipe is ready to be installed in the trench. Periodically open the plastic end caps and spray potable water inside the pipe for moisture control.

1.09 SUBMITTALS

A. The following items shall be submitted to the District for review and approval prior to fabrication of steel pipe and specials in accordance with Section 01000 :

1. An affidavit of compliance with AWWA C200 and C205.

2. Tabulated layout schedule including:

   a. Order of installation and closures.

   b. Pipe station and bottom of pipe (BOP) elevation at each change of grade and alignment.

   c. Elements of curves and bends, both in horizontal and vertical alignment.

   d. Pipe internal diameter, wall thickness, and internal design pressure.

   e. Locations of bulkheads for field hydrostatic testing. (Testing against valves shall not be permitted).

   f. Locations of closures, including cut-to-fit allowances, for length adjustment and for construction convenience.

   g. Locations of valves, flanges, appurtenances and other mechanical equipment.

3. Details of all specials, and of the lining and coating.

4. Calculations supporting the sizing of reinforcing collar plates, wrapper plates or crotch plates.

5. Calculations supporting selected wall thickness of pipe and specials.

6. Calculations supporting welded joint design and joint welding details.

7. Current shop welder and field welder certifications.

8. Mill test reports on each heat from which steel is rolled, at the discretion of the District Engineer.

9. Certification of dye-penetrate shop-weld testing.

1.10 RECYCLED WATER IDENTIFICATION

A. Cement-mortar lined and coated steel pipe and specials for recycled water shall be identified with purple colored coating, purple polyethylene sleeves, identification labels, or signs in accordance with Section 15005.

1.11 WARNING/IDENTIFICATION TAPE

A. Warning/Identification Tape shall be installed on all cement-mortar lined and coated steel recycled water mains in accordance with Section 15000.

PART 2. MATERIALS

2.01 STEEL PIPE AND SPECIALS

A. Steel pipe and specials shall conform to the requirements of the AWWA C200 and C205, and AWWA M11, except as modified herein.

B. Steel for fabricated cylinders shall conform to ASTM A36/A36M, ASTM A283/A283M, Grade D, or ASTM A1011/A1011M, Grade 36. Other steel grades may be used only upon approval of the District Engineer.

2.02 MORTAR LINING AND COATING

A. Cement used in mortar lining and coating shall be Portland Cement per ASTM C150, Type V for coating and Type II or Type V for lining.

B. Cement-mortar coating shall be reinforced in accordance with AWWA C205.

C. Cement mortar grout for field joints shall consist of a mixture of 1-1/2 to 2 parts sand to 1 part Type II or Type V Portland Cement with enough clean, potable water to permit packing and troweling without crumbling. The sand shall be washed, well-graded sand such that all will pass a No. 8 sieve. The quantity of water to be used in the preparation of grout shall be the minimum required to produce a mixture sufficiently workable for the purpose intended. Grout shall attain a minimum compressive strength of 1,800 psi in 28 days.

D. In certain circumstances, rapid-setting mortar may be required. Acceleration admixtures may be used in the mix as permitted by the District's Engineer. Calcium chloride shall not be used in the mix.

2.03 PAINTING AND COATING

A. Paint and coating products for exterior surfaces of all pipe and appurtenances not otherwise mortar-coated shall be in accordance with Section 09820 and the Approved Materials List.

B. Paint and coating products for areas in contact with potable water should be certified with NSF/ ANSI 61.

2.04 BOLTS AND NUTS FOR FLANGES

A. Bolts and nuts shall be in accordance with Section 15000 and the Approved Materials List.

2.05 GASKETS

A. Flange gaskets shall comply with AWWA C207. Flange gaskets shall be 1/8-inch thick non-asbestos for all sizes of pipe. Gaskets shall be ring-type extending to the inner edge of the bolt circumference of the flange.

B. In the event of encountering organic solvents or petroleum products during the course of the work, alternate gasket materials or joint treatment will be required as directed by the District Engineer.

2.06 IMPORTED GRANULAR MATERIAL FOR PIPE AND TRENCH ZONES

A. The imported granular material for use in pipe and trench zones shall be in accordance with Section 02223.

2.07 WARNING/IDENTIFICATION TAPE

A. Warning/Identification Tape materials shall be in accordance with Section 15000 and the Approved Materials List.

PART 3. EXECUTION

3.01 GENERAL

A. At all times when the work of installing pipe is not in progress, including worker break times, the ends of the pipe shall be closed with a vermin-proof and child-proof cap or plug. Do not permit trench water to enter the pipe. Do not place tools, clothing, or other materials in the pipe. The Contractor shall maintain the interior of the pipe in a sanitary condition free from foreign materials.

3.02 TRENCH EXCAVATION, BACKFILL AND COMPACTION

A. Trenching, backfilling and compaction shall be performed in accordance with Section 02223.

3.03 DEWATERING

A. The Contractor shall provide, and maintain at all times during construction, ample means and devices to promptly remove and dispose of all water from any source entering trench excavations or other parts of the work in accordance with Section 02223 . Any damage caused by flooding of the trench shall be the Contractors responsibility.

B. Dewatering shall be performed by methods that will maintain a dry excavation, preservation of the final lines and grades and protection of all utilities. If flooding of the trench does occur, the Contractor shall immediately dewater and restore the trench. Damaged or altered pipeline appurtenances shall be repaired or replaced as directed by the Engineer.

3.04 PIPE INSTALLATION

A. When the work requires and the size of the pipe allows entry of personnel into the pipe, the Contractor shall comply with all Federal and State regulations for confined space entry. Work inside pipelines shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1910.146, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5159 for confined space entry have been performed and the area is verified as safe to enter. Generally, the aforementioned safety provisions apply to pipe 24" and larger. Note that for pipe less than 24" diameter, more stringent safety procedures apply.

B. The Contractor shall furnish and install all pipe, specials, fittings, closure pieces, valves, supports, bolts, nuts, gaskets, jointing materials, and all other appurtenances as shown on the Approved Plans and as required to provide a complete and workable installation.

C. Pipe installation shall be as shown on the Approved Plans and Shop Drawings in accordance with the following:

1. No pipe shall be installed where the linings or coatings show cracks that may be harmful as determined by the District Engineer. Such damaged linings and coatings shall be repaired or new, undamaged pipe sections shall be provided.

2. Pipe damaged shall be repaired or replaced by the Contractor.

3. The Contractor shall inspect each pipe and fitting to insure that there are no damaged portions of the pipe. The Contractor shall remove or smooth out any burrs, gouges, weld splatter, or other small defects prior to laying the pipe.

4. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the work as noted above.

