



PEBBLE BEACH

COMMUNITY SERVICES DISTRICT

Wastewater Collection System STANDARD SPECIFICATIONS

April 2010

1 DEFINITION OF TERMS & ABBREVIATIONS

Whenever the following terms or abbreviations are used in PBCSD Standard Specifications, or other Contract Documents, where PBCSD Standard Specifications govern, they shall be defined as follows:

ABS – Acrylonitrile Butadiene Styrene

AC – Alternating Current

Acceptance – That action by the Board acknowledging that all provisions of the Agreement between PBCSD and the Applicant, or Permittee, have been fulfilled in all respects.

AGC – Associated General Contractors of America

Applicant – Any property owner in PBCSD who makes application to PBCSD for sewer service, or enters into an agreement with PBCSD for such service.

ASTM – American Society of Testing Materials

AWWA – American Water Works Association

ASCE – American Society of Civil Engineers

ASME – American Society of Mechanical Engineers

AASHTO – American Association of State Highway and Transportation Officials

Board – The Board of Directors for Pebble Beach Community Services District

Bond – Bid, performance, and payment bonds and other instruments of security furnished by the Contractor and his or her surety in accordance with the Contract Documents.

Building Sewer – See Sewer Service

Cal/OSHA – California Division of Occupational Safety and Health

Caltrans – California Department of Transportation

CAWD – Carmel Area Waste District

CCTV – Closed-Circuit Televis

CIP – Cast Iron Pipe

CISPI – Cast Iron Soil Pipe Institute

Contract – A legal agreement between two, or more, parties.

Contract Documents – Consists of drawings (or plans) and specifications, or exact reproductions thereof, which show the scope and character of the Work to be performed by a Contractor under Contract, and have been approved by PBCSD.

Contractor – The person, firm, corporation, or organization that performs the Work.

COP – Capital Outlay Program

CP – Concrete Pipe

CSWRCB – California State Water Resources Control Board

District – Pebble Beach Community Services District

District Engineer – A registered civil engineer in the State of California appointed by PBCSD to undertake the duties and powers assigned by PBCSD Standard Specifications, acting directly or through authorized representatives. The District Engineer may appoint a designated representative to perform any duties outlined in these Standard Specifications.

Enrollee – The legal public entity that owns a sanitary sewer system, as defined by the GWDR, which has submitted a complete and approved application for coverage under the GWDR. This is also called a sewer system agency or wastewater collection system agency, and in the case of this SSMP, is PBCSD.

Final Acceptance – See Acceptance.

FOG – Fats, Oils, and Grease

Force Main – A PBCSD-owned sewer, or portion thereof, constructed or proposed to be constructed, that delivers wastewater under pressure from a pump station to a manhole, or other point of discharge.

FT – Feet

GIS – Geographical Information System: A database linked with mapping, which includes various layers of information used by government officials. Examples of information found on a GIS can include a sewer map; sewer features such as pipe location, diameter, material, condition, last date cleaned or repaired. The GIS also typically contains base information such as streets and parcels.

GPM – Gallons Per Minute

GWDR – General Waste Discharge Requirements: See WDR.

HDPE – High Density Polyethylene

Hg – Mercury

HP – Horsepower

I/I – Infiltration and Inflow

InfoSys – Pebble Beach Community Services District's Information Systems Database

LRO – Legally Responsible Official

MRP – Monitoring and Reporting Program

NPDES – National Pollution Discharge Elimination System

O&M – Operations and Maintenance

PBCSD – Pebble Beach Community Services District

PCF – Pound per Cubic Foot

Pipe Segment – The section of pipeline between two manholes, or between two cleanouts, or between a manhole and a cleanout, etc.

Private Contract Work – Work done pursuant to a Contract between a Contractor and an Applicant.

Project – Improvements or development within PBCSD which connects more than one (1) user to the wastewater collection system.

Project Engineer – A registered civil engineer in the State of California that prepares Contract Documents and monitors construction of the Work.

PVC – Polyvinyl Chloride

PSI – Pound per Square Inch

PSIG – Pound per Square Inch Gauge

Questys – Pebble Beach Community Services District’s electronic filing system

ROW – Rights-of-Way

RPM – Revolutions Per Minute

Sanitary Sewer System – Any system of pipes, pump stations, sewer lines, or other conveyances, upstream of a wastewater treatment plant headworks used to collect and convey wastewater to the publicly owned treatment facility. Temporary storage and conveyance facilities are considered to be part of the sanitary sewer system and discharges into these temporary storage facilities are not to be considered SSOs.

SCADA – Supervisory Control and Data Acquisition

SDR – Standard Dimension Ratio

Sewer Interceptor – A PBCSD-owned sewer, or portion thereof, constructed or proposed to be constructed, that receives wastewater from one or more sewer mains and delivers directly to a wastewater treatment facility.

Sewer Lateral – see Sewer Service.

Sewer Main – a PBCSD-owned sewer, or portion thereof, constructed or proposed to be constructed, capable of receiving wastewater from one (1) or more sewer services and delivering to a sewer interceptor.

Sewer Service – a privately owned sewer line, or portion thereof, constructed or proposed to be constructed on private property from the plumbing outlets of the building to the connection point on the PBCSD wastewater collection system.

Service Lateral – See Sewer Service.

SSMP – Sewer System Management Plan: A series of written site specific programs that address how a collection system owner/operator conducts their daily business as is outlined in the WDR. Each SSMP is unique for an individual discharger, and includes provisions to provide proper and efficient management, operation, and maintenance of sanitary sewer systems, while taking into consideration risk management and cost benefit analysis. It also must contain a spill response plan. Certification is offered by technically qualified and experienced persons and provides a useful cost effective means for ensuring that SSMPs are developed and implemented appropriately.

SSO – Sanitary Sewer Overflow

Standard Drawings – Show the scope and character of standard Work, which are part of the Standard Specifications.

Standard Specifications – The Pebble Beach Community Services District’s Wastewater Collection System Standard Specifications.

Subcontractor and Sub-subcontractor – A Subcontractor is a person, firm, corporation, or organization who has a direct contract with the Contractor to perform any of the Work at the project site. A Sub-subcontractor is a person, firm, corporation, or organization who has a direct or indirect contract with the Subcontractor to perform any of the Work at the project site.

TDH – Total Dynamic Head

UPWWF – Ultimate Peak Wet Weather Flow

UPS – Uninterruptable Power Supply

VCP – Vitrified Clay Pipe

Wastewater Collection System – See Sanitary Sewer System.

WDR – Waste Discharge Requirements: Similar to a NPDES permit, but with significant differences. A WDR is an authorization to discharge waste with certain conditions, which can be issued on an individual basis or to a group of dischargers. WDRs do not sunset, unlike NPDES permits, and are most commonly issued by the Regional Water Boards. The Statewide General WDR for Sanitary Sewer Systems was adopted by the SWCRB and will be implemented by the Regional Water Boards and SWRCB.

WEF – Water Environment Federation

Work – Includes labor, materials, equipment and incidentals necessary to produce the construction required by the Contract Documents and the Contract, and any obligations, duties and responsibilities necessary to the successful completion of the construction assigned to or undertaken by the Contractor under the Contract.

Approved, Directed, Satisfactory, Proper, Acceptable, Required, Necessary, and/or Equal – Considered Approved, Directed, Satisfactory, Proper, Acceptable, Required, Necessary, and/or Equal in the opinion of the District Engineer.

2 GENERAL CONDITIONS

2.1 GENERAL

These Standard Specifications establish standards of work, materials, and construction procedures for improvements to the existing wastewater collection system of the Pebble Beach Community Services District (PBCSD). These Standard Specifications are not intended to establish general requirements or special conditions for a particular job, but rather are to be used as technical standards for all wastewater collection system improvements work within PBCSD.

These Standard Specifications apply to work contracted by others for dedication to and acceptance by PBCSD. Current PBCSD Plumbing Code Ordinance shall be considered as a part of these Standard Specifications and is included herewith as Appendix A. PBCSD Plumbing Code applies to individual service connections to the existing sewerage system.

The technical provisions of these Standard Specifications also apply to construction of work under direct contract with PBCSD. These Standard Specifications are to be used as a guide for the preparation of Contract Documents for PBCSD wastewater collection system improvements projects, and for performance testing and inspection of construction and connection work within PBCSD.

2.2 SUPPLEMENTARY SPECIFICATIONS

2.2.1 General

Wherever reference is made within PBCSD Standard Specifications to certain standard specifications, these supplemental specifications shall be construed to mean the standards, with all subsequent amendments, changes or additions that are in effect at the date of preparation of the Contract Documents.

2.2.2 California Department of Transportation

The PBCSD Standard Specifications shall be used in conjunction with California Department of Transportation Standard Specifications, which shall be referred herein to as State Standard Specifications or Caltrans SS. In the case of conflict between the PBCSD Standard Specifications and the Caltrans SS, PBCSD Standard Specifications shall prevail.

2.3 PROCESSING CONTRACT DOCUMENTS

2.3.1 General

Contract Documents for Private Contract Work shall be prepared by a Project Engineer and checked and approved by the District Engineer. Contract Documents must be approved by the District Engineer prior to starting Work.

It is expected that the Project Engineer shall thoroughly investigate the project site conditions and, from the information gained therefrom, prepare a complete set of Contract

Documents based upon PBCSD Standard Specifications, modified where necessary to suit particular work conditions. Special provisions, specification addenda and/or notes on the plans shall be provided when deemed necessary and shall be considered as part of the Contract Documents for the Work.

2.3.2 Preliminary Submittal

Prior to preparation of detailed Contract Documents for a particular project, the Project Engineer shall submit to the District Engineer for review and approval a Preliminary Plan for the Work, including, but not limited to the following:

- Description of project, including subdivision tract maps, contour maps, type of development, number of units, etc;
- Calculations for design flow projections;
- Proposed horizontal and vertical alignment of new sewer mains showing ground contours along the alignment;
- Proposed connection point to the existing wastewater collection system; and
- Evaluation of capacity restrictions in downstream sewer mains and interceptors, and pump stations.

The District Engineer must approve the Preliminary Plan prior to preparation of detailed Contract Documents. The Project Engineer shall revise the Preliminary Plan to the satisfaction of the District Engineer. The Work shall include all off-site improvements necessary to increase the capacity of existing facilities to accommodate the capacity requirements of the project, as determined by the Project Engineer and the District Engineer.

2.3.3 Plan Check Submittal Process

Based on the approved Preliminary Plan, the Project Engineer shall prepare and submit three (3) copies of detailed Contract Documents, as well as three (3) sets of updated project data such as recorded subdivision tract maps, to the District Engineer for review. The District Engineer will review the Contract Documents and project data and return them with comments to the Project Engineer.

The Project Engineer shall revise the Contract Documents to the satisfaction of the District Engineer and shall submit three (3) reproducible copies of the revised Contract Documents as well as one set of electronic Contract Documents to the District Engineer. Upon favorable review, the reproducible Contract Documents will be certified as follows by the District Engineer and returned to the Project Engineer:

PEBBLE BEACH COMMUNITY SERVICES DISTRICT REVIEW
Accepted for Compliance with PBCSD Standards By:

PBCSD District Engineer

Date

2.3.4 Plan Check and Inspection Fees

Following approval of the Preliminary Plan, PBCSD will establish plan check fees and inspection fees for the Work based on estimates of level of effort required in each particular case. If the actual total cost exceeds the estimated fees, the Applicant shall pay the difference to PBCSD. If the actual total cost is less than the estimated fees, PBCSD will refund the difference to the Applicant.

2.3.5 Responsibility of the Project Engineer

In accordance with the Civil and Professional Engineers Act of the California Business and Professions Code, all Contract Documents shall be prepared by a registered civil engineer in the State of California, or by a subordinate employee under his or her direction, and shall be signed by the registered civil engineer to indicate his or her responsibility for the design. Contract Documents submitted to the District Engineer for approval shall have thereon the name and registration number of the Project Engineer who prepared the Contract Documents, or the name of the engineering firm and the name and registration number of the Project Engineer under whose direction the Contract Documents were prepared.

2.3.6 Approval by District Engineer

Approval of Contract Documents by the District Engineer will not relieve the Applicant or the Project Engineer of any responsibility because of errors in the Contract Documents, either of commission or omission. Any such errors, when brought to the attention of the Project Engineer by the District Engineer, shall be promptly remedied. Approval of Contract Documents by PBCSD for any Work indicates only that the design is acceptable to PBCSD in that it meets the minimum design standards established in PBCSD Standard Specifications.

2.3.7 Requirements for Grading Plans

All Work involving cut and fill of existing grade shall be approved and certified by a registered geotechnical engineer and shall include all required retaining walls, slopes, drainage features and other work required to maintain a stable finished grade.

