CROCKETT COMMUNITY SERVICES DISTRICT

STANDARD SPECIFICATIONS

FOR THE DESIGN, CONSTRUCTION AND USE OF SANITARY SEWERS IN CROCKETT, VALONA, AND PORT COSTA, CALIFORNIA

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SECTION 1

INTRODUCTION

1-01. INTRODUCTION

The Standard Specifications for sewering shall govern requirements, design, and all work in connection with sewer construction and/or projects financed by private individuals within the jurisdiction of the Crockett Community Services District of Contra Costa County, California. The jurisdiction of the District includes the entire sewerage system and its appurtenances from the point of connection with the building plumbing to the discharge terminus of the treatment plant outfall. The District Code and all ordinances of the District shall be considered a part of these Specifications and all plans, profiles, cut sheets, right-of-way documents, and specifications shall conform to the standards and requirements herein established.

Addenda to these Specifications may be issued periodically and will be made available to the Public and Contractors at the District office. Users of this text are urged to review the latest addenda to apprise themselves of changes put into effect.

Only notes pertaining to sanitary sewer systems on drawings and plans that have been reviewed and accepted or the requirements of other jurisdictional authority when more stringent shall govern over these Specifications where apparent conflict may exist. Where any section, paragraph, subparagraph, clause, or other requirements of these Specifications is modified, deleted or additions made thereto by the requirements and conditions shown or set forth on drawings and plans, the unaltered provisions of that section, paragraph, subparagraph, clause, or drawing of these Specifications shall be considered to remain in effect. Where the requirements of another jurisdictional authority having influence on other than sanitary sewer system design are lesser in material strength, composition, characteristic, quality, dimension, or workmanship the work shall conform to the greater requirements of these Specifications. Likewise, where the requirements of another jurisdictional authority having influence on work outside the purview of the District are greater than that provided by these Specifications, the work shall conform to the greater requirement of that respective jurisdictional authority.

SECTION 2

DEFINITIONS AND TERMS

2-01. DEFINITIONS AND TERMS

Whenever in these Specifications or in any documents or instruments where these Specifications govern the following terms, abbreviations, or definitions are used, their intent and meaning shall be interpreted as follows:

ABBREVIATIONS

AAN	American Association of Nurserymen
AASHO	American Association of State Highway Officials
AB	Aggregate Base
AC	Asphalt Concrete
ACI	American Concrete Institute
ANSI	American National Standards Institute
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
COSHA	California Division of Occupational Safety and Health Act
CCSD	Crockett Community Services District
FED. SPEC.	Federal Specification
IAPMO	International Association of Plumbing and Mechanical Officials
IOD	Irrevocable Offer of Dedication
NEMA	National Electrical Manufacturers Association
PUE	Public Utility Easement
WEF	Water Environment Federation

PIPE TYPES

- ABS Acrylonitrile Butadiene Styrene
- ACP Asbestos Cement Pipe
- CIP Cast Iron Pipe
- CIPP Cured-In-Place Pipe
- CL Concrete Lined Steel Cylinder
- CL & C Concrete Lined and Coated Steel Cylinder
- CMP Corrugated Metal Pipe
- DIP Ductile Iron Pipe
- HDPE High Density Polyethylene Pipe
- PCC Portland Cement Concrete
- PMP Perforated Metal Pipe
- PVC Polyvinyl Chloride

RCPReinforced Concrete PipeVCPVitrified Clay Pipe

<u>TERMS</u>

<u>ACCEPTANCE</u> - The formal written acceptance by the District Engineer of an entire project which has been completed in all respects in accordance with the Plans and Specifications and any modifications thereof previously issued.

<u>ANNEXATION</u> - The inclusion of property within District boundaries by proper legal procedures.

<u>BACKFILL</u> - Earth or other special material used to replace material removed from trenches during construction that is between the pipe bedding or concrete trench slab, to the ground surface in unpaved areas, and the lowest point of the pavement structural section in paved areas.

<u>BEDDING</u> - That portion of the trench backfill which encases the sewer pipe to a minimum of three (3) inches above and below the lowest part of the barrel of the pipe for the purpose of properly supporting the pipe.

<u>BUILDING DRAIN</u> - The building drain is the lowest part of a wastewater piping system and connects other wastewater pipes from within a building with the side sewer, which begins no more than two to three (2-3) feet outside the building wall (building foundation) from each separate point of exit.

CALTRANS - State of California, Department of Transportation

<u>CODE</u> - The District Code of the Crockett Community Services District

<u>COMMON LATERAL</u> - Any portion of a lateral sewer that serves two or more buildings or properties in common.

<u>CONTRACTOR</u> or <u>SIDE SEWER CONTRACTOR</u> - Any Contractor who meets District requirements and is licensed by the State of California to enter into contracts for and to perform the work of installing sewers under District jurisdiction.

<u>CONTROLLED LOW STRENGTH MATERIAL (CLSM)</u> – A weak concrete slurry having a compression strength of 100-150 psi, typically having two sacks of concrete per cubic yard, as further specified in the project specifications.

<u>COUNTY</u> - The County of Contra Costa, State of California.

<u>CUT SHEETS</u> - Cut sheets are sheets of tabulated data, indicating stationing, structures, fittings, angle points, beginning of curves, points on curves, end of curves, sewer slope, staking offset, various elevations, offset cuts, and sewer depth.

<u>DEFINITIONS OF WORDS</u> - Wherever, in these specifications, the words <u>directed</u>, <u>required</u>, <u>permitted</u>, <u>ordered</u>, <u>designated</u>, <u>or</u> words of like importance are used, they shall be understood to mean the direction, requirement, permission, or order of designation of the Engineer. Similarly, the words <u>approved</u>, <u>acceptable</u>, <u>satisfactory</u>, shall mean approved by, acceptable to, or satisfactory to the Engineer.

<u>DISTRICT</u> - The Crockett Community Services District, Contra Costa County, California ("Crockett CSD").

DISTRICT BOARD - The governing body of the District.

<u>DUPLEX</u> – Any structure containing two residential units and no other separate use or additional residential units. This shall include two flats, two apartments side-by-side, or a primary dwelling with a "second unit" known also as a "granny flat" on an "in-law unit".

<u>EASEMENTS</u> - Any rights in real property granted or dedicated to the District for purposes stated in the document that creates the easement, or rights established by District ordinance when no document dedicating an easement has been discovered. Generally, these rights include the right to construct, alter, replace, repair, maintain, and operate sewer pipes, appurtenances, and appliances together with the reasonable right of access to such easement for said purposes over the remaining lands of the grantor.

<u>ENGINEER</u> - The General Manager of the District, acting either directly or through authorized agents. (District Code Section 2.08.010)

<u>FIXTURE UNIT EQUIVALENTS</u> - The unit equivalent of plumbing fixtures as tabulated in the Uniform Plumbing Code, latest edition.

<u>GUIDE FOR ENGINEERS</u> - The Guide for Engineers as contained herein, under Sections 3 through 9, and all subsequent additions, deletions, or revisions thereto.

<u>HOMEOWNER</u> - A person(s) who owns and occupies or will occupy the residence on which sewer work will be personally performed. (District Code Section 10.202.D.)

<u>INSPECTOR</u> - The person for the District duly authorized by the Engineer and responsible for inspections and enforcement of District regulations relating to construction of public and private sewers, including pipelines, structures, materials, instruments, and appurtenances.

<u>IRREVOCABLE OFFERS OF DEDICATION</u> - A legal document used to create easements for the District.

<u>JOB ENGINEER</u> - The Engineer licensed by the State of California as a civil engineer, under whose direction plans, profiles, and details for the work are prepared and submitted to the District for review. <u>MANUFACTURER'S NAME</u> - Any manufacturer's name, specification, catalog number, or type used herein is specified by make in order to establish the standard requirements of the District. Other equivalent makes will be considered for acceptance providing they are comparable with the established standard.

<u>OWNER</u> - Any individual, partnership, firm, or corporation by whom the Job Engineer has been retained or who, as the property owner, is making arrangements with the District.

<u>PARCEL NUMBER</u> - Parcel number is an arbitrary number assigned to each parcel of right-of-way, including easements and miscellaneous encroachments, as shown in the right-of-way log and/or on the sewer construction plans.

<u>PAVED SURFACE</u> - Any form of pavement used on street, sidewalk, or other areas composed of concrete, asphalt, oil, brick, or treated crushed rock or any combination of said forms of pavement having a dense, cohesive, stable surface.

<u>PERMITS</u> or <u>LICENSES</u> - Clearances to perform specific work under specific conditions at specific locations. The Job Engineer shall furnish to the District all necessary plans and documents required by the District to make application for permits and/or licenses.

<u>PERSON</u> - Any person, firm, company, corporation, or association.

<u>PLANS</u> - Construction plans, including system maps, sewer plans and profiles, cross sections, detail drawings, etc., or reproductions thereof, which show the location, character, dimensions, and details for the work to be done and which constitute a supplement to these Specifications.

<u>PLUMBING SYSTEM</u> - All plumbing fixtures and traps, or soil, waste, special waste, and vent pipes within a building and to a point two (2) feet outside the building foundation thereof.

<u>PUBLIC SEWER</u> - A sewer which has been or is being constructed to accommodate more than one side sewer or main sewer, and which is located within a public right-of-way or sanitary sewer easement, and which has been formally accepted by the District Board for public ownership.

<u>RECORD DRAWINGS</u> - Plans signed and dated by the District representative or design consultant, indicating that the Plans have been reviewed and revised, if necessary, to record as-built construction details to the maximum extent.

<u>RIGHT-OF-WAY</u> - All land or interest therein which by deed, conveyance, agreement, easement, dedication, usage, or process of law is reserved for or dedicated to the use of the general public, within which the District shall have the right to construct, alter, replace, repair, maintain, and operate sewer pipes, appurtenances, and appliances, together with the reasonable right of access to such easement for said purposes over the remaining lands of the grantor

<u>ROADBED</u> - The roadbed is that area between the intersection of the upper surface of the roadway and the side slopes or curb lines. The roadbed rises in elevation as each increment or layer of subbase, base, surfacing or pavement is placed.

<u>ROADWAY</u> - All of a right-of-way dedicated, granted, used, or to be used for vehicle movement.

<u>SANITARY DEPARTMENT</u> - The Crockett Sanitary Department or Port Costa Sanitary Department of Crockett Community Services District.

<u>SECTION</u> - Any reference to a section that is not accompanied by further reference refers to a section or sections of these Specifications.

SEWERS:

<u>TRUNK SEWER</u> - A public sewer that has been or is being constructed to accommodate one or more main sewers and is not used for side sewer connections. (Normally 12 inches or greater in diameter.)

<u>MAIN SEWER</u> - A public sewer which has been or is being constructed to accommodate one or more side sewers. (Normally 6, 8 or 10 inches in diameter.)

<u>SIDE SEWER</u> - The privately owned and maintained sewer line which links the sanitary or waste plumbing (building drain) of a house or other building with the main sewer. The side sewer begins at its point of connection (including the connection) with the main sewer and terminates at its point of connection to the building drain(s). The point of connection to the building drain(s) shall be three (3) feet or less from the building foundation at each point where the plumbing extends outside the foundation. (Normally 4 or 6 inches in diameter.)

BUILDING SEWER - Side sewer or lateral.

LATERAL SEWER - Side sewer or building sewer.

<u>SEWER PLANS</u> - Sewer plans (Scale: 1" = 100') are detail drawings which show the horizontal relationship between the proposed sewerage system, existing and/or proposed field conditions.

<u>SEWER PROFILES</u> - Sewer profiles (Scale: 1" = 100' Horiz. and 1" = 10' Vert.) are detail drawings which show the vertical relationship between the sewer line invert, the ground surface at time of construction and the finish surface, and other existing and/or proposed underground facilities.

<u>SINGLE FAMILY RESIDENCE</u> - A single, independent structure designed to provide living quarters for one family unit.

<u>SITE COLLECTOR SYSTEM</u> - A privately owned and maintained side sewer system normally 6 or 8 inches in diameter, installed to serve multi-unit structures on single ownership properties such as apartments, mobile home parks, planned unit developments, schools, etc.

<u>SPECIFICATIONS</u> - The directions, provisions, and requirements contained herein as may be necessary pertaining to the method and manner of performing the work or to the quantities and qualities of materials to be furnished.

<u>STANDARD DRAWINGS</u> - The drawings of structures or devices commonly used on District work and referred to on the Plans and in these Specifications. (See Section 28.)

<u>STANDARD SPECIFICATIONS</u> - The Standard Specifications of the Crockett Community Services District as contained herein and all subsequent additions, deletions, or revisions.

STATE - The State of California.

<u>STATE STANDARD SPECIFICATIONS</u> - The Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, current issue.

<u>STREETS</u> or <u>ROADS</u> - Any public highway, road, street, avenue, alley, way, easement, or right-of-way used or to be used for vehicle movement.

<u>STRUCTURES</u> - Those structures designated on the Standard Drawings as manholes, lampholes, rodding inlets, cleanouts etc. Detailed drawings or structures or devices commonly used in District work and mentioned in this guide are included in the Standard Specifications.

<u>SUBCONTRACTOR</u> - Any individual, partnership, firm, or corporation entering into a contract with the Contractor to perform part of the work.

<u>SUPERINTENDENT</u> - The executive representative of the Contractor, responsible for all work and present on the job at all times.

<u>SYSTEM MAPS</u> (by Job Engineer) - System maps are 1" = 100' scale maps on the first sheet or sheets of the Plans showing the relationship and ties between the properties to be improved and the nearest intersection of existing county improved road on each side of the property. The system maps also show all proposed sewer improvements and all parcels to be served by the improvements.

<u>TOPSOIL</u> - Surface soil suitable for growing grass lawns, or amended soil products sold as "topsoil" for that purpose.

TRAVELED WAY - The portion of the roadway for the movement of vehicles, exclusive

of shoulders and auxiliary lanes.

<u>UNIFORM PLUMBING CODE</u> - The Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials, latest edition.

<u>WORK</u> - All the work to be done under District permit or inspection, in accordance with the Plans, Specifications, and/or permit conditions.

SECTION 3

CODE PROVISIONS AND POLICIES (GUIDE FOR ENGINEERS)

3-01. DESCRIPTION

Knowledge of the following District Code provisions and established policies is essential to engineering practice in the District. Pertinent Code sections may be obtained at the District office for a fee upon request. The following statements are digests of the formal documents and must be interpreted as such:

3-02. THE GENERAL REGULATIONS

The District Code provides the authority of the Engineer, provides for inspection and review fees, states that only contractors licensed in the State of California (and Owners in one specific case) may perform work, requires contractor registration and provides for establishment of uniform capacity fees and service charges.

3-03. CAPACITY FEE SECTIONS OF CODE

The capacity fee sections of the Code (Chapter 6.12) require payment of fees for each connection or addition to the system. Also provided are charges to compensate for benefits received from mains installed by others. The Code also provides for commercial capacity fees and a yearly sewer service charge.

3-04. PAYMENT OF FEES AND CHARGES

Plan review and inspection fees, if required, must be paid before any sewer work is started (District Code Title 6). Annexation charges for small annexations must be paid before any sewer work is started. Annexation charges for large annexations and reorganizations must be paid at the time petitions for annexation are submitted (Ord. 78-79-2). Capacity fees must be paid before any sewer work is started, unless an alternate payment schedule is adopted by special action of the Board (Ord. 99-1; Res. 98-99-07).

3-05. REBATE POLICY

The rebate sections of the Code provide that sewer lines shall be installed to give the best service possible and to avoid relocation or duplication. In the event a line so installed provides service to property other than that owned by the installer, the prorated value of such service shall be determined and collected by the District for the installer. The District shall also collect and retain an appropriate District rebate administration fee for each connection made to the sewer main.

A. Rebate Procedure

- 1. The installer of a sewer line proposed for rebate will be required to furnish a map outlining the service area and showing the location of the sewer rebate line. The map shall also indicate property boundaries, acreage, present zoning, roads, and Owner's names for each potential rebate and drainage areas.
- 2. After completion of rebate sewer lines, the installer will furnish the District with contracts and receipts documenting the total sewer construction costs which include a cost breakdown of pipelines, special structures, District fees and charges, engineering, and right-of-way acquisition costs.
- 3. The Engineer will determine the justification for the rebate and the amount of the rebate.
- 4. Once the rebate account has been formally established, the outstanding account balances will be adjusted on a quarterly basis to provide for the effect of inflation.
- 5. Failure to submit the above information within six months from the date of Final Acceptance of the sewer project will make the project installation ineligible for any rebate reimbursements.

3-06. ENFORCEMENT ACTIONS

The District has the authority to disconnect sewers, impose fines, and take legal actions against persons who violate provisions of the District Code or Standard Specifications. If fees are not paid, if work is done without the issuance of permits, or if sewers are installed without inspection, the District will take the legal steps necessary to correct the violations including, but not limited to the filing of civil and/or criminal actions against the violator.

3-07. THE ANNEXATION POLICY

The annexation policy of the District provides for the consideration of sewer service to any property contiguous to the District boundary and that all properties served, if not already served under outside contract, must annex to the District and pay annexation charges. (District Code Chapter 6.08)

Annexation charges are intended to recover the administrative and related costs resulting from the annexation. Properties annexed must provide their own local, public, and private sewering and must pay all fees prior to receipt of service. Only complete properties of legal record can be annexed.

3-08. RIGHT-OF-WAY POLICY

The Right-of-Way Policy requires that all public sewers be constructed in easements granted or dedicated to the District for public sewers.

All new sewer easements must be created by Irrevocable Offers of Dedication to the District. All Irrevocable Offers of Dedication must be on standard forms supplied by the District (see Section 8). The properly executed and notarized Offers of Dedication shall be delivered to the District for recording prior to the final review for construction.

All sewers in public roads shall be within the paved portion of said road. It is the intent of the District to eliminate the use of side yard and rear yard public sewers. Whenever possible, the Job Engineer shall design public sewer systems so that they will be located within paved rights of way. In cases where new sewers cannot be installed within roadways, all-weather vehicular access to manholes shall be provided for maintenance of all public sewers (see Section 28-55).

Sewer easements are dedicated to the District for the purposes of constructing, altering, replacing, repairing, maintaining, and operating sewer pipes, appurtenances, and appliances together with the reasonable right of access to such easement for said purposes over the remaining lands of the grantor. In addition, no buildings, permanent improvements, or trees shall be placed on said easements, nor shall anything be done within the easement area that may interfere with the District's full enjoyment of said easement unless permitted by <u>encroachment permit</u> from the District as recorded by the County Costa County Recorder (see Section 8-01.I).

3-09. THE LINE SIZE AND SERVICE POLICY

The line size and service policy requires that the minimum size of any new public sewer shall be six (6) inches in diameter. Side sewers shall be connected only to existing or new six (6), eight (8), ten (10), or twelve (12) inch diameter main sewers. All side sewer connections to public sewers over twelve (12) inches in diameter shall be made at manholes or by extending an eight (8) inch main from a downstream manhole to the parcels being served, unless written special approval to allow taps is received from the District.

The side sewer size is four (4) inches in diameter for single family residential, duplex, or accessory dwelling. Six (6) inches or larger diameter side sewer shall be installed where use is to be industrial, commercial, or multi-family residential as required by capacity (see Section 4.01). Joint use of side sewers (known as common laterals) will not be permitted for new connections. Side sewers shall have an approved backwater overflow device installed on or near the cleanout. (See Sections 18-02.D and 28-34.)

3-10. THE ENGINEERING POLICY

All engineering plans, specifications, reports, or documents shall be prepared by the Job Engineer registered in the State of California and shall be signed by him and

stamped with his seal to indicate his responsibility for them. It shall be the Job Engineer's responsibility to review any proposed sewer system, extension, and/or existing system change with the District, prior to engineering or design work, to determine any special requirements or whether the proposal is permissible. A stamp of the District on the Plans, etc., for any job, does not in any way relieve the Job Engineer of his responsibility to meet all requirements of the District. The Plans, etc., for any job shall be revised or supplemented at any time it is determined that the full requirements of the District have not been met.

District policy requires a report by a Geotechnical Engineer registered in the State of California and reviewed by the District on projects located in hillside, creek areas, and where benching will occur. (See Sections 4-01.C and 6-01.F.G.)

Public sewers shall be designed, constructed, and installed in accordance with this Specification and the orders of the Engineer. Sewers connected to the District system shall be designed and constructed in a manner consistent with service to the ultimate service area.

3-11. BASIC SEWER SERVICE POLICY

Each property with a separate assessor's parcel number shall have a public sewer extended to it. Public sewers must have proper rights-of-way established in keeping with Section 3-08. Public sewers are owned and maintained by the District. District acceptance of a map of the sewer system shall constitute determination of the limit of public ownership and responsibility. Generally, the limit of public ownership and responsibility. Generally, the limit of public ownership and responsibility on each branch of the sewer system is defined as the last upstream manhole, lamphole or rodding inlet on each branch. Beyond that point the District shall bear no responsibility for maintenance and repair of sewer piping. Such piping that may exist is hereby defined as part of a building sewer or common lateral and is subject to private property maintenance requirements of Ordinance 78-79-2. Private sewers, i.e., the sewer pipeline from the building to the public sewer, including the connection to the public sewer, are owned and maintained by the Owner.

3-12. PRIVATE SEWAGE DISPOSAL SYSTEM POLICY

The design, construction, and maintenance of private sewage disposal, septic tank system, or any method of sewage disposal other than through the system of the District are governed by the ordinances, rules, and regulations of the County and the State.

3-13. PLAN REVIEW POLICY

The District's plan review process consists of three phases: (1) Initial Planning Review; (2) Preliminary Design Review; and (3) Final Review for Construction. The District provides comments on designs by Job Engineers throughout the second and third phases with the intent that when the Plans are ready for final review, all required changes have been incorporated into the design. It is the responsibility of the Job Engineer to design projects in accordance with the standards of the District. The fact

that a Plan has gone through one or more Preliminary Design Reviews is no guarantee that the proposed design will be reviewed for construction. The District will continue to comment on plans until all changes required have been made and all standards have been met. The District reserves the right to require changes to the design throughout the Review process. Job Engineers are advised that the District does not perform the final review for construction until after the Preliminary Design Review process is completed. (See Section 6.)

3-14. POLICY FOR ACCESSING PRIVATE PROPERTY

The District Board has adopted a "Policy for Accessing Private Property" to guide District staff in non-emergency and emergency situations. (See District Code Appendix) That written policy shall be considered a part of these Specifications.

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SECTION 4

DESIGN STANDARDS (GUIDE FOR ENGINEERS)

4-01. DESIGN CRITERIA

A. General

A capacity study report shall be submitted by the Project Engineer when plans are submitted for preliminary review. The capacity study report shall provide the pipe diameter, slope, length, roughness coefficient for Manning's equation, design capacity, full pipe capacity, design flow and the percent of full pipe capacity utilized for each sewer reach. The percent full pipe capacity utilized is calculated by dividing the design flow by the full pipe capacity and multiplying by 100. When the Project Engineer proposes to modify any existing District sewer, he/she shall contact the District for additional information and direction.

B. Design Flow

Design Flow Equations - The greater flow calculated from the following two equations is used as the design flow.

Design Flow 1 = (Average base wastewater flow times peaking factor) plus (groundwater infiltration factor times acres).

NOTE: Peaking Factor - The peaking factor for Equation 1 is provided in Figure 4-1. Figure 4-1 is the curve for maximum peaking factors observed (based on 15-minute flow readings) during a two-week dry period in late January and early February 1985.





Design Flow 2 = (Average base wastewater flow times 1.2) plus (groundwater infiltration factor times acres) plus (rainfall dependent infiltration and inflow factor times acres).

Average Base Wastewater - The average base wastewater unit flow factors are presented in Table 4.1.

		Unit Flow Factor
Land Use Category	Units	(gpd/Unit)
Residential, Single Family	Dwelling Unit	225
Residential, Multiple Family	Dwelling Unit	150
Commercial	Acre	1,000
High-Density Commercial	Acre	4,400
Industrial	Acre	1,000
Schools	Acre	430
Churches	Number	1,000

 Table 4.1 - Average Base Wastewater Unit Flow Factors

Note: These unit flow factors were calibrated to observed flows at 39 flow meters of the Central Contra Costa Sanitary District. Estimated groundwater infiltration has been excluded. School and church factors were based on adjusted water consumption data. High-density commercial factor was based on 100 gpd/1,000 sq. ft. of office space (from water consumption records) and 44,000 sq. ft. per acre (FAR = 1.0).

<u>Rainfall Dependent Infiltration and Inflow (RDI/I)</u> - The following equation is used to calculate the RDI/I rate for Equation 2. The RDI/I rate calculated from the following equation is for a sewer constructed after 1985, 20-year event and ultimate conditions. The mean annual rainfall (MAR) may be determined from the Contra Costa County Flood Control and Water Conservation District mean Seasonal Isohyets, or District staff may provide it to the project engineer.

RDI/I = 1.5 (469 + 55 MAR) GPD/ACRE

<u>Groundwater Infiltration (GWI)</u> - The GWI rate for equations 1 and 2 is 170 GPD/Acre when District staff does not provide the project engineer with a GWI rate for a specific area. This rate is an average rate for sewers constructed after 1985 in Central Contra Costa Sanitary District and during periods following extended rainfall.

- C. <u>Design Criteria</u> Gravity sewers within the District shall be designed in accordance with the following design criteria.
 - 1. <u>Design Capacities</u> Main and trunk sewers shall be designated on the following basis:

- a. Main sewers (six through ten inches in diameter): Design capacities shall be based on sewers flowing two-thirds full (d/D < or = 0.67).
- b. Trunk sewers (twelve inches and larger in diameter): Design capacities shall be based on sewers flowing full without surcharging (d/D < or = 1.0).
- 2. <u>Velocity and Slope</u> The minimum acceptable slope for sewer pipe is based upon a velocity of three (3) feet per second for main sewers and a velocity of two (2) feet per second for trunk sewers, both when flowing full. The minimum and maximum design flows for each pipe size at the minimum acceptable slope is provided in Section 4-02.A.5. However, the District, at its sole discretion, may allow another minimum acceptable slope and/or pipe size on a case-by-case basis where the elevation of the existing downstream system is high, precluding the use of the minimum acceptable slopes stipulated in Section 4-02.A.5. When the slope of the sewer exceeds ten percent (10%) for 8-, 10-, and 12-inch pipe, ductile iron pipe conforming to the requirements of Section 18 of these specifications shall be used. The District must be consulted when the slope exceeds two percent (2%) for 15-inch and larger pipe.
- 3. <u>Pipe Diameter</u> Diameter of gravity sewers shall be determined by Manning's pipe friction formula, using a roughness coefficient, "n," of 0.013 or the pipe manufacturer's recommendation, whichever is greater.
- 4. <u>Pipe Cover and Clearance</u> Minimum pipe covers and clearance, as herein designated under Section 4-02.C, shall be maintained in the design of sanitary sewers. If certain conditions exist which make it impractical to meet the minimum cover and clearance requirements, the conditions and locations shall be specifically noted above the sewer profile on the Plans. Each location not meeting the minimum cover and clearance requirements will require special approval for each case, in addition to the normal Plan approval.

Any planned condition being specially approved with less than minimum cover will require special pipe, bedding, and/or backfill as directed by the Engineer. Pipe cover requirements as shown in Section 4-02.C will be used to prepare Plans, but in the event that field conditions differ from those indicated on the Plans, the pipe cover requirements (Section 4-02.C) shall govern construction. Any field condition that does not meet the minimum cover requirements will also require special approval and shall be installed as directed by the Engineer.

5. <u>Unusual Design</u> - Special design of sewer force mains, nonresidential connections, or other unusual features or structures specified under Section 4-03.1 of these Specifications require individual study and approval by the District.

- a. All sewage pump systems, including residential sewage pumps, when proposed, shall be submitted to the District for determination of circumstances necessitating such pump usage and design thereof.
- b. A privately owned and operated sewage pump system will be approved if property cannot be served by a private gravity system and if a public gravity sewer main exists at one of the following locations:
 - i. Immediately adjacent to the property within a public right of way.
 - ii. Within ten (10) feet measured horizontally of any boundary of the property within a public sewer easement.
 - iii. Physically within the property.

If none of these three conditions exist, the Owner must extend a new gravity sewer main prior to installing a private pump system.

- C. Use of submersible type pumps for residential sewerage pumping systems will be considered where the installation as a whole will be made in conformance with the general requirements of COSHA and any local electrical codes that may be applicable. In general, a raw sewage sump is classified as a hazardous location that requires explosion-proof equipment with a UL label and/or equivalent construction. If the motor is not explosion proof, controls must be intrinsically safe with redundant controls and positive cutoff to avoid automatic total pump down that would expose the motor. Use of submersible pumps will not be approved unless the Owner provides the District with information that the proposed pump meets the above requirements. Where used, pump requirements insofar as solids handling capacity and pump rate head must conform to basic standards required for standard wet pit installations. See Section 28-50 of these Specifications for minimum requirements for residential sewerage pumping systems.
- D. Hillside and Creek Areas
 - 1. Soils reports will be required where:
 - a. Slopes of hills where sewers are proposed for installation exceed fifteen (15) percent.
 - b. Sewers are proposed for installation within fifty (50) feet of creek beds.

- c. Sewers are proposed for installation within the range of influence of a possible landslide from adjacent hill.
- d. Sewers are proposed for installation in historical slide locations.
- 2. A soils report prepared by a registered civil engineer practicing in Geotechnical Engineering must be submitted by the Job Engineer that covers the proposed project.
- 3. If the project geotechnical report provided does not cover an off-road sewer alignment, the District may require a supplementary report. This report, at a minimum, must address the following:
 - a. Supplementary geological setting, general soils and bedrock conditions along the proposed sewer alignment, and recommended setbacks from slides and creeks.
 - b. Stability or instability of selected sewer alignment.
 - c. Potential ground water problems.
 - d. Effect of trenching on slope stability (negative impacts on slope).
 - e. Special backfill, special trenching requirements, or special supports that may be recommended.
 - f. Erosion potential of soils around sewer near water courses.
 - g. Recommended corrections if an instability exists or may develop.
- 4. Installation of sewers in unrepaired slide areas is to be avoided.
 - a. If an acceptable gravity route is feasible around the unrepaired slide, the sewer must be installed around the slide.
 - b. If the only feasible gravity route is through a slide area, a complete study of the slide must be made by a Geotechnical Engineer. The Geotechnical Engineer must propose a solution that is satisfactory to the District. The normal solution is the repair of the slide.
 - c. If a satisfactory gravity solution does not exist, the pumping of sewage from individual homes will be considered.
- 5. The Job Engineer must furnish a map which shows existing creeks or swales which may convey water in the vicinity of any proposed sewer main alignments.

- 6. Sewers shall not be designed to be located in the bottom of swales or creeks.
- 7. For sewers that will be parallel to swales or creeks, the sewer must be designed far enough away from the drainageway to eliminate the possibility of future eroding around the sewer. A Geotechnical Engineer shall review the proposed alignment and furnish recommendations regarding long-term erosion potentials.
 - a. If it is unfeasible to locate sewer mains on the downslope side of future homes and maintain a safe distance from drainage ways, consideration will be given to installing the sewers in street areas which may result in the installation of residential sewage pumps on individual homes.
- 8. For sewers which cross creeks or swales, the crossing shall be as nearly perpendicular to the drainageway as feasible.
 - a. Bank and bottom protection shall be designed per the recommendation of a Geotechnical Engineer and shall be installed in the drainageway as part of the overhead or underground crossing.
 - b. The Job Engineer shall pay particular attention to designing adequate support foundations and protection for the foundation.
 - c. Maximum spans shall be thirty (30) feet.
 - d. No joints shall be located between supports. For span greater than eighteen (18) feet, CL&C pipe shall be used.
- 9. An access easement (minimum width of ten (10 feet) shall be granted by the Developer from the nearest public street to the creek crossing structure along the route of the sewer main, if possible, for future maintenance.
- 10. The following design standards shall be used by the Job Engineer when designing sewers in hillside and/or creek areas.
 - a. Sewers to be installed in easements and private streets that are located in hillside and/or creek areas shall be ductile iron (no bedding) when the soil in which the sewer will be installed is fine grained, such as clay.
 - b. Pipe material other than ductile iron may be used for sewers to be installed in easements and private streets that are located in hillside

and/or creek areas when the soil in which the sewer will be located is coarse grained (including bedrock).

- c. Pipe material other than ductile iron may be used for sewers to be installed in public streets that are located in hillside and/or creek areas.
- d. If groundwater is present in the trench area, sewers shall be ductile iron (no bedding) regardless of the type of soil.
- e. Subdrains may be installed to convey underground water from its source to a storm drain or channel. These subdrains must be maintained by others. Subdrains shall not be installed for the purpose of draining the trench in which a sanitary sewer will be installed.
 - i. Sewers to be installed parallel to defined creeks shall be located no closer than 20 feet from the top of the bank if the creek bank is defined; if not, no closer than 30 feet from the center line of the creek.
 - ii. Manholes to be installed on either end of creek crossings shall be located no closer than 20 feet from the top of the creek bank.

4-02. MINIMUM PIPE SIZES AND STANDARDS

- A. Main Sewers and Trunk Sewers
 - 1. <u>Construction Methods</u> Unless otherwise indicated on the Plans, sewers shall be installed by the open-cut method. Alternate methods of installation may be proposed by the Job Engineer during the Plan Review process subject to the following requirements:
 - a. Pipe Bursting (see Section 29) Replacement of pipelines with existing sags greater than 0.125 times the nominal diameter of the pipe shall not be installed by pipe bursting. Design of pipelines proposed for installation by pipe bursting shall fully comply with the requirements of Section 29.
 - b. Cured In Place Pipe (CIPP, see Section 30) Replacement of pipelines with existing sags greater than 0.125 times the nominal diameter of the pipe shall not be installed using the CIPP method. Design of pipelines proposed for installation by CIPP shall fully comply with the requirements of Section 30.

- 2. <u>Size</u> Minimum inside diameter of main sewer pipe shall be six (6) inches.
- 3. <u>Selection</u> Pipe cover requirements are shown in Section 4-02.C. Section 16 describes bedding conditions and minimum strength requirements for the types of pipe selected to meet the anticipated installation conditions. Guidance for selection is as follows:
 - a. Selection of pipe type, strength, and bedding requirements shall be made by the Job Engineer and shall be subject to the Engineer's review. All selections shall be indicated on the Construction Plans. The Contractor may request a change of material after review, but the change shall require resubmittal of Plans and review of the Engineer prior to construction.
 - b. All pipe and pipe joints installed between structures shall be of the same size, type, class, and manufacturer unless otherwise approved.
 - c. All pipe shall be laid to the depth, grade, and alignment as indicated on the approved Plans and cut sheets.
- 4. <u>Joint Deflections</u> The deflection in the joint between any two successive pipe sections shall not exceed eighty percent (80%) of the maximum deflection as recommended in writing by the pipe manufacturer (see Approved Materials List and Minimum Pipe Radius Chart, Section 28-31). Minimum two (2) feet pipe lengths may be supplied and used to install short radius curves providing such installations conform to the joint deflection limitation specified herein. Deviations from standards and number of special couplings shall be shown on the Plans.
- 5. <u>Minimum Acceptable Slope</u> The minimum acceptable slopes for sewer pipe sizes and corresponding minimum and maximum design flows are as shown in Table 4-2 on the following page.

MAIN SEWER				
MINIMUM MAXIMUM PIPE SIZE IN MINIMUM SLO DESIGN FLOW DESIGN FLOW INCHES FT PE		MINIMUM SLOPE RATIO IN FT PER FT		
0		6	0.0208	
0	0.81 cfs	8	0.0077	
0.82 cfs	1.28 cfs	10	0.0057	
	TR	UNK SEWER		
1.29	1.57	12	0.0022	
1.58	2.45	15	0.0015	
2.46	3.53	18	0.0012	
3.54 4.81 21 0.00095				
4.82 6.28 24 0.0008				
6.29 7.95 27 0.0007				
7.96	9.81	30	0.0006	
9.82	11.87	33	0.00055	
11.88 14.13 36 0.0005				

Table 4-2. Minimum Acceptable Slopes

B. Side Sewers

GENERAL - Each individual building shall be connected by a separate side sewer. S sewer layouts are illustrated in CCCSD Standard Drawing DWG-24.

- 1. <u>Plan Requirement</u> Side sewers of six (6) inches or eight (8) inches diameter require two (2) prints of Site Plans for permit issuance.
- 2. <u>Size and Slope</u>
 - a. Minimum sizes and slopes for side sewer shall not be less than indicated below:

	<u>Size</u>	<u>Slope</u>
Single Family Residential, Duplex	4"	2%
Other	6"	2.1%

- b. The size of the side sewer shall be increased to the largest of the building plumbing stub or the size indicated for horizontal drainage piping in Table 4-3 of the Uniform Plumbing Code, latest edition.
- c. The maximum slope of any portion of a side sewer shall not be

- d. greater than one hundred fifty percent (150%).
- e. Side sewers for townhouses and similar cluster housing developments shall be installed on an even slope from the main line connection to a point two (2) feet from the end of the building clean out conforming to the above requirements.
- 3. <u>Fixture Units</u> The fixture unit equivalents for plumbing fixtures shall be based on the tables of the Uniform Plumbing Code, latest edition. Side sewers exceeding two hundred (200) feet in length shall include an infiltration allowance of five (5) fixture units per acre or one (1) fixture unit per forty (40) feet of sewer installed.
- 4. <u>Pipe Types</u> A lateral sewer, being installed concurrently with a main sewer, shall be of the same type and class as the main. Any house sewer or side sewer, not being installed concurrently with the main sewer, may be any one of the types of pipe approved for side sewers, as indicated on the Approved Materials List.
- 5. <u>Vertical and Horizontal Deflections</u> All lateral sewers shall have an alignment that provides an angle of intersection with the downstream section of main sewer of no less than ninety degrees (90°). No lateral alignments adverse to the flow of the main will be permitted. Refer to Section 28-07 of these Specifications for example.

The maximum deflection at anyone point in a side sewer, not including fittings at wye connection to the main sewer or at angle points having clean outs shall be twenty-two and one-half degrees (22-1/2°) (1/1 6 bend) and any two (2)consecutive deflections (bends) shall not be less than two (2) feet apart.

- 6. <u>Building Drains</u> The "Building Drain" shall be arranged so that the point of connection with the house sewer is on the side of the building facing the public sewer main.
- 7. <u>Lateral Sewer Location</u> Location of lateral sewers in public road rights-ofway shall be in relation to the nearest corner of the property being served. Unless otherwise determined by physical controls, the lateral sewer shall be located ten (10) feet from the lower property corner at the right-of-way line of hillside lots (3 % + slope).
- 8. <u>Location Mark</u> Where curbs, gutters, and/or sidewalks exist or are to be installed as a part of an improvement, the lateral sewer shall be permanently located by imprinting an "S" (1-1/2" size) or by chiseling an "S" (4" high) in the concrete surface vertically above the side sewer pipe. The "S" shall be located in order of preference on sidewalk, gutter, or curb. (See Section 28-33.)

It shall be the responsibility of the Contractor installing such lateral sewer

to mark its location as specified herein.

- 9. <u>Lateral Sewer Depth</u> Depth of the lateral sewer end at the property line or easement edge shall be set by the Engineer to serve the house sewer. (See Section 28-33.) Where lateral sewer end depths must be specially designed to serve the home site, their depths shall be indicated on the Plans.
- 10. <u>Clean outs</u> Clean outs shall be provided in the side sewer system at the following locations:
 - a. At the point of connection to the building drain.
 - b. At any single turn greater than forty-five degrees (45°).
 - c. At intervals along the side sewer system where the accumulative total of deflection from the point of connection to the main or from another clean out exceeds forty-five degrees (45°).
 - d. At intervals not to exceed one hundred (100) feet along the side sewer system.
 - e. Clean out risers shall be cast iron, HDPE or ABS in conformance with Section 18-01.C.3 and equal in size to the side sewer and shall be installed in conformance with Standard Drawing Sections 28-32 through 28-34.
- 11. <u>Backwater Overflow Device</u> When stoppages occur in sanitary sewers, a danger of damage to health and property exists resulting from the possibility of sewage overflow and backflooding on public and private property. It is the purpose of the District to protect the health and safety of the residents of the District and to minimize the possibility of damage to property by requiring, where topographical conditions warrant it, the installation and maintenance of a protective device approved by the Engineer. (District Code Section 9.08)
 - a. No person shall construct, alter, or repair a side sewer connection to the District system without installing an approved backwater overflow device if one does not already provide protection.
 - b. A backwater overflow device, as detailed in Sections 28-34A and 28-34B of these Specifications, shall be installed in conformance with Section 18-02.B. A gate valve, as detailed and specified for backwater check valve and shutoff systems herein is optional but should be considered for installation for additional protection.

- c. Consideration must be given to the damage potential to adjacent property by sewage released through a backwater overflow device per Section 28-34.
- d. Backwater overflow devices shall be located in areas away from vehicular and foot traffic. If a backwater overflow device must be located in an area that will have concrete or asphalt such as a driveway or sidewalk, the device shall be installed in a reinforced concrete utility box with a lid marked SEWER. A "sewer popper" may be used as an overflow device provided that it is installed within a concrete Christy box (see Section 28-34B).
- e. Where the sewage cannot overflow on the area surrounding a backwater overflow device without damage to property, a backwater check valve and shutoff system, as detailed in Section 28-34 of these Specifications, shall be installed.
- f. Homeowners shall be responsible for the maintenance of backwater overflow devices. Homeowners shall be liable for the costs of cleanup and repair of damage from overflows if a backwater overflow device is tampered with or removed after it has been installed.
- g. In the event of any occurrence of backflow of sewage from the sewer system that results in sewage overflow inside a building, the District may adopt a finding by resolution that the building sewer is non-conforming. The property owner shall be immediately notified (1) that an overflow device is required and must be installed within 90 days; (2) that the property is vulnerable to future interior spills and the consequence of not installing an overflow device will be owner responsibility for future damages by interior spills; (3) that this notification will be recorded with the Contra Costa County Recorder; (4) that the County Environmental Health Department will be notified of an existing health hazard to be abated; and (5) that in the event of non-compliance the District may install an overflow device and recover abatement costs on the next tax roll as a surcharge on sewer service charges.
- i. In the event of a damage claim from the property owner for a sewage overflow that leads to a settlement of the claim, as a condition of payment the owner shall be required to sign an agreement that a portion of the settlement amount shall be withheld by the District to fund installation of an overflow device on the owner's behalf.

12. <u>Joint Building Sewers Not Permitted</u> – Every building containing sanitary plumbing or an interior drainage system shall be connected to the sewer system. A separate building sewer shall be provided for each building.

Where a joint building sewer ("common lateral") preexists these Specifications, such conditions are considered non-conforming. It is the policy of the District Board that non-conforming conditions, with the exception of common lateral on the same parcel, shall be abated as soon as possible and that no permit to repair or alter a common lateral shall be issued absent determination by the General Manager that no feasible alternative exists. Where common laterals are known to exist between multiple property owners, they shall be recorded with the Contra Costa County Recorder as awaiting abatement of non-conforming conditions and the owners shall be notified.

C. Pipe Cover and Clearance

The following minimum pipe covers and clearances shall be attained in design and construction of sanitary sewers. Any portion of a job, as shown on the Plans or encountered in the field, which does not meet the minimum cover or clearance requirements, must be changed or receive special approval before proceeding with the work. (See Section 4-01.)

Where sanitary main or trunk sewers are being designed for installation in parallel with other utility pipe and/or conduit lines, the Job Engineer shall design the vertical location of the sanitary sewer in a manner which will permit future side connection of main and/or side sewers and avoid conflict with paralleling utilities without abrupt changes in vertical grade of main or side sewers. Under no conditions or circumstances shall other utilities be allowed to be installed directly over and parallel or at flat angle crossings to any sanitary sewer installations.

- 1. <u>Main and Trunk Sewers</u> Main and trunk sewers shall have the following pipe cover:
 - a. The minimum pipe cover in existing roadways shall be six (6) feet. Where sewers are to be installed in existing roadways, which are not expected to receive major grade or surfacing changes, the pipe cover may be measured from the existing road surface to the top of pipe. Where sewers are to be installed in new roadways and/or in areas expected to become roadway, or in existing roadways that are intended to receive major grade or surfacing changes, the pipe cover shall be measured from the rough subgrade to the top of pipe. No sewer work shall begin in new or existing roadways that are scheduled for major improvement, until the roadway has been completely rough-graded to within six (6) inches of design subgrade.

