COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT

STANDARDS FOR SANITARY SEWER

DIVISION "C"
DESIGN CRITERIA AND PLAN PREPARATION

DIVISION "D"
GENERAL CONDITIONS
TECHNICAL SPECIFICATIONS

DIVISION "E"
STANDARD DRAWINGS

November 13, 2012

COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT

STANDARDS FOR SANITARY SEWERS

BOARD OF SUPERVISORS

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Board of Supervisors

SPECIAL DISTRICTS DEPARTMENT

Review by Special Districts Department of the Environmental Improvement Agency, County of San Bernardino

_____
Special Districts Department

Approved as to form this _____ day of _____, 2009

County Counsel _____
Deputy County Counsel

August 13, 2012

COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT

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DESIGN CRITERIA AND
PLAN PREPARATION SEWERS

COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT

DESIGN CRITERIA AND PLAN PREPARATION
SEWERS

The following requirements pertain to the design and preparation of plans for construction of the various components to the sewerage system.

1.1 GENERAL

1.1.01 Scope. - All sewers, sewage lift stations, treatment facilities and appurtenances to be owned, maintained and/or operated by the District shall be designed according to the criteria set forth in this section. **The same criteria shall hold for systems served but not owned, maintained and/or operated by the District insofar as said criteria may affect the efficiency of the District's system**. All additions to the District's system shall be plan checked and inspected by the District.

1.1.02 Design Competence. - All District facilities shall be designed by professional engineers according to accepted practice in the sewerage field. The design engineer shall arrange for a pre-design meeting with the District Engineer to review the proposed project.

1.1.03 Sewage Lift Stations and Inverted Siphons. - Every effort should be made, within economic reason, to avoid sewage lift stations, inverted siphons and exposed piping, Their use will be allowed only upon approval by the District.

1.1.04 Legal Access. - Each lot to be served by sewer shall abut a public street or sewer, shall abut a public street or recorded easement containing a sewer, or be provided with permanent legal access to such a sewer. The easement shall be clear of permanent structures, such as building eaves, roof lines, and large trees. Temporary construction easements of adequate size shall also be provided. The location of the street, easement, or legal access shall permit gravity flow from the lot to the sewer main. Deviations from any of the criteria adopted herein may be permitted upon written request to and approval by the District.

1.2 SEWERS AND APPURTENANCES.

1.2.01 Flows. - The flow used for the design capacity for sewers and sewage lift stations shall be the "computed peak flow," which shall be determined on the basis of projected land use and average daily flow per capita for the various geographical areas as follows:

Mountain Areas	80 gpcd
Valley and Desert Areas	100 gpcd

Sewer flows shall be computed from projected land use and population density over the area tributary to the sewer reach under consideration. The following peaking factors shall be applied to the sewer flows as determined above:

Average Flow (mgd)	Peak Factor
0.0 - 0.01	4.0
0.05	3.4
0.10	3.2
0.20	3.0
0.30	2.8
0.50	2.7
0.8	2.6
1.0	2.5
1.5	2.4
2.5	2.3
4.0	2.2
6.0	2.1
10	2.0
15	1.9
30	1.8

Design flows from commercial, industrial, hotels, motels, campgrounds, etc., shall be determined in consultation with the District.

1.2.02 Formula. - Capacity of all sewers shall be determined by the use of the "Mannings" formula:

$$Q = A \frac{1{,}486}{n} r^{2/3} s^{1/2}$$

where: Q = flow capacity - cfs
n = coefficient of roughness 0.013
r = hydraulic radius
s = slope
A = cross sectional area

1.2.03 Roughness Coefficient. - The Roughness coefficient used in design shall be n = .013 for all sewers. If any manufacturer claims that the "n" factor of his pipe should be less, he must submit documented evidence to substantiate his claims. The reliability of such evidence shall be determined by the District.

1.2.04 Pipe Size. - All gravity feed sewer pipe up to and including eight (8) inch diameter shall be sized to carry the peak flow when fifty percent (50%) full. This requirement shall apply regardless of the cross section shape of the sewer. All larger sewer pipe, except those designed as laterals, shall be sized to carry the peak flow when seventy-five (75%) full. This requirement shall apply regardless of the cross-section of the sewer. No sewer main with an internal diameter less than eight (8) inches shall be installed without prior written approval of the District.

1.2.05 Sewer Slopes and Velocities. - The minimum allowable slope is that which will give a velocity of not less than two (2) feet per second when the sewer is flowing fifty percent (50%) full. The purpose of this requirement is to prevent sewage sedimentation and subsequent generation of corrosive gases. The velocity shall be determined by means of the "Mannings Formula."

$$V = \frac{1,486}{n} r^{2/3} s^{1/2}$$

In sewers of uniform size passing through manholes without a major change in direction or slope, there shall be no arbitrary drop between inlet and outlet. In sewers which change slope but do not change direction or size, the slopes of the incoming sewers shall be carried through to the outlet of the manhole. Where diameters change, and in junctions involving major direction or slope changes, the various elevations shall be chosen to match water surfaces under average flow conditions at ultimate development of the tributary area (not under maximum flow conditions).

1.2.06 Minimum Slopes. - The minimum slopes to be used with various pipe sizes are listed herein and shall be used when necessary to prevent long reaches of deep sewer mains. The design engineer shall strive for minimum slopes of 0.008 to 0.01 feet per foot in order to maintain a cleaning velocity.

Diameter inches	Minimum Slope Ft./Ft.
6	0.0060
8	0.0040
10	0.0029
12	0.0022
15	0.0016
18	0.0012
21	0.0010
24	0.0008

1.2 .07 Exceptions to Minimum Slopes. - Where topography limits or prevents the use of minimum slopes as described herein, the District may require an engineer's report. This report shall describe the alternatives and their economies. The report shall also include an evaluation of prospective maintenance and sewer gas problems. Greater minimum slope than those specified in Section 1.2.06 hereof may be required where the presence of hydrogen sulfide may be detrimental to and affect the life of the sewer pipe being used.

1.2.08 Slopes in Force Mains. - In force mains a continuous uphill slope shall be provided from the sources to the outlet. Combination air and vacuum valves shall be provided where high points cannot be avoided.

1.2.09 Location. - All sewer mains shall be located in public streets or recorded easements such that each lot within a development can be served by gravity flow, and the services shall be extended according the Standard Drawings No. E-9 and E-10.

1.2.10 Curved Sewers, - Curvilinear vertical and horizontal alignment on sewer mains for new developments shall be avoided unless approved by the District review. If curvilinear sewers are permitted the following conditions must be met:

(a) No more than one (1) horizontal circular curve and one (1) vertical curve shall be permitted between any two (2) manholes. The curve may be a combination horizontal and vertical, but in no instance may there be more than one (1) vertical and one (1) horizontal curve between two (2) manholes.

(b) At least one (1) end of the curve shall terminate in a manhole.

(c) No sewer on a curvilinear alignment shall be less than eight (8) inch diameter.

(d) The radius of curvature is not less than one hundred and twenty-five (125) feet. A shorter radius of curvature may be used upon approval of the District, where shorter than normal depth pipe is used.

(e) The deflection of joints shall not exceed that recommended by the pipe manufacturer.

1.2.11 Sewer Under Structures. - No main sewer shall be located beneath a structure except as approved in writing by the District

1.2.12 Structural Integrity. - Provisions shall be made in all cases to preserve the structural integrity of the pipes, conduits, or structures affected.

