

WEST BAY
SANITARY DISTRICT
SAN MATEO COUNTY, CALIFORNIA

STANDARD SPECIFICATIONS
FOR
DESIGN AND CONSTRUCTION OF
SANITARY SEWER COLLECTION AND
CONVEYANCE FACILITIES

June 24, 2015

West Bay Sanitary District
500 Laurel Street
Menlo Park, CA 94025
(650) 321-0384

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PART A

GENERAL INFORMATION

SECTION A1 - INTRODUCTION AND SCOPE

SECTION A2 - DEFINITIONS

SECTION A1 - INTRODUCTION AND SCOPE

A1.01 INTRODUCTION

These Standard Specifications shall govern the design and installation of sanitary sewage collection and conveyance facilities under the jurisdiction of the West Bay Sanitary District. Reference is made hereby to the ordinances, rules and regulations of the District regarding sewage collection which shall be considered a part of these specifications as set forth in full, specifically Code of General Regulations Article IV.

The District's Standard Specifications have been prepared to aid all persons engaged in the design or construction of sewerage facilities for the District. These specifications are periodically updated to reflect changes in the technology affecting the District's sewerage facilities. Copies of changes will be distributed to interested parties upon receipt of request to the District office.

The information contained herein is not intended to be used as a contract document either for contracts between the District and a contractor or for contracts between a subdivider or private person and a contractor. Separate contract documents must be prepared for each project, with each such contract containing a "Special Provisions" section applicable to that particular project. In such contracts, construction details included herein may be included by reference.

The District Standard Specifications are divided into four parts, each of which is briefly described below:

1. Part A - General Information

Part A includes a general description of the intent and purpose of the District's Standard Specifications, a brief description of the District's Master Sewerage Plan, and definitions of terms used herein.

2. Part B - Design Standards

Part B describes standards to be used in the design of all sewerage facilities for the District.

3. Part C - Construction Standards

Part C, written in the form of typical specifications, covers the District's construction standards. These standards must be followed in any work constructed for the District's acceptance, and may be included by reference in construction contracts.

4. Part D - Standard Drawings

Part D consists of standard drawings and details which must be followed where applicable, in any work done for the District's acceptance.

A1.02 DISTRICT BOUNDARY

The boundary of the West Bay Sanitary District is available at the District Office. All sanitary sewers constructed within that boundary come under the jurisdiction of the District and must comply with the standards set forth herein.

A1.03 MASTER SEWERAGE PLAN

In July 2011, the District Board of the West Bay Sanitary District officially adopted a report entitled "Collection System Master Plan" to serve as a guide for future construction of sewerage system facilities. The Master Plan was revised in 2013.

That report identifies existing wastewater collection capacity and structural deficiencies and provides a staged capital improvements program to correct the existing deficiencies and to insure adequate capacity over the next 20 years to buildout of the service area. Copies of the report are on file in the District Office and it is suggested that any person who proposes to construct sewers within the District consult the report prior to design or layout.

SECTION A2 - DEFINITIONS

A2.01 DEFINITIONS

Terms that appear throughout these Standard Specifications shall have the following meanings:

1. APPLICANT shall mean the person making application for a permit for a sewer or plumbing installation and shall be the owner of the premises to be served by the sewer for which a permit is requested, or his authorized agent.
2. BOARD shall mean the Board of Directors of West Bay Sanitary District.
3. BUILDING shall mean any structure used for human habitation or a place of business, recreation or other purposes.
4. BUILDING SEWER shall mean the extension from the building drain to the public sewer or other place of disposal.
5. CITY shall mean the City of Menlo Park, Town of Atherton, City of East Palo Alto, Redwood City, Town of Woodside or Town of Portola Valley, California.
6. COMBINED SEWER shall mean a sewer that was designed to receive both surface runoff and sewage.
7. COMMERCIAL USER AND/OR INDUSTRIAL USER (both private and public) shall mean any user of the sewage works of the District located on property or in structures not classified as a single family unit or multiple dwellings.
8. CONTRACTOR shall mean an individual, firm, corporation, partnership, or association duly licensed by the State of California who shall do work for the District.
9. COUNTY shall mean the County of San Mateo or County of Santa Clara, California.
10. DAY means a calendar day of 24 hours, except when preceded by "working" as defined below.
11. DEFECTIVE WORK whenever used shall be understood to mean workmanship, materials, equipment or tools furnished by the Contractor

which in the opinion of the Engineer do not conform to the drawings and specifications or are otherwise unsatisfactory.

12. "Directed", "designated", "permitted", "required", "accepted", and words of like import, wherever and in whatever manner used, with or without reference to the Engineer, means as directed, designated, permitted, required, and accepted by the Engineer.
13. DISTRICT shall mean the West Bay Sanitary District.
14. DISTRICT ENGINEER as used in these specifications shall be taken to designate the party or parties authorized or employed by the District to observe completed work, and to observe their general compliance with plans, specifications, design and planning concept.
15. DISTRICT MANAGER shall mean the person appointed by the Board to administer and enforce the rules and regulations of the District.
16. DWELLING shall mean any house, duplex, apartment, commercial establishment, or any other building to be connected to a public or main sewer.
17. GARBAGE shall mean solid wastes from the preparation, cooking, and dispensing of food and from the handling, storage, and sale of produce.
18. INSTALL, wherever and in whatever manner used, shall mean the installation complete in place of an item of equipment.
19. LATERAL SEWER shall mean the portion of a side sewer lying within a public street/easement connecting a building sewer to the main sewer.
20. MAIN SEWER shall mean a public sewer designed to accommodate more than one lateral sewer.
21. MASCULINE gender words include the feminine.
22. MAY, wherever and in whatever manner used, is permissive.
23. MULTIPLE DWELLING shall mean a building containing two or more units for rental, lease, or similar legal instrument, for residential occupancy purposes, including, but not limited to the following: Hotels, Motels, Auto Courts, Trailer Courts, Mobil Home Parks, Apartment Houses, Duplexes, Rooming Houses, Boarding Houses, and Dormitories.

24. ORDINANCE shall mean the latest version of the West Bay Sanitary District's Code of General Regulations.
25. OUTSIDE SEWER shall mean a sanitary sewer beyond the limits of the District not subject to the control or jurisdiction of the District.
26. PERMIT shall mean any written authorization required pursuant to this or any regulation of the District for the installation of any sewerage works.
27. PERSON shall mean any human being, individual, firm, company, partnership, association and private or public and municipal corporation, the United States of America, the State of California, Districts, and all political subdivisions, governmental agencies and mandataries thereof.
21. PROVIDE, wherever and in whatever manner used, shall be understood to mean provide complete in place, that is, furnish and install.
22. PRIVATE SEWER shall mean that portion of a sewer serving an independent sewage disposal system not connected with a public sewer and which accommodates one or more buildings or industries.
23. PUBLIC NUISANCE shall mean continued habitation of any building or continued operation of any industrial facility in violation of the provisions the District's Ordinances, Rules or Regulations.
24. PUBLIC SEWER shall mean a sewer lying within a street or easement, and which is controlled by or under the jurisdiction of the District.
25. SANITARY SEWER shall mean a sewer which carries sewage and to which storm, surface, and ground waters are not intentionally admitted.
26. SEWAGE shall mean a combination of water-carried wastes from residences, business buildings, institutions, and industrial establishments.
27. SEWAGE TREATMENT PLANT shall mean any arrangement of devices and structures used for treating sewage.
28. SEWAGE WORKS shall mean all facilities owned or controlled by the District for collecting, pumping, treating, and disposing of sewage (Excepting private sewers).
29. SEWER shall mean a pipe or conduit for carrying sewage.
30. SHOWN, "indicated", "detailed", and words of like import, wherever and in

whatever manner used, with or without reference to the drawings, means shown, indicated or detailed on the drawings.

31. SHALL or "will", whenever used to stipulate anything, means shall or will be done or be performed.
32. SIDE SEWER shall mean the sewer line connecting any dwelling to a public sewer beginning at the foundation wall of any building and terminating at the main sewer and includes the building sewer and lateral sewer together.
33. SINGLE FAMILY DWELLING is defined to mean and refer to the place of residence, detached or attached unit, that can be legally owned by the occupant or occupants, including, but not limited to, condominiums, townhouses, houses or similar design.
34. SINGULAR words include the plural.
35. STANDARD SPECIFICATIONS shall mean a set of documents containing design and construction standards for all sewerage works within the District (i.e., this set of documents).
36. STATE STANDARD SPECIFICATIONS shall mean the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation Standard Specifications, latest edition.
37. STORM SEWER OR STORM DRAIN shall mean a sewer which carries storm and surface ground waters and drainage, but excludes sewage and polluted industrial wastes.
38. STREET shall mean any public highway, road, street, avenue, alley, way, public place, public easement, or right of way.
39. SUBMITTED, wherever and in whatever manner used, means submitted to the Engineer for his acceptance.
40. SUFFICIENT, "necessary", "proper", "acceptable", "satisfactory", "desirable", and works of like import, wherever and in whatever manner used, with or without reference to the Engineer, means sufficient, necessary, proper, acceptable, satisfactory and desirable in the judgement of the Engineer.
41. USER shall mean any owner, possessor, tenant, occupier, inhabitant, holder or person owning or occupying premises which are connected

directly or indirectly with the sewage works of the District.

42. WASTEWATER FACILITIES shall mean any part of the sewage collection system of the District.
43. WORK means and includes anything and everything to be done for the execution, completion and fulfillment of the contract to the satisfaction of the District.
44. WORKING DAY is any day except Saturdays, Sundays, or legal holidays, on which the normal working forces of the Contractor may proceed with regular work on the controlling operation or operations on the accepted work schedule for at least six hours toward completion of the contract, unless work is suspended for causes beyond the Contractor's control.

END PART A

PART B
DESIGN STANDARDS

SECTION B1 - GENERAL REQUIREMENTS

SECTION B2 - GRAVITY SEWERS, FORCE MAINS,
AND STEP SYSTEM

SECTION B1 - GENERAL REQUIREMENTS

B1.01 SCOPE

This section covers the general design requirements and design criteria applicable to the sewerage system as a whole.

B1.02 DESIGN CALCULATIONS

Design calculations submitted for District review shall be in a neat, acceptable form, and shall indicate the date, signature of the supervising engineer, and his State of California Engineering Registration Number and expiration date.

1. When Required

Design calculations along with maps and supporting data will be required for all subdivisions, industrial or commercial developments or when in the judgment of the District such information is necessary.

2. Sewers and Pipelines

Design calculations for sewers and pipelines shall be presented in tabular form and shall include the following information for each section of sewer: terminal manhole designation, ground elevations at the terminal manholes, incremental and cumulative tributary areas, incremental and cumulative tributary populations, incremental average and maximum domestic sewage flow, incremental infiltration allowance, cumulative design flow, invert elevations for terminal manholes, length of sewer run, and sewer size, slope, capacity, and velocity.

3. Pump Stations

Design calculations for pump stations shall include the following information: pad elevation at pump station surface, invert elevation of wet well, invert elevation of incoming and outgoing piping, headloss calculations, anticipated incoming flow calculations, pump run time calculations, wet well storage calculations, peak flows, system curve/pump curve overlay, and velocity through force main.

B1.03 UNIT DESIGN FACTORS

1. Population Densities

Population densities for determining ultimate tributary population shall be as indicated in the District's "Master Plan" of July 2011 or the latest revision on file at the District's Office or applicable City or County General Plan. Indicated densities shall be modified where conditions are known to be different. In the case of such modification, the applicant shall submit substantiating data.

2. Sewage Flow

- a. Per Capita Domestic Sewage Flow. The average dry weather per capita domestic flow shall be 85 gallons per day.
- b. Domestic Flow The average dry weather flow per single family dwelling and/or equivalent shall be 220 gallons per day.
- c. Ratio of Peak to Average Flow. The ratio of peak to average dry weather sewage flow is a function of the tributary population, and the tabulated values below shall be used.

<u>TRIBUTARY POPULATION</u>	<u>RATIO OF PEAK TO AVERAGE SEWAGE FLOW</u>
1,000 and less	5.0
2,000	4.4
3,000	4.0
4,000	3.7
5,000	3.5
10,000	3.2
20,000	2.8
50,000	2.4

- d. Infiltration. The infiltration allowance for areas to be served shall be 600 gallons per acre per day or 500 gallons per inch diameter per mile per day whichever is larger.
- e. Inflow Sources. No inflow sources which include rainwater, stormwater, groundwater, street drainage, subsurface drainage, roof drainage, yard drainage, and water from yard fountains, ponds, lawn sprays or swimming pools or any other uncontaminated water shall

be discharged into the public sewer.

- f. Commercial: Average dry weather flow rate of 90 gallons per day per 1,000 square feet or 2,500 gallons per acre per day.
- g. Office: Average dry weather flow rate of 300 square foot per employee and 15 gallons per day per employee or 2,000 gallons per day per acre.
- h. Restaurant: Average dry weather flow rate of 1 gallon per day per square foot.
- i. Industrial: Average dry weather flow rate of 3,000 gallons per acre per day.
- j. A minimum peak design value of 10,000 gallons/day per acre shall apply in all cases.

SECTION B2 - GRAVITY SEWERS, FORCEMAINS AND PRESSURE SYSTEMS

B2.01 SCOPE

This section covers basic design criteria and standards relating to gravity sewers, forcemains, and pressure systems.

B2.02 GRAVITY SEWERS

Design calculations for sewers and pipelines shall be presented in tabular form and shall include the following information for each section of sewer: terminal manhole designation, ground elevations at the terminal manholes, incremental and cumulative tributary areas, incremental and cumulative tributary population, incremental average and maximum domestic sewage flow, incremental infiltration allowance, cumulative design flow, invert elevations of terminal manholes, length of sewer run, and sewer size, slope, capacity, and velocity.

Gravity sewers shall be designed for obtaining reeration velocities and to prevent sulfide buildup by maintaining a self oxidizing condition. No surcharging of gravity sewers shall be allowed. Inverted siphons shall be avoided if at all possible. Design criteria for inverted siphons shall be established by the engineer on an individual basis only.

1. Minimum Size Main Sewer

The minimum diameter for main sewers shall be 8-inches. The use of 6-inch pipe may be allowed for the following conditions, if approved by the District Manager:

- a. Little or no possibility of future extension.
- b. Maximum tributary population of 25.
- c. Minimum slope of 1 percent on dead-end runs less than 200 feet in length.

2. Gravity Sanitary Sewer Lateral Connections

The minimum diameter for gravity sewer laterals shall be 4-inches. For gravity sewer laterals serving commercial or industrial buildings, or multiple family living units having more than three units, the minimum diameter shall be 6-inches.

The District Manager may grant a variance for commercial or industrial buildings, with only rest room facilities, to allow the use of a 4-inch side sewer. Such use must be guaranteed for future use of the facilities and no additional change will be allowed.

3. Minimum Slopes

The minimum slope of gravity sewer laterals shall be 2 percent for 4-inch sewers and 1 percent for 6-inch sewers. The minimum slope for main sewers shall be that required to obtain a velocity of 2 feet per second when the sewer is flowing full or one-half full. For the purpose of computing velocity, the Manning's coefficient of roughness "n" shall be 0.015 for sewers 8-inches in diameter and smaller, and 0.013 for sewers larger than 8-inches in diameter.

4. Steep Slopes

Special design features may be required for main sewers installed on steep slopes. Depending upon conditions of the specific installation, such items as underdrains, check dams, special anchorage, or special pipe material may be required. Based upon data supplied, the District Manager will assess each case and recommend certain special requirements.

5. Minimum Depth

The minimum depth of cover for any public sewer shall be 3 feet. If it is impossible to obtain the specified minimum depth, the sewer shall be either PVC-C900 DR 18 or ductile iron pipe for the entire length from manhole to manhole.

For gravity sewer laterals, minimum depths of cover shall be 3 feet, from property line to connection to sewer main. Where the minimum depths of cover is impossible to obtain, the use of PVC-C900 DR 18, or polyethylene encased ductile iron pipe will be required.

The use of public or gravity sewer laterals with less than 2 feet of cover will require special approval from the District Manager. Concrete Caps will not be permitted except where specifically approved by the District Manager.

6. Manholes

Manholes shall be provided at every line or grade change and at every point where the sewer changes size or material. In addition, manholes shall be

provided at maximum intervals of 300 feet on sewers 21-inches in diameter and smaller, and 400 feet on sewers larger than 21-inches in diameter.

7. Flushing Inlets or Rod Holes

Flushing inlets or rod holes will not be allowed.

8. Types of Pipe Permitted

Complete specifications for all approved pipe materials are given in Article C5.02. Limitations on the use of specific pipe materials are listed below.

- a. Gravity Sewers. Corrugated metal, high density polyethylene pipe and reinforced concrete pipes will not be permitted except where specifically approved by the District Manager. Asbestos cement pipe is not permitted. Plastic pipe with slopes greater than 10 percent will not be permitted except where specifically approved by the District Manager.
- b. Force Mains. In general, any pressure pipe material listed in Article C5.02 may be used. Asbestos cement pressure mains are not permitted.

The District Manager is the sole judge as to what types of pipe may or may not be used for each specific project.

9. Cleanouts

Each side sewer shall have a cleanout installed, at the property line, as shown on District Standard Drawing No. 7. The cleanout shall be the same size as the lateral. Each side sewer shall have a cleanout installed at the property line as per the requirements of the District's Code of General Regulations.

10. Backwater Check Valve

Gravity sewer laterals connecting houses having a finished floor elevation less than 12" above the top elevation of the nearest upstream structure (manhole) shall have a backwater check valve as required by the Uniform Plumbing Code. When conditions exist where the sewage cannot overflow on the area surrounding such installation without damage to property, a Backwater Check Valve and Shutoff System shall be installed.

11. Sampling Manhole

When required by the District Manager, any property served by a building sewer carrying non-residential wastes shall install a suitable control manhole in the building sewer in place of a cleanout as shown on District Standard Drawing No. 14.

12. Trace Wire

All new gravity sewer laterals and public main sewers shall have coated #8 gauge copper wire for tracing purposes placed over the pipe.

13. Root Control

All pipe joints shall be wrapped with an approved root control fabric, such as Biobarrier root control system or equal, to prevent future root intrusion into the new sewer. Root Control shall be placed over all joints, including laterals.

14. Lateral Abandonment

Laterals to be abandoned shall be disconnected at the main sewer connection as shown on District Standard Drawing No. 25. Laterals to be re-used shall be disconnected at the property line. The District shall approve all lateral abandonments.

B2.03 FORCEMAINS

1. Forcemains shall be designed using a Hazen and Williams coefficient for roughness "C" of 100 for non-plastic pipe, and 130 for plastic pipe.

2. Minimum Size Forcemain

The minimum diameter forcemain shall be 3-inches for septic tank effluent pumping (STEP) systems, 2-inch for grinder pump systems, and 4-inches for raw wastewater pump stations. Forcemains shall be sized for a maximum fluid velocity of 8 feet per second and of a pressure not to exceed half the pressure rating of the pipe, unless approved by the District Manager.

3. Slope and Termination

Forcemains shall have a uniform slope preventing high spots forming possible air pocket traps. Where high spots cannot be prevented, suitable air and/or vacuum release valve shall be installed at the high points. Each forcemain shall terminate in a vented transition structure designed to provide hydraulic characteristics compatible with the pump performance curve.

4. Maximum Size Forcemain

Forcemains shall be sized to carry grit and settleable solids expected in sewage tributary to the pump station. Minimum velocities of 2 feet per second should be maintained. Long forcemains and transition structures shall be designed resistant to corrosion resulting from sulfide generation.

5. Thrust Blocks

Concrete thrust blocks must be provided at all bends of the forcemain with angles 11 degrees or more. Thrust block must be sized based on soil conditions and maximum force exerted.

B2.04 PRESSURE SYSTEMS

1. SEPTIC TANK EFFLUENT PUMPING (STEP) SYSTEM (within On-Site Wastewater Disposal Zone)

a. Size of Septic Tank

1. Residential

2,500 gallons as shown on Standard Detail 18.

2. Commercial

Sewage flow up to 1,500 gallons per day: Daily Flow x 1.5

Sewage flow over 1,500 gallons per day: Daily Flow x 0.75 + 1,125

Reserve Capacity add: 500 gallons

b. Design

1. Septic tanks shall have two compartments, as shown on Standard Detail 18.

2. Septic tanks shall conform to the standard outlined in the manual for Septic Tank Practice of the U.S. Department of Health, Education and Welfare.

3. Septic tanks shall be of reinforced concrete material unless otherwise approved by the District Manager.
4. Septic tanks shall be structurally designed to withstand all anticipated earth, vehicle, or other loads. Complete plans and design calculations for the tanks shall be submitted to the District for approval.

Septic tanks shall be designed for the following minimum loading condition: Lateral Loads - 45 PCF (EFP)

5. Cleanout Stations shall be installed along the small diameter forcemain as shown on District Standard Drawing No. 11. The location of the cleanout station shall be submitted to the District for approval.
6. The lateral discharge line shall be 1- $\frac{1}{4}$ " from the STEP system pumps to the small diameter forcemain.
7. For each STEP system a Lateral Check Valve Station shall be installed along the lateral discharge line as shown on District Standard Drawing No. 12. The location of the lateral check valve station shall be submitted to the District for approval.
8. A Control/Telemetry unit with electrical bypass shall be installed at the STEP system as shown on District Standard Drawing No. 17. The location of the Control/Telemetry unit shall be submitted to the District and the Town of Portola Valley for approval. A dedicated phone line shall be supplied by the property owner for the telemetry system.
9. A Hose Bib shall be installed near the STEP system as shown on District Standard Drawing No. 15. The location of the hose bib shall be submitted to the District for approval.
10. Design plans and specifications shall direct contractor to provide one spare pump to the District prior to final approval of the system.
11. In the event that an on-site ejector pump is required to convey wastewater from a residential unit to the STEP system, the on-site ejector pump shall be sized to discharge at a rate no more than the STEP system discharge rate, unless approved by the District.

c. Location

1. The septic tank shall be located so as to provide vehicle access for maintenance unless otherwise approved by the District Manager. The District shall approve the location.
2. The septic tank shall be installed outside of traffic areas.
3. A recorded ingress/egress and maintenance easement must be dedicated to the District to gain access and maintain the pump.