- b. The minimum pipe cover in easements or other rights of way, not expected to be roadway, shall be four (4) feet. Minimum pipe cover in benched areas shall be from bench ground level to top of pipe.
- 2. <u>Side Sewers</u> Side sewers shall have the following pipe cover:
 - a. That portion of a side sewer within public roadway (lateral) shall have the minimum cover of five (5) feet at the property line or at a point five (5) feet outside the curb face or edge of paving, whichever is the greater distance from the roadway center line.
 - b. Minimum cover for side sewers in driveways, parking, and all other traffic areas within properties other than single family residential shall be five (5) feet. Such cover conditions shall exist from the property line to a point within eight (8) feet of the building drain connection. If the minimum cover cannot be obtained, cast iron or ductile iron pipe shall be used.
 - c. The minimum cover for side sewers outside of traffic areas from the property line to a point within eight (8) feet of the building drain connection shall be thirty (30) inches.
 - d. Minimum cover for side sewers at the point of connection to the building drain (within two (2) feet of the foundation) shall be eighteen (18) inches.
 - e. All side sewer pipelines within eight (8) feet of the building drain connection and having a minimum cover less than thirty (30) inches shall be cast iron or HDPE in conformance with Section 18-01.C.2.
 - f. Instrument control of grades with an engineer's level will be required where side sewer installation exceeds fifty (50) feet.
 - g. Where grades are less than two percent (2%), cut sheets will be required and cuts must be staked at the site prior to trenching.
- 3. <u>Minimum and Maximum Pipe Cover</u> Special approval of less than minimum pipe covers will be required. Any specially approved, planned, or field conditions, which will have less than minimum cover, as indicated herein, will require special pipe, bedding, and/or backfill as directed by the Engineer. The maximum pipe covers shown herein are based on the following design assumptions.
 - a. Height of backfill (cover) shall not exceed thirty (30) feet.
 - b. Backfill loading does not include live load considerations below minimum cover.
- c. Load calculations to determine pipe classes are based on the following design parameters:
 - i. Backfill density of one hundred twenty pounds (120 lbs.) per cubic foot.
 - ii. A totally vertical trench configuration from trench bottom to finish surface or subgrade within three (3) feet of finish grade.
 - iii. A maximum trench width in conformance with Section 16-02.B of these Specifications.
 - iv. Any deviation from the above design assumptions or parameters by either material or method of installation shall be noted on the Plans submitted for approval in accordance with Sections 5 and 6 of these Specifications.

SIZE (In)	MATERIAL	TYPE/CLASS	COVER IN FEET				
			MIN	MAX			
	LATERALS						
4-6	PVC	SDR26	5	24			
4-6	C900	DR25	5	24			
4-6	C900	DR18	4	24			
4-6	HDPE	SDR17	5	24			
	MAINS	UNDER ROADV	VAY				
8-10	PVC	SDR 26	5	24			
8-10	C900	DR25	5	24			
8-10	C900	DR18	4	24			
8-10	HDPE	SDR17	5	24			
	MAINS NOT UNDER ROADWAY						
8-10	PVC	SDR 26	4 *	24			
8-10	C900	DR14	3	24			
SMALL TRUNK SEWERS							
12-15	C905	DR51 6		24			
14-24	C905	DR41,	6	24			
		DR32.5,					
		DR25, DR21,					
		DR18					

PIPE COVER TABLE

* unless otherwise authorized by District.

Pipe Clearance - Pipe clearance of other facilities shall be as follows: All sewer pipes shall be designed and constructed to have a minimum ten (10) feet horizontal separation from water mains and be at least one (1) foot lower than water mains. All sewer pipes and structures shall be

designed and constructed to have a minimum of six (6) inches vertical and five feet horizontal clearance from all other utilities and/or improvements, unless a special approval is received from the Engineer. The District reserves the right to delay the installation of any job or portion thereof which, in the opinion of the Engineer, may be damaged by the installation of other underground facilities.

D. Horizontal and Vertical Curves

The radius, delta, and length of all curves shall be indicated on the Plans adjacent to the curve.

The sum of the horizontal and/or approximate vertical curve deltas between two (2) consecutive structures shall not exceed forty-five degrees (45°). No reverse curves or curves of opposite direction, horizontal or vertical, separated by a tangent will be permitted between structures. The maximum deflection between lengths of four (4) through twelve (12) inch sewer pipe shall be as specified under Section 4-02.A.4 of these Specifications. Minimum two (2) foot pipe lengths may be supplied or cut, if approved joint materials are available, to install short radius curves and conform to the deflection limitation. Short radius curves may be designed for ductile iron pipe installations utilizing eleven and one-quarter degree (11-1/4°) bends. Minimum pipe lengths, which can be used for ductile iron, short-radius curves, shall be nine (9) feet. Attention is directed to Section 28-31 of these Specifications for special requirements for pipeline curve installations.

E. Sewer Connections to Existing Systems

Connection of new main or trunk sewers to the existing sewer system shall be made at existing manholes or by constructing a new manhole at the point of connection.

Connection to an existing system may be made with an air test tee under the following conditions:

- 1. New main extends forward at same horizontal alignment and vertical grade.
- 2. New main is the same size, pipe type, and class as the existing system.

For side sewer connections to existing ten (10) inches or smaller sewers, see Section 18-02.C.2 of these Specifications. For side sewer connections to existing or new sewers twelve (12) inches or larger in diameter, see Section 3-09 of these specifications.

F. Sewer Alignment

Where sewer lines are to be installed within street or road rights of way, they shall, wherever practical, be designed and installed on the centerline of the existing or future roadway. Where a sewer line cannot be designed along the center line of a roadway, it shall be located within the paved area of the street or road, with not less than one (1) foot between the outside surface of the pipe or structure and the nearest lip of the gutter or edge of improved road shoulder. Where practical, all sewer lines within easements or reserves shall be designed and installed on the centerline of the sewer easement or reserve. (For District Right-of-Way Policy, see Section 3-08).

G. Sewer Pipe Stubs

Stubs shall be designed and installed in all manholes, from which future sewer line extensions are anticipated. Pipe stubs shall be minimum eight (8) inches in size or as directed by the Engineer and shall be of an approved type of pipe. Stubs shall protrude one (1) foot outside of the manhole base, and shall be channeled within the manhole as required on a regular sewer line. The outboard end of stubs shall be a standard pipe joint end and shall be plugged with a standard watertight plug or cap, as supplied by the pipe manufacturer.

H. Sewer Line Extensions

In all new roadways, including all roads fronting or within subdivisions or other new developments where sewer lines are expected to be extended to adjacent properties, the sewer line shall be designed and installed to the end of the proposed roadway improvement prior to final paving of such roadway improvement. The sewer extension shall terminate with the proper structure or fitting, which will minimize the amount of pavement to be disturbed by future sewer extensions. That portion of the required sewer extension not benefiting the present development may be installed as a rebate line. See Section 3-05 of these Specifications for requirements.

I. Sewers To Be Installed In Existing Improved Roadways

Where sewers are being designed for installation in existing County roadways, the Job Engineer shall submit the Plans for the proposed work to the County Public Works Department for location and encroachment approval. The public works approval shall be obtained prior to submitting plans to the District and shall be placed on the tracing for the first sheet of the Plans and shall appear on all subsequent prints of the Plans.

The County approval shall be preceded by the following note: "The following acknowledged public agency has reviewed these Plans and hereby approves the location of the proposed work and agrees to issue all necessary encroachment permits."

J. Utility Crossings

All sewer lines and structures shall be designed and installed well in the clear of all other improvements and utilities, in accordance with Section 4-02.C.4. In no case shall a sewer line or structure be nearer than six (6) inches vertical or five (5) feet horizontal, to any other improvement or utility, unless otherwise approved by the Engineer.

1. <u>Water Lines</u>

California Waterworks Standards shall apply. A minimum of ten feet (10) horizontal and one (1) foot crossing separations shall be required without restriction. Any separation less than minimum shall require the placement and use of special pipe as prescribed by the State Department of Health Services and as approved by the Engineer. In all cases less than minimum separations shall be noted on the project plans as "special approval for placement" with pipe type and joint placement, if applicable, clearly called out in both plan and profile.

2. <u>Other Utilities or Railroad Rights of Way</u>

Where sewers are to be constructed across or within utility or railroad rights of way requiring tunnels, bores, and/or special pipe, the special pipe shall extend the full length of the sewer line within the particular right-of-way. The minimum interior diameter of metal casings, when required, shall be eight (8) inches greater than the maximum outside diameter of the sewer pipe to be installed therein (see Section 16-04).

- K. Sewers to Be Installed As Site Collector Systems (See Definition In Section 2-01)
 - 1. <u>Design and Construction</u> Sewers shall be designed in conformance with main line standards specified within this Section 4.

Design and construction engineering procedure shall conform to the applicable sections of the Standard Specifications with the following additional requirements:

- a. Where fixture units exceed 1,500, the District may incorporate additional requirements, including such structures as manholes and rodding inlets.
- b. Minimum pipe cover for the site collector sewer pipe shall be as specified for main sewers in Section 4-02.C.
- c. Instrument control of grades will be required where side sewer installation exceeds fifty (50) feet.
- d. Where grades of side sewers are less than two percent (2%), cut

sheets will be required and cuts staked at the site prior to trenching.

- 2. <u>Plans</u> Plans shall be submitted in conformance with the requirements of Section 5, <u>Plan Preparation</u>, with the following exceptions:
 - a. Section 5-01 <u>Right-of-Way Map for Sewers</u>, Section 6-01E, <u>Permit</u> <u>or License Map</u>, and Section 8-01, <u>Grant of Easement (description)</u>, will not be required.
 - b. A 1'' = 40' scale plan is required, showing all improvements.
- 3. <u>Plan Review</u> Plan review procedure and fees shall conform to the applicable items of Section 6, Plan Review.

4-03. SEWER STRUCTURES

A. Manholes

1. Locations - Manholes shall be placed at all intersections of sewer lines other than side sewer connections, at all points of trunk, and main sewer pipeline size changes and at intervals not greater than two hundred fifty (250) feet. Where practical, manholes shall be located at the center of street or road intersections. All manholes, from which future sewer line extensions are anticipated, shall have a pipe stub planned and installed at the grade and the direction of the anticipated sewer extension. Pipe stub size, slope, length, and pipe type shall be shown on the Plans.

If a sewer line terminates in an easement with a manhole, said manhole shall be located a minimum of five (5) feet within the last property served. If a manhole is to be installed on the plugged end of an existing sewer main at the terminus of street paving, then the new manhole shall be located and stationed such that no existing pavement will be cut when the manhole is installed.

2. <u>Drop Across Structure</u> - Where there is to be more than thirty degrees (30°) of horizontal deflection angle between any inlet line and the outlet line of a structure, the vertical drop across the structure from said inlet to outlet shall be at least twenty-five hundredths (0.25) of a foot.

Drop manholes will not be permitted, unless approved by the Engineer. The maximum shelf height above crown of outlet pipe shall be one (1) foot. The invert of any inlet pipe shall not be higher than the top of the shelf and these controls can only be used with prior approval (see Section 28-06 for illustration).

3. <u>Line Deflection In Structure</u> - The angle of deflection between incoming and outgoing lines in a manhole shall not be greater than ninety degrees (90°).

- 4. <u>Connections To Existing Structures</u> Unless special arrangements are made, all lines connecting to existing manholes shall conform to the Standard Drawings of Section 28.
- <u>Cul-de-sac Requirement</u> A standard manhole shall be located at the end of any main line terminating within a cul-de-sac, which has three (3) or more lots or parcels of land fronting one the cul-de-sac. No more than five (5) side sewers shall be connected directly into such a manhole (see Section 28-07).
- 6. <u>Manhole Protection Wall</u> Reinforced concrete or concrete block walls shall be installed around manhole rims and top blocks where required by the engineer. (See Section 28-20.)
- 7. <u>Stationing and Elevations</u> For calculation purposes, the stationing of a manhole and the "thru elevation" of a manhole shall be considered as being located in the center of the manhole.
- B. Use Of Rodding Inlets

Rodding inlets shall generally be used at the end of new sewer construction when 1) future sewer construction with future sewer extensions is possible, 2) two or less sewer connections on the main between the last manhole and the rodding inlet are to be made, and 3) the length of the main between the last manhole and the rodding inlet does not exceed two hundred (200) feet. When construction of a new sewer ends in an area where there is no need for a future sewer extension, a manhole shall be required at the upstream terminus regardless of the number of connections to the sewer. See Section 21-14 for manhole specifications.

A rodding inlet shall be located at least fifteen (15) feet into the property or beyond the projection of the nearest property line at the end of each public sewer. Where rodding inlets are to be constructed as a part of a new sewer system being installed in a street and the street and the sewer can be extended in the future, the rodding inlet shall be located just beyond the limits of the present street improvement.

C. Test Fittings

All test fittings, unless otherwise approved, shall be wye or tee branches of the same size, type, and quality as that of the line in which they are being installed. Test fittings for air testing shall be installed in all new side sewers at the locations described herein under Section 18-02.B. Main and trunk sewer installations to be air tested will not require test fittings except where the main or trunk sewers are to be extensions of an existing sewer without a structure at the junction

between the existing and the new sewer. In this case, a test fitting will be required at the junction.

D. Plugs for Future Extensions

Where sewer lines are being constructed and expected to be extended in the future, an end cap or plug manufactured by the pipe supplier shall be installed.

E. Pressure Manhole Frame and Covers

Pressure (watertight) frames and covers shall be installed where drainage conditions may cause storm waters to inundate sewer structures.

F. Remodeling Structures

All sewer structures to be remodeled shall comply with Standard Specifications of the District. Any remodeling of any sewer structure shall be specified and/or detailed on the Plans for review by the District prior to any remodeling work.

G. Check Dams

Check dams, in conformance with Standard Drawing Section 28-56, shall be installed in all sewer trenches through areas where the slope of permanently unpaved ground surfaces equals or exceeds a horizontal to vertical ratio of one to one (1: 1).

- 1. Check dams shall be installed at twenty (20) foot maximum intervals, (horizontally measured) or at such minimum intervals as may be shown on the Plans or directed by the Engineer.
- H. Special Structures

Trunk manholes positioned on sewer lines forty-five (45) inches in diameter or larger, metering manholes, siphons, sewage pumping systems, vehicle/equipment, wash racks, trailer dump stations, all above ground installations, and other unusual structures or features shall require specific design review by the District.

Metering manhole systems shall be designed to accurately measure openchannel flows in the flow range expected. The metering manhole shall consist of a standard main manhole (see Section 28-01) equipped with a metering flume (e.g., Palmer-Bowles, Parshall, H-, etc.) and internal instrument racks and brackets to hold a level-sensing device. This page left intentionally blank

SECTION 5

PLAN PREPARATION (GUIDE FOR ENGINEERS)

5-01 SIZES OF REQUIRED PLANS, ETC.

All plans submitted to the District for review and/or approval shall be of the following sizes. Sizes other than those referenced below will not be accepted.

Description	Sheet Size
Sewer Plan & Profile (incl. Cover Sheet)	22" x 34"
Cut Sheet (Fig. 7-1)	8-1/2" x 11"
Right-of-Way Map for Sewer (Fig. 8-1)	8-1/2" x 11"

5-02 LETTERING

All printing and/or lettering shall be of one-eighth (1/8) inch minimum height and of such font and line weight as to be readily legible on all reproductions made from the original drawings.

5-03 TYPE OF PRINTS AND DUPLICATE TRACINGS

All prints of drawings, including plans, profiles, details, maps, cut sheets, etc., submitted for review, as required by Section 6, shall be legible, and of high definition line work and lettering produced on high contrast background paper. All required tracings shall be high quality originals capable of reproducing prints of equal or better quality than those submitted for review.

5-04 COMPLETE SETS

All sheets of each set of Plans shall be in order as specified by the District and stapled together as a complete set.

5-05 DATA REQUIRED ON PLANS

A. The Crockett Community Services District (District) project number, District page and grid number, and plan page number shall appear within the last 8-1/2" of the lower right hand corner of all plan sheets in minimum three-eighths (3/8) inch high figures.

Example: 98B5 SHEET 1 of 8 CCSD 5479

The District project number and District page and grid number will be assigned

by the District when project plans are received for preliminary design review. When submitting the project plans for subsequent plan reviews, the District project number shall appear on all sheets. The District project number shall also appear on all communications, easements, plats, cut sheets, etc. associated with the project.

B. Cover Sheet

All plans submitted to the District for review shall have a cover sheet containing all of the following information. The cover sheet may serve as the entire plan submittal provided that all of the information presented in this Section can be shown on a single sheet in the scales indicated. A quarter-sized example of the cover sheet is shown in Figure 5-1.

1. Vicinity Map / Location Map

The cover sheet shall include a Vicinity Map / Location Map showing the location of the project with enough detail to accurately determine the location of the proposed sewer improvements. Major cross streets and local highways shall be appropriately shown and labeled on this map.

2. System Map

The cover sheet shall include a 1" = 100' (1:1200M) system map. This system map shall be a composite map, where possible, showing all complete properties to be served by the sewer improvement, existing, proposed, abandoned/removed sewers, line sizes and designations, structures with their numbers, distances between structures or structure stationing, the distance from the new sewer line connection to the nearest existing structure, laterals and ties to nearest property corner, all rights of way with their widths and respective numbers, tract names or numbers, lot numbers or Owner's last name and street names. The 100' scale system map may also, when practical, serve as the sewer plan by adding all required information identified in Section 5-05.D.

3. Sewer Quantities Table

A Sewer Quantities Table shall be shown on the cover sheet indicating the total quantities of all types of pipe, structures, wye branches, laterals, etc. Where applicable, public and private system quantity totals shall be shown in separate quantity lists.

4. Sewer Quantities Abandoned Table

A Sewer Quantities Abandoned Table shall be shown on the cover sheet that indicates the total quantities of all types of pipe, structures, wye branches, laterals, etc., which are to abandoned or removed as part of the project. If the project involves the removal of existing commercial buildings, the table should also indicate the square footage of each building that is being demolished. A note shall be placed under this Table which states "All sewer abandonments related to this project shall be performed in accordance with Section 23 of the District Standard Specifications".

5. Right-of-Way Log

A Right-of-Way Log shall be shown on the cover sheet which shall contain parcel numbers, last name of grantor or subdivision number, the type of rights, and the recording data of such rights, if available, for each parcel.

6. Owner's Name

The names of all responsible owners, including addresses, zip codes, phone numbers, and contact persons shall be shown on the cover sheet near the title block.

7. Standard Notes

The following notes shall be shown on the cover sheet for all plan submittals:

"Materials and construction of sanitary sewers shall conform to the Crockett Community Services District's Standard Specifications. There shall be a Backwater Overflow Device (Section 18-02.B) installed on the side sewer at each building connection."

"Compaction testing of pipe bedding and backfill, conducted under the direction of a civil or geotechnical engineer licensed by the State of California, is required on this project. As a condition of the District's acceptance of complete project work, a Certification Report indicating that compaction results meet or exceed the requirements of the District Standard Specifications shall be submitted by the engineer in responsible charge of the compaction testing. Compaction testing shall be completed prior to acceptance televising the sewer and installation of final paving."

"The Contractor or Project Owner shall provide written notification to adjacent property owner(s) or residents, whose property is to be entered or constructed upon, that proposed sewer improvements are going to be installed. This notification shall be made before sewer plans are submitted for final review of construction plans and shall include information on major activities that will be performed on each specific property. A copy of this notification shall be submitted to the District as Part of the final construction plan review."

"This project is for the construction of the main sewer line and lateral sewers only. Structures shall not be connected to the sanitary sewer until:

- a. The sewer main extension is completed by an approved contractor and accepted for use by the District.
- b. The building rough plumbing is complete and approved by the proper authority.
- c. Applicable connection fees are paid to the District.
- d. An approved sewer contractor obtains a connection permit from the District.

"Survey staking of all public and private easements is required for this project. These survey stakes shall be set at the same time as the sewer cut stakes in order to verify that the proposed sanitary sewer will be constructed properly within the easement. Minimum acceptable survey staking shall be done at fifty (50) foot intervals, at all angle points, and at the beginning and end of curves. All easement staking and sewer cut stakes shall be available for preconstruction inspection by the District prior to acceptance of the final construction plans."

8. District Stamp Area

A 3" high x 4" wide blank area shall be provided on the cover sheet to provide a location for the District to stamp the set of drawings designating the preliminary or final review status of the plans.

C. North Arrow, Scale

The Vicinity Map and System Map located on the cover sheet shall have a North arrow and the appropriate scale shown thereon, and shall be drawn such that the North arrow orients to the top of the page. All associated sewer plan sheets shall be prepared as specified herein and shall be arranged such that the direction of North is oriented to coincide with the direction of flow as indicated in the profile view. Right-of-Way plats shall have a North arrow and the appropriate scale shown thereon, and shall be drawn such that the North arrow orients to the top of the page.

D. Sewer Plans

Sewer plans shall be drawn at a scale of 1" = 40' and shall show the true

horizontal relationship between the proposed sewer improvements and the existing and/or proposed field conditions, including existing or proposed utilities and other facilities in accordance with available information (Section 14-03). Sewer plans shall also show sewer line size and type, all structures and their respective numbers, all property lines and corners adjacent to the sewer alignment, lateral locations and ties to property corners, all necessary sewer line, lateral and structure stationing, horizontal curve data and stationing, and street names. Sewer plans shall also include, at appropriate scale, all proposed modifications or alternatives to the District Standard Specifications, including, but not limited to, special construction methods, trench configurations, and/or other requested special approvals, when such are anticipated or planned.

The System Map located on the cover sheet may serve as the sewer plan if all required data can be shown. However, for lot sizes 5,000 square feet or less, or for projects consisting of townhouses or other cluster-type homes, the Job Engineer shall provide a separate 1" = 40' (1:500M) scale sewer plan in addition to the System Map. A 1" = 20' (1:250M) scale sewer plan is acceptable if the plan can be completed on one standard sized sheet.

E. Sewer Profiles

Sewer profiles shall be drawn at a scale of 1" =40' (1:500M) horizontal and 1" =4' (1:50M) vertical. The sewer profile shall follow in the same direction as the sewer plan drawing and shall read from 0 + 00, left to right whenever possible. The profile shall show the vertical relationship between sewer line invert and the ground surface at the time of sewer construction and the finish ground and/or paving surface. The sewer profile shall show all structures with their appropriate designations and stationing, design rim elevations, the elevations of all inverts in and out of each structure, and vertical curve data and stationing. The sewer line size, pipe type, pipe class, slope, and pipe bedding detail letter designation shall be shown between each pair of consecutive structures. Pipe types may be designated by abbreviations listed under Section 2-01 and pipe class as tabulated under Section 28-21 and 28-22. Sewer profiles shall also show all existing and/or proposed utilities and/or other facilities in accordance with available information (Section 14-03), that cross the alignment of the sewer. The profile shall accurately indicate the vertical clearance between the sewer and other utilities when the vertical clearance is less than twelve (12) inches. All sections of sewer line necessarily designed with less than the required minimum cover shall be noted above the profile with the length of that portion of the sewer line indicated. All sewers necessarily designed with less than the required minimum cover shall require special approval from the District in each case. When the pipeline is to be constructed from a subgrade, bench, or subtrench more than three (3) feet below finish grade over the pipeline, such subgrade, bench, or subtrench profile shall be shown and identified on the sewer profile.

F. Elevation Datum

The acceptable elevation benchmark used as a basis for vertical control in the design and construction of sewer pipelines shall be in accordance with Section 11-07. The bench mark location shall be shown on the cover sheet of the plans and shall be described with the following information:

- 1. The Public Agency which established the benchmark.
- 2. The bench mark elevation.
- 3. A brief description of the benchmark and its location.
- G. Sewer Line Stationing

Each proposed sewer line and its structures shall be stationed continuously upgrade from station 0 + 00 at its point of connection to another sewer line, either proposed or existing. Sewer line stationing shall be provided for all structures, laterals, horizontal curves and vertical curves. Where a structure is part of two separate sections of sewer line, both sewer line stations shall be shown.

H. Horizontal and Vertical Curves

All horizontal and vertical curve information shall be shown on the sewer plans. For horizontal curves, the sewer line station shall be shown for the beginning and end of the curve. The radius, delta, and length of the curve shall also be shown. For curves which need the installation of angle couplings to achieve the desired radius, the number and type of angle couplings needed to achieve the radius with standard pipe lengths shall be listed as well. For vertical curves, sewer line stationing shall be shown for the beginning, mid-point and end of the curve. The tangent slope of the sewer line before and after the vertical curve, as well as the total length of the curve shall also be shown.

I. Ties to Existing System

Horizontal and vertical distance and/or elevation ties to the existing District sewerage system shall be indicated on the sewer plans.

J. Structure Numbers

Manholes, trunk manholes, rodding inlets, and all other sewer structures shall be numbered individually and consecutively upgrade by type of structure. The structure number shall appear on the plan and profile wherever the structure is shown or referred to. Numbers shall begin with one (01).

K. Lateral Sewer Locations

Lateral sewers conforming to the requirements of Section 4-02.B, shall be shown and stationed on the sewer plans and cut sheets. The length of each lateral shall be shown on the sewer plans either by note or by individual distance. Laterals shall be of sufficient length to clear all existing utility easements. The distance from the lateral where it crosses the property line to the nearest property corner shall be shown on the sewer plans.

- L. Laterals may not be installed by tapping into existing mains or manholes, unless otherwise approved by the Engineer. All taps to be made on new sewer projects shall be noted on the sewer plans submitted for review.
- M. Sequencing of Construction Work

Where existing live sewers are to be repaired, replaced, and/or relocated, the Job Engineer shall note on the Project Plans the sequencing of construction events to maintain uninterrupted flow of sewage. This sequencing shall be coordinated with the District in advance to ensure adequate inspection of the construction activities.

N. Seal of Registered Engineer

In accordance with the Business and Professions Code, Professional Engineers Act, Section 6735, all civil engineering plans, specifications, and reports submitted to the District shall be prepared by a registered civil engineer or by a subordinate under his or her direction, and shall be signed by him or her to indicate his or her responsibility for them. In addition to the signature, all final civil engineering plans, specifications, and reports shall bear the seal or stamp of the registrant, and the expiration date of the certificate or authority. The registered civil engineer shall use together with his or her signature or seal, the title "civil engineer".



SECTION 6

PLAN REVIEW (GUIDE FOR ENGINEERS)

6-01 REVIEW PROCEDURE

The following procedure shall be followed when submitting Plans to the District for review:

A. Plan Review Fee

The plan review fee shall be paid to the District prior to the review of plans.

This fee covers two (2) preliminary design reviews and one final construction review. An additional fee is due before the third and subsequent preliminary design reviews. The preliminary design review shall become void six (6) months from the date of last review, unless plans have been submitted for final review in which case the plans are void three (3) months after signing. Voided plans must be resubmitted for an additional review and payment of appropriate review fees in accordance with the current schedule of fees.

B. Minimum Standards

Plans submitted for review, which in the opinion of the District Engineer do not meet the minimum plan preparation and/or design standards, will not be reviewed and shall be returned to the Job Engineer for compliance with District standards.

C. Preliminary Design Review Submittals

All plans submitted for preliminary design review shall comply with the requirements of Section 5 of these Specifications. Submittals for preliminary design review shall include: two (2) complete sets of prints of the development plans, including a plan and profile sheet showing 100' scale sewer system map and vicinity map in conformance with Section 9-02; one (1) duplicate tracing of the sheet showing said 100' scale sewer system maps; two (2) sets of prints of the plat and description for each easement and/or other rights of way required by Section 5 of these Specifications; two (2) copies of all necessary permits and/or license requirements in conformance with Section 6-01.E of these Specifications; and one (1) print of subdivision or parcel map, including title or certificate sheet.

The submitted plans, easements, etc., will be reviewed by various District departments. If there are required revisions, they will be noted and one (1) set will be stamped "Preliminary Design Review" and returned to the Job Engineer for necessary revisions and resubmittal. This procedure will be repeated until all District requirements are met.

D. Easements

Irrevocable Offers of Dedication to the District and their respective right-of-way maps shall be prepared, obtained, and submitted by the Job Engineer to the District for review for all sewer installations on private property in conformance with Section 5 of these Specifications.

E. Permits and Licenses

Where permits and/or licenses, other than those issued by the District, are required, the Job Engineer shall prepare and provide to the District, for preliminary design review, two (2) copies of all necessary permit or license requirements. The Job Engineer shall contact the District for latest permit or license requirements and shall prepare a plat on the right-of-way tracing paper form, covering details regarding each permit or license.

- 1. Encroachment permit applications for all work within state highways, railroad rights of way, and utility rights of way shall be prepared by the Job Engineer and submitted to the District for acquisition. District requirements for state highway encroachments include the agency's encroachment permit form properly completed four (4) prints of an 8-1/2" x 14" detailed plan and profile map showing the area and the work to be done, and a brief description of special features, when necessary.
- 2. Encroachment permits to do work in county roads or city streets shall be obtained by the Contractor or Job Engineer, and copies submitted to the District before a sewer permit will be issued.
- 3. After all required and/or recommended revisions have been made, a detailed profile with horizontal and vertical scales of ten (10) feet to the inch for each sewer line crossing of a storm water channel, conduit, or drainage course shall be incorporated in the plans and submitted to the Contra Costa Flood Control and Water Conservation District. One (1) copy of each crossing profile, acknowledged by Flood Control District in writing, shall accompany plans submitted to the District for final review for construction.
- F. Geological Investigation

Due to the inherent hazards involved in excavation, trenching, and pipe laying in certain common formations within the District, the District reserves the right to require the submission of a geological investigation and report in conjunction with the plan review process. In general, locations on steep side hills, locations in areas of established instability, locations in known fault or slip zones, spring or

seepage areas, areas of corrosive soil, nearby "hot" conduits, or areas where concentrated or unusual development exists or is planned, shall be investigated, designed and constructed in accordance with the recommendations contained in the Geotechnical Engineer's report. (See Sections 4.01.C and 6-01.G.)

G. Geotechnical Review

For projects, which include the grading of benches for installation of sanitary sewer pipelines, the Geotechnical Engineer shall inspect the proposed sewer alignment prior to the commencement of any benching work. The Geotechnical Engineer shall issue a written report to the District stating the observations made, the problems identified, and recommendations to address the problems. The geotechnical review shall include, but not be limited to, slope stability, placement of spoils, control of excavated material, permanent versus temporary benches, effect of benching on existing trees and vegetation and erosion control. The report shall be submitted during the preliminary review process. In no case will grading be permitted prior to the District receiving the report and evaluating the adequacy of the report. (See Sections 3-10 and 4-01.C.)

H. Capacity Study Report

When the average base wastewater flow exceeds 45,000 GPD or flow carrying capacity is required for wastewater that is from off the project site, the project engineer shall provide the capacity study report stipulated in Section 4-01.A.. The capacity study report shall be submitted when plans are submitted for preliminary design review.

6-02 PLAN REVISIONS

All revisions recommended or required by the District will be indicated on the plans by their respective reference numbers as they appear in these Specifications and/or by notes written on the plans. Any revisions noted shall be made and the plans, cut sheets, etc., shall be resubmitted for further review.

6-03 FINAL REVIEW FOR CONSTRUCTION

All plans submitted for final review for construction shall comply with the requirements of Section 5 of these Specifications. When submitting plans for final review for construction, the following are required: (A) four (4) complete sets of prints, cut sheets, and one (1) complete set of high quality 3 mil Mylar duplicate tracings of the construction plans, including the 100' scale system maps; (8) one (1) print of the sewer plan (100' scale) and system map sheet, (C) one (1) set of prints of the recorded parcel or subdivision map; (D) all easement descriptions and right-of-way tracings, fully executed and ready for recording, and a sewer construction cost estimate or signed contract itemized in accordance with the Sewer Quantities Table in conformance with Section 5-05.B of these Specifications. The Job Engineer shall allow a minimum of one (1) week for this final review by the District. "Final Review of Construction Plans" implies

that the District has reviewed the plans, cut sheets, and the field area in which the work is proposed and the plans, cut sheets, and field conditions seem to meet the requirements of the District. Construction may begin only after the completion of the final review. Any office or field change from plans which have been processed completely through the final review, including changes of pipe type, class, grade, cover, quantities or any other details, which will affect the sanitary sewer installation, nullifies any prior review of the plans and will require that new plans be submitted and reviewed prior to construction.

If during construction the Contractor encounters field conditions which dictate that one or more of the changes mentioned above must be made in the Plans, construction shall be halted until plans are revised by the Job Engineer, resubmitted to the District and again issued for construction. The final review for construction may be withdrawn at any time it is determined that any portion of the plans, cut sheets, and/or construction work fails to meet all District requirements. If the Job Engineer fails to make the revisions that the District deems necessary, the District reserves the right to withhold any further review of the plans of the particular Job Engineer.

Final review for construction shall become void three (3) months from date the plans are signed, unless the sanitary sewer work, as detailed on the plans, has begun.

<u>Phased Construction</u>. Whenever construction in sections or phases takes place, submittals for construction shall include four (4) sets of prints, four (4) copies of cut sheets, and one (1) set of 3 mil Mylars of the project area being submitted for approval to construction. An additional print of the sewer plan (100' scale) and vicinity map shall be included with each submittal along with the required review fee for subsequent submittals.

6-04 COMMENCEMENT OF WORK

No work will be permitted to proceed (except construction of benches) until all District requirements have been met, including payment of all fees; acquisition of all easements, permits, and licenses; the cut sheets and plans are submitted and approved and the Contractor has posted all required bonds, and the permit has been signed and issued.

6-05 ITEMS TO BE CONSIDERED BEFORE SUBMITTING PLANS

The following is a general list of items to be considered by the Job Engineer before submitting plans for preliminary design review by the District.

- A. Have arrangements been made for the payment of the fee for the review of plans?
- B. Are there any special details needed, such as special drawings, notes, and/or specifications to supplement the Standard Specifications?

- C. Is the property within the District sphere of influence?
- D. Is the property to be sewered within the District boundaries?
- E. Annexation petitions for property outside the boundary of the District must be signed, received and reviewed by the Board of Directors before plans will be accepted for preliminary design review.
- F. Can the proposed sewerage system provide service to properties other than those arranging for the installation? If so, have full provisions been made for the additional service or future extension?
- G. Has Flood Control District been contacted for all sewer line crossings of storm water channels or conduits?
- H. Are all the necessary easements prepared?
- I. Are there any permits and/or licenses required?
- J. Have bonds and agreements executed by Owner/Developer been submitted?
- K. Are any special approval forms required and have they been completed?

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SECTION 7

CONSTRUCTION ENGINEERING (GUIDE FOR ENGINEERS)

7-01 REFERENCE

Refer to Sections 11-03, 11-07, and 13-05 of these Specifications.

Where curbs, gutters, and/or sidewalks exist or are to be a part of an improvement, each side sewer shall be permanently located by imprinting an "S" (1-1/2" size) or by chiseling an "S" (4" size) in the concrete surface vertically above the side sewer pipe. The "S" shall be marked on the curb, gutter, or on the sidewalk. Responsibility for providing the marking and for its accuracy shall rest with the sewer contractor.

- 7-02 CUT SHEETS
- A. General

Cut sheets shall be prepared in accordance with the example shown in Figure 7-1 of these Specifications for all sewer system pipe-lines specified herein, and submitted with plans for final review where noted below.

- 1. All truck, main, and site collector sewers.
- 2. All side sewers six (6) inches or greater in size and where such installations exceed fifty (50) feet (available in the field prior to trenching).
- 3. All side sewers for townhouses, condominiums, and similar cluster housing developments.
- 4. All side sewers permitted by the Engineer to be installed on less than minimum slope ratios specified under Section 4-02.B.2 (available in the field prior to trenching).
- B. Conformance with Staking

All cut sheets shall reflect the minimum staking requirements of Section 7-03 of these Specifications.

C. Submittals

Complete cut sheets as required herein shall be submitted and be a requirement prior to final review in accordance with Section 6-03 of these Specifications.

Cut sheets shall be submitted only after marking of stakes in the field is completed. Failure to have the stakes marked causing the inspector a second

trip shall result in a delay of at least forty-eight (48) hours to recheck the stakes.

7-03 FIELD SURVEYS

A. Cut Stakes

Each cut stake as required herein shall be marked showing offset distance from centerline, depth of cut, engineers station, and curve points, or structure type and number, including all wyes at plan locations. Straight horizontal alignments on constant slopes shall be staked at: (1) twenty-five (25) feet intervals maximum in hilly terrains exceeding a twenty percent (20%) grade or for design slopes of 0.006 or less; and (2), fifty (50) feet intervals maximum in relatively flat areas of less than twenty percent (20%) grade. When use of LASER grade setting systems are to be used for installations in conformance with Section 18-02.A.1, straight horizontal alignments on constant slopes may be staked at one hundred (100) feet maximum intervals. Such use of LASER systems shall be indicated on cut sheets submitted for the work. All cut stakes, as required, shall be placed and marked in advance of anticipated trenching.

- 1. All horizontal curves shall be staked at a minimum; at the beginning of curve, mid-point of curve, end of curve, and at intervals not to exceed twenty-five (25) feet. Long radius curves (five hundred (500) feet and greater) shall be staked at fifty (50) feet intervals.
- 2. All vertical curves shall be staked at a minimum; at the beginning of curve, mid-point of curve, and end of curve. Vertical curves of one-hundred-sixty (160) feet in length or more shall also be staked at eighth-point (1/8) length intervals.
- 3. If any building drains for townhouses and similar cluster housing developments have not been installed and marked, their ends shall be staked noting the appropriate building identification number to be served and cut to flow line on said stake. It is the responsibility of the Job Engineer to ensure that the ends of all such unit laterals, which shall also be staked as required herein, will meet the proposed building drains.
- 4. In areas where benching is required for installation of the sewer, benches shall be cut prior to staking. The final cut sheets shall reflect centerline cover from the top of the bench.
- B. Lateral Sewer Location

Prior to installation of lateral sewers in subdivisions, the lot corner nearest the side sewer and the lateral sewer terminus shall both be staked and flagged in the field.

C. Survey Authorization and Responsibility

When a survey is to be made on private property for a public sewer, permission of the Owner shall be obtained by the Job Engineer or his representatives prior to entry. The District will not be answerable or accountable in any manner for any loss or damage that may come about during or as a result of survey work by others.

D. Restaking

Any survey points which are removed before they have been used to set the grade of the sewer shall be replaced by the Job Engineer prior to the installation of the sewer. See Section 11-07.

E. Site Collector Systems

See Section 4-02.K for special requirements regarding surveying for side sewers.

7-04 COVER REQUIREMENTS AND MATERIALS

Cover requirements and all materials for construction shall be as set forth in the various sections of these Specifications, and as reflected on the Plans.

FIGURE 7-1 CUT SHEET FOR SEWER PIPE

FOR JOB ENGINEER'S USE					DISTRICT DATA		
PREPARED BY:	KED	SHEET:	1 of 1			# 80L	2005
OWNER: MJP Developers		CONTRACTOR: Jones & Co., Inc			REVIEWED BY JMM		
DATE:	08/05/2010	ENGR JOB#	Engr 05-00026	SUB #	5125	DATE:	8/12/2010

UNE Smith Rd., SS Line 'A'			STATION	0 + 00	to	4 ·	+ 23			
STATION	PIPE DIAMETER (in.)	STRUCTURE	SEWER SLOPE (ft/ft)	OFF SET	OFF SET STAKE ELEV.	F/L ELEV (invert)	OFF SET CUT	REMARKS	* C/L GROUND ELEV.	* CIL COVER
0 + 00.00	8.00	Ex. MH	0.0077	8' LT	108.00	100.00	8.00	Start	104.33	5.00
0 + 25.00	8.00		0.0077	8' LT	107.36	100.19	7.17		105.00	5.47
0 + 50.00	8.00		0.0077	8' LT	107.22	100.39	6.84		105.21	5.49
0 + 65.70	8.00	Lat. Rt.	0.0077	8' LT	107.30	100.51	6.79		105.33	5.49
0 + 75.00	8.00		0.0077	8' LT	107.24	100.58	6.66		105.65	5.74
1 + 00.00	8.00	MH # 1	0.012	8' LT	107.41	100.77	6.64		105.99	5.89
1 + 25.00	8.00		0.012	8' LT	108.71	101.07	7.64		106.39	5.99
1 + 48.40	8.00		0.012	8'LT	109.03	101.35	7.68	BC	106.68	6.00
1 + 62.00	8.00	Lat Dt	0.012	8'17	109.15	101.40	7.64		107.13	6.34
1 + 75.40	8.00	11 1/4° Coupling	0.012	8'LT	109.22	101.67	7.55		107.31	6.30
1 + 93.40	8.00	11 1/4° Coupling	0.012	8' LT	109.43	101.89	7.54		107.43	6.21
2 + 11.40	8.00	11 1/4° Coupling	0.012	8' LT	109.65	102.11	7.54		107.55	6.11
2 + 29.40	8.00	11 1/4° Coupling	0.012	8' LT	109.87	102.32	7.55		107.89	6.23
2 + 38.40	8.00		0.012	8' LT	108.97	102.43	6.54	EC	108.15	6.39
2 + 50.00	8.00		0.012	8' LT	109.33	102.57	6.76		108.39	6.49
2 + 75.00	8.00		0.012	8' LT	109.43	102.87	6.56		109.39	7.19
3 + 00.00	8.00		0.012	8' LT	110.03	103.17	6.86		109.99	7.49
3 + 25.00	8.00		0.012	8' LT	110.36	103.47	6.89		110.49	7.69
3 + 50.00	8.00		0.012	8'LT	110.48	103.77	6.71		110.89	7.79
3 + 75.00	8.00		0.012	8'LT	110.75	104.07	6.68		110.99	7.59
4 + 00.00	8.00	MH#2	0.012	8'11	112.27	104.3/	7.62	End	111.49	7.99
4 + 25.00	0.00	MIT # 2		OLI	112-27	704.00	7.02	End	111.07	1.88

SECTION 8

RIGHT OF WAY

8-01 RIGHT OF WAY

Rights of way define and establish the rights for the District to construct, alter, replace, repair, maintain, and operate sewer pipes, appurtenances, and appliances in the location designated by the Job Engineer. All sewer easement rights shall be created through the use of Irrevocable Offers of Dedication (IOD).

On non-subdivision related work, Irrevocable Offers of Dedication and a right-of-way map shall be provided by the Job Engineer to the District for all sewer installations in private property. No sewer work will be permitted to proceed until the District receives and accepts for recording the IOD's for all right-of-way parcels.

When sewer easement rights are to be created by dedication on subdivision maps and the subdivision map cannot be filed by the time sewer construction is ready to begin, permission may be granted to proceed with the sewer work. Prior to the acceptance of the public sewer work, the subdivision map must be recorded.

Upon project acceptance by the Engineer, the District Board of Directors will formally accept the project's work and the Offers of Dedication by passing and recording a Resolution of Acceptance.

A. Acceptable rights-of-way for public sewer easements.

Copies of filed subdivision maps, grants of easements or other evidence substantiating existence of easement rights for proposed sewer installations shall be submitted prior to final plan review. The following are acceptable rights of way for public sewers:

- 1. Easements shown and dedicated to the District on filed subdivision maps for public sanitary sewer purposes, using the herein dedication language.
- 2. An existing grant of easement to District describing easement for sewer purposes and shown on an accompanying right-of-way map for sewers.
- 3. IOD of easement to District describing easement for sewer purposes and shown on an accompanying right-of-way map for sewers.
- 4. Private access and utility type easements (Appurtenant easements) which specifically mention sewer pipes (where the sewer installation cannot be extended beyond the area which has rights in said easements)

The following are generally not acceptable rights-of-way for public sewers:

- a. Nonexclusive easements for all utilities, "PUE."
- b. Private roadways or other private easements designated for sewer pipes (where the sewer installation may be extended to serve properties not having rights over the private easement).

Any variation from the above conditions must be accepted in writing by the Engineer.

B. Certificate Sheet Requirement on Subdivision Final Maps

IOD's of easements for sewers shall be delineated on all new subdivision maps and shall be dedicated as either nonexclusive or exclusive subsurface rights and nonexclusive surface rights. The following paragraph shall be made part of the owner's certificate when easement rights are offered for dedication to this District:

The area marked "Sanitary Sewer Easement," or "S.S.E." is offered for dedication to the Crockett Community Services District or its designee in gross, as a non-exclusive subsurface easement (or as an exclusive subsurface easement, where indicated) and nonexclusive surface easement for sanitary sewer purposes, including construction, access or maintenance of works, improvements, and structures, and the clearing of obstructions and vegetation. No building or structure may be placed on said easement, nor shall anything be done thereon which may interfere with the District's full enjoyment of said easement.

C. Descriptions

Easements to be acquired shall be prepared on the IOD forms, furnished by the District (see Figure 8-1) dedicating rights along the alignment of the sewer. The job number and the parcel number shall appear in the upper right hand corner of the IOD. The correct name of the grantor (as it appears of record) shall be typed in the proper space of the IOD form. As a general rule, easements shall be described by perimeter center line, side line, or a metes and bounds description (as appropriate) and the point of beginning and the terminus of the description shall be descriptively tied to well-established record or permanent field points. Complete recording or filing information for any lot, parcel, or map mentioned in the description shall be included. If the easement follows the boundary of any particular parcel, tract, or right of way, the relationship of the boundary and the easement shall be fully qualified in the description. All points where an easement crosses or contacts a parcel or right-of-way boundary shall be fully referenced and qualified in the description. Two (2) copies of each easement description with its respective right-of-way map for sewer shall be submitted with plans for preliminary design review. After District review of the easement description and map, the description shall be typed on an original IOD form supplied by the District. The IOD shall then be properly signed, notarized, and submitted to the District for recording prior to final review for construction. All IOD's are legal documents and will be recorded at the County Recorder's Office. Therefore, all typing and writing thereon shall be of sufficiently high quality to be properly microfilmed.

D. Right-of-Way Map for Sewer

The right-of-way map for sewer shall be prepared using AutoCAD or other District engineer approved electronic mapping software and shall show the entire area to be covered by the easement, permit, or license. (See Figure 8-2 for sample right-of-way map and Figure 8-3 for sample legal description). The rightof-way map shall be drawn so that the north arrow points toward the top of the sheet. When necessary for clarity, a separate plat shall be prepared for each parcel, and shall show all necessary survey ties, courses, and distances along the right of way. Whenever possible, adjacent roads shall be shown to facilitate locating the subject easement area. The job number, parcel number, and the last name of the grantor shall also appear on each right-of-way plat. One copy of the respective right-of-way map for sewer(s) shall accompany each IOD, permit, or license. The original electronic drawing file shall be submitted to the District along with the IOD for recording by the District prior to the final review for construction. Upon acceptance of the project's work by the Engineer, the Board of Directors will formally accept the project's work and Offers of Dedication for each sewer easement.