2.3.8 Changes to Approved Contract Documents

Changes may be made in the approved Contract Documents upon approval of the District Engineer. To request such approval, the Project Engineer shall submit no less than two (2) sets of duplicate drawings of the original design, upon which the proposed changes shall be shown. If the changes are acceptable to the District Engineer, the District Engineer will certify the drawings and return one set of drawings to the Project Engineer.

2.4 RECORD DRAWINGS

After completion of the Work and prior to its Acceptance, the Project Engineer shall prepare "As-Built" record drawings from the latest revised set of drawings showing clearly all changes in location and elevation of constructed Work. The record drawings shall

accurately show the Work as actually constructed. The Project Engineer shall submit the final "As-Built" record drawings to the District Engineer for final approval. Upon approval by the District Engineer and, prior to Final Acceptance, the Project Engineer shall furnish PBCSD with one set of prints and one set of electronic copies of the record drawings.

2.5 COMPLIANCE WITH LAWS AND REGULATIONS

The Contractor and Applicant shall keep themselves fully informed of all existing and future State and Federal laws and all municipal ordinances and regulations of PBCSD and the County of Monterey which in any manner affect those engaged or employed in the Work, or the materials used in the Work, or which in any way affects the conduct or the Work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same.

All Work shall comply in every respect with all the governing laws, regulations and ordinances of PBCSD which shall be considered for the purpose of the Contract to which PBCSD Standard Specifications refer, a part thereof. The Contractor and Applicant shall give to the proper authorities all necessary notices relative to the Work, and shall obtain and pay for all such permits, licenses, notices, inspections or tests required.

2.6 CONTRACTOR'S RESPONSIBILITY

2.6.1 Defective Work

All work which is defective in its construction or deficient in any of the requirements of PBCSD Standard Specifications or the Contract Documents shall be remedied or removed and replaced by the Contractor in an acceptable manner. Compensation will not be allowed for such corrections. Defective work shall be made good, and unsuitable materials shall be rejected, notwithstanding the fact that such defective work and unsuitable materials have been previously overlooked or approved by the District Engineer or Project Engineer.

2.6.2 Responsibility for the Work

Until formal acceptance of the Work by the District Engineer, the Contractor shall have the charge and care thereof and shall bear the risk of injury or damage to any part thereof by the action of the elements or from any other cause whether arising from the execution or from the non-execution of the Work. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the Work occasioned by any of the above causes before Final Acceptance and shall bear the expense thereof, except such injuries or damages occasioned by acts of the federal government, the public enemy, or force majeure.

2.6.3 Safety

2.6.3.1 General

The Contractor is responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work until Final Acceptance of the Work. The Contractor shall designate a competent person whose duty shall be the prevention of

hazards and accidents. Before starting Work, the Contractor shall prepare a project safety plan. The Contractor must conform to all applicable laws and regulations of State of California Division of Occupational Safety and Health. The Contractor shall provide himself or herself with copies of these rules and orders, which may be obtained from the State Offices, Sacramento, California or from www.dir.ca.gov.

2.6.3.2 Trench Excavation Safety Measures

Before excavating any trenches 5 feet or more in depth, the Contractor shall prepare and submit to the Project Engineer for approval a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for workers' protection from the hazard of caving-in during the excavation of the trench or during the pipe installation therein. If the plan varies from the shoring system standards established Cal/OSHA, the plan must be prepared by a registered civil or structural engineer at the Contractor's expense.

2.6.3.3 General Safety

The Contractor shall take all necessary measures to protect the Work and prevent accidents during construction. The Contractor shall provide and maintain sufficient night lights, barricades, safeguards, temporary sidewalks, temporary bridges, danger signals, watchmen, and necessary appliances to eliminate hazards to people and properties.

2.6.3.4 Work in Roadways

The Pebble Beach Company owns and maintains roadways in Pebble Beach. All Work in roadways shall be coordinated with the Pebble Beach Company. The Contractor shall so conduct all operations as to offer the least possible obstruction and inconvenience to traffic and shall have under construction no greater amount of work than the Contractor can handle properly with due regard for the rights of the public. All traffic shall be permitted to pass through the Work site with as little delays and inconvenience as possible.

Convenience of adjacent property owners shall be provided for as far as practicable. Convenient access to mailboxes, driveways, houses and buildings adjoining the Work, as well as fire hydrants, shall be maintained, and temporary approaches to intersections shall be provided and kept in good condition. If necessary, the Contractor shall provide competent flagmen to direct traffic either through or around the work to avoid unnecessary delay to the traveling public. When a section of surfacing, pavement or a structure has been completed, it shall be opened for use by traffic.

The Contractor shall minimize the duration that steel plates are used in the roadways. Steel plates left in place for more than 8 hours shall be framed and tapered with cold mix asphalt. There shall be no gaps between steel plates. Generally, steel plates shall not be left in roadways during weekends.

2.6.3.5 Contractor's License

All Contractors performing Work within PBCSD must be licensed in accordance with the laws of State of California. A non-licensed Contractor is subject to the penalties imposed by such laws.

2.6.3.6 Public Liability and Property Damage Insurance

The Contractor, and all of his or her Subcontractors, shall carry comprehensive general liability policy with limits approved by the Board and no less than the following:

- General Liability: one million dollars (\$1,000,000) per occurrence and three million dollars (\$2,000,000) aggregate limit
- Property Damage Insurance: one million dollars (\$1,000,000) per occurrence and one million dollars (\$1,000,000) aggregate limit.

The insurance policy shall name the Pebble Beach Community Service District, as well as its directors, officers, employees, agents as additional insured. Proof of acceptable insurance shall be submitted to PBCSD prior to commencing Work.

2.6.3.7 Worker's Compensation and Employer's Liability Insurance

The Contractor shall maintain or cause to be maintained adequate worker's compensation insurance, including occupational disease provisions, under the laws of the State of California and employer's general liability insurance for the benefit of his or her employees and the employees of any Subcontractor under him or her not protected by such compensation laws. The worker's compensation insurance shall include an all states endorsement, a voluntary compensation endorsement, and an endorsement waiving subrogation against the Contractor, PBCSD, and the District Engineer.

2.6.3.8 Indemnification

The Contractor shall indemnify, defend and hold harmless PBCSD, its directors, officers, employees and agents from and against all losses and all claims, demands payment, suits, actions, recoveries, and judgments of every nature and description brought or recovered against him or her by reason of any act or omission of the Contractor, the Contractor's agents or employees, or of any subcontractor in execution of the Work. The Contractor shall maintain and pay for such insurance as will protect PBCSD and the District Engineer from any and all contingent liability, and a copy of such insurance policy shall be filed with PBCSD prior to commencing Work.

2.7 GUARANTEE

2.7.1 General

All materials supplied and all Work done shall be guaranteed by the Contractor or Applicant for a period of one year from the date of Final Acceptance of the Work by PBCSD. When defective material or workmanship is discovered in the Work, requiring repairs to be made under this guarantee, all such repair work shall be done by the Contractor or

Applicant at his or her own expense within 10 days after written notice has been given by PBCSD. Should the Contractor or Applicant fail to repair the Work as directed within 10 days thereafter, PBCSD may make the necessary repairs and charge the Contractor or Applicant with the actual cost of all labor and material required. In case of emergencies demanding immediate attention, PBCSD shall have the right to repair the defect or damage and charge the Contractor or Applicant with the actual cost of all labor and material required.

2.7.2 Performance Bond

The Applicant or Contractor shall furnish PBCSD, at no expense to PBCSD, a performance bond in the amount of twenty-five percent (25%) of the final contract price of the accepted Work for the performance of the foregoing guarantee. The performance bond shall be maintained in full force and effect during the guarantee period for the purpose of ensuring that said repairs or replacements will be made.

2.8 FINAL ACCEPTANCE

The District Engineer will accept the completed Work, including easements, following fulfillment of the following requirements, which are described in detail elsewhere in these Standard Specifications:

- All cleaning, flushing, testing and inspection have been completed to the satisfaction of the District Engineer in accordance with the provisions specified in these Standard Specifications;
- The Project Engineer has submitted written certification that the Work was constructed in accordance with these Standard Specifications and the approved Contract Documents, as specified in these Standard Specifications ;
- The Project Engineer has submitted approved As-Built Record Drawings as required per paragraph 2.4 of this Section;
- The Applicant or Contractor has provided a one-year guarantee performance bond as required per paragraph 2.6 of this Section;
- The Applicant has submitted an approved title report for sewer easements and all easement documents have been executed and delivered to PBCSD, including all necessary partial conveyances or subordination agreements; and
- All plan check, inspection and easement processing costs incurred by PBCSD have been reimbursed in full amount in accordance with paragraph 2.3.4 of this Section.

Prior to Acceptance of the completed Work, wastewater shall not be discharged from the completed Work to wastewater collection system.

2.9 SEWER SERVICE CONNECTION

Application for a permit to connect a sewer service to the existing wastewater collection system shall be made in accordance with the PBCSD Plumbing Code and shall be made by PBCSD Maintenance Staff or under the PBCSD Maintenance Supervisor's supervision.

3 DESIGN CRITERIA AND REQUIREMENTS FOR PREPARATION OF CONTRACT DOCUMENTS

3.1 GENERAL

Design of wastewater collection lines and appurtenant facilities shall be in accordance with the *Gravity Sanitary Sewer Design and Construction* in Water Environment Federation Manual of Practice No. FD-5, American Society of Civil Engineers Manuals and Reports on Engineering Practice No. 60, and as required herein. Any questions on matters of design not covered herein or interpretations of any part of these Standard Specifications shall be brought to the attention of the District Engineer for clarification.

3.2 WASTEWATER FLOW PROJECTION

3.2.1 Design Flow

Sewer lines 12-inch diameter and smaller shall be designed to discharge the projected ultimate peak wet weather flow when the pipe is flowing half full. Sewer lines larger than 12-inch diameter shall be designed to discharge the projected UPWWF when the pipe is flowing full without surcharge.

3.2.2 Flow Projections

Projections of ultimate flows shall be based on the approved Del Monte Forest Land Use Plan and on other development plans that require connection to the wastewater collection system. Figure 6 of the ASCE Manual of Engineering Practice No. 37 shall be used to estimate peak discharges for residential service. Average unit flow for residential dwellings shall be 250 gallons per day. Peak and average flows for other types of development shall be estimated on a case-by-case basis.

3.3 GRAVITY SEWER MAIN DESIGN CRITERIA

3.3.1 Pipe Size

Following are minimum pipe sizes required:

Classification	Minimum Nominal Diameter
Sewer Main	8-inch
Sewer Service	4-inch

3.3.2 Slope and Velocity

All gravity sewer lines shall be designed to provide mean velocities of 2 feet per second when flowing one-quarter full, based on Manning's equation using an "n" value of 0.01 for PVC pipe.

Following are minimum required slopes. Greater slopes are desirable:

Pipe Diameter	Minimum Slope (ft/ft)
4-inch	0.020
6-inch	0.010
8-inch and larger	0.006

3.3.3 Horizontal Alignment

Gravity sewer mains shall be located in road ROW under paved streets except where topography dictates otherwise. Gravity sewer mains shall be located near the centerline of the street to the greatest extent possible. Gravity sewer mains shall be laid in straight lines between manholes. Where curved sewers are necessary, with the approval of the District Engineer, the horizontal deflection at each joint shall be according to manufacturer's recommendations and shall not exceed 3 degrees.

Minimum centerline distance between a sewer main and water main shall be as shown on PBCSD Standard Drawing No. 16. Minimum centerline distance between a sewer main and other utilities shall be 5 feet. PBCSD will not accept any sewer main or sewer service that lies within a common trench with other utilities.

3.3.4 Vertical Alignment

The minimum depth of gravity sewer mains and sewer services shall be 3 feet. Except as approved by the District Engineer, sewer main and sewer service depth shall be adequate to provide gravity flow service and minimum slopes for all service connections, including future development of existing lots.

Gravity sewer mains shall cross water mains and be constructed in parallel with water mains at the minimum depths shown on PBCSD Standard Drawing No. 16. Gravity sewer mains shall be installed with a uniform slope between manholes. Vertical curves or bends shall not be used in construction of gravity sewers.

3.3.5 Manhole Spacing

The maximum spacing between manholes for 8-inch diameter through 18-inch diameter pipelines shall not exceed 350 feet. A maximum spacing of 500 feet is allowable for pipelines greater than 18-inch diameter subject approval by the District Engineer. Manholes shall be installed at all changes of: grade, size of pipe, horizontal alignment, and at all intersections with connecting sewer mains.

3.3.6 Manhole Drops

For pipeline sizes 15-inch diameter and smaller, the drop across a manhole shall be calculated by the following formula:

$$\text{Drop in feet} = [2(S_1 + S_2)] + [(D_2 - D_1)/2]$$

S_1 = the invert slope leaving the manhole.