2. GRINDER PUMP SYSTEM (Residential Only, in On-Site Wastewater Disposal Zone)

a. Minimum Size of Basin

1. Single Family Residential (simplex) 150 Gallons

Basin size must be submitted to the District for approval.

b. Design

1. Grinder pump system shall be a complete unit, including grinder pump, check valve, tank basin, electrical quick disconnect (NEMA 4X), pump removal system, shut-off valve, anti-siphon valve, internal wiring and controls. Grinder pump shall be as manufactured by Environmental One.
2. Concrete anchor shall be poured-in-place.
3. The pump shall be an integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with mechanical seal.
4. The pump shall be capable of delivering 15 gpm against a rated total dynamic head of 0 feet and 9 gpm against a rated total dynamic head of 138 feet. The pump must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head.
5. The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece stainless steel motor shaft. The grinder impeller assembly shall be securely

fastened to the pump motor shaft.

6. A Cleanout Station shall be installed along the small diameter forcemain as shown on District Standard Drawing No. 11. The location of the cleanout station shall be submitted to the District for approval.
7. The lateral discharge line shall be 1-¼" from the grinder pump(s) to the small diameter forcemain.
8. For each Grinder pump system a Lateral Check Valve Station shall be installed along the lateral discharge line as shown on District Standard Drawing No. 12. The location of the lateral check valve station shall be submitted to the District for approval.
9. A Control/Telemetry unit shall be installed for the grinder pump(s) as shown on District Standard Drawing No. 17. The location of the Control/Telemetry unit shall be submitted to the District and the Town for approval. A dedicated phone line shall be supplied by the property owner for the telemetry system.
10. A Hose Bib shall be installed near the grinder pump(s) as shown on District Standard Drawing No. 15. The location of the hose bib shall be submitted to the District for approval.
11. Design plans and specifications shall direct contractor to provide one spare pump to the District prior to final approval of the system.
12. In the event that an on-site ejector pump is required to convey wastewater from a residential unit to the grinder pump, the on-site ejector pump shall be sized to discharge at a rate no more than the grinder pump discharge rate, unless approved by the District..

c. Location

1. The grinder pump system shall be located so as to provide vehicle access for maintenance unless otherwise approved by the District Manager. The District shall approve the location.
2. The tank shall be installed outside of traffic areas.
3. A recorded easement must be dedicated to the District to gain access and maintain the pump(s).

END PART B

PART C

CONSTRUCTION STANDARDS

SECTION C1-	SPECIAL CONDITIONS AND CONSTRUCTION REQUIREMENTS
SECTION C2-	EARTHWORK
SECTION C3-	CONCRETE WORK
SECTION C4-	METALWORK
SECTION C5-	PIPELINES AND SEWERS
SECTION C6-	PAINTING
SECTION C7-	RESURFACING
SECTION C8-	SEWER LINE CLEANING
SECTION C9-	SMOKE TESTING
SECTION C10-	SEWER FLOW CONTROL
SECTION C11-	TELEVISION INSPECTION
SECTION C12-	PRESSURE SYSTEMS
SECTION C13-	GREASE INTERCEPTORS

SECTION C1 - SPECIAL CONDITIONS AND CONSTRUCTION REQUIREMENTS

C1.01 ARRANGEMENT OF SPECIFICATIONS

The Construction Standards are arranged in sections covering various phases of the work as follow:

<u>SECTION NUMBER</u>	<u>TITLE</u>
C1	Special Conditions and Construction Requirements
C2	Earthwork
C3	Concrete Work
C4	Metal Work
C5	Pipelines and Sewers
C6	Painting
C7	Resurfacing
C8	Sewer Line Cleaning
C9	Smoke Testing
C10	Sewer Flow control
C11	Television Inspection
C12	Pressure Systems
C13	Grease Interceptors

C1.02 STANDARD SPECIFICATIONS

Whenever Standard Specifications, codes, or regulations are referred to, they shall be the latest edition of those specifications, codes, or regulations, and they shall be considered to be a part of these standard insofar as they apply. Such documents from the following sources may be referred to herein:

- American Assoc. of State Highway and Transportation Officials (AASHTO)
- American Concrete Institute (ACI)
- American Gas Association (AGA)
- American Institute of Electrical Engineers (AIEE)
- American Institute of Steel Construction (AISC)
- American National Standards Institute, Inc. (ANSI)
- American Public Works Association (APWA)
- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- American Society for Testing and Materials (ASTM)
- American Welding Society (AWS)
- American Water Works Association (AWWA)
- State of California, Department of Transportation (CalTrans)
- State of California, Division of Occupational Safety and Health (CAL OSHA)
Construction Safety Orders

- Federal Environmental Protection Agency (EPA)
- Federal Specifications (Fed. Spec.)
- National Electrical Manufacturers' Association (NEMA)
- National Lumber Manufacturers' Association (NLMA)
- Uniform Building Code (UBC)

C1.03 EXISTING UTILITIES

The Contractor shall maintain all water or sewer lines, lighting, power or telephone conduits, structures, house connection lines, datacom, gas, and other surface or subsurface of any nature that may be affected by the work. Should it be necessary in the performance of the work to disconnect or reroute any underground utility, or should any such utility be damaged during construction, all expenses of whatever nature arising from such disconnection, rerouting, damage or replacement shall be borne by the Contractor.

The District reserves the right, if requested by the utility owner, to permit him to move or maintain any such conflicting utility at the Contractor's expense.

The right is reserved by the State, the County, the City or the District, and by owners of public utilities, to enter upon any street or road right-of-way, or easement for the purpose of maintaining their property and for making necessary repairs or changes caused by the work.

C1.04 DUST CONTROL

Reasonable means shall be provided to prevent a nuisance occurring due to dust from areas under construction. Such means shall include watering and sweeping, and in cases of extreme nuisance, light oiling of the affected surface.

C1.05 ENCROACHMENT PERMITS

Before any construction commences, the Contractor shall obtain any Encroachment Permit from the jurisdiction in which the work is located. All work done in City, Town, and County streets shall be subject to the requirements of the City, Town and/or County as included in the Encroachment Permit. Other jurisdictional agencies requiring encroachment permits are Caltrans and San Francisco Water. The Contractor shall provide a copy of any encroachment permit upon request by the District.

C1.06 WORK WITHIN RAILROAD AND HIGHWAY RIGHT-OF-WAYS

Construction within the Railroad and State Highway right-of-ways shall be subject to utility Encroachment Permits provided by the Railroad Company, Joint Powers,

or CalTrans.

C1.07 WORK IN EASEMENTS

Before construction commences on an easement, the District must have in its possession a signed copy of the Deed of Easement. Should an area greater than that included in the easement be required for construction purposes, the Contractor shall negotiate for use of the additional area from the property owners. Fences, structures, and landscaping, which are removed and damaged by the Contractor, shall be restored as nearly as possible to their original condition at the Contractor's expenses. Any damage caused by the Contractor's operations shall be the Contractor's responsibility.

The Contractor shall obtain a signed release from the affected property owner(s) after the work is completed.

C1.08 OPERATION OF EXISTING FACILITIES

Existing sewerage facilities shall be maintained in service at all times. The Contractor shall devise acceptable methods for maintaining continuity of service equal to that which existed prior to construction. If bypassing is required, the Contractor shall demonstrate bypassing operations to the District for approval prior to start of excavation.

Existing sewer manholes to be abandoned shall be broken up at the bottom and filled with structural backfill, the top three feet shall be removed, cone section crushed, and their frames and covers shall be salvaged by the Contractor. These District owned frames and covers shall be delivered by the Contractor to a location within the District designated by the District Manager.

The Contractor shall notify the District in writing at least seven days in advance before a new sewer line is to be connected to an existing sewer.

To prevent dirt, rocks, and other debris from entering the sewerage system, the Contractor shall install and maintain an acceptable grit interceptor in a manhole designated by the District Manager.

C1.09 SAFETY AND HEALTH PROVISIONS

The Contractor shall conform to all applicable occupational safety and health standards, rules, regulations and orders established by Federal and State Agencies.

All working areas utilized by the Contractor to perform work during the hours of

darkness, shall be lighted to conform to the minimum illumination intensities established by California Division of Occupational Safety and Health Construction Safety Orders (CAL OSHA).

All lighting fixtures shall be mounted and directed in a manner precluding glare to approaching traffic.

Specific attention is directed also to OSHA safety rules, regulations and precautions to be taken by the Contractor before entering sanitary sewer manholes, and other sanitation structures with respect to physical and chemical hazards which may be present.

C1.10 HAZARDOUS MATERIALS

If the Contractor encounters material on the site, which it reasonably believes may contain asbestos, Polychlorinated Biphenyl (PCB) or other suspected hazardous materials, the Contractor shall stop work in the affected area and notify the District Manager. The Contractor shall proceed with analysis, removal, and disposal of the material according to applicable federal and state guidelines.

C1.11 CONTRACTOR'S SUBMITTAL

Shop drawings or information regarding materials and equipment shall be submitted in five copies. The District, after taking appropriate action, will return two marked copies to the Contractor.

C1.12 TRAFFIC CONTROL

The Contractor shall furnish Traffic Control Plans for all phases of work for the project site, as required by the governing jurisdiction of the right of way in which to work is planned, in conformance with Caltrans Standards. **No construction site work shall commence prior to the jurisdictional agencies' approval of the Traffic Control Plans and installation of required signs.**

SECTION C2 - EARTHWORK

C2.01 SCOPE

Earthwork includes all plant, labor, equipment, appliances, and materials as required or necessary to excavate, trench, fill, backfill, and grade for the construction of structures, sewers, and graded areas.

C2.02 GENERAL REQUIREMENTS

1. Control of Water

The Contractor shall furnish, install, and operate all necessary machinery, appliances, and equipment to keep excavations reasonably free from water during construction and he shall dispose of the water so as not to cause injury to public or private property, or to cause a nuisance or a menace to the public. He shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies and shall have available at all times competent mechanics for the operation of all pumping equipment.

The control of ground water shall be such that softening of the bottom of the excavation, or the formation of "quick" conditions or "boils" shall be prevented. Dewatering systems shall be designed to operate so as to prevent the removal of the natural soils.

During excavation, installation of sewers, placing of trench backfill, and the placing and setting of concrete, the excavation shall be kept reasonably free of water. When specified, the static water level shall be drawn down below the bottom of the excavation so as to maintain the undisturbed state of the natural soil and to allow the placement of backfill to the required density. The dewatering system shall be installed and operated so that the ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

The release of ground water to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soil, prevent disturbances of compacted backfill, and prevent floatation or movement of structures and sewers.

If area is potentially contaminated or known to be contaminated, the Contractor shall notify the Regional Water Quality Control Board (RWQCB) prior to discharge of groundwater. Contractor shall adhere to the requirements of the RWQCB.

2. Excavated Material

Arrangements for proper disposing of excess excavated material unsuitable for backfill shall be made by the Contractor at his own expense. Excavated material suitable for backfill shall be stored temporarily in such a manner as will facilitate work under the contract.

Except as indicated elsewhere in these specifications, excess materials from trench and structure excavation shall become the property of the Contractor and shall be disposed of offsite. The Contractor is responsible for obtaining all necessary easements, rights, and permits pertaining to such proper disposal. The Contractor shall furnish a copy of all such easements, rights, and permits to the District prior to disposal of excavated materials. All expenses involved with offsite disposal shall be borne by the Contractor

3. Shoring, Sheeting and Bracing

Where sheet piling, shoring, sheeting, bracing, or other supports are necessary, they shall be furnished, placed, maintained and removed by the Contractor. At all times the rules of the California Department of Industrial Relations, Division of Industrial Accidents sec 6705, with respect to excavation and construction shall be strictly observed. Sheet piling and other supports shall be withdrawn in such a manner as to prevent subsequent settlement of the pipe, or additional backfill on sewer lines which might cause overloading.

Pursuant to State law, all open excavations greater than five feet shall be constructed with bracing, shoring, or other equipment method designed for the protection of life and limb. The contractor must at all times comply with the requirements of the construction safety orders of the Division of Industrial Safety.

The minimum required protection will be that described in the Construction Safety Orders of the Division of Industrial Safety. It shall be the contractor's responsibility to provide the additional strength required to support the sides of the excavation against loads that may exceed those employed to derive the criteria set forth in the Industrial Safety Orders. The contractor shall be solely responsible for any and all liabilities which may arise from his failure to provide adequate shoring, bracing or sheeting as necessary to support the excavation under any and all of the conditions of loading which may exist or which may arise during construction.

In addition, the Contractor shall obtain, pay for, and comply with all provisions of the permit required by Section 6500 of the California Occupational Safety and Health Act.

The design, planning, installation, and removal of all shoring, sheeting, and bracing shall be by a registered engineer and accomplished in such a manner as to maintain the undisturbed state of the soil adjacent to the trench and below the excavation bottom.

4. Removal of Obstructions

The Contractor shall remove, or cause to be removed, all trees, including stumps, fences, and all structures where the proper construction and completion of the work require their removal. The Contractor shall also remove all rock, stones, debris, and obstructions or whatsoever kind or character, whether natural or artificial, encountered in the construction of the work.

Material that is removed as hereinabove specified, and is not to be incorporated in the improvement being constructed, shall be disposed of according to applicable laws by the Contractor at his expense.

C2.03 CLEARING AND GRUBBING

1. Clearing shall consist of the satisfactory removal and disposal of vegetation designated for removal, including brush and rubbish occurring within the area to be cleared. Grubbing shall consist of the removal and disposal of matted roots from the designated clearing and grubbing areas. Clearing shall be limited to only the construction area and in no case shall it extend onto adjacent private property.
2. Unless otherwise shown or required, existing trees shall be preserved and protected. Limbs on trees which are to remain shall be trimmed by the Contractor in a professional manner if they interfere with construction to the satisfaction of the District and City or Town.
3. Roots, brush, grass and other vegetation in areas to be cleared shall be removed completely and disposed of by the Contractor.
4. The materials, together with organic items, masonry, concrete or metallic debris in the clearing and grubbing areas shall be excavated and removed to a depth of not less than 12 inches below the original surface level of the ground.

5. Depressions made by grubbing shall be filled with approved material and compacted in accordance with Section C2.04.3 to make the surface conform with the original adjacent surface of the ground, or with the rough finish surface as shown on the drawings.
6. Brush, rotten wood, and other refuse from the clearing and grubbing operations shall be completely removed and disposed of by the Contractor unless the property owner requests in writing that the material to remain.
7. Permission to dispose of cleared and grubbed material on the property of others shall be in writing, and a copy of this permission shall be filed with the District Manager.
8. Damages caused by the execution of this work shall be paid for by the Contractor.

C2.04 SITE GRADING

1. General Excavation
 - a. General excavation shall be performed in the areas shown on the Drawings to bring surface levels to the elevations indicated. Excavation shall include the removal of earth, loose rock, boulders, and other items or materials encountered in the work.
 - b. Common excavation shall include silt, clay, sand, gravel, topsoil, hard and compact materials such as hardpan, cemented gravel, shale, soft or disintegrated rock and boulders or detached pieces of solid rock or masonry less than 1/2 cubic yard in volume that can be removed by hand, power shovels, draglines and other excavating equipment and without continuous and systematic blasting or without the use of pneumatic tools for successful removal.
 - c. Excavated material suitable for fill or backfill shall be stockpiled as needed on the site in an area designated by the District Manager. Stockpiles shall be graded to shed water. Excess excavation not required shall be removed from the site and properly disposed of by the Contractor.
 - d. Material found unsuitable for use as fill or backfill shall be removed from the site and properly disposed of by the Contractor.

2. Filling

- a. Fill required to bring low areas to grade shall be clean, non-expansive, selected material with a plasticity index (PI) less than 10 and maximum dimension of 6 inches. Fill shall be obtained from excavations on site, or from off-site borrow sources if the amount of suitable material from on-site excavation is insufficient. No rocks larger than 4 inches in maximum dimension shall be placed in the upper two feet of fill.
- b. Subgrades on which fill material is to be placed shall be scarified to a depth of not less than 4 inches by plowing or discing. A layer of suitable fill material, approximately 3 inches in depth, shall be spread over the scarified surface and compacted as specified herein.
- c. Dumping, spreading and compacting of fill material shall be carried out in sequence as closely as possible. Unless otherwise specified, fill material shall be spread and compacted in uniform layers not exceeding 8 inches in depth (loose measure) until the total thickness of fill, as shown on the Drawings, is completed.
- d. When the quantity of material required for filling is not available within the limits of the job site, the Contractor shall provide sufficient material to construct the fills to the lines, elevations and cross-sections as shown on the Drawings from offsite borrow areas. If required, borrow areas shall be provided by the Contractor and at his expense. Borrow material shall meet the requirements and conditions of the fill in which it is to be deposited. Borrow areas selected by the Contractor and the materials contained there shall be approved by the District Manager prior to the placing of any such materials excavated from the borrow pit in fill or backfill.
- e. Procedures and requirements specified here for other excavation are also applicable to excavation from borrow areas.
- f. The Contractor shall notify the District Manager at least 10 days in advance of the opening of any borrow pit to permit any necessary elevations or measurements to be taken or any desired material tests to be made.
- g. Aggregate Base where indicated on the Drawings shall conform to section 26, Aggregate Bases, of the State Standard Specifications for Class 2 Aggregate Base as to materials and workmanship.

3. Compaction

- a. Compaction of each fill layer shall be performed with equipment and methods approved by the District Manager. Equipment shall be operated in one direction along the full length of each layer until the area has been thoroughly and uniformly compacted to the specified density. Fill areas shall be crowned and sloped to drainage ditches as shown on the Drawings, or as required to prevent ponding of surface water.
- b. In places inaccessible to rolling equipment, the required compaction may be obtained with mechanical tamps, single-shoe vibrators, or other approved equipment.
- c. Fills failing to meet the requirements for density, shall be further processed by mixing, rolling or other approved methods.
- d. Fill shall be compacted to 90 percent relative density per ASTM D 1557 test method.

4. Soil Testing

- a. A soil testing laboratory will be employed by the Contractor at his expense to determine sieve analysis and Proctor curves necessary to make field density tests for all work pertaining to the general construction.
- b. Compaction density will be based on the percent of standard Proctor ASTM D1557 for each of the materials and for the particular application as specified above.
- c. Method of determining the density in place of compacted soil will be in accordance with ASTM D2167.
- d. Density test will be run for each 1 foot of compacted fill unless otherwise required by the District Manager and/or the jurisdictional agency..
- e. It will be the Contractor's responsibility to keep the fill material near the optimum moisture content so as to obtain proper compaction and to notify the Engineer in sufficient time to observe the necessary field density tests. It will be the responsibility of the District Manager to determine the number and location of these tests.

- f. Proctor tests will be obtained at each new source of backfill material or when the characteristics of the material change sufficiently, in the opinion of the District Manager, to require further tests.
- g. A copy of all test results shall be provided to the District upon the completion of the tests.

C2.05 EXCAVATION BACKFILL AND COMPACTION FOR STRUCTURES

1. Excavation

The site shall be cleared of all natural obstructions, pavement, utilities, and other items which will interfere with construction. Unless otherwise specified, any method of excavation may be employed which, in the opinion of the Contractor, is considered best.

Ground shall not be dug by machinery nearer than 3 inches from any finished subgrade without the express approval of the District Manager. The last 3 inches shall be removed without disturbing the subgrade. Should the excavation be carried below the required lines and grades because of the Contractor's operations, the Contractor at his own expense shall refill such excavated space to the proper elevation in accordance with the procedure specified for backfill, or if under footings, the space shall be filled with concrete as directed by the District Manager.

Bearing surfaces under footings and foundations shall be level, except as otherwise shown on the Drawings. Interfering boulders in bearing surfaces shall be removed and replaced with concrete, at least equal in strength to the soil bearing value of the surrounding or overlying soil, or interfering portions jack hammered out, as directed by the District Manager.

Should bearing surfaces under footings, foundations or slabs appear inadequate at the design elevations for the loads indicated on the Drawings. The Contractor shall immediately notify the District Manager. The Contractor shall then proceed in accordance with the District Manager's direction.

Materials unsuitable for structure foundations encountered at the established elevation of the bottom of footings or the bottoms of floors of structures shall be removed to the depth required by the District Manager. The volume resulting from the removal of such unsuitable materials shall be backfilled with material approved by the District Manager and compacted to 95 percent of maximum density, as determined by ASTM D1557. Method

of determining the density in-place of compacted soil shall be in accordance with ASTM D2167.

Where, in the opinion of the District Manager, the undisturbed condition of the natural soil is not adequate to support the structure, the District Manager shall direct the Contractor to over excavate to adequate supporting soil and refill the over excavated space as directed by the District Manager. The quantity and placement of such material shall be as ordered by the District Manager.

Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is authorized to be deposited directly against excavated surfaces or against existing concrete surfaces.

2. Backfill and Compaction

After completion of foundation footings and walls, and of other construction below the elevation of the final grade, all forms shall be removed and the excavation shall be cleaned of all debris. Substructure surfaces shall be waterproofed if required and as specified. Sheet piling shall not be removed until backfilling operations are completed.

The Contractor shall keep all excavations free of water at his own expense. Contractor shall provide all dams, flumes, channels, sumps, or other works necessary to keep the excavation entirely clear of water, and shall provide and operate pumps and other suitable equipment of adequate capacity for dewatering the excavations. Contractor shall avoid producing mud in the excavated bottom by his operations, and, if necessary or so ordered, shall place crushed rock at his own expense to maintain a firm dry excavated bottom and base.

Backfill shall be composed of clean natural material or imported material acceptable to the District Manager. Backfill shall be placed in layers not exceeding 8 inches in loose depth and compacted by tamping or rolling. Jetting is not permitted.

The finished subgrade shall be brought to the elevations indicated on the Drawings and sloped to drain water away from the structure walls. Backfill shall be brought up to required elevations for any areas where settlement occurs. Density tests will be run for each 6 inches of compacted fill.