1.2.13 Depth of Sewer. - Permission from the District must be obtained if the following minimum depths may not be met. In general, the load on the pipe must be considered and adequate precautions taken to protect it either by means of encasement, supports, or added strength.

Minimum cover of pipe for various locations:

In public streets in pavement: 5 feet (service to properties permitting)
In public street parkways: 5 feet where possible
Lateral sewer (at curb or edge of pavement): 4 feet

In recorded easements, not subject to vehicular traffic...3 feet

Stream crossing: Standard drawings: No. E-13.

1.2.14 Sewer laterals. - A sewer lateral serving a single Family dwelling or equivalent shall be at least four inches in diameter, if the length of the lateral is one hundred feet or longer, a minimum of six inch diameter will be required. Sewer laterals shall conform to Section 3.15 of the Technical Specifications and Standard Drawings: E-9 Thu. E- 13 and Section 3.15 of the Technical Specifications. Sewer laterals in waterways, easements, and deep cuts should have the house service brought to a minimum depth of five (5) feet.

1.2.15 Special Sewer Design Conditions. _ When it is necessary to construct sewers and appurtenances in areas where a potential erosion hazard exists, individual design considerations shall be given to provide additional protection to the sewer facilities to prevent their damage. Special design considerations can be applicable to stream and canyon crossings, parallel construction to stream beds, construction on steep slopes requiring special anchorage, and shallow sewer construction in roadways. Concrete encasements, cutoff walls (Standard Drawing No. E-20), special backfill materials (soil cement), and special erosion - control facilities may be required.

1.2.16 Clearance From Other Utilities. - Special care shall be exercised in locating sewer lines near other utilities, especially water lines. Sewer lines shall, wherever possible, be located three (3) feet below water lines and where parallel installations occur, a ten (10) foot horizontal separation shall be maintained. Separations and special construction shall conform to Standard Drawing No. E-1.

1.2.17 Use of Asbestos- Cement Sewer Pipes. Due to the carcinogenic properties of asbestos fibers. Asbestos Cement pipe shall not be used in sanitary sewer systems.

1.3 OVERSIZING REQUIRED BY DISTRICT.

The District may find that the capacity of certain new sewers and pump stations within an area under development should be increased to accommodate existing or future additional development. In such a case, the quantity of additional flow shall be determined by the District's Engineer. The flow resulting from the addition of the developer's and the District Engineer's "Computer peak flow" shall be used as the basis of design. The District shall pay for any resulting increase in size or depth according to Section 1.9.07 of the District's Ordinance.

1.4 MANHOLES AND CLEANOUTS.

1.4.0 Manhole Location and Spacing. - Manholes shall be located at all junctions, all changes in direction (except curved sewers), and all changes in pipe size. Where the distance between manholes required for the foregoing reasons exceeds three hundred (300) feet. Good judgment should be used in placing intermediate man hole at points of probable sewer intersections, at beginning or end of curves, or lacking other reasons, at approximately equal intervals. In general, the space between Manholes is a maximum of three hundred (300) feet... In areas where slopes equal or exceed twenty five percent (25%) manhole spacing shall not exceed one hundred (100) feet. Good judgment should be used in the location of manholes along water courses. Manholes should not be placed directly in the water courses. Manholes can be either coated concrete or polymer based structures and shall conform to Standard Drawing No. E-2 thru E-6.

1.4.02 Shallow Manholes. - Manholes three (3) feet or less in depth above the shelf shall be of special design.

1.4.03 Cleanouts. - Dead-end sewers not over one hundred and seventy-five (175) feet in length shall terminate in standard manholes or cleanouts. Cleanouts shall be brought to ground surface in a long radius or two (2) forty-five degree (45) angles with a full sewer diameter opening. Cast iron frame and cover shall be provided. Dead ends over one hundred and seventy-five (175) feet shall terminate in standard manholes unless future extension of said dead end will include a manhole within three hundred and fifty (350) feet, in which case a temporary cleanout is permitted. Cleanouts shall conform to Standard Drawing No. E-14 and E-15 and Section 4.0 of the
Technical Specifications.

1.4.03.1 Abandoning Existing Sewer Stub– Existing sewer stubs to be abandoned shall be approved by District Engineer.

1.4.03.2 Grease Interceptor- A Grease interceptor shall be required for any business having the potential of producing grease. Size of the interceptor will be approved by the District Engineer.

1.4.03.3 Oil/Sand Interceptor- An oil/sand interceptor shall be installed for any business having the potential of producing oil and sand waste. Size of interceptor shall be approved by the District Engineer.

1.4.04 **Drop Manholes.** - Whenever possible, sewers shall be brought into manholes without a drop. Where the invert of an incoming sewer is above the top of an outlet sewer, a drop manhole will be required and shall conform to Standard Drawing No. E-4 and Section 4.0 of the Technical Specifications.

1.4.05 **Manhole Trap**. - A special type manhole trap may be required to provide a means to prevent debris from clogging the sewer. The manhole trap shall conform to Section 4.0 of the Technical Specifications.

1.4.06 **Frame and Covers.** - All manholes and cleanouts, except the manhole trap in 1.4.05, shall have cast iron frames and covers. All frame and covers shall be provided with stainless steel fasteners recessed into the cover for locking the cover in place. The tap shall be drilled through the frame for easy cleaning. In no case shall the diameter of a manhole be less than twenty four (24) inches, inside diameter.

1.5 SEWAGE LIFT STATIONS.

1.5.01 **General.** - Sewage lift stations shall only be utilized where it is impossible to provide gravity flow to interceptor sewers, or other portions of the collection system. The use of sewage lift stations to provide service to ten (10) or fewer lots or parcels of land will not be permitted. The use of underground, factory built units is desired; below ground use of reinforced concrete construction is discouraged; and masonry block structures are not permitted. Sewage lift stations shall be located in areas accessible to both men and equipment and upon land to which legal access is provided and for which a permanent easement or title is recorded. Where structures above ground are required, the structure shall be compatible with the surroundings, an alternate flow path shall be provided for wet well maintenance.

1.5.02 **Capacity.** - Capacity of the pumps shall be sufficient to handle ultimate peak flows from the tributary area with the largest pump out of service. If areas outside the proposed development may best be sewered to a sewage lift station, the District reserves the right to order oversizing of such facilities and provide reimbursement to the developer for the cost increment of the additional construction. The wet well storage shall be sized to be compatible with pump capacity and to eliminate frequent pump cycling.

1.5.03 **Standby Power.** - A standby generator shall be provided where, in the opinion of the District, potential hazard to the health and safety of the people in the immediate area, due to overflow, is imminent or the normal energy source is subject to outages. Capacity of the generator shall be sufficient to handle peak flows.

1.5.04 **Pumps and Motors.** - At least two (2) pumps or sewage ejectors shall be provided at each lift station. Pump or discharge shall be no less than four (4) inches in diameter; the pump shall be so placed that under normal operating conditions it will operate under a positive head at the suction inlet. The speed of pumps and motors shall be no greater than seventeen hundred and sixty (1,760) rpm, and the pump shaft shall not be supported by the motor shaft.

A separate sump pump shall be provided in the lift station structure to remove leakage or drainage, with the discharge into the wet well above the high water level.

The sewage ejector station shall have two (2) sewage pots, two (2) receiver type compressors and one (1) air storage tank.

1.5.05 **Structure.** - The wet well or manhole shall be completely separated from the main sewage lift station structure. The sewage lift station structure shall be designed by qualified engineers. Provisions within this structure shall be made to facilitate removing of pumps, motors and other equipment. Suitable stairways or ladders shall be provided for convenient access and all requirements of the State Division of Industrial Safety shall be complied with in the manufacturing of the unit, provisions for access, and for the protection of persons and property from mechanical or electrical equipment.