5. Pipe shall be laid directly on the bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings and to permit visual inspection of the joint. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coatings on field joints.

6. Each section of pipe shall be laid in the order and position shown on the Approved Plans. In addition, each section of pipe shall be laid so that no high or low points occur along the pipeline other than those shown on the Approved Plans.

7. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the District Engineer may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed 75 percent of the maximum deflection recommended by the pipe manufacturer. No joint shall be deflected any amount that will be detrimental to the strength and water tightness of the finished joint. In all cases the joint opening, before finishing with the protective mortar inside the pipe, shall be the controlling factor.

8. Pipes shall be laid uphill on grades exceeding 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until the following pipe section has been installed to provide sufficient support to prevent movement.

9. Temporary internal pipe bracing shall be left in place in pipe sizes larger than 24-inches until pipe zone compaction has have been completed. Bracing in pipe smaller than 24-inches may be removed immediately after the pipe has been laid into the trench. The Contractor shall employ a laboratory to monitor pipe deflection by measuring pipe inside diameter before bracing is removed and 24 hours after struts are removed. Pipe deflection shall not exceed 3 percent in 24 hours after the bracing has been removed. After the backfill has been placed, the struts shall be removed.

10. No pipe shall be installed upon a foundation onto which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No

pipe shall be laid unless it can be established that the trench will be backfilled prior to formation of ice and frost.

11. The openings of all pipe and specials where the pipe and specials have been mortar-lined in the shop shall be protected with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water, or any undesirable substance. The bulkheads shall be designed to prevent drying out of the interior of the pipe. The Contractor shall introduce water into the pipe to keep the mortar moist where moisture has been lost due to damaged bulkheads.

3.05 FIELD WELDED JOINTS

A. Welded joints shall be completed in the trench per AWWA C206.

B. Both the bell and spigot ends shall be cleaned of foreign matter prior to welding.

C. For pipe diameters less than 24-inches the exterior of the joint shall be welded. For pipe diameter over 24-inches, the joint shall be welded in accordance with the approved submittal. All welded joints shall remain exposed until inspection has been performed.

D. Welding electrodes shall be as recommended by the pipe manufacturer. Typically, electrodes shall be E6010 for root passes and E7018 for additional passes. Do not deposit more than 1/8-inch of throat thickness per pass.

E. Weld material shall be deposited in successive layers. Complete and clean each pass around the entire circumference of the pipe before commencing the next pass.

F. The minimum number of passes in the completed weld shall be as follows:

Steel Cylinder Thickness (inches)	Fillet Weld Minimum Number of Passes
1/4 and smaller	2
3/8 or greater	3

G. To minimize longitudinal stresses due to temperature variations, it is necessary to leave unwelded one joint per each 400 lineal feet of pipeline. This joint shall be left unwelded until all the joints on both sides of it are welded, and it shall be welded at the coolest time of the working day. The District Engineer shall decide if and when this procedure is warranted.

H. Tack-welding the joint may be permitted to hold the pipe in place. If the joint is to be circumferentially welded, sufficient time shall elapse to allow for an initial set of interior joint lining prior to proceeding with joint welding. Rapid-setting mortar may be used in accordance with this Section. In some cases, the District Engineer may require hand holes.

I. Field welders shall be certified in accordance with ASME Section 9 (pipe welders) or AWS D1.1 (plate welders). Welders shall present a copy of their certification to the District Engineer prior to performing any field welding.

J. Prior to butt-strap welding, the pipe and pipe joint shall be properly positioned in the trench using line-up damps so that, in the finished joint, the abutting pipe sections shall not be misaligned by more than 1/16-inch.

K. The pipe ends shall be cut straight on joints where butt straps are used for realignment, adjustment, or deflection, and fillet welds shall be made as indicated.

L. Inspection of Field Welded Joints:

1. The District shall arrange for the welds to be inspected. Inspection of welds shall take place as soon as possible following the completion of the welds.

2. The Contractor shall coordinate and supply ventilation, lighting, and other equipment deemed necessary for inspection. The Contractor shall be responsible for providing safe entry into and out of the trench, safety of inspection personal, traffic control and other safety precautions deemed necessary for the inspections.

3.06 INTERIOR JOINT FINISH - PIPE LESS THAN 24-INCHES

A. Complete interior mortar joints for pipe sizes less than 24-inches by drawing through a tightfitting swab or squeegee. Coat the face of the cement mortar lining at the bell with a sufficient amount of stiff cement mortar to fill the gap. Immediately after joining the pipes, draw the swab through the pipe to remove all excess mortar and expel it from the open pipe end. Do not move the pipe after the swab has been pulled past the joint. See requirements under "Field Welded Joints" for these joints requiring welding.

3.07 INTERIOR JOINT FINISH - PIPE 24-INCHES AND LARGER

A. Complete interior mortar joints for pipe sizes 24-inches and larger by the trowel method. Prior to applying interior mortar at the joints all backfill in the area shall be completed. After cleaning the interior joint, pack cement mortar into each joint. Finish the surface with a steel trowel to a smooth finish and equal thickness to match the adjoining pipe mortar.

B. Where more than a 4-inches joint strip of mortar is required, place galvanized welded wire mesh reinforcement in 2-inch x 4-inch pattern of No. 13 gauge over the exposed steel. Install the mesh so that the wires on the 2-inch spacing direction run circumferentially around the pipe. Crimp the wires on the 4-inch spacing to support the mesh 3/8-inch from the metal surface. Steel-trowel finish the interior mortar to match adjoining mortar-lined pipe sections.

3.08 EXTERIOR JOINT FINISH

A. The outside annular space between pipe sections shall be completely filled with grout formed by the use of polyethylene foam-lined fabric bands. The grout space shall be flushed with water prior to filling so that the surfaces of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured. The joint shall be filled with grout by pouring from one side only. Grout shall be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the pipe and up the opposite side. Pouring and rodding the grout shall be continued to allow completion of the filling of the entire joint recess in one operation. Care shall be taken to leave no unfilled space. Grouting of the outside joint spaces shall be kept as close behind the laying of the pipe as possible except that in no case shall grouting be closer than three joints of the pipe being laid.

B. The grout bands or heavy-duty diapers shall be polyethylene foam-lined fabric with steel strapping of sufficient strength to hold the fresh mortar, resist nodding of the mortar, and allow excess water to escape. The foam plastic shall be 100 percent closed cell, chemically inert, insoluble in water and resistant to acids, alkalis and solvents. Foam Plastic shall be Dow Chemical Company, Ethafoam 222, or equal.