S_2 = the invert slope entering the manhole.

D_1 = diameter of the inlet pipe.

D_2 = diameter of the outlet pipe.

For pipeline sizes greater than 15-inch diameter, approval of drop across the manhole shall be obtained from the District Engineer. A minimum drop of 0.10 foot and a maximum of 0.50 foot shall be used on straight-run manholes. For a 90-degree bend through the structure, a minimum drop of 0.20 foot and a maximum of 0.75 foot shall be used.

3.3.7 Flushing Inlets

The use of flushing inlets shall be limited to:

- Sections of pipeline less than 200 feet where the sewer main is planned to be extended in the future.
- The end of sewer mains where the distance from the downstream manhole does not exceed 150 feet.

3.4 GRAVITY SEWER SERVICE DESIGN CRITERIA

3.4.1 General

Building sewers shall be constructed as required by the Plumbing Code and as shown on PBCSD Standard Drawings. There shall be a minimum of one sewer service provided for each individual user, including multiple dwelling units and senior citizen housing units. Common service connections for more than one dwelling unit per lot will not be allowed. Sewer services shall be a minimum of 4-inches in diameter. Sewer service shall be installed at a minimum slope of $1/4$ -inch per foot (0.02 ft/ft), which must result in a minimum cover of 3 feet at the property line. Sewer services shall not be connected to manholes nor to sewer interceptors. No connection for a sewer service shall be placed closer than 5 feet from the outside wall of any manhole. No two (2) wyes shall be installed back-to-back. There shall be a minimum of 4 feet between each wye fitting.

3.4.2 Appurtenances

3.4.2.1 Sewer Relief Valve

Each sewer service shall have a sewer relief valve as shown in the PBCSD Standard Drawings. The overflow point of the sewer relief valve shall extend a minimum of 4 inches

above grade but at least 6 inches below the building’s lowest plumbing fixture connected to the sewer service.

3.4.2.2 Cleanout

Cleanouts shall be installed in accordance with PBCSD Standard Drawing No. 10 at intervals not to exceed 100 feet of straight runs and at all changes in alignment exceeding 22.5 degrees.

3.5 FORCE MAIN DESIGN CRITERIA

3.5.1 Pipe Size

Following are minimum pipe sizes required:

Classification	Minimum Nominal Diameter
Force Main	4-inch
Pressure Sewer Service	2-inch

3.5.2 Design Velocity

Following are velocity ranges required:

Classification	Minimum Velocity	Maximum Velocity
Force Main	2 fps	4 fps
Pressure Sewer Service	2 fps	4 fps

A design velocity of 3 feet per second is ideal.

3.6 WASTEWATER PUMP STATIONS

The use of wastewater pump stations to connect to the existing wastewater collection system is discouraged by PBCSD. In cases where no alternative exists for installing a wastewater pump station, the District Engineer will establish design criteria for type, performance and reliability on a case-by-case basis.

3.7 SHEETING AND SHORING

The design of sheeting and shoring for trenches shall be prepared in conformance with applicable requirements of Article 6, "Excavations, Trenches, Earthwork" of Construction Safety Orders of Cal/OSHA. Sloping of trenches shall not be employed below the groundwater elevation.

3.8 FOG INTERCEPTORS

3.8.1 General

In any establishment where fat, oil, grease or sand may be introduced into the wastewater collection system, which could cause line blockage, hinder wastewater flow or treatment, a FOG interceptor shall be installed when, in the judgment of the PBCSD, such waste pretreatment is required as provided by the PBCSD Plumbing Code. The FOG interceptor shall conform to the provisions established in the PBCSD Plumbing Code and shall be installed as shown on PBCSD Standard Drawing No. 18.

3.8.2 Capacity

Under all situations, interceptor capacity shall not be less than 750 gallons.

For restaurants, interceptor size shall be calculated as follows:

$$\text{Size in Gallons} = \text{Number of Seats} \times \text{Number of Hours Open} \times 5$$

For other commercial kitchens, interceptor size shall be calculated as follows:

$$\text{Size in Gallons} = \text{Number of Meals Served per Day} \times 28$$

3.9 UTILITY EASEMENTS

All sewer mains and force mains not located in a road ROW shall be provided with a minimum 10-foot wide utility easement centered on the alignment of the sewer main.

3.10 PREPARATION OF CONSTRUCTION DRAWINGS

3.10.1 General

For replacement or rehabilitation of existing pipeline using pipe bursting, slip-lining, or cured-in-place-piping, pipelines shall be shown on plan sheets. For new pipelines, or replacement or rehabilitation of existing pipelines using horizontal directional drilling or traditional open-trench methods, pipelines shall be shown on plan and profile sheets.

If deviations from PBCSD Standard Drawings are requested, a detailed drawing shall be submitted for approval to the District Engineer.

3.10.1.1 Plan View

The plan view shall show at a minimum:

- existing and finished grade contour lines
- roadway, property and easement lines
- horizontal alignment of the pipeline relative to the centerline of the street or to adjacent property line
- horizontal alignment of manholes, flushing inlets, and sewer services
- bearing of each pipe segment
- north arrow
- pipeline stationing

- station and coordinates of manholes, flushing inlets, cleanouts, sewer services and other appurtenances
- location of existing and new utilities, and their appurtenances
- trees, structures, and other existing or proposed features which might influence the design of the wastewater collection system
- labels including dimensions, street names; house numbers; commercial property names; manholes, flushing inlets, and cleanouts numbered sequentially beginning from downstream and continuing upstream to the highest point; etc.
- sewer service connection schedule
- horizontal drawing scale

3.10.1.2 Profile View

The profile of the pipeline shall be drawn directly below the plan view unless proven to be impractical. The profile shall show at a minimum:

- existing and finished grade profile at the centerline of the pipeline
- vertical alignment of the pipeline
- location of manholes, flushing inlets, cleanouts, sewer services, and other appurtenances
- rim elevations of each manhole
- inlet and outlet invert elevation of each manhole
- slope, direction of flow, length, pipe size and pipe material for each pipe segment
- location, elevation, size, type of all existing and new utilities
- vertical drawing scale

3.10.1.3 Standard Notes

The following notes shall be shown on all wastewater collection system construction plans:

- All Work shall conform to the Pebble Beach Community Services District's Standard Specifications.
- Approval of these Plans by the District Engineer of the Pebble Beach Community Services District certifies only that the design conforms to the requirements of Pebble Beach Community Services District's Standard Specifications.

4 MATERIALS

4.1 GENERAL

Materials to be used in all Work shall be as specified in this Section or on PBCSD Standard Drawings. All materials shall be new, free from defects and contamination, and shall be the standard product of the manufacturer unless otherwise specified. Materials not conforming to the requirements of these Standard Specifications shall be considered defective, and all such materials, whether in place or not, shall be rejected and shall be removed immediately from the site of the Work unless otherwise permitted by the District Engineer. Rejected materials, the defects of which have been subsequently corrected, shall not be used until approved in writing by the District Engineer.

4.2 ALTERNATIVE MATERIALS

For convenience in designation on the Contract Documents, certain articles or materials to be incorporated in the Work may be designated under a trade name or the name of a manufacturer and the manufacturer's catalog information. The use of an alternative article or material, which is of equal quality and of the required characteristics for the purpose intended, shall be permitted. The burden of proof as to the quality and suitability of alternatives shall be upon the Contractor, and the Contractor shall furnish all information necessary as required by the District Engineer. The District Engineer shall be the sole judge as to the quality and suitability of alternative articles or materials and the decision shall be final.

4.3 GRAVITY SEWER MAINS AND SEWER INTERCEPTORS

4.3.1 General

All pipe and fittings for construction of sewer mains and sewer interceptors shall be of PVC gravity sewer pipe or HDPE gravity sewer pipe, unless otherwise specified herein or approved by the District Engineer. Other pipe materials may be allowed on a case-by-case basis, or the District Engineer may require other pipe materials in specific situations.

4.3.2 PVC Gravity Pipe

4.3.2.1 Pipe and Fittings

PVC gravity sewer pipe and fittings to be used in all Work shall be designed and manufactured in accordance with ASTM D3034, Type PSM PVC Sewer Pipe and Fittings, for pipe sizes 15-inches and smaller in diameter. Pipe and fittings shall be fabricated of PVC plastic having a cell classification as defined in ASTM D1784. Pipe and fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform in density, color, opacity, and other physical properties. PVC gravity pipe shall have a maximum SDR of outside diameter to wall thickness of 35, per ASTM D3034. Standard section lengths shall be 20 feet. Use of random pipe lengths is subject to approval by the District Engineer. The maximum offset measured from the concave side of the pipe shall not exceed $1/16$ inch per foot of pipe length.

4.3.2.2 Joints

PVC gravity sewer pipe joints shall be elastomeric-gasketed, integral bell and spigot type. Joint assembly shall meet the requirements of ASTM D3212, Joints for Drain and Sewer Pipes using Flexible Elastomeric Seals. Pipe shall be provided with a reference mark on the spigot end to ensure proper position of the adjoining bell end. Pipe shall be manufactured with a socket configuration which will forestall improper installation of the gasket and will ensure the gasket remains in place during the joining operation. Elastomeric compounds used in manufacture of joint gaskets shall comply with the requirements specified in ASTM F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe. Repair Couplings shall be molded of same material as pipe specified herein. Furnish with gaskets

at both ends and without a stop. Flexible Couplings shall conform to ASSTM C564. Fabricate body of synthetic SDR rubber conforming to ASTM C564. Connection with pipe shall use a mechanical compression joint requiring no sealant. Furnish with at least two (2) Type 302 stainless steel bands and clams for each coupling.

4.3.3 HDPE Gravity Pipe

4.3.3.1 Pipe and Fittings

HDPE gravity sewer pipe and fittings to be used in all Work shall be designed and manufactured in accordance with ASTM F714 PE plastic pipe (SDR-PR) based on outside diameter, ASTM D4976 and ASTM D3350. Provide only pipe and fittings made of virgin material. No rework, except that obtained from the manufacturer's own production of the same formulation, shall be permitted. Furnish pipe and fittings that are homogenous throughout and free of visible cracks, holes, foreign material, blisters, or other deleterious faults. The minimum wall thickness of the HDPE pipe and fittings shall meet the requirements for SDR 17. Material color may be black, white, or light grey, with the interior of the pipe having a light reflective color to allow for the best viewing for television inspection. Fittings shall be fabricated in the pipe manufacturer's factory or other approved manufacturer of HDPE fittings. Remove the interior joint beads in the finished fittings prior to shipment by grinding or cutting to produce a smoother interior surface (maximum $1/16$ -inch protrusion, with no rough or jagged edges or undercuts). Elbows shall be of the long radius design. Lateral fittings may use fiberglass wrap to provide the necessary reinforcement.

4.3.3.2 Joints

HDPE gravity sewer pipe joints shall be butt-fused to provide a leak-proof joint. Threaded or solvent-cement joints and connections are not permitted. Joints shall be in true alignment and have uniform interior and exterior rollback beads. Remove the interior joint beads prior to making the subsequent joint or insertion of the new pipe into the host pipe by grinding or cutting to produce a smoother interior surface (maximum $1/16$ -inch protrusion, with no rough or jagged edges or undercuts).

4.4 GRAVITY SEWER SERVICES

4.4.1 General

Pipe materials to be used in construction of sewer services shall be PVC or HDPE. One type of material shall be used throughout each service, unless otherwise specified herein or approved by the District Engineer. Other pipe materials may be allowed on a case-by-case basis, or the District Engineer may require other pipe materials in specific situations.

4.4.2 PVC Pipe, Fittings and Joints

PVC pipe for sewer services shall be as specified in paragraph 4.3.2 of this Section, except that solvent weld joints are allowable for laterals up to 4-inches in diameter. Solvent cement used for solvent weld joints shall conform to the requirements of ASTM D2564.

4.4.3 HDPE Pipe, Fittings and Joints

HDPE pipe for sewer services shall be as specified in paragraph 4.3.3 of this Section.

4.5 FORCE MAINS

4.5.1 General

Pipe material for force mains shall be PVC pressure pipe unless otherwise specified herein or approved by the District Engineer. Other pipe materials may be allowed on a case-by-case basis, or the District Engineer may require other pipe materials in specific situations.

4.5.2 PVC Pressure Pipe

4.5.2.1 Pipe

PVC pressure pipe shall conform to the requirements of AWWA C900. Pipe pressure class and DR shall be determined by the Project Engineer as a function of the application, and subject to the approval of the District Engineer. All pipe and couplings shall conform to the outside diameter dimensions of cast iron or ductile iron pipe. Pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform in density color, opacity, and other physical properties.