1.5.06 **Electrical Equipment.**

(a) All electrical starters, switches, lights, motors, fixtures, controllers and instruments shall be enclosed and constructed in accordance with the National Board of Fire Underwriter's Specifications to meet the hazardous conditions anticipated. The Health and Safety Code of the State of California shall also be met.

(b) All starters shall be of the magnetic type and shall be provided with hand, off or, automatic (HOA) selector switches.

(c) The motor starters shall be operated automatically from a wet well liquid level control. Controls of the sonic level type are required.

(d) Standby equipment shall be started automatically upon power failure.

1.5.07 Miscellaneous Requirements.

(a) Adequate ventilation shall be provided for all pump stations. Where the pump pit is below the ground surface, mechanical ventilation is required to effectively ventilate the dry well and also the wet well if screens or mechanical equipment requiring maintenance or inspection are located in the wet well. The ventilation equipment should have a minimum capacity of six (6) turnovers per hour under continuous operation. With intermittent operation, a two (2) minute turnover should be provided. Equipment shall start automatically with door opening.

(b) Gate valves shall be placed on suction and discharge lines of each pump. A lever and weight operated swing check valve shall be placed on each discharge line between the gate valve and the pump.

(c) An air compressor, to inject air into the force main, may be required by the District, depending upon an analysis of possible sulfide conditions.

(d) Steel fabricated, factory units shall be provided with some means of cathodic protection.

(e) A high water alarm circuit shall be provided to permit transmission of high water level indication over leased telephone lines. The circuits shall be complete to and including terminal point for leased lines at station. A local alarm light and or horn may be required by the District.

(f) An electric dehumidifier shall be provided, which is to operate on a refrigeration cycle and is automatically controlled by and adjustable humidistat, and has a thermostatically controlled heater to complement the dehumidifier.

1.6 PLAN PREPARATION.

Plans prepared for additions to the District's sewerage system and submitted to the District for approval shall be in substantial form and contain the information as herein set forth.

1.6.01 - Drawings shall be ink on mylar, sheet size shall be 36-inch by 24-inch with standard District title block. FINAL drawings shall be placed in AutoCAD electronic format, copied and given to the District for archiving.

1.6.02 - The General Notes shall appear once on the first plan and profile sheet. All required certifications and approvals also appear on the first sheet.

1.6.03 - Each sheet shall have a title block in the lower right hand corner.

1.6.04 - Each sheet shall have a "North" arrow, where applicable.

1.6.05 - A key map having a scale of 1 inch = 500 feet or larger shall be shown on the first sheet of each set of drawings. Said key map shall show all sewers, their sizes, manholes and appurtenances in their scaled relation to one another. All roads shall be shown.

1.6.06 - Plan and profile sheets shall have a scale of 1 inch = 40 feet horizontal and 1 inch = 4 feet vertical. Or 1 inch = 50 feet horizontal and 1 inch = 5 feet vertical. Double plan and profile sheets may be used.

1.6 07 - At least one (1) bench mark shall be shown and/or described on each sheet.

1.6.08 - The profile shall show the size of pipe; the type of pipe; the pipe strength; manhole center location by station; invert; elevation of sewer pipe at manhole center; the existing ground elevation and proposed finished ground elevation; the grade of pipes in percent; the depth, size, nature and location of all other utilities which cross over or under the sewer; location and nature of special construction such as the encasement of bored casings; and any other information pertinent and necessary to the proper construction and recordation of the sewers.

1.6.09 - The plans shall show the tract and lot numbers of all property adjacent to the sewer to be constructed.

1.6.10 - The plans shall show all right of way lines, the distance form the centerline of all roads, rights of way and easements to the center of the sewer.

1.6.11 - The plans shall show exact location of proposed house connections.

1.6.12 - The plans shall show exact location of all structures within twenty (20) feet of the sewer centerline and shall show all water wells within fifty (50) feet of the sewer centerline.

1.7 TECHNICAL SPECIFICATIONS.

The District's Technical Specifications shall be utilized in the design of sewer facilities. Technical Specifications are in Division "D" of the District's adopted policies.

1.8 STANDARD DRAWINGS.

The District's Standard Drawings shall be utilized in the design of sewer facilities. Standard Drawings are shown in Division "E" of the District's adopted policies.

COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT

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GENERAL CONDITIONS

SPECIAL DISTRICTS DEPARTMENT

GENERAL CONDITIONS

1.0 DEFINITIONS.

Whenever any word or expression defined in this section, or pronoun used in its stead, occurs in these Contractual Documents, it shall have, and is mutually agreed to have, the following meaning:

ABANDONMENT - A procedure whereby a structure or facility is left "as is" and not utilized for the purpose intended.

ADDENDA - Additions to the Contractual Documents
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ADDENDUM - An addition to the Contractual Documents.

AGREEMENT, CONTRACT - These words are used synonymously to indicate a document expressing the terms under which "The Work" will be accomplished and remuneration will be made, that is in concurrence with all parties concerned.

ARCHITECT - Where "Engineer" is used in these specifications, it shall also mean Architect.

ASSIGN - To transfer.

BID, PROPOSAL - These words are used synonymously to indicate the document that states the conditions under which a contractor will accomplish "The Work"

CITY STREET - A secondary roadway for vehicular traffic, other than a County road or State highway.

CONDEMNED MATERIAL - Those items of material that are unfit for use or service.

CONTRACT - See "AGREEMENT."

CONTRACTOR - The party entering into an agreement with the Owner, who will accomplish "The Work" stipulated in the Contract.

CONTRACTUAL DOCUMENTS - The documents of or pertaining to the Contract, such as: Specifications, Bonds, Addenda, Drawings, and the Agreement.

CONTRACTUAL DRAWINGS - The Drawings of or pertaining to the Contract.

COUNTY ROAD - A primary or secondary roadway for vehicular traffic that is under the jurisdiction of and maintained by the County government within which it lies.

DISTRICT - The political subdivision which "The Work" is to be accomplished. Sometimes used synonymously with "Owner" and "Local Public Agency"

EMERGENCY - That period of time when action is imperative and where the normal channels of procedure could cause delay, thereby creating a condition of danger to life or property.

ENGINEER - That person or firm that represents the Owner on engineering matters related to "The Work." The Engineer shall be the supervisor and direct the construction of "The Work" under the Contract.

GUARANTEE - Giving security for the carrying out of assurances.

GUARANTY - A bond or security given to guarantee fulfillment of an obligation.

INSPECTOR - Personnel appointed by the Engineer to inspect construction of "The Work" for engineering and technical completeness. An inspector shall be limited to the particular duties entrusted to him.

LOCAL PUBLIC AGENCY - Generally, an organization established for the benefit of community betterment, sometimes used synonymously with "Owner" and "District."

OR EQUAL - Where used with brand names or specific manufactured products, shall mean the named commodity is a standard of quality. Items of equal quality may be substituted. However, the decision as to what constitutes "or equal" is the responsibility of the Engineer. Approval in writing from the Engineer must be obtained prior to making any substitutions.

OWNER - The person, group, political or governmental body for whom "The Work" is to be accomplished. Sometimes used synonymously with "District" or "Local Public Agency."

PROJECT AREA - The real extent within which "The Work" will be accomplished.

SPECIAL DISTRICTS DEPARTMENT - A division of County government responsible for the administration of County Special Districts.

