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 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 794 - Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
AWWA M23 - PVC Pipe – Design and Installation
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

Standard Drawings
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. ASTM D 3034, SDR-41 pipe shall be used for the installation of gate wells and access ports in water applications as shown on the Standard Drawings.

2. ASTM D 3034, SDR-35 pipe shall be used for the installation of sewer laterals with a minimum size of (4”) as shown on the Approved Plans.

3. ASTM D 3034, SDR-35 pipe shall be used for mains, fittings, couplings, and joints sized (4”) through (15”).

4. ASTM D 3034, SDR-26 pipe shall be used for mains, fittings, couplings, and joints sized (4") through (15") when depth exceeds 12 feet.

5. ASTM F 679, SDR-35 (T-1) pipe shall be used for mains, fittings, couplings, and joints sized (18") through (27") as shown on the Approved Plans.

6. ASTM F 794, Closed Profile pipe shall be used for mains, fittings, couplings, and joints sized (21") through (48") as shown on the Approved Plans.

1.05 DESIGN REQUIREMENTS

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

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

C. Horizontal curves in sewer mains shall be as shown on the Approved Plans.

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 D 3034, F 679, and/or F 794 as applicable.

B. PVC pipe and couplings shall bear indelible identification markings as required by ASTM D 3034, F 679, and/or F 794 and as follows:

1. All pipe, fittings, and couplings shall be clearly marked with the following information at an interval not to exceed (5'):

A. Nominal pipe diameter.

B. PVC cell classification.

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

D. Service designation or legend.

2. All pipe shall bear a "home" mark on the spigot end to indicate proper

penetration when the joint is made.

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

1.07 DELIVERY, STORAGE, AND HANDLING

A. PVC pipe shall be stored in suppliers' yards and on the job site by supporting the pipe uniformly in accordance with AWWA M23 and the manufacturer's recommendations. Pipe shall not be stacked higher than (4') 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 SADDLE CONNECTIONS TO EXISTING SEWER MAINS

Saddle-type connections are used for connecting new sewer laterals to existing sewer mains. The District shall perform all saddle connections to the existing system in accordance with this Section and the Standard Drawings.

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 MANHOLES

Manholes shall be installed in accordance with Section 03461 when shown on the Approved Plans.

1.12 CLEANOUTS

Size-on-size cleanouts are permissible at the end of mains (8") and smaller that extend no more than (200') and have no more than three (3) laterals installed at or near the end of the main. Cleanouts shall be installed at ends of mains and on sewer laterals in accordance with the Standard Drawings when shown on the Approved Plans.

1.13 SEWER FORCE MAINS

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

PART 2 MATERIALS

2.01 POLYVINYL CHLORIDE 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 (4") through (15") shall comply with the requirements of ASTM D 3034, and match the class of pipe shown on the approved plans.

C. PVC pipe in sizes (18") through (27"), when shown on the Approved Plans, shall comply with the requirements of ASTM F 679, SDR-35 (T-1).

D. PVC pipe in sizes (21") through (48"), when shown on the Approved Plans, shall comply with the requirements ASTM F 794, Closed Profile.

2.02 CRUSHED ROCK FOR PIPE ZONES

Crushed rock material for use in the pipe zone shall be in accordance with Section 02223.

2.03 IMPORTED GRANULAR MATERIAL FOR TRENCH ZONES

Imported granular material for use in trench zones shall be in accordance with Section 02223.

2.04 CONCRETE

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

2.05 WARNING/IDENTIFICATION TAPE

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

2.06 MANHOLES

Materials used for the installation of manholes shall be in accordance with Section 03461 and shall be 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, the ends of the pipe shall be closed with tight-fitting, vermin-proof and child-proof caps or plugs. 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 at all times.

B. 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 that has been gouged, scratched, or otherwise damaged shall be subject to rejection at the discretion of the District Engineer.

C. Where pipe lengths less than the standard (13') or (20') 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, which is not allowed) and shall only be used as specified herein or with the approval of the District Engineer. The minimum pipe length permitted is (5') when used to connect to manholes and cleanouts. The minimum pipe length permitted for stub outs is (36").

3.02 TRENCHING, BACKFILLING AND COMPACTION

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

3.03 DEWATERING

Dewatering of trench excavations shall be performed in accordance with Section 02223. If flooding of the trench does occur, the Contractor shall immediately dewater and restore the trench. Damaged or altered pipelines, appurtenances, or trench materials shall be repaired or replaced as directed by the District Engineer.

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, 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 and as follows:

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 (2”) horizontally or (1”) 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.

D. Field cutting and milling shall be performed in accordance with the manufacturer’s written instructions to equal the quality of shop-fabricated ends.

E. Pipe Assembly: Assemble the pipe joint using the lubricant supplied by the pipe manufacturer. Insert the spigot end into the bell 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. Wyes shall not be placed closer than (5') from the exterior of any structure such as manholes.

3.06 SEWER LATERALS

A. The Contractor shall install sewer laterals where shown on the Approved Plans in accordance with the Standard Drawings.

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

C. 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.

D. 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.

3.07 SADDLE CONNECTIONS TO EXISTING SEWER MAINS

The Contractor shall furnish saddle fittings, 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 connections 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. Location of any collars, pipe bells, fittings or couplings in the area of the connection that prohibit installation of laterals.

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 (10') gap between the new pipe installation and the proposed connection point at the existing main. The Contractor shall leave a gap longer than (10') if conditions warrant, or if directed by the District 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 notice of five (5) working days 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, when connection operations have been scheduled, and when a copy of the approved traffic control plan has been supplied to the District Engineer.

1. When directed to do so by the District Engineer, the Contractor shall saw-cut pavement, excavate, and provide and install shoring and steel plating one day prior to the cut-in installation.

2. The Contractor shall provide lights, barricades and traffic control in accordance with the requirements of the Agency of Jurisdiction and 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 and as follows:

A. Install 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. Repair or replace all pavement as necessary in accordance with the requirements of the Agency of Jurisdiction.

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 and in accordance with Section 03461. All work shall be performed in the presence of the District Engineer.

B. In order to prevent unauthorized or 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 and in accordance with the Standard Drawings.

3.10 WARNING/IDENTIFICATION TAPE

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

3.11 MANHOLES

Manholes shall be installed in accordance with Section 03461 at the locations shown on the Approved Plans.

3.12 CLEANOUTS

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

3.13 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.

3.14 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.

3.15 LEAKAGE AND INFILTRATION TESTING

Field leakage and infiltration testing of sewer mains shall be performed in accordance with Section 15043.

3.16 CLOSED-CIRCUIT TELEVISION INSPECTION

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

3.17 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. Final acceptance of the system will be withheld pending completion or correction of items identified during this inspection.

END OF SECTION 15065