C. The polyethylene foam-lined grout band shall be centered over the joint space with approximately equal widths extending over each pipe end and securely attached to the pipe with the steel straps. After filling the exterior joint space with grout, the flaps shall be closed and overlapped in a manner

that fully encloses the grout with polyethylene foam. The grout band shall remain in position on the pipe joint.

D. Following grouting, the joint shall be wrapped with two layers of polyethylene encasement in accordance with per Section 15000.

3.09 BUTT STRAP JOINTS

A. Butt strap closure joints shall be installed where shown on the Approved Plans in accordance with AWWA C206.

B. Butt straps shall be field welded to the outside plain end of the pipe along both edges with a full circumferential weld. A minimum of two weld passes shall be used.

C. The interior of the joints shall be filled with a rapid-set mortar and finished off smoothly to match the pipe interior diameter.

D. Clean the butt strap with a wire brush and apply a cement and water wash coat prior to applying cement mortar.

E. Galvanized wire mesh, 2-inch x 4”-inch x No. 13 gauge shall be installed to the exterior of the joint prior to applying the mortar coating.

F. Coat the exterior of the closure assemblies with mortar to cover all steel with a minimum of 1-1/4-inch.

G. Seal weld the steel plug to the hand hole after the interior of the joint has been inspected and approved by the District Engineer.

H. Following grouting, the joint shall then be wrapped with two layers of polyethylene encasement in accordance with Section 15000.

3.10 FLANGED CONNECTIONS

A. Flanged connections shall be installed where indicated on the Approved Plans.

B. Bolt holes shall straddle the horizontal and vertical centerlines.

C. The bolts, nuts and flange faces shall be thoroughly cleaned by wire brush prior to assembly.

D. Bolts and nuts shall be lubricated with a District-approved anti-seize compound.

E. Nuts shall be tightened in an alternating "star" pattern to the manufacturer's recommended torque.

F. Slip-on type flanges intended for field fit-up and welding shall be welded inside and outside in accordance with AWWA C207.

G. The joint shall be wrapped with two layers of polyethylene encasement in accoradance with Section 15000.

3.11 FLANGED COUPLING ADAPTERS

A. Flanged coupling adapters shall be installed in accordance with the manufacturer's recommendations. Bolts shall be tightened with a torque wrench in the presence of the District Engineer to the torque recommended by the manufacturer.

3.12 CONCRETE

A. Where required, concrete thrust and anchor blocks shall be installed in accordance with Section 03300 and as shown on the Approved Plans. Prior to filling the pipeline with water, refer to Section 03300 for the minimum concrete curing time required.

3.13 WARNING/IDENTIFICATION TAPE

A. Warning/Identification Tape shall be installed in accordance with Section 15000 and the Standard Drawings.

3.14 DISINFECTION AND BACTERIOLOGICAL TESTING

A. Disinfection, bacteriological testing, and flushing shall be performed in accordance with Section 15041.

3.15 HYDROSTATIC TESTING

A. Field hydrostatic testing shall be performed in accordance with Section 15042.

3.16 FIELD PAINTING AND COATING

A. Exterior surfaces of all pipe and appurtenances not otherwise mortar-coated shall be field painted in accordance with Section 09820.

B. Areas in contact with potable water should be certified with NSF/ ANSI 61.

END OF SECTION

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SECTION 15055 – COPPER TUBING, BRASS, AND BRONZE PIPE FITTINGS

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes materials and installation of copper tubing, brass and bronze pipe fittings and appurtenances.

1.02 RELATED WORK

A. Related Work Specified Elsewhere

1. Section 02223 – Trench, Excavation, Backfilling, and Compaction
2. Section 15000 – General Piping Systems and Appurtenances
3. Section 15005 – Piping Identification Systems
4. Section 15041 – Disinfection of Water Mains, Wells, and Reservoirs
5. Section 15042 – Hydrostatic Testing of Pressure Pipelines

B. Cucamonga Valley Water District Standard Drawings

1.03 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American National Standards Institute (ANSI)

1. ANSI B1.1 - Unified Inch Screw Threads
2. ANSI B1.2 - Gages and Gaging for Unified Inch Screw Threads
3. ANSI B1.20.1 - Pipe Threads, General Purpose (Inch)
4. ANSI B16.24 - Cast Copper Alloy Pipe Flanges and Flanged Fittings

C. American Society of Testing and Materials (ASTM)

1. ASTM A 307 - Carbon Steel Bolts and Studs
2. ASTM B 43 - Seamless Red Brass Pipe, Standard Sizes
3. ASTM B 62 - Composition Bronze or Ounce Metal Castings
4. ASTM B 88 - Seamless Copper Water Tube
5. ASTM B 88M - Seamless Copper Water Tube [Metric]

D. American Water Works Association (AWWA)

1. AWWA C800 - Underground Service Line Valves and Fittings

E. Inclusion of a specific manufacturer's name in the Specifications does not mean that the specific manufacturer's product will be acceptable. Specified manufacturer's or other manufacturer's standard product shall be modified as required to meet the Specifications.

1.04 SERVICE LATERAL WET TAP CONNECTIONS

A. The District will perform all wet tap connections to existing pipelines in accordance with Section 15000.

1.05 RECYCLED WATER IDENTIFICATION

A. Copper Tubing, Brass, and Bronze Pipe Fittings for recycled water shall be identified with purple color coating, purple polyethylene sleeve, identification labels or signs in accordance with Section 15005.

1.06 WARNING/IDENTIFICATION TAPE

A. Warning/Identification Tape shall be used for all copper tubing, except that which is bored or jacked, in accordance with Section 15000.

PART 2. MATERIALS

2.01 COPPER TUBING

A. Copper tubing shall conform to the requirements of ASTM B88 Type K or ASTM B88 M (Metric) Type A seamless copper water tube. Copper tubing up to 1-inch diameter shall be soft; 2-inch shall be hard. Components shall be selected from the Approved Materials List in accordance with the Standard Drawings.

2.02 BRASS PIPE, NIPPLES, AND FITTINGS

A. Threaded nipples, brass pipe and fittings shall conform to ASTM B43, regular wall thickness. Threads shall conform to ANSI B1.20.1. Fittings shall be compression type.

2.03 BRONZE APPURTENANCES

A. Corporation stops, curb stops, meter and angle meter stops, meter flange adapters, and bronze-bodied service saddles shall be selected from the Approved Materials List in accordance with the Standard Drawings.

B. Fittings shall be compression type.

C. All items specified herein shall be manufactured of bronze conforming to ASTM B62.

D. Service saddles shall be the double strap type. Service saddles shall be used on all service and appurtenance connections on PVC piping. For piping materials other than PVC, service and appurtenance connections shall be performed in accordance with the Approved Drawings.