Backfill shall be placed against foundations and concrete walls only after approval of the District Manager has been obtained. Backfill shall be placed

and compacted so as to minimize settlement and avoid any damage to concrete walls, to waterproofing, and other work in place.

No backfill shall be placed against structure walls until test specimens indicate that the concrete has developed the required compressive strength.

Backfill material shall be placed in such a manner that unbalanced loading will be prevented except in the case of retaining walls.

During backfilling, the Contractor shall take adequate precautions to prevent damage to or misalignment of work already in place, as a result of his methods of work, or the operation of his equipment, and shall pay the cost of rectifying any damage or misalignment thus caused.

Compacted backfill shall not be placed when, in the judgement of the District Manager, the weather or the condition of the fill preclude obtaining the degree of compaction specified.

Regardless of the method of compaction, the final density shall be as shown in the District's Standard Detail No. 8 with a maximum density at optimum moisture as determined by AASHTO T180 or by California Test 216.

C2.06 EXCAVATION AND BACKFILL FOR SEWER LINES

1. Trench Excavation

Unless otherwise indicated on the plans or in the special conditions, excavation for sewer lines shall be by open cut. Trenching machines may be used except where their use will result in damage to existing facilities. For sewers to be constructed in filled areas, the entire area fill shall be placed and compacted to at least five feet above the proposed sewer invert before the sewer trench is excavated.

Trenches shall be excavated at least 4 inches below the barrel of the pipe and the bottom refilled with select, virgin, imported material of the type specified under Article C2.06 2a - Bedding Material or as shown in the District's Standard Detail No. 8.

The maximum allowable width of trench measured at the top of the pipe shall be the outside diameter of the pipe, exclusive of bells and collar, plus 24 inches, and such maximum width shall be inclusive of all trench timbers. A minimum of 6 inches shall be maintained between pipe and trench wall. Whenever the maximum allowable trench width is exceeded for any reason, the Contractor shall embed or cradle the pipe in a manner satisfactory to

the District Manager.

Excavations shall be supported as set forth in the rules, orders and regulations of the California Department of Industrial Relations, Division of Industrial Accidents. Sheet piling and other timbers shall be withdrawn so as to prevent subsequent settlement of the pipe, or additional backfill that might overload the pipe. No sheeting will be withdrawn from below the top of the pipe after completion of backfill to that level.

Where water is encountered in pipe trenches, the Contractor shall furnish, install and operate such pumps or other devices that may be necessary for removing the water during the construction of the pipelines. Trenches shall be kept free from water while the pipe or other structures are installed, while concrete is setting and until backfill has progressed to a sufficient height to anchor the work against possible flotation or leakage. Water shall be disposed of in such a manner as not to cause injury to public or private property, or be a menace to the public health.

Whenever the bottom of the trench is rocky, soft, yielding, or in the opinion of the District Manager otherwise unsuitable as a foundation for pipe, the unsuitable material shall be removed to a depth such that when replaced with crushed rock it will provide a stable and satisfactory foundation. Special compaction of the imported material may be required.

Trenching adjacent to, or near, structures shall be made using construction methods that will not result in damage to the structure. Excess excavated material not required for backfilling shall be properly disposed of by the Contractor.

2. Trench Backfill

- a. Bedding Material. After the pipe has been properly laid and inspected, select, virgin, backfill material shall be placed under and around the pipe to a depth of 12 inches above the top of the pipe and shall be thoroughly consolidated to a final density of at least 90 percent of maximum density as determined by AASHTO T180 or by California Test 216. Consolidation shall be obtained by mechanical means. The select material shall be free from organic matter, and of such size and gradation that the desired compaction can be readily attained. The size of gradation shall fall within the following limits.

Bedding Material: Granular Bedding Requirements (ASTM D448 Size #67 and California Test 202).

<u>SIEVE SIZE</u>	<u>PERCENTAGE PASSING SIEVE</u>
1 inch	100
3/4"	90-100
3/8"	20-55
No. 4	0-10
No. 8	0-5

- b. Subsequent Backfill. Above the level of bedding material, the trench shall be filled with structural backfill as designated by Standard Detail No. 8. Backfill shall be placed in layers not exceeding 8 inches in loose depth and compacted by mechanical means to a density of not less than 95 percent maximum density at optimum moisture as determined by California Test 216 or 231 (Nuclear Gauge). In trenches where the structural backfill is deeper than 3.0 feet, the upper 3.0 feet of the structural backfill should be compacted to 95% relative compaction. Lower portions of the backfill material shall be compacted to a minimum of 90% relative compaction.

The size of gradation shall fall within the following limits:

Structural Backfill: Structural backfill requirements (CalTrans California Test 202) Minimum Sand Equivalent 20:

<u>SIEVE SIZE</u>	<u>PERCENTAGE PASSING SIEVE</u>
1-1/2"	100
3/4"	80-100
#4	30-60
#30	5-35
#200	0-12

The finishing of the roadway (aggregate base and asphalt concrete) shall match the existing finishing and be constructed to the requirements of San Mateo County, Caltrans, the Town or the City, whichever requirements apply.

Contractor shall provide a gradation analysis from the source or from a soil engineering firm to ascertain that the material used for bedding or structural backfill is in compliance with the District's Specifications.

C2.07 SITE DRAINAGE

The Contractor shall control the grading in the vicinity of any structure or trench

such that the surface of the ground will be properly sloped to prevent water from running into the excavated areas. Excavation shall be formed in such a manner that the area of the site and the area immediately surrounding the site for a distance of 25 feet, including slopes and ditches, will continually and effectively drain away from the excavated areas.

Pumps and discharge lines of sufficient capacity to prevent the accumulation of groundwater and rain water in the excavation shall be at the site and in proper operating condition at all times.

Except as authorized by the District Manager in writing, the excavation shall be continuously maintained dry until the progress of construction of the structure to be built in the excavation is above grade and the backfill is complete.

The Contractor's method for removal of water from foundation excavations shall be subject to the approval of the District Manager.

Water discharged from the excavation shall be disposed of in a manner to protect the work and adjacent property from damage. Except when authorized by the District Manager, no water shall be drained into work already built or under construction.

The Contractor shall be responsible for and shall repair at his expense any damage to the foundations, structures, or any other part of the work caused by floods, water, or failure of any part of the diversion or protective work.

C2.08 CLEAN UP

The Contractor shall not allow the site of the work to become littered with trash and waste material but shall maintain the site in its normal neat and orderly condition throughout the construction period. On or before the completion of the work, the Contractor shall carefully clean out all pits, drain lines and drains, chambers or conduits and shall tear down and remove all temporary structures built by him and shall remove rubbish of all kinds from any of the grounds which he has occupied and leave them in first-class condition.

After completing all work, the Contractor shall leave the site in a neat and clean condition, doing such grading as is required to restore the site to its original shape and configuration. Any existing features, improvements, structures, and other facilities damaged or affected by the work shall be replaced, repaired, or restored to their original condition or better.

C2.09 ARCHAEOLOGICAL MATERIALS

If archaeological materials are uncovered during earthwork or trenching, stop work within 100 feet of archaeological materials until a professional archaeologist certified by the Society of California Archaeology or the Society of Professional Archaeology has evaluated the significance of the find. Depending on significance of find, archaeologist may suggest mitigation measures.

In the event that archaeological remains are uncovered by work of this project and examination of remains delays Work, Contractor shall be entitled to an extension of contract duration equal to the number of days Contractor is delayed. No compensation or additional time will be allowed for delays caused by examination of archaeological remains.

C2.10 DISCOVERY OF PROTECTED ANIMAL AND PLANT LIFE

If protected animal or plant life is discovered during earthwork or trenching, work shall be stopped within 100 feet of the protected animal or plant life. The District will notify the effective agency and evaluate the significance of the find. Depending on significance of find, the District may suggest mitigation measures.

In the event that a discovery is uncovered by work of this project and examination of the discovery delays Work, Contractor shall be entitled to an extension of contract duration equal to the number of days Contractor is delayed. No compensation or additional time will be allowed for delays caused by examination of discovery of protected animal or plant life.

C2.11 STORM WATER POLLUTION PREVENTION PROGRAM

The City of Menlo Park adopted an ordinance to control the discharge of pollutants into storm sewers for protecting the water quality pursuant to the Clean Water Act. In order to implement the Federal Regulatory requirements, the Contractor and his subcontractors shall undertake all practicable measures specified herein to reduce pollutants.

The following are recommended construction materials handling and disposal practices for construction sites and a list of recyclers and disposal services to guide contractors/subcontractors in safe and non-polluting methods of disposal. The City of Menlo Park will enforce any of the provisions of this Section. The violation of any provisions of this Section or failure to comply with any of the mandatory requirements of this Section shall constitute a misdemeanor to be charged and prosecuted as provided by City code.

A. ROADWORK AND PAVING: Road construction often involves extensive earth work and grading, which loosens soils and creates opportunities for

erosion and deposition of sediments in storm drains and creeks. Road paving, surfacing and pavement removal happen right in the street where there are numerous opportunities for storm drain pollution by asphalt sawcut slurry or excavated material. Efforts should be made to store and dispose of materials properly and to guard against pollution of storm drains and creeks.

1. Check all equipment for leaks and repair leaking equipment promptly.
 2. Perform major maintenance, repairs and washing of equipment away from storm drains and creeks.
 3. When refueling or vehicle/equipment maintenance must be done on site, designate a completely contained area away from storm drains and creeks.
 4. Recycle used oil to lubricate (clean equipment and/or parts).
 5. Cover and seal catch basins and manholes when applying seal coats, slurry seal, and fog seal.
 6. Never wash excess material from exposed aggregate concrete or similar treatments into a street or storm drain. Collect, recycle or dispose to dirt area.
 7. Cover stockpiles and other construction materials with plastic tarps. Protect from rainfall to prevent run-off with temporary roofs or plastic sheets and berms.
 8. Catch drips from paver with drip pans or absorbent material. Place under machine when not in use.
 9. Clean all Spills and leaks using "dry methods" and dig up and remove contaminated soil.
 10. Avoid creating excess dust when breaking asphalt or concrete. After breaking up of pavement, be sure to remove all chunks and pieces from the site.
 11. Protect nearby storm drain inlets during sawcutting. Shovel or vacuum sawcut slurry deposits and remove from the site. Never hose down streets to cleanup tracked dirt. Use dry sweep methods.
- B. **HEAVY EQUIPMENT OPERATION:** Poorly maintained vehicles and heavy equipment leaking fuel, oil, anti-freeze or other fluids on the construction site are common sources of storm drain pollution. Prevent spills and leaks by isolating equipment from run-off channels and by watching for leaks and other maintenance problems. Remove such equipment from the site as soon as possible.
1. Maintain all vehicles and heavy equipment. Inspect frequently for and repair leaks.
 2. Perform major maintenance, repair jobs and vehicle equipment washing off site.
 3. If you must drain and replace motor oil, radiator coolant or other fluids on site, use drip pans or drop cloths to catch drips and spills. Collect all

fluids, store in separate containers and recycle whenever possible or dispose of fluids as hazardous waste.

4. Recycle used vehicle batteries.
5. Never hose down “dirty” pavement or impermeable surfaces where fluids have spilled. Use dry clean-up methods whenever possible.
6. Sweep up spilled dry materials immediately. Never attempt to wash them away with water or bury them.
7. Report significant spills to the appropriate spill response agencies immediately.

SECTION C3 - CONCRETE WORK

C3.01 SCOPE

Concrete work includes the construction of all manholes, footings, slabs, walls, supports, and other concrete items, complete with steel reinforcement. Concrete work shall include all material, labor, and other items necessary to construct concrete structures and appurtenances, specified and/or required to make the work complete and operable.

C3.02 MATERIALS

1. Cement

Portland cement concrete shall be Class 1 conforming to State Standard Specifications section 90, Portland Cement Concrete. Cement shall conform to Caltrans Standard Specification Section 90-1.01. Only one brand of cement shall be used for exposed architectural concrete throughout one structure or composite element. Insofar as possible, all cement used in the work shall be taken from stock bins at the place of manufacture.

Cement brought to the site of the work shall at all times be suitably stored and protected from exposure to the atmosphere. In the event the cement shows signs of deterioration, it shall be removed from the work unless additional tests show that it conforms to the requirements stated above.

2. Aggregate

Fine and coarse aggregate for concrete shall conform to ASTM C33 or to CalTrans Standard Specifications Section 90-2.02 "Aggregates" with the appropriate Test Methods designated therein. In reinforced concrete maximum size of aggregate shall be 1-1/2 inches except in slabs and walls 8 inches or less where 3/4 inch maximum aggregate shall be used.

3. Water

Water shall be any potable water, clean and free from injurious amounts of oil, acid, alkali, and organic materials.

4. Reinforcing Steel

Reinforcing steel shall consist of deformed bars and wire reinforcement. Steel shall conform to ASTM A615 Grade 60 and State Standard

Specification Section 52, Reinforcement. Deformation shall conform to ASTM A615. Wire reinforcement shall conform to ASTM A185, with mesh and wire sizes as specified.

5. Waterstops

Waterstops embedded in the concrete shall be 6 inch polyvinyl chloride. A sample shall be submitted to the District Manager for review. Waterstops shall be installed in as long lengths as possible. Joining splices and corners shall be heat fused in accordance with manufacturer's recommendations.

6. Joint Filler

Preformed joint fillers shall conform to ASTM D1751.

7. Joint Sealant

a. General. For below ground installation or in areas not subject to architectural consideration, joint sealers shall be of the mastic type. For above ground installations or where architectural appearance is important joint sealers shall be of the rubber sealant type.

b. Underground Sealant. For sealing non-moving underground joints, construction joints and grooves in slabs, the sealant shall be "Permapol RC-550 Sealant" as manufactured by Products Research and Chemical Corporation, Gloucester City, New Jersey, and distributed by Sherwin Williams Company, Emeryville, California, or equal. The product is a two-component, nonsag, elastomeric epoxy sealant. Color shall be black. Application shall be as recommended by the manufacturer.

c. Aboveground Sealant. For sealing exterior joints subject to structural movement, and for weathertight joints between various materials the sealant shall be "PRC Rubber Caulk 7000 Sealant" as manufactured by Products Research and Chemical Corporation, Gloucester City, New Jersey and distributed by Sherwin Williams Company, Emeryville, California, or equal. The product is a one-part low-modulus, polysulfide elastomer. Color shall match material being applied to. Application shall be as recommended by the manufacturer.

8. Forms

Form materials shall conform to State Standard Specification Section

C3.03 CONCRETE

1. Quality

Concrete shall be composed of cement, natural or crushed aggregate, and water proportioned and mixed as hereinafter specified. Pozzolan and water reducing air entraining agent shall be used when specified by the District Manager. All work shall be accomplished in compliance with A.C.I. Standards. The exact proportions of cement and aggregate shall be such as to produce a workable, strong, dense, impermeable concrete having approximate consistency and strength:

- a. Consistency. The quantity of water required for the proper consistency of the concrete shall be determined by the slump test, in accordance with ASTM C143. Slump allowances shall be as follows:

Vertical wall sections, columns: maximum slump, 4 inches plus or minus 1 inch tolerance.

Floor slabs, beams, and footings: maximum slump, 3 inches plus or minus 1/2 inch tolerance.

- b. Strength. Compressive strength shall be determined at the end of 28 days on standard 6 X 12 inch test cylinders in accordance with ASTM C39. The minimum compressive strength shall be 4,000 pounds per square inch.
- c. Tests. Test will be required by the District of the materials and of the resulting concrete at such intervals as deemed necessary by the District. Concrete testing shall be done at the Contractor's expense in the case where the work is being constructed by a property owner for the District. The slump tests and 3 day, 7 day, and 28 day test results shall be given to the District to ensure compliance to the Specifications. The concrete mix shall be changed whenever, in the opinion of the District such change is necessary or desirable to secure the required workability, density, impermeability, and strength.

2. Batching

Concrete batching equipment shall be provided to determine and to control

accurately the relative amounts of cement, water, sand, and each individual size of coarse aggregate entering into the concrete. Sand, cement, and coarse aggregate shall be measured by direct weighing.

Water shall be determined by direct weighing or by volumetric measurement. Equipment and its operation shall be subject at all times to the approval of the District.

3. Mixing

When authorized by the District, concrete may be mixed in a batch mixer of approved type which will insure a uniform distribution of the materials throughout the mass, so that the mixture is uniform in color and homogeneous. The mixer shall be equipped with a suitable charging hopper, a water storage and water measuring device controlled from a case which can be kept locked and so constructed that the water can be discharged only while the mixer is being charged. The entire contents of the mixing drum shall be discharged before recharging. The mixer shall be cleaned at frequent intervals while in use. The volume of mixed material per batch shall not exceed the rated capacity of the mixer.

4. Transit Mixed Concrete

Transit mixed concrete shall be used, provided that all of the above requirements as to batching, mixing, and placing are complied with, and provided further that the concrete shall be placed within 2 hours after water is first added to the batch. Transit mixed concrete shall comply with all provisions of ASTM C94.

5. Construction

Reinforcement: Reinforcing shall be placed in accordance with State Standard Specification Section 55.

Concrete: Concrete shall be constructed in accordance with the applicable portions of the following State Standard Specification Sections:

Placing:	51-1.09, 51-1.11,	Placing Concrete Construction Methods
Joints:	51-1.12, 51-1.13,	Expansion and Fixed Joints and Bearings Bonding

Finishing:	51-1.18A,	Ordinary Surface Finish
Curing:	90-7.03,	Curing Structures (method subject to approval by Engineer)

A minimum 24-hour cure period is required for manhole foundations/bases prior to installation of barrel and cone sections.

6. Sampling and Testing

- a. Sampling and testing of concrete materials shall be in accordance with ASTM Designations. Test samples shall be supplied by the Contractor at his expense. Tests will be made by an independent testing laboratory at the District's expense. The source from which concrete aggregates are to be obtained shall be selected by the Contractor well in advance of the time when they will be required in the work, and suitable samples, as they are to be used in the concrete, shall be furnished in advance of the time when the placing of the concrete is expected to begin.
- b. The Contractor shall provide a slump cone and perform slump tests in accordance with ASTM C143, "Test for slump of Portland Cement Concrete." A slump test shall be performed before the placement of each of the first two truck loads of ready-mix concrete at the beginning of a continuous pour. The slump test shall be conducted in the presence of the District. If the slump is greater than 4 inches, the concrete will be rejected. After the consistency of the mix is approved, additional slump testing will be necessary only when required by the District.
- c. If an entrainment is used, the Contractor shall provide an acceptable method for testing it. The Contractor may use any method approved by ASTM. The recommended methods are the pressure method ASTM C231 and the Chace air meter method. The method used by the Contractor shall be approved by the District prior to any concrete placement. The concrete shall be tested for air content before the placement of each of the first two truck loads of ready-mix concrete at the beginning of a continuous pour and at the time when strength test cylinders are prepared.
- d. For compressive strength test purposes, the Contractor shall provide one set of three cylinders taken from each day's pour or more frequently as required by the District. Test samples shall be supplied by the Contractor at his expense and tests will be made by an

independent testing laboratory at the District's expense. Test specimens shall be molded, laboratory-cured, and tested in accordance with State Standard Specification Section 90-9, Compressive Strength. Concrete represented by test specimens will be accepted or rejected as specified therein.

C3.04 MORTAR AND NON-SHRINK GROUT

Mortar and non-shrink grout shall be mixed in a suitable mixer in a watertight mixing box. The material must be thoroughly mixed dry until the mass assumes a uniform color and then sufficient water added to bring the mixture to a workable consistency. No mortar or grout which has begun to set shall be used, and no retempering thereof will be permitted.

- (a) Mortar shall have an ultimate strength at least equal to that required for Type A-I Mortar, ASTM C 270. Mortar shall be freshly prepared and uniformly mixed in a ratio by volume as follows:

1 Part Portland Cement, 1/4 Part Hydrated Lime or Lime Putty, 2-3/4 to 3-3/4 Parts Mortar Sand, Sufficient water for a workable mix. Portland Cement shall be added and such water shall not contain an amount of impurities that will cause a change in the setting time of Portland Cement of more than 25 percent nor a reduction in the compressive strength of mortar at 14 days of more than 5 percent when compared to the results obtained with distilled water nor cause discoloration of the concrete or produce etching of the surface.

Sand shall be clean, well graded, and free from loam, vegetative matter, or deleterious matter of any kind and shall comply with the requirements of ASTM C 144, except not less than 3% shall pass a 100 sieve.

Hydrated Lime for Masonry Purposes shall meet the requirements of ASTM Designation C 207, Type S and shall not contain air-entrainment additives.

Mortar materials shall be stored off the ground, under cover in a dry place.

- (b) Grout shall be as specified in ASTM C1107 with 28 day compressive strength of 3,000 PSI, and the proportions per cubic yard shall be as follows:

Portland Cement	7 Sacs
Aggregate	50% Sand
	50% Pea Gravel
Mixing Water	6" Slump Maximum

Pea-gravel shall be uniformly graded with not more than 5% passing a No. 8 sieve and all passing 3/8" sieve.

C3.05 PRECAST CONCRETE MANHOLES

Manholes shall be of precast concrete and shall conform to the details shown on District Standard Drawing Nos. 3 and 4. Materials shall conform to ASTM C478, and CalTrans Standard Specifications Section 90-2 "Materials".

Precast concrete base shall not be allowed unless approved by the District Manager in writing.

Pipe stubs for lateral sewers shall be built into the structures as required; the outer ends shall be sealed securely by a cap or stopper of the same material as the branch. In laying pipe up to the structures, the pipe shall not project beyond the inside of the wall of the structure and in no case shall the socket of a vitrified clay pipe be built into the wall of a structure.

Joints for precast manhole pipe sections shall be sealed by using "Ram-Nek" and Rub-r-Nek, preformed materials manufactured by K.T. Snyder Co., Houston, Texas, following the company's recommendations and Federal Specification SS-S-00210 (GSA-FSS).

Where the vertical distance from the pipe invert to finished grade is less than 3 feet, the manhole shall be constructed from reinforced concrete in a manner acceptable to the District Manager.

