

NORTH MARIN WATER DISTRICT

STANDARD SPECIFICATIONS

SECTION 15064 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

PART 1 GENERAL

1.01 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.

1.02 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 | - | Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. for Water Transmission and Distribution |
| AWWA C905 | - | Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. for Water Transmission and Distribution |
| AWWA M23 | - | PVC Pipe - Design and Installation |
| Uni-Bell | - | Handbook of PVC Pipe Design and Construction |

1.03 RELATED WORK SPECIFIED ELSEWHERE

NMWD Standard Drawings
NMWD Standard Specifications 02223, 03000, 09910, 15000, 15041, 15044, 15056, 15057, 15074, 15100, 15102, 15108, and 15300

1.04 SERVICE APPLICATION

- A. PVC pipe will be used to transport and distribute potable water or recycled water as indicated on the Approved Plans.
- B. In accordance with their AWWA designations PVC pipe shall be used for pipe sizes as follows:
 - 1. Four (4) inch C900 PVC pipe shall be used for the installation of appurtenances such as air valves, blowoffs and fire services.
 - 2. C900 PVC pipe shall be used for mains and related appurtenances sized six (6) inch through twelve (12) inch.
 - 3. C905 PVC pipe shall be used for mains sized fourteen (14) inch through thirty six (36) inch.

1.05 DESIGN REQUIREMENTS

- A. 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.
- B. PVC pipe shall be provided in standard twenty (20) foot 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 ten (10) foot and fifteen (15) foot lengths shall be allowed. Random lengths shall not exceed 15% of the total length provided.
- C. The minimum length of PVC pipe sections used for tie-ins and stub-outs shall be three (3) times the pipe diameter or forty-eight (48) inches, whichever is longer, unless otherwise approved by the District Engineer.
- D. Horizontal Radius: Bending of pipe shall be limited to use only on six through twelve (6-12) inches, AWWA C900 PVC pipe. Unless otherwise approved by the District Engineer, PVC pipe may be bent to form arcs with radii no less than the minimums noted below:

| <u>Pipe Size</u> | <u>Minimum Radius (for 20' pipe length)</u> |
|--------------------|---|
| Six (6) inches | 150 |
| Eight (8) inches | 200 |
| Ten (10) inches | 250 |
| Twelve (12) inches | 300 |

- E. Joint Restraint Systems may be used for PVC pipe. Design of thrust and anchor restraints shall be in accordance with AWWA M23 PVC Pipe - Design and Installation, latest edition or manufacturer's design recommendations.

1.06 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. In addition, all pipe shall bear a "home" mark on the spigot end to indicate proper penetration when the joint is made. PVC pipe for recycled water systems shall be purple. The pipe markings for PVC pipe for recycled water systems shall include the designation "RECYCLED WATER" in addition to the standard factory labels required by AWWA.

1.07 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. Store PVC pipe in the field by supporting the pipe uniformly in accordance with AWWA M23. Pipe shall not be stacked higher than four (4) feet or with weight on the bell ends.

- B. Cover stored PVC pipe with an opaque material to protect it from the sun's ultraviolet radiation. PVC pipe that has been subjected to excess ultraviolet radiation as identified by color fading or chalking shall not be used. The determination as to the acceptability of PVC pipe shall rest solely with the District Engineer.
- C. PVC pipe that has been contaminated in any way with petroleum products (on the inside or outside of the pipe) shall not be used.

1.08 SERVICE SADDLES FOR PVC PIPE

Service saddles shall be used for installation of pipe appurtenances two (2) inches and smaller in accordance with Section 15057. Note that the District will perform all hot tap connections to existing mains in accordance with Section 15000.

1.09 FITTINGS

Ductile-iron fittings shall be used for installation of pipe appurtenances four (4) inches and larger in accordance with Section 15056.

1.10 TRACER WIRE

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

1.11 WARNING/IDENTIFICATION TAPE

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

1.12 RECYCLED WATER IDENTIFICATION

PVC pipe for recycled water system applications shall be purple. 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 pressure pipe and appurtenant components and materials shall be selected from the Approved Materials List. Provide pipe with cast-iron equivalent outside diameter, and integral wall-thickened bell and spigot ends.
- B. PVC pipe in sizes four (4) inches through twelve (12) inches shall comply with the requirements of AWWA C900, Class 305 (DR14).
- C. PVC pipe in sizes fourteen (14) inches through thirty-six (36) inches shall comply with the requirements of AWWA C905, Class 165 (DR 14) or Class 235 (DR14), as shown on the Approved Plans.