2.04 BOLTS AND NUTS FOR FLANGES

A. Bolts and nuts shall be in accordance with Section 15000 and the Approved Materials List.

2.05 WARNING/IDENTIFICATION TAPE

A. Warning/Identification Tape materials shall be in accordance with Section 15000 and shall be selected from the Approved Materials List.

PART 3. EXECUTION

3.01 COPPER TUBING AND FITTINGS

A. Trenching, bedding, backfilling and compacting shall be performed in accordance with Section 02223 and the Standard Drawings. Provide a minimum cover of 30-inches below finished street grade.

B. Cut tubing true and square and remove burrs.

C. Bends in soft copper tubing shall be long sweep. Shape bends with shaping tools. Form bends without flattening, buckling, or thinning the tubing wall at any point.

D. Assemble copper tubing and fittings per the manufacturer's recommendation in accordance with the Standard Drawings.

E. Install warning/identification tape in accordance with Section 15000 and the Standard Drawings.

3.02 SERVICE SADDLES

A. Service saddles shall be located a minimum of 24-inches from any pipe joint or fittings.

B. Service saddles for connections shall be located a minimum of 24-inches from other saddles. Additionally, multiple service saddles for connections that are installed on the same side of a single pipe length shall be alternately staggered between 10 degrees and 30 degrees to prevent a weak plane in the pipe.

C. The surface of the pipe shall be clean and all loose material shall be removed to provide a hard, clean surface.

D. The service saddle shall be tightened in accordance with the manufacturer's recommendations to ensure a tight seal, using care to prevent damage or distortion of the service saddle or corporation stop due to over-tightening.

E. The tap into the pipe shall be made in accordance with the pipe manufacturer's recommendation. Tapping tools and shell cutters with internal teeth or double slots that will retain the coupon shall be used.

3.03 DISINFECTION AND BACTERIOLOGICAL TESTING

A. Disinfection, bacteriological testing, and flushing shall be performed in accordance with Section 15041.

3.04 HYDROSTATIC TESTING

A. Field hydrostatic testing shall be performed in accordance with Section 15042.

END OF SECTION

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SECTION 15100 – VALVES, GENERAL

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes materials, testing and installation of manually operated process valves such as corporation stops, meter stops and ball valves.

1.02 RELATED WORK

A. Related Work Specified Elsewhere

1. Section 01000 – General Requirements
2. Section 15000 – General Piping Systems and Appurtenances
3. Section 15005 – Piping Identification
4. Section 15006 – Pipe Supports
5. Section 15041 – Chlorination of Water Main, Wells, and Reservoirs
6. Section 15042 – Hydrostatic Testing of Pressure Pipes
7. Section 15250 – Backflow Devices

B. Cucamonga Valley Water District Standard Drawings

1.03 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American Society of Testing and Materials (ASTM)

1. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
2. ASTM A536 - Specification for Ductile Iron Castings
3. ASTM B61 - Specification for Steam or Valve Bronze Castings
4. ASTM B62 - Specification for Composition Bronze or Ounce Metal Castings
5. ASTM B584 - Specification for Copper Alloy Sand Castings for General Applications

C. National Sanitation Foundation (NSF)

D. Inclusion of a specific manufacturer's name in the Specifications does not mean that the specific manufacturer's product will be acceptable. Specified manufacturer's or other manufacturer's standard product shall be modified as required to meet the Specifications.

1.04 SERVICE APPLICATIONS

A. Check valves, gate valves and ball valves are primarily used in the installation of potable and recycled water main appurtenances and where called for on the Approved Plans and indicated on the Standard Drawings.

1.05 SUBMITTALS

A. The Contractor shall submit for review and approval in accordance with Section 01000, prior to ordering or delivery of valves the following:

1. The valve manufacturers catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.

2. Manufacturers catalog data and proof of NSF certification on the lining materials to be used.

3. Installation procedures including field adjustments as required.

1.06 SIZING OF VALVES

A. Valves shall be the same size as the appurtenance in which they are to be installed with unless otherwise called for on the Approved Plans or indicated on the Standard Drawings.

1.07 VALVE ENDS

A. Valve ends shall be compatible with the piping system or appurtenance in which they are to be installed or as called for on the Approved Plans or indicated on the Standard Drawings.

1.08 DELIVERY, STORAGE AND HANDLING

A. Valves shall be delivered and stored in accordance with the manufactures recommendations. Valves shall remain in factory packaging until ready for installation. Valves shall not be stored in contact with bare ground.

1.09 RECYCLED WATER IDENTIFICATION

A. Valves for recycled water shall be identified with purple-colored coating, identification labels or signs in accordance with Section 15005.

1.10 POLYETHYLENE WRAP

A. Polyethylene wrap shall be used for the buried installation of valves in accordance with Section 15000.

1.11 VALVE CANSAND EXTENSION STEMS

A. Valve cans and extension stems shall be installed in accordance with Section 15000 and the Standard Drawings.

PART 2. MATERIALS

2.01 SMALL DIAMETER ISOLATING VALVES

A. Provide all small diameter valves and cocks for shut-off process connections, instrumentation and other miscellaneous uses in accordance with the Approved Plans. These valves shall be of the same

material and pressure rating as the adjacent process piping. These valves shall be certified to NSF/ ANSI 61 and NSF/ ANSI 372.

2.02 CORPORATION STOPS

A. Corporation stops shall be the ball type with a brass body and T-Head operator. Valve ends shall be compatible with the piping system in which they are being installed or as called for on the Approved Plans or indicated on the Standard Drawings. Corporation stops shall be rated for a minimum pressure of 200 psi. Corporation stops shall be certified to NSF/ ANSI 61 and NSF/ ANSI 372. Corporation stops shall be selected from the Approved Materials List below:

Valve Size	Corporation Stops Ball Valve			
	Mueller	James Jones	A.Y. McDonald	Ford
1”	B25028N	E1935SG	74704BQ	FB1000-4-Q-NL
2”	B25028N	E1935SG	74704BQ	FB1000-7-Q-NL

2.03 ANGLE METER STOPS

A. Angle meter stops shall be the ball type with a brass body and 90 degree lock wing. Valve ends shall be 110-style compression inlet and swivel meter nut for 1-inch and meter flange for 2-inch outlets. Angle meter stops shall be rated for a minimum pressure of 200 psi. Angle meter stops shall be certified to NSF/ ANSI 61 and NSF/ ANSI 372. Angle meter stops shall be selected from the Approved Materials List below:

Valve Size	Ball Angle Meter Valve			
	Mueller	James Jones	A.Y. McDonald	Ford
1”	B24258N	E1963WSG	74602BQ	BA43-444W-Q-NL
2”	B24276N	E1975WSG	74602BQ	BFA43-777W-Q-NL

2.04 CUSTOMER METER SHUT-OFF VALVE

A. Customer meter shut-off valves shall be the ball type with a brass body and lever handle operator. Valve ends shall be swivel meter nut for 3/4-inch and 1-inch inlets and meter flange for 1-1/2-inch and 2-inch inlets. Outlets shall be female iron pipe thread (FIP) or compression. Customer meter shut-off valves shall be rated for a minimum pressure of 200 psi. Customer shut-off valves shall be certified to NSF/ ANSI 61 and NSF/ ANSI 372. The District Engineer may require the use of a customer meter shut-off valve equipped with a 90 degree lock wing.

