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SEWER PIPELINE CONSTRUCTION SPECIFICATIONS

1. SEWER PIPE INSTALLATION

A. General

The Contractor shall furnish and install all sewer pipeline material required for the construction of the sewer and appurtenances as herein specified and shown on the Drawings. All pipeline material shall be installed per manufacturer's published recommendations and per the applicable published standards for the particular material being installed unless otherwise modified herein. In case of any conflict, the most stringent and highest requirement shall govern, and the Contractor shall adhere to said requirement, all at no additional cost to the District.

B. Installation of Pipelines

Pipe laying shall proceed up-grade with the spigot ends of bell-and-spigot pipe pointing in the direction of the flow. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe, following manufacturer's instructions for the specific jointing method being used. Any pipe which exceeds 1/2-inch from true alignment, settlement, or joint offset after laying shall be taken up and relayed at the Contractor's expense. The SAG measuring device shall be approved by the District. The SAG measuring device shall have a scale to measure the depth of flow to the invert of the pipe and shall be placed in front of the camera. The Contractor shall clean the pipe by balling.

Notwithstanding prior factory or yard inspection, the District shall have the right to reject any damaged or defective pipe found on the job which in the District's opinion will affect the durability of the installation, and the District may order its removal from the work.

C. Sewer Constructed on Radius

Whenever portions of the proposed sewer construction are to be installed on the radius of a curve, the minimum radius and installation of the pipe shall be in accordance with the manufacturer's recommendations.

D. Cleaning

Before final acceptance of sewer facilities or prior to putting any sewer into service, all sewer facilities shall be visually checked and all foreign objects, materials or obstructions removed from the facilities. The District shall require that the facilities be cleaned by flushing, balling, rodding or other means so that the materials may be removed from the system.

E. Plastic Sewer Systems

(1) General

These provisions establish the requirements for the use of plastic pipe (i.e. PVC, ABS) for house lateral and main line sewer construction. Use is limited to those projects which are approved in writing by the District.

Plastic pipe may only be used where indicated on plans approved by the District. Where plastic pipe is used, one type shall be used between consecutive manholes and shall include the house laterals in that system. When pipe and fittings are fabricated by the same manufacturer, contractor will not be allowed to use fittings from other manufacturers.

Plastic pipe shall not be used for sewers serving industrial areas, or areas that, in the opinion of the District, are likely to be rezoned to industrial zones.

(2) Care & Handling

Pipe shall be stored at the jobsite in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression, damage or deformation to bell ends of the pipe. If pipe is to be exposed to direct

sunlight for more than 14 days, pipe must be covered with an opaque material while permitting adequate air circulation above and around the pipe to prevent excessive heat accumulation.

If pipe is strung along trench prior to installation, string only pipe to be used within a 24-hour period; all pipe is to be laid on a flat surface. The interior as well as all sealing surfaces of pipe, fittings, and other accessories shall be kept free from dirt and foreign matter. Gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease. Solvent cement when used shall be stored in tightly sealed containers away from excessive heat.

(3) Mandrel Test of ABS & PVC Pipe

Following the placement and densification of backfill and prior to the placing of permanent pavement, all main line pipe shall be cleaned and then mandrelled to measure for obstructions (deflections, joint offsets and lateral pipe intrusions). A rigid mandrel, approved by the Engineer, with a circular cross section having a diameter of at least 95% of the specified average inside diameter, shall be pulled through the pipe by hand.

Ninety-five (95%) of the specified average inside diameter for flexible plastic pipe taken from the appropriate ASTM requirements are as follows:

	ABS Solid Wall (ASTM D-2751) SDR		**PVC Solid Wall (ASTM D-3034) SDR**	
Pipe Nominal Dia.	**23.5"**	**35"**	**35"**	**26"**
4"	3.62"	3.69"	3.975"	3.891"
6"	5.33"	5.45"	5.915"	5.793"
8"	N/A	N/A	7.920"	7.754"
10"	N/A	N/A	9.900"	9.692"
12"	N/A	N/A	11.78"	11.538"

(4) High Density Polyethylene (HDPE) Pipe

All laying, slipling, jointing, testing for defects and for leakage shall be performed in the presence of the District's authorized

representative and will be subject to his/her approval before acceptance.

Installation shall conform to the requirements of ASTM D 2321, ASTM D 2774, ASTM F 585, instructions furnished by the pipe manufacturer and supplementary requirements or modifications specified herein. Wherever the requirements of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

HDPE pipe shall be limited for use in easements at the direction of the District. HDPE pipe may be laid with a horizontal curvature, however the curvature radius shall be no greater than 50-percent of the pipe manufacturer's recommendations.