E. Width of Required Rights of Way

Easements for sewers less than twelve (12) inches in diameter or where the depth is nine (9) feet or less shall have a minimum width of ten (10) feet. Easements for sewers twelve (12) inches or greater in diameter or where the depth is greater than nine (9) feet shall have a minimum width of twenty (20) feet. If new sewers will be installed across properties where existing improvements are adjacent to the new sewers and will remain in place, the easement width may be reduced at the discretion of the District, but in no case, can the width be less than ten (10) feet. Easements created for building sewers across adjacent properties must have a minimum width of five (5) feet.

F. Utility and Storm Drain Crossings

Utility and storm drain lines may cross the exclusive subsurface easement area at right angles or at angles not greater than forty-five (45) degrees from right angles to the easement and at elevations which will not conflict with any sanitary sewer installation.

G. Use of Sewer Easements

Established sewer easements (including recorded IOD's) and other rights of way, shall be used only for purposes of constructing, altering, replacing, repairing, maintaining, and operating sanitary sewer pipes, appurtenances, and appliances. Paralleling or flat-angle crossings by other underground utilities and facilities, including storm drains and crossings in contact or in near contact with existing or future sanitary sewer facilities will not be permitted without written special approval.

The use of sanitary sewer easement surfaces shall be limited to paving, shrubbery, gardening, and landscaping, not including trees. Trees, parallel surface drainage ways, and permanent structures, including but not limited to buildings, swimming pools, decks, and retaining walls, are not permitted within the easement area. District Ordinance No. 07-1 regulates encroachments on District easements.

Surface structures (manholes, rodding inlets, etc.) within easements shall not be covered by earth or other material and shall remain in an exposed and accessible condition at all times for routine and/or emergency maintenance that may be necessary to protect adjacent properties.

In limited cases, an encroachment may be permitted by action of the District Board, as provided in the District Code.

It shall be a violation to (1) allow or create any condition that results in an unauthorized encroachment; (2) abandon any items of property on or within a District easement; (3) deposit any debris, dirt, rock or other form of refuse on or within a District easement; (4) cause, permit or maintain any activity or condition off or outside the territory of a District easement that causes directly or indirectly a significant interference with the District's easement rights; (5) excavate a District easement to an extent that reduces the protective cover over a District easement to an extent that places an undue burden on a District sewer; (7) make alterations that create hazardous conditions above or around District structures; or (8) cause or permit any activity or condition on or within a District easement that constitutes a public or private nuisance.

IRREVOCABLE OFFER OF DEDICATION FORM, EASMENT PLAT AND SAMPLE DESCRIPTION

IRREVOCABLE OFFER OF DEDICATION

Annual of the natural of Careto Careto Careto Annuary Careto

Ream to: Central Contra Contra Sanitary District Construction Dynakon S019 Inhoff Place Martinez, CA 94553 Job No. _____ Parcel No. _____

IRREVOCABLE OFFER OF DEDICATION -SEWER PURPOSES

For good and valuable consideration received,

(developer), the undersigned, (hereinafter "Owner"), being the present title owner of record of the parcel of land described in Exhibit "A", strached hereto, does hereby make an irrevocable offer of dedication to the Central Contra Costa Sanitary District (hereinafter "District"), a special district of the State of California, and its successors or assigns, of an exclusive subsurface easement and nonexclusive surface easement (characterized as an easement in gross for all purposes of this dedication), situated in the County of Contra Costa, State of California, as described in Exhibit "B" (written legal description) and shown on Exhibit "C" (plat map), attached hereto, for the right to construct, aller, operate, maintain, replace (the initial or any other size) and repair such sewer line or lines as the District shall from time to time elect for conveying sewage, and all necessary laterals and appurtenances thereto, in such location and across such easement area as is hereinafter described in Exhibit "B", together with the free right of ingress and emergency access to said element over and across the remaining portion of the Owner's property, insofar as such right of ingress, egress and emergency access is necessary for the properuse of the rights granted herein and provided that said rights of ingress and egress shall be limited to the readway(s), pathway(s), or other avenue(s) or route(s) to the extent possible and as reasonably necessary to accomplish the purposes of construction, repair and maintenance of the sewer facilities within the parcel land the easement, as described herein.

The Owner reserves the right to landscape or make such other use of the lands included within the easement which is consistent with the District's use; however, such use by the Owner shall not include the planting of trees or construction of permanent structures, including but not limited to houses, garages, outbuilding, ewimming pools, tennis courts, retaining waits, decks, patios or other concrete architectural structures within the easement.

Owner hereby warrants that Owner possesses such title as required to make such offer of dedication and that upon total or partial failure of title resulting from the existence of a title superior to that of the Owner in the certain real property described in Exhibit "B", attached hereto, Owner will make compensation in damages for the losses sustained by the District.

It is understood and agreed that the District, and its successors or assigns, shall incur no liability with respect to such offer of dedication, and shall not assume any responsibility for the offered easement, or any improvements thereon or therein, until such offer has been accepted by appropriate action of the Board of Directors of the District, and its successors or assigns. Further, it is understood and agreed that the Owner shall indemnify, save and hold harmlees the District for any costs or liability incurred by the District with respect to the easement in gross described herein, prior to the formal acceptance by the Board of this irrevocable offer of dedication.

In consideration of this irrevocable offer of dedication, the District and its successors or assigns shall supply sewer service for the real property described in Exhibit "A", attached hereio, to the Owner or his heirs, successors, and/or assigns, provided that all applicable District rules, procedures, specifications, and all provisions of the District Code are adhered to, including payment of all applicable fees.

The provisions of this irrevocable offer shall inure to the benefit of and be binding upon the heirs, successors, assigns, and personal representatives of the respective parties hereto.

CENTRAL CONTRA COSTA SANITARY DISTRECT County of Contra Costa, State of California

Owner

0-

By: General Manager/Chiel Engineer or Designee

"ATTACH NOTARY STATEMENT HERE"

EASEMENT MAP FORM & SAMPLE PLAT

FORMS AVAILABLE AT DISTRICT OFFICE



FIG, 8-3

SAMPLE LEGAL DESCRIPTION

4634 JOB No.

PARCEL No - 4

EXHIBIT "B"

Portion of Lot 54, as said lot is shown on the map entitled, "Map of Rancho El Rio," filed March 24, 1910, in Book 2 of Maps at Page 48, in the Office of the Recorder of said County, as described in the following sub-parcels: SUB-PARCEL A:

A strip of land 10 feet in width, the centerline of which is described as follows:

follows: Beginning at a point on the northwestern line of the parcel of land described in the deed to DeForrest Donald Crose and Helen M. Crose, records February 18, 1960, in Book 3559 of Official Records of said County, at Role 475, said point bears north 40°43'36" east, 61.97 feet along said northwestern line from the southwestern corner of said Crose parcel (3559 O.R. 475); thence from said point of beginning south 22°17' east, 57.18 feet; thence south aster V along the arc of a tangent curve concave to the northeast having a reduct of 191.21 feet, the center of which from said point bears north 67°43' east, ab as distance of 79.64 feet; thence tangent to the last mentioned curve south a '09' east, 53.84 feet to a point on the southeastern line of said Lot 54, said point hereinafter referred to as Point A, said Point A bears north 44°30' east 17.37 feet along the southeastern line of said Lot 54 from the most southern corner thereof. The sidelines of serio 10 foot strip to be lengthened or shortened to extend entirely across said Crose parcel (3559 O.R. 475).

entirely across said Crose parcel (3559 O.R. 475). SUB-PARCEL B:

A strip of land 10 feet in width the northwestern line of which is parallel with and 10 feet northwesterly, measured at right angles, from the southeastern line, said southeastern line being described as follows:

Beginning at the hereinabove mentioned Point A; thence from said point of beginning north 44"30' east, 260.0 feet along the southeastern line of said Lot 54 to the northeastern corner thereof.

The northeastern terminus of said 10 foot strip shall be on the northern line of said Lot 54.

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SECTION 9

SOURCE CONTROL

9-01 GREASE, OIL, AND/OR SOLIDS REMOVAL DEVICES

The District may require any non-domestic user to install a grease, oil, and/or solids removal device according to guidelines set forth below and in Title 10 of the District Code in order to prevent grease, sand, flammable liquids, and other substances which are likely to restrict the flow or create a hazard within the sanitary sewer system from entering the system.

A. Food Service Facilities

Any commercial, institutional, or industrial establishment with common food preparation facilities shall have a grease interceptor and/or grease trap(s) installed, as specified by the District. For the purposes of this specification section, a food service facility is any facility that prepares or serves food to non-family members. This includes full-service restaurants, fast food restaurants, take-out restaurants, recreation facilities, cafeterias for employees, grocery store take-out restaurants, catering facilities, bakeries, delicatessens, etc. Standards for grease traps and grease interceptors for food service facilities are presented below.

- 1. The size and type of food service facility shall dictate the size of the grease trap or grease interceptor required. The minimum sizes specified are subject to review by the District and sized and installed according to criteria in the current Uniform Plumbing Code.
- 2. For the purpose of this section, the term" grease interceptor" shall mean a precast or cast-in-place concrete grease removal device (Section 28-45) with sampling box. The grease interceptor shall have a minimum capacity of 750 gallons unless otherwise approved by the District. If an alternate capacity is required due to site constraints or if alternate to gravity style grease interceptor is proposed, the District reserves the right to collect fees for review of the proposed alternate. The term "grease trap" shall mean a rust/corrosion resistant grease removal device that is sized and installed per the current edition of the Uniform Plumbing Code.
 - a. Grease Interceptors:

All new construction for restaurants shall have grease interceptors. Grease interceptors are not allowed within the public right-of-way. The grease interceptor shall be installed on private property outside the building in a location that is readily accessible for periodic cleaning, inspection, and/or sampling. When needed, an appropriately designed traffic cover shall be installed over the grease interceptor. (Section 28-47).

The following table shows the plumbing fixture connection requirements:

Fixture	Connect Direct to	Connect to Grease
	Sewer	Interceptor
Pot Sink		X
Prep Sink		X
3-Compartment Sink		X
Vegetable Prep Sink	Х	
Kitchen Mop Sink		X
Floor Drain (in kitchen)		X
Hand Wash Sink (in kitchen)	Х	
Dishwasher		X
Garbage Disposal	Х	
Commercial Trash Compactor		X
Trash Enclosure		X
Floor Sink (for beverage	Х	
dispenser)		
Condensate Discharge	X	
Walk-in Cooler Discharge	X	

Fast food restaurants, grease intensive restaurants with a seating capacity of 50 seats or more, and/or restaurants with a seating capacity of 70 seats or more shall have an outside grease interceptor installed with the minimum liquid capacity indicated below.

Restaurant Seating	Minimum Grease			
Capacity	Interceptor Capacity			
50 to 69 (1)	1,250 gallons			
70 to 125	1,500 gallons			
126 to 150	2,000 gallons			
151 or more	3,000 gallons			
Х				

(1) Grease intensive restaurant

Designation as a grease intensive restaurant shall be determined by the District Engineer. In given situations, or applications, the next larger size may be required due to the nature of the usage. Non-grease intensive restaurants shall typically include delicatessens, bakeries/donut shops, ice cream/frozen yogurt shops, pizza parlors and other restaurants with limited cooking that do not contain deep fat fryers, or grills.

All sanitary waste inlets (restroom facilities) shall be plumbed separately from non-domestic waste inlets and connected either to the building side sewer downstream of the grease interceptor or
directly to the main sewer.

Systems to add enzymes, microbes, or other materials intended to remove grease from a grease interceptor are prohibited. Use of such material to treat drain lines served by a grease interceptor are acceptable provided that the dosage is appropriate for drain line cleaning and not removal of grease from the grease interceptor.

A sampling box (Section 28-48) shall be installed immediately downstream of the grease interceptor.

b. Grease Traps (Hydromechanical Grease Interceptor):

The District may also allow the use of a grease trap provisionally, based upon successful operation, in lieu of a grease interceptor for tenant improvement projects where it is not feasible to install a grease interceptor. Grease traps shall be sized and installed per the current edition of the Uniform Plumbing Code. The grease trap(s) shall be installed in a location that is readily accessible for periodic cleaning, inspection, and/or sampling.

Fixture	Connect Direct to Sewer	Connect to Grease Trap
Pot Sink		Х
Prep Sink		Х
3-Compartment Sink		Х
Vegetable Prep Sink	Х	
Kitchen Mop Sink		Х
Floor Drain (in kitchen)	Х	
Dishwasher	Х	
Garbage Disposal	Х	
Floor Sink (for beverage dispenser)	Х	
Condensate Discharge	Х	
Walk-in Cooler Discharge	Х	

The grease trap shall be connected to specific plumbing fixtures or drains as required by the following table.

Garbage disposals/grinders are prohibited in any commercial establishment with common food preparation in which the kitchen plumbing is not served by a grease interceptor.

Sanitary waste shall not be plumbed to a grease trap.

The inlet pipe to the grease trap shall be equipped with a flow control fitting. The flow control fitting shall be designed so that the flow through the fitting does not exceed the designed input rate of the grease trap. A flow control fitting that has adjustable or removable parts is not permitted. Grease traps designed for use of enzymes and/or microbes are prohibited.

The installation of a grease draw-off valve on a grease trap is prohibited.

Grease interceptors shall also be required at commercial trash compactors, trash enclosures, and at other commercial and industrial establishments as deemed necessary by the District.

c. Automated Grease Traps (Grease Removal Devices (GRD)):

The term "automated grease trap" shall mean a device that is designed to remove grease from wastewater using mechanisms that do not rely on gravity to achieve the separation. All of the requirements specified above for grease traps, except for the prohibition on grease draw-off valves, shall apply to automated grease traps.

The installation of an automated grease trap requires special approval from the District Engineer. Automated Grease Traps shall be sized and installed per the current edition of the Uniform Plumbing Code.

B. Other Commercial Businesses

Any commercial establishment that has the potential to discharge wastes and/or wastewater that may contain oil, grease, and/or prohibited solids (e.g., vehicle service, heavy or light industrial, car washes, etc.) shall have a sand-oil interceptor and/or separator(s) installed, as specified by the District. Standards for sand-oil interceptors and separators are presented below.

1. For the purpose of this Section, the term "sand-oil interceptor" shall mean a precast or cast-in-place concrete grease, oil, and/or solids removal device with a minimum capacity of 300 gallons (Section 28-46) unless otherwise approved by the District.

The term "separator" shall mean a rust/corrosion resistant grease, oil, and/or solids separation device, typically designed to serve a single plumbing fixture, with a minimum flow rating of 20 gallons per minute (gpm).

a. Sand-Oil Interceptors:

When required by the District, the sand-oil interceptor shall be

installed in a location that is readily accessible for periodic cleaning, inspection, and/or sampling. When needed, an appropriately designed traffic cover shall be installed over the sand-oil interceptor (Section 28-47).

The sand-oil interceptor shall be designed in accordance with all of the following performance-based standards:

- i. The interceptor shall have the capacity for a 30-minute retention time, based on the maximum influent flow rate.
- ii. The interceptor shall be designed to reduce turbulence of the flow through the unit.
- iii. The interceptor shall provide for the removal of floatables and settleables from the wastewater to the maximum extent practicable using multiple sedimentation chambers, pipe elbows installed between chambers and/or other pretreatment design elements.

All plumbing fixtures which may discharge wastewater containing oil, grease, and/or solids to the sanitary sewer system including, but not limited to, floor drains, service sinks, mop sinks, and drains serving wash areas and/or trash enclosures shall be connected to the sand-oil interceptor.

All sanitary waste inlets shall be plumbed separately from nondomestic waste inlets and connected either to the building side sewer downstream of the sand-oil interceptor or directly to the main sewer.

A sampling structure, as specified by the District (Section 28-48), shall be installed immediately downstream of the sand-oil interceptor.

An example of a typical sand-oil interceptor is shown in Section 28-46. An alternative design may be submitted to the District for consideration. The specifications, operation, and effectiveness for the proposed application of the alternative design must be certified by a licensed professional engineer prior to approval by the District.

b. Separators:

When required by the District, the separator shall be installed in a location that is readily accessible for periodic cleaning, inspection, and/or sampling:

The sizing of a separator for the proposed application will be determined by the District on a case-by-case basis.

The design, specifications, operation, and effectiveness of the separator for the proposed application must be certified by a licensed professional engineer prior to approval by the District.

The separator shall be connected to specific plumbing fixtures or drains as required by the District.

Sanitary waste shall not be plumbed to a separator.

The inlet pipe to the separator shall be equipped with a flow control fitting. The flow control fitting shall be designed so that the flow through the fitting does not exceed the designed input rate of the separator. A flow control fitting that has adjustable or removable parts is prohibited.

The inlet to the separator shall be equipped with a solids capturing device (e.g. screen or basket).

The installation of a sampling structure (Section 28-48) immediately downstream of the separator may be required by the District on a case-by-case basis.

2. Hair Traps

Barbershops, beauty salons, pet groomers, and any other commercial facility that discharges wastewater containing significant amounts of hair and/or fibers shall install a hair trap or other pretreatment device as specified by the District.

9-02 SAMPLING STRUCTURES

- A. Sampling Manholes
 - 1. Shell Building Requirement: A sampling manhole (Section 28-48) shall be installed on the sanitary sewer lateral serving a shell building constructed in an area zoned for light or heavy industrial use. This manhole will serve as a potential sampling location for the District or for a tenant of the shell building should an Industrial User Permit be issued to the tenant by the District.
 - 2. Class I and II Industrial Users: A business operation which meets the definition of a Class I or II Industrial User (reference Title 10 of District Code, Section 10.12.030) is subject to the monitoring and reporting requirements of an Industrial User Permit and may be required by the

District to install a sampling manhole (Section 28-48) on the sanitary sewer lateral receiving process wastewater discharges from the facility. Contact the District for specific requirements.

- B. Other Sampling Structures
 - 1. A sampling structure (Section 28-48, or approved equal) as specified by the District shall be installed immediately downstream of a sand-oil interceptor as referenced in Section 9-01.B.
 - 2. A sample box (Section 28-48) shall be installed immediately downstream of a grease interceptor as referenced in Section 9-01.A.
 - 3. Installation of a sampling structure, as specified by the District, on a process waste line and/or immediately downstream of any pretreatment unit (e.g., silver recovery system, pH adjustment system, separator, grease trap) may be required by the District on a case-by-case basis.

9-03 SEWER CONNECTIONS IN OUTDOOR AREAS

A. General Requirements

Title 10 of the District Code prohibits the discharge of rainwater and storm water to the sanitary sewer. Standards for the connection of outdoor areas to the sanitary sewer are as follows:

- 1. The outdoor area shall be bermed, raised, and/or sloped to prevent storm water run-on.
- 2. The outdoor area shall be roofed or equipped with a cover to prevent rainwater from entering the sanitary sewer system. The roof shall extend past open sides without a gate by a distance equal to ½ the height of the opening (i.e. if the bottom of the roof is 2 feet above the top of the structure wall it is required to extent 1 foot past the outside edge of the wall).
- 3. Roof leaders shall not discharge to the sanitary sewer.
- 4. The District may consider an alternative positive storm water control method in lieu of a fixed roof or cover for the outdoor area on a case by case basis. The business shall provide the District with detailed design drawings, equipment specifications, and operation descriptions, including standard operation and maintenance procedures, for the proposed alternative positive storm water control method. In all cases, the District

has the authority to either approve, or disapprove a proposed alternative positive storm water control method.

The installation of a positive storm water control method other than a fixed roof or cover or a complete wastewater recycling system may subject the business operation to the monitoring and reporting requirements of an Industrial User Permit, including the payment of permit fees and additional oversight by the District.

- B. Wash Areas
 - 1. The outdoor wash area shall be sized to adequately capture all of the wastewater generated by the washing operations performed in that area.
 - 2. All sanitary sewer drains in the outdoor wash area shall discharge to an appropriately designed and sized grease, oil, and/or solids removal device as specified by the District.
- C. Trash Enclosures
 - 1. All sanitary sewer drains in an outdoor trash enclosure located on property zoned and/or used for food service facilities shall discharge to the facility's grease interceptor or grease trap as specified by the District.
 - 2. All sanitary sewer drains in an outdoor trash enclosure located on property zoned for light or heavy industrial or vehicle service, or used by any facility that may generate wastes containing oil, grease, flammable liquids, or other restricted materials shall discharge to an appropriately designed and sized grease, oil, and/or solids removal device as specified by the District.
 - 3. To allow garbage trucks to access the bins, the trash enclosure roof shall extend 6 inches past the outside edge of the gate (on the gate side of the structure only).
- D. RV Dump Stations
 - The installation of a centralized RV dump station at a commercial location may subject the business to the assessment of additional Sewer Service Charges and to the monitoring and reporting requirements of an Industrial User Permit, including the payment of fees and additional oversight by the District.
 - 2. The installation of an outdoor sanitary sewer drain inlet at a residential site to serve as a dump station for wastewater from a recreational vehicle (RV) is prohibited.

9-04 PARKING STRUCTURES

Title 10 of the District Code prohibits the discharge of rainwater and storm water to the sanitary sewer. Standards for the connection of parking garage structures to the sanitary sewer system are as follows:

- A. Drainage from uncovered areas that are exposed to rainwater and/or storm water run-on shall be directed into the storm drainage system. This includes, but is not limited to, trench drains placed at the entrance and/or exit of parking structures.
- B. All interior floor drains and/or catch basins which are plumbed to the sanitary sewer shall be connected to an appropriately designed and sized grease, oil and sand removal device as specified by the District.

The District recommends that the grease, oil and sand removal device be filled with clean water after installation and refilled with clean water after each cleaning in order to minimize odors.

9-05 SWIMMING POOLS

No person may discharge the contents of an outdoor swimming pool into a sewer without a permit from the District. The Engineer shall fix the terms and conditions of the permit. A swimming pool connected to the District sewer shall be equipped with a two-inch (2") maximum diameter discharge pipe and an approved air gap separation to prevent the entry of sewage into the swimming pool or piping system. Discharge of water from swimming pools to the sanitary sewer shall only be through pumping systems regulated to avoid surcharge at any portion of the sewer system (Section 28-34). Wastewater from the backwash of diatomaceous earth filters shall pass through a solids separation system (clarifier) prior to discharge to the sanitary sewer system.

See Section 9-03.A for requirements related to outdoor sewer connections (area drains, showers, etc.) associated with swimming pools.

9-06 PROHIBITED WASTES

The District expressly prohibits the introduction of listed contaminants into the sanitary sewer system from any building or property, directly or indirectly, or the disposal of listed contaminants into any manhole or other structure on the sewer system.

- A. Prohibit wastes are listed as follows:
 - 1. Any liquid or vapor having a temperature higher than 122°F (50°C) at the point of discharge.
 - 2. Any water or waste that may contain more than one hundred (100) milligrams of fat, oil, or grease per liter.
 - 3. Mineral oils, greases, or other products of petroleum origin.

- 4. Any gasoline, benzene, naptha, fuel oil, or other flammable or explosive liquid, solid, or gas.
- 5. Any garbage that has not been properly shredded.
- 6. Any ashes, cinders, sand, mud, straw, shavings, metal, glass, cloth, feathers, tar, plastics, wood, polymer, or any other solid or viscous substance capable of causing obstruction to the flow or undue maintenance of sewers or other interference with the proper operation of the treatment plant.
- 7. Any waters or wastes having a pH lower than 6.5 or higher than 8.5 or having any other corrosive property capable of causing damage or injury to structures, equipment, or personnel of the District.
- 8. Any waters or wastes containing algaecides, fungicides, antibiotics, insecticides, strong oxidizing agents or strong reducing agents.
- 9. Any waters or wastes containing Polychlorinated Biphenyls (PCB's).
- 10. Any waters or wastes containing mercury or mercury compounds.
- 11. Any waters or wastes specifically including the following:

	MAXIMUM ALLOWABLE
TOXICANT	CONCENTRATION (mg/l)
Aluminum	2.0
Ammonia (as nitrogen)	20.0
Antimony	5.0
Arsenic and Arsenicals	0.5
Barium	5.0
Benzene, Phenol & Derivatives	1.0
Beryllium	1.0
Bromine, Chlorine, Iodine (Total)	10.0
Cadmium	0.10
Chromium	0.50
Cobalt	1.0
Copper	0.17
Cyanide and Nitriles	2.0
Fatty Acids	5.0
Fluorides	2.0
Formaldehydes	5.0
Iron	5.0
Lead	0.50
Manganese	1.0
Nickel	1.0

Selenium	2.0
Silver	0.05
Solvents (Total)	1.0
Zinc	1.0

The maximum allowable concentration of other toxic, or potentially toxic, materials not listed herein may be determined by regulations of the District. Such regulations shall not be effective until after public hearing and approval by resolution of the District Board.

- 12. Any waters or wastes having a toxicity limit (TLm) lower than 25 percent as determined by a 96-hour fish bioassay.
- 13. Any waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such materials at the treatment plant.
- 14. Any noxious or malodorous gas or substance capable of creating a public nuisance either by itself or by interaction with other substances.
- 15. Any domestic or other wastes obtained from a septic tank, potable toilet, or recreational vehicle.
- 16. Any storm water, surface water, groundwater, roof runoff, subsurface drainage, or uncontaminated cooling water or process water.
- 17. Any water or waste that exerts or causes excessive discoloration.
- 18. Any water or waste containing substances that are not amenable to treatment or may cause damage to the District's facilities or that cause the treatment plant effluent to fail to meet the discharge standards established by the State Water Resources Control Board, the Bay Area Regional Water Quality Control Board, or any other State or Federal regulatory agency.

The admission into the sewer system of any waters or wastes having (a) a five day biochemical oxygen demand greater than two hundred fifty (250) milligrams per liter, or (b) containing more than two hundred fifty (250) milligrams per liter of suspended solids, or (c) containing any quantity of substances having the characteristics described in Section 9-06.A or (d) having an average daily flow greater than five percent of the average daily flow of the District, or 50,000 gallons, shall be subject to the review and approval by discharge permit issued by the District. The discharger shall provide, at his/her expense, protective facilities and/or pretreatment for such wastes to a condition acceptable to the District for discharge into the District's system.

9-07 PROHIBITED DISCHARGE LOCATION

No user shall discharge any wastewater directly into a manhole or other structure or opening in the District sewage system other than through sewer laterals or other sewer connections approved by the District unless a permit has first been obtained for such discharge. A permit will only be issued for such direct discharge in the event the discharge is otherwise in compliance with provisions of these District Specifications and no other alternative is reasonable available in the opinion of the District.

Penalties for unpermitted discharge of wastewater are set forth in Section 374.2 of the California Penal Code.

9-08 INFLOW & INFILTRATION CONTROL

The District has determined that significant public cost results from intrusion of rain water, ground water and other exterior sources of water, known collectively as "inflow & infiltration" (I&I). Storm water can invade defective building sewers and overload the District's sewer system, causing blockage and backups, causing sewer overflows, and occasionally overloading wastewater treatment facilities. Defective building sewers can also leak raw sewage into the ground, infiltrating the drainage system that flows to the bay, which is a public health hazard. To reduce these costly impacts to the public, the District requires that building sewers be maintained in reliable condition and be repaired or replaced when they have deteriorated to allow infiltration. Each building sewer shall be free of any structural defects, cracks, breaks or missing portions. All joints shall be tight and all pipe shall be sound.

A. No Reuse of Old Laterals

Preexisting laterals from demolished buildings may not be reused when a new building is built. Preexisting laterals from derelict buildings may not be reused when such a building is rehabilitated.

B. No Connection of Roof Leaders

Connection of roof leaders to the sanitary sewer is prohibited.

SECTION 10

DISTRICT PERMITS, LICENSES, AND BONDS

10-01 PERMITS

All work under the jurisdiction of the Crockett Community Services District requires a specific permit in accordance with the District Code and regulations. The Sewer Contractor shall obtain a COSHA permit conforming to the requirements of Section 16-02.C of these Specifications. The District reserves the right to require the contractor to file a copy of the COSHA permit with the District prior to issuing any permit for connection of a private structure to the District sewer system. Homeowners exclusively performing all of the work on their house sewer without employees or any other person or persons are exempt from securing a COSHA permit, workers' compensation insurance, and liability insurance. The Sewer Contractor must maintain proper liability insurance and workers' compensation coverage in accordance with Section 13-02 of these Specifications. Any permit issued by the District shall be kept on hand at the jobsite and made readily available for review during prosecution of the work. The various types of standard permits issued by the District are as follows:

A. Mainline Permits

Permits issued for construction of main and trunk sewers, special structures, manholes, rodding inlets, and laterals when part of the Mainline Project. Engineering plans are required in accordance with Sections 3 through 9 of these specifications.

- B. Side Sewer Permits
 - 1. <u>Lateral Permits</u>: Permits issued for construction or replacement of laterals when the public main is existing and available for connection. Laterals constructed as part of main line work will be covered under the Mainline Permit. Sewer plans for subdivision will show all lateral locations. Plans are required showing location and slope for all laterals six (6) inches or larger for non-subdivision work.
 - 2. <u>Repair Permits</u>: Permits issued for work on existing side sewers. Repair permits are issued when the work requires no alignment modification of the existing private system and all work is solely for repair of existing sewers, or when additional private systems are installed to existing side sewers, to sewer house additions, for modifications, or for ease of maintenance to existing side sewers.
- C. Miscellaneous Permits
 - 1. Grease Interceptor Permit To construct grease interceptor structures.

- 2. Abandonment Permit To abandon side sewers.
- 3. Pump Permit To construct non-gravity side sewer installation.
- 4. Backflow Prevention Permit To install a backflow prevention device.
- 5. Special Discharge To discharge approved wastewater directly into a manhole or other structure or opening in the District sewage system other than through approved connections.
- 6. Encroachment Permit To allow encroachment into a District easement.

10-02 LICENSE

All contractors doing sewer work within the District shall be properly licensed in accordance with the provisions of Division 3, Chapter 9, Business and Professional Code, of the State of California, as amended. Contractors shall present evidence of licensing, including license number. Work on public property, roads, streets, and other rights-of-way shall be performed only by duly licensed contractors. Acceptable license classifications are "A" General Engineering Contractor; C-34 Pipeline; and C-42 Sanitation Systems. (District Code Section 5.04.015)

Contractors with C-36 licenses may perform side sewer work to service those structures in which they have installed plumbing systems and repairs or alterations to existing private side sewers (excluding connections to the public sewer mains).

10-03 BOND AND AGREEMENTS

A. Contractor's Bonds

Contractors performing work requiring permit by the District shall post a refundable cash bond of one thousand dollars (\$1,000) to guarantee workmanship and materials in accordance with the District Code.

This cash deposit will be retained by the District for a minimum period of ninety days after final acceptance of the work and will be refunded only upon written application. A list of contractors having a bond on file with the District will be made public.

B. Owner's Sewer Improvement Security Bond

In addition to other bonds required herein, the Owner/Developer of a property to be developed, which requires a public sewer to be extended for sewer service, shall post a refundable improvements security with the District prior to issuance of any construction permit for the work. (District Code Chapter 5.16). The acceptable forms of security include any one of the following:

- 1. Cashier's check, if in the amount of \$50,000 or less
- 2. Certificate of Deposit, if in the amount of \$50,000 or less
- 3. Corporate Surety Bond. The amount of surety to be provided must be approved by the District. Said surety amount is determined from an engineer's estimate or a copy of an accepted Contractor's proposal.
- 4. Cash, if in the amount of \$50,000 or less
- C. The owner/developer is also required to execute an Owner's Sewer Improvement Agreement as part of the District's plan review process as covered in Section 6 of these specifications.

10-04 VIOLATIONS AND PENALTIES

A person who violates the provisions of these Specifications is guilty of a misdemeanor and may be punished by a fine or not more than one thousand dollars (\$1,000) or imprisonment of not more than thirty days, or both. Each violation of these Specifications is a separate offense and may be prosecuted separately. This section is a declaration of Section 6523, Health and Safety Code, State of California, and is not intended to create a different or separate penalty. (District Code Sections 1.08 and 1.14).

Prosecution for misdemeanor is not exclusive of other penalties or remedies. A person who violates these Specifications, in addition to being subject to misdemeanor prosecution, may be subject to prosecution for violation of any federal or state statute or county ordinance applicable to the act or omission that caused the violation of these Specifications. Prosecution of a person pursuant to this section does not limit other enforcement procedures, penalties or remedies that the District may have available at law or under these Specifications.

Any violation of the provisions of these Specifications or District ordinances in part or in total by a Contractor or Owner establishes the right of the District to enforce the penalties as set forth herein in addition to other penalties provided by the District Code.

- A. Forfeiture of the cash bond in part or in total.
- B. The District may require immediate excavation and inspection of buried work on side sewers, at no cost to the District, whenever work requiring a permit has been buried without inspection and approval by the District.
- C. The District may perform the work or have it performed by others at the Contractor's or Owner's expense.

- D. The District may refuse to accept the work and disconnect the work from the District system at the Contractor's or Owner's expense.
- E. The District may revoke or suspend for a period of time the Contractor's right to do sewer work in the District.
- F. The District may levy a fine of up to \$1,000 against the property owner for unpermitted alterations, repairs, realignments or replacements of side sewers or for discharge of sewage on the ground or for failure to comply with District regulations in other ways. Unless paid directly by the owner or contractor, such fines shall be collected on the property tax roll as a surcharge on the sewer service charge as a "special service fee".

Prior to collecting such fines on the property tax roll, the District shall follow procedures that ensure due notice to the property owner of a public hearing in the matter before adopting findings by resolution, directing appropriate actions by the owner, and instructing the collection of specific amounts on the tax roll, as provided in the District Code.

- G. <u>In addition to any fine levied</u> under paragraph F above, the District may recover from the property owner all costs incurred for abatement of nuisance, wastewater treatment, legal expenses, engineering expenses and administrative expenses.
- H. By Notice of Violation, when authorized by the General Manager, the District may order the property owner to discontinue use of the sewer and/or to discontinue all construction work with respect to the sewer and to abate defective lateral conditions under District permit. The District may similarly require immediate stoppage of any illegal discharge and actions to prevent recurrence, or immediate abatement of any other violation of these Specification or District ordinances. (District Code Section 1.08.010)

Such Notice of Violation shall be served personally to the owner or by mailing such notice to the owner certified, postage prepaid and addressed to the address last shown on the Contra Costa County secured assessment rolls. Any stoppage in the building lateral or break in the watertight integrity of the lateral shall be conclusively presumed to be a menace to life, health, safety or property for purposes of requiring abatement of such defective conditions. Should the property owner fail to comply with the Notice of Violation within the time limits set forth by the notice, the District Manager and his/her designee are hereby authorized to enter the property to cause such repairs as are necessary to abate a public nuisance.

I. The District may record the Notice of Violation of these Specifications or District ordinances with the Contra Costa County Recorder, upon specific approval of the District Board, while defective or unpermitted conditions and/or illegal discharge of sewage on the ground or wastewater to the sewage system await abatement and/or payment of fines or recovery of costs. Following abatement of the

violation, the District shall record a notice rescinding the Notice of Violation.

10-05 APPEALS

A process for appeal of staff decisions is set forth in District Code Chapters 1.14, 1.16. and 10.20.

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SECTION 11

CONTROL OF THE WORK

11-01 AUTHORITY OF ENGINEER

The Engineer shall decide all questions which may arise as to the quality or acceptability of materials furnished and work performed and as to the manner of performance of the work and all questions which may arise as to the interpretation of the Plans as they relate to these standard Specifications. The Engineer's decision shall be final and the Engineer shall have authority to enforce and make effective such decisions and orders which the Contractor fails to carry out promptly.

Should the Contractor fail to act promptly or be remiss in the prosecution of work done under these Specifications, or should the urgency of the case require that repairs or replacement be made before the Contractor can be notified or can respond to notification, the District may make or cause to be made the necessary repairs or replacements or perform the necessary work, and the Contractor shall be charged and shall pay to the District the cost of such work plus such currently established overheads for District administration of work as performed.

The Engineer may suspend the work wholly or in part, for such period as he may deem necessary, due to unsuitable weather, or to such other conditions as are considered unfavorable for the suitable prosecution of the work, and for such time as it may be deemed necessary, or due to the failure on the part of the Contractor to carry out orders given, or to perform any provision of the permit or contract. The Contractor shall immediately comply with the written order of the Engineer to suspend the work wholly or in part. The work shall be resumed when conditions are favorable and methods are correct, as ordered in writing by the Engineer.

In the event that a suspension of work is ordered as provided above, the Contractor, at no cost to the District, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic, during the period of such suspension. In the event that the Contractor fails to perform the work above as specified, the District will perform such work and the cost will be charged to the Contractor or Owner.

Action outlined above shall not relieve the Contractor and its surety of their obligation or responsibility in the prosecution of the job, nor do these provisions establish contingent liability on the part of the District.

The authority of the District is granted under the provisions of Government Code Section 61000 et seq. of the State of California, and regulations of the Crockett Community Services District.

11-02 PLANS

All alterations affecting, the requirements and information given on the plans shall be in writing. No changes shall be made in any plan or drawing after it has been final review by the Engineer, except by the Engineer's direction.

The Contractor shall ensure that a copy of the plans for the project, as well as a copy of these Standard Specifications and all other governing agency specifications incident to the work shall be kept on the jobsite during prosecution of the work and made accessible to the Engineer at all times. The Plans, Specifications, Standard Drawings, and all supplementary documents are to be considered the requirements of the work, and it shall be the responsibility of the Contractor to familiarize itself fully with the requirements of these and the various governing authorities having jurisdiction over the work.

Working drawings, not included in the Plans furnished by the Engineer, may be required for the prosecution of the work. They shall include shop details, erection plans, masonry layout diagrams, and bending diagrams for reinforcing steel, which shall be reviewed by the Engineer before any work involving these Plans is performed.

It is expressly understood that review by the Engineer of the Contractor's working drawings does not relieve the Contractor of any responsibility for accuracy of dimensions and details, or for mutual agreement of dimensions and details. It is mutually agreed that the Contractor shall be responsible for agreement and conformity of his working drawings with the Plans and Specifications.

11-03 CONFORMITY WITH THE PLANS AND ALLOWABLE DEVIATIONS

Finished surfaces in all cases shall conform with the lines, grades, cross-sections, and dimensions shown on the Plans.

Deviations from the Plans and working drawings, as may be required by the constraints of construction will, in all cases, be determined by the Engineer and authorized in writing.

The District reserves the right to make such alterations or deviations, additions to, or deletions from the Plans and Specifications covered by its permit, as may be determined during the progress of the work to be necessary and advisable for the proper completion thereof.

11-04 COORDINATION OF PLANS AND SPECIFICATIONS

These Specifications, the Plans, and all supplementary documents are essential parts of the permit, or agreement and a requirement occurring in one is as binding as though occurring in all. They are intended to be cooperative, and to describe and provide for a complete work.

Specifications shall govern over plans, unless deviation from the Specifications is specifically authorized by the Engineer in writing. Any job shall be installed in accordance with these Standard Specifications and addenda, in effect at the time plans were signed.

Final review of construction plans becomes void three (3) months from the date of signature, unless work has begun within that period.

11-05 INTERPRETATION OF PLANS AND SPECIFICATIONS

Should it appear that the work to be done or any of the matters relative thereto are not sufficiently detailed or explained in these Specifications and the Plans the Contractor shall apply to the Engineer for such further explanations as may be necessary and shall conform to them. In the event of any doubt or question respecting the requirements of the Specifications or Plans, reference shall be made to the Engineer, whose decision thereon shall be final.

In the event of any discrepancy between any drawing and the figures written thereon the figures shall be taken as correct.

In the event a Developer, Job Engineer, Contractor, etc., fails to comply with these Specifications, the District Code or specific instructions of the Engineer relative to any work under the jurisdiction of the District, the District reserves the right to suspend all proceedings, current and future, of an incident to said Developer's, Job Engineer's, Contractor's, etc., work and other projects within the purview of the District until such differences or deficiencies are resolved.

11-06 SUPERINTENDENCE

The Contractor or its representative, authorized to make field decisions for the Contractor, shall be present at the site of the work at all times while work is actually in progress. Whenever the Contractor is not present on any part of the work where it may be desired to give direction, orders will be given by the Engineer, which shall be conveyed in writing and obeyed by the authorized representative who may have charge of the particular work in reference to which the orders are given. Any order given by the Engineer, not otherwise required by the Specifications to be in writing will, on request of the Contractor, be given or confirmed by the Engineer in writing.

The Contractor shall file with the District an address and telephone number of any office he may have in the vicinity of the work, to which drawings, samples, notices, letters or other articles or communications may be mailed or delivered. The delivery to this address of any such matter from the District or its agents to the Contractor shall be deemed sufficient service thereof upon the Contractor, and the date of such service shall be the date of delivery.

11-07 LINES AND GRADES

When the Contractor requires stakes or marks, it shall notify the Job Engineer of the Contractor's requirements in advance of starting operations that require such stakes or marks.

The Contractor shall request marking by members of U.S.A. prior to staking.

Stakes and marks set by the Job Engineer shall be carefully preserved by the Contractor. If any such stakes and marks necessary to complete construction are destroyed or damaged by reason of the Contractor's operations, such stakes and marks shall be replaced at no cost to the District.

Elevations shown on the Plans shall be based on the National Geodetic Vertical Datum of 1929. Acceptable elevation benchmarks shall be permanently marked points of vertical control established by a public agency. Such control benchmarks shall be of record on file with the agency, and information as required by Section 5-05.F of these Specifications shall be available to the public. All vertical control for the design and construction of sewer pipelines and appurtenant structures shall be based on an acceptable elevation bench marks.

All lines and grades will be given by the Job Engineer, but the Contractor shall provide such materials and give such assistance as may be required to fully protect and preserve all the marks given. The Contractor shall keep the Job Engineer informed in advance of the times and places at which he intends to do work in order that necessary requirements for the progress of work can be made with a minimum of inconvenience to the Job Engineer or of delay to the Contractor.

All requests to the District for line and/or grade controls to be considered shall be made at least forty-eight (48) hours in advance of the times such measurements are required at the jobsite.

All distances given and measurements will be made in a horizontal plane. Grades are given from the top of stakes or nails or other points designated by the Engineer.

Three (3) consecutive points shown on the same rate of slope must be used in common in order to detect any variation from a straight grade, and in case any such discrepancy exists, it must be reported to the Engineer. If such discrepancy is not reported to the Engineer, the Contractor shall be responsible for any error in the finished work.

11-08 INSPECTION

The Engineer shall at all times have access to the work during its construction, and the Contractor shall provide proper and safe facilities for such access and for inspection. The Engineer shall be furnished with every reasonable facility for ascertaining that the materials and the workmanship are in accordance with the requirements and intentions of these Specifications. All work done and all materials furnished shall be subject to the

Engineer's inspection.

In the event the Engineer shall determine that the work is not proceeding in accordance with the Plans and these Specifications, or any applicable rules and regulations, the Engineer may order the cessation of further work until the work is brought into compliance with such requirements. All delays in the work occasioned by such stoppage shall not relieve the Contractor of any duty to perform the work. The Engineer may, at his option, also order such work to be done as shall be necessary to comply with all the requirements of the work at no cost to the District.

The work shall be done to the complete satisfaction of the District and in accordance with the laws of the State of California.

The inspection of the work shall not relieve the Contractor of any of its obligations to fulfill its contract as prescribed and defective work shall be made good and unsuitable materials may be rejected, notwithstanding that such defective work and materials have been previously overlooked and accepted by the Engineer. (See Section 13-10)

The Contractor shall, at any time when requested, submit to the Engineer properly authenticated documents or other satisfactory proofs as to the Contractors compliance with the requirements of these Specifications.

After completion of final pressure testing in conformance with Section 18-03.B and completion of preliminary cleaning in conformance with Section 18-03.C but prior to any placing of pavement structural sections for streets, roads or highways and prior to final inspection in accordance with Section 11-13, the Contractor will perform an internal closed circuit television inspection on all new main and trunk sewer pipeline installations (See Section 18-03.D). During inclement weather, the inspection will be made after air testing, cleaning and placement of aggregate base but prior to application of pavement. The following requirements apply to the television of sewer main stubs:

- A. Stubs over fifty (50) feet in length shall have temporary access structure provided by the Contractor on the upstream end. After the television inspection has been satisfactorily completed, the temporary access structure shall be removed and a permanent plug shall be installed in accordance with the manufacturer's recommendations. See Section 4-03.D.
- B. Stubs less than fifty (50) feet in length on any slope are to be televised, but no temporary access structure is required.

Should additional television inspections be required to check corrections to faulty or defective work discovered in the initial television inspection, such additional inspection costs will be charged to and paid by the Contractor in accordance with rates currently established by the District.

The Contractor shall make applications for District inspections required by these Specifications at least twenty-four (24) hours in advance of the times such inspections

are required for the work. Any changes in the Contractor's work schedule affecting scheduled inspections shall be phoned to the District as soon as possible to allow for rescheduling. The Contractor will schedule television inspections as soon as possible.

All inspection work performed by the District during hours other than between 8 a.m. and 4:30 p.m. on regular working days shall be considered as overtime inspection work. The fees for overtime inspection, established by the District, shall be charged to and paid by the Contractor. If amounts owed for such services are not paid within thirty (30) days from the date of billing, no final inspections will be made on work in progress, no additional overtime will be allowed, and no permits for additional work will be issued until the amounts owed plus delinquent charges are paid. If amounts owed for such services are not paid within sixty (60) days from the date of billing, such amounts will be deducted from the aforementioned cash deposit, and no additional permits for work will be issued until the value of said cash deposit is restored to its original amount.

