NORTH MARIN WATER DISTRICT

STANDARD SPECIFICATIONS

SECTION 15065 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

PART 1 GENERAL

1.01 DESCRIPTION

This section includes materials and installation of polyvinyl chloride (PVC) gravity sewer pipe and fittings.

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.

ASTM D 2321	-	Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 3034	-	Type PSM Poly (vinyl chloride) (PVC) Sewer Pipe and Fittings
ASTM F 679	-	PVC Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F 789	-	Type PS-46 PVC Plastic Gravity Flow Sewer Pipe And Fittings
California Administrative Code, Title 22		
SSPWC	-	Standard Specifications for Public Works Construction (Green Book)
UNI-B-5	-	Recommended Practice for the Installation of PVC Sewer Pipe
Uni-Bell	-	Handbook of PVC Pipe Design and Construction

1.03 RELATED WORK SPECIFIED ELSEWHERE

NMWD Standard Drawings
NMWD Standard Specifications 01000, 02223, 03000, 03461, 15000, 15043, 15045

1.04 SERVICE APPLICATION

A. PVC gravity sewer pipe will be used to convey sewage as indicated on the Approved Plans.

B. In accordance with their ASTM designations PVC gravity sewer pipe shall be used for pipe sizes as follows:

1. Sewer Laterals: Sewer laterals shall be as indicated on the Approved Plans with a minimum size of four (4) inch.

2. Sewer Mains: Sewer mains shall be as indicated on the Approved Plans.

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. Pipe, fittings, couplings, and joints shall comply with the size, dimensions, materials, and performance requirements of the following ASTM designations:

Four (4) inch through fifteen (15) inch	ASTM D 3034, SDR 26
Eighteen (18) inch through twenty-seven (27) inch	ASTM F 679, SDR 35 (T-I)
Twenty-one (21) inch through forty-eight (48) inch	ASTM F 794, Closed Profile

C. Sewer pipe shall be furnished in standard thirteen or twenty (13 or 20) foot lengths, unless otherwise detailed or required on the Approved Plans. Random lengths may be furnished but shall not exceed 15% of the total footage.

D. Follow the manufacturer's recommendations for the minimum allowable radius for the size of pipe used.

E. All pipe, fittings, and couplings shall be clearly marked in accordance with ASTM D3034, F679, and F794, respectively.

F. All pipe shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

G. The bell and spigot configuration for the fittings and couplings shall be compatible with those used for the pipe.

H. Minimum length of PVC pipe sections used for tie-ins and stub-outs shall be thirty-six (36) inches, unless otherwise approved by the District Engineer.

I. Curves will be allowed in the sewer usually to match the curve of the road in which the sewer main is to be installed. Curves in sewer pipe shall be as recommended by the pipe manufacturer with a minimum radius of two hundred (200) feet.

J. Minimum slope of sewer pipe shall be:

pipe size (inches)	Minimum Slope r in feet per foot
6	.006
8	.0035
10	.0025
12	.0020

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 gravity sewer pipe. Tests shall show that the pipe has been found to meet all the requirements of ASTM D3034, F679, and/or F794 as applicable.

B. PVC pipe and couplings shall bear indelible identification markings as required by ASTM

D3034, F679, and/or F794 and as follows:

1. All pipe, fittings, and couplings shall be clearly marked at an interval not to exceed five (5) feet as follows:

   a. Nominal pipe diameter.

   b. PVC cell classification.

   c. Company, plant, date of manufacture, ASTM and SDR designation. Fittings and couplings do not require the SDR designation.

   d. Service designation or legend.

2. All pipe shall have home marks on the spigot ends to indicate proper penetration when joints are made.

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. 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 pipe higher than four (4) feet or stack the pipe with weight on the bell ends. Cover stored PVC pipe to protect it from the sun's ultraviolet radiation. Any pipe that has been contaminated with any petroleum products (inside or outside) shall not be installed.

C. Pipe and fittings shall be handled according to manufacturer's recommendations. Proper care shall be used to prevent damage in handling, moving and placing the pipe. All pipe, fittings, 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 or fittings that have been gouged or scratched shall be subject to rejection as determined by the District Engineer.

1.08 SADDLE CONNECTIONS TO EXISTING SEWER MAINS

Saddle-type or wye connections are used for connecting new sewer laterals to existing sewer mains. All connections to be existing system must be performed in the presence of District Engineer.

1.09 WARNING/IDENTIFICATION TAPE

All PVC pipe sewer mains shall include the installation of Warning/Identification Tape in accordance with Section 15000.

1.10 CURB IDENTIFICATION MARK FOR SERVICES

The Contractor shall mark the location of each sewer lateral at the curb crossing as described in

Section 15000.