SHIPMENT, STORAGE AND HANDLING

The Manufacturer shall package products for shipment in a manner for safe transport by commercial carrier. The carrier shall use the appropriate methods and intermittent checks to insure the pipe is properly supported, stacked and restrained during transport such that the pipe is not nicked, gouged or physically damaged.

When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the Manufacturer.

Pipe shall be stored at the job site in unit package provided by the manufacturer. The Contractor shall take every precaution to avoid compression damage or deformation to the pipe and to the ends of the pipe. The pipe shall be stored in such a way as to prevent sagging or bending and shall be protected from exposure to direct sunlight. Gaskets should be stored in a cool, dark place out of the direct rays of the sun, preferably in the original cartons.

The Contractor shall prevent undue scratching or gouging of the pipe in storage and handling of the pipe. Sections of the pipe with cuts or gouges in excess of 10% of the pipe wall thickness shall be

cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.

When lifting and handling with slings, only wide fabric slings capable of safely carrying the load shall be used to lift, move or lower pipe and fittings. Metal, wire rope or chains shall not be used. Slings shall be of sufficient capacity for the load and shall be inspected before use. Worn or defective equipment shall not be used.

JOINING

HEAT FUSION JOINING: Joints between plain end pipes and fitting shall be made by butt fusion and joints between the main and saddle branch fittings shall be made using saddle fusion using only procedures that are recommended by the pipe and fittings Manufacturer. External beads produced by the heat fusion procedure shall not be removed, but internal beads shall be removed. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacture's recommended procedure. The Contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months before commencing construction. The Contractor shall schedule a time to have the pipe Manufacturer provide training to the Contractor's pipe installer and the District's representative.

MECHANICAL JOINING: Polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining HDPE pipe or for joining HDPE pipe to another pipe material such as PVC. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with the Manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings. When an outside diameter compression mechanical

coupling is used, a stainless steel stiffener shall be installed in the bore of the HDPE pipe.

MECHANICAL JOINT AND FLANGE INSTALLATION: Mechanical joints and flange connections shall be installed in accordance with the Manufacturer's recommended procedure. Flange faces shall be centered and aligned to each other before assembling and tightening of the bolts. In no case shall the flange bolts be used to draw the flanges into alignment. Bolt threads shall be lubricated and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening partner and torque step recommendations of the Pipe Manufacturer. The final tightening torque shall be 100 ft-lbs or less as recommended by the Pipe Manufacturer.

LARGE DIAMETER FITTINGS: Fabricated directional fittings 16 inches IPS and larger shall be butt fused to the end of the pipe. The flange directional outlet connections shall be made up in the trench.

EXCAVATION, BEDDING AND BACKFILL

EXCAVATION: Trench excavations shall conform to the plans and drawings or as otherwise authorized noted. The Contractor shall remove excess groundwater if any encountered. The trench walls shall be shored or reinforced when necessary. The Contractor shall take all the necessary precautions to ensure a safe working environment.

BEDDING: Pipe shall be laid on grade and on stable foundation. Unstable or "mucky" trench bottom soils shall be removed and a 6-inch bedding of compacted material shall be installed to the pipe bottom grade. Excess groundwater shall be removed from the trench before laying the bedding and the pipe. A trench cut in rock or stony soils shall be excavated 6 inches below the pipe bottom grade and brought back to grade with compacted bedding. All ledge rock, boulders and large stones shall be removed.

BACKFILLING: Backfilling shall be performed in accordance with the Manufacturer's recommendations and with the District's Standard Plans. Compacted material shall be at least 90% R.C. in 6-inch lifts.

FINAL BACKFILLING: Final backfill shall be placed and compacted to finish grade in accordance with the Manufacturer's recommendations and with the District's Standard Plans. Native soils without debris, stones, boulders, clumps, clods or the like larger than 8 inches may be used.

FIELD TESTING

BUTT FUSION TESTING: On every day that butt fusions are to be made, the first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, then fusion test straps shall be cut out. The test straps shall be 12-inch minimum or 30 times the wall thickness in length with the fusion in the center and 1-inch minimum or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made and the procedure to be repeated. The butt fusion procedure shall not commence until the trial fusion has passed this test.

HYDROSTATIC PRESSURE AND LEAKAGE TESTING: The Contractor shall perform hydrostatic pressure and leakage test in accordance to the District Standards and in strict accordance with the Manufacturer's recommendations. In the event the section of pipe being tested fails, the Contractor shall locate and repair failure at no additional cost to the Contact. Test results shall have the full acceptance of the District prior to passing. No leakage will be allowed for butt fusion joints.