11-09 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

All work that has been rejected shall be remedied or removed and replaced by the Contractor in a manner acceptable to the Engineer. Any work done beyond the lines and grades shown on the Plans or established by the Engineer, or any extra work done without written authority, will be considered as unauthorized. Work so done may be ordered removed at the Contractor's expense. Upon failure on the part of the Contractor to comply promptly with any order of the Engineer made under the provisions of this article, the Engineer shall have authority to cause defective work to be remedied or removed and replaced and unauthorized work to be removed at the Contractor's expense.

11-10 EQUIPMENT AND PLANT

The Contractor shall provide adequate and suitable equipment and plant to produce the quality of work required and, when ordered by the Engineer, shall remove unsuitable equipment from the work.

Each machine or unit of equipment shall be operated by a person experienced in handling the particular make of machine or unit of equipment in use, at a speed or rate of production not to exceed that recommended by the manufacturer.

Nothing in this Section shall relieve the Contractor of its responsibility for furnishing materials or producing finished work of the quality specified in these Standard Specifications.

11-11 MAINTENANCE OF DETOURS

The Contractor shall construct, maintain, and remove detours and detour bridges for the use of directing both pedestrian and vehicular traffic through or around the project site, as shown on the Plans or as directed by the Engineer or other public agency having jurisdiction.

Where the Contractor's operations are causing damage and/or interference to a roadway or detour or where detours are not being satisfactorily maintained by the Contractor for safe public traffic, the Engineer and/or other public agency having jurisdiction shall have the right to instruct the Contractor to correct any existing unsafe conditions, and the Contractor shall comply with such instructions.

The failure or refusal of the Contractor to construct and maintain detours at the proper time shall be sufficient cause for temporary suspension of the work in accordance with Section 11-01 of these specifications until such detours are in satisfactory condition for the safe use of public traffic.

11-12 CHARACTER OF WORKERS

If any subcontractor or person employed by the Contractor shall appear to the Engineer to be incompetent, or be under the influence of alcohol or illegal drugs, or act in an unsafe, disorderly, or improper manner, that person shall be disciplined. The offending action shall be sufficient cause for the Engineer to require that such person shall not again be employed on the work. However, nothing contained in this paragraph shall be used to shift the responsibility for supervision of persons employed by the Contractor, from the Contractor, or to require the Engineer to take any action with regard to an employee of the Contractor or subcontractor who is subject to discipline.

11-13 FINAL INSPECTION

When the work covered by the permit or agreement has been completed, including correction of any faulty workmanship or defective materials, the Engineer will, upon request by the Contractor, make the final inspection of the work site.

Final inspections for private developments such as subdivisions, tracts, townhouses, condominiums and commercial centers will be made only after the installations of all other utilities and permanent structural site improvements such as roadway surfacing, curbs, gutters, sidewalks, etc.

Before final inspection of the work, as provided above, the Contractor shall clean all roadways, rights of way, and all ground occupied by him in connection with the work, or all rubbish, excess materials, false work, temporary structures, and equipment, and all parts of the work shall be left in a neat and presentable condition. Nothing herein, however, shall require the Contractor to remove warning and directional signs prior to formal acceptance by the District, but the Contractor must do so upon formal acceptance. This page left intentionally blank

SECTION 12

CONTROL OF MATERIAL

12-01 CONTRACTOR FURNISHED MATERIALS

The Contractor shall furnish all materials required to complete the work.

12-02 SOURCE OF SUPPLY AND QUALITY OF MATERIALS

Materials listed on the current "Approved Material List" of the District shall be used in the work. New materials conforming to the requirements of these Specifications and review by the Engineer may be used in the work. All materials proposed for use may be inspected or tested by the Engineer at any time during their preparation and use. If it is found that sources of supply that have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish material from other sources on the current "Approved Materials List". No material, which after approval has in any way become unfit for use, shall be used in the work.

12-03 LOCAL MATERIALS

The Contractor shall satisfy itself as to the quantity of acceptable material that may be produced or obtained at local sources. The District will not assume any responsibility as to the quantities or quality of acceptable material available.

12-04 USE OF MATERIALS FOUND ON THE WORK

The Contractor, with the concurrence of the Engineer, may use in the proposed construction such stone, gravel, sand or other material suitable in the opinion of the Engineer as may be found in the excavation. The Contractor shall replace at its own expense with other suitable material all of that portion of the material so removed and used which was contemplated for use in the embankments, backfills, approaches, or otherwise.

12-05 ACQUISITION OF MATERIALS

The Contractor shall have on hand, at the time construction starts on any section of the work, all materials necessary to complete in a reasonable length of time, all work that would create a hazard or inconvenience if not completed.

12-06 STORAGE OF MATERIALS

Materials shall be so stored as to ensure the preservation of their quality and fitness for the work. When considered necessary by the Engineer, they shall be placed on wooden platforms or other hard, clean surfaces and not on the ground. They shall be placed under cover when so directed. Stored materials shall be so located as to facilitate prompt inspection. All surplus piping materials shall be removed from the site of the work within five (5) days after the completion of the pipe laying.

12-07 DEFECTIVE MATERIALS

All materials not conforming to the requirements of the Specifications shall be considered as defective and all such materials, whether in place or not, shall be rejected. They shall be removed immediately from the site of the work, unless otherwise permitted by the Engineer. No rejected material, the defects of which have been subsequently corrected, shall be used until approved in writing by the Engineer. The Engineer shall have authority to remove and replace defective material should the Contractor fail to comply promptly with any order of the Engineer made under the provisions of this Section. Any cost incurred by the District will be charged to the Contractor and/or owners.

12-08 TRADE NAMES AND ALTERNATIVES

For convenience in designation on the Plans or in the Specifications, certain equipment or articles or materials may be designated under trade names or the names of manufactures and with catalogue information. The use of alternative equipment or an article or material that is of equal quality and of the required characteristics for the purpose intended will be permitted in accordance with the following requirements:

The burden of proof as to the comparative quality and suitability of alternate equipment, articles and/or materials shall be upon the Job Engineer (excluding the District Engineer) or Prime Contractor performing the work, and all information necessary or related thereto as required by the District Engineer shall be furnished at no expense to the District. This information shall include: the method and materials of fabrication, the test procedures used for product uniformity, manufacturer's name, trade name or item identification, manufacturer's recommended application or installation procedures and any guarantees, warranties or effective use life of the proposed alternate. The final decision as to the acceptability of any alternate equipment, article and/or materials shall be vested with the District Engineer and its decision shall be final. Failure to submit requests for alternate equipment, articles and/or materials will be considered as evidence that the work anticipated shall utilize only those items of equipment, articles and/or materials that are included in the Specifications, shown on the Plans or shown on the District's current "Approved Materials List" on file and available at the District Office.

All alternate selections of construction materials and/or methods by the Contractor to be used where such alternate is allowed or permitted, explicit or not, in these Specifications shall be reviewed by the Engineer prior to their use.

12-09 TESTING MATERIALS

Whenever reference is made in these Specifications to a test designation of the

American Society for Testing and Materials, or any other recognized national organization, it is to be understood that the test method in use on the date of these specifications shall prevail.

Whenever abbreviations are used in these Specifications or on the Plans in connection with a reference to material or work requirements or test methods, such abbreviations shall be construed as set forth under Section 2 of these Specifications.

When requested by the Engineer, the Contractor shall furnish without charge, samples of all materials entering into the work. Materials may be tested at any time during the progress of the work, and defective materials will be rejected.

12-10 PLANT INSPECTION

The Engineer may inspect the production of material, or the manufacturer of products at the source of supply. Plant inspection, however, will not be undertaken until the Engineer is assured of the cooperation and assistance of both the Contractor and the material producer. The Engineer shall have free entry at all times to such parts of the plant as concerns the manufacture or production of the materials. Adequate facilities shall be furnished free of charge to make the necessary inspection. The District assumes no obligation to inspect materials at the source of supply.

12-11 CERTIFICATES OF COMPLIANCE

The Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance stating that the materials involved comply in all respects with the requirements of the Specifications. The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials.

All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Plans and Specifications and any such material not conforming to such requirements will be subject to rejection whether in place or not.

The District reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance. The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

12-12 SPECIAL TEST METHODS

Except as otherwise provided under Section 12-09, special tests and test methods shall be in conformance with those specified in the State Standard Specifications.

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SECTION 13

LEGAL RELATIONS AND RESPONSIBILITY

13-01 LAWS TO BE OBSERVED

The Contractor shall comply with all existing Federal, State, county, district, municipal, and local laws, ordinances, orders, and regulations that in any manner affect the work and/or those engaged or employed in the work. The Contractor shall defend, protect, indemnify, and hold the District, the District Engineer, and all of the District's officers, directors, employees, agents, and servants free and harmless from and against claim, loss and/or liability, including attorneys' fees arising from or based on the violation of any such law, ordinance, regulation, or order, whether by the Contractor or its employees, agents, or servants. If any discrepancy or inconsistency is discovered on the Plans, Drawings, Specifications, or Contract for the work in relation to any such law, ordinance, regulation, or order, the Contractor shall promptly report the same to the Engineer in writing.

All Contractors doing sewer work within the District shall be properly licensed in accordance with the provisions of Division 3, Chapter 9, Business and Professions Code of the State of California, as amended, and shall post a bond with the District.

13-02 INSURANCE

All contractors shall obtain and maintain workers' compensation insurance as required by California law, and general and automobile liability insurance, as set forth in the Crockett Community Services District Code, Section 5.08.010. Neither this section, nor Code Section 5.08.010, nor any predecessor section is or was intended to create or impose any responsibility upon the District to ensure that the Contractor obtains and maintains this insurance, such responsibility being solely that of the Contractor. The District may, however, investigate the contractor's insurance coverage at any time. Failure of the contractor to obtain and maintain the insurance as noted above may cause the denial and/or revocation of contractor's permit, at the sole and absolute discretion of the District.

13-03 PERMITS AND LICENSES

The Contractor shall (prior to beginning any work) procure all permits and licenses, pay all inspection charges and permit fees, and give all notices necessary for compliance with all applicable Federal, State, County, District, municipal, and local laws, ordinances, orders, and regulations.

13-04 PUBLIC CONVENIENCE

This Section defines, in part, the Contractor's responsibility with regard to providing for the passage of public traffic through the work during construction. The attention of the Contractor is directed to the encroachment permit requirements of Caltrans and/or Contra Costa County and/or cities within the County with regard to the Contractor's responsibility for providing for the convenience of the public in connection with its operations.

The Contractor shall so conduct its operations so as to offer the least possible obstruction and inconvenience to public traffic, and it shall have under construction no greater length or amount of work than it can prosecute properly with due regard to the rights and convenience of the public. Attention is directed to Section 16-02.A regarding maximum length of open pipe trench. Where existing roads are not available for use as detours, all traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. Spillage resulting from hauling operations along or across the traveled way shall be removed immediately, at the Contractor's expense.

Convenience of abutting property owners along the road or sewer shall be provided for as far as practicable. Convenient access to driveways, houses and buildings along the line of the work shall be maintained and temporary approaches to crossings or intersecting highways shall be provided and kept in good condition. It is the Contractor's responsibility to provide adequate prior notice of start of construction to owners affected by such construction.

Right is reserved to municipal corporations, local and county authorities, and to water, gas, telephone, telegraph, and electric power transmission utilities to enter upon any public highway, road or right of way for the purpose of making repairs and changes that have become necessary by the reason of the sewer installation.

All fences subject to interference shall be maintained by the Contractor until the work is completed, at which time they shall be restored to the condition existing prior to starting the work.

Excavation and backfill shall be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory for use by public traffic at all times. When possible, sewer construction shall be conducted on but one-half the width of the traveled way at a time and that portion of the traveled way being used by public traffic shall be kept open and unobstructed until the opposite side of the traveled way is completely ready for use by traffic.

While trenching and paving operations are under way, Contractor shall ensure that traffic shall be able to use the shoulders and the side of the roadbed opposite the one under construction. When sufficient width is available, a passageway wide enough to accommodate two (2) lanes of traffic shall be kept open at all times at locations where construction operations are in active progress.

Bridges of approved construction and designed by a California Professional Engineer shall be installed and maintained across the trench at all crosswalks, intersections, and at such other points where, in the opinion of the Engineer, traffic conditions make it advisable for the convenience of public pedestrian traffic.

In order to expedite the passage of public traffic through or around the work and where ordered by the State, municipal, local, and/or county authorities having jurisdiction and/or the Engineer, the Contractor shall install signs, lights, flares, barricades, and shall furnish a pilot car and driver and other facilities for the sole convenience and direction of public traffic. Whenever the Contractor's operations create a hazardous condition or where directed by the State, municipal, local, and/or County authorities having jurisdiction, the Contractor shall provide and station competent flaggers whose sole duties shall consist of directing the movement of public traffic through or around the work.

In addition to the requirements hereinbefore specified for furnishing facilities and flaggers for expediting the passage of public traffic through or around the work, the Contractor shall furnish and erect, within or adjacent to the limits of the work, such warning and directional signs as may be required by the previously named agencies having jurisdiction.

13-05 SAFETY

The Contractor alone shall be responsible for the safety in the work zone and of its plant, equipment, personnel, and methods.

The Contractor must make provisions for emergency access to and through the work zone at all times unless specific written permission to close or restrict the use of a particular roadway is given by Caltrans or the Public Works Director of Contra Costa County or by the city or locality affected. It shall be the Contractor's responsibility to notify all affected public bodies such as fire districts, school districts, etc., as to construction schedules, and the Contractor shall keep a current list or diagram of limited access areas.

Whenever the Contractor's operations create a hazardous condition, the Contractor shall furnish at its own expense such flaggers and guards as are necessary to give adequate warning of and protection from any dangerous conditions to be encountered, and it shall furnish, erect, and maintain such fences, barricades, lights, signs and other devices as are necessary to prevent accidents and avoid damage or injury. The Contractor shall ensure that signs, flags, lights, and other warning and safety devices shall conform to the requirements set forth in the current "MANUAL OF TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE WORK ZONES" issued by the State of California, Department of Transportation.

The Contractor shall advise the owner and possessor of land in the work zone of any abandoned mining shaft, pit, well, septic tank, cesspool, or other abandoned excavation dangerous to persons legally on the premises or to minors under the age of 12 years.

Owners of land in fee simple in a work zone or in possession thereof under lease or contract of sale are hereby notified of the requirement of their compliance with the provisions of Health and Safety Code Section 24400.

The State, municipal, local and/or County authorities having jurisdiction and/or the Engineer may direct attention to the existence of a hazard, and may order the Contractor to comply with applicable standards. The Contractor shall promptly comply with such orders. Any warning and protective measures required by Federal, State, County, District, municipal, and local laws, ordinances, orders, and regulations shall be furnished and installed by the Contractor without cost to the District. Notwithstanding orders from the Engineer, the Contractor remains responsible for the safety in the work zone, for the safety of its plant, equipment, personnel and methods, and for the cost of providing such safety.

The Contractor shall ensure that no material or equipment shall be stored where it will interfere with the free and safe passage of public traffic, and at the end of each day's work and at other times when construction operations are suspended for any reason the Contractor shall remove all equipment and other obstructions from that portion of any roadway or other passage to be open for use by public traffic.

The Contractor shall ensure that no material or other obstruction shall be placed within fifteen (15) feet of fire hydrants, which shall be at all times readily accessible to the Fire Department, nor within five (5) feet of United States Postal Service boxes.

The Contractor shall ensure that there are no open fires, smoking, the striking of matches, open-flame lamps or lanterns, or electrical equipment or appliances that will generate or produce sparks in the sewer or portion thereof where there is or may be an accumulation of flammable gas.

13-06 USE OF EXPLOSIVES

When the use of explosives is necessary for the prosecution of the sewer work, Contractor shall ensure that it has the proper COSHA license to handle and use explosives for such work. Contractor shall ensure that all explosives shall be stored in accordance with the provisions of Division XI of the Health and Safety Code. The Contractor shall take utmost care to avoid danger or damage to life and property. The District may inspect such license at any time. The Contractor shall obtain a permit for blasting from the Crockett-Carquinez Fire Protection District, 746 Loring Avenue, Crockett. The District may inspect such permit at any time. The Contractor shall notify the COSHA regarding the time and place of the Contractor's use of explosives.

13-07 DISPOSAL OF MATERIAL OUTSIDE THE RIGHT-OF-WAY

Unless otherwise specified on the Plans, the Contractor shall make arrangements for disposing of materials outside the right of way and he shall pay all costs.

When the materials, including excess or unsuitable excavated earth or other sewer materials, are to be disposed of or stored outside the right-of-way, the Contractor shall first obtain a written permit from the owner on whose property the disposal is to be made. The District may inspect such permit at any time.

When material is disposed of as above provided and the disposal area location is visible from a highway, the Contractor shall dispose of the material in a neat and uniform manner.

13-08 ACCEPTANCE AND WARRANTY OF WORK

Acceptance of the work will be made in writing by the Engineer only after the following requirements have been met: (1) The final inspection has been made in accordance with Section 11-13 of these Specifications, (2) In the opinion of the Engineer, the work is complete and has received a favorable final inspection, (3) The Job Engineer, if applicable, has been notified in writing by the Contractor that the work has been completed, and (4) Manufacturer's guarantees, instructions, and parts lists have been delivered to the Engineer.

Immediately upon acceptance of the work by the District, the one (1) year warranty period on all work shall begin. During the one (1) year warranty period, the District may perform an internal closed circuit television inspection, pull a mandrel, or take other action to determine the condition of the total line footage of the main and/or trunk sewers installed under this work.

Any faulty workmanship and/or defective materials that are discovered within one (1) year after acceptance of the work by the District shall be corrected and/or replaced by the Contractor at no expense to the District. The warranty period shall be extended until one (1) year after acceptance of such correction or replacement.

The one (1) year warranty shall be in addition to and not in limitation of any other guarantee of marketability or warranty/guarantee required by law or required by special provisions to a construction contract.

13-09 RIGHTS IN LAND AND IMPROVEMENTS

Nothing in these specifications shall be construed as allowing the Contractor to make any arrangements with any person or entity to permit occupancy or use of any land, structure, or building within the work zone for any purpose whatsoever, either with or without compensation, in conflict with any agreement between the District and any owner, former owner, or tenant of such land, structure, or building.

13-10 PERSONAL LIABILITY

No District director, officer, employee, or agent shall be personally responsible for any liability arising under or by virtue of the performance of the work.

13-11 SEWER SERVICE

The Contractor shall be held solely responsible to provide uninterrupted sewer service to all services affected by its work. The Contractor shall defend, protect, indemnify, and hold the District, its officers, directors, agents, and employees free and harmless against any loss, claim, or liability, including attorneys' fees, arising from or based on failure to provide such continuous service

SECTION 14

PRESERVATION OF PROPERTY

14-01 PRESERVATION OF PROPERTY

Due care shall be exercised to avoid damage to existing improvements, utility facilities, and adjacent property. When any railroad, street, highway, private or public utility is crossed, all precautionary construction measures required by the owner of said crossing shall be followed by the Contractor. The Contractor shall obtain and pay for all necessary permits, licenses, bonds, and fees required for the crossing and give all notices necessary and incident to the work.

Trees and shrubbery adjacent to the sewer trench, pole lines, fences, signs, survey markers and monuments, buildings and structures, conduits, pipe line under or above ground, sewer and water lines, all highway facilities and any other improvements or facilities within or adjacent to the sewer work shall be protected from injury or damage, and if ordered by the Engineer, the Contractor shall provide and install, without cost to the District, suitable safeguards to protect such objects from injury or damage.

The Contractor shall not remove trees or shrubs adjacent to the sewer trench line without authorization of the Engineer. Serious injuries to trees shall be avoided. No major roots or branches crossing the trench shall be cut if such cutting would seriously injure or imperil the safety of the tree or trench. All limbs, roots or branches that are cut or broken shall be cleanly trimmed. If other objects are injured or damaged by reason of the Contractor's operations, they shall be replaced or restored, at the Contractor's expense, to the condition in which they were in at the time the Contractor entered upon the site.

In case it shall be necessary to remove any telephone, telegraph, or electric power transmission poles, gas pipes, water pipes, electrical conduits or underground structures of any character, or any portion thereof, the Contractor shall notify the District and the owner of the structure. The Contractor shall not interfere with said utility facilities or structures until disposition of the obstruction to the work has been determined and/or notice to relocate or remove has been given by the Engineer or authorized agent of the owner of the facility so affected. In case water or gas service pipes crossing the line of the sewer trench are cut by the Contractor, such connection shall be restored without delay, after the passing of the trenching machine. Such cutting and restoration of service connections shall be done at such times and manner as to ensure the least inconvenience to the users.

The Contractor shall examine all roadbeds, bridges, culverts and other structures on or near the work, over which it will move its materials and equipment, and before using them, it shall properly strengthen such roads and structures, where necessary. The Contractor will be held responsible for any and all injury or damage to such roads and structures caused by reason of its operations.

14-02 RESPONSIBILITY FOR DAMAGE

The District, or any of its officers, or employees, or the Engineer shall not be answerable or accountable in any manner, for any loss or damage that may happen to the work or any part thereof; or for any of the materials or other things used or employed in performing the work; or for injury to any person or persons, either worker or the public; or for damage to property from any cause which might have been prevented by the Contractor, or its workers, or anyone employed by it; against all of which injuries or damages to persons and property the Contractor having control over such work must properly guard. The Contractor shall be responsible for any liability imposed by law upon the District, its officers, employees, or the Engineer for any damage to any person or property occurring or arising in the execution of a contract, agreement or permit or performance of the work, or occurring or arising out of the improper execution of a contract, agreement or permit or performance of the work, including such resulting from failure to abide by all applicable laws and regulations, or resulting from work or materials which are defective, unsatisfactory, or imperfect or whose defective, unsatisfactory, or imperfect nature is discovered during any guarantee period, and shall indemnify, defend, and save harmless the District, its officers and employees, and the Engineer from all suits, actions, claims and demands of every name and description, brought for, or on account of any such injuries or damages.

The Contractor shall be responsible for any liability imposed by law or for any damage to any person or property and shall indemnify, defend, and save harmless the county or incorporated city, its officers and employees, within the limits of the county or incorporated city work is being performed hereunder, all in the same manner and to the same extent as provided above for the protection of the District, its officers and employees, and the Engineer.

14-03 UTILITY FACILITIES

A particular effort has been made to locate and indicate on the Plans all aboveground and/or underground utilities and/or other facilities that may conflict with, cross or lie close to the work (See Section 5-05.E). While the locations shown are believed to be reasonably correct, neither the Job Engineer nor the District can guarantee the accuracy or adequacy of this information.

Prior to any excavation work, the Contractor shall contact Underground Services Alert, telephone number **(800) 227-2600**. The Contractor shall also arrange for all necessary suspension of service and make arrangements to physically locate and avoid interference with all existing facilities. The Contractor may make arrangements for alterations for its sole convenience (not actually required to complete the sewer installation); such alterations shall be made at the expense of the Contractor.

Where existing utilities and/or other facilities, aboveground and/or underground, are encountered during construction, they shall not be displaced or modified unless necessary. If it is necessary to relocate a facility, or if a facility is disturbed or accidentally damaged in the prosecution of the work, the Contractor shall notify the
District and the owner or proper authority and shall abide with the requirements of and cooperate with such owner or authority (who may enter upon the work at any time) while protecting, repairing, replacing or relocating such facilities. All abandoned pipelines that are severed during the work shall be immediately plugged by the Contractor with material specified in Section 23-01, unless otherwise authorized by the Engineer.

All utility and other facility arrangements, agreements, fees, locating, protection, repair, replacement, suspension of service, temporary relocations and all other work in connection with utilities and other facilities, shall be at no cost to the District. Necessary permanent relocation of utilities and other facilities to accommodate the sewer construction shall be at no cost to the District.

14-04 PRESERVING, REMOVING AND SALVAGING SEWERS AND OTHER IMPROVEMENTS

Existing improvements shall include all sewer lines, structures, monuments, fences, landscaping, trees, bushes, drainage facilities and structures of all kinds.

When an existing sewer line is cracked, broken, displaced or exposed, the District shall be immediately notified and the sewer line shall not be covered until the repair is made. No one, including contractors, utility companies and other public agencies, but District forces shall attempt to make necessary repairs to existing sewer lines unless otherwise ordered by the Engineer.

Unless otherwise specified or shown on the Plans or ordered by the Engineer, existing improvements along the alignment of the work, whether above or below ground, which are shown on the Plans or specified or designated by the Engineer to be removed and not salvaged, shall be removed and disposed of by the Contractor at its expense. Trenches or pits caused by the removal of existing improvements shall be backfilled with suitable material designated by the Engineer.

Existing improvements shown on the Plans or required by the Specifications or designated by the Engineer to be salvaged shall be carefully removed and stockpiled as directed by the Engineer.

14-05 SURVEY MONUMENTS

Various survey monuments consisting of nails, railroad spikes, iron pipe, concrete box with cast iron cover, concrete, wood, etc., are located along the centerlines of streets, at intersections, points of beginning and ending of curves, property corners, and other points. Where the installation of the sewers or other work of the contract may cause these monuments to be destroyed or disturbed, the Contractor shall notify the Job Engineer and the Contractor shall not disturb any monument or property corner that must be removed in the performance of his work until he has been advised by the Job Engineer that it has been properly referenced out for resetting. Should the Contractor disturb or remove any monuments or property corners due to its neglect, it shall be held responsible for the expense of their resetting by the Job Engineer.

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SECTION 15

CLEARING, GRUBBING AND DEMOLITION

15-01 DESCRIPTION

Clearing, grubbing, and demolition shall consist of removing all objectionable material from the sewer right-of-way, roadways, and areas through which work must be carried on. Clearing, grubbing, and demolition shall be performed in accordance with the requirements specified herein.

Where the construction is to be performed through orchard, vineyard, and other cultivated areas, the work shall be performed in a manner that will cause minimum damage.

Tree branches that have to be removed shall be cut off close to the boles in a workmanlike manner. If tree branches that extend over the work are removed, the Contractor shall remove other tree branches so that the tree will present a balanced appearance. Scars resulting from the removal of branches shall be treated with a heavy coat of tree seal.

Within sewer easements or rights-of-way, trees, shrubs, fences, and all other improvements that have to be removed to permit construction, shall be replaced (not including native trees under three (3) inches in diameter at the base and native brush) by the Contractor in kind and size or with substitutes acceptable to the property owner. Native trees larger than three (3) inches in diameter at the base shall not be removed without the Engineer's consent. The removal of any trees, shrubs, fences or other improvements outside of sewer easements or rights of way as deemed necessary by the Contractor, shall be arranged with the Owner, removed and replaced, if required, by the Contractor at its expense.

At locations shown on the Plans or where directed by the Engineer, portions of existing concrete pavement, curbs, gutters, sidewalks, foundations, and other concrete or mortared structures shall be removed to the lines and elevations specified or shown on the Plans or ordered by the Engineer.

Concrete removal operations in connection with the reconstruction of existing structures (Section 21-18) shall be performed without damage to any portion of the structure that is to remain in place. If damage occurs, the Contractor shall repair any such damage at its own expense, to the satisfaction of the Engineer. Where existing reinforcement is to be incorporated at new work, such reinforcement shall be protected from damage and shall be thoroughly cleaned of all adhering material before being embedded in new concrete.

Unless otherwise provided, material removed as above specified shall be broken into pieces not larger than two (2) feet in greatest dimension and disposed of in accordance

with these specifications.

15-02 REMOVAL AND DISPOSAL OF MATERIAL

Material removed as above specified shall be disposed of by the Contractor.

The right-of-way and adjacent areas shall be left with a neat and finished appearance. All slashings and other debris shall be disposed of and no accumulation of flammable material shall remain on or adjacent to the right-of-way.

Tree limbs and trunks (not including roots) over four (4) inches in diameter shall be cut into eight (8) foot maximum lengths and delivered to the property owner. If the property owner does not want the limbs, it shall be the Contractor's responsibility to properly dispose of them. Local fire ordinances prohibit burning of waste material. The disposal of all brush and other refuse shall be the Contractor's responsibility.

SECTION 16

EXCAVATION, BEDDING, AND BACKFILL

16-01 DESCRIPTION

Excavation and backfill shall consist of performing all operations necessary to excavate earth and rock from the trench or adjacent thereto when shown on the plans or ordered by the Engineer; to excavate all material, of whatever nature, necessary for the construction of foundations for structures, sewers, and drainage facilities; to place backfill around structures, sewers and drainage facilities, and over sewers, culverts, and drainage pipes; to backfill ditches, holes, pits and other depressions within the work area; to remove unsuitable material and replace with suitable material.

Water for compacting subgrades and for dust control caused by grading operations, excavation, backfill, and the passage of traffic through the work shall be applied by means that will ensure a uniform application of water. Dust resulting from the Contractor's operation shall be controlled and reduced to a minimum.

16-02 TRENCH EXCAVATION

Trench excavation shall consist of all excavation involved in the grading and construction of the sewer as herein specified, or as shown on the Plans.

A. Excavation - Prior to any excavation and backfill work, the Contractor shall obtain and provide the Engineer with copies or other evidence of acquisition thereof, all required permits for the work, including but not limited to: permits to do work in County roads or right-of-way; any bonds that may be required by encroachment permits for the work; District work permit; COSHA permit.

Excavation for sewers shall be made only after pipe and other necessary materials are delivered on the site of the work. After such delivery, trench excavation shall proceed as rapidly as possible, and the pipe installed and the trench backfilled without undue delay. The Engineer shall have the authority to limit the amount of trench to be opened or left open at any one time. In public street areas, excavation and pipe laying shall be coordinated to the end that a minimum of interference with public traffic will result.

For all trenching in existing streets, excavation and pipe laying shall be coordinated so that no more than one hundred (100) linear feet of trench will be open ahead of pipe laying during the normal work day for the operation. Backfilling operations shall closely follow pipe laying and no trench shall remain overnight without backfill. In new subdivisions more than 100 feet of trench may be opened if all the open trench is properly shored.

Where trenching occurs in paved areas, the pavement shall be blade cut or

scored and broken ahead of the trenching operations, and shall be cut or trimmed to a neat edge after backfilling and prior to repaving (See Section 16-03.G.). The proper tools and equipment shall be used in marking and breaking so that the pavement will be cut accurately and on neat lines parallel to the trench. Any pavement damaged outside these lines shall be re-cut and restored prior to final paving.

Trenching for all pipes, unless otherwise specified, shall be open cut to the lines and grades shown on the plans except those sections specifically indicated on the Plans or designated by the Engineer to be tunneled.

When trenching occurs in natural or filled ground which is neither paved nor intended to be paved, and the slope of such surface equals or exceeds a horizontal to vertical ratio of one to one (1:1), check dams shall be installed in conformance with Section 4-03.H.

Major roots (four [4] inches or greater in diameter) encountered in the course of excavation shall be exposed but not severed, and they shall be wrapped in burlap as a protective measure while exposed. Roots two [2] to four [4] inches in diameter) that are severed in the course of excavation shall be neatly trimmed.

Major roots of smaller trees and certain species may require additional care when excavating around or under these trees. The Engineer may require the Contractor to consult with a qualified arborist to determine methods to be used to protect these trees.

The Contractor shall remove all water that may accumulate in the excavation during progress of the work so that all work can be done in a dry trench. Trenches or other excavations shall be kept free from water while the pipe or structures are being 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 to cause no injury to public or private property or be a menace to the public health.

If the Contractor finds it necessary to employ the use of explosives, see Section 13-06. Excessive blasting will not be permitted, and any material outside the authorized cross-section that may be shattered or loosened by blasting shall be removed. The Engineer shall have authority to require the Contractor to discontinue any method of blasting which leads to overshooting or is dangerous to the public or destructive to property or to natural features. The hours of blasting shall be fixed by the Engineer, but will be during daylight. All loose material shall be removed from the bottom of the trench prior to placement of any bedding material.

B. Trench Width - Trenches shall be excavated to the widths as shown below with full depth vertical sides where possible. Minimum vertical trench shall be from pipe flow line to a point two (2) feet above top of pipe. Any over-width trench

- C. whether by over excavation, cave-in, or by ground movement, will require special pipe and/or special backfill, as directed by the Engineer.
 - 1. Trenches for sewer mains shall be sixteen (16) inches wider than the external diameter of the barrel of the pipe to be used in the trench.
 - 2. Trenches for side sewers up to three and one-half (3 1/2) feet in depth shall be eighteen (18) inches in width. Trenches for side sewers greater than three and one-half (3 1/2) feet in depth shall be twenty-four (24) inches in width.

Where shoring is required (see Section 16-02.C.) and sheathing is used, the width of the trench shall be increased only by the thickness of the sheathing.

D. Shoring - The Contractor shall ensure that all shoring for open excavations conforms to the requirements herein and to the requirements of the State of California, Department of Industrial Relations, Division of Occupational Safety 'Construction Safety Orders' (latest edition thereof), which are hereby adopted by reference as part of these Specifications.

The Contractor shall be responsible for adequately shored and braced excavations so that the earth will not slide, move, or settle and so that all existing improvements of any kind will be fully protected from damage. The protection of adjacent structures from movement of the ground and the elimination of the element of danger to life, property, or to existing improvements is the purpose of shoring the trench. All trenches with depth of five (5) feet or over shall be properly shored at the time of excavation.

Removal of shoring shall only be accomplished during backfill operations and in such a manner as to prevent any movement of the ground or damage to the piping or other structures.

When the Engineer requires that sheet piling, lagging and bracing be left in place, such materials shall be cut off where designated and the upper part withdrawn.

Undisturbed material outside the planned excavation slopes, which is unstable in the opinion of the Engineer and constitutes a potential slide, and material which has already come into the excavation, shall be removed to the lines designated by the Engineer.

It shall be the Prime Contractor's responsibility to obtain, at its own expense, all permits for any excavations over five (5) feet in depth into which a person is required to descend or any excavation less than five (5) feet in depth in soils where hazardous ground movement may be expected and into which a person is required to descend. Permits for such excavations shall be obtained from COSHA. The District reserves the right to require the Contractor to file a copy of

said permit with the District prior to any work permit issuance in conformance with Section 10-01. Should conditions of the work or types of soils be encountered which require the use of unique methods of shoring or should a situation arise which, in the opinion of the Engineer or COSHA requires additional or modified shoring other than that specified in said Safety Orders, the Contractor shall submit such revised shoring details, as required, to COSHA prior to starting any work so affected.

- D. Signing Whenever a contractor is working in an existing street, motorists must be given proper advance warning of the operation. Contractors shall place warning signs on either side of their work area. Placement of signs and barricades shall be in accordance with the requirements set forth in the current <u>Manual of Traffic Controls for Construction and Maintenance Work Zones</u> issued by the State of California, Department of Transportation. If the width of the pavement and/or drivable shoulder is less than twenty (20) feet or if two lanes of traffic cannot safely pass the area of work, flaggers must be used to control the flow of traffic. See Section 13-05 of these Specifications.
- E. Disposal of Excavated Material Excavated material to be used for backfill shall be laid alongside of the trench and kept trimmed up so as to cause as little inconvenience as possible to public travel and the normal use of adjacent properties. Free access must be provided to all fire hydrants, water gates, meters, and private drives. Gutters or other drainage ways shall be kept clear unless other provisions are made for handling drainage.

All material excavated in streets, roadways, and rights of way, which is determined unsuitable for use as backfill or in excess of the amount required for backfilling, shall be removed immediately and disposed of as described in Section 13-07 of these Specifications.

F. Unsuitable Material - In advance of placing sewer pipe, existing material within the area where such pipe is to be placed, which in the opinion of the Engineer is unsuitable as a foundation for the pipe, including but not limited to vegetable matter, garbage, and junk piles, either on the surface or buried, shall be removed in its entirety and disposed of in accordance with the provisions of Section 13-07 of these Specifications.

In rock excavation or a mixture of rock and earth excavation, such material shall be loosened and broken up for the full width of the trench so that no ribs, rocks, or solid projections will be within six (6) inches of the sewer pipe. The material thus broken up shall be removed and disposed of in accordance with the provisions of these Specifications.

Where the bottom of the trench becomes soft or is unstable due to groundwater and/or movement of construction equipment, the Contractor shall remove a minimum of nine (9) inches of unsuitable material or to a depth as otherwise directed by the Geotechnical Engineer. Geotextile fabric shall be placed on the trench bottom and course bedding material shall be placed on the fabric in conformance with Section 16-03.A of these specifications.

The geotextile fabric placed on the native ground below the coarse pipe bedding shall be non-woven fabric consisting of polymeric filaments formed into a stable network. The fabric shall be inert to commonly encountered chemicals, rot-proof, and resistant to ultra-violet light exposures, insects, and rodents.

The geotextile fabric shall have a minimum grab tensile strength of 100 pounds in any direction, as measured in accordance with ASTM D1682, a Mullen burst strength of at least 200 pounds per square inch per ASTM D3786, and Equivalent Opening Size (EOS) no larger than U.S. Standard Sieve Number 50, as determined by U.S. Corps of Engineers Specification CW-02215.

16-03 TRENCH BACKFILLING

Trench backfill shall consist of all materials returned to an excavation in the process of constructing a sewer line and/or appurtenances. No backfill shall be deposited over a sewer line and/or appurtenances until pipe laid has been inspected. Backfill operations shall closely follow pipe laying, and the Contractor shall ensure no trench shall remain overnight without backfill or shoring and trench plates.

- A. Except for required foundation material (in an envelope of geotextile fabric) or coarse bedding material being placed in over-excavated areas, where water or soft ground is present, backfill shall not be placed until after all water is removed from the excavation.
- B. Replacement of Unsuitable Material Materials excavated as being unstable or otherwise unsatisfactory in the vicinity of the sewer construction shall be replaced as follows:
 - 1. Material removed as unsuitable foundation for sewer construction shall be replaced with Coarse Bedding material (see Section 16-03.D.2.b) and compacted to achieve a firm trench bottom.

Under drains shall be installed as shown on the Plans or as directed by the Engineer and shall be constructed in accordance with the Specifications and details of Section 28-30.

- 2. Over-excavation below the construction grades of the sewer work shall be restored by placing and compacting standard bedding material to the proper grade prior to any sewer construction.
- 3. All unsuitable material (including slide, cave-in, etc.) which enters the excavation after pipe or other sewer construction materials have been placed in the excavation, shall be removed from the excavation prior to any backfilling with the specified bedding and/or backfill material.

C. Bedding Details - Attention is directed to CCCSD Standard Drawing DWG14 and DWG16 for applicable pipe bedding details. Unless otherwise specified, Bedding DWG14 shall be used in the design and construction of all sewer system pipelines in compliance with the minimum and maximum cover limitations tabulated for the various pipe sizes, types and strength classes. Bedding Details and cover dimensions other than those specified shall require approval of the Engineer.

Six inches of Standard Bedding Material shall be placed under precast manhole bases, where allowed, and shall be compacted to a relative compaction of ninety (90) percent per ASTM/D1557-78, Moisture-Density Relations of Soils and Soil-Aggregate Mixtures (Laboratory) and ASTM 02922-81, Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Field). Precast manhole bases, where allowed, shall be installed in accordance with Section 21-13.

- D. Bedding Material
 - 1. Standard Bedding Material shall be ³/₄" crushed rock, free from vegetable matter and other deleterious substances and shall form a firm, stable base when compacted.

The percentage composition by weight shall conform to the following grading:

SIEVE SIZES	PERCENTAGE PASSING		
1 "	100		
3/4"	87-100		
No.4	30-60		
No. 30	5-35		
No. 200	0-12		

The material shall also conform to the following quality requirements:

TESTS	CALIF. METHOD NO.	REQUIREMENTS
Resistance (R-Value)	301	78 Min.
Sand Equivalent	217	28 Min.

- 2. As determined by the Engineer, "Class 2 Aggregate Base" may be used in lieu of "standard bedding material". Class 2 Aggregate Base shall be newly quarried or recycled material (not mined alluvial material), and shall be certified by the quarry or recycler as complying with the provisions of Caltrans Specifications Section 26 (Class 2 Aggregate Base) for three-quarter (3/4) inch maximum grading.
- 3. The use of other special pipe bedding will be determined by the Engineer.

a. Fine bedding material shall be clean mineral aggregate free from deleterious substances, having a minimum sand equivalent of seventy-five (75) and conforming to the following grading requirements:

PERCENTAGE PASSING		
	100	
	90-100	
	40-100	
	0-60	
	0-45	
	0-3	
	90-100 40-100 0-60 0-45 0-3	

Pea gravel and backfill sand are common types of "fine bedding material".

b. Coarse bedding material shall be used under fine bedding material or TYPE I Backfill Material when conditions warrant or when ordered by the Engineer. Coarse bedding material shall be clean rock conforming to the following requirements:

GRADING LIMITS (CALIF. METHOD NO.202) SIEVE SIZE	PERCENTAGE PASSING		
2"	100		
1-1/2 "	90-100		
3/4"	5-30		
3/8"	0-5		
No. 200	0-2		

Unless otherwise ordered by the Engineer, the minimum vertical dimension of special bedding materials shall be six (6) inches under main sewers and nine (9) inches under trunk sewers.

- 4. Bedding around the pipe in restricted areas (tunnels, bores, casings, etc.) shall be placed by blowing sand in around the pipe or by the use of other suitable methods or materials accepted by the Engineer.
- 5. Bedding in trenches shall be placed uniformly on each side of the pipe to prevent displacement. Bedding shall be graded by hand to provide a uniform surface on which the sewer pipe is to be laid.
- 6. Bedding materials shall be compacted to a minimum of ninety (90) percent relative compaction and all bedding material shall be carefully handled to

prevent intrusion of foreign materials. Compaction tests may be required on a job by job basis. The Engineer may indicate the required tests on the Plans for the project or require that tests be taken during the construction of the project.

- E. Backfill Backfill is considered to be all material placed in the trench between the pipe bedding and the roadbed or ground surface. All backfill material shall be placed and consolidated in such a manner as to permanently prevent damage to the sewer, roadbed, road surfacing, and private property, or inconvenience to the public. Neither "recycled" backfill nor "recycled" bedding shall be used.
 - 1. Backfill Materials shall be referred to by the following types.
 - a. Type I: Type 1 Backfill Material shall be the same as standard bedding material.
 - b. Type II: Type II Backfill Material (Aggregate Subbase) shall be free from vegetable matter and other deleterious substances and shall conform to the following grading requirements:

SIEVE SIZES	PERCENTAGE PASSING		
2-1/2"	100		
No.4	25-60		
No. 200	0-11		
No.4 No. 200	25-60 0-11		

The material shall also conform to the following quality requirements:

CAL	IF. METHOD	
TESTS	NO.	REQUIREMENTS
Resistance (R-Value)	301	55 Min.
Sand Equivalent	217	25 Min.

- c. Type III: Type III Backfill Material (Trench Material) shall be free from vegetable matter and refuse and shall contain no concrete, stones or clods larger than four (4) inches in diameter and shall contain sufficient fines so that all voids will be filled when compacted, and shall be so constituted that compaction requirements can be met.
- d. SELECT TYPE III: SELECT TYPE III Backfill Material (trench material) shall meet all requirements of the above described TYPE III Material except that the maximum particle size shall be three-quarters (3/4) inch in diameter.

- e. Type IV: Type IV Backfill Material (Controlled Low Strength Material or CLSM shall be provided in lieu of Type I Bedding and Backfill Material where indicated on the Plans, and in accordance with Section 31, Controlled Low Strength Material. Contractor shall provide a method to prevent pipe from floating during backfill. (The remaining portions of the trench shall be backfilled as specified elsewhere in this Section.)
- 2. Procedures and Required Materials for backfilling the various depths and types of trenches are covered in the following classes of backfill work:
 - a. All trenches in roadways, driveways, shoulders, parking, and other paved areas and any excavation for repairs shall be backfilled with TYPE I Backfill Material, unless otherwise directed by the District.
 - b. Trenches in landscaped or cultivated areas shall have the top twelve (12) inches backfilled with approved topsoil.
 - c. Trenches in new subdivisions may be backfilled from the top of the pipe bedding to the subgrade with Type III backfill.
 - d. Other Trenches All trenches other than those in existing paved areas may be backfilled from the top of the pipe bedding to the finish grade with TYPE III Backfill unless otherwise specified.
 - e. Trench Maintenance All backfilled trenches within roadways shall be maintained in a smooth, safe, passable manner at all times until final compaction and paving are completed.
- 3. Earth Trench Dams (Sec. 28-53) shall be constructed over side sewers at property line or at the easement line, at locations indicated on the Plans and at locations designated by the Engineer.
- F. Compaction of Backfill
 - 1. Compaction of backfill material may be accomplished by mechanical tamper, by vibrating, by jetting or by a combination of these methods. Jetting of trench backfill will be permitted only when, in the written opinion of the Owner's Geotechnical Engineer, such backfill and surrounding ground are of such character that they will not soften or be otherwise damaged by applied waters. Jetting shall be supplemented by the use of mechanical compaction equipment to obtain the relative compaction requirements of these Specifications.