C3.06 SPECIAL CONCRETE STRUCTURES

1. Forms

Forms for concrete construction shall be of wood or steel. For surfaces not exposed to view, such as backfilled walls, the forms may be metal or smooth boards free from large or loose knots. For other surfaces, the forms shall be waterproof plywood, tongue and groove sheeting, or metal. All forms shall be true, rigid, tight, thoroughly braced, and sufficiently strong to carry all loads.

Bolts, rods, or single wires shall preferably be used for internal ties and if used shall be so arranged that when the forms are removed no metal shall be within 1 inch of any surface. Twisted wire ties will not be permitted in the forms for any wall later to be subject to water pressure. The Contractor

shall take due precautions to prevent future leakage or seepage along ties in all walls which will be subject to water pressure. Ties used in all such walls shall be cut back into the face of the wall at least 1 inch and the resulting holes pointed up with 1:1-½ mortar, cement to sand by volume. Forms shall comply with all provisions of the State Standard Specifications Section 51-1.05.

2. Placing Reinforcing Steel

Reinforcing steel, before being positioned, shall be cleaned thoroughly of mill and rust scale or other coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. Where there is delay in depositing concrete, reinforcement shall be inspected and, when necessary, cleaned. All bars shall be bent cold, shall be positioned accurately, and secured against displacement by using annealed iron wire or suitable clips.

3. Inserts

Where pipes, castings, or conduits are to pass through concrete walls, the Contractor shall place such pipes or castings in the forms being poured in the concrete, or in special cases, with the express consent and approval of the District Manager, shall build approved boxes in the forms to make cored openings for subsequent insertion of such pipes, castings, or conduits. To withstand water pressures and to insure watertightness around openings so formed, the boxes or cores shall be provided with continuous keyways with waterstops all around, and they shall have a slight flare to facilitate grouting and the escape of entrained air during grouting.

Additional reinforcement shall be provided around such openings, if large, to meet the approval of the District Manager. The pipes, castings, or conduits, as specified shall be grouted in place by pouring in non-shrink grout under a head of at least 4 inches. The non-shrink grout shall be poured and rammed or joggled into place to completely fill the space between the pipes, castings, or conduits, and the sides of the openings, so as to obtain the same watertightness as the wall itself. The grouting materials so placed shall be surfaced when the forms are removed to give a uniform appearance to the wall if such wall will be exposed to view.

The Contractor shall accurately set and hold in exact position the forms until the concrete is poured, and set all thimbles, special castings, or other metal parts that are to be embedded in the concrete. He shall furnish and accurately set all inserts and anchors or other bolts necessary for the attaching of piping, valves and equipment.

4. Depositing Concrete

Concrete shall not be placed until the forms and reinforcements have been approved by the District Manager.

5. Curing

Unformed concrete surfaces shall be covered with wet burlap mats as soon as the concrete has set sufficiently and shall thereafter be kept wet under burlap until backfilled or for 14 days after the concrete is placed. Formed surfaces, both interior and exterior, shall be similarly water-cured under burlap mats or by water sprays beginning as soon as the forms are stripped. At the option of the Contractor, concrete surfaces may be cured by the curing-compound method as defined below. Where wooden forms are used they shall be wetted immediately after concreting and shall be kept moist until removed, or may be treated with an approved form sealer before pouring.

Concrete curing compounds, if their use is permitted by the District Manager, shall be of a nature and composition not deleterious to concrete, and thinned to a working consistency, either with a volatile solvent or by emulsification with water. The curing compound shall be of a standard and uniform quality ready for use as shipped by the manufacturer. At the time of use, the curing compound shall be in a thoroughly stirred condition. Curing compound shall not be diluted by the addition of solvent or thinners or be altered in any manner without the specific approval of and in a manner prescribed by the manufacturer.

The curing compound shall, when tested in accordance with ASTM C156, be effective in limiting the water loss in the concrete test specimens to 3-½ percent when applied at the coverage rate recommended by the manufacturer. Any compound proposed by the Contractor shall be tested by a recognized testing laboratory at the Contractor's expense, and 3 certified copies of the test report shall be furnished to the District Manager.

Curing compound shall form a continuous, unbroken membrane which will adhere to moist concrete and which will not peel from the surface or show signs of such deterioration within 30 days after application under actual weather and working conditions.

The compound shall be sufficiently transparent and free from color so that there will be no permanent change in the color of the concrete. The compound shall contain however, a temporary hue of sufficient color to

make the membrane clearly visible for a period of at least 4 hours after application.

6. Protection and Repair of Concrete Construction

All surfaces shall be protected against injury. During the first 72 hours after placing the concrete, wheeling, working, or walking on the concrete shall not be permitted. All slabs subject to wear shall be covered with a layer of sand or other suitable material as soon as the concrete has set. "Sisalcraft" paper or other similar tough waterproof paper may also be used, provided all joints between adjacent strips of paper are carefully sealed. This does not alter the requirements for proper curing as specified in Article C3.06.5, above.

No concrete shall be placed during rain period. All concrete placed within the preceding 12 hours of a rainstorm shall be protected with waterproof canvas or other suitable coverings.

All concrete construction shall be protected from excessive loadings. Installation of mechanical and electrical equipment shall be accomplished by employing shores, bearing places, frames, cranes, and temporary beams.

Immediately after the removal of forms all concrete shall be inspected, and all poor joints, rough sections, or rock pockets containing loose materials shall be repaired by cutting back to solid concrete and making an opening of such size and shape as will form a 1 inch key for cement mortar fill. All form tie holes and small imperfections shall be kept wet for 2 hours and then coated with neat cement paste. The fill for small imperfections and form ties shall consist of cement mortar composed of 1 part cement well mixed with 1 1/2 parts of fine aggregate by volume and just enough water so that the mortar will stick together on being molded into a ball by slight pressure of the hands. This mortar shall be thoroughly compacted into place. Where the area and volume of defective concrete is large, it shall be repaired by reforming the surface and filling the opening with concrete. For such major repairs, the filling shall be reinforced and doweled securely to old concrete and shall be neatly finished to match the surface, color, and texture of the adjacent concrete. All patches shall be kept damp for 7 days.

Where the work requires concrete of existing structures to be removed, the existing concrete and steel shall be cut accurately to the lines required under the supervision of the District Manager. The cutting shall be accomplished in a manner that preserves, free from cracks or other injuries, those parts of the existing structure that are to remain. Where the cut

surface is to be left exposed, it shall be cleaned, sprayed with water, faced with 1:1-½ mortar, and finished to match adjacent surfaces.

7. Finish or Formed Surfaces

All finished or formed surfaces shall conform accurately to the shape, alignment, grades, and sections required. The finished surface shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth continuous hard surface. All sharp angles shall be rounded or beveled, where required. Any formed surface to be painted shall be free of any material that will be detrimental to the paint.

SECTION C4 - METALWORK

C4.01 SCOPE

Metalwork includes the providing of pipe handrails, stair treads, grating, plating, seat angles, stop gates, manhole frames and covers, anchor bolts and all other structural steel, miscellaneous metalwork, and castings.

C4.02 STRUCTURAL STEEL

1. Material

Structural steel shall conform to ASTM A36, Structural Grade unless otherwise designated and approved by the District.

2. Fabrication

Fabrication and workmanship shall be done in accordance with AISC "Specifications for Fabrication and Erection". Welding shall be done by welders who have been qualified by tests as prescribed by the American Welding Society in "Standard Qualification Procedure" to perform the type of work required. The quality of welding shall conform to "Code for Arc Welding in Building Construction", Section 4, Workmanship. Reinforcing rods to be welded shall be preheated to minimum of 212° F at a distance of 3 inches each side of the weld and then welded using a low hydrogen type welding rod.

3. Galvanizing

Fabricated steel items such as brackets, hangers, seating angles, door protectors, housings, and similar small items shall be galvanized after fabrication. Large structural steel items such as roof trusses shall be galvanized only if specifically required. Steel work to be of the following standard specifications as applicable: ASTM A123, A384, A385 and A386.

4. Bolted Connections

All bolted connections shall be AISC Standard "B" Series.

C4.03 PIPE HANDRAIL

Pipe handrail shall be standard 1 1/4 inch black steel pipe made up by welding. Railing shall be shop fabricated into easily handled units and galvanized after fabrication. Field joints shall be welded and ground smooth to match adjacent pipe

and shall be coated with molten Galvo-Weld or equal.

C4.04 PIPE COLUMNS

Steel for pipe columns shall conform to ASTM A53, Grade B.

C4.05 FLOOR GRATES, PLATES, AND SUPPORTS

Gratings and floor plates shall be galvanized steel or aluminum designed for the live load required. The minimum design live load shall be 100 pounds per square foot with a deflection of 1/8-inch or less. Floor plates and grates shall be adequately stiffened or shall be of sufficient thickness so that the maximum deflection at the design load does not exceed 1/240 of the span. Gratings shall be completely banded, and both gratings and plating shall be field measured for proper cutouts and size. No single pieces of grating or floor plate shall weigh more than 80 pounds. Gratings and platings shall be supported on steel seats and shall be set flush with the floor. Gratings, plating, and seat angles shall be galvanized after fabrication in accordance with ASTM A386.

Grating seat angles shall have suitable concrete anchors welded to back at a maximum of 3 feet centers and a minimum of 2 anchors per side. Surfaces in contact with concrete shall receive coat of zinc chromate primer prior to installation. Where changes in channel direction, openings for gates, ends of grating runs, etc., prohibit adequate support for grating, additional cross angles shall be furnished to provide a seating surface for the grating on all four sides.

All grating shall be fastened to supports by suitable removable fasteners. All fastener clips, bolts, nuts and washers shall be galvanized steel.

Gratings and floor plates shall be installed flush with the surrounding surface. Where floor plates are used as covers for access hatches, the plates shall be installed so as to facilitate drainage away from the hatch, to provide a close fit, and to eliminate ponding over the floor plate.

C4.06 SAFETY STAIR TREADS

All concrete steps shall have safety treads 4 inches wide and extending to 3 inches from each side of the step. Safety treads shall be American Abrasive metals Company, Feralum Style A, or equal. Safety treads shall meet all applicable requirements of state and federal safety regulations.

C4.07 ANCHOR BOLTS

Anchor bolts shall be fabricated as specified by the equipment manufacturer.

Anchor and assembly bolts shall be of ample size and strength for the purpose intended and stainless steel bolts shall be used in moist, damp or corrosive locations and wherever they are embedded in concrete. All bolts shall be standard machine bolts, with cold pressed hexagon nuts. Anchor bolts shall be secured in place with the forms before pouring concrete.

C4.08 IRON CASTINGS

All castings for manhole and covers shall be tough gray iron, free from cracks, blow holes, swells, and cold sheets, and be of workmanlike finish. The cast iron shall meet the requirements of ASTM A48, Class 25. Manhole covers shall be turned in a lathe and the outer 1½ inches dressed down to assure a tight fit and to prevent rocking. The seat for the manhole cover shall also be turned in a lathe to provide a true and smooth surface.

All manhole covers which do not fit neatly and bear firmly in the ring will be rejected. Manhole frames and covers shall be Phoenix P1090 with a Type C cover or equal. There shall be no pick hole or through holes in covers, but there shall be a blind pick hole approximately 5½ inches from the edge.

C4.09 ALUMINUM SLIDE GATES

Aluminum for slide gates shall conform with American Society of Civil Engineers Specifications for Structures of Aluminum, Alloy 6061-T6. Gate guides shall be fabricated from 316 stainless steel shapes.

SECTION C5 - PIPELINES AND SEWERS

C5.01 SCOPE

Pipelines and Sewers include the furnishing, installing, and testing of pipe, pipe supports, anchors, thrust blocks, fittings, valves, specials, and all necessary appurtenances to make the work complete and operable.

The Contractor's attention is directed to Article C 1.09 Safety and Health Provisions, of these Specifications with respect to CAL OSHA rules and regulations to follow before entering manholes.

C5.02 MATERIALS

1. Scope

All pipe materials that may be used are covered under this section. The inclusion of all acceptable material does not infer that any of the materials listed below may be used on any project for any set of conditions. Refer to Article B2.02 of these District Standard Specifications for limitations on the use of various types of pipe materials. Whenever possible, lateral sewers shall be of the same material as the main sewer to which they are connected. The following limitations are offered as guidelines to the Contractor for gravity sewer lines.

- (a) Unless otherwise indicated, extra strength vitrified clay or PVC C900 DR 25 may be used for main lines.
- (b) Where plans designate a specific type of pipe, no other type may be used.
- (c) At other locations, any acceptable pipe material may be used, in accordance with the indicated strength, bedding, and trench width requirements and subject to the specifications in this division, the standard details and general regulations.
- (d) No change in pipe materials may be made between manholes or on service laterals and service extensions, except between classes of the same pipe.

2. Vitrified Clay Pipe and Fittings

Vitrified clay pipe and fittings shall be extra strength, unglazed, conforming to ASTM C700, and shall be furnished with bell and spigot ends or plain ends.

Pipe joints shall be of a mechanical flexible compression type. Joints for bell and spigot pipe shall be made of plasticized polyvinyl chloride compound, bonded to the pipe, molded and cured to uniform harness so as to form a tight coupling when assembled. Joints for bell and spigot pipe shall be Wedge Lock and Speed Seal Mainline conforming to all provisions of current revision of ASTM C425. Joints for plain end pipe shall be rubber couplings secured with stainless steel bands. Joints for plain end pipe shall be Band Seal as manufactured by Mission Clay, Caulder Couplings Products Company or equal.

The connection of gravity sewer laterals to the public sewer shall be by means of a tee or a wye branch fitting. Connection to existing gravity mains may be permitted by means of a Taptite connection or equal. No breaking or rough cutting of the pipe shall be permitted when making service connections.

3. Plastic Pipe

Plastic pipe, fittings and joint materials for gravity sewer mains herein consist of Poly-Vinyl Chloride, hereinafter referred to as PVC only. Polyethylene pipe, hereinafter referred to PE, is not a standard District approved material for gravity sewer mains. PE shall only be used for small diameter STEP and Grinder Pump force mains. All materials incidental to plastic pipe installations such as gaskets, joint lubricants, cement, etc., shall be supplied by the pipe manufacturer. All plastic pipe required in odd lengths shall be cut using a proper cutting tool and guide that insures true line cut on planes perpendicular to the pipe axis. No bevel cuts for pipeline alignments will be permitted.

All bedding material around plastic pipe shall be placed in two stages as follows; first, from the bedding material foundation to the top of pipe, second, from the top of pipe to a point at least twelve (12) inches over the top of the pipe. Each stage shall be compacted by hand or mechanical tamping to a minimum of ninety (90) percent. No jetting of bedding materials will be permitted.

The inside diameter of an installed section of plastic pipe shall not be allowed to deflect more than five (5%) percent. The pipe deflection shall be checked by means of the deflection gauge in the presence of the District Manager after the placement of all trench backfills, aggregate subbase (if specified) but prior to installation of aggregate base and/or asphalt concrete.

The pipe deflection gauge shall be fabricated to permit passage through

installed sections of pipelines within the specified tolerances for plastic pipe applicable and the maximum deflection set forth herein. Any section or sections of plastic pipe that does not permit deflection gauge passage will not be accepted and said section or sections shall be repaired or replaced and rechecked as directed by the District Manager.

PVC Pipe

All PVC pipe and fittings shall, at a minimum, conform to the requirements of ASTM Designation D 1784, cell class 12454-B as they apply to material compound. The pipe and fittings shall meet AWWA C900 for pipe size 12 inches and smaller, and AWWA C905 for pipes larger than 12 inches. Unless otherwise indicated or required, the pipe shall DR 25. Sewer Pipe using an Elastomeric Gasket Joint in a bell and spigot assembly system shall meet the requirements of ASTM Designation F477. No solvent cement joints will be permitted.

All PVC pipe entering or leaving a concrete structure shall have a rubber sealing gasket, as supplied by the pipe manufacturer, firmly seated perpendicular to the pipe axis, around the pipe exterior and cast into the structure base or near the structure wall center as a water stop. Said water stop may also consist of a manhole coupling with rubber sealing rings cast into structure base.

PVC pipe joining may occur at any convenient distance beyond and/or between structures.

PVC pipes shall be white in color.. Metallic marking tape labeled "sanitary sewer" shall be placed 12" above the top of pipe for open trench or connected directly to the pipe for trenchless construction.

Polyethylene Pipe

Polyethylene pipe is not a standard District approved material for gravity sewer mains. Polyethylene pipe will only be considered for gravity sewer mains in special conditions where no other pipe materials can be installed. This condition shall be presented to the District and use of material can only be approved by the District Manager.

STEP and grinder pump system forcemains shall be SDR 11 high density polyethylene pipe with polyethylene fittings. The pipe material shall comply with all requirements for Type III, Class C. Category 5, Grade P 34 according to ASTM D1248, and have a PPI recommended designation of PE 3408.

Polyethylene pipe shall have a green stripe, or no stripe. Metallic marking tape labeled "sanitary sewer" shall be placed 12" above the top of pipe or connected directly to the pipe for trenchless construction.

4. Cast Iron and Ductile Iron Pipe

Grey cast iron pipe shall be Class 150 centrifugally cast, cement lined, and shall comply with ANSI A 21.6 (AWWA C106) for pipe cast in metal molds or ANSI A21.8 (AWWA C108) for pipe cast in sand-lined molds.

Ductile iron pipe shall comply with ANSI A21.51 (AWWA C151).

Cast and ductile iron pipe joints shall comply with the following requirements for the types specified:

<u>Type of Joint</u>	<u>Specifications</u>
Rubber Gasket Push-on Joint	ANSI A21.11 (AWWA C111)
Mechanical Joint	ANSI A21.11 (AWWA C111)
Flanged Joint	ANSI B16.1, B16.2, and A21.10 (AWWA C110)

Flanged Joint (Threaded Flanges) ANSI B1.1

Flange gaskets shall be 1/16 inch for pipe 10 inches and less and 1/8 inch for larger pipe. Flange assembly bolts shall be standard square headed machine bolts with heavy, hot pressed hexagon nuts. Threads shall conform to ANSI B1.1 coarse thread series, Class 2 fit. Bolt length shall be such that after joints are made up, the bolts shall protrude through the nut, but no more than 1/2 inch. Bolts and nuts for use in submerged services shall be of 316 stainless steel.

Flexible couplings shall be Smith-Blair flexible steel coupling series 411 or Dresser style 38 with the stop removed on middle ring. Exposed metal surfaces shall receive a protective coating as specified in Section C6 - Painting.

All rubber gasket, push-on, mechanical and flanged joint fittings for cast iron or ductile iron pipe shall be manufactured in accordance with ANSI A21.10 (AWWA C110).

Unless otherwise specified, the internal surfaces of cast iron and ductile iron pipe and fittings shall be lined with a uniform thickness of cement mortar then sealed with a bituminous coating in accordance with ANSI A21.4 (AWWA C104). The outside surfaces of cast iron and ductile iron pipe and fittings for general use shall be coated with a bituminous coating 1 mil (0.025mm) thick in accordance with ANSI A21.6 or ANSI A21.51.

The manufacturer shall furnish a certified statement that the pipe has been manufactured and tested in accordance with these specifications.

Loose polyethylene encasement for the protection of cast iron and ductile iron pipe shall be furnished and installed in accordance with the requirements of ANSI A21.5 (AWWA C105).

5. Conductor Pipe

Pipe used as a conductor under a highway, railroad, or other location, shall be welded steel pipe. Welded steel pipe shall be manufactured of a steel meeting ASTM A245, commercial grade. All joints shall be butt welded. Welded steel conductor pipe shall have a minimum wall thickness of 1/4 inch for sizes up to and including 26-inch in diameter, and 5/16-inch for sized 27-inch to 36-inch in diameter.

6. Manholes

Manholes shall be constructed of precast reinforced concrete pipe sections as specified in Article C3.05 of these specifications.

7. Backwater Check Valves

The contractor shall provide information about the type of backwater check valve and shutoff system intended for use. Detail drawings should conform to the most recent edition of the Uniform Plumbing Code.

C5.03 INSTALLATION

1. Pipe Laying

Pipe laying shall include the installation and jointing of the pipe. Pipe shall be laid with uniform bearing under the full length of the pipe. In general, pipe laying shall proceed upgrade with the spigot ends of the bell and spigot pipe pointing in the direction of flow. Each piece shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line. As the work

progresses, the interior of the sewer shall be cleared of all dirt and debris. Where cleaning after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and pulled forward past each joint immediately after jointing has been completed. Pipe shall not be laid when the condition of the trench or the weather is unsuitable. At times when work is not in progress, open ends of pipe and fittings shall be closed.

2. Pipe Jointing

- (1) For rubber gasket joints, the gasket and bell shall be thoroughly cleaned before inserting the gasket into the bell. After the gasket is positioned, a thin film of approved lubricant shall be applied to the exposed surface of the rubber gasket. After wiping the spigot clean, it shall be shoved home into the bell. If pipe is field cut, the spigot end shall be tapered with a file to about 1/8-inch back at an angle of 30 degrees with the centerline of the pipe.
- (2) Flexible Couplings shall be Smith-Blair Type 411, 431, 433, or equal. Buried couplings shall be extra heavy, with 316 stainless steel bolts and nuts, and shall be painted with two coats of bitumastic paint after installation.
- (3) Screwed Joint Material shall be best quality red lead for steel pipe or litharge and glycerin for stainless steel and chlorine piping.
- (4) Flanges, Gaskets, and Bolts - Flanges shall conform to dimensions and drilling of ASA B16.1, Class 125. Flange gaskets shall be ring type, Johns-Manville Style 60S or Cranite. Thickness shall be 1/16-inch for pipe 18-inches and smaller, and 1/8-inch for larger pipe. Flange assembly bolts shall be standard hexagon head machine bolts with heavy hot pressed, hexagon nuts, conforming to ASTM A387 Grade B. Bolt length shall be such that after the joints are made up, the bolts shall protrude through the nut, but not more than 1/2-inch.
- (5) Transition joints between different pipe materials shall be "Ceramicweld", "Calder", "Band-Seal", or other equal flexible coupling.

3. Construction

Pipe shall be inspected for cracked, broken, or defective pieces before laying. Pipe shall be carefully lowered into the trench to prevent damage. All dirt or other foreign matter shall be removed from inside pipe before

lowering into the trench. The Contractor will be required to replace all damaged pipe.