SPECIFICATIONS - Portions of the Contractual Documents delineating descriptions, particulars and terms of the Contract as well as details for completeness of "The Work" not shown on the Contractual Drawings.

SUBCONTRACTOR - A contractor to whom the Contractor has assigned a portion of "The Work" for completion.

SURETY - The security for payment or for the performance of work, and the company or organization that underwrites such bonds or security.

SUPERINTENDENT - Any authorized representative designated in writing by the Contractor, who shall have the authority to represent and act for the Contractor.

SUPERINTENDENT OF STREETS, DISTRICTS OR SEWERS - The title, "Superintendent," when followed by Streets, Districts, etc., shall designate the duly authorized person who can act for the Owner.

THE CONTRACT - That agreement or contract that relates particularly with "The Work" described in these Contractual Documents.

THE WORK - That which is to be accomplished by the Contractor to make the contents of the Contractual Documents a reality.

WRITTEN NOTICE SERVED - When written instruments have been delivered in person by the originator's courier, or posted to the U.S. Mail by Certified Mail.

2.0 BONDS

2.1 FAITHFUL PERFORMANCE BOND.

As a part of the execution of this Contract, the Contractor shall furnish a bond of a surety company acceptable to the Owner conditioned upon the faithful performance of all covenants and stipulations under this Contract. The amount of the bond shall be one hundred percent (100%) of the total Contract price, as this sum is set forth in the agreement.

2.2 MATERIAL AND LABOR BOND.

As a part of the execution of this Contract, the Contractor shall furnish a bond of a surety company acceptable to the Owner in a sum not less than one hundred percent (100%) of the total Contract price as this sum is set forth in the agreement, for the payment in full of all person, companies, or corporations who perform labor upon or furnish materials to be used in the work under this Contract, in accordance with the provisions of Sections 4200 to 4208, inclusive (Chapter 2, Division 5), of the Governmental Code of the State of California, and any acts amendatory thereof.

2.3 BIDDER'S GUARANTY.

All bids shall be accompanied by cash, cashier's check, certified check or bidder's bond, made payable to the Owner for an amount equal to at least ten percent (10%) of the amount of the bid.

2.4 NOTIFICATION OF SURETY COMPANIES.

The surety companies shall familiarize themselves with all of the conditions and provisions of this Contract, and they shall waive the right of special notification of any change or modification of this Contract or of extension of time, or of decreased or increased work, or of the cancellation of the Contract, or of any other act or acts by the Owner or its authorized agents under the terms of this Contract; and failure to so notify the aforesaid surety companies of such changes shall in no way relieve the surety companies of their obligation under this Contract.

2.5 SPECIAL BONDS.

Where the Owner may require special bonds because of the nature of the work, the method of financing, or special legal requirements, they are described in the "Special Conditions" of these specifications.

3.0 INSURANCE.

3.1 PUBLIC AND AUTOMOBILE LIABILITY AND PROPERTY DAMAGE INSURANCE.

The Contractor shall maintain and furnish the County with evidence of insurance of combined single limit liability insurance covering bodily injury and property damage in an amount not less than $1,000,000 or the equivalent thereof. Said insurance must contain an endorsement that; County of San Bernardino, San Bernardino County Flood Control District and all Board-governed Special District are named as additional insured's. Said Automobile and Public Liability insurance and property damage shall be maintained by the Contractor in full force and effect during the entire period of performance under this contract.

3.2 BUILDER'S RISK "ALL-RISK" INSURANCE.

Before commencement of the work, the Contractor will submit written evidence that he has obtained for the period of the Contract, Builder's Risk "All-Risk" Completed Value Insurance Coverage, including earthquake, upon the entire project which is the subject of this Contract and including completed work and work in progress. Such insurance shall include as Additional Named Insured's: the Owner; the Engineer and his consultants; and each of their officers, employees and agents; and any other persons with an insurable interest designated by the Owner as an Additional Named Insured.

Such insurance may have a deductible clause but not to exceed $1,000.00 on general coverage and a deductible clause not to exceed $5,000.00 on earthquake and flood coverage.

3.3 WORKER'S COMPENSATION INSURANCE.

The Contractor shall maintain adequate Worker's Compensation Insurance under the laws of the State of California for all labor employed by him or by any subcontractor under him who may come within the protection of such Worker's Compensation laws of the State of California, and shall provide, where practicable, employer's general liability insurance for the benefit of his employees and the employees of any subcontractor under him, not protected by such compensation laws, and proof of such insurance satisfactory to the owner shall be given by filing certificates of such insurance with the Owner in form satisfactory to said owner. If such insurance is underwritten by any agency other than the State Compensation Fund, such agency shall be a company authorized to do business in the State of California.

3.4 LIMIT OF LIABILITY.

Nothing herein contained shall be construed as limiting in any way the extent to which the Contractor may be held responsible for payment of damages to persons or property resulting from his operations or the operations of any subcontractor under him.

3.5 CANCELLATION OF INSURANCE.

Each of the policies of insurance provided for in the sections above shall contain a clause substantially in the following words:
It is hereby understood and agreed that this policy may not be canceled nor the amount of the coverage thereof be reduced until thirty (30) days after receipt by the Owner of a WRITTEN NOTICE of such cancellation or reduction in coverage, as evidenced by receipt of a registered letter.

3.6 EVIDENCE AND PAYMENT OF INSURANCE.

The Contractor shall at the time of the execution of the Contract present the original policies of insurance required or present a certificate of an insurance company showing the issuance of such insurance. No work shall begin until the certificates are delivered to and approved by the Owner.

The payments for all insurance policies shall be borne by the Contractor and shall be included in the bid and/or Contract amount.

3.7 ADDITIONAL INSURANCE.

The Contractor's attention is directed to the "Special Conditions" of these specifications for additions or modifications to the insurance requirements of this section.

4.0 PERMITS AND LAW OBSERVANCES.

4.1 PERMITS.

The Owner will obtain and pay for building, plumbing, electrical, encroachment and other permits necessary for the construction of the work herein set forth. The Contractor shall obtain and pay for all licenses required by cities, County of San Bernardino, or State laws.

The Contractor doing the work shall be licensed in California in accordance with appropriate classifications listed in the latest addition of "CONTRACTOR'S LICENSE LAW AND REFERENCE BOOK."

4.2 REGULATIONS.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the Drawings and Specifications are at variance therewith, he shall promptly notify the Engineer in writing and any necessary changes shall be adjusted as provided in the Contract for changes in the work.

4.3 OBSERVANCE OF LABOR CODE AND OTHER LAWS.

The Contractor shall inform himself as to Sections 1735, 1771, 1773, 1774, 1775, 1776, 1777, 1777.5, 1777.6, 1810, 1812, 1813, 1814, 1815, 1816, and 1850 of the Labor Code of the State of California, and shall comply with these and with all other applicable laws. In accordance with Section 1770 of the Labor Code, the Owner has ascertained the prevailing wages applicable to the work to be done as set forth in these Specifications.

5.0 ASSIGNMENTS, SUBCONTRACTS.

5.1 ASSIGNMENT.

The Contractor shall not assign. transfer, convey or otherwise dispose of this Contract, or of his right, title or interest in or to the same or any part thereof, without the previous consent in writing of the Owner: and he shall not assign by power of attorney, or otherwise, any of the moneys to become due and payable under the Contract, unless by and with the like consent signified in like manner. If the Contractor shall, without such previous consent, assign, transfer, convey or otherwise dispose of the Contract, or of his right, title, or interest therein, or any of the moneys to become due under the Contract to any other person, company, or other corporation, the Contract may, at the option of the Owner, be terminated and revoked, and the Owner shall thereupon be relieved and discharged from any and all liability and obligations growing out of the same to the Contractor, and to his assignee or transferee. No right under the Contract, nor any right to any money to become due hereunder, shall be asserted against the Owner in the law or equity by reason of any so-called assignment of the Contract, or any part thereof, or by reason of the assignment of any moneys to become due hereunder, unless authorized as aforesaid by the written consent of the owner.