F. Measurement and Payment

Unless specifically otherwise provided for in these Specifications, full compensation for the work required for a complete installation of sewer pipeline

shall be considered included in the bid unit price per linear foot of pipe, and no other compensation shall be made therefore.

Measurement for payment of pipe shall be on the basis of the horizontal linear footage constructed by the Contractor, complete in place. Measurement will exclude the space occupied by structures constructed by the Contractor. Pipe stubs of one pipe length or less installed in manholes shall be included in the price for manholes and will not be included in the measurement for pipe.

Where excavation depth breakdowns are indicated on the Bidding Sheet, the depths (sewer invert to ground surface) shall be determined by the cut sheets prepared by the survey crew.

Where the offset stake elevation varies more than 0.5 feet from the pipe centerline elevation (at the ground surface), the survey crew will take elevation shots to determine the actual cut from ground surface to invert of pipe. Using this procedure, the payment depth will be based upon average depth between 25-foot interval stations.

The District reserves the right to revise pipeline grades, and the Contractor shall trench and lay accordingly. Payment for said grade revisions shall be based upon the unit bid price for the appropriate size and depth category, and no additional compensation shall be made therefore.

G. Payments to Contractor for Completed Work

NO PARTIAL PAYMENT SHALL BE GIVEN TO THE CONTRACTOR FOR CONSTRUCTION OF THE SYSTEM UNTIL THE PORTION OF THE SYSTEM FOR WHICH THE PAYMENT IS TO BE MADE HAS BEEN TESTED AND THE ENGINEER HAS CERTIFIED THAT THE SYSTEM IS SUBSTANTIALLY COMPLETED AND READY FOR USE.

Consideration for partial payment may be given prior to the Contractor completing the permanent pavement (excluding AC Cap), provided the delay of placing the permanent paving was, in the opinion of the Engineer, due to causes beyond the control of the Contractor.

The Engineer may establish priorities for completion of certain parts of the work which may be necessary to provide certain services or which they may deem advisable in the interests of public safety and convenience.

2. MANHOLES

A. General

The manholes shall be constructed in accordance with the Standard Drawing, and at the locations shown on the plans. All concrete used in the manholes shall be Class "A" Concrete, as provided in Section 5 of these Basic Construction Specifications, unless otherwise indicated herein.

B. Precast Concrete Sections

Precast manhole sections shall conform to the size, shape, form and details shown on the Standard Drawing. The precast cylinder units and precast eccentric top sections shall meet the strength requirements for "Precast Reinforced Concrete Manhole Risers and Tops", ASTM C478. The Contractor shall submit shop drawings of the precast manhole Contractor proposes to use. Each manhole section shall be sealed with an approved preformed, permanently flexible gasket to form a watertight joint. Sealed joints shall conform to ASTM C-990; and shall not shrink, harden or oxidize upon aging. Precast concrete grade rings are to be joined and sealed with CS-102B butyl/bitumen blended sealant as manufactured by ConSeal of New Carlisle, Ohio, or District approved equal. Manhole sections shall be set perfectly plumb. Sections of various heights shall be used in order to bring the top of the manhole ring and cover to the elevation shown on the plans.

C. Manhole Bases

Manhole bases shall be constructed of Class "A" concrete poured against native undisturbed material and to the form and dimensions shown on the Standard Drawing. If the Contractor over-excavates beyond the vertical dimensions shown on the Standard Drawing, the depth of concrete below the invert of the pipe shall be increased to greater than the 9" minimum as required to meet undisturbed material; all at no additional cost to the District.

Concrete shall be poured to a level ring-section seating surface, with the base centered over the sewer intersection unless otherwise specified. A metal forming ring shall be used to form a level joint groove in the manhole base. The groove will receive the first precast section to form a watertight joint.

Concrete shall be allowed to reach sufficient compressive strength prior to the installation of the precast manhole sections.

Connections of plastic sewer pipe to a manhole shall be watertight. All PVC or other flexible pipes entering or leaving concrete structures, including manholes, shall have a rubber sealing gasket, as supplied by the pipe manufacturer, firmly seated perpendicular to the pipe axis, around the pipe exterior and cast into the structure as a water stop. Additional requirements may be imposed by the District for manhole connections in projects constructed in areas of high or potentially high groundwater.

Precast manhole bases WILL NOT be allowed.

D. Manhole Frames and Covers

Manhole frames and covers shall be in accordance with the Standard Drawing. All frames and covers shall be traffic strength and shall be monogrammed according to the agency having jurisdiction. All frames and covers shall be composite material, EJ Series per District Standard Drawing No. S-7, Sheet 2 of 2.