All pipe shall be carefully placed and supported at the proper lines and grades and, where possible, shall be sloped to permit complete drainage. Piping runs shown on the Drawings shall be followed as closely as possible, except for minor adjustments to avoid architectural and structural features. If minor relocations are required, they shall be approved by the Engineer.

Pipe, fittings and appurtenances shall be installed in accordance with the manufacturer's written instructions and in accordance with AWWA C-600. The allowable angle of deflection at any joint shall not exceed the amount recommended by the pipe manufacturer for the particular pipe size used. The pipe shall be protected to prevent entrance of foreign material during laying operations. When laying is not in progress, open pipe ends shall be protected with a watertight plug or other approved means to exclude water or foreign material.

Excavation, bedding, and backfilling shall conform to these specifications.

C5.04 CONNECTIONS TO EXISTING MANHOLES

Pipe connections to existing manholes shall be made in such a manner that the finished work shall conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping.

Where holes are to be broken in existing manhole barrels, the work shall be carefully done. After insertion the annular space shall be tightly packed with a "dry" cement mortar. Surfaces to be in contact with the mortar shall be thoroughly moistened and then scrubbed with Portland cement paste. The inside of the manhole barrel shall be neatly finished. The manhole bottom shall be rechannelized as necessary to provide smooth transitions with good hydraulic properties.

Any line to be connected to an existing manhole shall, unless otherwise shown, be installed by forming a new channel with the top invert of the new installed pipe to the same elevation as the top invert of the existing main sewer.

C5.05 CONNECTIONS TO EXISTING PIPES

The approximate locations of existing sewers are shown at the points where the new sewers are to be connected. It is the responsibility of the Contractor to determine the exact location and depth of existing sewers prior to the laying of any

sewer pipe. Prior to construction of any portion of a side sewer, the Contractor shall also determine the elevation of the plumbing outlet of the structure to be connected and to confirm that the required grade can be maintained between the outlet and the main sewer.

Fittings or adapters required to connect new pipe to existing pipe shall be provided by the Contractor. Detail drawings of such fittings or adapters and the method of connection shall be submitted to the District Manager for approval.

C5.06 REPAIR OF PIPELINES

Repair of breaks in pipe lines shall be made by making clean cuts on either side of the breaks, inserting new straight sections of pipe with plain ends in line, and connecting the ends with flexible couplings similar and equal to the couplings manufactured by Calder. Clamp screws shall be retightened after a lapse of at least five minutes. Maximum trench width limitations at top of pipe must be observed during repairs as well as original construction.

C5.07 GRAVITY SEWER LATERAL CONNECTIONS TO MAIN SEWERS

1. Concurrent Construction

Where gravity sewer laterals are constructed concurrently with main sewers, connections shall be made with regularly manufactured wye or tee branches. The ends of the side sewer shall be securely stopped with plugs or caps which can easily be removed without damage to the pipe end. The ends of the side sewers shall be marked with a 2 x 4 redwood stake extending from the sewer invert to finished grade. In the case of new subdivision work, curbs shall be imprinted with an "s" directly over the sewer laterals.

2. Gravity Sewer Lateral Connection to Existing Main Sewer

Lateral connections to existing main sewers shall be made at wye or tee branches. No breaking or rough cutting of the pipe shall be permitted when making service connections. Where, in the opinion of the District Manager it is impractical to connect to an existing wye or tee branch, the connection shall be made by the use of special fittings as described below.

- i. Cut out a section of the main sewer and install a plain-end wye branch using banded rubber seal sleeves with stainless steel bands. This method shall be used whenever the side sewer is the same size as the main sewer.

- ii. Core a neat trim opening in the upper portion of the main sewer and install a special drilled fitting (i.e., tap-tight) to complete the side sewer connection.

C5.08 BORING AND JACKING

1. General

The work contemplated under this heading consists of installing sewer pipe, in a conductor pipe, under a paved roadway, street or railroad to a true line and grade, by means of jacking operations. The equipment and method of operation shall be approved by the District Manager before proceeding with the work. Approval of the proposed method by the District Manager will not relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workmen experienced in the jacking of conductor pipes shall be used in performing the work. Sewer pipe shall be installed in the conductor pipe in the manner shown on the plans.

The Contractor shall obtain all encroachment permits or other types of permits required by the Owner or authority having jurisdiction over the proposed work area.

2. Bores

Where a conductor or sewer pipe is installed in a bored hole, the hole shall be bored by use of a machine which will cut a true circular bore to the required line and grade. Bored tunnels shall be no more than one inch larger than the outside limits of the conductor pipe to be placed therein. If so required bracing and shoring shall be provided to adequately protect the workmen and the roadway or railroad. The conductor pipe shall be placed closely behind and in conjunction with the boring operation.

3. Placing Sewer Pipe in Conductor

Sewer pipe shall be strapped to two nylon skids with steel straps. The nylon skids shall be near the center of each pipe section and shall be large enough to prevent any part of the joint from bearing on the conductor. Skids may have to be adjusted in height to hold the pipe on correct line and grade. In lieu of nylon skids, Contractor may use conductor pipe spacers as herein specified.

After installation of the sewer pipe, clean, dry sand shall then be blown into

the conductor pipe on both sides to the full depth of the conductor pipe. Casing seals, shall be provided at each end of conductor pipe to contain the sand. Casing seals shall be Plico Type 660 or P.S.I. Model W, or equal.

4. Jacking Heads

Whenever the nature of the soil indicates, in the opinion of the Engineer, the likelihood of ground loss during the driving of the conduit, the use of a steel jacking head will be required. The jacking head shall be fitted to the leading section of the conduit in such a manner that it extends around the outer surface of the upper two-thirds of the circumference of the conduit and projects at least 18 inches beyond the driving end at the top of the conduit, but does not protrude over 1/2 inch outside of the outer conduit surface. This head shall be securely anchored to prevent any wobble or alignment variation during the jacking operation. Excavation shall be carried out entirely within the jacking head and no excavation in advance thereof will be permitted. Every effort shall be made to avoid any loss of ground outside the perimeter of the jacking head.

5. Backpacking Voids

In general, excavated material shall be removed from the conduit as jacking progresses and no accumulation of excavated material within the conduit will be permitted. Should appreciable loss of ground occur, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of one part cement to five parts of granular material. When material selected from the spoil is not suitable for this purpose, the Contractor shall import suitable material at his sole expense. The soil cement shall be thoroughly mixed and rammed into place as soon after the loss of ground as possible.

After jacking is completed, the Contractor shall drill holes in the conduit at the locations of ground loss and elsewhere where voids behind the conduit are suspected. If such holes disclose void spaces existing, the Contractor shall force grout into such voids to refusal at pressure as directed by the District Manager, but not to exceed 50 pounds per square inch. He shall then repair the drilled holes, including any plastic lining. Grout shall be a lean mixture of sand and cement. Backpacking of the one inch annular space in the case of bores will not be required, unless specifically called for on the plans.

6. Tolerances

Extreme care shall be exercised by the Contractor to maintain line and grade during jacking operations, and the Contractor may be required to modify the manner in which he is conducting his jacking operation to correct any deviation which deemed necessary by the District Manager.

Maximum deviation from stated line and grade of conductor pipe shall be such that line and grade of the sanitary sewer pipe can be adjusted a sufficient amount within the conductor pipe to achieve the line and grade shown on the plans to within 0.25 feet per 100 feet, unless otherwise directed by the District Manager.

7. Conductor Pipe Spacers

Insulating casing spacers, where used, will be installed at not over 10 foot spacing, prior to inserting pipe in the casing. Spacers will be similar and equal to "Plico" Type 512M or P.S.I. Model A12 with insulating skid, 12" bolted spacer with 6 skids. Segment with 4 skids will be placed on the bottom, with skids sized to give equal bearing pressure on the casing without deformation of the pipe.

C5.09 CONCRETE THRUST BLOCKS

Concrete thrust blocks shall be provided on all force main bends having a deflection angle of 11 degrees or more. Thrust blocks shall have a sufficient bearing area to withstand the maximum force to be exerted.

The use of other means of anchoring piping against thrust may be permitted; however, the proposed method shall be submitted to the District for approval. Calculations and drawings on the approved anchoring method shall be submitted to the District.

C5.10 ACCEPTANCE TESTS

All gravity sewers shall be tested for both obstructions and leakage; all gravity sewer laterals shall be tested for leakage; all force mains shall be tested for leakage. The District Manager reserves the right to require additional testing, if deemed necessary. The Contractor shall provide all labor, tools, equipment, and utilities necessary to make the tests, to perform any work incidental thereto, and to dispose of all waste.

1. Obstructions

After backfilling and compacting, but before paving, all main sewers shall be

tested for obstructions either by rodding or by the sewer ball method. Means shall be provided for intercepting all grit, rocks, and other flushed debris to keep debris from entering the existing sewerage system.

2. Leakage

The program of testing shall fit the conditions as mutually determined by the District Manager and the Contractor. The Contractor shall, at his own expense, correct any excess leakage resulting from or caused by this test. Where the actual leakage exceeds the allowable, the Contractor shall determine the cause and remedy it before the test is accepted. If the leakage is less than the allowable and leaks are observed, such leaks shall be repaired at the District Manager's direction.

- a. Gravity Main Sewers. After main sewers have been inspected and cleared of obstructions and following backfill, but prior to repaving, they shall be tested for leakage. Each section of sewer shall be tested between successive manholes by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole with stoppers. At the Contractor's option either the hydrostatic or air test may be used.

Hydrostatic Test for Gravity Sewer Main- Fill the pipe and manhole with water to a point four feet below the ground surface of the upper manhole, but in no case less than four feet above the pipe invert. If ground water is present, the water surface in the upper manhole shall be at least four feet above the level of the ground water. The line shall be filled at least one hour prior to testing and shall be tested at least 2 hours by maintaining the head specified above with measured additions of water. The sum of these additions of water in the two-hour period shall be the leakage amount for the test period.

The maximum allowable head of water above any portion of sewer being tested shall be 15 feet. Where the difference in elevation between successive manholes exceeds 15 feet a test tee shall be installed between manholes, and testing shall be carried on between the tee and the manhole.

The allowable leakage shall not exceed 0.1 gallons per minute per inch diameter, per 1000 feet of main line sewer being tested.

Air Test for Gravity Sewer Main - Air test shall be applied to each length between adjacent manholes, and the procedure shall be as follows:

Pressurize the test section to 3.5 p.s.i. and hold above 3.0 p.s.i. for not less than 5 minutes. Add air if necessary to keep the pressure above 3.0 p.s.i. At the end of this 5 minute saturation period, note the pressure (must be 3.0 p.s.i. min.) and begin the timed period. If the pressure drops 0.5 p.s.i. in less than the time given in the following table the section of pipe has not passed the test.

<u>SIZE</u>	<u>MINIMUM TIME IN SECONDS</u>
4"	125
6"	185
8"	245
10"	310
12"	370
15"	460
18"	555

<u>SIZE</u>	<u>TIME IN MINUTES</u>
21"	10
24"	12
27"	14
30"	16
36"	18
42"	20
48"	23
54"	26

If the time for the pressure to drop 0.5 p.s.i. is 125% or less of the time indicated, the line shall immediately be repressurized to 3.0 p.s.i.g. and the test repeated. If, during the 5 minute saturation period, the pressure drops less than 0.5 p.s.i. after the initial pressurization and air is not added, the section undergoing the test shall have passed.

If the test did not pass, the leak shall be found and repaired to the satisfaction of the District Manager, and the section shall be retested.

When the prevailing ground water is above the line being tested, air pressure shall be increased 0.43 p.s.i. for each foot the water table is above the invert of the line.

The pressure gauge used shall be supplied by the contractor, shall

have minimum divisions of 0.10 p.s.i., and shall have an accuracy of 0.04 p.s.i. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six (6) month intervals or when requested by the District Manager.

- b. Manhole Testing - After completion of manhole construction, all manholes shall be tested for leakage. The Contractor shall furnish all labor, tools, and equipment necessary to make the tests and to perform any work incidental thereto. He shall, at his own expense, correct any excess leakage and repair any damage to the pipe and its appurtenances or to any structures resulting from or caused by these tests. Each manhole shall be tested by Vacuum Test or by Hydrostatic Test.

Vacuum Test - Testing shall be performed in accordance with ASTM C1244-93, "Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test."

The vacuum test shall be performed prior to backfilling around the manhole.

Preparation of the manhole prior to testing shall include plugging all lift holes and temporarily plugging all pipes entering and existing the manhole, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

The test head shall be placed at the inside top of the cone section and the seal inflated in accordance with the manufacturer's recommendation.

A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valve closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass if the time is greater than 60 seconds for a 48" diameter manhole, 75 seconds for 60" diameter, and 90 seconds for 72" diameter.

If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

Hydrostatic Test - Each manhole shall be tested by inserting inflatable plugs in all sewer inlets and outlets of the manhole, and filling the manholes with water to a point six inches below the base of the manhole frame.

The manhole shall be filled at least one hour in advance of the official test period to allow time for absorption. The loss of water may be determined by measuring additions of water required to maintain the specified water level, but the level shall not be allowed to fall more than 25% of the manhole depth.

The allowable leakage shall be determined by the following formula:

$$Em = .0002 \times L \times \text{square root } H$$

where Em =amount of allowable leakage in gallons per minute.

L =depth of manhole from top to bottom. (feet)

H =head of water in feet, as measured from the sewer line invert or from prevailing ground water against outside of manhole barrel. The lesser height governs.

Where the actual leakage in a manhole exceeds the allowable, the Contractor shall discover the cause, remedy it, and retest the manhole before the manhole is accepted. If the leakage is less than allowable and leaks are observed, such leaks shall be repaired.

As an alternative to the above procedure, the Contractor may fill the manhole with water prior to backfill and repair all visible leaks provided there is no ground water above base. Any visible leaks into or out of a manhole shall be repaired. Alternative methods of manhole testing will be considered by the District Manager.

Where media other than water is used for testing, the allowable leakage shall be as mutually agreed to by the District Manager and Contractor.

- c. Gravity Sewer Laterals. Gravity sewer laterals shall be tested before backfilling. The side sewer shall be plugged at its ends and filled with water through the cleanouts. The water level in the cleanouts shall be maintained throughout the test period as high as possible. One hour after filling the pipe with water, the entire line shall be visually examined for leakage. All leaks shall be repaired in an acceptable manner. The trench shall not be backfilled until the

complete inspection has been made. Following approval by the District Manager, the plugs shall be removed, the water disposed of, and the connection at the main sewer completed.

- d. Force Mains. Force mains shall be tested for leakage in conformance with applicable portions of Section 13, American Water Works Association C600, for test pressure of 150 percent of the specified working pressure for the pipe.

The test shall last at least one hour at the required pressure measured at the test pump. The allowable leakage shall be computed by the following formula:

$$L = \frac{ND(P)^{1/2}}{1850}$$

where

- L = allowable leakage, gallons per hour
- N = number of joints in test section
- D = nominal pipe diameter, inches
- P = average test pressure, pounds per square inch.

C5.11 Inspections

- (1) General Requirements: All materials, equipment, installation, and workmanship, if so required by the District, shall be tested and inspected to prove compliance with the contract requirements. For the purpose of this requirement "equipment" shall mean any mechanical, electrical, or instrumentation devices and other items with one or more moving parts.

No tests specified herein shall be applied until the item to be tested has been inspected and approval given for the application of such test.

Tests and inspections shall include:

- a. The delivery acceptance test and inspections.
- b. The installed tests and inspections of items.

Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry.

The form of evidence of satisfactory fulfillment of delivery acceptance test and of installed test and inspection requirements shall be, at the discretion

of the District, either by tests and inspections carried out in his presence or by certificates or reports of tests and inspections carried out by approved persons or organizations. The Contractor shall provide and use forms which include all test information and are acceptable in content to the District.

- (2) Delivery Inspection: The delivery inspection shall be at the Contractor's expense for any materials or equipment specified herein and shall include the following:
 - a. Inspections of items during the process of manufacture and/or on completion of manufacture, comprising material tests, hydraulic pressure tests, electric tests, performance and operating tests and inspections in accordance with the relevant standards of the industry and more particularly as detailed in individual clauses of these Specifications to satisfy the District that the items tested and inspected comply with the requirements of this contract.
 - b. Inspection of all items delivered at the site in order that the District may be satisfied that such items are of the specified quality and workmanship and are in good order and condition at the time of delivery.
- (3) Television Inspections: The District may require the use of television inspection to inspect laterals and main sewers for review and before acceptance. Copies of the tapes of such television inspection shall be submitted to the District. The District will not deem a project complete until the line is deemed acceptable by visual observation.

SECTION C6 - PAINTING

C6.01 SCOPE

Painting shall include the furnishing of all plant labor, equipment, appliances and material, and the performing of all operation in connection with the preparation of surfaces, application of all paint or other materials, and the manufacture of paints, paint materials, and miscellaneous materials incidental thereto. Surface to be painted shall receive the treatment and the number of coats prescribed in the Painting Schedule.

C6.02 STANDARD PRODUCTS

All materials, supplies, and articles furnished shall, whenever practicable, be the standard product of a recognized, reputable manufacturer. The standard products of manufacturers other than those specified will be acceptable when it is proved to the satisfaction of the District that all paint materials comply fully with the specification.

Precautions concerning the handling and the application of paint shall be shown on the label of paint and solvent containers in accordance with the Construction Safety Orders and General Industry Safety Orders of the State of California.

C6.03 CLEANING AND PREPARATION OF SURFACES

Surfaces to be painted shall be clean before applying paint or surface treatments. Oil, grease, dirt, rust, loose millscale, old weathered paint, and other foreign substances shall be removed. The removal of oil and grease shall, in general, be accomplished by blast cleaning. Minor amounts of grease and oil contaminants will be tolerated on the surface prior to blast cleaning, provided that abrasive is not reclaimed and reused.

Clean cloths and clean fluids shall be used in solvent cleaning to avoid leaving a thin film of greasy residue. Cleaning and painting shall be so programmed that dust or spray from the cleaning process will not fall on wet, newly painted surfaces. Hardware and similar accessories shall be removed or suitably masked during preparation and painting operations, or shall otherwise be satisfactorily protected.

In all cases, the recommendations of the paint manufacturer shall be rigidly followed.

C6.04 PAINT APPLICATION

1. Workmanship

In general all painting shall be done as specified herein and as set forth in CalTrans Standard Specifications Section 59 "Painting" applicable provisions.

All work shall be done in a workmanlike manner so that the finished surfaces will be free from runs, drops, ridges, waves, laps, and unnecessary brush marks. All coats shall be applied in such manner as to produce an even film of uniform thickness completely coating all corners and crevices. All painting shall be done by thoroughly experienced workman. Care shall be exercised during spraying to hold the nozzle sufficiently close to the surface being painted to avoid excessive evaporation of the volatile constituents and loss of materials into the air, or the bridging over of crevices and corners.

Spray equipment shall be equipped with mechanical agitators, pressure gauges, and pressure regulators. Nozzles shall be of proper size. Floors, roofs, and other adjacent areas and installations shall be satisfactorily protected by drop cloths or other precautionary measures. All overspray shall be removed by approved method or the affected surface repainted.

2. Atmospheric Conditions

Except as specified or required for certain water-thinned paints, paints shall be applied only to surfaces that are thoroughly dry and only under such combination of humidity and temperature of the atmosphere and surfaces to be painted as will cause evaporation rather than condensation. In no case shall any paint be applied during rainy, misty weather, or to surfaces upon which there is frost or moisture condensation without suitable protection. Where painting is permitted during damp weather, or when the temperature is at or below 50 degrees Fahrenheit, the surface shall be heated to prevent moisture condensation thereon. Bare metal surfaces, except those that may be warped by heat, may be dehydrated by flame-heating devices, immediately prior to paint application. While any painting is being done, the temperature of the surfaces to be painted and of atmosphere in contact therewith, shall be maintained at or above 50 degrees Fahrenheit, except where paints are being used which dry solely by evaporation, in which case temperature of the air and surface may be 35 degrees Fahrenheit. All paint when applied shall be approximately the same temperature as that of the surface on which it is applied.

3. Protection of Painted Surfaces

Where protection is provided for paint surfaces, such protection shall be

preserved in place until the paint film has properly dried, and the removal of the protection is approved. Items, which have been painted, shall not be handled, worked on, or otherwise disturbed until the paint coat is completely dry and hard. After delivery at the site, all shop-coated metalwork shall be repainted or retouched from time to time with specified paint whenever, in the opinion of the District Manager, it becomes necessary to maintain the integrity of the film.

4. Method of Paint Application

The specified primer or first coat of paint shall be applied by brush to ferrous surfaces which have not been blast cleaned, except as hereinafter specified. All subsequent coats for all ferrous surfaces may be brushed or sprayed. All coats for miscellaneous ferrous metal surfaces may be either brush or spray applied.

5. Coverage and Film Thickness

The actual surface area covered per gallon of paint for metal surfaces shall not exceed those listed in the following table. The first coat on metal surfaces refers to the first full paint coat and not to conditioning or other pretreatment applications. Bituminous type coating shall be applied to the thickness and in accordance with instructions contained herein. Specified coverage rates do not include spraying and other losses of material resulting from the conditions under which coating is applied.

On atmosphere exposed steel and other metal surfaces:

1st coat	500 sq ft/gal
2nd coat	500 sq ft/gal
3rd coat	550 sq ft/gal
4th coat (where required)	550 sq ft/gal

In no case shall the average total thickness (dry) of the completed protective coating system on exposed metal surfaces be less than 1.25 mils per coat as determined by G. E. film thickness gauge. The minimum thickness at any point shall not deviate more than 25 per cent from the required average.

6. Continuity

In testing for continuity about welds, projections, such as bolts and nuts, and crevices, the District Manager shall determine the minimum conductivity for smooth areas of like coating where the dry mil thickness has

been found adequate. This conductivity shall then be taken as the minimum required for these rough, irregular areas. All pin holes and holidays shall be repainted to the required coat coverage. All ferrous metal surfaces shall meet minimum continuity requirements.