Jetting may be accomplished as follows or under the direction of a Geotechnical Engineer: by introducing water into the backfill by means of a jet pipe. The jet pipe shall be not less than one (1) inch in diameter and

shall extend to within fifteen (15) inches of the top of the sewer pipe during jetting. The source of water for jetting shall be a pressure hydrant or a water tank with a minimum pressure of sixty (60) pounds per square inch. All "bridges" in backfill shall be completely broken down during the jetting process without flooding. Proceeding upgrade, jet points along the line of the ditch shall be staggered from side to side at intervals not to exceed six (6) feet center to center or as necessary to ensure that the backfill takes full possible subsidence while water is being introduced into it through the jet pipe. When this method of consolidation is permitted either by the District or other agency having governing controls on such method, the backfill shall be placed in lifts or steps complying with the specific requirements of such agency having jurisdiction. Under no conditions shall successive lifts or steps of backfill placements to be jetted exceed six (6) feet in height.

- 2. For trenches in County roads, the relative compaction of trench backfill from the pipe bedding up to the subgrade or base of surfacing replacement shall be not less than ninety (90) percent.
- 3. Aggregate subbase or aggregate base shall be compacted to a minimum of ninety (90) percent relative compaction.
- 4. Standards designated above for County roads will be used.
- 5. Trench work within State Highway rights of way requires a specific permit to be obtained from Caltrans. Unless otherwise noted on the permit, all backfill will be compacted as specified above for County roads.
- 6. Trench backfill in private roadways and/or in other paved areas shall be placed and compacted in accordance with the requirements for County roads.
- 7. Type III Backfill Material not under pavement shall be compacted to a minimum of eighty (80) percent relative compaction. Jetting may be used for compaction if recommended by the Owner's Geotechnical Engineer.
- 8. Type IV Backfill Material shall be installed in accordance with Section 31.
- 9. All bedding material around plastic pipe specified in Section 18-01.D of these Specifications, excluding ABS Composite 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 three (3) inches over the top of the pipe. Each above-mentioned stage shall be compacted by hand or mechanical tamping to a minimum of eight-five (85) percent. No jetting of bedding materials will be permitted.

10. Relative compaction tests are required on a job by job basis. Tests shall conform to ASTM 01557-78 (Laboratory) Moisture-Density Relations of Soils and Soil-Aggregate Mixtures and ASTM 02922-81 (Field) Density of Soils and Soil-Aggregate in Place by Nuclear Methods, unless specified otherwise by the Geotechnical Engineer for the particular job. Test results shall be expressed in terms of percent relative compaction, optimum moisture content in percent and maximum dry density in pounds per cubic foot. The Engineer may indicate the required tests on the plans for the project and may require that tests be taken during the construction phase of the project.

Where sewer work falls within existing public road areas, compaction is required (See Section 28-24). The Geotechnical Engineer for the job will specify the number, location and nature of the tests.

Confirmation, in writing, that all compaction has been satisfactorily <u>completed</u> shall be submitted by the Geotechnical Engineer prior to the installation of final pavement.

- G. Temporary Paving The same day the trench is backfilled, it will be graded to conform to the existing surface and temporary pavement consisting of a minimum of two (2) inches of premixed asphaltic paving material will be placed over the trench. Temporary pavement shall be maintained in a safe and driveable condition until permanent paving is placed.
- H. Permanent Surfacing Replacement During sealing or paving operations, all structure surface castings shall be protected from being covered. No adhesive materials that would affix to the top of said castings or otherwise fill frame and cover joints will be permitted.

Temporary pavement shall be removed and permanent pavement shall be installed within two (2) weeks after backfilling and compacting unless otherwise specified by the District or County. The permanent pavement shall be maintained to the satisfaction of the Engineer for the full guarantee period or until relief from maintenance is obtained in writing from the Owner or Agency maintaining the paved area.

- 1. Public Streets Surfacing replacement in public streets and highways shall conform to the requirements of the Agency maintaining such streets and highways, but in no case will consist of less than the following:
 - a. Asphaltic pavement shall be replaced with an equal thickness of Asphalt Concrete or two (2) inches of Asphalt Concrete, whichever is greater.
 - b. Portland Cement Concrete pavement shall be replaced with an equal thickness of concrete, but not less than nine (9) inches, with

the top of the replacement level with the top of existing concrete pavement. Paving materials above the concrete pavement shall be replaced with Asphalt Concrete.

- c. Excavations backfilled with TYPE II (or better) backfill shall be restored with twelve (12) inches of Aggregate Base under paving.
- d. Unpaved public streets, and public street areas outside of the traveled way but used by traffic, shall be surfaced with a minimum of six (6) inches of Aggregate Base.
- 2. Areas Other Than Public Streets Paved or surfaced area other than public streets (such as private driveways) shall be restored by replacement of identical pavement and base when practical. Portland Cement Concrete pavement shall be replaced in kind, and color shall be matched. Asphaltic pavements shall be replaced with an equal or greater thickness of Asphalt Concrete, but in no case will less than two (2) inches be applied over trench areas. Base material will be replaced with a minimum of six (6) inches of Aggregate Base.

16-04 CASING, BORES, AND TUNNELS

For sewer lines within utility, road or railroad rights-of-way requiring tunnels, bores, and/or special pipe, the special pipe shall extend the entire length of the sewer within the particular right-of-way, unless otherwise designated by the Engineer.

A. Bores - Where a casing or sewer pipe is installed in a bored hole, whether wet or dry, 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 two (2) inches larger in diameter than the maximum outside diameter of the casing or sewer pipe to be placed therein.

When designated on the plans, permit, or by the Engineer in writing, metal casing shall be placed in a bored hole under the area to be crossed. Metal casings, when required, shall have a minimum wall thickness as shown on the Plans and have an inside diameter not less than eight (8) inches greater than the largest outside diameter dimension of the sewer pipe to be installed therein. All metal casing used for any particular bore shall be the same throughout the limit of such bore. All bore and/or jacking pit shoring shall comply with Section 16-02.C of these Specifications.

After the casing has been installed, redwood planks with guide strips nailed thereon shall be inserted and blocked or wedged securely to grade. The previously jointed sewer pipe shall be placed thereon and slid along the guide planks into the casing. Standard jointing material shall be used on all sewer pipe placed in casings. If other than Ductile Iron pipe is used, a double joint immediately outside the casing is required to provide flexibility.

When casings or sewer pipes are jacked, guide rails shall be accurately set to the line and grade so that the pipe, while being jacked will be guided along the prescribed line and grade.

A rigid backstop shall be erected to withstand the full thrust of the jacks during the process of installing the pipe. Jacks and bearing frame with necessary blocking shall be provided of sufficient strength and number to propel the pipe forward as excavation progresses ahead of the forward end of the pipe.

Main or side sewer pipes installed in tunnels or bores without casings shall be ductile iron (Class 53 or better).

B. Tunnels - Where tunnels or casings are required or permitted, they may be drilled as specified in Section 16-04.A above for bored holes, or they may be excavated by standard tunnel operations using shoring methods in accordance with the requirements of COSHA.

Upon written request, the Engineer may allow the tunnel to be dug by hand by men digging just ahead of and from within a metal casing that is being jacked. Work performed in this manner shall be done in accordance with special conditions prepared by the Job Engineer and reviewed by the Engineer.

Trunk sewer pipe installed in tunnels or bores shall be shown on the Plans.

C. Backfill - After the main or sewer pipe is secured in place, a sand or concrete backfill shall be placed that completely fills the annular space between sewer pipe and casing and any annular space exceeding the specified clearance of two (2) inches between the sewer pipe or casing and bore or tunnel, as directed by the Engineer. Except for railroad rights of way, no backfill is required between the sewer pipe and casing if the sewer pipe is Ductile Iron.

16-05 STRUCTURE EXCAVATION AND BACKFILL

Structure excavation shall consist of the removal, to the lines designated on the plans or specified or ordered by the Engineer, of all material of whatever nature necessary for the construction of foundations and other structures and other excavation specifically designated on the Plans or in these Specifications.

Structure backfill shall consist of placing and compacting, to the lines designated on the Plans or specified or ordered by the Engineer, backfill material around structures and other backfill specifically designated on the Plans or in these Specifications as structure backfill.

Structure excavation and backfill shall include the furnishing of all equipment and the

construction or installation of all cofferdams and other facilities which may be necessary to perform the excavations and place and compact the backfill, and the subsequent removal of such facilities except where they are required or permitted by the Plans or Specifications to remain in place.

A. Excavation - All excavation for structures shall be done to the dimensions and levels indicated on the plans or specified herein. Excavation shall be made to such width outside the lines of the structure as may be required for proper working methods, the erection of forms, and the protection of the work. Care shall be taken to preserve the foundation surfaces shown on the Plans in an undisturbed condition.

If the Contractor over-excavates or disturbs the foundation surfaces shown on the plans or specified herein without written authorization of the Engineer, the Contractor shall replace such foundations with compacted, standard bedding material (See Section 16-03.C) in a manner that will show by test an equal bearing quality with the undisturbed foundation material. If the Contractor encounters ground water and/or unsuitable foundation material, it shall increase the depth of excavation to a minimum of nine (9) inches below the required concrete base of the structure. The over-excavation (min. 9") shall be backfilled with Coarse Bedding Material (See Section 16-03.C) and compacted to a relative compaction of ninety (90) percent.

If the Contractor excavates beyond the limits that are specified for poured-inplace manhole bases, it shall install forms so that the concrete base, when poured, will conform to the dimensions shown on the details or Plans.

The Contractor shall notify the Engineer when excavation for a structure is complete and no forms, reinforcing steel, concrete, or pipe shall be placed until the excavation has been inspected by the Engineer.

B. Foundation Treatment - When footing concrete or masonry is to rest upon rock, the rock shall be fully uncovered and the surface thereof shall be removed to a depth sufficient to expose sound rock. The rock shall be roughly leveled off or cut to approximate horizontal and vertical steps and shall be roughened.

When piles are to be used, the Contractor will be permitted to excavate a sufficient distance below the bottom of the footing as shown on the plans to take care of swell due to driving piles. After the piles are driven, if it is found that the ground has risen above plan grade, the Contractor shall remove such surplus material. After the piles are driven, if it is found that the surface of the ground is below plan grade, the Contractor shall backfill to the plan grade with standard bedding material (See Section 16-03.C).

In order to determine the character of the foundation material, the Contractor shall, if ordered by the Engineer, dig test pits and make test borings and foundation bearing tests.

- C. Inspection Whenever any structure excavation is completed to the grade of the bottom of the footing shown on the plans, or as set forth in the special provisions or ordered by the Engineer, the Contractor shall notify the Engineer, who will make an inspection of the elevation and character of the foundation. No footing concrete or masonry shall be placed in a footing until the Engineer has inspected the elevation and character of the footing.
- D. Backfill Structure backfill operations shall conform to the requirements of this section.

Backfill material for all structures that are to be installed in existing streets shall be Type II Backfill Material as specified in Section 16-03.D.1.b of these Specifications. Structure backfill in areas other than streets may be native material free from stones and lumps four (4) inches and larger, vegetable and other deleterious matter resulting from structure excavation, when permitted by the Engineer.

Material resulting from structure excavation and not used as structure backfill shall be disposed of as specified in Section 13-07.

Structure backfill shall not be placed until the structure footings or other portions of the structures or facilities to be below ground line have been inspected by the Engineer. No backfill material shall be deposited against outside walls of concrete structures until the concrete has developed a strength of 2,500 pounds per square inch in compression as determined by test samples cured under conditions similar to those prevailing at the site and tested in accordance with standard methods.

All structure backfill material shall be placed in horizontal layers not exceeding eight (8) inches in loose thickness and brought up uniformly on all sides of the structure to avoid bending or distortional stresses. Each layer of backfill shall be moistened as required and thoroughly tamped, rolled or otherwise compacted until a relative compaction of not less than ninety (90) percent is achieved. Compaction by jetting or ponding may be allowed by the Engineer for import granular backfill materials and backfills placed outside of existing streets under the provisions and requirements of Section 16-03.E and/or Section 21-14.D of these Specifications.

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SECTION 17

EMBANKMENT CONSTRUCTION

17-01 DESCRIPTION

Embankment construction shall consist of the construction of fills, including the preparation of the ground areas upon which they are to rest; the construction of earth dikes for site protection; the placing and compacting of material within areas where unsuitable fill foundation material has been removed; and the placing and compacting of embankment material in holes, pits and other depressions within the work area.

Water for embankment construction and for dust control caused by grading operations and the passage of traffic through the work shall be applied by means of distributors equipped with a spray system that will ensure a uniform application of water. Dust resulting from the Contractor's operation shall be controlled and reduced to a minimum.

17-02 GENERAL REQUIREMENTS

The relative compaction of the natural ground area upon which embankments are to be constructed, for a depth of not less than three (3) feet below finished grade, shall be not less than ninety (90) percent. Relative compaction tests are required on a job by job basis. Tests shall conform to ASTM 01557-78 (Laboratory) moisture-density relations of soils and soil-aggregate mixtures and ASTM 02922-81 (Field) density of soils and soil-aggregate in place by nuclear methods, unless specified otherwise by the Geotechnical Engineer for the particular job. Test results shall be expressed in terms of percent relative compaction, optimum moisture content in percent and maximum dry density in pounds per cubic foot. The Engineer may indicate the required tests on the Construction plans for the project and he may require that tests be taken during the construction phase of the project.

Where sewer work falls within existing public road areas, off-site to subdivision construction, compaction tests are required (See Section 28-24). The Geotechnical Engineer for the job will specify the number, location and nature of the tests. Confirmation, in writing, that all compaction has been satisfactorily completed, shall be submitted by the Geotechnical Engineer prior to the installation of final pavement.

If finished grade is less than three (3) feet above natural ground, the natural ground shall be excavated to a depth of not less than three (3) feet below finished grade and recompacted to a relative compaction of not less than ninety (90) percent. Embankment material shall be placed in layers not exceeding eight (8) inches in loose thickness before compaction and each layer shall be compacted to a relative compaction of not less than ninety (90) percent.

When embankments are to be made and compacted on hillsides, or where new fill is to be compacted against existing embankments, the slopes of the original hillside, old or new fill, shall be cut into a minimum of six (6) feet horizontally as the work is brought up in layers. Material thus cut out shall be recompacted along with the new fill.

Whenever selection is possible, embankment material having a sand equivalent value of less than ten (10) shall be deposited in the lower portions of embankments and no such material shall be placed within three (3) feet of planned finished grade.

When the embankment material consists of large rocky material or hard lumps such as hardpan or cemented gravel that cannot be broken readily, such material shall be well distributed throughout the embankment, and sufficient earth or other fine material shall be placed around the large material as it is deposited so as to fill the interstices and produce a dense compact embankment. In no case shall any material exceed twenty-four (24) inches in any dimension.

17-03 COMPACTING

Embankments shall be constructed in compacted layers of uniform thickness and each layer shall be compacted by means of compacting equipment with the following two exceptions. Sidehill fills, where the width, including bench cuts for bonding existing and new embankments, is too narrow to accommodate compacting equipment, may be placed by end dumping until the width of the embankment, including benching, becomes great enough to permit the use of compacting equipment, after which the remainder of the embankment shall be placed in layers and compacted as specified. Where embankments are to be constructed across low swampy ground that will not support the weight of trucks or other hauling equipment, the lower part of the fill may be constructed by dumping successive vehicle loads in a uniformly distributed layer of a thickness not greater than that necessary to support the vehicle while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified.

At the time of compaction, the moisture content of embankment material shall be such that the relative compactions specified will be obtained and the embankment will be in a firm and stable condition. Embankment material that contains less than the required moisture content shall be watered and material that contains excessive moisture shall not be compacted until the material is dry enough to obtain the required compaction.

SECTION 18

SEWER PIPELINES

18-01 MATERIALS

- Α. General - All pipe installation procedures and materials shall be in accordance with the pipe manufacturer's recommendations where not modified under the various types of pipeline materials specified herein. A current list, referred to as "Approved Material List", of all pipe, fitting and joint materials specifically approved by the Engineer as conforming to these Specifications and for use in sewer pipeline installations under the jurisdiction of the District is on file and available at said District offices. Pipe, pipe products and/or pipe specifications not appearing on said "Approved Material List" shall not be used within the District without approval of and written authorization from the Engineer. All pipe sizes refer to the nominal inside diameter of pipe (including any pipe linings) and no pipe, except were specified herein, shall be more than one-quarter (1/4) inch smaller than the nominal size designated. All pipe, pipe joints incorporated into the pipe, and manufactured fittings connecting pipe between structures shall be of one and only one manufacturer's brand and of the same type, quality, class and size. Jointing of pipe dissimilar in size and/or material shall be accomplished either by use of an Expansion Block as detailed and specified under Section 28-40 of these Specifications or by use of special adapters or couplings accepted by All field cut pipe shall be accomplished with the Engineer for such use. equipment recommended by the pipe manufacturer. No hammer and chisel cuts will be permitted. All pipe and fittings delivered to the jobsite shall be marked by the manufacturer with such inventory and identification (Brand Name, Pipe Type, Strength Class, Batch Lot, Lengths, etc.) as to be properly identified in the field as meeting the requirements herein and for the work.
- B. Banded rubber couplings for use in the joining of new pipe or repair of existing pipelines shall be compression type "Band-Seal" couplings with external adjustable stainless steel shear rings, Mission Clay Products Corp., or "Ceramicweld" couplings Joints, Inc., or approved equal. Use of couplings without external shear support, or couplings with shear rings in direct contact with the pipe at joints, (internal of the rubber collar), will not be permitted except when joining dissimilar pipe (e.g. clay to cast iron).
- C. Rigid Pipe Rigid pipe, fittings and joint materials specified herein consists of Vitrified Clay Pipe (VCP), Cast Iron Pipe (CIP), Reinforced Concrete Pipe (RCP), Concrete Lined Steel Cylinder (CL), Concrete Lined and/or Coated (CL&C), and Ductile Iron Pipe (DIP). See Section 18-02.D for repair procedures for rigid pipe in new construction.
 - 1. Vitrified Clay Pipe All VCP and fittings shall conform to the requirements of ASTM Designation C 700 as it applies to <u>high strength</u>, unglazed vitrified clay pipe.

- a. Resilient material conforming to the requirements of ASTM Designation C 425 shall be used for VCP Jointing.
- b. Rubber couplings used to join plain end VCP shall conform to the material and performance requirements of ASTM Designation C 594.
- 2. Cast Iron Pipe All CIP, for use in side sewer installations only, shall conform to the requirements of ASTM Designation A-74 as it applies to Single Hub, extra heavy and service weight pipe. Service weight, Class SV, pipe shall be the normal requirement of CIP installations; however, the Engineer may require use of extra heavy, Class XH, pipe under special conditions. CIP may be installed without the use of foundation bedding material where such trench bottom provides solid bearing for the full length of the pipe.

Cast Iron "No-Hub" pipe and fittings may only be used for four (4) and six (6) inch side sewers and, at a minimum, shall conform to the requirements of the Cast Iron Soil Pipe Institute, (CISPI), "Standard No. 301". "No-Hub" pipe shall be installed in accordance with CISPI Pamphlet No.100 using only "No-Hub" couplings, except where otherwise designated by the Engineer for dissimilar joints. Minimum cover for "No-Hub" installations in traffic areas shall be three (3) feet.

Maximum deflection permitted per "No-Hub" joint shall be ten (10) inches per ten (10) foot length of pipe or appropriate ratio thereof. Use of a properly calibrated torque wrench for jointing shall be mandatory.

3. Ductile Iron Pipe - All DIP and fittings for main and trunk sewers shall conform to the requirements of ANSI Standards A21.52 (<u>Class 52</u>) as they apply to Ductile Iron Pipe. All main and trunks sewer DIP and fittings shall be of sufficient thickness to withstand the depth of cover under the laying conditions and provisions of Section 4-02.C of these Specifications. There are no special lining or coating requirements; however, bituminous material coated or concrete coated and/or lined pipe conforming to the requirements of ANSI Standard A21.4 may be used.

All DIP shall be shown on construction drawings by type and thickness class designations herein.

a. Bell and spigot joint assemblies shall conform to the requirements of Federal Specification WW-P-421c, Section 3.1.2 as it applies to TYPE II, Grades B or C pipe.

- b. Standardized mechanical joint assemblies shall conform to the applicable requirements of ANSI Standards for the pipe specified and ANSI Standard A21.11.
- c. Lead caulked joint assembles will not be permitted.
- d. No joint will be required immediately outside of structure bases for all DIP installations.
- e. DIP may be installed without use of foundation bedding material where trench bottom provides solid bearing for the full length of pipe between bell holes, where such installation otherwise meets the requirements of these Specifications and as approved by the Engineer.
- f. The minimum radius for DIP shall be as shown on Section 28-31 of these Specifications.
- 4. Reinforced Concrete Pipe All RCP and fittings shall conform to the requirements of either ASTM Designations C76 or C361, as modified hereunder:
 - a. Where not otherwise modified by these Specifications, all provisions of the above-mentioned ASTM Designations shall govern.
 - b. The basis of acceptance of RCP manufactured in compliance with these Specifications shall be in accordance with Section 4.1.1 of ASTM Designation C76 and as follows:
 - i. Engineer review of submittals required under Sections 18-01.C.4.b.3, d.4, and f.7 of these Specifications.
 - ii. Three-edge bearing test loads shall be applied to the extent that no greater than a O.O1-inch crack is produced in tested pipe sections. Applied test loading may be terminated without producing a 0.01-inch maximum crack if or when such loading has reached one hundred twenty-five (125) percent of that required for and related to the specified Dload for the subject pipe.
 - iii. Test results shall be submitted to the District prior to shipment to the project jobsite. Results shall indicate the District-assigned project number, agency and operator performing the test, test date, pipe size and specified D-load and ultimate test load applied.

- c. Materials shall comply with Section 5 of the appropriate ASTM Designation under which the subject pipe is to be manufactured, modified as specified hereunder:
 - i. Cement used in the manufacture of RCP shall be TYPE II in conformance with ASTM Designation C150.
 - ii. Aggregates used shall consist of granitic, calcareous or combinations thereof such that the concrete material samples for testing alkalinity in conformance with Section 18-01.C.4.f of these Specifications shall exhibit a total Carbonate equivalence of not less than fifty (50) percent.
 - iii. No admixtures shall be introduced to concrete mixes without specific District authorization. Authorization for admixture or blend usage for pipe for a given project shall not be considered a general use authorization for subsequent projects unless so stated.
 - iv. Rubber for gaskets shall comply with the requirements of Section 2.11 of AWWA Standard C302.
- d. Design shall comply with Sections 6 and 7 of appropriate ASTM Designation under which the subject pipe is to be manufactured, modified as specified hereunder:
 - i. All RCP shall be designed for anticipated trench loads calculated in conformance with Section 18-01.C.4.g of these Specifications, combined with a minimum head of at least twenty-five (25) feet. However, in no case shall pipe design under ASTM C76 provisions be less than that specified therein for CLASS III (1350-D), nor shall pipe design under ASTM C361 provisions be less than that specified therein for Class B.
 - ii. Total concrete cover of reinforcement at the inner wall, (clearance of steel surface to inner wall surface), shall not be less than one (1) inch, regardless of pipe diameter size or type and placement configuration of reinforcement.
 - iii. Joint assembly design shall be reinforced concrete bell and spigot type incorporating a fully retained, single rubber gasket in accordance with Section 3.3 of AWWA Standard C302.
 - iv. Manufacturer's design drawings for each project shall be submitted to the Engineer for review prior to fabrication.

Drawings shall indicate, at relative scale, concrete covers, reinforcement placements and joint assembly design. Submittals shall also include the design pipe size, D-load, cement type, concrete strength and areas, types and placements of reinforcement.

- e. Pipe manufactured under these Specifications shall be fabricated by the "centrifugal spun" process in accordance with AWWA Standard C302 and as modified hereunder.
 - i. Section 3.6.9 Form oils or release agents shall not contain any material or substance as would penetrate or otherwise retard concrete set at the formed surface.
 - ii. Section 3.6.10 The steel forms shall be placed horizontally in a machine capable of spinning the forms at speeds that will produce concrete meeting or exceeding the concrete strengths required under the appropriate ASTM standard for the subject pipe specified.
- f. The method and procedure for determining the alkalinity content for the inner wall of RCP shall be as follows:
 - i. A minimum of two (2) carbonate equivalence tests shall be run on sample pipe manufactured from concrete ingredients batched each week of manufacture for each pipe size manufactured there from. Additional testing on different pipe sections shall be required if the carbonate equivalence results of individual tests per pipe sample vary by more than ten (10) percent.
 - ii. Test samples of concrete shall be obtained from random selected pipe sections by drilling, using carbide concrete bits as will procure at least five (5) grams of material per drilling. Sample material shall be taken at two (2) locations at least twelve (12) inches apart longitudinally and to the depth of the steel reinforcement, surface. (For elliptically-placed reinforcements, sample material shall be taken at the minor axis as marked on the pipe.)
 - iii. All drilled holes shall be repaired with cement and fine aggregate as specified and used in the manufacture of the subject pipe.
 - iv. Each material sample shall be tested separately as obtained from the subject pipe. Test material shall be ground or

pulverized sample material, oven dried for at least four (4) hours at a temperature of $100^{\circ}C \pm 50^{\circ}C$ just prior to testing.

- v. Testing shall involve the following equipment and procedures:
 - I. Equipment Sample weighing shall be performed with a precision balance readable to at least the nearest ten (10) milligrams. Liquid measures shall be performed with precision burettes readable to at least two-tenths (0.2) of a milliliter. Ph meters shall read to at least the nearest tenth (0.1) of a unit. Weighing and pH meter equipment shall have been calibrated for correctness within six (6) months of the test.
 - II. Test procedure - Weight at least one (1) gram of the test material of each sample into an appropriately sized Erlenmeyer flask and add about 100 ml of distilled water. (Place glass funnel in neck of flask to minimize spray losses). Slowly add 50 ml of Standardized 1-Normal Hydrochloric Acid per gram of test material. When effervescence has subsided, heat to boiling and boil about 1/2 minute period. Cool and add 50-100 ml distilled water. Titrate with standardized. carbonate-free, 1-Normal Sodium Hydroxide solution to an end point of pH metering reading of 6.8 minimum to 7.8 maximum. End point reading must be stabilized for not less than two (2) minutes.
- vi. Calculation of Carbonate Equivalence Calculations shall be based upon the chemical reaction of equivalent weights of Calcium Carbonate, CaCO3 and the liquid measures of specifically standardized acid and base titrating solutions, to the nearest tenth of one (0.1) gram at the stabilized end point. The equivalence of the tested sample shall be expressed in a percentage as CaCO3 to the nearest tenth of one (0.1) percent.
- vii. Quality Control Records The Contractor shall, prior to pipe installation, furnish the Engineer with two (2) copy sets of the manufacturer's quality control records for pipe manufactured in accordance with this section. Records shall indicate thereon: (1) the agency and technician performing the test, (2) the test date, (3) the District's Job Number assigned to the project, (4) the pipe size and date manufactured, (5) the weight of the test material, (6) the actual standardized

normality of the acid and titrate solutions and the test amounts used, and (7) the individual sample and pipe section average equivalent CaCO3 percentage. Each test record sheet shall be endorsed by the manufacturer, (and the agency performing the test if other than the manufacturer), as certifying compliance with this Section.

- g. Trench load calculations and design shall reflect the following minimum criteria:
 - i. Maximum trench width of twenty-four (24) inches greater than the outside diametric dimension (O.D.) of the pipe and a backfill density relative to that anticipated but in all cases not less than one hundred twenty (120) pounds per cubic foot.
 - ii. A dead load factor not greater than one and nine-tenths (1.9)
 - iii. Live load and impact factors relative to that anticipated but in all cases not less than that produced by using AASHO H-20 load criteria and a one and one-half (1.5) impact factor.
 - iv. A safety factor of not less than one and one half (1.5).
- 5. CL and CL&C Pipe CL and CL&C pipe shall conform to the requirements of Federal Specifications SS-P-381a of December 14, 1967 and latest amendments thereto and/or SS-P-385a of January 31, 1964 and latest amendments thereto except as modified herein. The total area of steel used for design purposes shall be the cross-sectional area of steel in the wall of the pipe cylinder only.

Rod-wrapping cross-sectional area shall not be considered for design purposes. Reinforcing steel used for rod-wrapping for all CL&C pipe shall have a minimum diameter of seven thirty-seconds (7/32) inch. Concrete linings and coatings shall be manufactured with Type II Portland cement conforming to the requirements of ASTM Designation C 150 Concrete linings shall extend to the ends of each pipe length. The concrete coating shall be held back three (3) inches from each end of each pipe, except where otherwise specified for abutting pipe or structure connections. An acceptable corrosion protective coating shall be shop applied to all exposed metal portions of pipe before shipment. Minor shop coating damage shall be repaired in the field with material consistent with that used by the pipe manufacturer as directed by and to the satisfaction of the Engineer. Except where shorter lengths are required to meet special conditions with due allowance for jointing, CL and CL&C pipe shall be fabricated in individual lengths not exceeding forty (40) feet. All pipe shall be clearly marked with date of manufacture, type of concrete lining and/or coating and name or trademark of the manufacturer as identification on each individual length unless otherwise specified or shown on the Drawings. Fabrication of CL&C pipe for above ground crossings, siphon installations or other underground installations specified shall be in accordance with the minimum basic requirements of the following table: (Based on a maximum span of thirty (30) feet).

Lined inside diameter					
of pipe (In.)	6	8	10	12	14
Steel Cylinder Gauge					
(US Standard)	10	10	7	7	7
Uniform minimum Lining					
Thickness	1/2	1/2	1/2	2/3	2/3
Uniform minimum Coating					
Thickness	1	1	1	1	1
Rod-wrapping or wire					
Reinforcement	7/32 inch diameter or greater at			ater at	
	1.75	inche	es ma	aximun	n clear
	spaci	ng.	Self-f	urring	welded
	fabric	; of 2-b	y-4 inc	h No.	13 gage
	steel	wire.			

Steel cylinders in the above table shall be such that the lined pipe shall have the nominal pipe size within the one-quarter (1/4) inch tolerance set by these Specifications. Fittings for CL&C pipe shall conform to the requirements of AWWA Standard C 208. Special fittings shall be shop fabricated as detailed on drawings for construction.

Deflection fittings shall not exceed fifteen (15) degrees at any one angle break in such fitting and the distance between all miters in a fabricated fitting shall be three (3) nominal pipe size diameters. The Contractor shall submit, at his own expense, shop and material details of all CL and/or CL&C pipe and fittings for District review before the pipe and/or fittings are manufactured for use in the work.

If such shop drawings are to be submitted by the pipe fabricator or manufacturer for District review, the District assigned Job Number and Contractor's signature must appear on each drawing, attesting the fact it has reviewed the drawings and if such are accepted, installation will be in conformance therewith.

a. CL and/or CL&C joining by butt-welding shall be performed on all plain end pipe. Field welds will be permitted at support points only as designated on drawings reviewed by the Engineer and provided that the ends of such pipe are clean of all concrete, grease, scale and dirt. All welding shall be accomplished as specified in accordance with the latest AWS standards. After field welding is complete and inspected by the Engineer, all exposed portions of the cylinder and joint shall be wrapped with eighteen (18) gage stucco wire and then cement grout band coated with CLASS I grout specified in Section 21 of these Specifications. The grout band, once finished, shall immediately be coated with a membrane-type, fast-curing material that will seal the band surface completely.

b. Appropriately sized joint rings for joining CL and/or CL&C pipe shall be welded to the cylinder to form a self-centering bell and spigot type joint sealed by a compressed rubber gasket conforming to the requirements of said Federal Specification SS-P-381a. When such method of jointing is used,

CLASS I mortar, as specified in said Section 21, shall be used to point the joint on the inside and CLASS I grout, conforming to said Section 21, shall be used to completely fill the annular space between abutting pipe sections on the outside.

- c. Flexible steel couplings for joining CL and/or CL&C pipe shall consist of acceptable beveled or flared sleeves, pressed or rolled steel flanges, rubber or neoprene gaskets and steel bolts with hexagon nuts.
- D. Plastic Pipe Plastic pipe, fittings and joint materials specified herein consist of Acrylonitrile Butadiene Styrene (ABS), High Density Polyethylene (HDPE) and Poly-Vinyl Chloride (PVC). All materials incidental to plastic pipe installations such as gaskets, joint lubricants, cements, 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 ensures true line cut on planes perpendicular to the pipe axis. No bevel cuts for pipeline alignment adjustments will be permitted.

HDPE plastic pipe shall be bedded in 2-sack cement slurry wherever exposed in open trench. ABS Composite Pipe shall be bedded in pea gravel or backfill sand.

PVC plastic pipe shall be bedded and backfilled as specified with extra care taken in compaction of said bedding and backfills as specified in Section 16-03.F.9 of these Specifications.

The inside diameter of an installed section of plastic pipe shall not be allowed to deflect more than indicated below.

PVC SEWER PIPE DEFLECTION STANDARDS

<u>PIPE SIZE, IN.</u>	MANDREL O.D.,	MANDREL O.D., IN.			
6	5.619 }				
8	7.524 }				
10	9.405 }	ASTM D-3034			
12	11.191}	SDR 35			
15	13.849				
18	16.924	ASTM F-679			
21	19.952	T-1 Wall			
Over 21	Not Allowe	Not Allowed			

Rerounding through the use of a vibratory machine will not be permitted.

1. ABS Pipe - All ABS pipe six (6) inches and greater in diameter shall conform to the requirements of ASTM Designation D 2680-86 as it applies to Composite Pipe. Fittings or parts thereof for the above-mentioned pipe sizes not manufactured under the provisions for Composite Pipe shall be shop fabricated or molded from resins specified and shall conform to the physical requirements in said ASTM D 2680 and shall be tested and proved to be equivalent quality to the pipe.

All ABS solid wall pipe and fittings less than eight (8) inches in diameter (side sewer) shall, at a minimum, conform to the requirements of ASTM Designation D 2751-75 and D 1527 as they apply to type SDR 35 and Schedule 40 ABS sewer pipe respectively using solvent cement joint assembly systems.

- a. Cement used for all ABS pipe joints shall conform to paragraph 7.3 of ASTM D 2680. Jointing shall be accomplished by applying a coating of cement to the inside to the socket and to the outside of the spigot end of pipe to be joined in sufficient quantity that when the spigot is fully inserted into the socket a bead of excess cement will form around the entire circumference of the outside juncture of said spigot and socket. Excess cement shall then be removed. The Contractor shall apply a coating of cement to all pipe ends of ABS Composite pipe whether within a coupling or not. The purpose is to prevent migration of ground water into the annular space.
- b. All ABS pipe entering or leaving a concrete structure shall have a standard (water stop) manhole gasket, as supplied by the pipe manufacturer, firmly clamped around the pipe exterior and cast into the structure base or near the structure wall center as a water stop. Where high groundwater is anticipated a LinkSeal may be substituted for a water stop at the discretion of the Engineer.

- c. ABS pipe is allowed for side sewers only and may not be installed outside the property line.
- d. Individual pipe lengths for side sewers shall not exceed twelve and one-half (12.5) feet.
- e. See Section 18-02.E for repair procedures for ABS pipe in new construction.
- 2. HDPE Pipe All HDPE pipe and fittings shall, at a minimum, conform to the requirements of PPI/ASTM Designation PE 3408 with a material classification as per ASTM 1248, III C 5 P34 and a cell classification of PE 345434C. The pipe shall be gray in color and shall consist of virgin high molecular weight polyethylene, specified under ASTM D3350. All HDPE pipe shall be heat-welded, seamless pipe. Alternately, electrofusion HDPE couplings may be used to connect sections of HDPE pipe.
 - a. HDPE pipe shall have a yield tensile strength of at least 3,200 psi and a ratio of pipe diameter to wall thickness of SDR 17 or better.
 - b. Side sewer connections to HDPE pipe shall be made by heatwelding an HDPE stub onto the main and tapping the pipe.
 - c. Neoprene gasket repair couplings with stainless steel shear bands may be used only to connect HDPE pipe to other pipe materials.
 - d. All HDPE pipe entering or leaving a concrete structure shall have a standard (water stop) manhole gasket, as supplied by the pipe manufacturer, firmly clamped around the pipe exterior and cast into the structure base or near the structure wall center as a water stop. Where high groundwater is anticipated, a Linkseal may be substituted at the discretion of the Engineer.
- 3. PVC Solid Wall Pipe
 - a. All PVC pipe and fittings shall, at a minimum, conform to the requirements of ASTM Designation D 3034, minimum wall thickness of SDR 26, ASTM Designation F-679 Type PS-115, or the requirements for PVC pressure pipe, as they apply to type SDR 26 PVC Sewer Pipe using an Elastomeric Gasket Joint in a bell and spigot assembly system. Rubber sealing gaskets shall meet the requirements of ASTM Designation D-1869 or F-477.
 - b. 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 the structure base. All rubber ring gaskets shall be in accordance with ASTM Designation F-477. Lubricant used for field assembly of gasketed PVC Pipe shall have no detrimental effect on the gasket, joint, fitting or pipe and shall be as recommended by the manufacturer. Where high groundwater is anticipated, a Linkseal may be substituted at the discretion of the Engineer.

- c. PVC pipe joining may occur at any convenient distance beyond and/or between structures.
- d. Cement used for non-gasketed PVC Pipe shall conform to ASTM Designation D 2564. Jointing of wet pipe is not allowed. Jointing of pipe shall be accomplished by applying a coating of cement to the inside of the bell and the outside of the spigot. The cement shall be applied in sufficient quantity to produce a bead of cement around the entire circumference of the pipe joint. Excess cement shall then be removed.
- e. See Section 18-02.E for repair procedures for PVC pipe in new construction.
- f. All sun-faded pipe or pipe with noticeable surface defects will be rejected and shall be replaced by the Contractor.
- 4. PVC Pressure Pipe
 - a. Where PVC pressure pipe is required, PVC pressure pipe shall conform to the requirements of AWWA C-900-16 minimum Class 150 for Pressure Pipe manufactured in sizes from four (4) inches to thirty-six (36) inches in diameter. PVC pressure pipe shall be furnished in Ductile Iron Pipe equivalent outside diameters with rubber gaskets, separate couplings, or approved equal. Thrust restraint shall be provided at valves and changes of direction for pressure flow applications.

18-02 INSTALLATION

A. Main or Trunk Sewer Installation by Open Cut Methods - All main and trunk sewer pipe installations shall be accomplished as specified, except where modified by the requirements peculiar to the various types of pipeline materials

specified under Section 18-01.C and D.

1. All sewer pipe shall be laid with a minimum six (6) inches vertical clearance from all other improvements and utilities, unless otherwise restricted by the other agency. Refer to the Pipe Cover Requirements at Section 4-02.C for minimum cover requirements. All pipe shall be laid to conform to the prescribed line and grade as shown on the plans and each pipe length checked to the grade line which the Contractor established from the grade stakes.

This grade line shall be established before any pipe is laid in the trench. For pipes with slopes greater than one (1) percent, the string line set for trenching purposes may be used as the grade line. For pipes with slopes less than one

(1) percent, either: (1) a grade line shall be established in the bottom of the trench such that the top of each bell will touch the line when the pipe has been properly positioned or, (2) a grade line shall be established above the trench on firmly secured batter boards from which the grade of each pipe can be checked by using a grade pole.

Alternate use of commercial LASER grade setting systems in lieu of string lines specified herein are acceptable when the following requirements and conditions are met:

- a. The Contractor shall have the responsibility of providing an instrument operator who is qualified and trained in the operation of the LASER and said operator must adhere to the provisions of the State of California Construction Safety Orders issued by the Division of Industrial Safety. Attention is particularly directed to Sections 1516 and 1800 through 1801 of said Orders for applicable requirements.
- b. All LASER control points shall be established benchmarks or construction offset stakes identified on cut sheets and set in the field for the work. LASER set up points shall be on these control points or on points set directly from them by instrument.

2. Each length of pipe shall be laid on compacted, standard bedding material as specified and shall have full bearing for its entire length between bell holes excavated in said bedding material to allow for unobstructed assembly of all bell and spigot joints. 'Stabbing', 'Swinging In', or 'Popping On' spigot ends of pipe into bell ends will not be permitted. After jointing is accomplished, all annular spaces between pipe and bell holes shall be packed with bedding material, taking care not to damage, move, or lift the pipe from its bedding support.

Minimum two (2) foot pipe lengths may be supplied to install short radius curves conforming to the deflection limitation set forth in Section 4-02.A.3 of these Specifications.

Adjustments of pipe to line and grade shall be made by scraping away or filling in and tamping bedding material under the body of the pipe. No wedging or blocking to support the pipe will be permitted.

A sewer line, gravity, or pressure, unless otherwise permitted by the Engineer, shall be laid, without break, upgrade from point of connection to existing sewer and with the bell end forward or upgrade. Pipe shall not be laid when the Engineer determines that the condition of the trench or the weather is unsuitable. When pipe laying is not in progress, the forward end of the pipe shall be kept effectively closed with an acceptable temporary plug or cap.

Sewer pipes, branches, stubs, or other open ends that are not to be immediately connected, shall be plugged or capped with a standard watertight plug or cap, as approved by the District for use in the particular installation. (See Approved Materials List.) The plug or cap shall be placed on a standard end. Open pipe ends on which rodding inlets, etc., are to be constructed shall be plugged with mechanical expanding plug at all times until the structure is completed and the cover is in place.

All rigid pipe entering and leaving manholes or other structures shall have a joint within forty-eight (48) inches of the center of manhole base. (See Section 28-01.)

In all cases, flexibility of joints in or at the manhole base shall be preserved to prevent damage to the pipe by differential settlement.

All sewer line connections to manholes, trunk sewers, or side sewers shall be left uncovered until after the inspection has been made. After inspection of the connection, the trench shall be backfilled as specified.

The Engineer may, at any time, require special pipe to be laid in areas that are potentially unstable or subject to settlement if in the Engineer's opinion field conditions warrant.
If the sewer is to be laid in an area that is to be filled, and the cover prior to filling is less than five (5) feet, the pipe shall not be laid until the area has been filled to a level five (5) feet above the proposed pipe and compacted to ninety (90) percent relative compaction, unless otherwise authorized by the Engineer.

When a new main or trunk sewer is extended from other than an existing manhole and the first new manhole upstream of the connection establishes conditions prescribed under Section 4-02.B.11, the Contractor installing such new facilities shall also be responsible for installing backwater overflow devices in conformance with said Section 4-02.B.11 on existing side sewers so affected.

B. Side Sewer Installations by Open Cut Methods - Attention is directed to Sections 4-01.C, 4-02, and 28-32 through 28-35 of these Specifications for additional details and requirements pertinent to side sewer installations. When a Backwater Overflow Device or Backwater Check Valve and Shutoff System is required as specified under Section 4-02.B.11, such installation shall be made at the time of connection and at a location where sewage can overflow without serious property damage on adjacent areas.

All side sewer pipe, where applicable, shall be laid in conformance with the above requirements for Main and Trunk Sewer Pipe laying and to the following requirements:

- 1. Whenever the grade of any sewer pipeline has been designated by the Engineer to be installed on less than the minimum slope ratios specified under Section 4-02.B.2 of these Specifications, such pipeline installations shall be done under instrument control of grades.
- 2. The maximum slope of any portion of a side sewer shall not be greater than one hundred fifty (150) percent, (1-1/2 vertical to 1 horizontal ratio).
- 3. If a building is located immediately adjacent to a sewer main, the point of connection to the main shall be sufficiently downstream of the building sewer outlet so that the above maximum slope is not exceeded.
- 3. When a lateral sewer is not installed and tested in conjunction with a main line installation, it shall be installed as follows to provide for air testing: Place a test plug, with adequate length of one-quarter (1/4) inch minimum diameter air hose attached, in the downstream end of the first length of pipe upstream of the saddle. Thread the air hose through each successive length of pipe as it is laid to the property line, then place a test fitting at the upstream end of the lateral and plug the straight through end of the fitting.

4. If a complete side sewer is to be installed and tested as one section of sewer, a test fitting or test plug (as shown in Section 28-37) shall be installed immediately upstream of the saddle and at any alignment fittings at the main sewer.

Complete installation of the side sewer from the test fitting or test plug to a point near the building plumbing outlet, but do not connect until testing is complete and inspected. Side sewers shall not be connected directly into manholes on the line. The final air test for townhouses and similar housing developments shall be performed as specified herein for complete side sewers after all other utilities for such units have been installed.

- 5. A house sewer shall be installed by first placing a test fitting on the upstream end of the lateral sewer, unless this fitting has been previously installed. Then proceed with the installation of the house sewer to a point near the building plumbing outlet, but do not connect until all testing is completed and inspected.
- 6. All upstream ends of side sewer installations for townhouses and similar cluster housing developments shall be plugged with a standard watertight plug or cap, as supplied by the pipe manufacturer, immediately after such installation and shall remain plugged until the time of building drain connection. No side sewers in this category may be used until the job has been completed and accepted by the District.
- 7. Test fittings (See Section 28-37) shall be wye or tee branches of the same type, size, and quality as that to the side sewer pipe, unless otherwise approved, and shall be installed where required. The branch of each test fitting shall be laid in an upright position.
- 8. If the vertical location of adjacent utilities is such that it is necessary to install side sewers over the utilities, the side sewer shall be installed after these utilities have been properly installed and backfilled.
- 9. Contractors may tap and install four and six-inch diameter laterals on new HDPE and DIP sewer main pipelines under the following conditions:
 - a. All taps and materials used are to be installed in strict compliance with the pipe manufacturer's recommendations.
 - b. The location of each tap is to be verified by the Inspector prior to the drilling of each tap. Taps shall be spaced a minimum of two (2) feet for DIP. Contractors shall not be allowed to make taps on CIP, ABS or PVC. Taps may be allowed on VCP of 12 inches diameter or larger, only.

