SECTION 15064
POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

PART 1 - GENERAL

A. DESCRIPTION.

This section includes materials and installation procedures for polyvinyl chloride (PVC) pressure pipe. Generally, this section refers to the materials and procedures for installing pipe and appurtenances for potable and recycled water systems.

B. REFERENCE STANDARDS.

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.

AWWA C900	PVC Pressure Pipe, 4" Through 12" for Water Distribution
AWWA C905	PVC Water Transmission Pipe, 14" through 48”
AWWA M23	PVC Pipe-Design and Installation
Uni-Bell	Handbook of PVC Pipe Design and Construction

C. RELATED WORK SPECIFIED ELSEWHERE.

VCMWD Standard Drawings

Specifications 02221, 03300, 09900, 15000, 15041, 15044,

D. SERVICE APPLICATION.

A. PVC pipe will be used to transport and distribute potable water or recycled water as indicated on the Approved Plans.

E. DESIGN REQUIREMENTS.

SEE PART 2

F. QUALITY ASSURANCE.

A. The manufacturer of each shipment of pipe shall be required to supply a statement certifying that each lot or load of pipe has been subjected to the tests specified for PVC pipe, and has been found to meet all the requirements of AWWA C900 and/or C905 as applicable.

B. PVC pipe shall carry a current certification of the National Sanitation Foundation (NSF) as acceptable to use in the transport of potable water.

C. PVC pipe and couplings shall bear indelible identification markings as required by AWWA C900 and C905. See additional identification requirement below.

D. Provide pipe with cast-iron equivalent outside diameter, and integral wall-thickened bell and spigot ends.

E. All pipe shall have a home mark on the spigot end to indicate proper penetration when

the joint is made.

G. DELIVERY, STORAGE, AND HANDLING.

A. PVC pipe shall be stored in suppliers' yards and on the job site in accordance with AWWA M23 and the manufacturer's recommendations. PVC pipe that has been subjected to excessive ultraviolet radiation from the sun shall not be used. The determination as to the acceptability of PVC pipe faded by the sun's radiation shall rest solely with the District Engineer.

B. Store PVC pipe in the field by supporting the pipe uniformly per AWWA M23. Do not stack the pipe higher than 4’ or with weight on the bell ends. Cover stored PVC pipe to protect it from the sun's ultraviolet radiation. Pipe that has been contaminated with any petroleum products (inside or outside) shall not be installed.

C. Proper care shall be used to prevent damage in handling, moving and placing the pipe. All pipe, fittings, valves, and other pipeline materials shall be lowered into the trench in a manner that prevents damage. The pipe shall not be dropped, dragged or handled in a manner that will cause bruises, cracks, or other damage. PVC pipe that has been gouged or scratched shall be subject to rejection at the discretion of the District Engineer.

H. SERVICE SADDLES FOR PVC PIPE.

Service saddles shall be used for installation of pipe appurtenances 2” and smaller in accordance with Section 15057. Note that the Contractor shall perform all hot tap connections to existing mains in accordance with Section 15000.

I. FITTINGS.

A. PVC solvent welded joints shall be used for installation of pipe 3” and smaller

B. Ductile-iron fittings shall be used for installation of pipe appurtenances 4” and larger in accordance with Section 15056.

C. TRACER WIRE.

Tracer wire shall be installed for all PVC water mains, whether potable or recycled, in accordance with Section 15000.

D. WARNING/IDENTIFICATION TAPE.

Warning/Identification tape shall be installed for all PVC water mains, whether potable or recycled, in accordance with Section 15000.

E. RECYCLED WATER IDENTIFICATION.

A. PVC pipe for recycled water system applications shall be purple. The pipe markings shall include the designation "RECYCLED WATER" in addition to the standard factory labels required by AWWA.

B. Fittings and pipe appurtenances installed with PVC mains for recycled water shall be identified with purple-colored coating, purple polyethylene sleeves, identification labels, or signs in accordance with Section 15151.