C6.05 PAINT MATERIALS

Specifications of primers, washcoats, and paints are as follows:

1. Paints for Metal

IDENTIFICATION NUMBER	PAINT SPECIFICATION
P1	CALTRANS STD. SPECS. SEC. 91-2.07; Pretreatment, Vinyl Wash Primer (State Specification 8010-31A-27) For application prior to painting clean aluminum, galvanized surfaces, or blast-cleaned steel.
P2	CALTRANS STD. SPECS. SEC. 91-2.10; Vinyl Primer, Red Iron Oxide Type (State Specification 8010-31A-23) For use on metal surfaces treated with Vinyl Wash Primer, P1, above.
P3	CALTRANS STD. SPECS. SEC. 91-2.22; White Tintable Vinyl Finish Coat (State Specification 3010-31A-35) For use on metal surfaces, treated with Vinyl Wash Primer, P1, above; primarily for spray application.
P4	CALTRANS STD. SPECS. SEC. 91-2.08; Aluminum Paint, Finish Coat (State Specification 8010-31A-45) For use as a finish coat on steel, above and below water.

2. Paints for Wood

P5	CALTRANS STD. SPECS. SEC. 91-3.01; Wood Primer, Latex-Base (Federal Specification TT-P-001984, Latest Revision) For use on unpainted wood.
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P6 CALTRANS STD. SPECS. SEC. 91-3.02; Paint, Latex-Base for Exterior Wood, White and Tints (Federal Specification TT-P-96D)

For wood subject to outside exposures, previously treated with wood primer, P5, above.

3. Miscellaneous Paints

P7 SHERWIN-WILLIAMS CO., CLEVELAND, OHIO; Coal Tar Epoxy C-200; or RUST-OLEUM CORP., VERNAN HILLS, ILLINOIS; Coating No. 9578 Coal Tar Epoxy; or equal.

Two-coat application on iron and steel exposed underground and/or to moisture or sewage.

P8 CALTRANS STD. SPECS. SEC. 91-4.05; Paint, Acrylic Emulsion Exterior White and Light and Medium Tints (Federal Specification TT-P-19)

For use on exterior masonry.

P9 CALTRANS STD. SPECS. SEC. 91-4.09; Enamel, Gloss, Industrial (Federal Specification TT-E-489, Class A, Air Drying)

For use where high gloss enamel is desired, for exterior and interior primed wood and metal surfaces.

All materials shall be specifically manufactured for use on projects of this type, and shall be used on surfaces intended by the manufacturer. All materials shall be delivered in original containers, with seals unbroken.

Colors for the various surfaces to be painted shall be as required by the District. Use of different colors for the various structures or for surfaces of a single structure may be directed by the District.

C6.06 PAINTING SCHEDULE

In general, the following items shall be painted: exposed iron and steel surfaces in underground pipelines; iron and steel surfaces in above ground pipelines; exterior woodwork; all visible surfaces of equipment, bolts, nuts, hangers, clamps and similar metal devices; and all galvanized surfaces, except gratings and floor plates.

Notes:

1. For exposed iron and steel surfaces in underground pipe installation prime coat may be brush applied in shop. Touch up prime coat as required in field. Prime shall be allowed at least 72 hours drying time in good weather before recoating. All coats may be brush or spray applied. Allow at least 2 days for drying between coats.
2. For iron and steel surfaces in above ground pipe installation the surface shall be blast cleaned. Apply paint with brush or spray. Mil thickness for first two coats, 1.2 mils per coat and 1.0 mil per coat for last two coats. Second and third coats to be tinted.
3. For exterior woodwork, apply paint with brush or spray.
4. For iron and steel exposed to moisture or sewage apply coal tar epoxy a minimum of two brush coats to give a minimum of 25 mils total film thickness. Brush each coat perpendicular to strokes of preceding coat. Drying time between coats shall be as recommended by the manufacturer.

C6.07 TESTING

Testing will be conducted in accordance with the latest test methods of American Society of Testing Materials and of the Federal Test Method Standard No. 141, as applicable.

SECTION C7 - RESURFACING

C7.01 SCOPE

Resurfacing includes the furnishing and installation of all materials, equipment, and labor necessary for the replacement and restoration of all streets, roads, highways, sidewalks, curbs, gutters, driveways, and similar surfaces.

C7.02 GENERAL

Any concrete or bituminous paved surface which is broken, removed, or damaged by the Contractor's operations shall be restored at least to the condition existing prior to beginning work. Notwithstanding the provisions of this section, all work will be subject to the requirements of the entity having jurisdiction over the affected area. The Contractor shall familiarize himself with the requirements of said entity and shall comply in all respects with these requirements. Wherever there is a conflict between the requirements of the entity having jurisdiction and the requirements of this Section, the more restrictive of the two shall be the requirement with which the Contractor shall comply.

All trenches shall be saw cut prior to excavation. All breaks shall be saw cut prior to patching.

C7.03 MATERIALS

1. Concrete

Concrete shall be as hereinbefore specified in Section C3.

2. Aggregate Base Course

Aggregate base course shall conform to the requirements of CalTrans Standard Specifications, Section 26 and shall be Class 2, 1-½ inch maximum size.

3. Prime Coat

Prime coat shall conform to the requirements of CalTrans Specifications, Section 39. Liquid asphalt grade for prime coat shall be Grade MC-70.

4. Asphalt Concrete Surfacing

Asphalt concrete surface shall conform to the requirements of CalTrans Specifications, Section 39, and shall be Type B, 1/2 inch maximum size.

Paving asphalt shall conform to the provisions in Section 92 and shall be of the penetration range specified the entity having jurisdiction. Viscosity grade shall be AR 4000.

C7.04 PREPARATION OF SUBGRADE

After backfill has been properly placed in the trench and other affected areas, in accordance with the provisions herein, the surface shall be rolled or tamped until the subbase is firm and unyielding. Mud or other soft or spongy material shall be removed and the space filled with gravel and rolled or tamped in layers not exceeding 4 inches in thickness. The edges of all existing surfaces shall be saw cut and square prior to placement of the base course and final surface.

C7.05 BASE COURSE

In the absence of any requirements to the contrary by an agency having jurisdiction over the pavement replacement, the base course shall consist of a lean concrete base. Lean concrete base shall conform to the provisions of Section 90 of CalTrans Standard Specifications except that the cement content shall be not less than 2 1/2 and not more than 3 1/2 sacks per cubic yard.

Concrete base shall be placed to a depth of 6 inches (minimum) and shall extend six inches (minimum) outside of the trench line.

Aggregate base may be used for a base course at the following locations:

1. When the trench is entirely within the shoulder, gutter, or sidewalk on a public street.
2. When the trench is located in a paved area which is not a public street. Aggregate base course shall be placed to a compacted thickness equal to that which existed prior to construction or to a minimum compacted depth of 6 inches. Spreading and compacting shall be in accordance with the applicable portions of CalTrans Standard Specification, Section 26.

C7.06 CONCRETE SURFACES

Reconstruction of concrete curbs, gutters, driveways, and sidewalks shall be of the same kind of material and in not less than the same dimensions as the overall work. In the case of concrete slabs, the minimum thickness shall be 4 inches. Repairs shall be made by removing and replacing the entire portions between joints or scores and not merely by refinishing the damaged part. All work shall match the appearance of the existing improvements as nearly as practicable.

C7.07 ASPHALTIC SURFACES

After the base course has been compacted, plant-mix surfacing shall be applied to a minimum depth of 2 inches, but in no case less than the thickness of the existing pavement. Before placing the plant-mix surfacing, a prime coat of asphaltic emulsion shall be applied over the area to be resurfaced. Proportioning, mixing, spreading, and compaction of asphalt concrete shall conform to applicable portions of CalTrans Standard Specification, Section 39, except that a self-propelled mechanical spreading and finishing machine need not be used. The finished work shall be to the satisfaction of the entity having jurisdiction.

The Contractor shall submit samples of the asphalt and the aggregate for use in the design of the mix. Thickness shall be as indicated, but in no case less than that removed.

The subgrade shall be smooth graded to an even elevation using finish elevations. Any soft or spongy material encountered shall be removed and replaced with approved gravel. The Contractor shall provide adequate drainage at all times to prevent water from standing on the subgrade.

The prime coat shall be applied only when the base course is dry or contains moisture not in excess of that which will permit uniform distribution and the desired penetration. It shall not be applied unless the air temperature is 60 degrees F and rising and shall be applied at the rate of 0.25 gallons per square yard.

No mixture shall be mixed or spread when the air temperature is at or below 50 degrees F, nor when the base or binder is wet, nor when other conditions are obviously unsuitable.

No vehicular traffic of any kind shall be permitted on the finished surface until the bituminous material has cured sufficiently not to be unduly distorted.

Any foreign material that may have accumulated on the surface shall be removed before the surfaces are rolled.

C7.08 SURFACE TREATMENTS

If special surface treatments such as seal coat, armor coats, or fog seal are required by the jurisdictional authority, they shall be done to the requirements of the authority.

C7.09 RESTORATION OF SURFACE MARKERS

Traffic markers or other surface markings painted on the roadway surface which

have been damaged or destroyed shall be replaced in strict accordance with the requirements of the jurisdictional authority.

C7.10 REPLACEMENT OF TRAFFIC LOOPS

Traffic Loops that are damaged by construction shall be replaced as possible upon damage. The Contractor shall notify the District, the Police Department, and the Fire Department after damage occurs. The Contractor shall replace the damaged loops in strict accordance with the requirements of jurisdictional authority.

SECTION C8 - SEWER LINE CLEANING

C8.01 SCOPE

The Contractor should understand the purpose and scope of any sewer line cleaning specified in relation to the degree of cleaning and inspection required. The Contractor's attention is directed to the Safety and Health Provisions with respect to CAL OSHA rules and regulations to follow before entering manholes.

Examples of cleaning purposes and associated cleaning requirements follow.

1. **Removal of Blockages:** This is usually emergency cleaning. The requirement is to remove or relieve a particular blockage and prevent sewage back-up, overflow, and property damage.
2. **Routine Maintenance:** This often involves moderate root removal or the removal of light to heavy debris preventing adequate flow. The intent is to prevent blockages and restore the sewer to near-full capacity and self-scouring velocity. Cleaning requirements are not usually stringent if the purpose appears to have been achieved.
3. **Cleaning Prior to TV Inspection:** Cleaning in preparation for TV inspection must be performed. Pipe walls must be clean enough for the camera to discern structural defects, misalignment and points of infiltration. Small amounts of debris left on the sewer invert, such as sand, stone or sewage solids, may not interfere with effective inspection.
4. **Cleaning in Preparation for Sewer Pipe Joint Sealing or Pipe Lining:** Cleaning must be much more thorough than for sewer maintenance. All sand, rocks, gravel, grease, mud, sludge and other debris must be removed from the sewer invert to permit operation of a sealing packer. Roots usually enter the top portion of the pipe and should be removed to the extent necessary to effectively seal the joints.

It is usually desirable to perform the cleaning immediately prior to joint sealing or pipe lining operations to preclude the buildup of materials from infiltration and inflow sources and the shoaling of wastewater debris.

C8.02 MATERIALS TO BE REMOVED

The bulk of sewer cleaning is involved with the removal of sludge, mud, sand, gravel, rocks, bricks, grease, and roots from pipes, manholes, and wet well. Other material may be found in combined sewers.

Removal of bricks, pieces of tile and clean sand or soil indicates structural

problems such as broken or collapsed pipe (see Cleaning Precautions, of these specifications)

C8.03 SEWER CLEANING PROCEDURES

Sewers are generally cleaned downstream starting at the upstream manhole section of the area to be cleaned. Selection of equipment and methods often depends on the conditions at the time the work commences. The equipment should be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment may be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it may be assumed that a major blockage exists and the cleaning effort should be terminated. The Contractor should make note of the indicated location (footage) of the blockage in anticipation of excavation which may be required. The Contractor should make note of the sewage flow and determine if the blockage is causing a sewage back-up which requires near-term or emergency action by the District. The Contractor should immediately report the need for appropriate action to the District.

C8.04 PIPE DAMAGE PREVENTING CLEANING OPERATIONS

The Contractor should recognize that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where damage would result if cleaning were attempted or continued. Should such conditions be encountered, the Contractor should not be required to clean those specific manhole sections. The Contractor will be knowledgeable of and alert for any conditions which warrant termination of cleaning activities.

Example: The removal of large quantities of fresh soil with a jet cleaner may indicate broken or collapsed pipe.

Example: The removal of bricks from a brick sewer with a bucket machine may indicate more harm is being done than good.

C8.05 DEBRIS REMOVAL

Sludge, dirt, sand, rocks, grease, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be done.

C8.06 CLEANING TASKS

The Primary tasks performed in sewer cleaning are:

1. Dislodge materials.
2. Transport materials to a point of access.
3. Remove materials from the sewer system.
4. Transport materials to a disposal site.

Most cleaning techniques require access for men and equipment at the downstream manhole where materials are to be removed. Some cleaning techniques require equipment access to both ends of a manhole section.

C8.07 CLEANING METHODS

The Contractor should be experienced with the methods and techniques generally used with each type of sewer cleaning equipment.

1. Rodding Machine

Rotating-rod sewer cleaning equipment is practical and useful for returning clogged sewers to service. The rods are generally 3/8- to 1/2-inch in diameter and may be sectional or continuous. Rods are made of high-strength, oil-tempered spring steel.

A sewer rodding machine can push the rod through a sewer for a distance as great as 800 feet. It can also be used in curved sections.

The rodding machine should be set up in close proximity to the downstream manhole and positioned so that the flexible rod guide (containing the rotating rod) makes a gentle curve from the machine to the entrance of the sewer pipe at the bottom of the manhole. The rod is usually pushed upstream so that the flow will help bring the debris back toward the machine.

The rod can be fitted with a variety of tools. To open a line that is completely plugged, the operator can place a small spear or a corkscrew device on the end of the rod. The rodding machine will push and rotate the rod into the blockage to make an opening large enough to permit wastewater to start flowing.

The operator can then replace the corkscrew with an auger. Augers are

spiral-shaped cutting devices with diameters smaller than that of the pipe to be cleaned. The rodding machine rotates the rod and the auger, forcing the auger upstream into the sewer to grab as much of the clogging material as it can, and then retrieves the rod, pulling the debris back downstream.

The operator should set the footage meter on the machine to zero before pushing the rod up the sewer. This zero setting indicates how far the cleaning tool is into the line.

The operator can move the rod forward without rotating it, but it should be rotated in larger pipes or if debris is encountered to prevent buckling the rod. If the line is fairly clean, the rotating rod can be moved quickly and easily. When cleaning becomes difficult, increasing hydraulic system pressure and the sound and speed of the machine alert the operator. Cleaning can continue if the hydraulic pressure is within limits, but the forward speed should be reduced and the rod rotation speed maintained. The machine must have a pressure (or mechanical) overload device to prevent the rod from being twisted off if the tools should stop rotating in the sewer.

If the rod and the cutter appear to be making no forward progress and high hydraulic system pressure is indicated, the cutter probably has encountered a heavy mass of roots or other obstruction. The operator should reverse the rotation, retrieve the rod and cutter, clean the cutter of entangling roots, and then run the rod and cutter back to again attack the obstruction.

The rod can be pulled back without rotating, but in general it should not be. Spring-blade cutters can be attached at the upstream manhole and pulled back with the cutter rotating at maximum speed.

Many cleaning tools can be used by rodding machines. Among them are:

- Root saws.
- Expandable cutters with two or three knife blades that can adjust to the diameter of the sewer being cleaned.
- Sand cups are rubber discs designed to permit passage of a portion of the wastewater flow through holes in the disc, thereby creating jets which flush the debris toward the downstream manhole.

2. Bucket Machine

Bucket machines are strong, powerful pieces of equipment. They can open heavily blocked sewers clogged with large masses of roots, sand, or clay.

When a crew completes its cleaning using this type of machine, the sewer should be in good flowing condition, unless it contains broken pipe.

The crew must first thread the cable through the length of sewer to be cleaned. One method is to float or flush a light rope through the pipe, assuming that the flow is sufficient and there are no blockages or root curtains. A more positive method is to pull the cable through using a rodding machine or jet cleaner.

A bucket machine setup consists of two powered winches, each equipped with sufficient steel cable to reach between two manholes, generally not over 750 feet. The cleaning crew will center the machines over the two manholes.

A specially designed bucket serves as the connecting link between the two cables permitting the machines to pull the bucket in either direction. The bucket is designed so that one end opens and closes. One of the machines pulls the bucket into the sewer with the bucket end open. When the bucket is full, the other machine pulls it back. When the bucket is pulled back, the "clam shell" end automatically closes.

Most models can draw the bucket completely out of the manhole and, by use of a swinging boom or chute, discharge the debris into a dump truck.

After the operators have removed the bulk of the debris from the sewer line, they can replace the bucket with a "porcupine". This is a cleaning tool with stiff wire cables protruding outward. By drawing it back and forth in the sewer, the operator can remove roots and grease deposits. For a final, wiped-clean finish, the operator can replace the porcupine with a rubber "squeegee"/"swab".

3. High-Velocity Jet Machine

High-velocity jet sewer cleaning using water pressure can produce excellent results. Under favorable conditions, jet cleaning has demonstrated the ability to clean a line faster and with greater efficiency than any of the other methods.

There are many advantages. Operation is at street level without requiring the crew to enter the manhole. Little time is required for setup. An operator can quickly and thoroughly clean a small-diameter sewer 500 feet long.

Although the method uses water at high pressure, tests have shown that the water jets do not harm pipe joints. A jet cleaner can clean curved lines

where buckets and rotary cutters would harm the pipe.

The nozzle provides the cleaning action. The nozzle has a backward spray that propels the hose up the sewer to be cleaned. When the operator retrieves the hose, the water jets scour the sewer and move the debris to the downstream manhole. Refer to Section C8.05 Debris Removal for additional requirements.

4. Hydraulically Propelled Equipment

(a) Cleaning Ball:

Over the years, the use of a rubberized ball to clean flowing sewers has proved its effectiveness. An experienced operator will hold back the ball to permit wastewater to pass around its lower perimeter, thus flushing the debris ahead to the downstream manhole.

To use sewer balls, a crew should be equipped with:

- At least 600 feet of 0.5-inch synthetic-fiber rope mounted on a winch. For balls over 15 inches in diameter, steel cable is preferred.
- A swivel and clevis that serves to attach the rope or cable to the ball.
- 400 feet of fire hose and a gate valve fitted with connections to attach to a hydrant.
- A downhole roller having a free-running wheel to be fitted into the upstream manhole for the rope or cable.
- Rubber buckets, appropriate shovels, boots, and safety harnesses for use when crew members enter the manhole.

The downhole roller is placed in the upstream manhole and set firmly in place. The wheel should be above and opposite the outgoing sewer opening which serves as the entry point for the ball. This wheel location permits the cleaning crew to insert the ball into the downstream pipe.

An elbow trap is placed in the outgoing pipe of the downstream manhole to confine debris flushed out by the ball and permit passage of wastewater downstream. The rope or cable is passed under the roller and secured to the ball. The ball is then inserted into the

outgoing pipe. Finally, hydrant water, via air gap, is introduced at an upstream manhole to raise the level in the upstream manhole to a depth of approximately 3 feet.

A few tugs on the rope, permitting some water to escape around the perimeter of the ball, will start the ball moving. Most of the water will escape around the lower surface of the ball since the ball's buoyancy will hold it against the top of the pipe. The static head will then force the ball to move downstream. The operator must keep the rope or cable tight to prevent it from overriding the ball if the ball is not inflated to a snug fit.

The ribbed ball flutters, rather than spins, in the pipe. It will develop about 6 inches of turbulent water on the downstream side, and this water will lift the debris and flush it toward the downstream manhole, where it can be shoveled out or removed by debris removal equipment. If the ball stops moving, it is pulled back, increasing the flow around the ball, which levels the debris and allows the ball to proceed.

In general, the ball is inflated with enough air to make it fit snugly in the pipe, although some conditions can require the ball to be underinflated. The operators must learn through experience how much inflation is required.

The cross-sectional area of a cleaning ball increases with the square of its diameter. Thus, a 30-inch ball has four times the area of a 15-inch ball. With the same head of water behind it, the 30-inch ball will have four times the propulsive force of a 15-inch ball and nine times the force of a 10-inch ball. Large cleaning balls are hard to control and difficult to handle and may require winch truck with cable.

(b) Hinged-Disc Cleaner (Scooter):

The hinged-disc cleaner operates in a manner similar to that of the ball. The device is inserted into the outgoing sewer line. Flow is reduced and the resulting head causes the machine to roll down the pipe until debris is encountered. The scooter will then stop, causing the water to rise upstream. A cable attached to the device is then pulled back, causing the upper half of the disc to rotate backward and release the accumulated head. The velocity of the released water is generally several times the normal velocity of the sewage and washes the debris downstream, where it is removed at the next manhole.

When heavy debris is encountered, the device is pulled back, causing the flushing action, and then released. This operation results in a completely clean pipe.

The hydraulic force available increases with the square of the pipe diameter, while the amount of debris increases in proportion to the diameter. As a consequence, the scooter's ability and efficiency increase in larger pipe, but a large amount of water is required.

C8.08 CLEANING EQUIPMENT

There are five types of cleaning equipment:

- a. Rodding machines
- b. Bucket machines
- c. High-velocity jet machines
- d. Hydraulically propelled equipment
- e. Debris removal equipment (including combination machines)

Cleaning equipment is available with characteristics ranging from light to heavy duty. Each type of equipment can utilize special attachments, tools, and methods to expand its capabilities. Cleaning equipment will be evaluated here with emphasis on its primary application.

The Contractor should be concerned with the type of equipment used most notably in areas where the Contractor's equipment is likely to cause pipe damaged, flooding of private property, etc. In hills, only the bucket machine can be used for sewer cleaning unless authorized by the District Manager.

The applications, advantages and limitations of each type of sewer cleaning equipment are summarized on the following pages.

1. Rodding Machines

Materials removed:

Most effective for dislodging roots and relieving blockages.

Applicable for dislodging and transporting sludge, mud, and grease using appropriate accessory tools and adequate flushing water.