2.05 BALL VALVES

A. Ball valves 2-inch and smaller shall be brass body and equipped with a T-Head or lever handle operator as required. Valve ends shall be compatible with the piping system in which they are being installed or as indicated on the Approved Plans or Standard Drawings. Ball valves shall be rated for a minimum pressure of 200 psi. Ball valves shall be certified to NSF/ ANSI 61 and NSF/ ANSI 372. Ball valves shall be selected from the Approved Materials List.

2.06 BACKFLOW PREVENTERS

A. Backflow preventers shall be in accordance with Section 15250 and selected from the Approved Materials List.

2.07 POLYETHYLENE WRAP

A. Polyethylene wrap shall be in accordance with Section 15000 and selected from the Approved Materials List.

2.08 VALVE CANS AND EXTENSION STEMS

A. Gate wells and extension stems for buried valves shall be in accordance with Section 15000 and selected from the Approved Materials List.

PART 3. EXECUTION

3.01 INSTALLATION

A. Valves shall be set in true alignment straddling the centerline of pipe with the valve operator in the vertical position unless otherwise noted on the Approved Plans or shown on the Standard Drawings.

B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

C. Above ground valves shall be rigidly held in place using supports and hangers in accordance with the Approved Plans and Standard Drawings. The stem orientation of valves in elevated piping shall be as approved by the District Engineer for accessibility, except that no valves shall be installed with stems aligned below horizontal. Adjustable saddle type supports shall be provided and constructed in accordance with Section 15006. .

3.02 POLYETHYLENE WRAP

A. Installation of polyethylene wrap for buried valves shall be in accordance with Section 15000.

3.03 VALVE CANS AND EXTENSION STEMS

A. Gate wells and extension stems for buried valves shall be in accordance with Section 15000 and the Standard Drawings.

3.04 DISINFECTION OF THE VALVES

A. Disinfection and flushing shall be in accordance with Section 15041 as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.05 HYDROSTATIC TESTING

A. Valves shall be hydrostatically tested in conjunction with the pipelines in which they are installed in accordance with Section 15042.

END OF SECTION

SECTION 15110 – RESILIENT WEDGE (RW) GATE VALVES

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes materials, testing, and installation of manually operated resilient wedge (RW) gate valves.

1.02 RELATED WORK

A. Related Work Specified Elsewhere.

1. Section 01000 – General Requirements
2. Section 15000 – General Piping Systems and Appurtenances
3. Section 15005 – Piping Identification
4. Section 15041 – Chlorination of Water Main, Wells, and Reservoirs
5. Section 15042 – Hydrostatic Testing of Pressure Pipes
6. Section 15051 – Cement-Mortar Lined and Coated (CML&C) Steel Pipe and Specials
7. Section 15053 – Ductile Iron Pipe (DIP) and Fittings
8. Section 15120 – Butterfly Valves

B. Cucamonga Valley Water District Standard Drawings

1.03 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American Water Works Association (AWWA)

1. AWWA C210 - Liquid Epoxy Coating Systems for the interior and exterior of steel water Pipelines
2. AWWA C213 - Fusion Bonded Epoxy Coating for the interior and exterior of steel water Pipelines
3. AWWA C509 - Resilient Seated Gate Valves for water supply service
4. AWWA C515 - Reduced Wall, Resilient Wedge Gate Valves for water supply service
5. AWWA C550 - Protective Epoxy Interior Coatings for valves and hydrants

C. Steel Structure Painting Council (SSPC)

D. Inclusion of a specific manufacturer's name in the Specifications does not mean that the specific manufacturer's product will be acceptable. Specified manufacturer's or other manufacturer's standard product shall be modified as required to meet the Specifications.

1.04 SERVICE APPLICATION

A. All RW gate valves shall be installed on potable and recycled water mains and appurtenances in accordance with the Approved Plans and the Standard Drawings.

B. All RW gate valves shall be used for open/closed operations, throttling service and frequent operation after long periods of inactivity.

C. In general, RW gate valves shall be used when valves are required on pipelines and appurtenances 4-inch through 12-inch.

D. Valves for pipelines sized 16-inch and larger generally require the use of butterfly valves (BFV) in accordance with Section 15120.

1.05 SUBMITTALS

A. The following items shall be submitted for review and approval by the District Engineer prior to ordering or delivery of RW gate valves:

1. An affidavit from the valve manufacture stating that valves have successfully passed hydrostatic tests in accordance with AWWA C509 and manufacturer's own coatings tests.

2. The valve manufacturer's catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.

3. Manufacturer's catalog data and proof of NSF certification for the lining materials to be used.

1.06 SIZING OF VALVES

A. Valves shall be the same size as the line in which they are installed unless otherwise noted on the Approved Plans.

1.07 VALVE ENDS

A. Valve ends shall be compatible with the piping system in which they are being installed in accordance with the Approved Plans or directed by the District Engineer. Ductile-iron flanges shall be in accordance with Section 15053.

1.08 VALVE TESTING

A. RW gate valves shall be hydrostatically tested and valve coatings shall be holiday detected prior to shipment to the field in accordance with AWWA C509. Valves delivered to the site prior to successful hydrostatic testing and holiday detection shall be subject to rejection.

1.09 DELIVERY, STORAGE AND HANDLING

A. Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until valves are ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

1.10 RECYCLED WATER IDENTIFICATION

A. RW Gate Valves used for recycled water shall be identified with purple-colored coating, identification labels or signs in accordance with Section 15005.

1.11 POLYETHYLENE WRAP

A. Polyethylene wrap shall be used for the buried installation of resilient wedge gate valves in accordance with Section 15000.

PART 2. MATERIALS

2.01 RESILIENT WEDGE (RW) GATE VALVES

A. RW gate valves and appurtenant components and materials shall be selected from the Approved Materials List.

B. RW gate valves shall be ductile-iron in accordance with AWWA C509 and C515 except as modified herein.

C. Each valve shall have a smooth unobstructed waterway free from any sediment pockets.

D. All RW gate valves shall be leak-tight at their rated pressure.

E. RW gate valves shall have a non-rising low-zinc bronze or stainless steel stem, opened by turning left (counterclockwise).