5.2 LIMITATIONS CONCERNING SUBCONTRACTORS.

(a) Reference is hereby made to the provisions of Chapter 2 of Division 5, Title 1 of the Government Code of the State of California (commencing at Section 4100), which are incorporated herein and made a part hereof by reference.

(b) A copy of each subcontract, if in writing, or if not in writing, then a written statement signed by the Contractor, giving the name of the subcontractor, and the terms and conditions of such subcontractor shall be filed with the Engineer before the subcontractor begins work. Each subcontract shall contain a reference to the Agreement between the Owner and the Contractor, and the terms of that Agreement and all parts thereof shall be made a part of such subcontract insofar as applicable to the work covered thereby. Each subcontract shall provide for its annulment by the Contractor at the order of the Engineer, if, in the Engineer's opinion, the subcontractor fails to comply with the requirements of the principal Contract insofar as the same may be applicable to the work. Nothing herein contained shall create any contractual relation between any subcontractor of any liability or obligation hereunder.

(c) The Contractor hereby agrees to reimburse the District for costs incurred by the awarding authority in the substitution of subcontractors. Where a hearing is held pursuant to the provisions of Chapter 2, Division 5, Title 1, of the Government Code (commencing with Section 4100) by the awarding authority or a duly appointed hearing officer, the Clerk of the Board of Supervisors shall prepare and certify a statement of all costs incurred by the District for investigation and conduct of the hearing, including the costs of any hearing officer or shorthand reporter.

The statement shall then be sent to the General Contractor who shall reimburse the District for such costs. If not paid separately, such reimbursement may be deducted from any money due and owing the General Contractor prior to the acceptance of the project.

6.0 RESPONSIBILITIES AND RIGHTS OF THE CONTRACTOR

6.1 LEGAL ADDRESS OF CONTRACTOR.

Both the address given in the proposal and the Contractor's office in the vicinity of the work are hereby designated as places to either of which drawings, samples, notices, letters, or other articles of communication to the Contractor may be mailed or delivered. The delivery at either of these places of any such thing from the Owner 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 such delivery. The address named in proposal may be changed at any time by notice in writing from the Contractor to the Owner. Nothing herein contained shall be deemed to preclude or render inoperative the service of any drawing, sample, notice, letter or other article of communication to or upon the Contractor personally.

6.2 OFFICE OF CONTRACTOR AT SITE.

During the performance of this Contract, the Contractor shall maintain a suitable office at the site of the work which shall be the headquarters of a representative authorized to receive drawings, instructions, or other communications or articles from the Owner or its agents; and any such thing given to the said representative or delivered at the Contractor's office at the site of the Work in his absence shall be deemed to have been given to the Contractor.

6.3 COOPERATION WITH OWNER OR ENGINEER.

Contractor shall comply with all orders of the Owner or Engineer in regard to maintaining an adequate progress, but neither the making of such demands nor the failure of the Owner or Engineer to make such demands shall relieve the Contractor of his obligation to secure the quality of equipment and/or material and/or performance of work and the rate of delivery of said equipment and/or materials and/or completion of work as stipulated in the Contract, and the Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, equipment, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation.

6.4 EXAMINATION OF SITE AND DOCUMENTS.

Contractor acknowledges that he has examined the Special Conditions, General Conditions, and Drawings, has visited and examined the delivery route(s) and the installation site for equipment and/or materials which he has agreed to supply herein, and/or the work site upon which he has agreed to perform herein and is familiar with local conditions which may effect his manufacture and delivery of said equipment and/or materials: he will make no claims or additional compensation over and above the quotations set forth in the Bidding Documents because of difficulties, real or anticipated.

6.5 ATTENTION TO WORK.

The Contractor shall at all times diligently pursue the work to completion and shall give his personal attention to and shall supervise the work to the end that it shall be prosecuted faithfully; and when he is not personally present on the work, he shall at all reasonable times be represented by a competent superintendent who shall receive and obey all instructions or orders given under this Contract, and who shall have full authority to execute the same, and to supply materials, tools and labor without delay, and who shall be the local representative of the Contractor and shall be liable for the faithful observance of any instructions delivered to him or to his authorized representative.

6.6 TIME AND ORDER OF PERFORMANCE

Time is of the essence to this Contract ("time" is defined herein as the time(s) specified by the bidder in the Bidding Documents within which he could perform if awarded the Contract and if there be no such specific designation, "time" shall be the time for completion designated in the Proposal herein). The contractor shall at all times employ such force, equipment, plant, materials, and/or tools as will be sufficient in the opinion of the Engineer, to complete the performance of the Contract and every part thereof within the time limit(s) fixed by the Contract. If, in the opinion of the Engineer, the Contractor should fail to employ sufficient force, equipment, plant, materials and tools, or to maintain adequate progress toward meeting the said time limit(s), he may, after such failure, be required to increase the efficiency, capacity, or character of his equipment, or to modify his plans and procedures in such manner and to such extent as the Engineer may direct. No extension of time shall be made for ordinary delays and accidents, and the occurrence of such shall not relieve the Contractor from the necessity of maintaining the required progress. In case of an extension by the Engineer of the time for the completion of the Contract as hereinafter provided, a revised schedule of progress may be prescribed by the Owner in accordance with such extension of time.

6.7 LIABILITY OF CONTRACTOR.

The Contractor shall do all of the work and furnish all labor, materials, tools, and appliances, except as otherwise herein expressly stipulated, necessary or proper for performing and completing the work herein required in the manner and within the time herein specified, The mention of any specific duty or liability impose upon the Contractor shall not be construed as a limitation or restriction of any general liability or duty imposed upon the Contractor by this Contract, or the reference to any specific duty or liability being made herein merely for the purpose of explanation.

The right of general supervision by the Owner shall not make the Contractor an agent of the Owner, and the liability of the Contractor for all damages to persons or to public or private property, arising from the Contractor's execution of the work, shall not be lessened because of such general supervision.

The Contractor shall assume the defense of, and indemnify and save harmless the Owner and each and every employee and agent thereof from all suits, actions, damages, or claims of every name and description, to which the Owner may be subjected or put by reason of injury to persons or property in the execution of the work or resulting from negligence or carelessness on the part of the Contractor, his employees or agents, in the delivery of materials and supplies; or by or on account of any act or omission of the Contractor, his employees or agents; including any failure to fulfill the terms of all laws and regulations which apply to this Contract; and the Owner shall have the right to estimate the amount of such damage, to pay the same, and the amount so paid for such damage shall be deducted from the money due the Contractor under this Contract; or the whole or so much of the money due or to become due the Contractor under this Contract as may be considered necessary by the Owner, shall be retained by the Owner until such suits or claims for damages shall have been settled or otherwise disposed of, and satisfactory evidence to the effect furnished to the Owner.