The elevations at which manhole frames and covers are to be set shall conform to the requirements set forth on the plans, but in all cases shall be governed by the District in the field. Manholes shall not be constructed to final grade until final paving has been completed. Where the cover is in existing pavement or in the traveled way of the existing road shoulder, it is to be placed flush with the existing surface. Where the cover is in unpaved areas, it shall be set per the Standard Drawing.

Manhole frames shall be set at the required grade and shall be securely attached to the top precast manhole shaft unit with a grout bed and filled as shown on the Standard Drawing. After the frames are securely set in the place provided herein, covers shall be installed and all necessary cleaning and scraping of foreign

materials from the frames and covers shall be accomplished to ensure a fine satisfactory fit. All costs of setting and securing manhole frame and cover sets in place as herein provided, including all necessary concrete work, shall be considered as included in applicable contract unit prices and no additional allowance will be made therefore.

E. Standard Manholes

Standard manholes shall be constructed in accordance with the Standard Drawing and at the locations shown on the plans. Materials and construction of standard manholes shall conform in all respects to the applicable provisions of these specifications.

Standard manholes shall be either four-(4)-foot, five-(5)-foot, or six-(6)-foot diameter as shown on the plans. Full compensation for a complete installation of standard manholes shall be paid for at bid unit price per each and no other compensation will be made therefore.

F. Joint Wrap in Groundwater Conditions

In conditions where groundwater exists (or where the soils report indicates it could potentially exist) external wrap all joints with an approved joint wrap impermeable to the groundwater. Joint wrap shall be a minimum of 65 mils thickness with width at least four (4) inches either side of concrete section joint. Product shall be ConWrap as manufactured by ConSeal of New Carlisle, Ohio, or District approved equal. The external wrap shall be installed in addition to the required joint sealant per Section E.2.B herein.

G. Testing of Manholes

(1) Ground Water Conditions – Infiltration Test

All manholes in areas where ground water exists over the top of the pipe shall be water tested. All pumping of ground water shall be discontinued for at least three (3) days, after which the manhole shall be tested for infiltration. The inlet (s) and outlet of each manhole shall be

plugged. Test for a minimum of thirty (30) minutes. No visible leakage shall be allowed.

(2) Vacuum Testing

All manholes shall be vacuum tested. Refer to Section E.12 herein for specification requirements.

H. Lining of Manholes

Utilithane 1600 Polyurethane Coating, 30SPL, as manufactured by Prime Coatings Inc. is ASTM D16, Type V, elastomeric, high build, corrosion and abrasion resistant, 100-percent pure polyurethane and 100-percent solids (no solvents) containing no volatile organic compounds or fillers.

Hydrogen sulfide resistant and tested by City of Los Angeles per SSPWC Greenbook Section 211-2. The service duty to be for new concrete sanitation wastewater structures, minimum of 150 mils thickness. Adhesion strength to concrete substrate per ASTM D4541 elcometer pull test, with primer, adhesion meets or exceeds 200 psi or the cohesive strength of the concrete substrate. The following are the minimum properties:

(1) Shore D Hardness ASTM D2240: D66-70
(2) Tensile Strength ASTM D638 IV: 3,000 psi
(3) Tear Resistance ASTM D624: 191 psi
(4) Elongation at Break ASTM D638 IV: 43 to 50%
(5) Flexibility ASTM D1737: Zero Bend on 1/2" Mandrel at 20 mils
(6) Dielectric Strength ASTM D149: Greater than 350 volts/mil
(7) Abrasion Resistance ASTM D4060, CS-17: 378 mg
Weight Loss 1,000 gms/cycle
(8) Impact Resistance ASTM G14: 140 in-lbs

Apply Utilithane LTE 900 Primer for use with concrete substrate. Perform surface preparation per manufacturer's recommendations.

3. SEWER LATERALS

A. General

The sewer laterals shall be constructed as shown on the Standard Drawing. Sewer laterals of the size called for on the plans shall be installed at approximately

the locations shown on the plans. The exact location will be determined in the field by the District or private developer. The Contractor shall field reference each lateral connection with a surface marker. The marker shall be as specified on the Standard Drawing.

B. Materials

All sewer laterals shall be constructed using PVC pipe , and shall meet the requirements of ASTM D-3034.

C. Tees and Wyes

Tees and wyes shall be of the same material as the sewer main and the longitudinal barrel of the tee or wye shall be of the same size as the sewer main. Tees or wyes of the size called for on the plans shall be installed at approximately the locations shown on the plans. The exact location will be determined in the field by the District or private developer. A suitable plug shall be provided and installed prior to backfilling operations to ensure a watertight joint.

D. Construction

All sewer laterals shall be installed per the Standard Drawing. In no case shall any lateral be constructed at less than two percent (2%) slope unless shown on plans. The sewer lateral shall be constructed a minimum distance of five (5) feet horizontally from existing water services.