Pipe size range:

Generally 6-inch to 18-inch pipes due to the limited pulling power and the tendency of the rod to bend in larger pipes.

Technique advantages:

Access to the downstream manhole only is required.

Can be used at the upstream manhole under surcharge conditions.

Threading the sewer line is not necessary; often used for threading sewer lines for other cleaning or inspection equipment.

Fast response to emergency stoppages.

Technique limitations:

Generally ineffective for cleaning heavy solids.

A large quantity of water is required for "brush and flush" cleaning.

Does not provide for removal of materials from the manhole.

Rod and/or tool can be broken off in the sewer line.
Operation is moderately hazardous.

2. Bucket Machines

Materials removed:

Most effective for dislodging, transporting and removing heavy solids such as gravel, rocks, bricks, and roots.

Applicable for dislodging and transporting mud, sand, and grease.

Pipe size range:

Generally 18-inch to 36-inch pipes make the best use of the available power although 8-inch to 15-inch pipes can be cleaned.

Technique advantages:

Provides the "iron and power" for removal of large amounts of heavy

solids and roots.

Effective in large-diameter pipe.

Various buckets, scrapers, brushes, and squeegees are available.

Can remove materials from the manhole.

Technique limitations:

Access to both manholes is required.

Threading the sewer line is necessary.

Time consumed is longer than for other methods for light cleaning.

Uses heavy tools and has the power to damage the pipe.

Curved pipe, structurally damaged pipe, off-set joints, and intruding service connections can preclude the use of bucket machine tools.

Bucket machines are hazardous to transport, set up and operate.

3. High Velocity Jet Machines (capabilities depend on size of machine)

Materials removed:

Most effective for cleaning pipes of light solids such as sludge, mud, sand, and gravel.

Applicable for dislodging and transporting rocks and grease.

Capable of cutting root growth by using special tools in pipes. Some larger tools are available.

Effective for cleaning manholes using a scouring gun.

Pipe size range:

Most effective in 6-inch to 24-inch pipes. The effectiveness in larger pipes is reduced, especially on grease.

Materials can be cleaned from the invert of larger pipes by using a weighted nozzle.

Technique advantages:

Access to the downstream manhole only is required.

Threading the sewer line is not necessary; often used for threading sewer lines for other cleaning or inspection equipment.

Setup is fast.

Fast method for light cleaning and removal of blockages.

Operation is comparatively easy.

Effective for final cleaning prior to rehabilitation work.

Low pipe damage potential except in badly deteriorated pipe.

Few operator safety hazards are involved.

Jet cleaning provides ventilation when the upstream manhole cover is removed.

Technique limitations:

Water must be available reasonably near the work site.

Least effective on large and heavy materials such as roots, rocks, bricks.

Can cause cavitation of backfill outside broken pipe.

4. Hydraulically Propelled Equipment (cleaning ball, hinged-disc cleaner)

Materials removed:

Most effective for cleaning pipes of light solids such as sludge, mud, and sand.

Fair applicability for dislodging and transporting gravel, rocks, and grease.

Pipe size range:

Generally 8-inch to 36-inch pipes.

Best in intermediate sizes, with extreme caution required in large pipes (see Cleaning Precautions, Section 8.09 of these Specifications).

Technique advantages:

Crew access only to upstream and downstream manholes.

Minimum equipment requirements.

Operation is easy.

Few safety hazards are involved, except manhole entry.

Technique limitations:

A large quantity of water is required at or upstream of the site.

Basement flooding is a real possibility; may be used only where head in sewer will not exceed basement drain elevations.

Not applicable for removal of blockages .. sewer must be flowing.

Does not provide for removal of materials from the manhole.

Caution is required when using hydraulically propelled devices in large pipes due to the large propulsive force and the possibility of getting the equipment stuck in the sewer line with dig-up becoming the only solution.

5. Debris Removal Equipment (including combination machines)

Vacuum machines are primarily used for removal of materials from manholes when other cleaning equipment is used to dislodge and transport the materials to the access point. Some vacuum machines can remove heavy materials such as bricks. Most machines can separate solid materials from cleaning water and transport the debris to a dump site.

Note: A vacuum machine in combination with a jet machine is called a "combination machine."

Trash pumps are frequently used to remove sludge, mud, sand, and gravel from manholes.

Trailers (sometimes containing pumps, tanks and settling baffles) are frequently used to separate solid materials from cleaning water and to transport the debris to a dump site.

C8.09 CLEANING PRECAUTIONS

The Contractor should be aware of several precautions to be taken during cleaning operations.

Eroded, corroded, or otherwise structurally deteriorated pipe may collapse during cleaning operations. Visible inspection must be used to ascertain the advisability of cleaning. Sometimes a television inspection must be made prior to cleaning in such situations.

Clean soil and pieces of broken tile observed in a manhole trough are strong indications of broken, crushed, or collapsed pipe in the upstream section. Exercise due caution.

Full gage cleaning tools are subject to getting "hung up" on off-set joints, intruding service connections, root masses, and other obstructions. A tag cable and winch should be used when practical to retrieve cleaning tools and devices.

Pipe damage is possible any time powerful cleaning equipment is used. Cleaning equipment and tools should be matched to both the job and pipe conditions to avoid pipe damage.

When bucket machines are used, downhole cable rollers should always be employed. Properly installed, the lower "V" of the roller should be just below the top of the sewer pipe so the cable does not rub or catch on the entrance to the pipe. The roller must be high enough to permit free passage of the bucket into and out of the sewer pipe.

When hydraulically propelled cleaning tools (which depend on water pressure to provide their cleaning force) or any equipment which retards the flow in the sewer is used, a real possibility of a sewage back-up resulting in flooding and property damage exists. When a hydraulically propelled cleaning tool stops moving downstream for any reason (e.g., stopped by a roller in a downstream manhole), a sewage back-up starts to take place, especially if water is being added from an upstream hydrant. The Contractor should be on the lookout for such a situation.

C8.10 DISPOSAL OF MATERIALS

Solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of at a site designated by the District. All materials shall be removed from the site at the end of each workday. The Contractor may be allowed to accumulate debris at the work site beyond the stated time in enclosed

containers and as approved by the District.

C8.11 ROOT REMOVAL

Roots shall be removed in the designated sections where root intrusion is a problem. Special attention shall be used during the cleaning operations to assure almost complete removal of roots from the joints prior to joint sealing. Roots which could prevent the seating of the packer or could prevent the proper application of chemical sealants must be removed. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters, root saws, porcupines, and jet machines equipped with hydraulically driven cutters.

C8.12 CHEMICAL ROOT TREATMENT

To aid in the control of roots, manhole sections that have root intrusion may be treated with an Environmental Protection Agency (EPA) registered herbicide. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and in such a manner to preclude damage to surrounding vegetation. Damaged vegetation shall be replaced by the Contractor at no additional cost to the District. Safety precautions as recommended by the manufacturer shall be adhered to concerning handling and application of the herbicide.

C8.13 CHEMICAL ROOT TREATMENT METHODS

With the following application methods, roots absorb the killing agent and inhibitor.

Soil in the sewer joints absorbs the inhibitor allowing it to be effective for as much as three years in open joints.

The preferred method of treating roots with a foam fumigant is as follows: The foam generator is set up at the downstream manhole. The fumigant hose is pulled through the sewer to the upstream manhole. The foam generator is then started and run until foam shows at the upstream manhole. The hose is then retrieved at a rate given on a chart provided by the equipment supplier. Foaming is terminated when foam appears at the downstream manhole. No plugs need to be used as the sewage will flow under the foam and does not rapidly wash it away. The foam tends to cling to the upper portion of the sewer giving the roots time to absorb the fumigant.

C8.14 FINAL ACCEPTANCE

Acceptance criteria for sewer line cleaning shall be as specified in the contract. The District Manager shall be satisfied that the degree of cleaning is adequate for the purpose and intent of the contract. Acceptance of sewer cleaning shall be

made upon the successful completion of the television inspection if specified in the contract. If TV inspection shows the cleaning to be unsatisfactory, the Contractor shall reclean and reinspect the sewer line until the cleaning is shown to be satisfactory. If internal sealing is to follow the television inspection, particular attention should be given to the adequacy of the cleaning to insure that proper seating of the sealing packer can be achieved.

C8.15 VARIABLES WHICH AFFECT THE DIFFICULTY OF SEWER CLEANING

The Contractor should be familiar with the many variables which may have impact on his performance, production and cost on any particular sewer cleaning job. Some variables apply to each manhole section to be cleaned.

1. Locating, exposing, removing manhole covers.
2. Access to manholes, terrain, traffic control requirements.
3. Condition of the manholes -- steps, cleanliness, structure.
4. Depth of the sewer -- difficulty of entry and debris removal.
5. Size of the pipe.
6. Depth and velocity of sewage flow.
7. Structural integrity of the pipe.
8. Off-set joints, intruding service connections, curved pipe.
9. Availability of hydrant water at or upstream of the site.
10. Depth of deposition in the pipe.
11. Type of solid materials to be removed, arranged in order of increasing difficulty -- sludge, mud, sand, gravel, rocks, grease, bricks and roots. Roots are difficult to remove completely and may be a significant factor.
12. Degree of cleanliness required -- see Intent, Article C8.01 of these specifications.
13. Productivity differences in cleaning successive vs. random manhole sections.
14. Requirements for transportation and disposal of solid materials and distance to the disposal site.

SECTION C9 - SMOKE TESTING

C9.01 EQUIPMENT

The Contractor shall provide a portable blower designed and built specifically for the use of smoke testing. The blower shall be self-contained and powered by a minimum three (3) horsepower (HP) gasoline engine and be capable of producing a minimum of 1800 cubic feet of air per minute. In addition to the blower, the Contractor shall provide all other equipment and tools and incidentals required to perform smoke testing as required by these specifications.

Attention by the Contractor is directed to the Safety and Health Provisions with respect to CAL OSHA rules and regulations to follow before entering manholes.

C9.02 SMOKE PRODUCT

The smoke product shall produce a chemical reaction generating white to gray smoke, leaving no residue, and shall be non-toxic and non-explosive. Each product shall be capable of producing 100,000 cubic feet of smoke within five (5) minutes.

Manufacturer's literature on the smoke product to be used in this project shall be provided by the Contractor for review by the District Manager prior to commencement of any work.

C9.03 PERSONNEL

The Contractor's employees performing the smoke testing under the provisions of these specifications shall be properly trained in the use of the equipment and procedures. As a minimum, they shall have at least five (5) days of previous testing experience. The five (5) days of experience shall have been acquired within a maximum of six (6) months prior to the date of award of this contract, unless specifically waived by the District. A list of employees to be used shall be provided to the District upon request.

C9.04 PROCEDURE

Upon award of the Agreement by the District and PRIOR TO COMMENCING ANY WORK, the Contractor shall provide a complete WORK SCHEDULE to the District Manager for review and approval. The Work Schedule shall be typed and shall indicate the planned progress for the proposed work.

The Work Schedule shall indicate the following:

- a. Street Name (In easements - the names of the abutting streets).

- b. Street Limits (Cross streets or property addresses).
- c. Upstream and Downstream Manhole Numbers (from District Maps).
- d. Date of Testing.
- e. Starting Time.
- f. Ending Time.

The Contractor shall not commence testing before 8 a.m. and shall terminate testing no later than 4 p.m. each day. If the Contractor wishes to test before 8 a.m. in commercial areas of the District, such testing shall be shown on the submitted WORK SCHEDULE and is subject to the approval of the District Manager. Smoke testing shall not be performed on weekends or on holidays without the prior approval of the District Manager.

Once the WORK SCHEDULE is approved by the District Manager, the Contractor shall not make any revisions or modifications to it without the WRITTEN APPROVAL of the District Manager.

The Contractor shall not perform smoke testing on days that, in the opinion of the District Manager, will hinder the results of the test.

C9.05 NOTIFICATION AND PUBLIC INFORMATION

1. The Contractor shall notify all providers of emergency services by phone daily of the area to be tested the next day of work. Notification shall be 24 hours in advance of the testing.

Providers of emergency services shall include the police, fire and medevac agencies which serve the area being smoke tested.

It shall be the Contractor's responsibility to keep adequate records of all notifications to emergency services and to produce them upon request by the District. Failure to comply with this requirement may be cause for the District to suspend the Contractor's operations until compliance is achieved.

2. The Contractor shall notify, by hand delivery of a notification letter to each address, all RESIDENCES AND BUSINESSES in the area to be tested, 48 hours in advance of the testing.
3. The Contractor shall require all personnel to demonstrate good judgement in performing the testing. The Contractor shall take appropriate action to insure that his employees are polite to the public in all aspects of the work and that immediate assistance is provided to property owners if needed.

C9.06 RECORDS

1. The Contractor shall prepare a bound report of the smoke testing. The report shall contain a typed log that clearly identifies each sewer main tested. For each sewer main tested, the log shall identify each point of smoke exfiltration from:
 - a. Roof gutters
 - b. Sewer cleanouts
 - c. Leakage in house laterals
 - d. Patio or area drains
 - e. Storm drain cross connections
 - f. Any other source not stated above.
2. The points of exfiltration, as identified above, shall be referenced to permanent landmarks and/or house or lot numbers. A photograph of all leaks, using a digital camera or approved equal, shall be included in the bound report. All photographs shall be clearly cross referenced to the typed log indicating the location of the leak. The Contractor shall provide the District with the photos at the end of the project in jpeg format on disk or flash drive.

All smoke testing information shall be accurately and neatly recorded on field worksheets and on 200 scale maps (1 in. = 200 ft.) or other maps of suitable scale as provided by the District. The form of the field worksheet shall be approved by the District Manager prior to the commencement of work by the Contractor.

All items described above shall be placed in a bound report. Two (2) complete copies of the report shall be submitted to the District Manager for review. Upon receiving the District Manager's review comments, the Contractor shall edit or revise the report as necessary and resubmit two copies to the District Manager.

C9.07 SAFETY

The Contractor and his personnel shall be aware of and shall follow all Federal, State and Local safety laws and regulations. Specific attention is directed to Article C1.09 Safety and Health Provisions of these specifications.

Prior to placing any smoke product into a manhole, the Contractor shall first evacuate the system with a blower.

The area of work shall at all times be protected by means of an adequate number of cones, barricades, flags or whatever means is necessary to properly and safely

protect both vehicular and pedestrian traffic.

Any condition deemed to be an unsafe condition shall be immediately corrected by the Contractor. The failure of the District Manager or its representatives to bring a potentially dangerous situation to the Contractor's attention shall not relieve the Contractor from his responsibility for providing a safe work area.

SECTION C10 - SEWER FLOW CONTROL

C10.01 INTENT

Most cleaning, inspection, joint testing, joint sealing, sewer lining and excavation operations require minimal, or at least acceptable, depth of flow in order to be performed effectively. The Contractor should be aware that excessive depth of flow will inhibit and may even prevent some cleaning, inspection and rehabilitation procedures. The Contractor shall know the provisions, requirements, specifications and responsibilities for sewer flow control (if any) that are necessary. Attention by the Contractor is directed to the Safety and Health Provisions with respect to CAL OSHA rules and regulations to follow before entering manholes.

C10.02 DEPTH OF FLOW

For effective television inspection, joint testing and/or sealing operations, the depth of flow at the upstream manhole of the manhole section being worked shall be within the recommended limits given below:

Recommended Maximum Depth of Flow for Television Inspection:

6" - 10" Pipe	20% of pipe diameter
12" - 24" Pipe	25% of pipe diameter
27" & up Pipe	30% of pipe diameter

Recommended Maximum Depth of Flow for Joint Testing/Sealing:

6" - 12" Pipe	25% of pipe diameter
15" - 24" Pipe	30% of pipe diameter
7" & up Pipe	35% of pipe diameter

When depth of flow is greater than recommended for television inspection, joint testing and/or sealing, the flow may be reduced by operation of pump stations, plugging, or by pumping and bypassing of the flow.

C10.03 PLUGGING

A sewer line plug may be installed upstream of the section being worked. The plug should be designed to permit a portion of the sewage to be released. After the work has been completed, sewage flow shall be restored to normal.

Sewer plugs are always installed in the upstream (incoming) pipe of a manhole. It is desirable that the plug be equipped with an airhose to permit deflation from above ground. A strong rope or cable shall be attached to enable the plug to be quickly pulled out of the manhole. Care must be taken to prevent a plug from being pushed into the outgoing pipe when the backed-up sewage is released.

C10.04 PUMPING AND BYPASSING

When pumping and bypassing is required, pumps, conduits, and other equipment are needed to bypass the flow of sewage around the manhole section in which work is to be performed. The bypass system shall have sufficient capacity to handle the existing flow plus additional flow that may occur. Contractor shall demonstrate bypassing operations to the District prior to any excavation. Excavation cannot begin until bypassing operations have been approved by the District.

C10.05 FLOW CONTROL PRECAUTIONS

When the flow in a sewer line is reduced, plugged, or bypassed, precautions must be taken to insure that the operations do not cause overflows, flooding or damage to public or private property. The Contractor shall closely monitor sewer surcharging upstream of the manhole section being worked and be alert for situations such as residential overflows and flooding that would be likely to occur, particularly where there are steep sewers serving houses with basements having floor drains or toilet facilities.

SECTION C11 - TELEVISION INSPECTION

C11.01 GENERAL

1. Contractor shall provide the District's with copies of all CCTV operators' NASSCO certifications. All operators shall be certified.
2. The video recordings shall be in color electronic data format, and shall give clear video/pictures of conditions of pipelines requiring cleaning and any other structural problems. VHS recordings are not allowed.
3. All data and video recording will become the sole property of the District without restrictions of future use, duplication, modification, and dissemination. The Contractor shall have no vested rights to the completed work.
4. The project data furnished by the District to the Contractor for this work shall remain the property of the District and shall be returned on termination of the contract. The Contractor may not distribute, sell or otherwise use data without permission of the District.
5. The Contractor shall have the ability to communicate with its crew at all times (i.e. cellular phone, radio, etc.) to ensure that adequate communications exists between members of the crew.
6. If the Contractor encounters a condition where public safety is threatened (such as, but not limited to, a pipe hole, pipe collapse, stoppage, blockage and/or eminent sewer spill) the District's representative shall be notified immediately. Furthermore, the Contractor shall provide a visual record of the section of line containing the condition within 8 hours to District.
7. If the CCTV camera becomes lodged inside the sewer and cannot be retrieved, the Contractor shall inform the District immediately. It is the Contractor's responsibility to remove the camera and ensure that the sewer is not damaged and SSOs do not occur.

C11.02 EQUIPMENT AND TV PICTURE QUALITY

1. The Contractor's CCTV equipment shall include video cameras, a video monitor cable, power sources, and all other equipment necessary to perform the needed CCTV inspections.
2. The cameras shall meet Cal-OSHA requirements for operating in the sanitary sewer environment.
3. The cameras shall have Pan-and-Tilt capabilities, and shall have a minimum of 360 x 270 degree rotation and illumination sensitivity shall be three lux or less and provide a minimum of 460 lines of resolution. The focal distance shall be adjustable through a range from 25 mm (1 inch) to infinity.
4. The television shall be operative in 100 percent humidity conditions.
5. During CCTV inspection, lighting intensity shall be adjusted to minimize glare. The camera must have its own light source suitable to provide a clear, in-focus

- picture of the entire periphery of the pipeline for all conditions encountered.
6. All camera systems shall be able to navigate around minor objects, roots, and debris. The system used to move the camera through the pipe shall not obstruct the camera's view or interfere with proper documentation of the sewer conditions.
 7. Manual winches, power winches, TV cable powered rewind or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the line.
 8. The camera cable shall be retracted to remove slack and to ensure an accurate footage reading.
 9. The distance shall be measured between the exit of the start manhole and the entrance of the finish manhole for a true measurement of the length of the pipe segment, as required by PACP. Distance shall be recorded in standard units and the video display readout shall display units to one-tenth of a foot.
 10. The cable footage-counter shall be accurate to plus or minus 2 feet per 1,000 feet. The Contractor shall calibrate their measuring device monthly with a known distance prior to starting the inspection and recording process.
 11. The camera lens shall be kept clear of condensation and debris during the CCTV inspection.
 12. A Nationally Recognized Testing Laboratory must approve all electrical equipment, including CCTV cameras, for use in a Hazardous location and wet environments. This equipment must be approved for use in Class I, Division I, Group 0 Hazardous Locations as defined by the National Fire Protection Association (NFPA) Code 820-1999.
 13. Contractor shall have replacement equipment available within twenty-four (24) hours in the event of equipment breakdown.
 14. To insure peak picture quality throughout all conditions encountered during the survey, a variable intensity control of the camera lights and remote control adjustments for focus shall be located at the monitoring station. Focal distance shall be adjustable. Continuously displayed on the monitors as part of the video presentation shall be the date of the survey, number designation of the manhole section being surveyed, and a continuous forward read-out of the camera distance from the manhole of reference.

C11.03 VIDEO LABELING REQUIREMENTS

- A. The naming of the video file shall be automatic, consisting of the "FROM MANHOLE" ID, "TO MANHOLE" ID, and the eight-digit inspection date, as shown in the following example, or as specified by the District:

B10106_B10105_20100721
(FromMH_ ToMH_ YYYYMMDD)

- B. Each pipe segment (manhole to manhole) shall be identified with an initial text screen and completed in accordance with PACP's CCTV inspection form header format, as follows:

<u>Line</u>	<u>Number & Description</u>
Line 1:	Surveyed By
Line 2:	Street
Line 3:	Location Code*
Line 4:	Weather*
Line 5:	Direction of Survey (upstream/downstream)
Line 6:	Use of sewer*
Line 7:	Pipe Material
Line 8:	Pipe Diameter/Height
Line 9:	Pipe Length (on plans)
Line 10:	Start Manhole Number
Line 11:	End Manhole Number
Line 12:	Pipe ID (PSR or MMS #)
Line 13:	Inspection Time/Date

Line items noted with an asterisk (*) are optional depending on the line capacity of the text overlay equipment.