- c. All taps to be made by contractors on New Projects shall be noted on the Plans.
- To mark the location of laterals, a three (3) inch wide strip of green plastic electronically detectable marking tape shall be installed horizontally one (1) foot below subgrade from the main line end of each sewer lateral. The electronically detectable tape shall be labeled" Buried Sewer Line Below."

When a lateral sewer is installed in advance of the house sewer, it shall be terminated five (5) feet within the property line. The contractor shall mark the location of the plugged end of the lateral with a No.4 reinforcing bar brought up to grade.

11. When an existing building that is sewered by a septic tank is to be connected to the public sewer system, the new side sewer shall be installed in accordance with these Specifications. A cleanout and backwater overflow device shall be installed at the building, and a new side sewer shall be installed from the building to the public sewer. If a portion of the existing piping from the building to the septic tank is a minimum of four (4) inches in diameter and will hold a pressure test, as required in Section 18-03.B.2., that portion of the existing piping may be used in the new side sewer.

The air test of any existing piping, as well as the installation of the new side sewer, must be completed and accepted before the existing septic tank is removed from service. Removal of a septic tank from service shall be in accordance with the regulations of the Health Officer of Contra Costa County dated March 18, 1983, as follows:

"420-1.609.3 <u>Abandonment of a Septic Tank.</u> An abandoned tank shall be backfilled immediately. The tank shall be uncovered and filled with compacted dirt or sand. Gravel or crushed stone is not acceptable. If the drain field is not flooded, it may not be necessary to pump out the tank as the contents will rise and overflow to the drain field. The tank contents shall not be permitted to surface. Slight mounding of the final cover is acceptable to allow for subsequent settling.

- C. Connections to Existing Sewerage Systems The existing sewers are shown on the Plans at the locations where the new sewers are to be connected. It is the responsibility of the Contractor to determine the exact location and depth of the existing sewers prior to the installation of any sewer pipe.
 - 1. Connection of new main and/or trunk sewers to existing lines up to and including forty-eight (48) inch in diameter shall be made at existing manholes or by constructing a new manhole over the point of connection or by removing an existing rodding inlet or plug. Where the connection is

to be made into an existing manhole, the Contractor shall make the connection by breaking through the manhole shelf to the existing channel, installing the new pipe (see Sections 28-01 and 02 for required joints), finishing a new channel within the manhole and repairing any damage to the structure. Where the connection is to be made by constructing a new manhole on an existing sewer, the manhole and new connection shall conform to details as shown in Sections 28-01 and 02. The existing sewer shall not be broken until immediately before the cleaning and flushing operation commences. Where the connection is to be made at a removed rodding inlet or plug, an air test fitting shall be installed at the connection of new and existing pipelines in preparation for said test, as directed by the Engineer. In each of the applicable cases mentioned above, temporary plugs shall be installed as specified in Section 21-17 of these Specifications.

- 2. Where wyes, tees, and/or laterals were previously installed on the main sewer, the side sewer shall be connected to the wye, tee or lateral as provided for the particular connection. Side sewer or lateral connections to new or existing manholes shall be as detailed on the drawing for Standard manholes (see Sections 28-01 and 02), unless otherwise shown on the Plans or directed by the Engineer. All side sewer connections shall be made with fittings or adapters recommended by the manufacturer for use with the particular pipe.
 - a. Side sewer connections to main sewers ten (10) inches or smaller where wyes, tees, or laterals were not installed, the Contractor shall install a new wye or tee to make the connection. A tap and saddle connection will not be permitted unless the standard fitting cannot be installed. The Contractor shall make arrangement for said tap and saddle at least forty-eight (48) hours in advance of the time the Contractor intends work. Contractors shall have adequate shoring on the jobsite conforming to the requirements of Section 16-02.C of these Specifications for the trench they plan to excavate. Contractors who have taps scheduled for District forces to install shall have a minimum of two (2) sets of approved shoring equipment at the site of work.
 - b.

The required excavation and cleaning of main surfaces for a tap and saddle shall be performed by the Contractor and when such taps are installed by District forces, the Contractor shall have the additional materials and equipment at the job site as follows: hard hats for all workers under its supervision; barricades; proper pipe; Standard Bedding material as specified under Section 16-03.C.1 of these Specifications; and a ladder long enough to extend two and one half (2-1/2) feet above the top of the excavation. The Contractor will be charged a minimum of one (1) hour standby time (including overhead charges established by the District) when the above-mentioned materials and equipment are not on hand at the jobsite when the work is scheduled. The excavation shall provide a minimum clearance of three (3) inches under and six (6) inches on each side of the main sewer for a distance of twelve (12) inches each way along the main from the point of connection. The outer surface of the main in this exposed area shall be thoroughly cleaned.

The excavation above the main, for the tap working area, shall be a minimum of two (2) feet in width without under-cut sides and shall be properly shored. Before the tap is made, the Contractor shall have sufficient standard bedding material at the site of the work to adequately backfill under the saddle to support it. No backfill shall be placed on the saddle fitting within one-half (1/2) hour after the completion of the work by District forces. If the Contractor breaks or otherwise damages the main while excavating for the tap, he shall notify the District and shall make repairs as necessary at the Contractor's sole expense.

- b. Side sewers equal in size to the main sewer shall be connected by installing a standard wye branch or tee fitting, of the same size and type of material as the main line, into the main line at the point of connection. The installation of the standard wye branch or tee shall be arranged with the District and the work will be performed by the Contractor. For a tee or wye installation, the Contractor shall excavate six (6) feet along the main line and install sufficient shoring to ensure a safe trench. The Contractor shall also provide ladder, bedding, and other necessary items as specified above in Section 18-02.C.2.a.
- D. Repairs to Existing Side Sewers and Mains The Contractor will make all repairs to existing sewer lines unless otherwise ordered by the Engineer. Repairs to main sewers shall be made using the same pipe material as the existing pipe. Repairs to side sewers shall be made using service weight soil pipe or CIP of quality stipulated by the Engineer and shall conform to the general requirements of Section 28-35. When a repair of a damaged section of pipe is required within 18 inches of a pipe joint, the repair replacement section shall be extended to include the joint. All repair couplings shall have shear bands. If an existing side sewer is being repaired or altered, a backwater overflow device or backwater check valve and shutoff system shall be installed on such side sewer system as part of the work.
- E. <u>Repairs to New Sewer Mains The contractor shall use caution when doing</u> <u>construction on sewer pipelines. If the contractor damages new main sewer pipe</u> during construction, the contractor shall contact the construction inspector to determine the type and extent of repairs necessary. The construction inspector shall determine if the damage is repairable or if complete sewer line replacement

is necessary. When a repair of a damaged section of pipe is required within 18 inches of a pipe joint, the repair replacement section shall be extended to include the joint. Repair procedures shall comply with the following:

- 1. VCP, CIP and DIP SEWER MAINS Manufacturer's recommended couplings and/or clamps shall be used. Remove the damaged section by squarely cutting the ends of the damaged section and smooth the ends of the remaining pipe as needed. Cut replacement sections of pipe to fit with a maximum gap of one-half inch at each joint. Slide couplings/clamps onto appropriate ends and insert the replacement pipe. Slide couplings over the new joint and tighten accordingly. Place compacted bedding material around pipe prior to backfilling.
- HDPE SEWER MAINS A standard heat welded coupling is required for each joint. A minimum of a two-foot length of pipe shall be used. Do not apply test pressures for 16 hours, but install 2-sack slurry backfill as soon as desired.
- G. Side Sewer Construction Requiring a Residential Sewage Pump All information applicable to Section 28-50 shall be submitted and reviewed in accordance with Sections 28-50 and 4-01.Bb before a permit is issued or any work can begin on the side sewer or pumping system.
- H. A residential sewage pump station is subject to the provisions of CCCSD Standard Specifications Section 15.13100 Individual Lot Pumping Systems, Section 28-50, Section 28-50a, and approval by the Engineer.
- I. Pipe Installation Using Pipe Bursting Methods Sewers that are installed using the pipe bursting installation method shall be installed in accordance with Section 29 Pipe Bursting.
- J. Pipe Rehabilitation Using Cured-in-Place Pipe Methods Sewers that are rehabilitated using the cured-in-place pipe method shall be installed in accordance with Section 30 Cured-in-Place Pipe.

18-03 CLEANING AND TESTING

A. Description - All work involved in testing and preliminary cleaning of sewer lines between manholes and/or rodding inlets, as required herein, shall be completed prior to the submission of the request for television inspection. In new subdivisions or projects involving possible conflicts with other underground utilities, preliminary tests may be conducted at the discretion and expense of the Contractor at any time, but the final test for acceptance will be made after the installation of all underground facilities and installation of aggregate subbase, but prior to installation of aggregate base. In wet weather, the Contractor may perform final tests after the installation of aggregate base. Where new roadways are to be all asphalt concrete layer constructed, pipelines installed under such paved ways shall be air tested prior to placement of the final layer of said asphalt concrete pavement.

If damage is done to the sewer system subsequent to the final test, the Contractor will be required to make another final test after the damage has been repaired. All final testing and cleaning of sewer lines shall be done in the presence of the Engineer. The Contractor shall furnish all labor, materials, tools, and equipment necessary to make the test, clean the lines, and perform any work incidental thereto. Precautions shall be taken to prevent joints from moving during tests, and any damage resulting from tests shall be repaired by the Contractor at his own expense. The type of test and the time of testing shall be specified by the Engineer.

B. Testing - The Contractor shall perform pressure tests on the total footage of all new sewer pipeline installations after such pipelines have been properly installed, including necessary test fittings, backfilling, and, in the case of all main and trunk sewer pipeline installations, before all required District television inspections specified under Section 11-08 of these Specifications.

In new tract or subdivision developments, pressure testing shall be performed only after the installation of all proposed lateral sewers to the main sewer system has been completed. Attention is directed to Section 18-02C of these Specifications for other side sewer system installations to be air tested.

1. SEWERS UP TO AND INCLUDING 17-INCH DIAMETER - Low pressure air tests shall be conducted in accordance with the following Test Procedure and the details shown on Sections 28-37 of these Specifications. All necessary test equipment shall conform to the requirements of said Section 28-37 in proper working order and tests shall be made in the presence of the Contractor and a District representative. Test plugs shall be carefully placed at each end of the section of line to be tested. When all necessary test equipment (see Section 28-37) is in place, a compressed air supply shall be attached to the air fitting on the test equipment and the air pressure within the line increased to four (4) pounds per square inch (psi). After the air supply is securely turned off or disconnected, there shall be a two (2) minute waiting period to allow stabilization of air within the sewer line before the actual test period begins. In no case shall the air pressure, within the line, be less than 3.5 psi at the beginning of the test period. The allowable air pressure loss shall not exceed one (1) pound per square inch. When testing sewers up to and including seventeen (17) inches in diameter, refer to Section 28-37 of these Specifications for the length of the test period (minimum two (2) minutes). When testing side sewers, or portions thereof, the test period shall be two (2) minutes and the allowable loss shall not exceed one (1) pound per square inch. After completion of a test, the air pressure shall be released slowly through the valve, which is incorporated in the test equipment.

Air test plugs shall not be removed until the air pressure is no longer measurable.

2. SEWERS GREATER THAN 17-INCH DIAMETER

a. Exfiltration Test

New sewers larger than 17 inches in diameter shall be hydrostatically tested in accordance with the following procedure:

After installation, all new Trunk Sewer pipelines shall be thoroughly cleaned prior to pressure testing. A section of trunk sewer shall be prepared for testing between two structures by plugging the inlet side of the discharge manhole and all openings in the upstream manhole except the discharge opening. All plugs shall be properly braced against the manhole wall to withstand the forces of the test in order to prevent loss in the event of a failure.

A section of the trunk sewer prepared as above shall be tested by filling it with water to an elevation five feet above the top of pipe at the upstream end of the test section, or five feet above the existing groundwater elevation, whichever is greater. The water shall be introduced into the test section at least one hour in advance of the official test period to allow the pipe and joint material to become saturated. The loss in water may be determined by measuring the rate of fall of the water level, but the level shall not be allowed to fall less than one foot below the specified head during the test prior.

For RCP, the pressure shall be maintained for not less than four hours and the leakage rate shall not exceed two hundred (200) gallons per inch of diameter per mile of pipe for 24 hours (ASTM C 969-82). For VCP, the pressure shall be maintained for not less than one hour and the leakage rate shall not exceed two hundred (200) gallons per inch diameter per mile for 24 hours (ASTM C 1091-88). For DIP, the pressure shall be maintained for not less than one hour and the leakage rate shall not exceed seventy (70) gallons per inch diameter per mile of pipe of 24 hours (AWWA C600-54T). All expenses of testing shall be borne by the contractor.

b. Infiltration Allowance

In addition to the requirements of Section 2(a) above, infiltration shall not exceed 15 gallons per day/inch diameter/1000 linear feet on new sewers greater than 17-inch diameter.

- C. Cleaning All new main and trunk sewer installations, and such site collector and side sewer system installations deemed necessary by the Engineer, shall be cleaned as required herein with a cleaning ball or device in accordance with such device manufacturer's instructions or recommendations and/or flushed prior to sanitary waste use. If high-pressure water cleaning such as hydro-flush is utilized, the pressure must be maintained below 2000 psi. Sand traps with screens shall be used in trapping debris, shall be in accordance with Section 28-39 and shall be secured to the manhole to prevent the sand trap from entering the pipe. All cleaning, including screen installations and removal, shall be accomplished by the Contractor in the presence of the Engineer.
 - 1. After all work on the pipeline installation has been completed to the satisfaction of the Engineer, including all manhole channeling and final pressure testing, but prior to any final pavement placements and television inspection, the Contractor shall perform a preliminary cleaning in conformance with this Section 18-03.C to prepare installations for District television inspections in accordance with Section 11-08 of these Specifications.
 - 2. Prior to acceptance, and after all other required inspections, and after the installation of final paving, top block, frames, and covers, the Contractor may be required to clean the pipeline a final time in conformance with this Section 18-03.C unless debris covers are installed in the manholes after television inspection.
 - D. Television Inspection of New Work The Contractor shall arrange for television inspection in accordance with the following procedures:
 - 1. The complete job is ready for television inspection when the following work has been completed:
 - a. All sewer pipelines are installed, backfilled, and compacted.
 - b. All structures are in place, all channeling is complete and pipelines are accessible from structures.

- c. All other underground facilities, utility piping, and conduits are installed.
- d. Final street subgrading is complete. For wet weather periods, placement of aggregate base has been completed.
- e. Pipelines to be inspected have been preliminarily cleaned and flushed.
- f. Final pressure test has been completed.
- 2. After the above work is complete, the Contractor shall arrange for television inspection at his/her sole expense.
- 3. The entire job will be initially televised by the Contractor and recorded in NASSCO PACP format DVD for the District to keep.
 - a. If no deficiencies are observed, the work will be considered satisfactory.
 - b. If deficiencies are observed, any defects serious enough to require correction will be determined by the District.
- 4. Notification will be made in writing of any deficiencies revealed by the television inspection that will require repair. If corrective work is indicated and viewing of the videotapes is desired, the District shall be contacted to set a time for the viewing with the Engineer.
- 5. Corrective work shall be done. District reserves the right to require another re-air test of any repair.
- 6. Those portions of the pipeline system that have been corrected must be re-televised for District review.
- 7. The procedure outlined in conditions 1 through 6 above will be repeated until all deficiencies observed by television inspection have been corrected to the complete satisfaction of the District.
- 8. All sewer main stubs will be televised.
- 9. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to paving:
 - a. Low spot 0.125 x diameter of pipe or greater, i.e. 1" for 8" pipe

- b. Joint separations [three quarters [3/4] inch or greater opening between pipe sections]
- c. Cocked joints present in straight runs or on the wrong side of pipe curves
- d. Chips in pipe ends
- e. Cracked or damaged pipe
- f. Offset joints
- g. Infiltration
- h. Debris or other foreign objects
- i. Other obvious deficiencies
- j. Irregular condition without logical explanation
- 10. Television-inspection of new work and the correction of observed defects will not relieve the Contractor of its responsibility for the one-year guarantee period. The District may inspect and/or televise portions of any projects during said guarantee period. This inspection may include a televising of the pipelines and the checking of the pipeline deflection in the case of plastic pipes.

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SECTION 19

PORTLAND CEMENT CONCRETE AND MORTAR

19-01 DESCRIPTION

Portland cement concrete shall, unless otherwise specified, be composed of TYPE II Portland cement, fine aggregate, coarse aggregate, and water, proportioned and mixed as herein specified (based on ninety-four [94] pound sacks). Unless otherwise specified, all reinforced concrete shall comply with the requirements for Class A concrete specified herein.

Unless otherwise specified, Class A concrete shall have:

- A. A minimum compressive strength of 3,000 pounds per square inch at 28 days.
- B. A one (1) inch maximum combined aggregate grading.
- C. No admixtures shall be incorporated without review by the Engineer.
- D. A slump of from three (3) to six (6) inches.

CLASS A concrete shall contain five hundred sixty-four (564) pounds (six [6] sacks) of Portland cement per cubic yard.

The relative proportions of fine and coarse aggregate shall be changed as necessary to maintain a constant quantity of Portland cement in each cubic yard of concrete. Portland Cement Concrete materials, mixing, handling, and curing shall conform to the requirements of Section 90 of the State Standard Specifications.

Mortar shall be composed of equal parts by volume of TYPE II Portland cement and sand conforming to the requirement set forth for fine aggregate, proportioned and mixed as specified herein:

Grout shall be composed of mortar diluted with water to flow readily.

No mortar or grout shall be used later than thirty (30) minutes after the water has been introduced in the mix.

Mortar shall be prepared by mixing the sand and cement dry until the mixture assumes a uniform color, after which water shall be added as the mixing continues. Mortar shall be of such consistency that it can be easily handled and spread with a trowel. This page left intentionally blank

SECTION 20

REINFORCEMENT

20-01 DESCRIPTION

Reinforcement shall conform to these Specifications and be of the shape and dimensions shown on the plans.

20-02 MATERIALS

The following Specifications set forth the requirements for bar reinforcement, mesh reinforcement, and black annealed wire.

- A. Bar Reinforcement Bar reinforcement shall be deformed bars conforming to ASTM A-615, Grade 40 or Grade 60.
- B. Mesh Reinforcement Mesh or welded steel wire fabric reinforcement shall conform to the requirements of the ASTM A-185. The gauge of the wire and the dimensions of the mesh will be shown on the Plans.
- C. Black Annealed Wire All wire used as reinforcing steel, but not including tie wire, in structures and concrete piles as shown on the Plans, shall be black annealed wire of the gauge designated, the gauge to be American Steel and Wire Gauge.

20-03 CLEANING

Reinforcing steel, before being placed in the forms, shall be thoroughly cleaned of loose mill scale and rust, mortar, oil, dirt, and of coating of any character that would destroy or reduce the bond.

20-04 BENDING

Reinforcing steel shall conform accurately to the dimensions shown on the Plans.

Bars shall not be bent or straightened in a manner that will injure the material. Bars with kinks shall not be used.

Hooks shall conform to the manual of standard practice of the American Concrete Institute. Bars shall not be heated to facilitate bending.

20-05 PLACING

Reinforcing bars shall be placed as shown on the Plans and shall be firmly and securely held in position by wiring at intersections with No. 14 or No. 16 wire and by using

concrete or metal chairs, spacers, metal hangers, and supporting wires of sufficient strength to resist crushing under full load. Metal supports that extend to the surface of the concrete, except where shown on the Plans, and wooden supports shall not be used. Placing bars on layers of fresh concrete as the work progresses and adjusting bars during the placing of concrete will not be permitted.

Bars shall be accurately spaced as shown on the Plans. In no case shall the clear distance between paralleled bars be less than two and one-half (2-1/2) diameters of the bar with a minimum of two (2) inches.

Unless otherwise specified, all reinforcement, other than stirrups or spacers, shall have a clear coverage of three (3) inches, measured from the surface of the concrete to the outside of the bar when exposed to wet conditions, two (2) inches of any exposed surface, and a minimum of one (1) inch clear of all pipes or other objects piercing the structure. Additional coverage shall be provided for reinforcement in the bottoms of footings or where exposed to salt water or unusual corrosive or abrasive conditions.

20-06 SPLICING

Bars shall not be spliced except as shown on the Plans. Splices of tensile reinforcement at points of maximum stress shall be avoided. Where bars are spliced they shall be lapped at least twenty (20) diameters, except where otherwise shown on the Plans.

20-07 SAFETY

- A. Guarding No employee shall be permitted to work above vertically protruding reinforcing steel until the steel has been so protected that the employee cannot fall or be impaled on the steel.
- B. Installing Employees working more than 6 feet above any adjacent working surface placing and tying reinforcing steel in walls, piers, columns, etc., shall be provided with and required to use a safety belt or other device affording equivalent protection for the hazard of falls from elevated surfaces.
- C. Guying Reinforcing steel for walls, piers, columns, and similar vertical structures shall be guyed and supported to prevent collapse.
- D. Wire Mesh Rolls Wire mesh rolls shall be secured at each end to prevent dangerous recoiling action.

20-08 INSPECTION

No concrete shall be deposited until the Engineer has inspected the placing of the reinforcing steel and given permission to place concrete. Concrete placed in violation of this provision will be rejected.

SECTION 21

CONCRETE STRUCTURES

21-01 DESCRIPTION

Concrete manholes, manhole bases, expansion blocks, pedestal supports, walls, and all other types of concrete structures shall be constructed to the dimensions, lines and grades given by the Job Engineer and in accordance with the designs shown on the Standard Drawing or Plans. Class A concrete shall be used, and the aggregate shall conform to the combined aggregate size designated as one inch maximum.

21-02 DEPTH OF FOOTING

The elevations of the bottoms of footings, as shown on the Plans, shall be considered as approximate only and the Engineer may order in writing such changes in dimensions or elevations of footings as may be necessary to secure a satisfactory foundation (see Section 16-05.A).

21-03 PUMPING OF WATER

Pumping of water from the interior of any foundation enclosure shall be done in such manner as to preclude the possibility of any portion of the concrete materials being carried away. No pumping will be permitted during the placing of concrete, or for a period of at least eight (8) hours thereafter, unless it is done from a suitable sump separated from the concrete work.

21-04 FORMS

The forms shall be smooth, mortar-tight, true to the required lines and grade, and of sufficient strength to resist any appreciably amount of springing out of shape during the placing of the concrete. All dirt, chips, sawdust, and other foreign matter shall be thoroughly removed from forms before any concrete is deposited therein. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being reused. Before concrete is poured in forms, all inside surface of the forms shall be thoroughly coated with form oil. The form oil shall be of high penetrating qualities leaving no film on the surface of the forms that can be absorbed by the concrete.

Falsework and forms supporting concrete beams, ribs, slabs, or other members subject to direct bending stress and forms on the underside of structures shall not be removed or released in less than twenty-one (21) days after the concrete has been placed, unless concrete test cylinders shown a strength of not less than three thousand (3,000) pounds per square inch in compression when cured under conditions similar to those affecting the structure. At times of low temperatures or other adverse conditions, the Job Engineer may increase the curing time.

Forms for all surfaces, which will not be completely enclosed or hidden below the permanent surface of the ground, or where plywood forms are not specified, shall be made of surfaced lumber or material that will provide a surface equally satisfactory. Any lumber or material that becomes badly warped or checked prior to placing of the concrete may be rejected.

All exterior angles shall be chamfered with one (1) inch by one (1) inch triangular fillets, unless otherwise directed by the Engineer. The triangular fillets or chamfer strips shall be milled or surfaced on all sides. Curved surfaces shall be formed of strips of matched lumber not over four (4) inches wide or of other material, such as plywood or metal.

Forms shall be sufficient strength to carry the dead weight of the concrete as a liquid without appreciable deflection, and if any such deflection occurs, it shall be sufficient cause for the rejection of the work. Form clamps or bolts shall be used to fasten forms. The use of ties consisting of twisted wire loops to hold forms in position during placing of concrete will not be permitted.

Bolts or form clamps shall be positive in action and shall be of sufficient strength and number to prevent spreading of the forms. They shall be of such type that they can be entirely removed or cut back one (1) inch below the finished surface of the concrete. All forms for the outside surfaces shall be constructed with stiff wales at right angles to the studs and all form clamps shall extend through and fasten such wales.

Forms for exposed surfaces shall be constructed of plywood or material that will produce a surface substantially equal to that which would result by the use of plywood forms.

21-05. FALSEWORK

When specified or requested, detailed plans of the falsework shall be supplied to the Job Engineer, but in no case shall the Contractor be relieved of responsibility for results obtained by use of these Plans.

All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads.

Falsework shall be founded upon a solid footing.

21-06. PLACING CONCRETE

All dirt, chips, sawdust, and other foreign material shall be removed from the forms prior to depositing any concrete. All concrete or mortar shall be used while fresh and before it has taken an initial set. Re-tempering any partially hardened concrete with additional water will not be permitted.

Any concrete pour involving four (4) or more cubic yards shall be made only under the

inspection of Engineer.

Where pavement or surfacing is to be placed around or adjacent to manholes, or other structures, which will be located within traffic lanes, concrete around such structures shall be poured to a grade two (2) inches below final pavement or surfacing.

Concrete, when mixed, shall be deposited immediately without segregation of its ingredients and shall be consolidated with internal vibrators in layers until it is thoroughly compacted, all voids are filled and free mortar appears on the surface. The concrete shall be placed as close as possible in its final position and the use of vibrators for extensive shifting of the mass of fresh concrete will not be permitted. Fresh concrete shall not be permitted to fall from a height greater than six (6) feet without the use of adjustable length pipes or "elephant trunks."

The use of external vibrators for compacting concrete will be permitted when the concrete is otherwise inaccessible for adequate compaction provided the forms are constructed sufficiently rigid to resist displacement or damage from external vibration.

The use of chutes in conveying or depositing concrete will be allowed only at the discretion of the Job Engineer, and wherever they are used, they shall be laid at such inclination as will permit the flow of concrete of such consistency as is required. Where necessary in order to prevent separation, chutes shall be provided with baffle boards or a reversed section at the outlet.

NO CONCRETE SHALL BE DEPOSITED UNDER WATER.

21-07. CONSTRUCTION METHODS

The concrete in each integral part of the structure shall be placed continuously, and the Contractor will not be allowed to commence work on any such part until all material is on hand, and its forces are sufficient to complete the part without interruption.

21-08. JOINTS

Construction joints shall be made only where located on the plan or shown in the pouring schedule. In case of emergencies, joints shall be placed as directed by the Engineer.

When it is necessary to make a joint because of an emergency, additional reinforcing steel shall be placed across the joint as directed by the Engineer.

After the pour has been completed to the construction joint and after the concrete has taken a permanent set, the entire surface of the joint and the rebar shall be thoroughly cleaned of surface laitance and clean aggregate shall be exposed by wire brushing, sandblasting, or air and water pressure jets.

21-09. WATERSTOPS

Waterstops shall be furnished and installed in accordance with the details shown on the Plans.

21-10. BONDING

Construction joints shall be mechanically bonded by means of keys cast into the surfaces in contact. Keys shall be formed by beveled strips or boards placed at right angles to the direction of shear. Except where otherwise specified, keys shall be at least one and one-half (1-1/2) inches in depth over at least twenty-five (25) percent of the area of the section.

Where existing concrete and new concrete are to be joined, holes shall be drilled in the existing concrete and bar reinforcing steel dowels grouted in place as shown on the plans. The holes shall be filled with grout before placing the dowels.

Immediately before making a new concrete pour, the entire contact surface of the construction joint or the existing concrete structure shall be cleaned by methods specified in Section 21-08.

21-11. CURING

With certain exceptions described below, all newly placed concrete shall be kept wet by the continuous application of water for the first seven (7) days after the concrete has been placed. Water for use in curing concrete shall conform to the requirements for water for use in the manufacture of concrete.

Concrete surfaces where only Ordinary Surface Finish is to be applied and of which a uniform color is not required and which will not be visible from the traveled way, may be cured by the pigmented sealing compound method. Surfaces to be cured by the pigmented sealing compound method shall be kept moist or wet until the sealing compound is applied, and it shall not be applied until all patching or surface finishing has been completed.

21-12. SURFACE FINISHES

Ordinary Surface Finish in conformance with Section 51-1.18A of the State's Standard Specifications shall be applied to all concrete surfaces either as a final finish or preparatory to a higher class finish. On surfaces which are to be buried underground and are in contact with the ground or specified backfill, the removal of fins and form marks and the rubbing of mortared surfaces to a uniform color will not be required. Ordinary surface finish, unless otherwise specified, shall be considered as a final finish.

During the pouring of concrete, care shall be taken that the methods of compaction used will result in a surface of even texture free from voids, water, or air pockets, and that the coarse aggregate is forced away from the forms in order to leave a smooth mortar surface.

Forms on all vertical faces that do not act as supporting members shall be removed as soon as practicable, but not sooner than forty-eight (48) hours after the concrete is poured.

Immediately after the forms have been removed, all form bolts shall be removed to a depth of at least one (1) inch below the surface of the concrete. All holes and depressions caused by the removal and setting back of such form bolts shall be cleaned and filled with a mortar of matching color. Care shall be exercised to obtain a perfect bond with the concrete. All fins caused by form joints, and other projections shall be removed and all pockets cleaned and filled. Cement mortar for filling pockets shall be treated as specified for bolt holes. In the judgment of the Engineer, if rock pockets are of such an extent or character as to materially affect the strength of the structure or to endanger the service life of the steel reinforcement, the Engineer may declare the concrete defective and require the removal and replacement of that portion of the structure affected.

21-13. MANHOLE BASES

A. Cast-in-place manhole bases are intended to be poured against native, undisturbed material, which has been excavated to the dimensions shown on the plans (see Sections 28-01 through 28-08). If the Contractor over-excavates beyond the horizontal dimensions shown on the standard drawings, he shall construct forms and pour the base to the specified dimensions.

A forming ring shall be used to form a level joint groove in fresh concrete of a manhole base; to receive the first precast barrel section of the manhole. The metal forming ring may be removed as soon as the concrete has set sufficiently to eliminate any slump in the joint groove.

Special approval must be obtained from the District prior to any work on a manhole to be constructed in an existing street or other area, which requires that the manhole barrel be set directly into the freshly poured manhole base in order that the manhole may be backfilled the same day that it is excavated.

B. <u>Precast manhole bases will not normally be permitted</u>. Precast manhole bases may be installed if they are specifically designated for use on the approved sewer construction plans. Precast manhole bases shall be manufactured in accordance with the requirements of ASTM Designation C478-85a. Precast manhole bases shall have a smooth flow line with a constant slope from inlet to outlet. Precast bases shall have a shelf area conforming to the requirements of Section 28-01. Aggregate base shall be placed in accordance with the requirements of Section 16-05.0. Precast manhole bases shall be installed to the sewer design lines and grades shown on the plans and shall be installed as an integral part of the pipe laying

21-14. MANHOLES

All manhole precast sections shall conform to ASTM C-478-85a where not otherwise modified in the Standard Drawings of Section 28. Manholes shall be leak-free structures. Structures constructed with precast sections shall be so constructed using a single manufacturer's products and/or with such compatible products as may be recommended by the precast section manufacturer.

- A. Types of Manholes -
 - 1. Standard Manholes are precast reinforced concrete section manholes conforming to the applicable Section 28-01 or 28-02 requirements of these Specifications.
 - 2. Special shallow manholes are precast concrete grade ring manholes conforming to the applicable Section 28-05 requirements of these specifications.
 - 3. Syphon Manholes are reinforced cast-in-place concrete structures conforming to the applicable Section 28-08 or 28-09 requirements of these Specifications
 - 4. Metering Manholes are precast reinforced concrete section manholes with appurtenances specified in Section 4-03.1 of these Specifications.
- B. Manhole Channels Where sewer lines pass through manholes, construction shall conform to the applicable Standard Detail. Pipe shall be used as a form for the channel. After the manhole base concrete has taken a set, the channel shall be carefully shaped and mortared to obtain a smooth channel. All channels shall be checked with the proper template.
- Manhole Throat The maximum depth of the manhole throat shall be eighteen (18) inches, measured from the top of the manhole cover to the lower extremity of the throat at the top of the cone section.

The throat shall be constructed by use of appropriately sized reinforced concrete grade rings that will bring the manhole cover to finished grade surface. No plastic sealing gaskets shall be used for jointing grade or extension rings in place.

D. Manhole Construction - All manholes shall be excavated and backfilled in conformance with the requirements of Section 16-05.D of these Specifications and installed as specified herein. All embedment materials under, around, and at least three (3) inches over all pipelines located within five (5) feet of structure bases shall be compacted without jetting prior to barrel section placement. All manholes shall be constructed to subgrade prior to jetting adjoining sewer pipeline trench and/or structure backfill where such method of compaction is

permitted and used.

All joint surfaces of precast sections and face of manhole base shall be thoroughly clean prior to setting precast sections. These various sections shall be set in preformed plastic sealing gaskets of material conforming to the requirements of Federal Specifications SS-S-00210.

- 1. Installation of gaskets
 - a. Apply one coat of primer to clean, dry joint surface (both tongue and groove) and allow to dry. Remove the paper wrapper from one side only of the two-piece wrapper on the gasket. The outside paper will protect the gasket and assure against stretching. Before setting the manhole section in the trench, attach the plastic gasket strips end-to-end to the tongue or groove of each joint, forming a continuous gasket around the entire circumference of the manhole joint.
 - b. Handling of barrel sections after the plastic gasket has been affixed shall be carefully controlled to avoid bumping the gasket and thus displacing it or covering it with dirt or other foreign material. Any gaskets so disturbed shall be removed and replaced if damaged and repositioned if displaced.
 - c. Care shall be taken to properly align the manhole section with the previously set section before it is lowered into position.
 - d. During cold or wet weather, pass direct heat over the concrete joint surface lightly until ice, frost, and moisture are removed and surface to be primed is dry and warm immediately before application of primer. Direct heat shall also be passed over plastic gasket strips immediately prior to attaching them to joint surfaces and immediately prior to insertion of tongue into groove.
- 2. When plastic sewer pipelines are installed, the manholes constructed in conjunction with the pipelines shall be marked to indicate that the pipelines entering or leaving the manholes are plastic. The marking shall consist of a raised ceramic pavement marker epoxied to the top grade ring. The marker shall be white for PVC, yellow for ABS, and orange for other materials.
- E. Manhole Surface Block Manhole blocks for precast manholes are intended to be poured against native, undisturbed earth or compacted structure backfill material, (see Section 16-05.0) which has been excavated to the dimensions shown on the drawings, (see Sections 28-01 and 28-02). If the Contractor over-excavates beyond or otherwise cannot maintain the horizontal or vertical dimensions shown on the Standard Drawings, the Contractor shall construct

forms to the specified dimensions prior to placement of concrete for the surface block.

F. Manholes on Steep Slopes - All manholes to be located on slopes steeper than forty-five (45) degrees in easement areas shall be constructed without top blocks with the rim elevation set approximately twelve (12) inches above the adjacent upslope ground surface. The method proposed to attach the frame assembly to the cone shall be shown in a detail on the plans. Manhole rims and top blocks on less steep slopes shall have a reinforced concrete or reinforced concrete block retaining wall where required.

21-15. RODDING INLETS

Rodding inlets shall conform to Section 28-11. The frame and cover shall not be installed at the same time that the top block is poured. A recess shall be formed to receive the frame and cover. The Contractor may use repair couplings to extend the pipe portion of the rodding inlet structure on new installations when raising the inlet to its final elevation.

21-16. OTHER STANDARD STRUCTURES

All other standard structures to be made of concrete shall be constructed in accordance with this section and as detailed in Section 28.

21-17. TEMPORARY COVERS AND PLUGS FOR STRUCTURES

A. Temporary .Covers - Temporary covers for new construction or reconstruction of manholes shall be fabricated as detailed in Section 28-54.

Temporary covers shall be used during construction in subdivisions or other areas where final grades for unfinished roadbeds have not been determined, or where ordered by the Engineer.

A temporary debris cover, as described in Section 21-17.B, shall be placed over the base of any existing manhole prior to beginning any adjustment or repair work.

B. Temporary debris covers (false bottom) should be installed in all manholes after TV. If covers are not installed the Contractor shall be required to clean and flush the lines a final time. See Section 18-03.C.2.

Temporary Plugs - Temporary plugs shall be mechanical expanding types. These plugs shall be installed and removed in the presence of an Inspector and shall be secured to the top 1 foot of a 2x4 using a 1/4 inch nylon rope. The 2x4 shall be of sufficient length to extend to within 6 inches of grade when placed on the manhole shelf. Temporary plugs shall be installed on all projects as noted below

and remain there intact, until immediately prior to the beginning of the cleaning and flushing operation.

- 1. If there is an existing manhole at the beginning of a new system, a plug shall be installed in the new pipe at the existing manhole and another plug installed on the downstream side of the first manhole upstream in the new system pipeline.
- 2. If the Contractor constructs a new manhole at the beginning of a new system, the existing pipe in that manhole shall not be broken until immediately prior to the commencing of the balling and flushing operation and a plug shall be installed on the downstream side of the first manhole upstream from the existing manhole.
- 3. If the new system begins at an existing rodding inlet or stub, a plug shall be installed on the downstream sides of the first two manholes upstream from the beginning of the new system.
- 4. Temporary plugs shall be installed in the open ends of sewer lines while adjusting, repairing, or pouring the top blocks on rodding inlets or similar structures.

21-18. RECONSTRUCTION OF EXISTING STRUCTURES

A. General - The Contractor, when removing existing structures located on live systems, shall take precautions to insure that no foreign material enters into the existing sewer lines. Care shall be taken and proper methods employed to prevent pieces of concrete mortar, brick, wood, etc., from entering into the live lines.

During the period of time in which the Contractor is rebuilding a structure located on a live sewer system, District maintenance forces shall have continuous access to the structure. All work on the new structure shall be diligently prosecuted and shall be completed within three (3) days after the old structure is removed.

- B. Structure Adjustments and Repairs All workmanship and materials for structure adjustments shall conform to the requirements of these Specifications and the provisions herein. In the case of existing brick or cast-in-place concrete structures, repair or adjustments shall be accomplished with materials in kind or with precast elements as detailed on the drawings.
 - 1. Before any work is started on adjusting or repairing manhole, the channels in the base shall be covered with plywood or a similar material and then

the entire base covered with a heavy piece of canvas temporary debris cover. This temporary debris cover shall be kept in place during all work, and upon completion, picked up containing all debris. The canvas and the plywood shall be carefully removed from the manhole allowing no debris to fall or to remain in the manhole.

- 2. Existing structure precast elements, adjustment rings, frames, and covers removed in adjustments and/or repairs may be reinstalled only when such undamaged items are permitted by the Engineer for reuse.
- 3. Manhole adjustments shall be accomplished by one of the methods specified herein or as detailed on the Drawings.
 - a. Upward adjustments of standard manholes to finish grade surface may be accomplished with reinforced concrete grade rings or formed concrete (Case II) and/or a cast iron extension ring (Case I) when the completed manhole throat does not exceed a total of eighteen (18) inches; single concrete grade rings may be used for such adjustments not exceeding four (4) inches. In no case shall multiple cast iron extension rings be used in adjustments. When adjustments are made that position the bottom of the cast iron manhole frame above the existing concrete block, said block shall be extended to meet the requirements of Section 28-01 or 28-02 of these Specifications and as directed by the Engineer.
 - b. Precast reinforced concrete grade rings and/or cast iron extension rings shall not be used in upward adjustments of standard manholes that would create a completed manhole throat section exceeding eighteen (18) inches. In all such cases, the upper manhole section, including reinforced concrete block and cone section shall be removed and the adjustment shall be accomplished by use of additional manhole barrel sections, cone, grade rings, etc., (Case III) and such manhole reconstruction shall comply with the requirements of Section 28-01 or 28-02 and applicable provisions thereto of these Specifications.
 - c. Downward adjustments of standard manholes (Case III) may be accomplished by removal of existing grade or extension rings and/or, when specifically permitted by the Engineer, by carefully chipping the top of the existing precast cone section away such that the inside diameter of said cone at the top does not exceed twenty-seven (27) inches. When chipping the cone is so permitted, the chipped portion of the cone shall be mortared to a smooth, level surface with mortar in conformance with Section 19-01 and allowed to dry prior to replacement of the frame and cover. No downward adjustment by chipping will be permitted if the frame and cover casting is the standard weight variety (see Section 28-15). When

such removals and/or chipping will not accomplish the necessary adjustment, the upper manhole section, including barrel sections as required, shall be removed and the manhole reconstructed as specified in Section 21-18.B.3.b above. In all downward adjustments the dimensional requirements of the reinforced concrete block in the upper section of the manhole as detailed in said Section 28-01 or 28-02 shall be maintained or restored.

- d. Unless otherwise designated by the Engineer, when adjustment of an existing standard main or trunk manhole in a street or other traveled way is required and no manhole surface block exists, the Contractor performing the adjustment shall provide and install a manhole surface block in conformance with the applicable Section 28-01 or 28-02 as part of the work.
- 4. Rodding inlet adjustments shall be accomplished by one of the methods specified herein or as detailed on the Drawings.
 - a. Upward adjustments of rodding inlets to finish grade surface may be accomplished with formed concrete or a cast iron extension ring (Case I) where such does not already exist and where such extension does not exceed eight (8) inches. The existing reinforced concrete block shall be extended whenever the bottom of the cast iron frame is to be positioned above the top of said existing block.
 - b. Upward adjustments of rodding inlets exceeding eight (8) inches shall be accomplished by removing the structure's frame, cover, and concrete block and reconstructing said structure as detailed in Section 28-11 of these Specifications (Case II). Pipe used for such adjustments shall be consistent in material, line and grade with that already in place and be appropriately jointed where required.
 - c. Downward adjustments of rodding inlets shall be accomplished by removal and reconstruction of the entire upper section, including the block (Case III).

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SECTION 22

CASTINGS AND METAL FABRICATIONS

22-01 DESCRIPTION

The Contractor shall install or erect the metal work, remove the temporary construction, including the removal of the old structure or structures if specified, in accordance with the Plans and/or these Specifications.

22-02 MATERIALS

The various materials shall conform to the requirements of the specifications of the ASTM as listed in the following tabulation with certain modifications and additions as specified later in this Section.

MATERIAL	ASTM DESIGNATION
Structural steel	A-36
High-strength low-alloy	
structural steel for welding	A-242
Bolts and nuts	A-307
Black steel pipe	
(std. wt. seamless)	A-120
Carbon steel for forgings	A-668, Class C
Alloy steel for forgings	A-668, Class A
Steel castings	A-27, Grade 65-35
Gray iron castings	A-48, Class 30
Malleable iron castings	A-47, Grade 32510
Bronze castings	B-22, UNS No. C93700
Aluminum Alloy GS11A-T6	B-209
Stainless steel forgings	A-473
Ductile iron castings	A-536, Grade 65-45-12

Materials used in the manufacture of corrugated metal pipes shall conform to AASHO Designation: M-36.

Where the Contractor substitutes rolled stock for forgings, the rolled stock shall meet the physical and chemical requirements for forged steel.

22-03 CASTINGS

The steel used in steel castings shall contain not less than 0.60 percent of manganese and not less than 0.20 percent of silicon.

All castings shall be sound and free from shrinkage cracks, blow holes, and other defects. All fins and burnt sand shall be removed. Excessive porosity and spongy

surfaces will constitute causes for rejection. The Engineer shall be final judge as to whether the defects present are sufficient to cause rejection.

No welding or patching of defects in castings will be permitted unless authorized by the Engineer. Any such welding or patching done without the Engineer's consent shall be cause for rejection.

All castings shall be true to the form and dimensions shown on the plans. After inspection and prior to shipping, all machined surfaces shall be coated with a blue rust inhibitive lacquer, or other material that can be easily removed, unless otherwise specified.

The dimensions of the finished casting shall not be less than the specified dimensions. Castings shall not be more than seven and one-half (7 1/2) percent overweight. Large castings shall be suspended and hammered over their entire area. No cracks, flaws, or other defects shall appear after such hammering.

22-04 CAST IRON FRAME AND COVERS

Castings shall conform to the shape and dimensions shown on the Standard Drawings. (See Section 28.)

The cover and its seat in the frame shall be machined so that the cover will sit evenly and firmly in the frame.

Cast iron frames and covers shall be dipped or painted with asphalt.

22-05 FILLETS

Steel, gray iron, malleable iron, and bronze castings shall be provided with adequate continuous fillets cast in place in all re-entrant angles. The radius of curvature of the exposed surface of a fillet shall define the size of the fillet.

The size of fillets shall not be less than one-half (1/2) of the thickness of the thinnest adjoined member nor less than one-half (1/2) inch.

22-06 STRAIGHTENING MATERIAL

If straightening is necessary, it shall be done by methods that are acceptable to the Engineer. Sharp kinks and bends may be cause for rejection of the material.

Following the straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fracture.

22-07 MATCH MARKING AND FINISH

Connecting parts assembled in the shop for the purpose of reaming holes in field

connections shall be matched marked, and a diagram showing such marks shall be furnished to the Engineer. Portions of the work exposed to view shall be finished neatly. Shearing and chipping shall be done carefully and accurately.

22-08 BOLTS

Bolted connections shall be used unless otherwise shown on the plans. Where bolted connections are required, the bolts shall be galvanized bolts or turned bolts, as specified. Bolts shall have hexagonal heads and nuts and shall be of such length that they will extend entirely through the nut but not more than one-quarter (1/4) inch beyond. Bolts in tension shall have two (2) nuts.