Unless otherwise approved by the District, any required saddle connections to existing mains shall be made with an approved sewer tapping machine. The Contractor shall submit to the District the Contractor’s proposed method for tapping, including manufacturer's tapping equipment descriptions, etc.

E. Payment

Sewer laterals shall be paid for at the unit price per foot bid, measured in a horizontal plane along the centerline of the sewer lateral from the centerline of the main sewer to the property line. Said prices per linear foot shall be considered full compensation for furnishing all pipe and fittings, other materials, equipment and

labor necessary to install the pipe; including clearing and grubbing, pavement removal and replacement, placement of bedding in the locations shown on the plans in accordance with the Standard Drawings and specifications, removal and/or replacement of existing interfering improvements; and all other work pertinent to installing the sewer lateral complete in place and for which no additional compensation shall be made therefore.

In payment for tees and wyes, compensation shall be made for each tee and wye installed at the unit price bid, excepting for tees and wyes installed for cleanouts, compensation for which shall be included in the price per cleanout. The portion of the tee or wye covered by such compensation shall be considered to be the branch portion.

4. TESTS FOR LEAKAGE IN SEWER

A. General

All leakage tests for exfiltration from, and infiltration into the system shall be in accordance with Section 306-1.4 of the "Standard Specifications for Public Works Construction", Latest Edition, except as modified herein. The method of testing and testing equipment shall be approved by the District.

The Contractor shall, at their own expense, furnish all materials for making the tests required under the direction of the District.

If the leakage or infiltration, as shown by the tests, exceeds the standard set forth in said section, Contractor shall, at no additional cost to the District, make the necessary repairs by methods approved by the Engineer to correct the deficiencies. All tests must be completed before the street or trench is resurfaced with permanent pavement replacement, but after complete installation and trench compaction of all facilities within a particular section between manholes.

Full compensation for testing shall be included in the bid price of various items of work, and no other compensation shall be made therefore.

B. Air Testing (Gravity Sanitary Sewers)

The Contractor shall test all sewers by means of the air test specified herein, unless otherwise directed by the District. The air test shall be in accordance with ASTM C828 Standard Test Methods, Latest Edition, for PVC pipeline installations.

Air shall be introduced into the pipeline until 4.0 psi gauge pressure has been reached, at which time the flow of air to the pipe shall be shut off. After the temperature has stabilized the air pressure shall be permitted to drop and, when the internal pressure has reached 3.5 psi gauge, the time lapse required for the air pressure to drop to 2.5 psi gauge shall be measured. The time lapse required for the air pressure to decrease from 3.5 to 2.5 psi (gauge) shall not be less than that calculated based upon equations from ASTM C828. An alternate method of determining the allowable time lapse is to utilize the tables from the National Clay Pipe Institute (NCPI) publication entitled "Low Pressure Air Test for Sanitary Sewers". Tables shall be utilized by taking the next highest main line and lateral lengths in the table which exceeds the actual main line and lateral lengths.

If the time lapse exceeds that calculated or shown in the NCPI tables, the pipe shall be presumed to be within acceptable limits; if the time lapse is less, the Contractor shall make the necessary corrections to reduce the leakage to acceptable limits by repair methods approved by the District.

C. Water Infiltration Test (Gravity Sanitary Sewers)

Where ground water conditions are encountered and the water level prior to any pumping or dewatering operations is above the top of the proposed sewer pipe, then the Water Infiltration Test shall be used in lieu of the air test specified in Section 5-B of these Basic Specifications. The Water Infiltration Test shall be in accordance with Section 306-1.4.3 of the Standard Specifications for Public Works Construction, Latest Edition, except as herein modified.

The infiltration shall not exceed 0.0016 gallons per hour per foot of sewer, per inch of pipe diameter. The test shall be run for a minimum period of two (2) hours. The Contractor shall furnish all labor, materials, equipment required for the infiltration test, at no additional cost to the District.

If ground water conditions are such that the ground water level is between the flow line of the proposed sewer pipe and the top of the pipe, both the air test and the water infiltration test shall be conducted at no additional cost to the District. In such a case, the section of pipe being tested shall be deemed acceptable only if it passes both the air test and the water infiltration test.

D. Force Main Pressure Test

Field hydrostatic test and leakage test shall be performed in accordance with all provisions of Section C12, (Water Pipeline Construction Specifications) with the following modifications.

The test pressure at the location of the testing equipment shall be computed on the basis of the relative elevations of the test gauge and the lowest point in the section being tested, and shall result in a pressure of 150 percent of the design pressure at the lowest point in said section. The test pressure at the highest point in the test section shall be not less than 120 percent of design pressure. The test pump and gauge shall be connected to the force main at a location other than the highest point in the line, to facilitate release of air from the high point.