6.8 RISK OF LOSS.

Until by the formal acceptance by the Owner of the performance of the Contractor hereunder either by furnishing equipment and/or materials or by performance of work, the Contractor shall have the charge and care thereof and shall bear the risk of injury or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the no execution of the work, The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of that which he is to provide or complete hereunder, occasioned by any of the above causes before completion and acceptance and shall bear the expense thereof, except for such injuries or damages as are occasioned by acts of the Federal government and the public enemy. In case of suspension of work from any cause whatsoever, the Contractor shall be responsible for all equipment and/or materials then upon the Owner's property and shall properly store them, if necessary, and shall erect temporary structures where necessary in so doing. Nothing in this Contract shall be considered as vesting in the Contractor any right of property in materials used after they have been attached or affixed to the work or the soil upon owner's real property, but all such materials shall, upon being so attached or so affixed, become the property of the Owner.

6.9 PROTECTION OF PERSONS AND PROPERTY.

The Contractor shall furnish such watchmen, guards, fences, warning signs, walks, and lights as shall be necessary and shall take all other necessary precautions to prevent damage or injury to persons and property.

All fences, buildings, shrubs, lawns, gardens and other property in the vicinity of the work shall be protected by the Contractor; and if they are injured or destroyed, they and any other property injured by the Contractor, his employees or agents shall be restored to a condition as good as when he entered upon the work, and without cost to the Owner or other private property owners. All trees along the work which are not to be removed shall be protected from injury, If so required by the Owner or Engineer, the trunks of trees shall be covered with burlap or stakes shall be driven around them for complete protection.

6.10 REMOVING OBSTRUCTIONS AND MAINTENANCE OF EXISTING IMPROVEMENTS.

When the work hereunder involves performance upon Owner's property, and when the proper completion of the said work requires their temporary or permanent removal, the Contractor shall, at his own expense, remove, and without delay, temporarily or permanently replace or relocate in a workmanlike manner and to the satisfaction of the Owner and of any other person or agency having jurisdiction, all water pipes, gas pipes, drainage lines, irrigation lines, sewer lines, pipelines, conduits, culverts, roads, driveways, fences, bridges, railroad tracks, wires, poles, towers, retaining walls, buildings, curbs, gutters, concrete walks, trees, shrubs, lawns, and all other improvements of whatsoever character not required by law to be removed by the owner thereof; and all such improvements temporarily removed shall be maintained until permanently replaced, all at the Contractor's expense.

Where the work is to be constructed in or adjacent to areas which have been improved by lawns, trees shrubs, or gardens, the Contractor shall remove such trees or plants as may be necessary for the prosecution of the work and give them proper care and attention until the work has been satisfactorily completed, after which the Contractor shall replace them in as nearly the original condition and location as is reasonably possible, Where it is necessary to deposit the excavated materials on lawns during the process of construction, the Contractor shall first lay burlap or canvas on the lawn to prevent contact between the excavated material and the lawn.

Unless otherwise indicated on the Drawings, General or Special Conditions, or unless otherwise cared for by the owner of a public utility or franchise, all water, gas, oil, or irrigation lines, lighting, power, telephone conduits or wires, or sewer lines, structures, house connections in place, and all other surface or subsurface structures or lines shall not be disturbed, disconnected, damaged by him during the progress of the work; provided, that should the Contractor in the performance of the work disturb, disconnect, or damage any of the above, all expenses, of whatever nature, arising thereof, shall be borne by the Contractor.

6.11 PROTECTION OF OWNER AGAINST PATENT CLAIMS.

All fees, royalties, or claims for any patented invention, article, or method that may be used upon or in any manner connected with the work under this Contract shall be included in the price bid for the work, and the Contractor and his sureties shall protect and hold the Owner together with all of its officers, agents, servants, and employees, harmless against any and all demands made for such fees or claims brought or made by the holders of any invention or patent; and before the final payment is made on the account of this Contract, the Contractor shall, if requested by the Engineer, furnish acceptable proof of a proper release from all such fees or claims.

Should the Contractor, his agents, servants, or employees or any of them, be enjoined form furnishing or using any invention, article, material or appliances supplied or required to be supplied or used under this Contract, the Contractor shall promptly substitute other articles, materials, or appliances in lieu thereof, of equal efficiency, quality, finish, suitability and market value, and satisfactory in all respects to the Engineer. Or in the event that the Engineer elects, in lieu of such substitution, to have supplied, and to retain and use, any such invention, article, material or appliance, as may by this Contract be required to be supplied, in that event, the Contractor shall pay such royalties and secure valid licenses as may be requisite and necessary for the Owner, its officers, agents, servants and employees, or any of them to use such invention, article, material or appliance without being disturbed or in any way interfered with by any proceeding in law or equity on account thereof. Should the Contractor neglect or refuse to make the substitution promptly, or to pay such royalties and secure such licenses as may be necessary; then in that event, the Engineer shall have the right to make such substitution or the Owner may pay such royalties and secure such licenses and charge the cost thereof against any money due the Contractor from the Owner or recover the amount thereof from him and his sureties even though final payment under this Contract may have been made.

6.12 LAWS AND REGULATIONS.

The Contractor shall keep himself fully informed of all laws, ordinances, and regulations in any manner affecting those engaged or employed on the Contract work, or in any way affecting the conduct of the Contract work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency should be discovered in this Contract, or in the Special or General Conditions or Drawings herein referred to, in relation to any such law, ordinance, regulation, order, or decree the Contractor shall forthwith report the same in writing to the Owner or the Engineer. He shall at all times himself observe and comply with and shall cause all his agents and employees to observe and comply with all such applicable laws, ordinances, regulations, orders and decrees in effect or which may become effective before completion of this Contract; and shall protect and indemnify the Owner and its officers and agents against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself, by his employee or by a subcontractor. Except as otherwise explicitly provided elsewhere in the Special Conditions, General Conditions or Drawings, all permits necessary to the prosecution of the Contract work shall be secured by the Owner. All licenses necessary to the prosecution of this Contract work shall be secured by the Contractor at his own expense and he shall pay all taxes properly assessed against his equipment or property used or required.

6.13 PROTECTION OF CONTRACTOR'S WORK AND PROPERTY.

The Contractor shall protect his work, supplies, and materials from damage due to the nature of the work, the action of the elements, trespassers, or any cause whatsoever, until the completion and acceptance of the work. Neither the Owner nor any of its agents assumes any responsibility for collecting indemnity from any person or persons causing damage to the work of the Contractor.

6.14 PUBLIC UTILITIES, FRANCHISES, PIPES AND CONDUITS.

Before entering upon the work to be done under these specifications, the Contractor shall ascertain the existence, location and ownership of all public utility structures, main pipelines and main-line conduits situated within the streets, public ways or rights of way on or in which the work is to be done.

Attention is directed to possible existence of underground facilities not known to the Owner or in a location different from that which is shown on the plans.

In case it shall be necessary to remove any telephone, telegraph or electric power transmission poles, gas pipes, water pipes, sewer pipes, electrical conduits or underground structures of any character, or any portion thereof or their agents or superintendents, upon proper application of the Contractor, shall be notified by the authorized official, to remove same within a specified time, and the Contractor shall not interfere with said structures until the time specified in the said notice have expired. In case any utility service line is cut by the Contractor, it shall be restored without delay at the sole expense of the Contractor.

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

6.15 BLASTING.

When the use of explosives is necessary for the prosecution of the work, the Contractor shall use the utmost care not to endanger life or property. All explosives shall be stored in a secure manner in compliance with all State, County and municipal laws, ordinances, and regulations, and all such storage places shall be clearly marked "DANGEROUS - EXPLOSIVES."

6.16 MAINTENANCE OF TRAFFIC.

The Contractor shall so conduct his operations as to cause the least possible obstruction and inconvenience to public traffic. Unless in the Special Provisions other existing streets are stipulated to be used as detours, all traffic shall be permitted to pass through the work.