F. Stem seals shall be the O-ring type incorporating a minimum of two rings as required by AWWA C509.

G. Low-friction torque-reduction thrust washers or bearings shall be provided on the stem collar.

H. Wedge (gate) shall be fully encapsulated with a bonded-in-place Nitrile elastomer covering. Minimum thickness of the rubber seating area shall be 1/4-inch.

I. Valves for buried applications shall be provided with a 2-inch square operating nut, and valves located above ground or in structures shall be equipped with a hand wheel in accordance with AWWA C509 unless otherwise indicated on the Approved Plans.

J. RW gate valves interior and exterior surfaces (except for the encapsulated disc) shall be coated as described below.

K. All bolts and nuts used in the construction of RW gate valves shall be carbon steel confirming to ASTM A307, Grade A and zince-plated..

2.02 EPOXY LINING AND COATING

A. Epoxy linings and coatings for valves shall be provided in accordance with AWWA C210, C213 and C550 with the following modifications:

1. Epoxy lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel, where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.

2. Repairs made to manufactures applied coatings shall be performed in a facility with qualified personnel, where the environment can be controlled. The facility shall be approved by the valve

manufacturer. Surface preparation shall be as detailed in SSPC-SP5, White-Metal Blast Cleaning.

3. Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.

4. The minimum dry film thickness for epoxy linings shall be 0.008-inch or 8 mils. Liquid epoxy lining shall be applied in two (2) coats in accordance AWWA C210.

5. Powder epoxy coating materials shall contain one hundred (100) percent solids, in accordance with AWWA C213.

2.03 VALVE CANS AND EXTENSION STEMS

A. Valve cans and extension stems for buried valves shall be in accordance with Section 15000 and selected from the Approved Materials List.

2.04 POLYETHYLENE WRAP

A. Polyethylene wrap shall be in accordance with Section 15000 and selected from the Approved Materials List.

PART 3. EXECUTION

3.01 INSTALLATION

A. Install valves with the bolt holes straddling the vertical centerline of pipe and the operating nut in the vertical position unless otherwise noted on the Approved Plans.

B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

C. Joints shall be cleaned and installed in accordance with Sections 15051 and 15053.

3.02 POLYETHYLENE WRAP

A. Installation of polyethylene wrap for buried valves shall be in accordance with Section 15000.

3.03 VALVE CANS AND EXTENSION STEMS

A. Valve cans and extension stems for buried valves shall be installed in accordance with Section 15000 and the Standard Drawings.

3.04 DISINFECTION OF VALVES

A. Disinfection and flushing of valves shall be in accordance with Section 15041 as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.05 HYDROSTATIC TESTING

A. Valves shall be hydrostatically tested in conjunction with the pipeline in which they are installed in accordance with Section 15042.

END OF SECTION

SECTION 15120 – BUTTERFLY VALVES (BFV)

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes materials, testing, and installation of manually operated butterfly valves (BFV).

1.02 RELATED WORK

A. Related Work Specified Elsewhere

1. Section 01000 – General Requirements
2. Section 15000 – General Piping Systems and Appurtenances
3. Section 15005 – Piping Identification
4. Section 15041 – Chlorination of Water Main, Wells, and Reservoirs
5. Section 15042 – Hydrostatic Testing of Pressure Pipes
6. Section 15051 – Cement-Mortar Lined and Coated (CML&C) Steel Pipe and Specials
7. Section 15053 – Ductile Iron Pipe (DIP) and Fittings
8. Section 15110 – Resilient Wedge (RW) Gate Valves

B. Cucamonga Valley Water District Standard Drawings

1.03 REFERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. References shall be made to the latest edition of said standards unless otherwise called for.

B. American Water Works Association (AWWA)

1. AWWA C210 Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
2. AWWA C213 Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
3. AWWA C504 Rubber-Seated Butterfly Valves
4. AWWA C550 Protective Epoxy Interior Coatings for Valves and Hydrants

C. Steel Structures Painting Council (SSPC)

D. Inclusion of a specific manufacturer's name in the Specifications does not mean that the specific manufacturer's product will be acceptable. Specified manufacturer's or other manufacturer's standard product shall be modified as required to meet the Specifications.

1.04 SERVICE APPLICATION

A. Butterfly valves (BFV) shall be installed on potable and recycled water mains and appurtenances where shown on the Approved Plans and in accordance with the Standard Drawings.

B. Butterfly valves shall be used for open/closed operations and throttling service and frequent operation after long periods of inactivity.

C. In general butterfly valves shall be used when valves are required on pipelines 16-inch and larger and where the use of a motor-operated valve is required as shown on the Approved Plans. Butterfly valves smaller than 16-inches shall only be used as indicated on the Approved Plans or with the prior approval of the District Engineer.

D. Valves for pipelines sized 12-inch and smaller generally require resilient wedge (RW) gate valves in accordance with Section 15110.

1.05 SUBMITTALS

A. The following items shall be submitted, in accordance with Section 01000, for review and approval by the District Engineer prior to ordering or delivery of butterfly valves.

1. An affidavit from the valve manufacturer showing the following:

    a. Actuators used were furnished and installed by the valve manufacturer.

    b. Valves have successfully passed hydrostatic testing per AWWA C504 and coatings testing by the valve manufacturer.

2. The valve manufacturer's catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.

3. Actuator manufacturer's catalog data and detail construction sheets showing the dimensions, materials, number of turns, and required torque input of the actuator to be used.

4. Manufacturer's catalog data and proof of NSF certification on the lining materials to be used.

1.06 SIZING OF VALVES

A. Valves shall be the same size as the line in which they are installed unless otherwise shown on the Approved Plans.

1.07 VALVE ENDS

A. Valve ends shall be flanged ductile-iron unless otherwise called for on the Approved Plans or as directed by the District Engineer.

B. Ductile-iron flanges shall generally be in accordance with AWWA C115, rated at a working pressure of 250 psi. When Class 250 butterfly valves are shown on the Approved Plans or are otherwise required, ductile-iron flanges shall be compatible with AWWA C207, Class "F".

C. Maximum working pressure of the flange shall as specified in AWWA or ASME/ANSI. Flanges shall be integrally cast per AWWA C110.

1.08 VALVE TESTING

A. Butterfly valves shall be hydrostatically tested and coatings holiday detected prior to shipment to the field in accordance with AWWA C504. Valves delivered to the site prior to successful hydrostatic testing and holiday detection will be subject to rejection.