4.5.2.2 Fittings

Fittings for AWWA C900 PVC pressure pipe shall be ductile iron or gray iron, in conformance with the requirements of ANSI/AWWA C110. The minimum pressure rating for gray iron fittings shall be 150 psi and for ductile iron fittings shall be 250 psi. The pressure rating of the fittings shall be sufficient for the pipeline leakage test pressure specified in Section 6. Fittings shall be bell and spigot push-on type or mechanical joint type for use with AWWA C900 pipe. Fittings shall be furnished with a factory applied bituminous coating and cement mortar lining. Cement mortar lining shall be in accordance with ANSI/AWWA A21.4 and cement shall be Type V conforming to ASTM C150. The lining shall be given a factory applied bituminous coating. PVC fittings may be used in lieu of iron fittings subject to the approval of the District Engineer.

4.5.2.3 Joints

Joints shall be elastomeric-gasket, integral bell and spigot type conforming to the requirements of AWWA C900.

4.6 PRESSURE SEWER SERVICES

4.6.1 General

Pipe material for pressure sewer services shall be PVC Schedule 80 unless otherwise specified herein or approved by the District Engineer. Other pipe materials may be allowed on a case-by-case basis, or the District Engineer may require other pipe materials in specific situations.

4.6.2 Pipe and Fittings

PVC Schedule 80 pipe shall conform to the requirements of ASTM D1785, Schedule 80, Type I, Grade I. Joints shall be threaded or solvent weld. Fittings shall conform to the requirements of ASTM D2467, Type I, Grade I for socket type and ASTM D2464 for threaded type. Compounds for pipe and fittings shall conform to the requirements of ASTM D1784, Type I, Grade I.

4.7 WARNING TAPE

All pipelines shall be marked continuous with detectable warning tape. Furnish tape of minimum 5 mils total thickness, minimum 3-inches wide, and containing a solid aluminum foil core of no less than 50-gauge (0.005 inch) thickness. Design tape specifically for direct burial, with foil visible from both sides of the tape and a protective plastic jacket bonded to both sides of the foil. Apply the bonding adhesive directly to the film and foil layers with no inks or printing extending to the edges of the tape. Encase printing to prevent the ink from rubbing off while handling. Furnish tape in colors conforming to the AWPA code for the respective intended service. Imprint on the tape the following message appropriate for the respective services:

CAUTION: SEWER LINE BURIED BELOW

When required, furnish tape conforming to the above requirements for placement above existing utilities encountered and uncovered during construction. Imprint tape with a message similar to above appropriate for the respective service. Repeat message at 30-inch intervals, minimum. Furnish product of T. Christy Enterprises, Inc., Terra Tape by Griffolyn Company, Inc., or equal.

4.8 MANHOLES

4.8.1 General

All manholes shall conform to requirements of ASTM C478. Manhole vertical sections, rings, cones, grade rings and caps shall be designed for AASHTO H20 highway loading. Use Class A Portland Cement Concrete conforming to Section 90 of Caltrans SS throughout the Work, except as otherwise specified. Reinforcing steel of single circular cage shall be designed with a minimum cross-sectional area of 0.2 square inch of steel per foot. Elliptical single line reinforcing is not permitted.

Manhole sections shall be precast reinforced concrete, and include precast manhole risers, concentric cone tops and grade rings, conforming to the requirements of PBCSD Standard Drawing Nos. 05, 06 and 07. Manhole sections shall be no more than 48-inches inside diameter, unless otherwise indicated on PBCSD Standard Drawings. Manhole sections shall be provided with joints conforming to ASTM C76 and shall be furnished without steps.

Manhole cone (taper section) shall be maximum 3-feet in height and shall be concentrically tapered from diameter of vertical section to 24-inches inside diameter at the opposite end. Provide grade rings in sections not greater than 6-inches in height and with an inside diameter of 24-inches, unless otherwise approved by the District Engineer.

4.8.2 Frames and Covers

Manhole frames and covers shall be gray cast iron in superior quality, free from cracks, holes, and cold shuts, conforming to requirements of ASTM A48, or shall be ductile iron conforming to requirements of ASTM A536 and designed for H20 loading. Manhole frame and cover sets shall weigh a minimum of 320 pounds each. Casting shall be 24-inch inside diameter in accordance with PBCSD Standard Drawing No. 08. Bearing surfaces shall be machined to provide even surfaces. Covers shall be solid lip type. Covers shall have the letter "S" or the word "Sanitary Sewer" cast in them. Contractor shall include the lettering details with the submittal. Manhole frames and covers shall be Phoenix Iron Works P-1001, Alhambra Foundry Company A-1176, or equal.

4.8.3 Precast Concrete Manhole Bases

With approval from the District Engineer, the Contractor may provide precast concrete manhole bases by the same manufacturer as for the precast manholes furnished per paragraph 4.8.1 of this Section. Precast concrete manhole bases shall be made of Class 2, 3,000 psi Portland Cement Concrete. Reinforcing steel in each precast manhole bases shall be the same as required for cast-in-place manhole base.

4.8.4 Gasket seal for Precast Concrete Manhole Sections

The Contractor shall provide gasket seals at the joint of precast concrete sections. Size the gaskets to suit joint dimensions, surface conditions and to assure a watertight seal. Seal shall consist of either: compressible closed-cell neoprene rods with compatible bonding agent recommended by material manufacturer; or G.S. No. 5 extruded non-hardening rubber-based Precast Concrete Sealant produced by General Sealants, Inc., City of Industry, California; or equal non-bituminous joint sealing compressible gaskets.

4.9 FLUSHING INLETS

Flushing inlets shall be constructed as shown on PBCSD Standard Drawing 09, with the cover, frame, and concrete pad independent of the riser pipe. Flushing inlet riser pipe shall be constructed of the same size and material as the sewer main it serves and shall be laid at a 45-degree angle. Flushing inlet frames and covers shall be made of gray cast iron and

conform to Federal Specification QQ-1-652 Gray Iron Castings, or shall be ductile iron conforming to ASTM A536. Frames and covers shall be free from cracks, holes, and cold shuts. Frames and covers shall be Phoenix Iron Works P-7004 or equal.

4.10 CONCRETE

All concrete shall be Portland Cement Concrete, unless otherwise specified herein or indicated on PBCSD Standard Drawings conforming to the provisions of Section 90 of the Caltrans SS for Class A concrete.

4.11 CONCRETE REINFORCING

Steel reinforcing shall conform to the requirements of ASTM A615, Grade 60. Wire fabric mesh for reinforcing shall conform to the requirements of ASTM A185.

4.12 PAVEMENT

4.12.1 Asphalt

4.12.1.1 Asphalt Binder

All asphalt to be mixed with aggregate shall be steam refined paving asphalt, Grade AR4000 conforming to the provisions of Section 92 of Caltrans SS.

4.12.1.2 Asphalt Concrete

All asphalt concrete shall conform to Type B asphalt concrete in accordance with Section 39 of Caltrans SS.

4.12.1.3 Liquid Asphalt

All liquid asphalt where approved, shall conform to Section 93 of Caltrans SS.

4.12.2 Portland Cement Concrete Pavement

All Portland Cement Concrete Pavement shall conform to the provisions of Section 40 of Caltrans SS.

4.12.3 Aggregate Subbases

Aggregate subbases shall conform to the provisions of Section 25 of Caltrans SS.

4.12.4 Cement Treated Bases

Cement treated bases shall conform to the provisions of Section 27 of Caltrans SS.

4.12.5 Bituminous Seals and Screenings

All bituminous seals and screenings shall conform to the provisions of Section 37 of Caltrans SS.

4.13 EARTHWORK MATERIAL

4.13.1 Sand

Minimum sand equivalent shall be 50 for native material and 70 for imported material, as determined by ASTM D2419 or California Test No. 217. Native sand shall be classified in accordance with the requirements of ASTM D2387. Imported Granular Material, sand equivalent shall conform to the requirements of ASTM D2419.

4.13.2 Drain Rock

One-half inch (1/2-inch) drain rock shall conform to the following grading when determined by California Test Method No. 202:

Sieve Size	Percent Passing	
	Minimum	Maximum
3/4-inch	100	-
1/2-inch	95	98
3/8-inch	54	64
No. 4	0	3

The 1/2-inch drain rock shall conform to the following quality requirements:

Cleanness Value	Minimum 75
Durability Index	Minimum 50
Specific Gravity	Minimum 2.7
L.A. Rattler Percent Loss (500 REV)	Maximum 40
Specific Weight, Rodded	Minimum 98 pcf

One and one-half inch (1 1/2-inch) drain rock shall conform to the following grading when determined by California Test Method No. 202:

Sieve Size	Percent Passing	
	Minimum	Maximum
2-inch	100	-
1 1/2-inch	94	96
1-inch	20	40
3/4-inch	4	8

The 1 1/2-inch drain rock shall conform to the following quality requirements:

Cleanness Value	Minimum 75
Durability Index	Minimum 75
Specific Gravity	Minimum 2.91
L.A. Rattler Percent Loss (500 REV)	Maximum 30
Specific Weight, Rodded	Minimum 98 pcf

4.14 FOG INTERCEPTORS

Fat, oil, grease, and sand interceptors shall be provided in accordance with the requirements of the PBCSD Plumbing Code and as specified herein. Interceptors shall be constructed of reinforced Class A Portland Cement Concrete conforming to Section 90 of Caltrans SS with cast iron fittings in accordance with PBCSD Standard Drawing No. 18. Interceptors shall be M.C. Nottingham of California Hygi Sept Model, or equal. The FOG interceptor shall have two or more compartments, with manholes brought to grade. Frames and covers shall be made of cast iron, free from defects and shall provide a minimum access of 24-inches in diameter for cleaning of interceptor. Frame and cover shall be machined to fit with positive pressure on all sides and shall be gas tight. Grease traps will be considered on a case-by-case basis by the District Engineer.

5 INSTALLATION AND CONSTRUCTION

5.1 GENERAL

The construction of wastewater collection systems shall include clearing, excavation, pipe bursting, tunneling, boring, jacking, preparation of pipeline subgrade, pipeline installation, construction of manholes and other structures, backfilling, compaction, disposal of excess excavated material, testing of pipe and manholes, restoration of existing surfaces and all incidentals to wastewater collection system construction, as required by the approved Contract Documents and in accordance with the PBCSD Standard Specifications. All workmanship shall be performed in accordance with the best trade practices. Particular attention shall be given to the appearance of exposed Work. Any Work or workmanship not conforming to the best practices shall be subject to rejection at the discretion of the District Engineer.

5.2 SITE INVESTIGATIONS

The Contractor shall carefully examine the site and make all inspections necessary to determine the full extent of the Work required making the completed Work in conformance with the approved Contract Documents and PBCSD Standard Specifications. The Contractor shall satisfy himself or herself as to the nature and location of the Work, the conformation and conditions of the existing site conditions and ground surface, and the equipment and facilities needed prior to and during prosecution of the Work. The Contractor shall also satisfy himself or herself as to the character, quality and quantity of subsurface material or obstacles to be encountered in performance of the Work. Any inaccuracies or discrepancies discovered between actual site conditions and the approved Contract Documents or PBCSD Standard Specifications shall be brought to the attention of the Project Engineer for clarification upon discovery.

5.3 CLEARING AND GRUBBING

5.3.1 General

Clearing the site shall be performed to such depths below the existing ground surface or subgrade as required for the removal of all vegetation, including, but not limited to, weed growth, brush, shrubs, stumps, logs, roots, and all other objectional materials such as boulders and concrete or masonry within the limits specified on the approved Contract Documents, as well as those foundations, walks, slabs, pavements, walkways, buried drain lines, utilities and pipes indicated on the approved Contract Documents to be removed. Holes resulting from the removal of underground structures and roots that extend below the finished grade shall be cleaned and backfilled with suitable material and compacted. Objectionable material shall be removed from the Work site and disposed of at a suitable location and shall not be used for compacted fill as part of the Work.

5.3.2 Trees and Vegetation

Damage to trees and shrubs not within the limits of the Work shall be avoided. Removal of trees, shrubs, and vegetation not indicated for removal in the Contract Documents shall

occur only with prior approval of the District Engineer. Violation of this provision shall require the Contractor to bear all damages and consequences.

5.3.3 Topsoil

The Contractor shall remove topsoil from the area to be excavated to a designated, approved stockpile area. Topsoil shall be protected from contamination and erosion. Topsoil shall be kept separate from other fill and backfill material. Following completion of the pipe installation, backfill and testing operations, the topsoil shall be spread to the original depth over the stripped construction area.