1.11 CLEANOUTS

Size-on-size cleanouts are required at the end of mains eight (8) inches and smaller that extend no more than two hundred (200) feet and have no more than three (3) laterals installed at or near the end of the main. Manholes are required at the ends of mains larger than eight (8) inches, or on mains which have four (4) or more laterals at or near the end, or on mains extending beyond two hundred (200) feet.

1.12 SEWER FORCE MAINS

Sewer force mains are pressure lines and shall be constructed of PVC pipe in accordance with Section 15064 and the Approved Plans.

PART 2 MATERIALS

2.01 PIPE AND FITTINGS

A. PVC gravity sewer pipe and appurtenant components and materials shall be selected from the Approved Materials List.

B. PVC pipe in sizes four (4) inches through fifteen (15) inches shall comply with the requirements of ASTM D3034, SDR-26.

C. PVC pipe in sizes eighteen (18) inches through (27) inches shall comply with the requirements of ASTM F679, SDR-29 (T-1).

D. PVC pipe in sizes twenty one (21) inches through forty eight (48) inches shall comply with the requirements ASTM F794, Closed Profile.

2.02 PIPE ZONE MATERIAL

Material for use in the pipe zone shall be in accordance with Section 02223.

2.03 TRENCH PLUGS

When shown on drawing, trench plugs consisting of compacted selected impervious materials or sand cement slurry, shall be in accordance with Section 02223 and Standard Drawing.

2.04 TRENCH ZONE MATERIAL

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

2.05 CONCRETE

Concrete used for anchor blocks, lugs and other uses as required shall be in accordance with Section 03000.

2.06 WARNING/IDENTIFICATION TAPE

Warning/Identification Tape materials shall be in accordance with Section 15000 and selected from the Approved Materials List.

2.07 CLEANOUTS

Materials used for the installation of cleanouts shall be 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, close the ends of the pipe 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. Where pipe sections less than the standard thirteen or twenty (13 or 20) foot pipe lengths are required, the pipe sections shall be installed in accordance with the manufacturer's installation guide and shall only be used with the approval of the District Engineer. The minimum pipe length permitted is five (5) feet when used to connect to manholes and cleanouts. The minimum pipe length permitted for stub outs shall be thirty six (36) inches.

3.02 TRENCHING, BACKFILLING AND COMPACTION

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

3.03 TRENCH PLUGS

The installation of sewer mains shall incorporate trench plugs. Trench plugs shall be installed in accordance with Section 02223 and Standard Drawings.

3.04 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. Sewer mains shall not be used as drains for dewatering construction trenches. 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.

3.05 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, supports, gaskets, jointing materials, and all other appurtenances as shown and as required to provide a complete and workable installation. Pipe installation shall be as recommended in UNI-B-5 except as modified below and as shown on the Approved Plans.

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 pipe clean during and after installation.

B. Install pipe according to the manufacturer's approved order of installation to the proper lines and grades as shown on the Approved Plans.

1. Pipe shall be installed with pipe bells up-grade. Lay pipes 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.

4. Avoidance of reverse slope: Any pipeline installed with reversed slope, as evidenced by ponding of water or sag, is not allowed. Any such pipeline shall be removed and replaced (at proper line and grade) to the nearest upstream and downstream sewer structure as directed by the District Engineer.

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.

C. Field cutting and milling shall be accomplished to equal the quality of shop-fabricated ends in accordance with the manufacturer's written instructions.

D. Pipe Assembly: Assemble the pipe joint using NSF 61 approved lubricant supplied by the pipe manufacturer. 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 the spigot end into the bell in accordance with the manufacturer's recommendations. Stabbing shall not be permitted.

F. Horizontal or vertical curve alignments shall be accomplished as required, in accordance with the manufacturer's recommendations. A combination of random pipe lengths, bending, and joint deflection shall be utilized to create smooth radius curves in accordance with the manufacturer's recommendations and as directed by the District Engineer.

G. PVC wyes shall be located where shown on the Approved Plans in accordance with the Standard Drawings. Wyes shall not be placed closer than five (5) feet from the exterior of any structure such as manholes.

3.06 SEWER LATERALS

A. The Contractor shall install sewer laterals using wye-branch fittings sized and located as shown on the Approved Plans.

B. All sewer laterals that are to be left unconnected to a building lateral extension shall be capped and identified as shown on the Standard Drawings.

C. All sewer laterals shall run perpendicular from the sewer main to the property line. They shall be bedded, backfilled and compacted the same as the sewer main into which they connect in accordance with Section 02223.