Unfinished bolts in shear shall have not more than one thread within the grip. The diameter of the unfinished bolt shall not be more than one thirty-second (1/32) inch smaller than the diameter of the hole.

The threads of turned bolts shall be entirely outside the grip. Nut locks or flat washers one-quarter (1/4) inch thick shall be furnished, as specified. The holes for turned bolts shall be reamed and the bolts shall be finished to provide a driving fit.

Threads shall make close fits in the nuts.

22-09 EYE BARS

Eye bars shall be straight, true to size, and free from twists, folds in the neck and head, and other defects. The heads shall be made by upsetting and rolling or forging, and not by welding. The form of the heads will be determined by the dies in use at the work where the eye bars are made, if they are satisfactory to the Engineer. The thickness of the head and neck shall not overrun more than one-sixteenth (1/16) inch.

All eye bars that are to be placed side by side in anyone group in the structure shall be bored so accurately that upon being placed together, pins one thirty-second (1/32) inch less in diameter than the pin holes will pass through the holes at both ends at the same time without driving.

22-10 BEARINGS AND ANCHORAGE

During construction, the anchor bolts shall be placed within pipe sleeves as shown on the Plans or as directed by the Engineer. The concrete bearing plates shall be set level and properly supported in exact position until fixed with Portland cement grout. The grout shall be forced under the plates so as to completely fill the pipe sleeves and to give a uniform and even bearing for the plates.

22-11 CUTTING WITH TORCH

The use of a cutting torch is permissible if the metal being cut is not carrying stress during the operation.

The radius of re-entrant flame cut fillets shall be as large as possible, but never less than one (1) inch. To determine the net area of members so cut, one-eighth (1/8) inch shall be deducted from the flame cut edges. Stresses shall not be transmitted through a flame cut surface.

When cutting with a torch, cuts shall be true to line with a maximum deviation of onesixteenth (1/16) inch. All burned edges shall be finished by grinding or chipping.

The use of the cutting torch will be permitted on ends that form compression connections, providing a minimum of one-quarter (1/4) inch of metal is left to be removed by machining.

22-12 WELDING

All welding shall be done by certified welders in accordance with the requirements of the American Welding Society. All welding operators shall be subject to examination for recertification at any time during the progress of the work.

Welding electrodes shall comply with the requirements of the ASTM Designation: A233, except they shall be uniformly and heavily coated (not washed) and shall be of such nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

22-13 GALVANIZING

When galvanizing is specified for structural steel shapes, plates, and bars, and other products, it shall be performed by the hot-dip process after fabrication into the largest practical sections. The galvanizing shall conform to the requirements of the ASTM Designation: A123. Fabrication shall include all operations such as shearing, punching, forming, bending, welding, riveting, etc. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the spelter coating.

Small structural steel or cast steel articles, such bolts, nuts, washers, and similar articles that are to be galvanized, shall be galvanized after fabrication in accordance with the requirements of the ASTM Designation: A153.

22-14 REMOVAL OF OLD FABRICATIONS AND FALSEWORK

The Contractor shall dismantle old structures, which, unless otherwise provided on the plans, shall be disposed of by the Contractor at no cost to the District. If a structure is to be re-erected, it shall be dismantled without unnecessary damage and the parts match marked and carefully stored.

The Contractor shall dismantle the falsework, and remove all debris and refuse resulting from his work leaving the premises in a clean condition.

22-15 INSPECTION

All castings and fabrications shall be inspected prior to installation. Finished members shall be true to line and free from twists, bends, and open joints. District reserves the right to reject the material before or after the installation, if found defective. Rejected material shall be replaced promptly or corrected by the Contractor.

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SECTION 23

ABANDONMENT OF LINES AND STRUCTURES

23-01 ABANDONMENT OF SEWER LINES

- A. Main Sewer Lines Main line sewers to be abandoned shall be filled completely with sand or 2-sack sand/cement slurry.
- B. Side Sewer Lines Before a building connected to the District sewer system is removed or modified in a manner that requires a physical disconnection of the building from the sewer system, the owner of the building shall obtain an abandonment permit from the District.

The District will allow the owner's contractor to abandon the side sewer on a case by case basis.

The side sewer to be abandoned shall be sealed at the property line by use of a concrete plug or a manufactured plug or cap.

23-02 STRUCTURES TO BE ABANDONED

Structures to be abandoned shall have their bases broken to prevent entrapment of water. The structure shall be removed to a point three (3) feet below the proposed street grade or ground surface and filled with TYPE I backfill if structure is in State, County or City roadway right of way; or filled with earth and compacted if structure is outside of State, County or City roadway right of way.

23-03 SALVAGED MATERIALS

Salvaged metal castings such as frames and covers and other metal appurtenances shall be delivered to the District's pump station for reuse.

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PAINTING

24-01 PAINTING

Where not otherwise specified, all exposed metal fabrications and construction work not shop painted or corrosion protected by galvanizing specified in Section 22-13 of these Specifications shall be thoroughly cleaned and/or sandblasted and coated. All primers and finish coatings must be reviewed by the Job Engineer prior to application.

AGGREGATE BASE

25-01 AGGREGATE BASE

Aggregate base shall consist of mineral aggregate, furnished and placed on prepared subgrade, subbase or as backfill in conformity with the lines, grades and dimensions shown on the Plans or Standard Drawings. Material, subgrade preparation, adding water, spreading, and compacting shall conform to the requirements for "AGGREGATE BASE" under SECTION 26 of the State Standard Specifications.

BITUMINOUS SEALS

26-01 SEAL COATS

Seal coats shall consist of an application or applications of bituminous binder and a cover of screenings applied to pavement, prepared base or surfacing in conformance with the requirement excluding measurement and payment for a BITUMINOUS SEALS under SECTION 37 subsection "37-1 SEAL COATS" and the requirements, excluding measurement, for "ASPHALTIC EMULSIONS" under SECTION 94 of the State Standard Specifications.

Unless otherwise specified or directed by the Job Engineer, Seal Coats specified herein shall meet the requirements for "Fine" Seal Coat Type and the bituminous binder shall be penetration type asphaltic emulsion Grade MS2 specified in said State Standard Specifications.

ASPHALT CONCRETE

27-01 ASPHALT CONCRETE

Asphalt Concrete shall consist of a mixture of mineral aggregate and bituminous binder, the materials of which, proportioning, mixing spreading and compaction thereof shall conform to the requirements, excluding measurement and payment, for "ASPHALT CONCRETE" under SECTION 39, "ASPHALTS" under SECTION 92, "LIQUID ASPHALTS" under SECTION 93, and for "ASPHALTIC EMULSIONS" under SECTION 94 of the State Standard Specifications. Unless otherwise specified or directed by the Job Engineer, Asphalt Concrete shall be Type B with aggregate conforming to the grading requirements specified for the one-half (112) inch maximum medium grading. Asphalt binder for permanent paving shall consist of paving asphalt, Grade designation AR-4000. Asphalt binder for temporary paving shall consist of liquid asphalt grade MC-800. Liquid asphalt for use as a Prime Coat shall be Grade SC-70, spread at the approximate total rate of one-quarter (1/4) gallon per square yard of surface covered. Asphaltic emulsion for use as a Paint Binder shall be Grade SS-1, applied in one application at a rate of from two-hundredths (0.02) to one-tenth (0.10) gallon per square yard of surface covered.

STANDARD DRAWINGS

28 STANDARD DRAWINGS

The standard drawings are placed at the end of the specifications for easy reference.

PIPE BURSTING

29-01 PIPE BURSTING

- A. Pipe bursting work shall be done by a qualified Contractor with at least five (5) years of pipe bursting experience including a minimum of three (3) projects of similar in pipe size and length to the work to be done.
- B. All work shall be performed as indicated on the plans and as required in these Specifications and shall be supervised by personnel experienced in installation of pipe using the pipe bursting technique. The Contractor shall provide all materials, labor, equipment, and services necessary for bypass pumping and/or diversion of sewage flows, installation of sewer pipe, and testing of completed pipe system.
- C. The Contractor's pipe bursting equipment shall be capable of bursting the host pipe and installing the new pipe as shown on the plans and specified herein.
- D. The Contractor shall be responsible for repairing or replacing existing utilities, pavements, structures or other improvements damaged by the pipe bursting work.
- E. If pipe bursting operation results in a partial or complete blockage of the public main sewer, the Contractor shall immediately notify the District. If the District is required to clear the blockage, the Contractor will be billed for all District costs incurred to clear the blockage.

29-02 CONTRACTOR SUBMITTALS

- A. The Contractor shall submit the following items to the District for review prior to ordering pipe materials and/or commencement of work.
 - 1. Pipe manufacturer's technical information; physical properties of pipe; joining/fusion method; dimensions of pipe and fittings; manufacturer's recommendation for handling; storage and repair of pipe and fittings; and certificate of compliance of the pipe and fittings with these Specifications.
 - 2. Method of pipe bursting; type of bursting tool (e.g., pneumatic, static) and installation equipment; procedures for operating the equipment; copies of any technology licenses; and types of lubricant and Material Safety Data Sheets (MSDS).

- 3. Estimated pull load, jacking/winch, cable/tow rod capacity for static pipe bursting method.
- 4. Pneumatic hammer size and winch capacity.
- 5. Service connection restoration plan/installation schedule; shop drawings and written description of the entire construction sequence, procedures for bedding pipe and insertion/reception/lateral connection pits; plan to remove and dispose of old pipe (if necessary) and a contingency plan.
- 6. Contingency plans for the following: unforeseen obstructions causing burst stoppage, surface heave, damage to existing utilities and improvements, loss of return to line and grade, and sewer backup.
- 7. Sewer bypassing plans and procedures.
- 8. Site layout including: location/dimension of insertion and reception pits; pipe layout and joining work areas; storage and equipment layout areas; proposed modifications of manholes; and traffic control plans.
- 9. Reports from independent testing laboratory certifying that the pipe material including physical properties and dimensions meet the requirements of these Specifications.
- 10. Contractor's pipe bursting qualifications.
- 11. Data from potholing of existing utilities.
- 12. Procedures for protection of existing utilities, structures and other improvements.

29-03 PIPE MATERIALS

The Contractor shall provide thermo-fusion welded HDPE pipe (minimum SDR 17) as specified in Section 18.01D – Plastic Pipe.

29-04 INSTALLATION

- A. The Contractor shall fully clean the sewer proposed for pipe bursting and inspect the line to reveal any deficiencies in the line (e.g., sags, offsets and/or repaired sections that could affect pipe bursting). Deficiencies shall be corrected prior to pipe bursting.
- B. The Contractor shall provide bypass pumping and/or diversion as required for acceptable completion of the pipe installation.

- C. The Contractor shall locate, design, construct, properly brace or shore, dewater, maintain, and restore insertion and receiving pits. Insertion and receiving pits shall be large enough large enough so that the pipe can be installed without exceeding the manufacturer's recommendations for curvature of the pipe.
- E. The Contractor shall fully expose the main sewer where a lateral is to be joined to the new sewer.
- F. The pipe bursting machine shall be equipped with a direct-reading pulling force gauge. The maximum pulling force that may be applied to any pipe shall be as follows:

HDPE-SDR 17 (DIPS) Nominal Pipe Size	Outside Diameter (inches)	Minimum Wall Thickness (inches)	Average Inside Diameter (inches)	Allowable Maximum Pulling Force (Ibs.)
4-inch	4.800	0.282	4.202	3,500
6-inch	6.900	0.406	6.039	7,500
8-inch	9.050	0.532	7.922	13,000
10-inch	11.100	0.653	9.726	20,000
12-inch	13.200	0.776	11.555	28,000

- G. Pipe shall not be pulled through bends greater than forty- five degrees (45°).
- H. The pipe shall be pulled a minimum of two (2) feet beyond the planned connection to allow inspection of the condition of the pipe (e.g., for scarring or other damage).
- I. Prior to making connection at each end of an installed reach of pipe with fittings or couplings, the Contractor shall allow a minimum of six (6) hours to elapse to allow pipe to relax from the tension resulting from pulling the pipe and for the pipe to equalize with ambient ground temperature.
- J. Connections at and restoration of manholes shall be in accordance with Section 21-14, Manholes.
- K. Restoration of sewer laterals and other requirements not described in this Section shall be in accordance with Section 18 Sewer Pipelines.

CURED IN PLACE PIPE (CIPP)

30-01 CURED-IN-PLACE PIPE

- A. Cured in place pipe installation shall be done by a qualified Contractor with at least five (5) years of cured in place pipe installation experience including a minimum of three (3) projects of similar in pipe size and length to the work to be done.
- B. The Contractor shall furnish and install cured in place pipe (CIPP), as indicated on the plans and as required in these Specifications. Work shall be supervised by personnel experienced in installation of cured in place pipe. The Contractor shall furnish all materials, labor, equipment and services necessary for bypass pumping, and or diversion of sewer flows, pretreatment or disposal of process wastewater, installation of sewer pipe liner and testing of completed piping system.
- C. This specification references American Society for Testing and Materials (ASTM) Standard Specification F1216, F1743, D790 (latest editions) and their reference standards, which are made a part hereof by such reference and shall be the latest edition and revision thereof. All work shall comply with the reference standard.
- D. The Contractor shall not discharge CIPP process wastewater to the public sewer system, storm drains, gutters, watercourses, swales, impoundments or onto the ground.
- E. Any deficient work identified during or after construction shall be properly repaired or replaced by open-cut construction methods at the discretion of the District.
- F. If the CIPP repair operation results in a partial or complete blockage of the public main sewer, the Contractor shall immediately notify the District. If the District is required to clear the blockage, the Contractor will be billed for all District costs incurred to clear the blockage.
- G. All other requirements not described in this Section shall be in accordance with Section 18 Sewer Pipelines.

30-02 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR shall submit the following information to the District prior to the commencement of any work.
 - 1. CIPP System Data

- 2. Felt Manufacturer References and Location
- 3. Manufacturer's Resin Data and Test Results
- B. Prior to installation of the line, design calculations shall be submitted to determine the minimum thickness of the liner to be installed. The pipe design shall have sufficient strength to support all dead loads, live loads and groundwater loads imposed, and shall presume that the existing sewer is fully deteriorated. The actual liner thickness shall be no less than 4.5 mm for 6-inch diameter pipelines and 6.0 mm for 8-inch diameter pipelines with an invert less than or equal to 15 feet,
- C. Evidence of operator certification for the CIPP system proposed and a copy of the manufacturer's system written procedures shall be submitted to the District prior to the start of work.

30-03 PIPE MATERIALS

- A. The liner, including any plastic covering and the thermosetting resin, shall meet the minimum mechanical properties defined in ASTM.
- B. The felt material shall be manufactured by companies specializing in felt production for CIPP. The manufacturer shall have manufactured felt material for CIPP for at least two (2) years as documented by references. The felt material manufacturer and facility shall not change throughout the duration of the Contract.
- C. Polyester resins shall have a minimum Heat Distortion Temperature of 212 degrees Fahrenheit per ASTM D648. Vinyl Ester resins shall have a minimum Heat Distortion Temperature of 220 degrees Fahrenheit per ASTM D648. The exact makeup of the resin shall be submitted to the District including chemical resistance information, cure logs and temperatures. The exact mixture ratio of resin and catalyst shall also be submitted. The catalyst system shall be identified by product name.

30-04 INSTALLATION

- A. Prior to starting work all tools and materials needed for the job, including (but not limited to) CIPP wetting, insertion and curing equipment, pipe, fittings, couplings, shoring, gas detector, ladder, trench plates (if needed for street installations) or one and one-eighth (1-1/8) inch plywood (for off-road installations) shall be onsite.
- B. During preparation, placement and curing, a CIPP system manufacturercertified operator shall be on the jobsite in charge of the work and the Contractor shall strictly comply with the CIPP system manufacturer's written procedures.
- C. Prior to the installation of the liner, the Contractor shall thoroughly clean the

sewer designated to receive the liner. Cleaning shall constitute removal of all debris, solids, roots and other deposits in the sewer line. The Contractor shall inspect the sewer segment(s) designated to receive the liner using closed circuit television. The Contractor shall be responsible for confirming the locations of all lateral connections prior to installing and curing the CIPP. A video tape and suitable log shall be kept for later reference by the District.

- D. Following CCTV inspection, the Contractor shall clear the designated sewer line of obstructions such as protruding lateral connections that will prevent the insertion of liner.
- E. The Contractor shall provide for maintenance of flow, including necessary bypass facilities and operations, in the affected portions of the sewer system during installation of the cured-in-place pipe liner.
- F. The Contractor shall designate a location where the uncured resin in the original containers and the unimpregnated fabric tube will be vacuum impregnated prior to installation (i.e., "wet out"). The quantities of the liquid thermosetting materials shall be per ASTM and manufacturer's standards to provide the required design lining thickness. No liners on this project shall be "wet out" more than 72 hours prior to installation.
- G. The resin impregnated fabric tube shall be inserted through an existing manhole or other approved access in accordance with ASTM and manufacturer's standards. Care shall be taken during the insertion process to avoid overstressing of the fabric materials. Use of a lubricant during the insertion is allowed in accordance with the manufacturer's recommendations to reduce friction. The lubricant shall be nontoxic, unable to support bacterial growth, and shall not adversely affect the fluid to be transported. Such lubricant shall be in a container clearly marked as to its contents.
- H. After installation of the liner is completed, the Contractor shall cure the liner in strict accordance with ASTM and manufacturer's recommendations.
- I. Initial cure shall be deemed to be completed when inspection of the exposed portions of the cured-in-place pipe appear to be hard and sound. The cure and post-cure period and temperature shall be as recommended by the resin manufacturer. The curing process shall take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture content, thermal conductivity, etc.).
- K. The Contractor shall cool the finished cured-in-place pipe to specified temperature in strict accordance with ASTM and manufacturer's recommendations before relieving the internal pressure in the cured-in-place pipe. Care shall be taken in the release of the static head such that a vacuum will not be developed that could damage the newly installed cured-in-place pipe.

L. The finished cured-in-place pipe shall be continuous over the entire length of the insertion run and be free from significant defects including dry spots, lifts, and delaminations. Any defects which will affect the integrity or strength of cured-in-place pipe shall be removed and replaced at the Contractor's expense. For pulled-in-place installation techniques where the inflation bladder does not bond to the liner, all portions of the bladder shall be removed. Written curing and cool down logs shall be submitted to OWNER. No payment for lining work will be provided until such logs have been submitted and approved.

30-05 RESTORATION OF PRIVATE LATERAL CONNECTIONS

- A. The Contractor shall fully reopen all of the existing active service connections in each length of sewer following lining. The service connections shall be reopened from inside the sewer by means of a closed-circuit television camera controlled cutting device appropriate for the CIPP.
- B. All openings shall be clean and neatly cut and shall be flush with the lateral pipe. The opening shall also be buffed with a wire brush to remove rough edges and provide a smooth finish. The bottom of the opening shall be flush with the bottom of the lateral pipe to remove any lip that could catch debris. Openings shall be 100% of the service lateral pipe diameter.
- C. The Contractor shall certify it has a minimum of two (2) complete working cutters plus spare key components on the site before each inversion. Unless otherwise directed by the District, all laterals will be reinstated. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor will be responsible for all costs and liability associated with such excavation and restoration work.

CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

31-01 CONTROLLED LOW STRENGTH MATERIAL

A. The Contractor shall furnish all materials for Controlled Low Strength Material (CLSM) in accordance with the provisions of this Section.

31-02 SUBMITTALS

- A. The Contractor shall submit the following:
 - 1. Design mix for CLSM, including list of admixtures to be used. Design mix shall include source of materials and gradations of aggregate.
 - 2. Manufacturers' information for admixtures.
 - 3. CLSM properties including, but not limited to, design flow and design air content.
 - 4. Strength test report for preliminary trial mix(es), including all admixtures.

31-03 MATERIALS

- A. CLSM shall be a mixture of cement (one (1) sack per cubic yard minimum; two (2) sacks per cubic yard maximum), pozzolan, fly ash, coarse and fine aggregate, admixtures, and water batched by a ready mix concrete plant and delivered to the work by means of standard transit mixing trucks. The mixture shall produce a material which may be excavated by hand. The minimum twenty-eight (28) day compressive strength shall be fifty (50) psi and the maximum twenty-eight (28) day compressive strength shall be no greater than one hundred fifty (150) psi in accordance with ASTM C 39.
- B. Cement shall be Type II in accordance with the requirements of ASTM C 150.
- C. Pozzolan and/or fly ash may be added to improve the flowability and shall be Type F in accordance with the requirements of ASTM C 618.
- D. Coarse aggregate shall consist of a well-graded mixture of crushed rock, or sand with a maximum size aggregate of three-eighth (3/8) inch. One hundred percent (100%) shall pass the one-half (1/2) inch sieve. Not more than thirty percent (30%) shall be retained by the three-eighth (3/8) inch sieve and not more than twelve percent (12%) shall pass the number two hundred (200) sieve. All material shall be free from organic matter and meet the requirements of ASTM C 33.

- E. Clean potable water free from objectionable quantities of silty organic matter, alkali salts and other impurities shall be used.
- 31-04 ADMIXTURES
- A. An air entraining admixture may be added to improve the workability and shall be in accordance with the requirements of ASTM C 260. The entrained air content shall be a minimum of eight percent (8%) and a maximum of twenty percent (20%) as required by the Contractor to meet the uses specified herein.
- B. A water reducing agent may be added in accordance with the requirements of ASTM C 494 to improve workability.

31-05 INSTALLATION

- A. The subgrade and compacted fill and/or trench to receive CLSM shall be complete and acceptable in accordance with Section 16 Excavation, Bedding and Backfill.
- B. Use of CLSM in the pipe zone may cause flotation or displacement of the pipe during installation of the CLSM. The Contractor shall take necessary precautions to prevent flotation and ensure that the pipe is installed according to the alignment and grade shown on the plans.
- C. A vibrator may be used to ensure that all voids, crevices, and pockets are filled with CLSM. Care shall be taken to avoid over-consolidation of the material separating the large and fine aggregate.
- D. Where new CLSM must be placed against existing CLSM, the placement shall be clean of all loose and foreign material. The surface of existing CLSM shall be soaked a minimum of one (1) hour before placement of fresh CLSM. No standing water will be allowed before starting placement of fresh CLSM.
- E. When placing CLSM for trench dams, the Contractor shall ensure that no voids exist around the pipe barrel and that the CLSM completely fills the trench width, including keyways, for the full depth required, as shown.
- F. The finished surface of CLSM shall be smooth and to the grade shown on the plans or as directed by the District.
- G. CLSM shall be protected from running water, rain, freezing, or other conditions that could damage the material until cure is complete.
- H. No equipment, traffic, or backfill shall be allowed on the CLSM until the surface of the CLSM is able to withstand a twenty (20) psi load without displacement or damage. If necessary, the Contractor shall provide steel trench plates that span the trench until the CLSM has reached the required strength.

I. When using CLSM as abandonment grout, the Contractor shall contain CLSM in sewer pipelines and structures to be abandoned using bulkheads.

SEWER LATERALS

32-01 SEWER LATERALS

This specification references and consolidates other Sections related to sewer laterals. When conflicts occur between this Section 32 and the referenced specification sections, the referenced section takes precedence.

32-02 LINE SIZE AND SERVICE POLICY (ref. Section 3-09)

- A. Side sewers shall be connected only to existing or new six (6), eight (8), ten (10), or twelve (12) inch diameter main sewers. All side sewer connections to public sewers over twelve (12) inches in diameter shall be made at manholes or by extending an eight (8) inch main from a downstream manhole to the parcels being served, unless written special approval to allow taps is received from the District.
- B. The side sewer size is four (4) inches in diameter for single family residential, duplex, or accessory dwelling. Six (6) inches or larger diameter side sewer shall be installed where use is to be industrial, commercial, or multi-family residential as required by capacity (see Section 4.01). Joint use of side sewers (known as common laterals) will not be permitted for new connections. Side sewers shall have an approved backwater overflow device installed on or near the cleanout. (See Sections 18-02.D, 28-34A, and 28-34B.)

32-03 BASIC SEWER SERVICE POLICY (ref. Section 3-11)

Generally, the limit of public ownership and responsibility on each branch of the sewer system is defined as the last upstream manhole, lamphole or rodding inlet on each branch. Beyond that point the District shall bear no responsibility for maintenance and repair of sewer piping. Such piping that may exist is hereby defined as part of a building sewer or common lateral and is subject to private property maintenance requirements of Ordinance 78-79-2. Private sewers, i.e., the sewer pipeline from the building to the public sewer, including the connection to the public sewer, are owned and maintained by the Owner. (ref. Section 3-10)

32-04 SEWER LATERAL DESIGN STANDARDS (ref. Section 4)

- A. Each individual building shall be connected by a separate side sewer. Sample side sewer layouts are illustrated in Section 4-02B.
- B. Side sewers of six (6) inches or eight (8) inches diameter require two (2) prints of Site Plans for permit issuance.
- C. Size and Slope

1. Minimum sizes and slopes for side sewer shall not be less than indicated below:

	<u>Size</u>	<u>Slope</u>
- Single Family Residential, Duplex	4"	2%
- Other	6"	1.1%

- 2. The size of the side sewer shall be increased to the largest of the building plumbing stub or the size indicated for horizontal drainage piping in Table 4-3 of the Uniform Plumbing Code, latest edition.
- 3. The maximum slope of any portion of a side sewer shall not be greater than one hundred fifty percent (150%).
- 4. Side sewers for townhouses and similar cluster housing developments shall be installed on an even slope from the main line connection to a point two (2) feet from the end of the building clean out conforming to the above requirements.
- D. Fixture Units
 - 1. The fixture unit equivalents for plumbing fixtures shall be based on the tables of the Uniform Plumbing Code, latest edition.
 - 2. Side sewers exceeding two hundred (200) feet in length shall include an infiltration allowance of five (5) fixture units per acre or one (1) fixture unit per forty (40) feet of sewer installed.
- E. Pipe Material. A lateral sewer, being installed concurrently with a main sewer, shall be of the same type and class as the main. Any house sewer or side sewer, not being installed concurrently with the main sewer, may be any one of the types of pipe approved for side sewers, as indicated on the Approved Materials List. Shear band couplings are required on all lateral joints.
- F. Vertical and Horizontal Deflections
 - 1. All lateral sewers shall have an alignment that provides an angle of intersection with the downstream section of main sewer of no less than ninety degrees (90°). No lateral alignments adverse to the flow of the main will be permitted. Refer to Section 28-07 of these Specifications for example.
 - 2. The maximum deflection at anyone point in a side sewer, not including fittings at wye connection to the main sewer or at angle points having clean outs shall be twenty-two and one-half degrees (22-1/2°) (1/1 6 bend) and any two (2)consecutive deflections (bends) shall not be less than two (2) feet apart.

- G. Building Drains. The "Building Drain" shall be arranged so that the point of connection with the house sewer is on the side of the building facing the public sewer main.
- H. Lateral Sewer Location. Location of lateral sewers in public road rights-of-way shall be in relation to the nearest corner of the property being served. Unless otherwise determined by physical controls, the lateral sewer shall be located ten (10) feet from the lower property corner at the right-of-way line of hillside lots (3 % + slope).
- I. Location Mark
 - Where curbs, gutters, and/or sidewalks exist or are to be installed as a part of an improvement, the lateral sewer shall be permanently located by imprinting an "S" (1-1/2" size) or by chiseling an "S" (4" high) in the concrete surface vertically above the side sewer pipe. The "S" shall be located in order of preference on sidewalk, gutter, or curb. (See Section 28-33.)
 - 2. It shall be the responsibility of the Contractor installing such lateral sewer to mark its location as specified herein.
- J. Lateral Depth. Depth of the lateral sewer end at the property line or easement edge shall be set by the Engineer to serve the house sewer. (See Section 28-33.) Where lateral sewer end depths must be specially designed to serve the home site, their depths shall be indicated on the Plans.
- K. Clean outs shall be provided in the side sewer system at the following locations:
 - 1. At the point of connection to the building drain.
 - 2. At any single turn greater than forty-five degrees (45°).
 - 3. At intervals along the side sewer system where the accumulative total of deflection from the point of connection to the main or from another clean out exceeds forty-five degrees (45°).
 - 4. At intervals not to exceed one hundred (100) feet along the side sewer system.
 - 5. Clean out risers shall be cast iron, HDPE or ABS in conformance with Section 18-01.C and Section 18-01.D and equal in size to the side sewer and shall be installed in conformance with Standard Drawing Sections 28-32 through 28-34.
- L. Backflow Prevention Device. When stoppages occur in sanitary sewers, a danger

of damage to health and property exists resulting from the possibility of sewage overflow and backflooding on public and private property. It is the purpose of the District to protect the health and safety of the residents of the District and to minimize the possibility of damage to property by requiring, where topographical conditions warrant it, the installation and maintenance of a protective device approved by the Engineer. (District Code Section 9.08)

- 1. No person shall construct, alter, or repair a side sewer connection to the District system without installing an approved backwater overflow device if one does not already provide protection.
- 2. A backwater overflow device, as detailed in Sections 28-34of these Specifications, shall be installed in conformance with Section 18-02.B. A gate valve, as detailed and specified for backwater check valve and shutoff systems herein is optional but should be considered for installation for additional protection.
- Consideration must be given to the damage potential to adjacent property by sewage released through a backwater overflow device per Section 28-34.
- 4. Backwater overflow devices shall be located in areas away from vehicular and foot traffic. If a backwater overflow device must be located in an area that will have concrete or asphalt such as a driveway or sidewalk, the device shall be installed in a reinforced concrete utility box with a lid marked SEWER. A "sewer popper" may be used as an overflow device provided that it is installed within a concrete Christy box (see Section 28-34B).
- 5. Where the sewage cannot overflow on the area surrounding a backwater overflow device without damage to property, a backwater check valve and shutoff system, as detailed in Sections 28-34A and 28-34B of these Specifications, shall be installed.
- 6. Homeowners shall be responsible for the maintenance of backwater overflow devices. Homeowners shall be liable for the costs of cleanup and repair of damage from overflows if a backwater overflow device is tampered with or removed after it has been installed.
- 7. In the event of any occurrence of backflow of sewage from the sewer system that results in a sewage overflow inside a building, the District may adopt a finding by resolution that the building sewer is non-conforming. The property owner shall be immediately notified (1) that an overflow device is required and must be installed within 90 days; (2) that the property is vulnerable to future interior spills and the consequence of not installing an overflow device will be owner responsibility for future damages by interior spills; (3) that this notification will be recorded with the

Contra Costa County Recorder; (4) that the County Environmental Health Department will be notified of an existing health hazard to be abated; and (5) that in the event of non-compliance the District may install an overflow device and recover abatement costs on the next tax roll as a surcharge on sewer service charges.

- 8. In the event of a damage claim from the property owner for a sewage overflow that leads to a settlement of the claim, as a condition of payment the owner shall be required to sign an agreement that a portion of the settlement amount shall be withheld by the District to fund installation of an overflow device on the owner's behalf.
- M. Joint Building Sewers Not Permitted
 - 1. Every building containing sanitary plumbing or an interior drainage system shall be connected to the sewer system. A separate building sewer shall be provided for each building.
 - 2. Where a joint building sewer ("common lateral") preexists these Specifications, such conditions are considered non-conforming. It is the policy of the District Board that non-conforming conditions, with the exception of common lateral on the same parcel, shall be abated as soon as possible and that no permit to repair or alter a common lateral shall be issued absent determination by the General Manager that no feasible alternative exists. Where common laterals are known to exist between multiple property owners, they shall be recorded with the Contra Costa County Recorder as awaiting abatement of non-conforming conditions and the owner's shall be notified.
- N. Pipe Cover. Side sewers shall have the following pipe cover:

That portion of a side sewer within public roadway (lateral) shall have the minimum cover of five (5) feet at the property line or at a point five (5) feet outside the curb face or edge of paving, whichever is the greater distance from the roadway center line.

Minimum cover for side sewers in driveways, parking, and all other traffic areas within properties other than single family residential shall be five (5) feet. Such cover conditions shall exist from the property line to a point within eight (8) feet of the building drain connection. If the minimum cover cannot be obtained, cast iron or ductile iron pipe shall be used.

The minimum cover for side sewers outside of traffic areas from the property line to a point within eight (8) feet of the building drain connection shall be thirty (30) inches.

Minimum cover for side sewers at the point of connection to the building drain

(within two (2) feet of the foundation) shall be eighteen (18) inches. All side sewer pipelines within eight (8) ft. of the building drain connection and having a minimum cover less than thirty (30) inches shall be cast iron or HDPE in conformance with Section 18-01.C.2. Instrument control of grades with an engineer's level will be required where side sewer installation exceeds fifty (50) ft.

Where grades are less than two percent (2%), cut sheets will be required and cuts must be staked at the site prior to trenching.

For side sewer connections to existing ten (10) inches or smaller sewers, see Section 18-02.C.2 of these Specifications. For side sewer connections to existing or new sewers twelve (12) inches or larger in diameter, see Section 3-09 of these specifications.

- O. Sewers to Be Installed As Site Collector Systems (See Definition In Section 2-01)
 - 1. Sewers shall be designed in conformance with main line standards specified within Section 4.
 - 2. Design and construction engineering procedures shall conform to the applicable sections of the Standard Specifications with the following additional requirements:
 - a. Where fixture units exceed 1,500, the District may incorporate additional requirements, including such structures as manholes and rodding inlets.
 - b. Minimum pipe cover for the site collector sewer pipe shall be as specified for main sewers in Section 4-02.C.
 - c. Instrument control of grades will be required where side sewer installation exceeds fifty (50) feet.
 - d. Where grades of side sewers are less than two percent (2%), cut sheets will be required and cuts staked at the site prior to trenching.
- P. Test Fittings
 - 1. All test fittings, unless otherwise approved, shall be wye or tee branches of the same size, type, and quality as that of the line in which they are being installed.
 - 2. Test fittings for air testing shall be installed in all new side sewers at the locations described herein under Section 18-02.B.
- 32.05 Lateral Sewer Locations on Plans (ref. Section 5-05)
- A. Lateral sewers shall be shown and stationed on the sewer plans and cut sheets.

The length of each lateral shall be shown on the sewer plans either by note or by individual distance. Laterals shall be of sufficient length to clear all existing utility easements. The distance from the lateral where it crosses the property line to the nearest property corner shall be shown on the sewer plans.

B. Laterals may not be installed by tapping into existing mains or manholes, unless otherwise approved by the Engineer. All taps to be made on new sewer projects shall be noted on the sewer plans submitted for review.

32-06 MARKING OF SIDE SEWERS (ref. Section 7-01)

A. Where curbs, gutters, and/or sidewalks exist or are to be a part of an improvement, each side sewer shall be permanently located by imprinting an "S" (1-1/2" size) or by chiseling an "S" (4" size) in the concrete surface vertically above the side sewer pipe. The "S" shall be marked on the curb, gutter, or on the sidewalk. Responsibility for providing the marking and for its accuracy shall rest with the sewer contractor.

32-07 LATERAL CUT SHEETS (ref. 7-02)

Cut sheets shall be prepared in accordance with the example shown in Figure 7-1 of these Specifications for all sewer system pipe-lines specified herein, and submitted with plans for final review where noted below.

- A. All side sewers six (6) inches or greater in size and where such installations exceed fifty (50) feet (available in the field prior to trenching).
- B. All side sewers for townhouses, condominiums, and similar cluster housing developments.
- C. All side sewers permitted by the Engineer to be installed on less than minimum slope ratios specified under Section 4-02.B.2 (available in the field prior to trenching).

32-08 LATERAL SEWER LOCATION FIELD SURVEY (ref. Section 7-03)

A. Prior to installation of lateral sewers in subdivisions, the lot corner nearest the side sewer and the lateral sewer terminus shall both be staked and flagged in the field.

32-09 NO REUSE OF OLD LATERALS (I&I Control, ref. Section 9-08)

A. Preexisting laterals from demolished buildings may not be reused when a new building is built. Preexisting laterals from derelict buildings may not be reused when such a building is rehabilitated.

32-10 SIDE SEWER PERMITS (ref. Section 10-02)

- A. Lateral Permits shall be issued for construction or replacement of laterals when the public main is existing and available for connection. Laterals constructed as part of main line work will be covered under the Mainline Permit. Sewer plans for subdivision will show all lateral locations. Plans are required showing location and slope for all laterals six (6) inches or larger for non-subdivision work.
- B. Repair Permits shall be issued for work on existing side sewers. Repair permits are issued when the work requires no alignment modification of the existing private system and all work is solely for repair of existing sewers, or when additional private systems are installed to existing side sewers, to sewer house additions, for modifications, or for ease of maintenance to existing side sewers.
- C. Abandonment Permits shall be issued for abandonment of side sewers.
- D. Pump Permit shall be issued for construction of non-gravity side sewer installation.
- 32-11 LICENSING (ref. Section 10-02)
- A. All contractors doing sewer work within the District shall be properly licensed in accordance with the provisions of Division 3, Chapter 9, Business and Professional Code, of the State of California, as amended. Contractors shall present evidence of licensing, including license number. Work on public property, roads, streets, and other rights-of-way shall be performed only by duly licensed contractors. Acceptable license classifications are "A" General Engineering Contractor; C-34 Pipeline; and C-42 Sanitation Systems. (District Code Section 5.04.015)
- B. Contractors with C-36 licenses may perform side sewer work to service those structures in which they have installed plumbing systems and repairs or alterations to existing private side sewers (excluding connections to the public sewer mains).
- 32-12 VIOLATIONS AND PENALTIES (ref. Section 10.04)
- A. The District may require immediate excavation and inspection of buried work on side sewers, at no cost to the District, whenever work requiring a permit has been buried without inspection and approval by the District.
- B. By Notice of Violation, when authorized by the General Manager, the District may order the property owner to discontinue use of the sewer and/or to discontinue all construction work with respect to the sewer and to abate defective lateral conditions under District permit. The District may similarly require immediate stoppage of any illegal discharge and actions to prevent recurrence, or immediate abatement of any other violation of these Specification or District

Ordinances. (District Code Section 1.08.010)

C. Such Notice of Violation shall be served personally to the owner or by mailing such notice to the owner certified, postage prepaid and addressed to the address last shown on the Contra Costa County secured assessment rolls. Any stoppage in the building lateral or break in the watertight integrity of the lateral shall be conclusively presumed to be a menace to life, health, safety or property for purposes of requiring abatement of such defective conditions. Should the property owner fail to comply with the Notice of Violation within the time limits set forth by the notice, the District Manager and his/her designee are hereby authorized to enter the property to cause such repairs as are necessary to abate a public nuisance.

32-13 EXCAVATION AND BACKFILL (ref. Section 16-02)

- A. Trench Width
 - 1. Trenches shall be excavated with full depth vertical sides where possible. Minimum vertical trench shall be from pipe flow line to a point two (2) feet above top of pipe. Any over-width trench, whether by over excavation, cave-in, or by ground movement, will require special pipe and/or special backfill, as directed by the Engineer.
 - 2. Trenches for side sewers up to three and one-half (3 1/2) feet in depth shall be eighteen (18) inches in width. Trenches for side sewers greater than three and one-half (3 1/2) feet in depth shall be twenty-four (24) inches in width.
- B. Earth Trench Dams (Sec. 28-39) shall be constructed over side sewers at property line or at the easement line, at locations indicated on the Plans and at locations designated by the Engineer.
- 32-14 CASINGS, BORES, OR TUNNELS (ref. Section 16-04) Main or side sewer pipes installed in tunnels or bores without casings shall be ductile iron (Class 53 or better).
- 32-15 SEWER PIPELINE MATERIALS (ref. Section 18-01)
- A. General All pipe installation procedures and materials shall be in accordance with the pipe manufacturer's recommendations where not modified under the various types of pipeline materials specified herein. A current list, referred to as "Approved Material List", of all pipe, fitting and joint materials specifically approved by the Engineer as conforming to these Specifications and for use in sewer pipeline installations under the jurisdiction of the District is on file and available at said District offices. Pipe, pipe products and/or pipe specifications not appearing on said "Approved Material List" shall not be used within the District without approval of and written authorization from the Engineer. All pipe

sizes refer to the nominal inside diameter of pipe (including any pipe linings) and no pipe, except were specified herein, shall be more than one-quarter (1/4) inch smaller than the nominal size designated. All pipe, pipe joints incorporated into the pipe, and manufactured fittings connecting pipe between structures shall be of one and only one manufacturer's brand and of the same type, quality, class and size. Jointing of pipe dissimilar in size and/or material shall be accomplished either by use of an Expansion Block as detailed and specified under Section 28-40 of these Specifications or by use of special adapters or couplings accepted by the Engineer for such use. All field cut pipe shall be accomplished with equipment recommended by the pipe manufacturer. No hammer and chisel cuts will be permitted. All pipe and fittings delivered to the jobsite shall be marked by the manufacturer with such inventory and identification (Brand Name, Pipe Type, Strength Class, Batch Lot, Lengths, etc.) as to be properly identified in the field as meeting the requirements herein and for the work.

- B. Banded rubber couplings for use in the joining of new pipe or repair of existing pipelines shall be compression type "Band-Seal" couplings with external adjustable stainless steel shear rings, Mission Clay Products Corp., or "Ceramicweld" couplings Joints, Inc., or approved equal. Use of couplings without external shear support, or couplings with shear rings in direct contact with the pipe at joints, (internal of the rubber collar), will not be permitted except when joining dissimilar pipe (e.g. clay to cast iron).
- C. Rigid Pipe Rigid pipe, fittings and joint materials specified herein consists of Vitrified Clay Pipe (VCP), Cast Iron Pipe (CIP), Reinforced Concrete Pipe (RCP), Concrete Lined Steel Cylinder (CL), Concrete Lined and/or Coated (CL&C), and Ductile Iron Pipe (DIP). See Section 18-02.D for repair procedures for rigid pipe in new construction.
 - 1. Vitrified Clay Pipe All VCP and fittings shall conform to the requirements of ASTM Designation C 700 as it applies to <u>high strength</u>, unglazed vitrified clay pipe.
 - a. Resilient material conforming to the requirements of ASTM Designation C 425 shall be used for VCP Jointing.
 - b. Rubber couplings used to join plain end VCP shall conform to the material and performance requirements of ASTM Designation C 594.
 - 2. Cast Iron Pipe All CIP for use in side sewer installations only, shall conform to the requirements of ASTM Designation A-74 as it applies to Single Hub, extra heavy and service weight pipe. Service weight, Class SV, pipe shall be the normal requirement of CIP installations; however, the Engineer may require use of extra heavy, Class XH, pipe under special conditions. CIP may be installed without the use of foundation bedding

material where such trench bottom provides solid bearing for the full length of the pipe.

Cast Iron "No-Hub" pipe and fittings may only be used for four (4) and six (6) inch side sewers and, at a minimum, shall conform to the requirements of the Cast Iron Soil Pipe Institute, (CISPI), "Standard No. 301". "No-Hub" pipe shall be installed in accordance with CISPI Pamphlet No.100 using only "No-Hub" couplings, except where otherwise designated by the Engineer for dissimilar joints. Minimum cover for "No-Hub" installations in traffic areas shall be three (3) feet.

Maximum deflection permitted per "No-Hub" joint shall be ten (10) inches per ten (10) foot length of pipe or appropriate ratio thereof. Use of a properly calibrated torque wrench for jointing shall be mandatory.

3. Ductile Iron Pipe - All DIP and fittings for main and trunk sewers shall conform to the requirements of ANSI Standards A21.52 (<u>Class 52</u>) as they apply to Ductile Iron Pipe. All main and trunks sewer DIP and fittings shall be of sufficient thickness to withstand the depth of cover under the laying conditions and provisions of Section 4-02.C of these Specifications. There are no special lining or coating requirements; however, bituminous material coated or concrete coated and/or lined pipe conforming to the requirements of ANSI Standard A21.4 may be used.

All DIP shall be shown on construction drawings by type and thickness class designations herein specified.

- a. Bell and spigot joint assemblies shall conform to the requirements of Federal Specification WW-P-421c, Section 3.1.2 as it applies to TYPE II, Grades B or C pipe.
- b. Standardized mechanical joint assemblies shall conform to the applicable requirements of ANSI Standards for the pipe specified and ANSI Standard A21.11.
- c. Lead caulked joint assembles will not be permitted.
- d. No joint will be required immediately outside of structure bases for all DIP installations.
- e. DIP may be installed without use of foundation bedding material where trench bottom provides solid bearing for the full length of pipe between bell holes, and where such installation otherwise meets the requirements of these Specifications.

- f. The minimum radius for DIP shall be as shown on Section 28-31 of these Specifications.
- 4. Reinforced Concrete Pipe All RCP and fittings shall conform to the requirements of either ASTM Designations C76 or C361, as modified hereunder:
 - a. Where not otherwise modified by these Specifications, all provisions of the above-mentioned ASTM Designations shall govern.
 - b. The basis of acceptance of RCP manufactured in compliance with these Specifications shall be in accordance with Section 4.1.1 of ASTM Designation C76 and as follows:
 - i. Engineer review of submittals required under Sections 18-01.C.4.b.3, d.4, and f.7 of these Specifications.
 - ii. Three-edge bearing test loads shall be applied to the extent that no greater than a O.O1-inch crack is produced in tested pipe sections. Applied test loading may be terminated without producing a 0.01-inch maximum crack if or when such loading has reached one hundred twenty-five (125) percent of that required for and related to the specified Dload for the subject pipe.
 - iii. Test results shall be submitted to the District prior to shipment to the project jobsite. Results shall indicate the District-assigned project number, agency and operator performing the test, test date, pipe size and specified D-load and ultimate test load applied.
 - c. Materials shall comply with Section 5 of the appropriate ASTM Designation under which the subject pipe is to be manufactured, modified as specified hereunder:
 - i. Cement used in the manufacture of RCP shall be TYPE II in conformance with ASTM Designation C150.
 - ii. Aggregates used shall consist of granitic, calcareous or combinations thereof such that the concrete material samples for testing alkalinity in conformance with Section 18-01.C.4.f of these Specifications shall exhibit a total Carbonate equivalence of not less than fifty (50) percent.
 - iii. No admixtures shall be introduced to concrete mixes without specific District authorization. Authorization for admixture or

blend usage for pipe for a given project shall not be considered a general use authorization for subsequent projects unless so stated.