5.4 TRENCHING, BACKFILLING AND COMPACTING

5.4.1 General

The Work shall include all labor, machinery, construction equipment, and appliances to satisfactorily perform all trenching, excavating, and backfilling Work shown on the approved Contract Documents and specified for the installation of buried pipe, including sewer interceptors, sewer mains, force mains and sewer services. The Work performed shall be constructed to the lines, grades, elevations, slopes and cross-sections indicated on the approved Contract Documents and as specified herein, and/or directed by the Project Engineer. Slopes, grades, surfaces and drainage features shall present a neat, uniform appearance upon completion of the Work.

5.4.2 Trench Excavation

5.4.2.1 General

Excavation for trenches shall include the removal of all material of any nature for the installation of sewer interceptors, sewer mains, force mains, sewer services, and appurtenant facilities. All trench excavation shall be made by open-cut unless otherwise specified or shown on the approved Contract Documents. All excavated and imported material suitable for use as backfill shall be stockpiled in an orderly manner a sufficient distance from excavated trench banks to avoid overloading and to prevent sliding or cave-ins of trench banks. Excavated material deemed unsuitable for backfill, as specified herein or determined by the Project Engineer from tests or visual inspection, shall be removed from the work site in an expeditious manner and shall be wasted in an area provided by the Contractor, that is acceptable to the Project Engineer.

5.4.2.2 Safety

All measures shall be taken by the Contractor during the performance of the Work necessary to protect the entire work area and adjacent properties from storm damage, flooding, caving-in of trenches and embankments, and sloughing of material resulting from performance of the Work.

5.4.2.3 Trench Width

The minimum width of trenches for pipelines as measured at the bottom of the trench shall be the pipe outer-diameter plus 2 feet. The maximum width of trenches for pipelines as measured at the bottom of the trench shall be the pipe outer-diameter plus 4 feet.

5.4.2.4 Open-Trench Length

Except by special permission from the District Engineer, only that amount of pipeline construction will be permitted, including excavation, placement of the pipe, backfill and temporary replacement of road surfaces where required, in any one location, which can be completed in one day. Maximum length of open trench permitted is 200 feet.

5.4.3 Dewatering

The Contractor shall provide and maintain at all times during construction, ample means and devices with which to promptly remove and dispose of all water, from any source, entering the excavation or other parts of the Work. Water shall be disposed in accordance with State and Federal Regulations. Water may be disposed into the wastewater collection system with prior approval from the District Engineer. Dewatering for the structures and pipelines shall commence when groundwater is first encountered and shall be continuous until completion of backfill operations. No concrete shall be poured in water nor shall water be allowed to rise over newly poured concrete or mortar until the concrete or mortar has set at least 8 hours.

Dewatering shall be done by methods that will ensure a dry excavation and preservation of the final line and grade of the trench bottom. Dewatering methods may include well points, sump pumps, suitable rock or gravel placed below the required bedding for drainage and pumping, temporary pipelines, and other means, all subject to approval of the Project Engineer. Such grading shall be performed as may be necessary to prevent surface water from flowing into trenches. Any water accumulated therein shall be removed by pumping or other approved means.

5.4.4 Trench Support and Bracing

The Contractor shall take the necessary precautions to be consistent with the rules, orders, and regulations of Cal/OSHA. The Contractor shall designate a competent person whose duty shall be the prevention of hazards and accidents. Excavations greater than 5 feet in depth shall be so braced, sheeted, shored, timbered and supported that they will be safe and the ground alongside the excavation will not slide or settle and all existing improvements of any kind, either public or private property, will be fully protected from damage. The bracing, sheeting, shoring, and timbering shall be arranged so as to not place any stress on portions of the Work until the general construction thereof has proceeded far enough to provide ample strength.

Care shall be exercised in installation or removal of bracing, sheeting, shoring and timbering to prevent the caving or collapse of the excavation faces being supported. No

bracing, sheeting, shoring or timbering shall be left in the trench. Space left by withdrawal of bracing, sheeting, shoring, and timbering shall be backfilled completely as specified in this Section.

5.4.5 Pipe Foundation

At subgrade, if foundation soil in the trench is soft, wet, spongy, unstable or does not afford solid foundation as determined by the Project Engineer, the Contractor shall excavate such material to 12 inches below the pipe depth for the full width of the trench. The trench shall be backfilled with 8 inches of 1 1/2-inch drain rock to provide a stable base for placement of bedding. Bedding shall be placed over the 1 1/2-inch drain, rock as specified hereinbelow.

If any trench, through the neglect of the Contractor, is excavated below the bottom grade required, it shall be backfilled to the bottom grade, at the Contractor's expense for all labor and materials, with 1 1/2-inch drain rock.

5.4.6 Pipe Bedding

The Contractor shall excavate 6 inches below the pipe invert for the full width of the trench and shall place 6 inches of sand or rock bedding upon which the pipe will be laid. In cases, as determined by the Project Engineer, where trench material is suitable for use as bedding, the trench may be excavated to a point immediately above the pipe invert grade, and the trench bottom hand-shaped so that the bottom segment of the pipe is firmly supported on undisturbed material.

Before any pipe is placed in the trench, prepare the trench bottom so that each pipe will have a firm uniform bearing over the entire length of the pipe to a width equal to one-half the outside diameter of the pipe. Make adjustments in line and grade by scraping away of filling and tamping in under the pipe. Wedging or blocking is not permitted. At each joint, the pipe bedding shall be recessed so as to relieve the bell of the pipe of all load and to ensure continuous bearing along the length of the pipe.

Should large gravel and cobbles be encountered at the trench bottom, they shall be removed and replaced with sand or 1/2-inch drain rock, compacted to provide uniform support and a firm foundation.

Where rock is encountered, it shall be removed to a minimum of 12-inch depth below pipe invert and the trench shall be backfilled with sand or 1/2-inch drain rock to provide bedding.

5.4.7 Pipe Zone Backfill

Selected backfill material to 12 inches above the top of the pipe shall consist of imported sand or suitable native material approved by the Project Engineer in advance of placement. Placement of backfill material shall be simultaneous on each side of the pipe for the full width of the trench in layers not to exceed 6 inches uncompacted depth. Each layer shall be thoroughly compacted by tamping. Water settling is not permitted. Care shall be taken to

ensure that no voids remain under, around or near the pipe. Care shall be taken not to damage pipe during backfilling operations. Perform backfilling of the pipe zone by hand tools, except when backfilling the pipe zone above the pipe spring-line with suitable equipment may be done in a manner that does not disturb or damage the pipe. Pay particular attention to the underside of the pipe and fittings to provide a firm support along the entire length of the pipe.

5.4.8 Trench Backfill

After pipe has been placed in the trench and has been inspected and approved, and backfilling in the pipe zone is complete and compacted, the remainder of the trench may be backfilled. Exercise care to ensure that no voids remain under, around, or near the pipes. The backfill material shall be imported sand or suitable native material.

5.4.9 Compaction Requirements

Field density tests shall be determined in accordance with California Tests 216/231. Minimum relative compaction densities shall be in accordance with the following:

Trench Zone	Compaction
Pipe Zone from bedding to 12 inches above top of pipe	95%
Pipe Trench under pavement, including driveways, and within 3 feet of edge of pavement	95%
Pipe Trench under areas 3 feet or more outside of edge of pavement	90%

Where the soil has a clay-like behavior and has a sand equivalent of less than 10, as determined by California Test 217, only the upper 3 feet of backfill material shall require the specified minimum compaction.

5.4.10 Compaction Methods

5.4.10.1 General

The placement and compaction of all trench backfill shall conform to one of the following methods and shall be subject to the qualifications specified herein.

5.4.10.2 Mechanically Compacted Backfill

Backfill shall be mechanically compacted by means of tamping rollers, sheepfoot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers. All such equipment shall be of size and type necessary to achieve the compaction results specified in the

Contract Documents and approved by the Project Engineer. Impact-type pavement breakers (stompers) will not be permitted over any pipe. Vibratory and/or impact type compaction equipment shall not be permitted in the pipe zone or within 4 feet over installed pipe of any kind.

Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that use of such equipment will not result in damage to adjacent ground, existing improvements or improvements installed under the Contract. The Contractor shall make his or her own determination in this regard. Mechanically compacted backfill shall be placed in horizontal lifts not exceeding the maximum lift thickness specified below. Each lift shall be evenly spaced, the moisture content shall be brought to near optimum condition and then tamped or rolled until the specific relative compaction has been attained.

Compaction Equipment	Minimum Lift Thickness
Vibratory	16 inches
Rolling	8 inches
Hand-Directed Mechanical Tampers	4 inches

5.4.11 Spoils

Excavated materials which are determined by the Project Engineer to be unsuitable for the use in backfill or compacted fills, or excavated material that is in excess of that required to be used for backfill or to construct fills, shall be disposed of away from the site at the expense of the Contractor.

5.4.12 Dust Control

The Contractor shall perform all work required for the alleviation or prevention of any dust nuisance on the site or access roads caused by the Contractor's operations, either during the performance of the earthwork or resulting from the condition in which the Contractor leaves the site.

5.4.13 Clean-up

Immediately upon completion of earthwork specified above, all rubbish and debris shall be removed from the work site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition.

5.5 INSTALLATION OF PVC GRAVITY SEWER PIPE

5.5.1 General

PVC gravity sewer pipe and fittings shall be installed in accordance with the procedures and methods recommended by the pipe manufacturer, the requirements of ASTM D2321 and as supplemented by the provisions specified in these Standard Specifications. Install piping and accessories in accordance with the requirements contained herein, and the

respective pipe material sections, instructions, and recommendations of the manufacturer. Lay pipe in accordance with the manufacturer's approved layout drawings. Reference layout and trenching to the stationing in the Construction Documents. Except as otherwise shown in the Construction Documents, install buried piping with minimum cover over the pipe to finish grade as specified in PBCSD Standard Specifications.

Bury warning tape in trench directly above the gravity sewer mains and sewer interceptors. Provide warning tape above the following existing utility pipelines uncovered during performance of this Work before backfilling: potable Water pipelines, recycled water pipelines, gas pipelines, telephone or television cable.

If at any time before the completion of the Contract or guarantee period, in the judgment of the District Engineer, any pipe is irreparably damaged or any defects are found in the lines and/or their appurtenances, remove and replace same by proper material and workmanship at the expense of the Contractor. Carefully examine all materials for defects just before placing in the trench and do not place in the trench any pipe found defective, but replace with satisfactory material. Reject and remove from the site pipe having cracks, splits, pipe curvature exceeding the offset specified herein above or scratches which, in the judgment of the District Engineer, affect the pipe strength. Repair of damaged PVC pipe will not be permitted.

5.5.2 Storage and Handling of Materials

Store pipe sections on suitable supports to prevent damage from any kind of rolling. Store fittings on a clean surface such as pavement or gravel. Protect gaskets and machined surfaces from weather and dirt by membrane covers. Only that material which can be used that same day may be stockpiled in public ROW, subject to conditions specified for traffic control and in applicable permits. Leave no material overnight in a public ROW. Maintain sufficient materials on the jobsite to prevent the Project schedule from being negatively impacted. Damaged and unprotected or improperly stored materials shall be rejected.

5.5.3 Pipe Laying

5.5.3.1 Equipment for Handling Material

Use proper and suitable tools and appliances for the safe and convenient handling/laying of pipe.

5.5.3.2 Handling and Alignment of Pipe

Carefully handle and lower pipe into the trench. Install pipe in accordance with the Contract Documents. The end of the joint bell shall define the station of the joint. In laying pipe, take special care to ensure that each length abuts against the next in such a manner that the manufacturer's recommended joint spacing and the amount of deflection for the type of joint or pipe material being used is not exceeded.

Deliver PVC pipe to the job site from the factory and store at the job site in palletized units or bundles to prevent unnecessary deflection prior to installation. Size each palletized unit to limit the stacking of pipe to not exceed 30 inches high or as approved by the Project Engineer. Transport pipe with care to ensure that the binding and tie-down methods do not damage or deflect the pipe in any manner. Pipe bent, deflected, or otherwise damaged during shipping shall be rejected. Ensure that pipe storage at the job site conforms to manufacturer's recommendations regarding protection from long-term exposure to sunlight. Do not uncover or remove PVC pipe from the pallet or stage along the trench until the bedding material is in place and ready to receive pipe.

5.5.3.3 Positioning of Pipe

Carefully inspect all pipes for defects before placing in the trench. Avoid abrasion or scratching of the pipe exterior surface during installation. Unless otherwise required, lay all pipes straight between changes in grade. Make changes in a grade only at manholes, unless otherwise indicated in the Construction Documents.

In general, lay pipe up-station, from point-to-point or structure-to-structure. Lay pipe spools other than straight pipe with the field identifications mark on top. For bell and spigot pipe, normally face the position or direction of bells at the upstream end in case of gravity sewer mains, unless otherwise directed or permitted by the District Engineer.