D. All sewer laterals shall be plugged or capped at the end of the last joint, to withstand the internal pressure during leakage and infiltration testing.

3.07 SADDLE CONNECTIONS TO EXISTING SEWER MAINS

The Contractor shall furnish the saddle fitting, appurtenances and all other materials as called for in the Standard Specifications 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 backfill and pavement replacement. In certain circumstances the Contractor may be required to provide a water truck, bypass pump, and fittings as part of the equipment for making the connections. Emergency standby equipment or materials may be required of the Contractor by the District Engineer.

Saddle connections to existing sewer mains for the tie-in of new sewer laterals shall be as follows:

A. Prior to construction, Contractor shall pothole the existing pipe at the location of the proposed connection. The District 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 Record Drawings:

1. Pipe size, outside diameter.

2. Pipe type such as PVC or VCP.

3. Elevation, grade, and alignment.

4. Can the tie in be made at the indicated location, assure no collars, pipe bells, fittings or couplings exist in the area of the connection.

5. Potential conflicts with existing utilities.

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

C. After the District Engineer has given approval to proceed with the connection, the Contractor shall schedule with the District Engineer for the connection.

1. Tie-ins will be scheduled at the convenience of the District. Work may be scheduled for nights and weekends if required.

2. The Contractor shall give the District Engineer a minimum of five (5) working days notice prior to any proposed excavation. Scheduling shall be subject to approval of the District Engineer.

3. The District Engineer may postpone or reschedule the connection 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.

4. 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.

D. Contractor may proceed with the excavation and connection, only when approved materials are onsite, connection operations have been scheduled and a copy of the approved traffic control plan has been supplied to the District Engineer.

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

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

3. After the District has performed connection operations, and the District Engineer has given approval to proceed, the Contractor shall complete the installation as shown on the Approved Plans in accordance with Standard Specifications including:

a. Installing the pipe section(s) necessary to make the closure to the new system.

b. Complete all backfill and compaction of the trench in accordance with Section 02223.

c. Make all pavement repairs and/or replacement as necessary in accordance with agency of jurisdiction requirements.

d. Discard pipe and appurtenances removed from service as specified in this Section.

3.08 CONNECTION TO EXISTING SEWER SYSTEM

A. Connection to the existing sewer system at an existing manhole or dead end shall be made as shown on the Approved Plans in accordance with Section 03461. All work shall be performed in the presence of the District Engineer.

B. In order to prevent accidental use of the new sewer before completion and acceptance, the new inlet to the existing tie-in manhole and the outlet of the first new upstream manhole shall be sealed with expandable plugs. Installation of plugs shall be in accordance with the manufacturer's recommendations and as approved by the District Engineer. Plugs shall be removed at the time of final inspection or as directed by the District Engineer.

3.09 CONCRETE

Concrete for anchor blocks, lugs and other uses shall be installed as called for in Section 03000 in accordance with the Standard Drawings. Refer to Section 03000 for the minimum concrete curing time required.

3.10 WARNING/IDENTIFICATION TAPE

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

3.11 CLEANOUTS

Cleanouts shall be installed at the locations shown on the Approved Plans in accordance with the Standard Drawings.

3.12 CLEANING

A. Before testing, each pipe shall be thoroughly flushed with clean water from manhole to manhole with an appropriately- sized inflatable ball.

B. All construction debris and water shall be removed from each manhole prior to removal of the plugs.

C. Water used in flushing out the new sewer mains, laterals, or house plumbing shall not be discharged into the existing sewer system.

3.13 MANDREL TEST

A. Following backfill and compaction, installation of all utilities, and prior to permanent pavement replacement, all main line sewer pipe shall be mandrelled to check for obstructions. A rigid mandrel, circular in cross section, having a diameter of 95% of the pipe inside diameter, and equal in length to the pipe diameter, shall be pulled through the pipe by hand.

B. Obstructions encountered by the mandrel shall be corrected by the Contractor. If an obstruction is encountered, the District Engineer shall approve corrective measures prior to implementation.

3.14 LEAKAGE AND INFILTRATION TESTING

Field leakage and infiltration testing of sewer mains shall be performed in accordance with Section

Section 15043.

3.15 CLOSED-CIRCUIT TELEVISION INSPECTION

Closed-circuit television (CCTV) inspections of sewer mains shall be performed in accordance with Section 15045.

3.16 FINAL INSPECTION

A final visual inspection shall be made after paving has been completed and all manhole frames have been raised to grade. The Contractor shall have a responsible person present and shall furnish the necessary labor to assist the District Engineer in making the final inspection. Acceptance of the system will be pending completion or correction of items identified during this inspection.

END OF SECTION