Residents along the road or street shall be provided passage as far as practicable. Convenient access to driveways, houses and buildings along the line of work must be maintained at all times. Temporary approaches to, and crossing of, intersection streets shall be provided and kept in good condition. During excavation and grading operations, no driveways shall be closed or made inaccessible more than twenty-four (24) hours.

The Contractor shall furnish, erect and maintain such fences, barriers, lights, signs, including "Street Closed" signs, and flagmen as are necessary to give adequate warning to the public at all times that there is construction under way and of any dangerous conditions to be encountered as a result thereof. All warning signs, lights and devices shall be in conformance with the "Manual of Warning Signs, Lights and Devices for Use in Performance of Work upon Highways" issued by the Department of Public Works, State of California, dated 1975. In no case shall the spacing between lights be more than fifty (50) feet along the length of any trench adjacent to or within the boundary of a thoroughfare. No material or other obstruction shall be placed within fifteen (15) feet of fire hydrants.

All safety orders, rules and recommendations of the Division of Industrial Safety of the Department of Industrial Relations of the State of California applicable to the work to be done under this Contract shall be obeyed and enforced by the Contractor. The Contractor shall comply with all applicable regulations of the Owner.

6.17 CONSTRUCTION UTILITIES.

The Contractor shall be responsible for providing for, and in behalf of, his work under this Contract, all necessary utilities such as special connections to water supply, telephone, power lines, fences, roads, flagmen, suitable storage places, etc.

6.18 APPROVAL OF CONTRACTOR'S PLANS.

The approval by the Engineer of any drawings or any method of work proposed by the Contractor in accordance with paragraph 8.6 shall not relieve the Contractor of any of his responsibility for any errors therein and shall not be regarded as an assumption of risk or liability by the Owner or any officer or employee thereof, and the Contractor shall have no claim under this Contract on account of the failure or partial failure or inefficiency of any plan or method so approved. Such approval shall be considered to mean merely that the Engineer has no objection to the Contractor's using, upon his own full responsibility, the plan or method proposed.

6.19 SUGGESTIONS TO CONTRACTOR.

Any plan or method of work suggested by the Engineer, but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor; and the Engineer and the Owner shall assume no responsibility therefore.

6.20 TERMINATION OF UNSATISFACTORY SUBCONTRACTORS.

Should any subcontractor fail to perform in a satisfactory manner the work undertaken by him, such subcontract shall be terminated immediately by the Contractor upon written notice from the Engineer.

6.21 PERPETUATION OF SURVEY MONUMENTS AND PROPERTY CORNER STAKES.

The Contractor shall be responsible for preserving all existing survey monuments and property corner stakes within the limits of construction. Prior to the commencement of construction, Contractor shall secure the services of a licensed land surveyor or registered civil engineer to make reference ties to all survey monuments that may be destroyed in the process of construction, One copy of these ties shall be delivered to the office of the County Surveyor before construction begins. Any such survey monuments and/or property corner stakes removed, disturbed or destroyed shall be replaced by the licensed land surveyor or registered civil engineer, at the Contractor's expense, after construction is complete in a reasonable time.

6.22 SURVEYS.

Unless otherwise specified, the Owner will furnish all land surveys and establish all base lines for location the principal component parts of the work, together with a suitable number of bench marks adjacent to the work. From the information provided by the Owner, the Contractor shall develop and make all detail surveys needed for construction, such as slope stakes, batter boards, stakes for pile locations and other working points, lines and elevations. In the case of sewer and water lines to be laid on grade, the Owner will furnish an offset grade line and cut sheets.

The Contractor shall carefully preserve bench marks, reference points and stakes and, in the case of destruction, will be charged with the resulting expense of replacement. The Contractor shall be responsible for any mistakes that may be caused by their loss or disturbance.

6.23 REMOVAL OF CONDEMNED MATERIALS AND STRUCTURES.

The Contractor shall remove from the site of the work, without delay, all rejected and condemned materials or structures of any kind brought to or incorporated in the work, and upon his failure to do so, or to make satisfactory progress in so doing, within forty-eight (48) hour after the service of a written notice from the Engineer, the condemned material or work may be removed by the Owner and the cost of such removal shall be taken out of the money that may be due or may become due the Contractor on account of or by virtue of this Contract. No such rejected or condemned material shall again be offered for use by the Contractor under this Contract.

6.24 PROOF OF COMPLIANCE WITH CONTRACT.

In order that the Engineer may determine whether the Contractor has complied with the requirements of this Contract not readily enforceable through inspection and tests of the work and materials, the Contractor shall at any time when requested, submit to the Engineer properly authenticated documents or other satisfactory proofs as to his compliance with such requirement.

6.25 ERRORS AND OMISSIONS.

If the Contractor, in the course of the work, finds any errors or omissions in plans or in the layout as given by survey points and instructions, or if he finds any discrepancy between the plans and the physical conditions of the locality, he shall promptly verify the same with the Engineer and the Engineer's decision shall be final. Any work done after such discovery will be done at the Contractor's risk.

6.26 COOPERATION.

The Contractor shall cooperate with all other contractors who may be performing work in behalf of the Owner and workmen who may be employed by the Owner on any work in the vicinity of the work to be done under this Contract; and he shall so conduct his operations as to interfere to the least possible extent with the work of such contractors or workmen. He shall make good promptly, at his own expense, any injury or damage that may be sustained by other contractors or employees of the Owner at his hands.

Any differences or conflict which may arise between the Contractor and other contractors, or between the Contractor and workmen of the Owner in regard to their work, shall be adjusted and determined by the Engineer.

If the work of the Contractor is delayed because of any acts or omissions of any other contractor or of the Owner, the Contractor shall on that account have no claim against the Owner other than for an extension of time.

6.27 HIRING AND DISMISSAL OF EMPLOYEES.

The Contractor shall employ only such foremen, mechanics and labors as are competent and skilled in their respective lines of work, and whenever the Engineer shall notify the Contractor that any man on the work is, in his opinion, incompetent, unfaithful, intemperate, or disorderly, or refuses to carry out the provisions of this Contract, or uses threatening or abusive language to any person on the work representing the Owner, or is otherwise unsatisfactory, such man shall be discharged immediately from the work and shall not be re-employed upon it except with the consent of the Engineer.

The Contractor shall comply with all existing State and Federal laws and County and municipal ordinances and regulations limiting or controlling the work in any manner.

6.28 WAGES OF EMPLOYEES.

The Owner has ascertained the general prevailing rates of wages applicable to the work to be performed under this Contract. These are set forth in Section 1 Procedural Legal Documents:

The Contractor shall forfeit to the Owner, as a penalty, twenty-five dollars ($25.00) for each calendar day, or portion thereof, for each work-man paid less than the said stipulated prevailing rates for any work done under this contract by him or by any subcontractor under him, in violation of the California Labor Code. Nothing herein shall preclude employment of properly indentured apprentices in accordance with Section 1777.5 of said Labor Code.

6.29 CLEANING UP.

The Contractor shall not allow the site of the work to become littered with trash and waste material, but shall maintain the same in a neat and orderly condition throughout the construction period. The Engineer shall have the right to determine what is or is not waste material or rubbish and the place and manner of disposal.

On or before the completion of the work, the Contractor shall, without charge therefore, carefully clean out all pits, pipes, chambers or conduits and shall tear down and remove all temporary structures from any of the grounds which he has occupied and leave them in first-class condition.