PART 2 - MATERIALS

2.01 POLYVINYL CHLORIDE PIPE.

A. PVC pipe 3” and smaller, Schedule shall be as indicated on the plans

B. PVC pipe in sizes 4" through 12" shall comply with the requirements of AWWA C900, Class 235 DR18 and Class 305 (DR14) as shown on approved plans.

C. PVC pipe in sizes 14" through 36” shall comply with the requirements of AWWA C905, pressure ratings of Class 235 (DR18) and Class 305, as shown on the Approved Plans.

D. PVC pipe shall have common profiles for inter-changeability between rough-barrel dimensions, couplings, ends, and elastomeric gaskets to facilitate future repairs. When assembled, the pipe shall have only one gasket per bell and spigot end, and/or two gaskets per coupling.

E. PVC pipe shall be provided in standard 20' lengths, unless otherwise detailed or required on the Approved Plans. When deep trenches or shoring restrictions hinder the use of the standard length sections, the use of 10' and 15' lengths shall be allowed. Random lengths shall not exceed 15% of the total length provided.

F. The minimum length of PVC pipe sections used for tie-ins and stub-outs shall be three (3) times the pipe diameter or 24”, whichever is longer, unless otherwise approved by the District Engineer.

G. Horizontal Radius: In areas where it is required to lay the pipe along a curve, the use of deflection couplings will be used to form the arc. The pipe shall not be bent to form the arc, nor shall the pipe be deflected within integral bells or ductile-iron fittings. Deflection couplings shall be limited to use only on 6”-12”, AWWA C900 PVC pipe.

2.02 DEFLECTION COUPLINGS.

A. Unless otherwise approved by the District Engineer, AWWA C900 PVC pipe shall be installed using 5° deflection couplings (2½° at each bell).

B. Deflection couplings for use with AWWA C905 PVC Pipe shall be in accordance with the manufacturer’s recommendations, and shall be submitted to and approved by the District Engineer prior to installation.

2.03 FITTINGS.

A. PVC solvent welded joints shall be used for installation of pipe 3” and smaller.

B. Ductile-iron fittings shall be in accordance with Section 15056 The fittings shall have mechanical joint type or push-on type joints manufactured specifically for PVC pipe.

C. Ring type gaskets are approved with operating pressures up to 200psi and full face gaskets will be required with operating pressures greater than 200psi on all flanged fittings.

2.04 JOINTS

A. PVC solvent welded joints shall be used for installation of pipe 3” and smaller.

B. For PVC pipe 4” and larger, joints shall be prepared in accordance with the Manufacturer’s printed instructions and the Special Provisions. Gaskets shell elastomeric and shall conform to ASTM F477. Joint shall meet the requirements of ASTM D-3139. An approved lubricant recommended by the pipe manufacturer shall be used during assembly

C. Except where otherwise shown or specified, restraint harness shall be installed on buried PVC AWWA C900/905 pipe as follows:

1. Force mains shall have all joint restraints where concrete thrust blocks are not possible
2. Gravity pressure lines shall require joint restraints as necessary for pressure testing.

D. Restraint harnesses shall be designed specifically for PVC AWWA C900/905 pipe push-on joints and shall be EBAA Iron Series 1900, or approved equal

2.05 IMPORTED GRANULAR MATERIAL FOR PIPE BEDDING AND PIPE ZONES.

Sand material for use in pipe bidding and pipe zones shall be in accordance with Section 02221.

2.06 CONCRETE.

Concrete used for thrust and anchor blocks shall be in accordance with Section 03300.

2.07 TRACER WIRE.

Tracer wire materials shall be in accordance with Section 15000

2.08 WARNING/IDENTIFICATION TAPE.

Warning/Identification tape materials be in accordance with Section 15000

PART 3 - EXECUTION

3.01 GENERAL.

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 tight-fitting, 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 TRENCHING, BACKFILLING AND COMPACTION.

Trenching, bedding, backfilling and compaction operations shall be performed in accordance with Section 02221.