THE MEASURED LEAKAGE SHALL NOT EXCEED 2 GALLONS PER INCH DIAMETER OF PIPE PER 1000 FEET OF PIPE PER 24 HOURS. Should leakage exceed this amount, the section being tested will be considered defective and Contractor shall determine points of leakage, make necessary repairs, and conduct a second test. This procedure shall be continued until leakage equals or is less than the allowable minimum.

5. CONCRETE WORK

A. General

Concrete shall be composed of portland cement, natural aggregates, and water proportioned to produce required strength and well mixed into required consistency, Type II-V for all concrete in contact with wastewater.

Portland cement concrete for manhole bases, cradles, encasements, thrust blocks and structures shall be composed of portland cement, fine aggregate, coarse aggregate and water proportioned and mixed in accordance with the requirements

of Section 90 of the State of California Department of Transportation Standard Specifications, except as may be herein modified.

Concrete for manhole bases, cradles and encasements, and all other concrete structures, shall be constructed to the lines and grades and in accordance with the design shown in the details on the plans.

Prior to placing any concrete, the Contractor shall submit to the District the design mix proposed to be used. Said mix shall set forth the weights of cement, sand, coarse aggregate and the amount of water to be used. (Source of supply shall also be furnished to the District.) The proposed mix shall be approved by the District prior to placing any concrete.

B. Portland Cement Concrete Classification

Concrete Class	**Compressive Strength @ 28 days (psi)**	**Sacks of Cement/CY**
"A"	3,500	6
"B"	2,500	5
"C"	2,000	4
"D"	4,000	7

The amount of free water used in concrete shall not exceed 312 pounds per cubic yard, plus 20 pounds for each required 100 pounds of cement in excess of 564 per cubic yard.

Additional cement and a modified concrete mix, as approved by Engineer, will be required for situations requiring pumping of concrete.

C. Class "B" Concrete Encasement

Class "B" concrete shall be used for unreinforced concrete encasements that may be required by unforeseen field conditions. The quantity shown on the proposal is an estimate. The District hereby reserves the right to reduce this item to a small percentage of that shown on the proposal forms, delete it or increase it, without altering the unit price bid for cubic yard of concrete.

The unit price bid for cubic yard of concrete shall include furnishing all materials and labor and equipment to properly place the concrete as may be required, and no other compensation shall be made therefore.

D. Reinforced Concrete Encasement

At the locations shown on the plans, and in accordance with the detail shown on the plans and/or Standard Drawing, and these Basic Specifications, the Contractor shall construct reinforced concrete encasement around the sewer carrier pipe. Concrete for reinforced concrete encasement shall be Class "A". Reinforcing steel (unless otherwise indicated) shall be No. 4 bar, billet steel having minimum yield point of 60,000 psi, formed and spaced as shown on the plans or the Standard Drawing.

Payment for reinforced concrete encasement shall be at the unit price per cubic yard of concrete for the section as shown on the plans or Standard Drawing, and no other compensation will be made therefore.

6. PAVEMENT REMOVAL AND REPLACEMENT

A. General

Pavement removal and replacement for all public roads, including aggregate base and temporary paving where required, shall comply with all the requirements of the agency issuing the Encroachment Permit. In roads established under formation of a special road district, the specifications of the Encroachment Permit shall apply. Any private roads and streets, including driveways in which the surface is removed or damaged, shall be restored to the original grade and crown by the Contractor. Removed or damaged sections shall be restored with the type of improvements (or better) conforming to that which existed at the time the Contractor entered upon the work.

It shall be the responsibility of the bidder to satisfy themselves as to the existing pavement sections prior to submitting their bid.

Full compensation for temporary and permanent resurfacing, including the replacement of base material as required, shall be included in the unit bid price for pavement removal and replacement per linear foot of mainline trench. Any

required pavement removal and replacement for manholes, house connection laterals, or other appurtenances shall be considered included in the bid price for the various items, and no additional compensation shall be made therefore.

B. Pavement Cutting

Pavement shall be cut to a straight edge parallel to the pipe alignment prior to excavation. Method of pavement cutting shall be as specified by the Agency having jurisdiction. Under no circumstances shall excavation be started prior to scoring of pavement. If the adjacent pavement is disturbed during the Contractor's operation, the pavement shall be recut on a straight line to remove the damaged pavement before resurfacing. Portland cement concrete pavement and sidewalk shall be saw cut. Pavement cutting shall be considered included in the bid price for pavement removal, disposal and replacement, and no additional compensation shall be made therefore.