5.5.3.4 Bedding of Pipe

Before joints are made, bed each pipe well on a solid foundation. Do not bring the next pipe section into position until the preceding length has been checked for proper line and grade. Correct defects due to settlement. Dig bell holes sufficiently large to ensure the making of proper joints. Compact and grade fill material or trench subgrade to provide a uniform and continuous support beneath the pipe at all points between the pipe joints.

5.5.3.5 Cleaning Pipes

Thoroughly clean pipe sections and fittings before laying and keep them clean at all times. Provide a watertight plug or cap on the open ends of all pipelines, carefully fitted so as to keep water, dirt and other substances from entering. Keep the plug or cap in place on the open end of the pipeline at all times when laying is not in actual progress and when working in the vicinity of other utility piping which, if damaged, could spill their contents into the pipe trench. Conduct Work to prevent pipe flotation should the trench fill with water.

5.5.3.6 Cutting Pipe

Whenever a standard pipe length requires cutting to fit into the line, provide for a sewer service connection, or to bring it to the required location, perform work in accordance with the manufacturer's instructions so as to leave a smooth, square end with a beveled lip. Provide a new homing mark on all cut pipes equal to that shown on a standard pipe length. Field welds will not be permitted for gasketed joint pipe. Where a plain end to plain end

joint occurs as a result of cutting into the pipe, install a solid wall repair coupling. Flexible couplings are only permitted when necessary to join pipe of different materials having different outside diameters.

5.5.3.7 Trench Water

Maintain the excavation in which pipe is being laid free from water and do not assemble pipe joints under water. Do not allow water to rise in the excavation until the joint material has received its set. Perform the Work in a manner to secure watertightness and to prevent damage to, or disturbance of, the joints during the refilling process, or at any other time.

5.5.4 Manhole Connections

On connections to existing manholes, chip an opening in the base of the existing manhole of sufficient size to install the required diameter pipe and gaskets. On all pipe entering a manhole, install a gasket joint within 1 foot maximum of the manhole base and install a standard manhole gasket (water stop) as supplied by the manufacturer firmly clamped around the pipe's exterior and near the structure wall center. Dry pack the annular space at the manhole connection and coat the exterior surfaces of the completed manhole connection (interior and exterior) with an approved crystalline waterproofing material.

5.5.5 Joint Construction

Wipe all pipe joints clean of dirt, oil, grease, and other foreign materials before inserting the spigot end of a pipe section into the bell end of the adjoining piece. Bring the spigot end of the pipe true to line and grade and insert to the required depth of the bell according to the pipe manufacturer's instruction and recommendations before the joints are made. Ensure that the inner surface of adjoining pipe conforms at the joints, except where deflected joints are used. Where joint deflection is permitted and used, verify that the annular space for the gasket element is of uniform width and depth before deflecting the joint. If any pipe does not allow sufficient space for the gasket element, replace with one of proper dimensions.

Perform solvent welded jointing of sewer service pipe in strict accordance with the manufacturer's instructions. Insert the pipe spigot end to the proper depth of the bell as indicated by the home mark.

5.5.6 Sewer Service Connections

5.5.6.1 General

There shall be a minimum of one sewer service connection for each individual user, including undeveloped lots.

Install sewer services, where applicable, in conformance with the requirements specified herein for gravity sewer main, Construction Documents, the applicable building and plumbing codes, and to the following requirements:

The sewer service connection to the sewer main shall be made by PBCSD staff, or under the direct supervision thereof.

Where sewer services, new or reconnections, are required, install a wye fitting of the same diameter, quality and type of material as the sewer pipe, in-line and grade with the sewer main. The use of tees or saddles for this connection to the main is not allowed.

Unless otherwise specified or permitted, incline the branch of the wye fitting upward at an angle not greater than 45 degrees from the horizontal plane. Sewer services shall not be connected to manholes, interceptor sewers, nor pump station wet wells. Do not install service connections closer than 5 feet from the outside wall of any manhole. Do not install adjacent wyes for service connections back to back; provide a minimum of 4 feet between adjacent wye fittings. Sewer services shall be laid at a minimum grade of 2 percent (equivalent to $\frac{1}{4}$ inch per foot) and shall have a minimum cover of 3 feet at the property line.

Install sewer service piping to the property or easement line or as otherwise shown in the Construction Documents. If there is no existing sewer service to connect to, terminate the upstream end of the sewer service with a spigot plug with a rubber-sealing ring. Mark the end of sewer service as shown in PBCSD Standard Drawing No. 4. Where there is an existing sewer service, connect the new or replacement sewer service to the existing with a banded rubber coupling.

5.5.7 Locating Wire

Install locating wire on new PVC sewer mains and interceptors. Locating wire shall be #10 gauge insulated wire. Attach wire to pipe and terminate wires in valve box.

5.5.8 Piping Appurtenances

Provide all accessories and appurtenances required for the proper installation and operation of the piping and accessories including, but not limited to: guides, inserts, anchor and assembly bolts, washers, nuts, gaskets, and where permitted or specifically required, thrust blocks. For installations in damp or submerged locations, embedded in concrete, or in buried locations, use Type 316 stainless steel bolts and nuts. For damp enclosures, use either Type 316 stainless steel or cadmium-plated steel bolts and nuts. In dry locations, use bolts and nuts of black steel or other materials listed herein.

5.5.9 Protecting and Backfilling Pipes

5.5.9.1 Protecting Laid Pipe

After pipes have been laid and the joints have been made, carefully remove sheeting and shoring or any other work around the pipe to avoid hitting or dropping heavy, hard objects which may damage the pipe.

5.5.9.2 Backfilling Around Pipes

After the joints have been made and checked for gasket position or completion of restraints, backfill the trench in accordance with PBCSD Standard Specifications and Construction Documents.

5.5.10 Clean-up

Remove tools, equipment, rocks larger than 1-inch diameter, and other foreign matter from the pipe trench before beginning backfilling operations.

5.6 REHABILITATION OF GRAVITY SEWER PIPE BY PIPE BURSTING

5.6.1 General

Pipe bursting is a patented trenchless method by which a burster unit splits the existing pipe while simultaneously installing a new HDPE pipe of the same or larger diameter in place of the existing pipe. Only pneumatically operated equipment with either front or rear expanders for the proper connection to the HDPE pipe will be allowed for use. The pneumatic tool used in conjunction with a constant tension hydraulic twin captain winch shall be 5, 10, or 20-ton size, as recommended by the equipment manufacturer for the applicable project conditions. The equipment to be used shall conform to the requirements described herein.

5.6.2 Delivery, Storage and Handling

Transport, handle, and store HDPE pipe and fittings as recommended by the manufacturer. If new pipe and fittings become damaged before or during installation, make repairs as recommended by the manufacturer, or, where directed by the District Engineer, replace the damaged materials before proceeding with the Work. Deliver, store and handle other materials as required to prevent damage.

5.6.3 Preparation

5.6.3.1 Pre-Construction Investigation

Examine the location of the sewer pipelines designated for replacement and verify accessibility to the pipeline for the equipment required to conduct the Work. Use video televising, electronic ferrets, or other means to ensure all service connections on the pipelines designated for replacement have been identified, located and marked.

5.6.3.2 By-Pass Pumping

Provide facilities for wastewater flow diversion during replacement process when and where necessary to provide continuity of sewer service, to prevent the back-up of wastewater into connected dwellings, and to prevent potential health and safety hazards resulting from a SSO. Provide pumps, where necessary, and by-pass pipelines for this purpose that are of adequate capacity and size to handle all wastewater flows and of sufficient redundancy to ensure uninterrupted operation until completion of the Work.

5.6.3.3 Cleaning

Cleaning of the host pipeline is not required for this Work. Pushing of the pipe sediments contained in the host pipeline into the surrounding soils during the pipe bursting operations is acceptable providing there is no surfacing of the contaminant materials or any exposure of the public to a potential health and safety hazard.

5.6.4 Equipment

5.6.4.1 Pipe Bursting Tool

Use a pipe bursting tool designed and manufactured to force its way through existing pipe materials by fragmenting the pipe and compressing the old pipe sections into the surrounding soil as it progresses. The bursting unit shall be pneumatic and shall generate sufficient force to burst and compact the existing pipeline. Comply with manufacturer's specifications in selecting the size tool to be used for the diameter of the host pipe and new pipe. Static bursters may be used for replacement of sewer services only, subject to the Project Engineers approval. The pipe bursting tool shall be pulled through the pipeline by a winch located at the upstream manhole or access pit. The bursting unit shall pull the HDPE pipe with it as it moves forward. Use a bursting head that incorporates a shield/expander to prevent collapse of the hole ahead of the HDPE pipe insertion. The pipe bursting unit shall be remotely controlled. The bursting action of the pneumatic tool shall increase the external dimensions sufficiently, causing breakage of the existing pipe, at the same time expanding the surrounding ground. This action shall not only break the pipe, but also create the void into which the burster can be winched, and enables forward progress to be made. At the same time, the HDPE pipe directly attached to the sleeve on the rear of the burster shall move forward. The burster shall have its own forward momentum while being assisted by winching. A hydraulic winch shall give the burster friction by which it can move forward. To form a complete operating system, the burster must be matched to a constant tension hydraulic winching system.

5.6.4.2 Winch Unit

Provide a winch of the constant tension type, fitted with a direct reading load gauge to measure the winching load and controls to automatically maintain a constant tension at a set tonnage reading. Attach the winch to the front of the bursting unit. Operation of the winch shall provide a constant tension to the burster throughout the operation in order that it may operate in an efficient manner and also ensure directional stability in keeping

the unit on-line. Set-up and operate the winch to supply sufficient cable in one continuous length so that the pull may be continuous between winching points. Provide the winch, cable and cable drum with safety cage and supports to ensure safe operation and prevent injury to persons or property. Provide a system of guide pulleys and bracing at each manhole or access pit to minimize cable contact with the existing pipeline between the access points. Do not allow the supports for the trench shoring in the access pit to come in contact with the winch boom support system. Design and construct the trench shoring and its supports, such that neither the pipe nor the winch cable shall be in contact with it.

5.6.5 Pipe Bursting Operations

Pipe Bursting shall proceed continuously and without interruption from one manhole to another, from access pit to manhole, or access pit to access pit, as applicable, unless otherwise approved by Project Engineer.

5.6.5.1 Access Pit Locations

Excavate the machine pits at the ends of the pipelines designated for replacement unless otherwise necessary and authorized by the Project Engineer. Center the pit over the existing pipeline. Verify pit location, including use of existing manholes, and size in the field prior to construction and obtain Project Engineer approval. Minimize the number of pits required, except provide sufficient number of pits that are necessary to properly complete the Work.

Where manholes are used as machine or new pipe insertion pits, modify, repair or replace such manholes in accordance with the Contract Documents and to conditions equal to or better than existing conditions. Where the pipe bursting tool and new pipe are planned or required to traverse a manhole without interruption during pipe bursting operations, modify the pipe inlets and outlets in the manhole to dimensions appropriate for the indicated size of the new pipe.

5.6.5.2 Access Pit Location Conflicts

Where damage to surrounding infrastructure may occur due to standard procedures for construction of a pit, a patented “windowing” method, performed in strict accordance with the manufacturer’s instructions, may be used on HDPE pipe 12-inch diameter or smaller and with Project Engineer approval. Thoroughly locate underground utilities in the vicinity of the proposed pit location prior to determining the necessity and feasibility of the “windowing” method.

Where construction of an exit pit is difficult due to underground utility placement or surrounding infrastructure, use of a remote controlled reversal procedure whereby the head expander is removed back through the newly installed HDPE pipe may be permitted with Project Engineer approval. The reversal procedure shall not cause any damage to the HDPE pipe during removal of the expander head.

5.6.5.3 Control Devices

Install all pulleys, rollers, bumpers, alignment control devices and other equipment required to protect existing manholes, and protect the new pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances during the installation should the pipe be allowed to stress beyond its elastic limit. Center the winch line in pipe using an adjustable boom or other acceptable means.

5.6.5.4 Pipe Relaxation Period

Following installation of new HDPE pipe, allow a time period as recommended by the pipe manufacturer, but not less than 4 hours, for cooling and relaxation of tensile stressing caused by the installation process before performing any reconnection of sewer services, sealing of the annular space at manhole terminations, or backfilling of the access pit. Provide sufficient excess length of new pipe, not less than 4 inches, to protrude into the manhole or beyond indicated termination points, to compensate for any reduction in length due to cooling or stress relaxation.

Restrain pipe ends using electrofusion couplings as manufactured by Central Plastics, or equal. Slip the electrofusion couplings over pipe ends against the manhole wall and fuse in place. Install electrofusion couplings in accordance with the manufacturer's recommended procedures.