1.09 DELIVERY, STORAGE AND HANDLING

A. Valves shall be delivered and stored in accordance with AWWA C504 and AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until the valve is ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

1.10 RECYCLED WATER IDENTIFICATION

A. Butterfly Valves for recycled water shall be identified with purple-colored coating, identification labels or signs in accordance with Section 15005.

1.11 POLYETHYLENE WRAP

A. Polyethylene wrap shall be used for buried installation of butterfly valves in accordance with Section 15000.

PART 2. MATERIALS

2.01 BUTTERFLY VALVES (BFV)

A. Butterfly valves and appurtenant components and materials shall be selected from the Approved Materials List.

B. Butterfly valves shall be short body, leak-tight closing, and rubber-seated in accordance with AWWA C504 except as modified herein.

C. Butterfly valve bodies shall be ductile-iron as defined within AWWA C504.

D. Except as modified below, BFV's shall be Class 150B in accordance with AWWA C504, rated for a flow velocity of 16ft/s.

E. Where the static pressure of the pipeline in which the BFV is to be installed exceeds 150psi, a Class 250B butterfly valve in general conformance with AWWA C504 shall be required. Class 250B butterfly valves shall be submitted to the Engineer for approval prior to ordering or delivery.

F. Butterfly valves shall open by turning left (counterclockwise). Valve disc shall rotate 90 degrees from the full open position to the tight shut position.

G. Butterfly valve interior and exterior surfaces shall be coated as described below.

2.02 MANUAL VALVE ACTUATORS

A. General:

1. All valve actuators shall be watertight, designed for buried or submerged uses. Actuators shall be fully gasketed, sealed, and factory packed with grease.

2. As directed by the District Engineer, actuators for valves located above ground or in vaults and structures may have hand wheels. Minimum hand wheel diameter shall be 12-inches. The

actuator shall be equipped with a dial indicator, which shows the position of the valve disc. The District Engineer may require the use of a 2-inch square-operating nut in some cases.

3. Actuators for valves shall be provided with a 2-inch square-operating nut when buried or when indicated on the Approved Plans.

4. Actuators shall have travel stops, which can be adjusted in the field without having to remove the actuator from the valve.

5. Actuators shall be sized for opening and closing the valve at the valve's full rated working pressure and at a flow velocity of 16 ft/s.

6. Actuators shall accept a minimum of 300 foot-pounds of input torque at the full open and full closed positions without damage to the actuator or the valve.

7. Actuators equipped with 2-inch operator nuts shall require a maximum input torque of 150 foot-pounds to operate the valve. A maximum input torque of 80 foot-pounds shall be required to operate valves with hand wheels.

8. Actuators shall be of the same manufacturer as the valve where possible or as directed by the District Engineer.

9. Actuators shall be installed, adjusted, tested and certified by the valve manufacture prior to shipping.

10. Actuators shall require a maximum of one hundred (100) input turns for the complete 90 degree movement of the disc.

11. Actuators shall receive an epoxy coating on the exterior surface as described below.

B. Traveling Nut Actuators:

1. Actuators for butterfly valves may be the manual traveling nut type. Traveling nut actuators shall not be used on valves requiring motor driven actuators or where the District has specified a worm gear type actuator.

2. Actuators shall be capable of producing the below listed output torque at the closed position:

Valve Size (inches)	Output Torque (foot-pounds)
16	2050
18	2750
20	2750
24	4700

C. Worm Gear Type Actuators:

1. Actuators for butterfly valves 30-inch or larger shall be the worm gear type. In addition, worm gear type actuators shall be used on butterfly valves requiring motor driven actuators or where the District has specified a worm gear actuator.

2. Worm gear actuators shall be totally enclosed and self-locking.

2.03 EPOXY LINING AND COATING

A. Epoxy linings and coatings for valves and actuators shall be provided in accordance with AWWA C210, C213 and C550, with the following modifications:

1. Epoxy lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel, where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.

2. Repairs made to shop-applied coatings shall be performed in a facility with qualified personnel, where the environment can be controlled. The facility shall be one that is approved by the valve manufacturer.

3. Surface preparation shall be as detailed in SSPC-SP5 White Metal Blast Cleaning.

4. Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.

5. The minimum dry film thickness for epoxy linings shall be 0.008- inch or 8 mils).

B. Liquid epoxy lining shall be applied in two (2) coats in accordance AWWA C210. F. Powder epoxy coating materials shall contain one hundred (100) percent solids, in accordance with AWWA 213.

2.04 VALVE CANS AND EXTENSION STEMS

A. Valve cans and extension stems for buried valves shall be in accordance with Section 15000 and the Approved Materials List.

2.05 POLYETHYLENE WRAP

A. Polyethylene wrap shall be in accordance with Section 15000 and the Approved Materials List.

PART 3. EXECUTION

3.01 INSTALLATION

A. Install valves with the bolt holes straddling the vertical and horizontal centerlines of pipe, with the operating nut in the vertical position, unless otherwise noted on the Approved Plans.

B. Valves shall be installed per the manufacturer's recommendation in accordance with the applicable specification for the piping material and joint type being used for the valve and the water main.

C. Joints shall be cleaned and installed in accordance with Section 15051 and 15053.

3.02 FLANGE INSULATING KITS

A. Flange insulating kits shall be installed only where shown on the Approved Plans in accordance with Section 15000.

3.03 POLYETHYLENE WRAP

A. Installation of polyethylene wrap for buried valves shall be performed in accordance with Section 15000.

3.04 VALVE CANS AND EXTENSION STEMS

A. Valve cans and extension stems for buried valves shall be installed in accordance with Section 15000 and the Standard Drawings.

3.05 DISINFECTION OF THE VALVES

A. Disinfection and flushing shall be performed in accordance with Section 15041, as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.06 HYDROSTATIC TESTING

A. Valves shall be hydrostatically tested in conjunction with the pipeline in which it is connected in accordance with Section 15042.

END OF SECTION

SECTION 15140 – BLOW-OFF ASSEMBLIES

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes materials, testing, and installation of blow-off assemblies.

1.02 RELATED WORK

A. Related Work Specified Elsewhere

1. Section 03300 – Cast-In-Place Concrete
2. Section 09820 – Field Painting and Coatings
3. Section 15000 – General Piping Systems and Appurtenances
4. Section 15005 – Piping Identification
5. Section 15041 – Chlorination of Water Main, Wells, and Reservoirs
6. Section 15042 – Hydrostatic Testing of Pressure Pipes

B. Cucamonga Valley Water District Standard Drawings

1.03 ERVICE APPLICATION

A. Blow-off assemblies shall be installed on potable and recycled water mains.

B. Blow-off assemblies shall be sized and located as shown on the Approved Plans. In general, blow-off assemblies will be installed at the ends and at low points of pipelines as shown below:

Blow-off Size (inches)	Pipe Size (inches)
2	12 and below
4	16 to 21
6	24 and above

Note: 2-inch blow-off assemblies will be required on pipelines for temporary use or as otherwise directed by the District Engineer.