2.02 DEFLECTION COUPLINGS

- A. PVC deflection couplings that allow for 2½° deflection at each bell for a maximum of 5° total deflection are limited to use on four (4) inches through twelve (12) inches, AWWA C900 PVC Pipe. Deflection couplings shall be selected from the Approved Materials List.
- 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

Ductile-iron fittings shall be in accordance with Section 15056 and selected from the Approved Materials List. The fittings shall have flange type, mechanical joint type, or push-on type joints manufactured specifically for PVC pipe.

2.04 MATERIAL FOR PIPE AND TRENCH ZONES

Material for use in pipe and trench zones shall be in accordance with Section 02223.

2.05 CONCRETE

Concrete used for thrust and anchor blocks shall be in accordance with Section 03000.

2.06 JOINT RESTRAINT

Joint restraint systems shall be in accordance with Section 15000 and shall be selected from the Approved Materials List.

2.07 TRACER WIRE

Tracer wire materials shall be in accordance with Section 15000 and selected from the Approved Materials List.

2.08 WARNING/IDENTIFICATION TAPE

Warning/Identification tape materials be in accordance with Section 15000 and selected from 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 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.
- B. 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.

- C. Where pipe sections less than the standard twenty (20) foot pipe lengths are required, the pipe sections shall be installed in accordance with the manufacturer's installation guide (with the exception of deflection at the bell and spigot) and shall only be used with the approval of the District Engineer. The minimum pipe length permitted is five (5) feet, except at fittings, stub outs and valves where a four (4) foot minimum length is allowable.

3.02 TRENCHING, BACKFILLING AND COMPACTION

Trenching, bedding, backfilling and compaction operations shall be performed in accordance with Section 02223.

3.03 DEWATERING

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 02223. Any damage caused by flooding of the trench shall be the Contractors responsibility.

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 District Engineer.

Dewatering operations shall employ Best Management Practices (BMPs) and comply with local ordinances, approved Erosion and Sediment Control Plans, approved Stormwater Pollution Prevention Plans (SWPPP) or requirements of an encroachment permit issued by a local agency. Non-stormwater discharges to the storm drain system is typically prohibited. Uncontaminated pumped groundwater or accumulated rainwater may be discharged to the storm drain system but must be managed to minimize sediment reaching storm drains and ensure downstream creeks, wetlands, and the Bay or Ocean are not polluted. The storm drain system includes streets, gutters, storm drain inlets, ditches, creeks, and wetlands.

3.04 PIPE INSTALLATION

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.

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:

- A. 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.
- B. Install pipe according to the manufacturer's approved order of installation to the proper lines and grades in accordance with the Approved Plans.
 - 1. Install pipe uphill if the grade exceeds ten percent (10%).

2. Installation tolerances for the pipe shall not vary more than two (2) inches horizontally or one (1) inch vertically from the alignment and elevations shown on the Approved Plans.
 3. 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.
- C. 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.
- D. The beveled end of the pipe shall be removed prior to insertion into a mechanical joint fitting.
- E. Field cutting and milling shall be performed in accordance with the manufacturer's written instructions to equal the quality of shop-fabricated ends.
- F. Pipe Assembly:
1. Push on Type: Assemble the pipe joint using a lubricant selected from the Approved Materials List. 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.
 2. Mechanical Joint Type: When specified on approved plans, assembly of mechanical joint fittings shall be in accordance with the manufacturer's recommendations regarding installation.
- G. Install deflection couplings selected from the Approved Materials List on AWWA C900 pipe for horizontal and vertical changes in direction not greater than 5°, and for installation of C900 pipe through curves.
- H. 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 District 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 03000 and the Standard Drawings to prevent the fitting or valve weight from being carried entirely by the PVC pipe.

3.06 THRUST AND ANCHOR BLOCKS

Concrete thrust and anchor blocks shall be installed in accordance with Section 03000 and the Standard Drawings. Prior to filling the pipeline with water, refer to Section 03000 for the minimum concrete curing time required.

3.07 JOINT RESTRAINT SYSTEMS

Joint restraint systems shall be installed in accordance with Section 15000. Joint restraint lengths along new pipelines shall be as shown on the Approved Plans. Concrete thrust and anchor blocks may be used in conjunction with Joint restraint systems at the discretion of the District Engineer. If the installation of concrete thrust blocks is not practical and use of joint restraint systems are approved by the District Engineer, calculations indicating joint restraint lengths along new pipelines shall be submitted to the District Engineer for approval. Joint restraints shall be designed in accordance with AWWA M23.

3.08 TRACER WIRE

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

3.09 WARNING/IDENTIFICATION TAPE

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

3.10 DISINFECTION AND BACTERIOLOGICAL TESTING

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

3.11 HYDROSTATIC TESTING

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

END OF SECTION 15064