5.6.5.5 Annular Spaces

Following the relaxation period, seal the annular space between the outside barrel of new pipe and the opening in the manhole base provided for the pipeline using a material approved by the Project Engineer. Pack a solid mass of the sealing material a minimum of 8 inches into the manhole wall in such a manner as to form a smooth, uniform, watertight joint.

5.6.6 Pipe Joining

Assemble and join the HDPE pipe at the site using the butt-fusion method to provide a leak-proof joint. Threaded or solvent-cement joints and connections are not permitted. Use and operate equipment and follow procedures for joining pipe in strict accordance with the manufacturer's recommendations. Use only personnel certified as fusion technicians by a manufacturer of HDPE pipe and/or fusing equipment to make the joints.

Make butt-fused joints that are in true alignment and have uniform interior and exterior rollback beads resulting from the use of proper temperature and pressure. Allow the joint adequate cooling time before removal of pressure from the fusion machine. The completed fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All joints shall be subject to acceptance by the District Engineer prior to insertion.

Cut out defective joints and replace. Do not use any section of HDPE pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than 10 percent of

the wall thickness. Remove defective pipe from the site. However, a defective area of the pipe may be cut out and the resulting section ends fusion jointed in accordance with the procedures stated above. Furthermore, discard and remove from the site any section of the pipe having other defects, such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness, or any other defect of manufacturing or handling as determined by the District Engineer.

Where terminal sections of pipe are joined within the insertion pit, make the connection using electrofusion couplings or connectors as manufactured by Central Plastics, or equal. Provide couplings or connectors having tensile strength equivalent to or greater than that of the pipe being joined.

Where the new HDPE pipe is to be joined to existing buried pipe, make the connection using a transition coupling manufactured by Fernco, or equal. Verify the outside diameter of the existing pipe prior to commencing work on the respective section.

Where fittings, including service connections, are required, field-join the fittings to the already installed adjoining sections of HDPE pipe using an appropriate fusion machine designed for in-trench joining, or by means of electrofusion couplings as specified above. Prior to closing a field-made joint on a fitting installation, grind or cut the interior beads resulting from preceding field-made joints on the fitting to the standards specified above.

5.6.7 Sewer Service Connections

Perform the Work in a manner that ensures all service connections are reconnected to the new HDPE pipeline prior to finishing work for the day.

After a section of existing pipeline has been satisfactorily pipe burst, and prior to reconnection of the sewer services, perform a low-pressure air test on the new pipe section in accordance with the procedures outlined in Section 6.

After the pipeline has passed the low-pressure air test, the specified cooling and stress relaxation period has expired, and any required couplings have been installed, proceed in an expeditious manner to reconnect all the services so as to minimize any inconvenience to the customers. Connect sewer services to the new pipe by fusing a saddle connection to the pipeline. Provide saddles made of a material compatible with that of the pipe. Either electrofusion or conventional fusion saddles may be used. Provide electrofusion saddles as manufactured by Central Plastics, or approved equal. Provide conventional fusion saddles as manufactured by Central Plastics, Phillips Driscopipe, Plexco, or approved equal. Install saddles in accordance with the manufacturer's recommended procedures. Existing sewer services may be PVC, clay, ABS or other materials. Replace service pipe that is broken, damaged, or removed as a result of the activities for this Work with PVC SDR35 pipe conforming to the requirements of Section 5.5. Provide couplings of the type as required to

complete the reconnection of the existing sewer service material to the fusion saddle on the pipeline.

5.7 INSTALLATION OF PVC PRESSURE SEWER PIPE

5.7.1 General

PVC pressure pipe and fittings shall be installed in accordance with the manufacturer's requirements and recommendations, the requirements specified hereinbefore for PVC gravity sewer installation and ASTM D2321.

5.7.2 Pipe Laying

All pipe shall be carefully inspected for defects before being placed in the trench. Care shall be taken to avoid abrasion or scratching of the pipe exterior surface during installation. Small diameter solvent weld joint pipe shall be snaked in the trench to accommodate thermal expansion and contraction.

Bury warning tape in trench directly above the pressure sewer pipe. Provide warning tape above the following existing utility pipelines uncovered during performance of this Work before backfilling: potable Water pipelines, recycled water pipelines, gas pipelines, telephone or television cable.

5.7.3 Cutting Pipe

Whenever a standard pipe length requires cutting to fit into the line, Work shall be done in accordance with the manufacturer's instructions and so as to leave a smooth, square end with a beveled lip. Contractor shall indicate a new homing mark on all cut pipe equal to that shown on a standard pipe length. Field solvent welds will not be permitted for gasketed-joint pipe.

5.7.4 Joint Construction

All pipe joints shall be wiped clean of dirt, soil, grease, and other foreign material before inserting the spigot end of one pipe section into the bell end of the adjoining piece. The pipe spigot end shall be inserted to the proper depth of the socket as indicated by the home mark.

5.7.5 Thrust Restraint

All buried pressure piping shall be adequately braced against thrust using restrained joints according to ASTM Standard F1674, "Standard Test Method for Joint Restraint Products for Use with PVC Pipe".

5.7.6 Locating Wire

Install locating wire on new PVC force mains. Locating wire shall be #10 gauge insulated wire. Attach wire to pipe and terminate wires in valve box as shown.

5.8 MANHOLE CONSTRUCTION

5.8.1 General

Sewer manholes shall be constructed of pre-cast concrete manhole sections in accordance with these Specifications at the locations and depths shown on the approved Contract Documents. New manholes shall be generally water-tight against infiltration of groundwater and inward flow of run-off waters. Any proposed work inside an existing manhole that is part of a wastewater collection system in service shall not be undertaken until all the tests and safety provisions of Cal/OSHA have been made.

5.8.2 Manhole Base

Manhole bases shall be constructed of cast-in-place concrete in accordance with PBCSD Standard Drawings. Sewer mains shall be set before the concrete for the base is poured and shall be rechecked for correct alignment and grade before the concrete has set. The various sized inlets and outlets in the manhole shall be located as indicated on the approved Contract Documents and as detailed on the Standard Drawings. The base shall be extended 9 inches below the bottom of the lowest pipe and 3 inches above the top of the highest pipe. The concrete base shall be shaped with a wood float and shall receive a hard steel troweled finish before the concrete sets.

In the event additional mortar is required after initial set has taken place, the surface to receive the mortar shall be primed, and the mortar mixed with a concrete adhesive in the amounts and proportions recommended by the manufacturer and as directed by the Project Engineer. The base shall set a minimum of 24 hours before manhole construction is continued. In certain critical situations, the time of setting may be reduced upon approval of the Project Engineer.

The invert of the manhole base shall be hand-worked so as to provide channels conforming in size and shape to the lower portions of the inlet and outlet pipes. The channel shall vary uniformly in size and shape from inlet to outlet and shall be smooth and accurately shaped.

5.8.3 Pre-Cast Manhole Sections

Each manhole section, including the section set on the base, shall be sealed with a pre-formed plastic joint sealant material to make a watertight joint, shall be neatly grouted on the inside and out, and shall be set perfectly plumb. Sections of various height grade rings shall be used in order to bring the top of the manhole ring and cover to the required elevation, but shall be limited to a maximum of 12 inches of grade rings.

5.8.4 Manhole Frames and Covers

The finished elevation at which manhole frames and covers are to be set shall conform to the requirements set forth on the approved Contract Documents and the Standard Drawings. Manhole frames shall be set at the required grade and shall be securely attached to the top precast manhole riser with a cement-mortar bed and fillet. After the frames are securely set

in place, covers shall be installed and all necessary cleaning and scraping of foreign materials from the frames and covers shall be accomplished to ensure a satisfactory fit.

5.8.5 Manhole Connections

Pipe may be laid through a manhole when possible to form a channel. In this case, the Contractor shall return after construction of the manhole and cut out the top of the pipe. All pipe entering a manhole shall have a gasketed joint installed within 1 foot maximum of the manhole base and shall have a standard manhole gasket (waterstop) firmly clamped around the exterior of the pipe and near the center of the manhole wall.

5.8.6 Manhole Stubs and Stoppers

Sewer pipe stubs shall be furnished and installed in manholes at the location shown on the approved Contract Documents. All stubs shall be plugged with stoppers at locations as shown on the approved Contract Documents for various sizes of pipe.

5.9 CONNECTION TO EXISTING FACILITIES

During the course of the Work, the point of connection of the new sewer pipe to the existing wastewater collection system shall be plugged to ensure that no materials from the construction activities involved in the installation of new sewer pipe enters the existing system. Connections or modifications to the existing system shall only be made in the presence of the District Engineer. PBCSD reserves the right to require the Contractor to present the proposed connection procedure in writing for PBCSD approval prior to commencing the connection or modification.

Where new construction is started at a stub of an existing manhole, the Contractor shall plug the opening into the manhole before removing the plug or stopper from the stub. Said plug shall remain in place until the District Engineer approves its removal. New connections to existing manholes wherein stubs have not been provided shall be made by core drilling or breaking through the walls and base of the manhole and grouting the pipe in place with cement mortar. Channels for new connections shall be provided in the manhole base as specified above.

5.10 FLUSHING

All piping shall be flushed clean of all dirt and foreign material prior to testing. A heavy rubber ball, such as the "Wayne Ball" manufactured by Sider Company, Los Alamitos, California, or approved equal, shall be inflated with air so that it will fit snugly into the sewer pipe to be cleaned. The ball shall be placed in the upstream structure in the line, and water shall be introduced into the structure in back of the ball. The ball shall be passed through the sewer pipe with only the pressure of the water behind it. Care must be taken not to feed the ball too rapidly. Debris flushed out ahead of the ball shall be removed at each downstream manhole. Screens may be installed to aide in the collection of debris at each downstream structure.

The Contractor shall provide all water, equipment, and supplies for performing the flushing, and shall waste the flushing water at locations or by procedures approved by the Project Engineer.

5.11 PRESSURE PIPELINE PIGGING

Following completion of backfill, all force mains shall be thoroughly cleaned by pigging. Water pressure shall be used to force the pig through the pipeline. All debris discharged at the force main termination point shall be removed by the Contractor.

5.12 ASPHALT PAVING

5.12.1 General

Unless specifically shown to be removed on the approved Contract Documents, all asphalt paved areas damaged or removed as part of the Work shall be repaved with asphalt concrete as specified herein. Paving includes all work and materials for the replacement and restoration of pavement that has been removed or damaged by construction operations. All paved areas shall be restored to the elevations and character of the pavement existing prior to the beginning of the Work. Paving shall include all paved surfaces, including curbs and gutters of any road, street or lane used as a public or private thoroughfare or driveway.

5.12.2 Temporary Patch

Trenches in paved areas shall be completely backfilled at the end of each working day. Aggregate base shall be placed to grade to provide a preliminary patch over the trench in paved areas at the end of each working day. The Contractor shall proceed immediately to resurface with temporary pavement any excavation in paved areas subject to heavy traffic as shown on the approved Contract Documents or upon notice from the Project Engineer.

5.12.3 Pavement Subgrade

All base course and asphalt concrete pavement shall be underlaid by a minimum 12-inch thickness of compacted fill. In areas where less than 12 inches of fill or no filling is proposed, the existing grade shall be cleared, grubbed, stripped and scarified, the moisture content adjusted to optimum and then re-compacted to a depth of at least 12 inches. Compaction shall be a minimum of 95 percent relative compaction per California Test Methods 216/231.

5.12.4 Aggregate Base

Spread and compact the base in accordance with Caltrans SS Sections 26-1.03 through 26-1.05. The thickness of the compacted aggregate base course shall be the same thickness as the base course removed in excavation of the trench, except that the compacted thickness of aggregate base shall not be less than 6 inches.

5.12.5 Asphalt Concrete

Prior to placement of the surface course of asphalt concrete, the Contractor shall saw-cut the existing pavement to a minimum depth of 2 1/2 inches within an undamaged existing paved area or as indicated on the approved Contract Drawings. The damaged pavement

shall be removed to a depth equal to the thickness of the surface course of existing asphalt concrete. A prime coat shall be applied to exposed surfaces in accordance with Section 39 of the Caltrans SS. Asphalt concrete shall be spread in accordance with the requirements of Section 39 of the Caltrans SS, and as specified herein. The thickness of the asphalt concrete pavement shall be the same thickness as the asphalt removed, except that the completed thickness of the asphalt concrete shall not be less than 2 inches.

Asphalt concrete shall be placed and compacted in maximum 2-inch layers. The Contractor shall match the existing pavement elevation and grade at the saw-cuts and the finished surface shall be free from undulations or abrupt changes in elevation or grade.