- C. This data must completely match the data entered in the database header information.
- D. During the CCTV inspection, the video shall show the following text at all times:

<u>Line Number</u>	<u>Description</u>
Line 1:	District
Line 2:	Street/ Start Manhole No. / Direction of Inspection/ End Manhole No.
Line 3:	Pipe Material / Pipe Size
Line 4:	Inspection Time/Date/Running Total

C11.04 CONDUCTING THE VIDEO INSPECTION

1. Video inspection and reporting shall be submitted in a NASSCO-compatible format and transferrable to the District's current Asset Management Software.
2. The recorded files shall have a minimum resolution of 352 by 240 pixels and an interlaced frame rate of a minimum of 24 frames per second.
3. The initial text screen shall appear no more than 15 seconds at the beginning

- of the video footage, and shall appear before the 360 degree pan of the starting manhole.
4. The camera shall be moved through the line at a uniform rate stopping when necessary to ensure proper documentation of the sewer's condition but in no case shall the television camera be pulled at a speed greater than thirty feet per minute (30 fpm).
 5. The Contractor shall make a continuous color recording of each complete pipe inspection. The recording shall also be used as a permanent record of defects. Unless directed otherwise by the District, the recording shall be MPEG 4.
 6. Separate video and data files shall be created for each sewer line segment. In case of reverse setup, such inspection shall be stored in a separate video and data files.
 7. The video recording shall include on-screen observation text and narrative for every observation recorded, in addition to the general descriptive text above.
 8. If an undocumented manhole is discovered during the inspection, then a separate inspection shall be started for the additional pipe segment.
 9. The Contractor shall pause the digital recording at any time there is a delay in the inspection and restart the digital video recording in the same digital file. The pause shall in no way affect, freeze, or interrupt the reply of the video and shall not close the video file during the inspection.
 10. During the CCTV inspection, the camera shall stop at all lateral connections, defects, and significant observations to ensure a clear and focused view of the pipe condition and shall rotate the camera head at the defect to allow for adequate evaluation at a later time. The camera shall be panned to look up all laterals.
 11. All defects and significant observations shall include a text overlay and audio narrative of the recorded observation.
 12. If the television camera will not pass through the entire section, the Contractor shall re-set his equipment in a manner so that the inspection can be performed from the opposite maintenance hole. If the camera continues to fail to pass through the entire section, the Contractor shall notify the District as soon as practicable.
 13. A full 360-degree pan of all manholes starting from street level and proceeding to the bottom of manhole is required. This video footage shall occur at the beginning of each pipe segment survey inspection. In instances when the manhole is the terminating manhole, then the pan shall occur at the end of the pipe segment survey inspection.
 14. Video footage shall be taken centered on the pipe with the water level running horizontally. The camera shall run along the invert of the pipe and not at its side, unless it is passing a point obstacle. If extended driving on the side of the pipe is required, then either the pipe needs a more thorough cleaning or an observation should be noted from the PACP codes describing the

nature of the obstacle.

C11.05 PHOTO OBSERVATIONS

- A. Digital photographs in JPEG format shall be made of all recorded defect observations. These photographs will be computer generated with the use of the inspection reporting system software.
- B. All pictures shall be recorded as a JPEG image at a minimum resolution of 640 X 480 pixels.
- C. At a minimum, all photographs shall be named consisting of the following descriptions: "FROM MANHOLE STATION NUMBER", "TO MANHOLE STATION NUMBER", eight digit inspection date, and the defect 'station' location along the pipe. It is in the Contractor's discretion as to additional data information that may be needed in the naming of the files to make each file unique within the file naming constraints of their inspection software.

B10106_B1010_20100721_125_A.jpg
FromMHStation_ToMHStation_YYYYMMDD_Defect
Position_UniqueData)

- D. A minimum of TWO photographs of each defect shall be taken, one with a perspective view and one with a close-up view.
- E. ONE photograph is required for each lateral connection looking directly at the connection and each manhole observation from the bottom of the manhole looking up. At minimum, each lateral must be verified to be in service or not, and each "live" lateral must be identified with an address.

C11.06 SPECIAL CONDITIONS

- 1. Maximum depth of flow for CCTV inspections shall be 25 percent of the pipe diameter. If the depth of flow is greater, then flow control measures must be used as described in Section C10. At the contractor's option and approval from the District, the CCTV inspection may be performed during the low flow periods between the hours of 10:00 p.m. to 6:00 a.m. The Contractor shall pay special attention to all local jurisdiction rules and regulations, especially regarding activities during off-peak hours.
- 2. If the Contractor encounters a surcharging manhole (whereas the flow at the manhole is at least 50 percent of the sewer pipe diameter), then the Contractor shall immediately notify the District's representative.

C11.07 TYPES OF PIPE (Abbreviations)

Acrylonitrile-butadiene-styrene (ABS)
Asbestos-Cement (AC)
Brick Pipe (BP)
Cast Iron Pipe (CIP)
Concrete Pipe (CP)
Corrugated Metal Pipe (CMP)
Polyethylene (PE)
Polyvinyl Chloride (PVC)
Reinforced Concrete (RC)
Reinforced Plastic Mortar (RPM)
Steel Pipe (SP)
Vitrified Clay Pipe (VCP)

C11.08 TYPES OF SEWER PIPE JOINTS

Asphaltic/Bituminous
Cement Mortar
Compression Gasket (e.g. O-ring, molded elastomeric seal)
Solvent Weld (e.g. ABS & PVC pipe)
Thermal Weld (e.g. Polyethylene pipe)

C11.09 TYPES OF SERVICE CONNECTIONS

Intruding Service Connection--is a building sewer pipe inserted into the street sewer (often through a hole broken through the side of the street sewer) which intrudes into the sewer

Saddle Tap--is a device used for a cut-in connection.

Tee--manufactured pipe fitting, enters pipe at 90° angle.

Wye--manufactured pipe fitting, enters pipe at less than 90° angle.

C11.10 TYPE OF DEBRIS (in order of increasing difficulty of removal)

Sludge--organic materials
Silt--light soil
Mud--clay soil
Sand--sand, soil and grit
Gravel--smaller than 0.5 inch
Rocks--larger than 0.5 inch

Bricks

Grease

Roots

Root Curtains--growth fills most of area above water level

Root Blockages--growth fills the pipe and causes a stoppage

C11.11

VARIABLES WHICH AFFECT THE DIFFICULTY OF TV INSPECTION

The Contractor shall be familiar with the many variables that may have impact on his performance. Some variables applying to each manhole section to be inspected are as follows:

1. Locating, exposing, removing manhole covers.
2. Access to manholes, terrain, traffic control requirements.
3. Condition of the manholes, steps, cleanliness, structure
4. Depth of the sewer, difficulty and safety of entry.
5. Depth and velocity of sewage flow.
6. Availability of water for threading the sewer line.
7. Plugging requirements--ability to plug, necessity to bypass.
8. Presence of explosive gas or combustible liquid.
9. Off-set joints, intruding joint materials, intruding service connections, curved pipe, crushed pipe and other obstructions which could prevent the passage of the camera.
10. Cleanliness of the pipe and the presence of root curtains or grease, which could foul the camera lens.
11. Size of the pipe, 6 and 8-inch pipe is tight and may involve equipment clearance problems; 10 to 21-inch pipe is best for inspection; 24 to 36-inch pipe may require special illumination and skids.
12. Production is sensitive to the number of setups required; it is possible to televise 1000 feet in one direction from a single location when inspecting successive manhole sections. Random inspection

of single manhole sections is more time-consuming.

13. Requirements for documentation by means of monitor photographs and videotape recording.
14. Weather conditions--rain affects the production rate.

C11.12 SPECIAL CONDITIONS

- A. Maximum depth of flow for CCTV inspections shall be 25 percent of the pipe diameter. If the depth of flow is greater, then flow control measures must be used as described in Section C10. At the contractor's option and approval from the District, the CCTV inspection may be performed during the low flow periods between the hours of 10:00 p.m. to 6:00 a.m. The Contractor shall pay special attention to all local jurisdiction rules and regulations, especially regarding activities during off-peak hours.
- B. If the Contractor encounters a surcharging manhole (whereas the flow at the manhole is at least 50 percent of the sewer pipe diameter), then the Contractor shall immediately notify the District's representative.

SECTION C12 – PRESSURE SYSTEMS

C12.01 SCOPE

Pressure systems include all labor, equipment and materials as required or necessary to excavate, trench, install and backfill for the construction of tank, pumps, forcemains, laterals, valves, and electrical conduit, control panel, telemetry, wiring and all related work.

C12.02 GENERAL

- A. Septic Tank Effluent Pumping (STEP) system includes a septic tank and a pump tank fitted with manhole risers, covers, and poured in place concrete slabs as shown on the District Standard Details.
- B. Grinder Pump system includes a semi-positive displacement type grinder pump mounted in a self contained basin with covers and poured in place concrete anchors as shown on the District Standard Details.

C12.03 STEP SYSTEM (On-Site Wastewater Disposal Zone only)

A. SEPTIC TANK

1. Size and design of the tank shall be as specified in Section B2.04 and Section C12 herein of these standard specifications.
2. Material for Construction
 - a) Walls, bottom and top of reinforced-concrete tanks shall be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically-constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed frame.
 - b) Subgrade shall be prepared per manufacturer recommendations.
 - c) Reinforcing steel shall be ASTM A-615 Grade 60, $f_y=60,000$ psi. Details and placement shall be in accordance with ACI 315 and ACI 318.
 - d) Concrete shall be ready mix with cement conforming to ASTM C150, Type II. There shall be a cement content of not less than six (6) sacks per cubic yard, with 3/4-inch maximum aggregate size, and concrete shall achieve a minimum compressive strength of 3,000

psi, in 28 days.

- e) Tank shall be protected by applying a waterproof coating, Thoroseal or equal, on both inside and outside surfaces, in compliance with Council of American Building Officials (CABO), report #NRB-168; 6181.
- f) Tank shall be manufactured and furnished with access openings of the size and configuration shown on the drawings. Access covers shall have watertight seals.
- g) Outlet Risers shall be 18-inches high, shall have a minimum nominal diameter of 26 inches, and shall be factory-equipped with the following:
 - i. One 1-inch or 1¼ inch diameter (IPS) neoprene grommet for the pump discharge installed no less than eight inches from the top of the risers.
 - ii. A PVC splice box, with threaded access cap, bonded to the riser.
 - iii. Four (4) UL listed electrical cord grips, installed in the riser to provide access to the splice box.
- h) A lid shall be furnished with each riser. It shall be latching and shall be constructed of fiberglass with an aggregate finish. Riser and lid shall be located below the manhole cover.

3. Construction

- a) Riser installation - Each riser shall be bonded to the top of the concrete tank with a two-part epoxy available from Orenco Systems, Inc. The epoxy shall be applied in accordance with the manufacturer's recommendations. A generous bead of epoxy shall be laid completely around the bottom of the riser prior to mounting the riser on the top of the tank. After the riser is in place, a generous fillet of sealant shall be run completely around the inside base. Four hours curing time shall be allowed the epoxy before backfill is placed over the tanks. Care shall be exercised during the curing period to avoid dislodging the riser or disrupting the watertight seal between the riser and tank.
- b) Before backfilling, all exterior concrete joints shall be coated with a

paste of powdered bentonite clay and water. To insure water tightness, backfill around the tank shall be granular bentonite clay backfill.

4. Testing

- a) In order to demonstrate watertightness, tanks shall be tested twice prior to acceptance. Each tank shall be tested at the factory, prior to shipping, by filling to the soffit and letting stand. After 24 hours, the tank shall be refilled to the soffit and the exfiltration rate shall be determined by measuring the water loss during the next two hours. The two hour loss shall not exceed six gallons. After installation is completed, each tank shall be filled with water to the top of the riser and retested in the manner previously described.

B. EFFLUENT PUMP FOR SINGLE-FAMILY DWELLINGS

1. Material

- a) Per West Bay Sanitary District Standard Detail 21.
- b) Spare pump shall be provided to the District prior to final approval.

2. Installation

- a) Pumping system shall be installed in accordance with the manufacturer's recommendations and the standard plans.

C12.04 GRINDER PUMP SYSTEM (Single Family, On-Site Wastewater Disposal Zone only)

A. BASIN TANK

1. Size and design of the tank shall be as specified in Section B2.04 and Section C12 herein of these standard specifications.
2. Material for Construction
 - a) The tank shall be molded of fiberglass reinforced polyester resin or high density polyethylene of a grade selected for environmental stress cracking resistance and shall be with one inlet grommet to accept a pipe.
 - b) Corrugated sections are to be made of a double wall construction

with the internal wall being generally smooth to promote scouring.

- c) Corrugations of outside wall are to be of a minimum amplitude of 1 ½ inches to provide necessary transverse stiffness.
- d) Any incidental sections of a single wall construction are to be a minimum .250 inch thick.
- e) All seams that created during tank construction are to be thermally welded and factory tested for leak tightness.
- f) Tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All components must function normally when exposed to maximum external soil and hydrostatic pressure.
- g) The accessway shall be an integral extension of the wet well assembly and include a lockable cover assembly providing low profile mounting and watertight capability. The accessway shall include a single NEMA 4X electrical quick disconnect for all power and control functions. The accessway shall include a vent to prevent sewage gases from accumulating in the tank.
- h) The tank and accessway shall have all necessary penetrations molded in and factory sealed. All penetrations shall be watertight. No field penetrations shall be acceptable.
- i) All discharge piping shall be constructed of 304 series stainless steel and terminate outside of the accessway bulkhead with a stainless steel, 1 ¼ inch female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 200 psi. A factory installed, gravity operated, flapper-type check valve shall be built into the stainless steel discharge piping.

3. Construction

- a) Tank Installation – Excavate to a depth that the removable cover extends above the finished grade line, the grade should slope away from the unit. The diameter of the excavation must be large enough to allow for a concrete anchor. The unit shall be placed on a 6 inch deep bed of clean rounded aggregate. The aggregate shall be no larger than ¾ inch in diameter and no less than 1/8 inch in diameter. The tank shall be filled with water to the bottom of the inlet while the concrete anchor is poured. No concrete shall be poured above the

inlet.

- b) The system shall be connected as per the manufacturers recommendations and the Districts Standard Detail.

4. Testing

- a) To demonstrate watertightness, tanks shall be tested twice prior to acceptance. Each tank shall be tested at the factory, prior to shipping. After 24 hours, the tank shall be refilled and the exfiltration rate shall be determined by measuring the water loss during the next two hours. The two-hour loss shall not exceed one gallon. After installation is completed, each tank shall be filled with water and retested in the manner previously described.

B. SEMI-POSITIVE DISPLACEMENT PUMP

1. Material

- a) Pumping system shall be capable of delivering 15 gallons per minute (gpm) against a rated total dynamic head (TDH) of 0 feet and 9 gpm against a rated TDH of 138-feet.
 - i. The pump shall be a designed, integral, vertical rotor, motor driven, solids handling pump of the progressive cavity type with mechanical seal. The rotor shall be hardened stainless steel. The material for the stator shall have physical properties that include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, good aging properties, and outstanding wear resistance.
 - ii. The grinder shall be placed below the pumping elements and shall be direct driven by a single, one piece stainless steel motor shaft. The grinder will be the rotating type with stationary hardened chrome steel shedding ring in alignment with the driven impeller assembly. The driven impeller assembly shall carry two hardened type 400 series stainless steel cutter bars.
 - iii. The motor shall be a 1 HP, 1725 RPM, 240V 60 Hz, single phase, capacity start, ball bearing, squirrel cage induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds.

- iv. Spare pump shall be provided to the District prior to final approval.

2. Installation

- a) Pumping system shall be installed in accordance with the manufacturer's recommendations and the standard plans.

C12.05 PRESSURE SYSTEM FORCEMAIN

A. Materials

1. STEP and grinder pump system forcemains shall be SDR 11 high density polyethylene pipe with polyethylene fittings. The pipe material shall comply with all requirements for Type III, Class C. Category 5, Grade P 34 according to ASTM D1248, and have a PPI recommended designation of PE 3408.
2. Tracing wire shall be coated #8 solid copper wire.

B. Construction

1. Forcemain installation shall be performed in conformance with these Standard Specifications.

C. Testing

1. Forcemain shall be tested at operating pressure for one hour.

C12.06 VALVES

A. Materials

1. Ball valves shall be polyethylene ball valves rated for 150 psi.
2. Check valves shall be of stainless steel.
3. Valve box shall be Christy reinforced concrete utility boxes with Christy reinforced concrete lids, or equal.

B. Installation

All valves and valve boxes shall be installed in accordance with the manufacturer's recommendations and the plans. All concrete boxes in paved areas shall be traffic type.

C12.07 ELECTRICAL

A. Materials

Telemetry/Control and alarms shall be installed in accordance with the manufacturer's recommendations. All elements of the installation shall conform to applicable state and local codes and regulations.

Telemetry/Control panels shall have the following features:

1. Exposed metal parts shall be treated for corrosion resistance.
2. Automatic audio-alarm reset.
3. NEMA 4X-rated, fiberglass enclosure with hinged cover.
4. Alarm circuit shall be wired separately from the pump, so that if the internal overload switch is tripped, the alarm will still function.
5. Double insulated, motor rated, single or double pole, single throw isolation switch.
6. Current Limiting Circuit Breaker: 20 amps, OFF/ON switch, DIN rail mounting (Single Pole/115V - Double Pole/220 V) with thermal magnetic tripping characteristics.
7. Electrical bypass shall be provided within the control panel.
8. Dedicated telephone line for Telemetry, supplied by the property owner.

B. Installation

The pump control panel shall be mounted on a pressure treated post near the septic tank or grinder pump. A 24-hour emergency telephone number shall be posted in the same location.

C12.08 EXISTING FACILITIES TO BE ABANDONED

After all the new installations are completed, tested and functioning, the

existing septic tank, laterals and related items shall be emptied and filled with structural backfill material or native excavated material. Ends of all pipes shall be plugged with cement concrete. Abandonment of existing septic tank shall be in accordance with the Authority having jurisdiction.

SECTION C13 – GREASE INTERCEPTORS

C13.01 SCOPE

All food service establishments are required to install, operate, and maintain an approved type and adequately sized grease interceptor necessary to maintain compliance with the objectives of this Section. All grease interceptors must meet the requirements and sizing of the California Plumbing Code and the Uniform Plumbing Code, latest editions.

C13.02 GENERAL

Grease interceptors shall be fitted with manhole risers, piping and covers, as shown on the District Standard Details. Grease interceptors shall be permanently and legibly marked with the following:

1. Manufacturer's name, model number, and trademark.
2. UPC registration mark.
3. Any other marking required by law.
4. Sampling manholes or sampling boxes may be required by the District downstream of the interceptor, on a case by case basis.

C13.03 GREASE INTERCEPTORS

Grease Interceptor Requirements.

1. **New Food Service Establishments.** All new establishments are subject to grease interceptor requirements. All such facilities must obtain prior approval from the District for grease interceptor sizing prior to submitting plans for a permit.
2. **Existing Food Service Establishments.** All existing food service establishments determined by the District to have a potential to adversely impact the District's sewer collection system will be notified of their obligation to install a grease interceptor within a specified period set forth in the notification letter. These establishments must obtain approval from the District for grease interceptor sizing prior to submitting plans for a building permit.
3. **Shared Grease Interceptors.** One or more food service establishments may comply with the requirements of this Section by use of a shared

grease interceptor. Such shared interceptor may be located on an adjacent or adjoining parcel, provided, however, that the food service establishment seeking to establish compliance by means of this Section shall demonstrate to the satisfaction of the District that: (1) it has enforceable rights to utilize the shared interceptor pursuant to an easement; declaration; covenants, conditions, and restrictions; or similar instrument; and (2) the shared interceptor is sized as necessary to accommodate the discharges of all food service establishments enjoying rights to use such interceptor; and (3) there is a mechanism providing for continued maintenance of such shared interceptor.

4. Variance from Grease Interceptor Requirements. Grease interceptors required under this Section shall be installed unless the District determines that the installation of a grease interceptor would not be feasible and authorizes the installation of an indoor grease trap or other alternative pretreatment technology. Alternative pretreatment technology includes, but is not limited to, devices that are used to trap, separate and hold grease from wastewater and prevent it from being discharged into the sanitary sewer collection system. All alternative pretreatment technology must be appropriately sized and approved by the District.

The food service establishment bears the burden of demonstrating that the installation of a grease interceptor is not feasible. If a food service establishment believes the installation of a grease interceptor is infeasible, because of documented space constraints, the request for alternate pretreatment technology shall contain the following information:

- a. Location of sewer main and any easements in relation to available exterior space outside the building;
- b. Existing building and site plumbing line plan that uses common plumbing for all services at that site;
- c. Proposed drawings and plans for the alternative pretreatment technology.

5. Installation

Grease interceptors shall be installed in accordance with the manufacturer's recommendations and the standard plans.

PART D
STANDARD DRAWINGS

Manhole Frame and Cover	1
Screw Down Type Manhole Frame and Cover	2
Manhole for 21" Diameter and Smaller Pipe	3
Manhole for 24" Diameter and Larger Pipe	4
Standard Inside Drop Manholes (4", 6" and 8" Diameter Pipes only)	5
Sanitary Sewer Lateral Connections	6
Service Lateral Cleanout	7
Excavation, Backfill and Surface Restoration	8
Drop Manhole Detail for Connection of Existing Sewer to New Manhole	9
Air Release Assembly for STEP Main	10
Cleanout 2" – 3" Forcemain (STEP and Grinder Pump Systems)	11
1-1/4" Lateral Check Valve Station	12
Root Control System	13
Sampling Manhole	14
Typical STEP/Grinder Pump System	15
Forcemain Service Connection	16
Control/Telemetry Panel for STEP/Grinder Systems	17
Single Family Septic Tank Effluent Pumping (STEP) System	18
Single Family Grinder Pump Installation Detail	19
Single Family Grinder Pump Information Detail	20
Pump Detail – STEP System	21
Sanitary Sewer Water Main Crossings	22
Sanitary Sewer Lateral Utility Crossings (Excluding Water)	23
Sanitary Sewer Lateral Disconnections	24
Repair Coupling for 15" Diameter and Larger Pipe	25
Grease Interceptor	26