C. Permanent Trench Pavement

The permanent trench pavement shall be in accordance with the Agency having jurisdiction. If not specifically addressed by the road agency's permit, the existing pavement shall be saw cut and the permanent trench base paving shall be constructed to be flush with existing so that the asphalt concrete is smooth, true to grade and cross section thus providing an even driving surface without undulations The completed base paving surface shall be provided as described herein whether an asphalt concrete cap is specified or not specified. Should an asphalt concrete cap be required, Contractor shall grind down the base paving prior to placement of the A.C. cap.

D. Asphalt Concrete Cap

Where required by the agency issuing the Encroachment Permit or other agency having jurisdiction, an asphalt concrete cap shall be placed along the length of the trench. The installation of the asphalt concrete cap shall be in accordance with the specifications and policies of the agency having jurisdiction. Where the asphalt concrete cap is not specifically stated in the applicable permit or on the drawings, and when directed by the District, the minimum cap shall be a grinded

0.10-foot thick, 12-foot wide section centered over the center of the trench or the traveled way, and pulled with a "Barber Greene" or equivalent.

Full compensation for placement of asphalt concrete cap, where required, shall be included in the unit bid price per linear foot of mainline trench. Any required asphalt concrete cap for house connection laterals or other appurtenances shall be considered included in the bid price for the various items, and no additional compensation shall be made therefore.

7. CONNECTIONS TO EXISTING MANHOLES

The Contractor shall make connections to existing manholes at the location and elevation shown on the plans and as verified in the field by the Contractor. Where new flow-through channels have to be cut in the existing manhole base, they shall be cut so that the resulting section is smooth and conforms to the intended shape. Deviation from form and grade shall not be greater than 1/4 inch. The channel surface shall be smoothed with epoxy mortar. The new PVC sewer shall be firmly embedded in epoxy grout where it joins the existing manhole.

Payment for connections to existing manholes shall be included in the contract price paid for the various items of work wherein connections to existing manholes are required, and no additional allowance will be made therefore.

8. TEMPORARY HANDLING OF SEWAGE

Certain work in connection with tying into existing sewers and manholes, may require the temporary handling of sewage either by temporary bypass lines, pumping, bulkheading at low flows, or other means, to be approved by the District. Sewage so diverted shall be handled in a manner such that all sewage shall be contained and properly disposed of so as not to create a public nuisance or health hazard. No extra compensation will be allowed in connection with the temporary diversion of sewage, and all such costs shall be included in the various contract unit prices.

Should the Contractor's operation result in fine(s) from other agency jurisdictions or result in the District's need for cleanup assistance, the payment of such fines and District assistance shall be the responsibility of the Contractor.

9. VIDEO INSPECTION

Upon successful completion of the first leakage test for the sewer and after base rock placement and compaction is complete, the contractor shall notify the District that the pipeline system is ready for video inspection. Said notification shall be made at least five working days in advance of the actual video inspection date. The video inspection will be made by a video inspection company approved by the District and hired by the Contractor. Video inspection shall be made in the presence of the District or District's representative. Prior to the video inspection, the contractor shall be responsible to provide the following items:

A. Clean sewer pipelines free of all dirt, rock, debris, etc.

B. Water source with an adequate amount water, pipe, hose, etc. to place enough water in the pipelines to evaluate pipeline alignment "SAGS".

C. Driveable truck access to each manhole within the system to be videoed.

D. Provide all traffic control methods required.

E. Acceptable depth gauge.

Should any of the aforementioned items not be in compliance by the time the video inspection is to occur, the contractor shall be subject to compensating the District for all costs incurred.

Full compensation to the contractor for complying with the above requirements shall be considered as included in the contract lump sum provided for such work and no additional allowance will be made therefore.

Upon completion of the video for the subject sewerlines, the video inspection company will provide the District with the DVD (video file format to be viewable on a standard DVD player/computer and/or as approved by the District) and a written report detailing the condition of the interior of the mainline and joints. Subsequent to review of the DVD and report by the District, the District will notify the Contractor that the Contractor may then proceed with completion of the project; or the District will provide a list of corrective measures that must occur prior to acceptance.

Should remedial activities be necessary, the reconstruction methodology shall be approved by the District prior to commencement of the work. Upon completion of the remedial construction, the contractor shall once again notify the District that the sewerlines

are ready for a video inspection. The District reserves the right to re-video any portions of the sewer system they determine may have been affected by the reconstruction work activities. Further, all related costs including but not limited to reconstruction materials, labor, equipment, video inspection, District and other agency inspection, and administrative costs shall be borne by the contractor.