5.12.6 Chip Seal Coat

A bituminous seal coat with screenings shall be applied to all areas of pavement replacement to at least 6 inches beyond the newly paved area. Chip seal prime coat, bituminous binder, and screenings shall be applied at the rates specified in Section 37.3 of the Caltrans SS.

5.12.7 Pavement Marking and Striping

All existing pavement markings damaged or obliterated by the Contractor's operations shall be repainted in kind and size as existing, subject to approval of the Project Engineer and governing local street or road department. Pavement markings shall be applied at a wet film thickness of 15 mils (0.015 inch).

5.13 FOG INTERCEPTORS

Grease interceptors shall be installed in accordance with the manufacturer's recommendations, PBCSD Plumbing Code and the following requirements:

- The interceptor shall be installed as close to the grease source as possible. Proper setbacks shall be maintained from structures, property lines, etc. to comply with local codes.
- Location of the interceptor should be dependent upon easy pump-truck access.
- Unit shall be backfilled with clean sand and compacted as specified hereinbefore for trench excavation.
- Access manholes shall be finished to grade.

5.14 SEWER SERVICE CONNECTIONS

Sewer service connections to existing sewer mains shall be constructed in accordance with PBCSD Plumbing Code, the Standard Drawings and the requirements specified in this Section. Final connection to sewer main shall be performed by PBCSD staff.

5.15 CLEAN-UP

During the progress of the Work, the Contractor shall at all times maintain an orderly job, keep the Work area in a neat and clean condition, and dispose of rubbish in a satisfactory manner. Tools, rubbish, and materials shall be picked-up and stored in an orderly manner at

all times. At no time shall there be any accumulation of rubbish, excavated material or equipment that will interfere with the convenience or operation of others or result in unsightly appearance of the Work.

The Contractor shall remove from the vicinity of the completed work all material and equipment during construction. Surfaces shall be returned to a condition acceptable to the District Engineer. All excess material shall be disposed of as directed by the Project Engineer or removed from the job site.

Prior to final acceptance of the Work, the Contractor shall thoroughly clean the Work area, remove all temporary structures, and have all equipment and surplus construction material and debris from the area. The entire project, before acceptance by PBCSD, shall be left in a neat and clean condition.

6 TESTS AND INSPECTIONS

6.1 GENERAL

All materials and work shall be made available for inspection by the District Engineer. All materials not conforming to these Specifications shall be considered defective and shall be rejected and removed from the site. The Contractor shall perform all excavation and other work required to locate and correct defects which may be disclosed or developed under tests or inspections. The Contractor shall replace any backfill or other permanent work removed in locating and correcting defective work.

6.2 MANDREL TEST

Following the placement and compaction of backfill and flushing of sewer mains and prior to leakage testing and video inspection of the pipe and final surface restoration, all main line pipe shall be mandrelled by the Contractor to test for obstructions, deflections, joint offsets, and pipe intrusions. A rigid mandrel shall be pulled through the pipe by hand, or by mechanical means approved by the District Engineer. The mandrel shall have cross section equivalent to a circle having a diameter of at least 96 percent of the specified average inside diameter of the pipe. The mandrel shall be composed of two (2) steel circular plates set parallel and joined by half inch steel flats set on edge around the plate to form points of contact with the pipe being tested. The contact points shall be odd numbered, not less than nine in number.

At the beginning of test, the pipe manufacturer shall inspect the Contractor's mandrel and certify that the mandrel precision conforms to the permitted deflection specified herein. If during the course of the test the Contractor changes mandrels, each new mandrel shall be inspected and certified by the pipe manufacturer. Pipe exceeding the permitted deflection shall be removed and replaced in conformance with these Specifications and at the Contractor's expense.

6.3 LEAKAGE TEST

6.3.1 General

All gravity sewer pipelines, including sewer mains and sewer services, shall be tested for leakage prior to Final Acceptance. Leakage testing of pipelines shall occur following mandrel testing. Leakage testing shall be by either air pressure testing or exfiltration testing. When pipelines do not meet the minimum test standards, the Contractor shall locate the source(s) of leakage and perform all work necessary to correct the leakage and shall repeat the test until the minimum standards are met.

6.3.2 Air Test

For sewer mains, all service connections and stubs shall be sealed with plugs capable of withstanding the internal test pressure. For sewer services, a plug shall be provided at the connection point to the building plumbing and at the connection to the wastewater

collection system, and at all cleanouts and backflow devices. The plugs shall be removable, and their removal shall provide a suitable connection for sewer main extension, service connection, or installation of cleanouts and backflow devices.

All sections of the pipeline shall be tested with air at not less than 3.5 psig above the average groundwater pressure above the top of the pipe. The requirements of this Specification shall be considered satisfied if the duration required in seconds for the pressure to decrease 0.5 psig from the initial 3.5 psig above groundwater pressure is not less than that exhibited below:

Pipe Diameter (inches)	Minimum Time (h:mm:ss)
4	0:01:53
6	0:02:50
8	0:03:47
10	0:04:53
12	0:05:40
15	0:07:05
18	0:08:30
21	0:09:55
24	0:11:20
27	0:12:45

6.4 EXFILTRATION TEST

Gravity pipelines shall be tested between manholes by plugging the manhole at the lowest end and filling the pipeline with water. The pipeline shall be filled so that the maximum internal pipe pressure at the lowest end shall not exceed 10.8 psig and the water level inside the manhole shall not be in excess of 2 feet above the top of pipe or 2 feet higher than the groundwater (whichever is greater). The allowable exfiltration for any length of pipe shall not exceed 50 gallons per inch of internal pipe diameter per mile of pipe length per day. The Contractor shall be responsible for furnishing and disposing of all water used for testing.

6.5 PVC PRESSURE PIPE TESTING

Upon completion of the laying, jointing, and backfilling, pressure pipelines shall be hydrostatically tested. A minimum of 24 hours shall elapse between completion of backfilling and before applying the pressure test. For convenience of testing, the pipeline may be divided into sections and each section tested separately. All PVC pressure pipelines shall be tested in accordance with the provisions for pipeline testing contained in AWWA C600 and as described below.

After the section of pipeline has been bulkheaded and completely filled with water, it shall be allowed to stand under pressure a sufficient time to allow the pipe to obtain a maximum absorption of water and to allow the escape of air from any air pockets. The pressure shall then be increased to the specified test pressure as hereinafter described, and shall be maintained at this pressure for not less than 2 hours.

All force main pipe shall be hydrostatically tested at the pipe pressure rating at the respective lift or pump station. The maximum leakage allowed will be 2 gallons per day per inch of inside diameter at one thousand feet of length. If the leakage exceeds this amount, the section being tested will be considered defective. The Contractor shall determine the source(s) of leakage, make the necessary repairs, and make another test. This procedure shall be continued until the leakage falls below the allowable maximum. Leakage shall be determined by metering the water injected into the pipeline while under the required pressure.

After the pipe has successfully met all test requirements specified herein, including pigging the pipeline, the entire pipeline shall be filled with water and so maintained until the completion of the Contract unless otherwise ordered by the Project Engineer.

6.6 MANHOLE TESTING

6.6.1 General

All manholes shall be tested for leakage prior to Final Acceptance by one of the following methods: 1) exfiltration; 2) infiltration; or 3) vacuum. When tested manholes do not meet the minimum test standards, the Contractor shall locate the source(s) of leakage, shall perform all corrective work necessary and shall repeat the test until the minimum standards are met.

6.6.2 Exfiltration Test

Where manholes are located above the groundwater level, the Contractor shall test manhole leakage by exfiltration. The inlets and outlets in each manhole shall be sealed with a plug and securely fastened. Once the pipe stubs are plugged, the manhole shall be filled with water and leakage measured over a period of not less than 1 hour. Allowable leakage shall not exceed a rate of one 1 gallon per hour per ten 10-foot depth of manhole. The Contractor shall be responsible for furnishing and disposing of the water used for testing.

6.6.3 Infiltration Test

Where manholes are located in high groundwater conditions, the Contractor may elect to test leakage by measurement of infiltration. No visible leakage will be allowed over a period of 24 hours.

6.6.4 Vacuum Test

With the approval of the District Engineer, the Contractor may elect to test manhole leakage by vacuum testing. The inlets and outlets in each manhole shall be sealed with a plug and securely fastened. Vacuum testing shall be performed with the P.A. Glazier Manhole Vacuum Tester or an equivalent system approved by the District Engineer. The manhole cover seal shall be inflated to 40 psi to create a seal between the vacuum base and the structure. A vacuum of 10 inches Hg shall be drawn and vacuum valves on the test mechanism closed. The requirements of this Specification shall be considered satisfied if the manhole does not exhibit a decrease of more than 1 inch Hg vacuum in 1 minute.

6.7 COMPACTION TEST

The maximum dry density and optimum moisture content of each soil type used in the controlled compacted backfill shall be determined in accordance with California Test 216. Field density tests shall be required at intervals of no less than one (1) every 300 feet of pipeline length and shall be in accordance with California Test 216 or 231. Soil density tests shall be performed by the Project Engineer. Results of field density tests shall be submitted to the District Engineer prior to Final Acceptance.

6.8 SEWER SERVICES AND FOG INTERCEPTOR TEST

Sewer services and FOG interceptors shall be tested in accordance with the requirements of PBCSD Plumbing Code.

6.9 NOTIFICATION OF TESTS

The Project Engineer or Contractor shall notify the District Engineer of all tests specified herein at least two (2) working days prior to performance of the test(s) to allow the District Engineer or a representative to witness testing. The District Engineer will not be available to witness tests on weekends or holidays. Any tests performed without such notification shall be repeated at the expense of the Contractor.

6.10 VIDEO INSPECTION

The Contractor shall provide video inspection and taping of all gravity sewer mains for review by the District Engineer prior to Final Acceptance. Video inspection shall be performed upon completion of the mandrel test and the leakage test. All pipe intrusions, deflected or offset joints, sags and other defects not conforming to the requirements of these Specifications found as a result of the video inspection shall be corrected by the Contractor as directed by the District Engineer. All required corrective work shall be at the expense of the Contractor.

6.11 SEWER SERVICE INSPECTION

6.11.1 General

Backfilling of sewer services and appurtenances shall not occur prior to inspection and approval by the District Engineer. The Contractor shall correct at his expense all defective work discovered by the District Engineer prior to approval to backfill by the District

Engineer. Corrective work must be inspected and approved by the District Engineer as described above prior to backfilling the trench.

6.11.2 Notification

The Contractor shall notify the District Engineer at least two (2) working days in advance of required sewer service inspection. Sewer services and FOG interceptors backfilled without the inspection and approval of the District Engineer shall be considered defective and shall be removed and replaced in the presence of the District Engineer by and at the expense of the Contractor.

6.12 SEWER MAIN INSPECTION

6.12.1 General

The inspection requirements presented below apply to Work involving the construction of sewer mains and appurtenances and other facilities under Contract with others (Applicant) for Final Acceptance by PBCSD.

6.12.2 Inspections by the District Engineer

The District Engineer will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner that, when completed, will be in accordance with these Specifications and the approved Contract Documents. However, the District Engineer will not make exhaustive or continuous on-site inspections to check quality of the Work. Observation of the Work by the District Engineer shall not relieve the Contractor from obligations to perform and construct the Work in accordance with the requirements of these Specifications and the approved Contract Documents.

Any defective or deficient work or materials discovered by the District Engineer during such observations shall be corrected by and at the expense of the Contractor, notwithstanding that such work and materials may have been previously overlooked by the District Engineer.

The Project Engineer shall keep the District Engineer advised of the progress and schedule of the Work to allow the District Engineer to schedule appropriate site visits.

6.12.3 Inspections by Project Engineer

The Project Engineer shall provide inspection and observation of the Work at regular intervals to verify that the completed Work is in accordance with these Specifications and the approved Contract Documents. Prior to Final Acceptance, the Project Engineer shall submit written certification to PBCSD that the Work was constructed in accordance with these Specifications and the approved Contract Documents.

7 STANDARD DRAWINGS

Drawing No.	Drawing Title
1	Lateral Sewer Standard Connection
2	Lateral Sewer Deep-Cut Connection I
3	Not Used
4	Lateral Sewer Connection with Grade Change
5	Standard Sewer Manhole
6	Sewer Drop Manhole
7	Shallow Sewer Manholes
8	Manhole Frame and Cover
9	Sewer Flushing Inlet
10	Building Sewer Cleanout
11	Building Sewer Backwater Protection
12	Sewer Relief Valve and Backwater Valve Details
13	Typical Pipe Trench Section
14	Pipe Encasement Cradle and Backfill
15	Trench Erosion Stop Detail
16	Sewer and Water Main Separation Requirements
17	Sewer and Water Main Separation Requirement Exceptions
18	Grease Interceptor 750 Gallon to 1,500 Gallon Capacity