1.04 RECYCLED WATER IDENTIFICATION

A. Blow-off assemblies for recycled water shall be identified with purple-colored coating, identification labels or signs in accordance with Section 15005.

PART 2. MATERIALS

2.01 GENERAL

A. Blow-off assemblies and appurtenant components and materials shall be selected from the Approved Materials List.

2.02 CONCRETE

A. Concrete used for thrust or anchor blocks shall be in accordance with Section 03300.

2.03 FIELD PAINTING AND COATING

A. Field painting and coating materials shall be in accordance with Section 09820 and the Approved Materials List.

PART 3. EXECUTION

3.01 INSTALLATION

A. Blow-off assemblies shall be installed at locations shown on the Approved Plans or as directed by the District Engineer in accordance with the Standard Drawings. Blow-off assemblies shall be connected to water mains no closer than 24-inches to a bell, coupling, joint or fitting.

3.02 CONCRETE

A. Concrete thrust and anchor blocks shall be installed in accordance with Section 03300 and the Standard Drawings. Refer to Section 03300 for the minimum concrete curing time required.

3.03 DISINFECTION OF BLOW-OFF ASSEMBLIES

A. Blow-off assemblies shall be disinfected in accordance with Section 15041 in conjunction with disinfecting the main to which it is connected. Blow-off assembly valves shall be operated and the assembly shall be flushed to completely disinfect all internal parts.

3.04 HYDROSTATIC TESTING

A. Blow-off assemblies shall be hydrostatically tested in accordance with Section 15042 in conjunction with hydrostatically testing the pipeline to which it is connected.

3.05 FIELD PAINTING AND COATING

A. Blow-off assembly appurtenances shall be field-painted in accordance with Section 09820.

END OF SECTION

SECTION 15150 – AIR RELEASE VALVE, AIR AND VACUUM VALVE, AND COMBINATION AIR VALVE ASSEMBLIES

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes the materials and installation instructions for above ground combination air valve assemblies. The term "air valve" is used generically in this specification to refer to requirements of combination air valves.

1.02 RELATED WORK

A. Related Work Specified Elsewhere

1. Section 03300 – Cast-In-Place Concrete
2. Section 09820 – Field Painting and Coatings
3. Section 09920 – Shop-Applied Fusion-Bonded Polyester Coatings
4. Section 15000 – General Piping Systems and Appurtenances
5. Section 15005 – Piping Identification
6. Section 15041 – Chlorination of Water Main, Wells, and Reservoirs
7. Section 15042 – Hydrostatic Testing of Pressure Pipes

B. Cucamonga Valley Water District Standard Drawings

1.03 REFRERENCE STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. American Water Works Association (AWWA)

1. AWWA C512 - Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service
2. AWWA C550 - Protective Interior Coatings for Valves and Hydrants

C. National Sanitation Foundation (NSF)

D. Inclusion of a specific manufacturer’s name in the Specifications does not mean that the specific manufacturer’s product will be acceptable. Specified manufacturer’s or other manufacturer’s standard product shall be modified as required to meet the Specifications.

1.04 SERVICE APPLICATION

A. Combination air valves are generally installed on all potable and recycled water mains where shown on the Approved Plans and in accordance with the Standard Drawings.

B. Unless otherwise directed by the District Engineer, combination air valves will be required as indicated below:

Combination Air Valve Size (inches)	Pipe Size (inches)
2	12 and below
4	16 and above

C. Air release valves and air and vacuum valves shall be installed in accordance with the Approved Plans and Standard Drawing or as directed by the District Engineer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard, or wood while in transit and during storage in the field. These covers shall remain in place until the valve is ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

1.06 RECYCLED WATER IDENTIFICATION

A. Air valve assemblies and enclosures used for recycled water shall be identified with purple colored coating, identification labels or signs in accordance with Section 15005.

PART 2. MATERIALS

2.01 COMBINATION AIR VALVES

A. Combination air valves and appurtenant components and materials suitable for the system pressure shall be selected from the Approved Materials List.

B. Combination air valves shall comply with AWWA C512 except as modified herein.

C. 2-inch combination air valves shall be the single-body type incorporating stainless steel internal components and suction screen. National Pipe Threaded (NPT) inlet and outlet configurations.

D. 4-inch and 6-inch Combination Air Valves shall be the single-body type incorporating stainless steel internal components, protective hood, suction screen and flanged inlet.

E. Internal protective epoxy coatings shall be provided in accordance with AWWA C550.

1. Liquid epoxy lining and coating materials shall be certified to NSF/ ANSI 61.

2. The minimum dry film thickness for epoxy linings shall be 0.008-inch or 8 mils. Liquid epoxy lining shall be applied in two (2) coats in accordance with AWWA C210.

2.02 ENCLOSURES

A. Combination Air Valve Enclosures shall be selected from the Approved Materials List.

2.03 CONCRETE

A. Concrete used for anchor or thrust blocks and equipment pads shall be in accordance with Section 03300.

2.04 FIELD PAINTING AND COATING

A. Field painting and coating materials shall be in accordance with Section 09820 and selected from the Approved Materials List.

PART 3. EXECUTION

3.01 INSTALLATION

A. Combination air valve assemblies shall be provided as shown on the Approved Plans.

B. Combination air valve assemblies shall be installed relative to street improvements in accordance with the Standard Drawings.

C. Connections for the combination air valve assemblies shall be made within a section of the main line no closer than 24-inches to a bell, coupling, joint or fitting.

3.02 ENCLOSURES

A. Combination air valve enclosures shall be installed in accordance with Standard Drawing.

3.03 CONCRETE

A. Concrete thrust or anchor blocks and equipment pads shall be installed in accordance with Section 03300 and the Standard Drawings. Refer to Section 03300 for the minimum concrete curing time required.

3.04 DISINFECTION

A. Air valve assemblies shall be disinfected in accordance with Section 15041 in conjunction with disinfecting the main to which it is connected. The assembly valves shall be operated and the assembly flushed to completely disinfect all internal parts.

3.05 HYDROSTATIC TESTING

A. Air valve assemblies shall be hydrostatically tested in accordance with Section 15042 in conjunction with the pipeline to which they are connected.

3.06 FIELD PAINTING AND COATINGS

A. Combination air valve assemblies and enclosures shall be safety yellow, in accordance with Section 09820.

END OF SECTION

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