- iv. Rubber for gaskets shall comply with the requirements of Section 2.11 of AWWA Standard C302.
- d. Design shall comply with Sections 6 and 7 of appropriate ASTM Designation under which the subject pipe is to be manufactured, modified as specified hereunder:
 - i. All RCP shall be designed for anticipated trench loads calculated in conformance with Section 18-01.C.4.g of these Specifications, combined with a minimum head of at least twenty-five (25) feet. However, in no case shall pipe design under ASTM C76 provisions be less than that specified therein for CLASS III (1350-D), nor shall pipe design under ASTM C361 provisions be less than that specified therein for Class B.
 - ii. Total concrete cover of reinforcement at the inner wall, (clearance of steel surface to inner wall surface), shall not be less than one (1) inch, regardless of pipe diameter size or type and placement configuration of reinforcement.
 - iii. Joint assembly design shall be reinforced concrete bell and spigot type incorporating a fully retained, single rubber gasket in accordance with Section 3.3 of AWWA Standard C302.
 - iv. Manufacturer's design drawings for each project shall be submitted to the Engineer for review prior to fabrication. Drawings shall indicate, at relative scale, concrete covers, reinforcement placements and joint assembly design. Submittals shall also include the design pipe size, D-load, cement type, concrete strength and areas, types and placements of reinforcement.
- e. Pipe manufactured under these Specifications shall be fabricated by the "centrifugal spun" process in accordance with AWWA Standard C302 and as modified hereunder.
 - i. Section 3.6.9 Form oils or release agents shall not contain any material or substance as would penetrate or otherwise retard concrete set at the formed surface.
 - ii. Section 3.6.10 The steel forms shall be placed horizontally

in a machine capable of spinning the forms at speeds that will produce concrete meeting or exceeding the concrete strengths required under the appropriate ASTM standard for the subject pipe specified.

- f. The method and procedure for determining the alkalinity content for the inner wall of RCP shall be as follows:
 - i. A minimum of two (2) carbonate equivalence tests shall be run on sample pipe manufactured from concrete ingredients batched each week of manufacture for each pipe size manufactured there from. Additional testing on different pipe sections shall be required if the carbonate equivalence results of individual tests per pipe sample vary by more than ten (10) percent.
 - ii. Test samples of concrete shall be obtained from random selected pipe sections by drilling, using carbide concrete bits as will procure at least five (5) grams of material per drilling. Sample material shall be taken at two (2) locations at least twelve (12) inches apart longitudinally and to the depth of the steel reinforcement, surface. (For elliptically-placed reinforcements, sample material shall be taken at the minor axis as marked on the pipe.)
 - iii. All drilled holes shall be repaired with cement and fine aggregate as specified and used in the manufacture of the subject pipe.
 - iv. Each material sample shall be tested separately as obtained from the subject pipe. Test material shall be ground or pulverized sample material, oven dried for at least four (4) hours at a temperature of $100^{\circ}C \pm 50^{\circ}C$ just prior to testing.
 - v. Testing shall involve the following equipment and procedures:
 - I. Equipment Sample weighing shall be performed with a precision balance readable to at least the nearest ten (10) milligrams. Liquid measures shall be performed with precision burettes readable to at least two-tenths (0.2) of a milliliter. Ph meters shall read to at least the nearest tenth (0.1) of a unit. Weighing and pH meter equipment shall have been calibrated for correctness within six (6) months of the test.
 - II. Test procedure Weight at least one (1) gram of the
test material of each sample into an appropriately sized Erlenmeyer flask and add about 100 ml of distilled water. (Place glass funnel in neck of flask to minimize spray losses). Slowly add 50 ml of Standardized 1-Normal Hydrochloric Acid per gram of test material. When effervescence has subsided, heat to boiling and boil about 1/2 minute period. Cool and add 50-100 ml distilled water. Titrate with standardized, carbonate-free, 1-Normal Sodium Hydroxide solution to an end point of pH metering reading of 6.8 minimum to 7.8 maximum. End point reading must be stabilized for not less than two (2) minutes.

- vi. Calculation of Carbonate Equivalence Calculations shall be based upon the chemical reaction of equivalent weights of Calcium Carbonate, CaCO3 and the liquid measures of specifically standardized acid and base titrating solutions, to the nearest tenth of one (0.1) gram at the stabilized end point. The equivalence of the tested sample shall be expressed in a percentage as CaCO3 to the nearest tenth of one (0.1) percent.
- vii. Quality Control Records - The Contractor shall, prior to pipe installation, furnish the Engineer with two (2) copy sets of the manufacturer's quality control records for pipe manufactured in accordance with this section. Records shall indicate thereon: (1) the agency and technician performing the test, (2) the test date, (3) the District's Job Number assigned to the project, (4) the pipe size and date manufactured, (5) the weight of the test material, (6) the actual standardized normality of the acid and titrate solutions and the test amounts used, and (7) the individual sample and pipe section average equivalent CaCO3 percentage. Each test record sheet shall be endorsed by the manufacturer, (and the agency performing the test if other than the manufacturer), as certifying compliance with this Section.
- g. Trench load calculations and design shall reflect the following minimum criteria:
 - i. Maximum trench width of twenty-four (24) inches greater than the outside diametric dimension (O.D.) of the pipe and a backfill density relative to that anticipated but in all cases not less than one hundred twenty (120) pounds per cubic foot.

- ii. A dead load factor not greater than one and nine-tenths (1.9).
- iii. Live load and impact factors relative to that anticipated but in all cases not less than that produced by using AASHO H-20 load criteria and a one and one-half (1.5) impact factor.
- iv. A safety factor of not less than one and one half (1.5).
- 5. CL and CL&C Pipe CL and CL&C pipe shall conform to the requirements of Federal Specifications SS-P-381a of December 14, 1967 and latest amendments thereto and/or SS-P-385a of January 31, 1964 and latest amendments thereto except as modified herein. The total area of steel used for design purposes shall be the cross-sectional area of steel in the wall of the pipe cylinder only.
 - Rod-wrapping cross-sectional area shall not be considered for design purposes. Reinforcing steel used for rod-wrapping for all CL&C pipe shall have a minimum diameter of seven thirty-seconds (7/32) inch.
 - c. Concrete linings and coatings shall be manufactured with Type II Portland cement conforming to the requirements of ASTM Designation C 150 Concrete linings shall extend to the ends of each pipe length. The concrete coating shall be held back three (3) inches from each end of each pipe, except where otherwise specified for abutting pipe or structure connections. An acceptable corrosion protective coating shall be shop applied to all exposed metal portions of pipe before shipment. Minor shop coating damage shall be repaired in the field with material consistent with that used by the pipe manufacturer as directed by and to the satisfaction of the Engineer.
 - d. Except where shorter lengths are required to meet special conditions with due allowance for jointing, CL and CL&C pipe shall be fabricated in individual lengths not exceeding forty (40) feet. All pipe shall be clearly marked with date of manufacture, type of concrete lining and/or coating and name or trademark of the manufacturer as identification on each individual length unless otherwise specified or shown on the Drawings.
 - e. Fabrication of CL&C pipe for above ground crossings, siphon installations or other underground installations specified shall be in accordance with the minimum basic requirements of the following table: (Based on a maximum span of thirty (30) feet).

Lined inside diameter							
of pipe (In.)	6	8	10	12	14		
Steel Cylinder Gauge							
(US Standard)	10	10	7	7	7		
Uniform minimum Lining							
Thickness	1/2	1/2	1/2	2/3	2/3		
Uniform minimum Coating							
Thickness	1	1	1	1	1		
Rod-wrapping or wire							
reinforcement	7/32 inch diameter or greater						
	1.75 inches maximum clear						
	spacing. Self-furring welded fabric of 2-by-4 inch No. 13 gage						
	steel wire.						

Steel cylinders in the above table shall be such that the lined pipe shall have the nominal pipe size within the one-quarter (1/4) inch tolerance set by these Specifications. Fittings for CL&C pipe shall conform to the requirements of AWWA Standard C 208. Special fittings shall be shop fabricated as detailed on drawings for construction.

- f. Deflection fittings shall not exceed fifteen (15) degrees at any one angle break in such fitting and the distance between all miters in a fabricated fitting shall be three (3) nominal pipe size diameters.
- g. The Contractor shall submit, at his own expense, shop and material details of all CL and/or CL&C pipe and fittings for District review before the pipe and/or fittings are manufactured for use in the work.

If such shop drawings are to be submitted by the pipe fabricator or manufacturer for District review, the District assigned Job Number and Contractor's signature must appear on each drawing, attesting the fact it has reviewed the drawings and if such are accepted, installation will be in conformance therewith.

h. CL and/or CL&C joining by butt-welding shall be performed on all plain end pipe. Field welds will be permitted at support points only as designated on drawings reviewed by the Engineer and provided that the ends of such pipe are clean of all concrete, grease, scale and dirt. All welding shall be accomplished as specified in accordance with the latest AWS standards. After field welding is complete and inspected by the Engineer, all exposed portions of the cylinder and joint shall be wrapped with eighteen (18) gage stucco wire and then cement grout band coated with CLASS I grout specified in Section 21 of these Specifications. The grout band, once finished, shall immediately be coated with a membrane-type, fast-curing material that will seal the band surface completely.

- i. Appropriately sized joint rings for joining CL and/or CL&C pipe shall be welded to the cylinder to form a self-centering bell and spigot type joint sealed by a compressed rubber gasket conforming to the requirements of said Federal Specification SS-P-381a. When such method of jointing is used, CLASS I mortar, as specified in said Section 21, shall be used to point the joint on the inside and CLASS I grout, conforming to said Section 21, shall be used to completely fill the annular space between abutting pipe sections on the outside.
- j. Flexible steel couplings for joining CL and/or CL&C pipe shall consist of acceptable beveled or flared sleeves, pressed or rolled steel flanges, rubber or neoprene gaskets and steel bolts with hexagon nuts.
- 6. Plastic Pipe Plastic pipe, fittings and joint materials specified herein consist of Acrylonitrile Butadiene Styrene (ABS), High Density Polyethylene (HDPE) and Poly-Vinyl Chloride (PVC). All materials incidental to plastic pipe installations such as gaskets, joint lubricants, cements, 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 ensures true line cut on planes perpendicular to the pipe axis. No bevel cuts for pipeline alignment adjustments will be permitted.
 - a. HDPE plastic pipe shall be bedded in 2-sack cement slurry wherever exposed in open trench. ABS Composite Pipe shall be bedded in pea gravel or backfill sand.
 - b. PVC plastic pipe shall be bedded and backfilled as specified with extra care taken in compaction of said bedding and backfills as specified in Section 16-03.F.9 of these Specifications.
 - c. The inside diameter of an installed section of plastic pipe shall not be allowed to deflect more than indicated below.

PVC SEWER PIPE DEFLECTION STANDARDS

<u>PIPE SIZE, IN.</u>	MANDREL O.D., IN.			
6	5.619 }			
8	7.524 }			
10	9.405 } ASTM D-3034	1		
12	11.191} SDR 35			
15	13.849}			
18	16.924 ASTM F-679			
21	19.952 T-1 Wall			
Over 21	Not Allowed			

- a. Rerounding through the use of a vibratory machine will not be permitted.
- 7. ABS Pipe All ABS pipe six (6) inches and greater in diameter shall conform to the requirements of ASTM Designation D 2680-86 as it applies to Composite Pipe. Fittings or parts thereof for the above-mentioned pipe sizes not manufactured under the provisions for Composite Pipe shall be shop fabricated or molded from resins specified and shall conform to the physical requirements in said ASTM D 2680 and shall be tested and proved to be equivalent quality to the pipe.
 - a. All ABS solid wall pipe and fittings less than eight (8) inches in diameter (side sewer) shall, at a minimum, conform to the requirements of ASTM Designation D 2751-75 and D 1527 as they apply to type SDR 35 and Schedule 40 ABS sewer pipe respectively using solvent cement joint assembly systems.
 - b. Cement used for all ABS pipe joints shall conform to paragraph 7.3 of ASTM D 2680. Jointing shall be accomplished by applying a coating of cement to the inside to the socket and to the outside of the spigot end of pipe to be joined in sufficient quantity that when the spigot is fully inserted into the socket a bead of excess cement will form around the entire circumference of the outside juncture of said spigot and socket. Excess cement shall then be removed. The Contractor shall apply a coating of cement to all pipe ends of ABS Composite pipe whether within a coupling or not. The purpose is to prevent migration of ground water into the annular space.
 - c. All ABS pipe entering or leaving a concrete structure shall have a standard (water stop) manhole gasket, as supplied by the pipe manufacturer, firmly clamped around the pipe exterior and cast into the structure base or near the structure wall center as a water stop.

- d. ABS pipe is allowed for side sewers only and may not be installed outside the property line.
- e. Individual pipe lengths for side sewers shall not exceed twelve and one-half (12.5) feet.
- f. See Section 18-02.E for repair procedures for ABS pipe in new construction.
- 8. HDPE Pipe All HDPE pipe and fittings shall, at a minimum, conform to the requirements of PPI/ASTM Designation PE 3408 with a material classification as per ASTM 1248, III C 5 P34 and a cell classification of PE 345434C. The pipe shall be gray in color and shall consist of virgin high molecular weight polyethylene, specified under ASTM D3350. All HDPE pipe shall be heat-welded, seamless pipe. Alternately, electrofusion HDPE couplings may be used to connect sections of HDPE pipe.
 - a. HDPE pipe shall have a yield tensile strength of at least 3,200 psi and a ratio of pipe diameter to wall thickness of SDR 17 or better.
 - b. Side sewer connections to HDPE pipe shall be made by heatwelding an HDPE stub onto the main and tapping the pipe.
 - c. Neoprene gasket repair couplings with stainless steel shear bands may be used only to connect HDPE pipe to other pipe materials.
 - d. All HDPE pipe entering or leaving a concrete structure shall have a standard (water stop) manhole gasket, as supplied by the pipe manufacturer, firmly clamped around the pipe exterior and cast into the structure base or near the structure wall center as a water stop. Where high groundwater is anticipated, a Linkseal, may be substituted at the discretion of the Engineer.
- 9. PVC Solid Wall Pipe
 - a. All PVC pipe and fittings shall, at a minimum, conform to the requirements of ASTM Designation D 3034, minimum wall thickness of SDR 26, ASTM Designation F-679 Type PS-115, or the requirements for PVC pressure pipe, as they apply to type SDR 26 PVC Sewer Pipe using an Elastomeric Gasket Joint in a bell and spigot assembly system. Rubber sealing gaskets shall meet the requirements of ASTM Designation D-1869 or F-477.
 - b. 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 the structure base. All rubber ring gaskets shall be in accordance with ASTM Designation F-477. Lubricant used for field assembly of gasketed PVC Pipe shall have no detrimental effect on the gasket, joint, fitting or pipe and shall be as recommended by the manufacturer. Where high groundwater is anticipated, a Linkseal, may be substituted at the discretion of the Engineer.

- c. PVC pipe joining may occur at any convenient distance beyond and/or between structures.
- d. Cement used for non-gasketed PVC Pipe shall conform to ASTM Designation D 2564. Jointing of wet pipe is not allowed. Jointing of pipe shall be accomplished by applying a coating of cement to the inside of the bell and the outside of the spigot. The cement shall be applied in sufficient quantity to produce a bead of cement around the entire circumference of the pipe joint. Excess cement shall then be removed.
- e. See Section 18-02.E for repair procedures for PVC pipe in new construction.
- f. All sun-faded pipe or pipe with noticeable surface defects will be rejected and shall be replaced by the Contractor.

32-16 SIDE SEWER INSTALLATIONS BY OPEN CUT METHODS (ref Section 18-02)

- A. All sewer line connections to manholes, trunk sewers, or side sewers shall be left uncovered until after the inspection has been made. After inspection of the connection, the trench shall be backfilled as specified.
- B. Attention is directed to Sections 4-01.C, 4-02, and 28-32 through 28-35 of these Specifications for additional details and requirements pertinent to side sewer installations. When a Backwater Overflow Device or Backwater Check Valve and Shutoff System is required as specified under Section 4-02.B.11, such installation shall be made at the time of connection and at a location where sewage can overflow without serious property damage on adjacent areas.
- C. All side sewer pipe, where applicable, shall be laid in conformance with the requirements in Section 18 for Main and Trunk Sewer Pipe laying and to the following requirements:
 - 1. The maximum slope of any portion of a side sewer shall not be greater than one hundred fifty (150) percent, (1-1/2 vertical to 1 horizontal ratio). If a building is located immediately adjacent to a sewer main, the point of

connection to the main shall be sufficiently downstream of the building sewer outlet so that the above maximum slope is not exceeded.

- 2. When a lateral sewer is not installed and tested in conjunction with a main line installation, it shall be installed as follows to provide for air testing: Place a test plug, with adequate length of one-quarter (1/4) inch minimum diameter air hose attached, in the downstream end of the first length of pipe upstream of the saddle. Thread the air hose through each successive length of pipe as it is laid to the property line, then place a test fitting at the upstream end of the lateral and plug the straight through end of the fitting.
- 3. If a complete side sewer is to be installed and tested as one section of sewer, a test fitting or test plug (as shown in Section 28-37) shall be installed immediately upstream of the saddle and at any alignment fittings at the main sewer.
- 4. Contractor shall complete installation of the side sewer from the test fitting or test plug to a point near the building plumbing outlet, but shall not connect until testing is complete and inspected. Side sewers shall not be connected directly into manholes on the line. The final air test for townhouses and similar housing developments shall be performed as specified herein for complete side sewers after all other utilities for such units have been installed.
- 5. A house sewer shall be installed by first placing a test fitting on the upstream end of the lateral sewer, unless this fitting has been previously installed. Then proceed with the installation of the house sewer to a point near the building plumbing outlet, but do not connect until all testing is completed and inspected.
- 6. All upstream ends of side sewer installations for townhouses and similar cluster housing developments shall be plugged with a standard watertight plug or cap, as supplied by the pipe manufacturer, immediately after such installation and shall remain plugged until the time of building drain connection. No side sewers in this category may be used until the job has been completed and accepted by the District.
- 7. Test fittings (See Section 28-37) shall be wye or tee branches of the same type, size, and quality as that to the side sewer pipe, unless otherwise approved, and shall be installed where required. The branch of each test fitting shall be laid in an upright position.
- 8. If the vertical location of adjacent utilities is such that it is necessary to install side sewers over the utilities, the side sewer shall be installed after these utilities have been properly installed and backfilled.

- 9. Contractors may tap and install four and six-inch diameter laterals on new HDPE and DIP sewer main pipelines under the following conditions:
 - a. All taps and materials used are to be installed in strict compliance with the pipe manufacturer's recommendations.
 - b. The location of each tap is to be verified by the Inspector prior to the drilling of each tap. Taps shall be spaced a minimum of two (2) feet for DIP. Contractors shall not be allowed to make taps on CIP, ABS or PVC. Taps may be allowed on VCP of 12 inches diameter or larger, only.
 - c. All taps to be made by contractors on New Projects shall be noted on the Plans.
- To mark the location of laterals, a three (3) inch wide strip of green plastic electronically detectable marking tape shall be installed horizontally one (1) foot below subgrade from the main line end of each sewer lateral. The electronically detectable tape shall be labeled" Buried Sewer Line Below."
- 11. When a lateral sewer is installed in advance of the house sewer, it shall be terminated five (5) feet within the property line. The contractor shall mark the location of the plugged end of the lateral with a No.4 reinforcing bar brought up to grade.
- 12. When an existing building that is sewered by a septic tank is to be connected to the public sewer system, the new side sewer shall be installed in accordance with these Specifications. A cleanout and backwater overflow device shall be installed at the building, and a new side sewer shall be installed from the building to the public sewer. If a portion of the existing piping from the building to the septic tank is a minimum of four (4) inches in diameter and will hold a pressure test, as required in Section 18-03.B, that portion of the existing piping may be used in the new side sewer.
- 13. The air test of any existing piping, as well as the installation of the new side sewer, must be completed and accepted before the existing septic tank is removed from service. Removal of a septic tank from service shall be in accordance with the regulations of the Health Officer of Contra Costa County dated March 18, 1983, as follows:

"420-1.609.3 Abandonment of a Septic Tank. An abandoned tank shall be backfilled immediately. The tank shall be uncovered and filled with compacted dirt or sand. Gravel or crushed stone is not acceptable. If the drain field is not flooded, it may not be necessary to pump out the tank as the contents will rise and overflow to the drain field. The tank contents shall not be permitted to surface. Slight mounding of the final cover is acceptable to allow for subsequent settling."

- 14. Where wyes, tees, and/or laterals were previously installed on the main sewer, the side sewer shall be connected to the wye, tee or lateral as provided for the particular connection. Side sewer or lateral connections to new or existing manholes shall be as detailed on the drawing for Standard manholes (see Sections 28-01 and 02), unless otherwise shown on the Plans or directed by the Engineer. All side sewer connections shall be made with fittings or adapters recommended by the manufacturer for use with the particular pipe.
- 15. Side sewer connections to main sewers ten (10) inches or smaller where wyes, tees, or laterals were not installed, the Contractor shall install a new wye or tee to make the connection. A tap and saddle connection will not be permitted unless the standard fitting cannot be installed. The Contractor shall make arrangement for said tap and saddle at least forty-eight (48) hours in advance of the time the Contractor intends work. Contractors shall have adequate shoring on the jobsite conforming to the requirements of Section 16-02.C of these Specifications for the trench they plan to excavate. Contractors who have taps scheduled for District forces to install shall have a minimum of two (2) sets of approved shoring equipment at the site of work.
- 16. The required excavation and cleaning of main surfaces for a tap and saddle shall be performed by the Contractor and when such taps are installed by District forces, the Contractor shall have the additional materials and equipment at the job site as follows: hard hats for all workers under its supervision; barricades; proper pipe; Standard Bedding material as specified under Section 16-03.D.1 of these Specifications; and a ladder long enough to extend two and one half (2-1/2) feet above the top of the excavation. The Contractor will be charged a minimum of one (1) hour standby time (including overhead charges established by the District) when the above-mentioned materials and equipment are not on hand at the jobsite when the work is scheduled. The excavation shall provide a minimum clearance of three (3) inches under and six (6) inches on each side of the main sewer for a distance of twelve (12) inches each way along the main from the point of connection. The outer surface of the main in this exposed area shall be thoroughly cleaned.
- 17. The excavation above the main, for the tap working area, shall be a minimum of two (2) feet in width without under-cut sides and shall be properly shored. Before the tap is made, the Contractor shall have sufficient standard bedding material at the site of the work to adequately backfill under the saddle to support it. No backfill shall be placed on the saddle fitting within one-half (1/2) hour after the completion of the work by District forces. If the Contractor breaks or otherwise damages the main while excavating for the tap, he shall notify the District and shall make repairs as necessary at the Contractor's sole expense.

- 18. Side sewers equal in size to the main sewer shall be connected by installing a standard wye branch or tee fitting, of the same size and type of material as the main line, into the main line at the point of connection. The installation of the standard wye branch or tee shall be arranged with the District and the work will be performed by the Contractor. For a tee or wye installation, the Contractor shall excavate six (6) feet along the main line and install sufficient shoring to ensure a safe trench. The Contractor shall also provide ladder, bedding, and other necessary items as specified above in Section 18-02.C.2.a.
- 19. The Contractor will make all repairs to existing sewer lines unless otherwise ordered by the Engineer. Repairs to side sewers shall be made using service weight soil pipe or CIP of quality stipulated by the Engineer and shall conform to the general requirements of Section 28-35.
- 20. If an existing side sewer is being repaired or altered, a backwater overflow device or backwater check valve and shutoff system shall be installed on such side sewer system as part of the work.
- D. Side Sewer Construction Requiring a Residential Sewage Pump All information applicable to Sections 28-50 and 28-50a shall be submitted in accordance with Section 28-50, 28-50a, and 4.01.B before a permit is issued or any work can begin on the side sewer or pumping system.

32-17 CLEANING AND TESTING (ref. 18-03)

- A. In new tract or subdivision developments, pressure testing shall be performed only after the installation of all proposed lateral sewers to the main sewer system has been completed. Attention is directed to Section 18-02.C of these Specifications for other side sewer system installations to be air tested.
- Β. Low pressure air tests shall be conducted in accordance with the following Test Procedure and the details shown on Sections 28-37 and 28-38 of these Specifications. All necessary test equipment shall conform to the requirements of said Section 28-38 in proper working order and tests shall be made in the presence of the Contractor and a District representative. Test plugs shall be carefully placed at each end of the section of line to be tested. When all necessary test equipment (see Section 28-38) is in place, a compressed air supply shall be attached to the air fitting on the test equipment and the air pressure within the line increased to four (4) pounds per square inch (psi). After the air supply is securely turned off or disconnected, there shall be a two (2) minute waiting period to allow stabilization of air within the sewer line before the actual test period begins. In no case shall the air pressure, within the line, be less than 3.5 psi at the beginning of the test period. The allowable air pressure loss shall not exceed one (1) pound per square inch. When testing side sewers, or portions thereof, the test period shall be two (2) minutes and the allowable loss

shall not exceed one (1) pound per square inch. After completion of a test, the air pressure shall be released slowly through the valve, which is incorporated in the test equipment

- C. Air test plugs shall not be removed until the air pressure is no longer measurable.
- D. Cleaning All new main and trunk sewer installations, and such site collector and side sewer system installations deemed necessary by the Engineer, shall be cleaned as required herein with a cleaning ball or device in accordance with such device manufacturer's instructions or recommendations and/or flushed prior to sanitary waste use. If high-pressure water cleaning such as hydro-flush is utilized, the pressure must be maintained below 2000 psi. Sand traps with screens shall be used in trapping debris, shall be in accordance with Section 28-39, and shall be secured to the manhole to prevent the sand trap from entering the pipe. All cleaning, including screen installations and removal, shall be accomplished by the Contractor in the presence of the Engineer.
- E. Television Inspection The Contractor shall arrange for television inspection in accordance with the following procedures:
 - 1. The complete job is ready for television inspection when the following work has been completed:
 - a. All sewer pipelines are installed, backfilled, and compacted.
 - b. All structures are in place, all channeling is complete and pipelines are accessible from structures.
 - c. All other underground facilities, utility piping, and conduits are installed.
 - d. Final street subgrading is complete. For wet weather periods, placement of aggregate base has been completed.
 - e. Pipelines to be inspected have been preliminarily cleaned and flushed.
 - f. Final pressure test has been completed.
 - 2. After the above work is complete, the Contractor shall arrange for television inspection at his/her sole expense.
 - a. The entire job will be initially televised by the Contractor and recorded in NASSCO PACP format DVD for the District to keep.
 - b. If no deficiencies are observed, the work will be considered satisfactory.

- c. If deficiencies are observed, any defects serious enough to require correction will be determined by the District.
- d. Notification will be made in writing of any deficiencies revealed by the television inspection that will require repair. If corrective work is indicated and viewing of the videotapes is desired, the District shall be contacted to set a time for the viewing with the Engineer.
- e. Corrective work shall be done. District reserves the right to require another re-air test of any repair.
- f. Those portions of the pipeline system that have been corrected must be re-televised for District review.
- g. The procedure outlined above will be repeated until all deficiencies observed by television inspection have been corrected to the complete satisfaction of the District.
- 3. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to paving:
 - a. Low spot 0.125 x diameter of pipe or greater, i.e. 1" for 8" pipe
 - b. Joint separations [three quarters [3/4] inch or greater opening between pipe ends]
 - c. Cocked joints present in straight runs or on the wrong side of pipe curves
 - d. Chips in pipe ends
 - e. Cracked or damaged pipe
 - f. Offset joints
 - g. Infiltration
 - h. Debris or other foreign objects
 - i. Other obvious deficiencies
 - j. Irregular condition without logical explanation

4. Television-inspection of new work and the correction of observed defects will not relieve the Contractor of its responsibility for the one-year guarantee period. The District may inspect and/or televise portions of any projects during said guarantee period. This inspection may include a televising of the pipelines and the checking of the pipeline deflection in the case of plastic pipes.

32-18 ABANDONMENT (ref. Section 23)

- A. Before a building connected to the District sewer system is removed or modified in a manner that requires a physical disconnection of the building from the sewer system, the owner of the building shall obtain an abandonment permit from the District.
- B. The District will allow the owner's contractor to abandon the side sewer on a case by case basis.
- C. The side sewer to be abandoned shall be sealed at the property line by use of a concrete plug or a manufactured plug or cap.

SECTION 33

HORIZONTAL DIRECTIONAL DRILLING (HDD)

33.01 GENERAL SUMMARY

- A The Contractor shall furnish and install sewer pipe, complete and in place, by the horizontal directional drilling (HDD) method. All work shall be performed as indicated in the Contract Documents and as required in these Specifications and shall be supervised by personnel experienced in HDD pipe installation. Note that HDD installation of sewers will only be allowed where the design slope is at least three percent (3 percent; S \geq 0.0300).
- B. The HDD rig and tooling shall be of sufficient capacity to complete the pilot bore, reaming and pull-back of pipe.
- C. The drilling fluid mixing and delivery system shall be of sufficient capacity to successfully complete the HDD work.
- D. The Contractor shall provide all materials, labor, equipment and services necessary for bypass pumping and/or diversion of sewage flow (if required), installation of sewer pipe and testing of the completed pipe system.

33.02 EXPERIENCE REQUIREMENTS

- A. Contractor shall have a minimum of three (3) HDD projects of similar diameter, length, soil type and installation conditions successfully completed within the last 3 years.
- B. Fusion equipment shall be operated only by technicians who have been certified by the pipe manufacturer or supplier and who have a minimum of three (3) years of experience fusion welding 4-inch or larger diameter HDPE pipelines.

33.03 SUBMITTALS

- A. The Contractor shall submit the following to the District for review and approval prior to ordering materials:
 - 1. Cut Sheets for field staking at twenty (20) foot intervals along the proposed centerline of the pipe alignment. No HDD work shall be started prior to the District's field check of the stakes.
 - 2. Site maps to scale indicating the locations proposed for pipe assembly work (e.g., butt-fusion welding), laydown areas, pipe and material storage areas, insertion and receiving pits, Pipe

- 3. location monitoring grid, tanks, pumps, HDD rig and trailers.
- 4. Technical data for pipe and fittings, and pipe joining, drilling, reaming, pulling and locating equipment.
- 5. A proposed construction sequencing plan.
- 6. Procedure for handling and disposal of drilling fluids and cuttings including the locations of disposal sites.
- 7. Calculations of anticipated HDD installation loads demonstrating that the pipe and pipe fittings system is capable of withstanding the anticipated installation and operating loads with an appropriate factor of safety.
- 8. Calculations of minimum penetration rates for all reaming passes.
- 9. Contingency Plan for dealing with the potential for drilling fluids to surface (e.g., through hydrofractures).
- 10. Material Safety Data Sheets (MSDS) for all drilling fluids, lubricants, and other products used for the HDD drilling and pipe installation work.
- 11. A statement of the qualifications of the foreman, local operator and crew who will be responsible for HDD work. No Substitution of these personnel shall be made without the written acceptance of the District.
- B. The Contractor shall submit the following installation information daily:
 - 1. Raw pilot hole data including all magnetic steering and surface monitoring readings.
 - 2. The pitch and three (3) dimensional (x, y, z) coordinates of the probe for every drill rod length or thirty (30) feet, whichever is shorter length. Coordinates shall be referenced to the drilling entry pit coordinate taken as the origin (0, 0, 0).
 - 3. A log of the maximum thrust, maximum torque, and maximum slurry flow during pull back at every drill rod length or thirty (30) feet whichever is shorter length.
 - 4. Records of any hydrofracture encountered or other problems and correction measures taken.
 - 5. The Contractor shall submit detail drawings and a written description of the construction procedure, sequence to bypass sewage flow, install pipe, and reconnect lateral sewers.
 - 6. The Contractor shall submit Pre- and Post-CCTV Inspection videos of all sanitary sewer mains within the scope of work. See Section 18-03D, TELEVISION INSPECTION.
 - 7. The Contractor shall submit a copy of the technician's

- 8. certification(s) for the operation of the fusion equipment for HDPE pipe.
- 9. Submit debeading process and equipment for use in removing the internal bead for the newly joined HDPE pipe sections.

33.04 QUALITY ASSURANCE

- A. The Contractor shall test and inspect the installed pipeline and shall conduct post- job television inspection in accordance with the requirements of Section 18-03D, TELEVISION INSPECTION.
- B. All HDD work shall be done by a qualified Contractor with at least five (5) years' experience with HDD and a minimum of three (3) projects of similar diameter, depth, and length.

33.05 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall exercise special care during the unloading, handling, and storage of all polyethylene pipe to ensure that the pipe is not cut, gouged, scored or otherwise damaged. Any pipe segment which has cuts in the pipe wall exceeding 10 percent of the wall thickness shall be cut out and removed from the site at the Contractor's cost. The pipe shall be stored so that it is not deformed axially or circumferentially.
- B. All pipe without an ultraviolet inhibitor shall not be stored uncovered outside.

33.06 PRODUCTS

- A. The Contractor shall provide HDPE pipe with butt fusion welded joints, as specified in Section 18-01D(2), HIGH DENSITY POLYETHYLENE (HDPE) PIPE.
 - 1. For installations with shallow cover, restrained-joint ductile iron pipe as specified in Section 18-01C(3), DUCTILE IRON PIPE (DIP) may be used if approved by the District.

33.07 HDD EQUIPMENT AND MATERIALS

A The drill unit shall be a remote-steerable tunneling system that is designed and is capable of accurately drilling (true to line and grade as specified on the drawings) through the ground conditions identified in the geotechnical report and in bedrock and in mixed bedrock and soil face conditions. The drilling system shall utilize a high-pressure, low-volume,

- B. slurry-assisted, mechanical excavation technology capable of installing pipelines of the diameter required.
- C. The drilling slurry compound shall be totally inert.
- D. The Contractor shall provide and use an electronic detection system that is capable of continuously locating the position of the drilling head to an accuracy of one percent (1%) of the depth in both the horizontal and vertical planes (e.g., within 0.1 feet when the drilling head is ten (10) feet deep), if the design slope of the sewer being installed by HDD is less that ten percent (10%; S = < 0.010 feet per foot). Where the design slope for the sewer being installed by HDD is equal to or greater than ten percent (10%), the electronic detection system shall be capable of continuously locating the drilling head to an accuracy of five percent (5%) of the depth in both the horizontal and vertical planes (e.g., within 0.5 feet when the drilling head is ten (10) feet deep).
- E. All drilling equipment shall have a permanent, inherent alarm system capable of detecting an electrical current. The equipment shall be grounded and shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable.
- F. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, hot boots and gloves.

33.08 EXECUTION

- A. Work shall meet or exceed the requirements of these Standard Specifications.
- B. The Contractor shall protect all surface and subsurface site improvements, facilities, and utility pipelines, ducts and conduits from being damaged by the directional drilling operation.

33.09 PREPARATION

- A. Cut Stakes shall be provided at twenty (20) foot intervals along centerline to provide for monitoring of the drilling head.
- B. Easements shall be staked at fifty (50) foot intervals.
- C. Potholing shall be required for marked utilities within ten (10) feet of centerline.
- D. The Contractor shall walk the alignment to check for potential sources of interference that could affect the accuracy of the drilling head locating

E. system. The Contractor shall properly calibrate the locating system prior to beginning and regularly during the HDD operation as required to achieve the accuracy specified herein.

33.10 BYPASS PUMPING

A. The Contractor shall provide bypass pumping and/or diversion when required for acceptable completion of the pipe installation.

33.11 PIPE INSTALLATION

- A. The Contractor shall locate, design, construct, properly brace or shore, dewater, maintain, and restore insertion and receiving pits. Insertion and receiving pits shall be a minimum of four (4") feet by six (6") feet in horizontal cross section and shall be shored in accordance with Section 16-02D, SHORING. Bracing shall be adequate to resist drilling and pull-back loads.
- B. The Contractor shall employ a slurry-assisted, mechanical excavation process for the HDD operation. The drilling slurry compound shall maintain boring stability and provide lubrication to reduce frictional drag while the pipe is being installed.
- C. The Contractor shall employ a mobile vacuum spoils recovery vehicle or drilling fluid recycling system to remove drilling spoils from the access pits. The Contractor shall collect, transport, and properly dispose of drilling spoils away from the jobsite. Disposal of drilling spoils to sanitary, storm or other public or private drainage systems or waterways is strictly prohibited. The Contractor shall immediately clean up any leakage or spillage of drilling fluids.
- D. Mechanical, pneumatic, or water-jetting methods are unacceptable due to the possibility of surface subsidence.
- E. After a pilot bore has been completed, a reamer shall be installed at the termination pit and the bore shall be reamed, as many times as necessary, for proper insertion of the pipe, before the pipe is pulled back to the starting pit. The reamer shall be capable of discharging drilling slurry compound to facilitate the installation of the pipe into a stabilized and lubricated tunnel.
- F. Prior to insertion of thermo-fusion welded HDPE pipe larger than six (6) inches in diameter, the Contractor shall properly remove all internal weld beads from the interior surface of the pipe.
- G. During insertion, the pipe shall be supported on roller supports to isolate the pipe from the ground or pavement and avoid damage to the pipe.

- H. During pull back operations, the maximum safe pulling load for the pipe shall not be exceeded.
- I. Prior to making connection at each end of an installed reach of HDPE pipe, the Contractor shall allow a minimum of six (6) hours to elapse to allow pipe to relax from the tension resulting from pulling the pipe into and for the pipe to equalize with ambient ground temperature.
- J. Upon completion of boring and pipe installation, the Contractor shall remove all spoils, debris and unsuitable material from the starting and termination pits. All pits shall be backfilled in accordance with the requirements of Section 16-03, TRENCH BACKFILLING.
- K. The installed pipeline shall be within six (6) inches horizontal and one (1) inch vertical of the alignment indicated in the Project Contract Documents at all locations. In addition, for gravity sewers the pipeline shall be free-draining throughout.
- L. The Contractor shall repair, replace or compensate the respective Owners for any damage to property including, but not limited to, utilities, pavements, landscaping and other improvements.







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PIPE	PIPE					4	PIPE DI	AMETEF	~				
TYPE	LENGTH	4"	.9		10"	12"	14"	15"	16"	18"	20"	21"	24"
ABS/PVC TRUSS				(Y)	(B)	(C)		(D)					
LANDARD	12'-6"			475	600	725		006					
	6'-3"			240	300	362		450					
TNC	12′-6"			131	163	175		200					
	6'-3"			67	81	88		100					
ABS/PVC SOL ID UPL ING	12'-6" 20'-0"			100 160									
DRCED ND)	12'-6" 20'-0"	127 127	191 191	250 250	313 313	375 375		438 438					
01P-CL52				(E)	(E)	(E)	(F)		(F)	(9)	(9)		(9)
.25° UPLING	18′-0" 18′-0"			260 90	260 90	260 90	325		325	430	430		430
(INIOL/ °2	,,0-,6			45	45	45							
VCP													
* /JOINT) -	6, -0" 5, -0"	171	171	171	171	171		222 204		222 204		222 204	222 204
"5° /JOJNT)	044W0 11111 00000	114 864 576 576	1123 1123 575 57	1123 1123 566 57	123 1123 57 57	1124 586 786 700		185 1487 111		185 167 1148 74		185 1148 74	185 1167 111 74
RCP													
.5° /JOINT) .5° /JOINT) .2° /JOINT)	888 100 100 100 100 100 100 100 100 100					220		220		295		295	356

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Backwater Prevention Devices (BPDs)

Required at every location where sanitary sewer piping exits a building/home to prevent sewage from entering homes and businesses and reroute the spill outside the building.

BPD Type	MANUFACTURER	PRODUCT NAME
Type 1 or "Mushroom" Type	Genplex	Kelly Backwater Device (No-Hub & IPS)
	Stephens Corp	Sewer Popper™ Model S62-304
Туре 2	Unlimited Home Solutions LLC (www.unlimitedhomesolutions.com)	Sewer Relief Cap

<u>Type 1</u>



Mushroom Type

<u>Type 2</u>



Sewer Popper[™] OPD



Sewer Relief Cap



	36*Max. top width of trench (For wider trenches see Note No. 4) SIDE SE	WER
	New Utility Pipe	
	BREAK	
	Backfill material to be Class II Aggregate Base, untreated rock base, or select fines as required.	
Trim side sewer pipe to a clean - cut, undamaged end. Support Cast Iron Pipe on undisturbed earth or use - brick or concrete shims.	18* Min. C.I. PIPE OF EQUAL I.D. SERVICE WEIGHT SOIL PIPE Undisturb DEPAIR	1/4" max. clearance between pipes Approved banded rubber adapter coupling. bed earth alternate
NOTE	REPAIN	
 Repair method for Alteration of sew permission has be After 1959 standa Sewer Practice. Repair of side se shall be as direct Use adjustable st 	breaks occasioned by new utility construction. For grades will be permitted only after then given by the District Engineer. For adapoted by East Bay Conference on wers for trench widths greater than 36" ed by the District Engineer. Approved ainless steel shear ring.	Paul D. Winnicki District Engineer
WEAT	CONTRA COOTA CANUTARY	DISTRICT
WEST	CONTRA COSTA SANITARY	
DRAWN BY, akk & jgb DATE, January, 1991	SIDE SEWER REPAIR	R DETAIL NO. G-1
		filename: B:DETAILG





DIAMETER OF PIPE INCHES	LENGTH OF LINE FEET	LENGTH OF TEST MINUTES
4	ALL	2
6	0 TO 300	2
6	300 TO 370	2 1/2
6	370 AND GREATER	3
8	0 TO 170	2
8	170 TO 210	2 1/2
8	210 TO 250	3
8	250 TO 290	3 1/2
8	290 AND GREATER	3 3/4
10	0 TO 110	2
10	110 TO 165	3

DIAMETER OF PIPE INCHES	LENGTH OF LINE FEET	LENGTH OF TEST MINUTES
10	165 TO 215	4
10	215 AND GREATER	4 3/4
12	0 TO 115	3
12	115 TO 155	4
12	155 TO 190	5
12	190 TO GREATER	6
15	0 TO 120	5
15	120 TO 165	7
15	165 AND GREATER	8
18	ALL	8 1/2
21	ALL	10

INITIAL AIR PRESSURE WITHIN THE LINE SHALL BE INCREASED TO FOUR POUNDS PER SQUARE INCH (4 PSI). AFTER AIR SUPPLY IS SECURELY TURNED OFF, OR DISCONNECTED, THERE SHALL BE A TWO (2) MINUTE STABILIZATION PERIOD BEFORE THE ACTUAL TEST BEGINS. MINIMUM AIR PRESSURE AT THE BEGINNING OF TEST PERIOD SHALL NOT BE LESS THAN 3.5 PSI. THE DURATION OF THE TEST PERIOD SHALL BE AS SPECIFIED IN THE TABLE ABOVE, WITH MAXIMUM AIR PRESSURE LOSS NOT TO EXCEED 1 PSI.

APPROVED:7 PAUL D. WINNICKI

DISTRICT ENGINEER

WEST CONTRA COSTA SANITARY DISTRICT

DRAWN BY: AKK DATE: MARCH, 1991

AIR TEST TIME CHART

STANDARD

DETAIL NO.G-88











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CENTRA	L CONTRA COSTA MARTINEZ, CALIFO	SANITAR Ornia	Y DISTRICT	
RESID	ENTIAL SEWERAGE	PUMPING	SYSTEM	
			Owner:	
DAG	STRUCTURE	CCSD /	Address:	
EF	EN		Site Location:	
	G		Sewer Contractor:	
STATIC H				
	-4" PBESSURE GRAVITY		Disposal?	
	AE EG DISCHARGE LINE		Do you have a Sept Tank?	ic
HYDRAULIC	PROFILE		PUMP HEAD REQUI	REMENTS
(See standard draw	ving for detail layout)		Surcharge Head	Ft. Ft
			Friction Head	Ft.
	EQUIPMENT DATA		Total Dynamic Head	Ft.
1. Pump Manufacturer		Model #		
2. Pump Capacity	, GPM @	,TDH (Attach	Pump Curve)	
4. Pump Discharge size	inches and will pass a	, Built for		deep_sump.
5. Pump Brake Horsepower				inch sphere.
6. Motor HP, RPN	1, PHAS	SE	, VOLTS	
7. Pump Sump Manufacturer		, Diamete	er x Height –	X
Tank Material _	, C	over Material		
DISTRIBUTOR NAME: PHONE #	BY:		DATE:	
			· · · · · · · · · · · · · · · · · · ·	
Procedure	DISTRICT USE ONLY (Do not write Date	e delow this line	e) Bv	
1. Plot plan submitted:				
2. Elevation and distances check	<ed:< td=""><td></td><td></td><td></td></ed:<>			
3. Equipment data submitted:				
4. Reviewed and approved:				
5. Associate Engineer plan review	<i></i>			



WEST CONTRA COSTA SANITARY DISTRICT










SEC. 28-55