10. VACUUM TESTING OF MANHOLES

A. General

All manholes shall be vacuum tested unless otherwise waived in writing by the District. Vacuum testing shall be performed either pre or post backfilling in accordance with the criteria stated herein. In all cases vacuum testing shall be performed prior to video inspection.

Contractor shall be solely responsible for safe access to the manholes and all necessary safety measures required for the vacuum testing.

B. Pre versus Post Backfilling Test Criteria

(1) All manholes with depths from rim to pipe flowline less than or equal to twelve (12) feet shall be vacuum tested prior to backfilling.

(2) All manholes with depths greater than twelve (12) feet from rim to pipe flowline shall be vacuum test post backfilling unless otherwise approved by the District.

C. Reference Standard

Unless otherwise modified herein, vacuum testing shall be in accordance with ASTM C1244-11.

D. Manhole Preparation

(1) Plug and seal all lift holes.

(2) Care shall be taken to effect a seal between the vacuum base and the manhole rim. Pipe plugs shall be secured to prevent movement while the vacuum is drawn.

(3) All pipe entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into manhole.

E. Basic Field Testing Procedure

(1) The test head gauge shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

(2) A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury.

(3) The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in the table under Par. F.

(4) If the manhole fails the initial test, necessary repairs shall be made in accordance with a submitted plan and method approved by the District. The manhole shall then be re-tested until a satisfactory test is obtained. All repairs shall be the sole responsibility of the Contractor.

F. Minimum Test Times – Standard Manholes

(1) Testing Criteria

[SEE TABLE ON NEXT PAGE]

	Diameter of manhole (feet)		
Depth of Manhole	4	5	6
(feet)	**Time (Sec)**		
Up to 8 feet	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	79	97
26	64	85	105
28	69	91	113
30+	74	98	121

For manholes deeper than thirty (30) feet or larger than six (6) feet in diameter contact District for specific requirements.

(2) Testing Form and Certification

Submit testing form to District for approval. Include the following as a minimum:

- Date of Test
- Project Description
- General Contractor
- Agent/Company Performing Test
- Specific Location, Including Station and Manhole Number
- Detailed Test Results
- Certification Signed by Testing Company

G. Inspection and Re-Testing

The Inspector shall be notified when the testing will be performed and by whom. The inspector shall witness testing to verify procedures are being followed correctly, and must be given at least 48 hours notice.

Retesting manholes more than once may result in additional inspection fees chargeable to the Contractor.

H. Approved Vacuum Testing Companies

Vacuum testing shall be performed by Old Castle Precast of Riverside, California or other qualified testing organization approved by the District. Submit qualified testing company along with suitable documentation if alternate is proposed.

VIDEO INSPECTION COMPANY REQUIREMENTS
(Closed Circuit Television Inspection - CCTV)

1. Rotating lens camera with articulating head.

2. Scanning capabilities of 360°.

3. Operative in 100% humidity conditions.

4. Lighting for the camera shall minimize reflective glare.

5. Lighting and camera quality shall be suitable to provide clear, in focus picture of the entire periphery of the pipe for all conditions.

6. Camera focal distance shall be adjustable through a range from 6" to infinity.

7. Remote reading distance (footage) counter shall be accurate to one percent (1%) over the length of the particular section being inspected. Provide depth gauge for SAG measurement acceptable to District.

8. The camera, television monitor, and other components of the color video system shall be capable of producing a minimum of 350 line resolution.

9. Documentation consisting of a DVD (video file format to be viewable on a standard DVD player/computer and/or as approved by the District) and a written report detailing the condition of the mainline and joints shall be submitted to the District inspector immediately following the video inspection. Each disc shall be labeled with the project or subdivision name, number and pipe run numbers it contains. Each disc shall be delivered in a plastic case. District will also accept the following formats: Thumb Drive and Cloud Service.

10. <u>All video equipment used for domestic sewer systems shall be certified for domestic sewerline inspection only.</u>

11. The CCTV camera operator shall stop at each defect and pipe joint and televise the entire joint with the pan and tilt feature on the head of the camera, initially, in a complete counterclockwise direction followed by a complete clockwise direction. If a defect is found, the CCTV operator will "home up" the camera prior to defining the defect and determining it's size and location. The CCTV operator will also stop and record <u>any</u> questionable item such as a stain, crack, paint mark, shadow found or character change in a pipe being inspected. In other words, the CCTV operator must stop, record and note anything questionable no matter how minor. The Engineer, as defined by JCSD Standard Specifications, not the CCTV operator, will decide if a questionable items is a "problem event" when that Engineer reviews the video inspection.

    Refer to Appendix P, Closed Circuit Television (CCTV) Inspection Standards for Acceptance of New Sewers for additional requirements.