3.03 DEWATERING.

A. The Contractor shall provide, and maintain at all times during construction, ample means and devices to promptly remove and dispose all water from any source entering trench excavations or other parts of the work in accordance with Section 02221. 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 or trench materials 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.

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. Install pipe in the trench as follows:

1. Inspect each section of pipe prior to lowering the pipe into the trench. Thoroughly clean the ends of the pipe. Remove foreign matter and dirt from inside of the pipe and keep clean during and after installation.
2. Install pipe according to the manufacturer's approved order of installation to the proper lines and grades in accordance with the Approved Plans.
    a. Install pipe uphill if the grade exceeds ten percent (10%).
    b. Installation tolerances for the pipe shall not vary more than 2” horizontally or 1” vertically from the alignment and elevations shown on the Approved Plans.
    c. Install the pipe such that the identification markings on each pipe section are continuously aligned for the total length of the pipeline alignment. Orient the strip marking upward to the 12 o’clock position (top) of the trench opening.
3. The pipe shall have firm bearing along its full length, and bell holes shall be provided at each joint to permit visual inspection of the joint and prevent the pipe from being supported by the bell end or coupling.
4. The beveled end of the pipe shall be in place prior to insertion into a mechanical joint fitting.
5. Field cutting and milling shall be performed in accordance with the manufactures written instructions to equal the quality of shop-fabricated ends.
6. Pipe Assembly:
    a. Push on Type: Assemble the pipe joint using a lubricant. Insert the spigot end into the bell or coupling to the proper insertion mark. Check that the elastomeric ring has not left the groove during assembly by passing a feeler gauge around the completed joint. Drive spigot ends of the pipe into bell ends in accordance with the manufacturer’s recommendations. Stabbing shall not be permitted.
    b. Mechanical Joint Type: Assembly of mechanical joint fittings shall be in accordance with the manufacturer’s recommendations regarding installation.
7. Install deflection couplings on AWWA C900 pipe for horizontal and vertical changes in direction not greater than 80% of the manufactures recommendations and for installation of C900 pipe through curves. C900 pipe sections of differing lengths may be used as follows to facilitate the installation of pipelines through curves:
    a. Allowable lengths of pipe sections through curves are 20’, 10’, or 5’ only.
    b. No more than two 5' pipe sections may be used in succession without being separated by a 20’ or 10' section. Pipe layout through curves is subject to approval

by the Engineer. In no case shall the minimum radius be less than 76'.

c. PVC pipe shall not be bent, nor shall PVC pipe be deflected at pipe connections other than deflection couplings.

8. Methods for changes in direction or installation through curves for AWWA C905 pipe shall be as shown on the Approved Plans, and shall be submitted to and approved by the Engineer prior to installation.

3.05 SUPPORT FOR DUCTILE-IRON FITTINGS AND VALVES.

All fittings and valves shall be supported by concrete cradles in accordance with Section 03300 and the VCMWD Standard Drawings to prevent the fitting or valve weight from being carried entirely by the PVC pipe.

3.06 THRUST AND ANCHOR BLOCKS.

A. Concrete thrust and anchor blocks shall be installed in accordance with Section 03300 and the VCMWD Standard Drawings. Prior to filling the pipeline with water, refer to Section 03300 for the minimum concrete curing time required.

B. Joint restraint systems, in accordance with Section 15000, may be used only where concrete thrust blocks are not possible and with prior approval of the District Engineer.

3.07 TRACER WIRE.

Tracer wire shall be installed in accordance with Section 15000 and the VCMWD Standard Drawings.

3.08 WARNING/IDENTIFICATION TAPE.

Warning/Identification tape shall be installed in accordance with Section 15000 and the VCMWD Standard Drawings.

3.09 DISINFECTION AND BACTERIOLOGICAL TESTING.

Disinfection, bacteriological testing and flushing shall in accordance with Section 15041.

3.10 HYDROSTATIC TESTING.

Field hydrostatic testing shall be performed in accordance with Section 15044.

END OF SECTION 15064