6.30 GUARANTY.

The Contractor shall guarantee that all materials and equipment furnished will be new unless otherwise specified and shall guarantee the work performed for a period of two (2) years form the date of Substantial Completion. The Contractor warrants and guarantees for a period of two (2) years from the date of Substantial Completion of the system that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reasons of such defects including the repairs of any damage to other parts of the system resulting from such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period provided, however, that in case of and emergency, where, in the opinion of the Owner, delay would cause serious loss or damage, repairs may be made without notice being sent to the Contractor, and the Contractor shall pay the costs thereof.

6.31 NOTIFICATION OF OWNER, ENGINEER AND INSPECTOR.

The Contractor shall notify the Owner, Engineer and Inspector one (1) week in advance of when he plans to start construction. At that time or any such time prior to that as may be specified by the Engineer, the Contractor shall submit a schedule of his work showing principal operations and their estimated starting dates. When inspections or engineering judgments become necessary as set forth in these Specifications, the Contractor shall give at least twenty-four (24) hours notice.

6.32 SAFETY.

In accordance with generally accepted construction practices, the Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

The duty of the Engineer to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

6.33 PRECONSTRUCTION CONFERENCE.

A pre-construction conference shall be held prior to the commencement of construction of the work herein defined and all understandings, interpretations and agreements reached at said conference shall be reduced to writing by the Engineer and mailed to all parties attending said pre-construction conference. The understanding, interpretations and agreements set forth herein shall hereinafter be considered as a part of the Contract Documents.

7.0 RESPONSIBILITIES AND RIGHTS OF THE OWNER.

7.1 SPECIAL DISTRICTS DEPARTMENT.

The Special Districts Department shall mean the representative agency of the Owner and shall represent the Owner within the provisions of these specifications.

7.2 AUTHORITY OF THE ENGINEER.

All work done under this Contract shall be done in a workmanlike manner and shall be performed to the reasonable satisfaction of the Engineer, who shall have general supervision of all work included hereunder. To prevent disputes and litigation, the Engineer shall in all cases determine the amount, quality, acceptability, and fitness of the several kinds of work and materials which are to be paid for under this Contract; and shall decide all questions relative to the true construction, meaning, and intent of the Specifications and Drawings; shall decide all questions which may arise relative to the classifications and measurements of quantities and materials and the fulfillment of this Contract; and shall have the power to reject or condemn all work or materials which does not conform to the terms of this Contract. His estimate and decision in all matters shall be a condition precedent to the right of the Contractor to receive, demand, or claim any money or other compensation under this agreement and a condition precedent to any liability on the part of the Owner to the Contractor on account of this Contract. Whenever the Engineer shall be unable to act, in consequence of absence or other cause, then such engineer as the Engineer or Owner shall designate, shall perform any and all of the duties and be vested with any or all of the powers herein given to the Engineer. Decision of the Engineer as provided herein shall be set forth in writing with copies to Contractor and Owner.

The Engineer shall have no power to waive the obligation of the Contract for the performance of work and/or furnishing by the Contractor of the equipment and/or material conforming to the Special Conditions, General Conditions and Drawings.

7.3 INSPECTION.

The Engineer and his representative shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection.

If the Specifications, the Engineer's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection, and if the inspection is by another authority than the Engineer, of the date fixed for such inspection. Inspections by the Engineer shall be promptly made, and where practicable, at the source of supply. If any work should be covered up without approval or consent of the Engineer, it must, if required by the Engineer, be uncovered for examination and be properly restored at the Contractor's expense.

Re-examination of any work may be ordered by the Engineer, and, if so ordered, the work must be uncovered by the Contractor. If such work is found to be in accordance with Contract Documents, the Contractor shall pay such costs.

Properly authorized and accredited inspectors shall be considered to be the representatives of the Engineer limited to the duties and powers entrusted to them. It will be their duty to inspect material and workmanship of those portions of the work to which they are assigned, either individually or collectively, under instructions of the Engineer and to report any and all deviations form the Drawings, Specifications, and other Contract Provisions which may come to their notice. Any inspector may be considered to have the right to order the work entrusted to his supervision stopped, if in his opinion such action becomes necessary, until the Engineer is notified and has determined and ordered that the work may proceed in due fulfillment of all Contract requirements.

In accordance with generally accepted construction practices, the Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

The duty of the Engineer to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

7.4 SURVEYS.

Unless otherwise specified, the Owner will furnish all land surveys and establish all base lines for locating the principal component parts of the work together with a suitable number of bench marks adjacent to the work. From the information provided by the Owner, the Contractor shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines and elevations. In the case of sewer and water lines to be laid on grade, the Owner will furnish an offset grade line and cut sheets.

7.5 RIGHTS OF WAY.

The Owner will provide all rights of way and easements in or beneath which pipes and other structures will be constructed by the Contractor under this Contract.

7.6 RETENTION OF IMPERFECT WORK.

If any portion of the work done or material furnished under this Contract shall prove defective and not in accordance with the Specifications and Drawings, and if the imperfection in the same shall not be of sufficient magnitude or importance to make the work dangerous or undesirable, the Engineer shall have the right and authority to retain such work, with the written approval of the Owner, instead of requiring the imperfect work to be removed and reconstructed; but he shall then make deductions therefore in the payments due or to become due the Contractor as may be just and reasonable.

7.7 CHANGES IN THE WORK.

Refer to Section 10.7.

7.8 ADDITIONAL DRAWINGS BY OWNER.

The Drawings made as part of this Contract at the time of its execution are intended to be fairly comprehensive and to indicate in more or less detail the scope of the work. In addition to these Drawings, however, the Engineer will furnish such additional drawings from time to time during the progress of the work as are necessary to make clear or to define in greater detail the intent of the Specifications and Contract Drawings, and the Contractor shall make his work conform to all such drawings.

7.9 ADDITIONAL AND EMERGENCY PROTECTION.

Whenever, in the opinion of the Engineer, the Contractor has not taken sufficient precautions for the safety of the public or the protection of the works to be constructed under this Contract, or of adjacent structures or property which may be injured by the progresses of construction on account of such neglect; and whenever, in the opinion of the Engineer, an emergency shall arise and immediate action shall be considered necessary in order to protect pubic or private, personal or property interest, then and in that event, the Engineer, with or without notice to the Contractor, may provide suitable protection to the said interests by causing such work to be done and such material to be furnished as shall provide such protection as the Engineer may consider necessary and adequate.

The cost and expense of such work and materials so furnished shall be borne by the Contractor and if the same shall not be paid on presentation of the bills therefore, then such costs shall be deducted from any amounts due or to become due the Contractor.

The performance of such emergency work under the direction of the Engineer shall in no way relieve the Contractor from any damages which may occur during or after such precaution has been taken by the Engineer.

7.10 SUSPENSION OF CONTRACT.

(a) If the equipment and/or material to be furnished or the work to be performed by the Contractor under the Contract shall be abandoned by the Contractor, or if the Contractor shall make a general assignment for the benefit of his creditors or be adjudicated a bankrupt, or if a Receiver of his property or business be appointed by a court of competent jurisdiction, or if his Contract shall be assigned by him otherwise than hereinabove specified, or if, at any time, the Owner or Engineer shall be of the opinion that the performance of the Contract is unnecessarily or unreasonably delayed, or that the Contractor is willfully violating any of the conditions or covenants of the Contract, or of the Specifications, or is executing the same in bad faith or not in accordance with the terms thereof, or if the terms of the Contract be not fully completed within the time named in the Contract for its completion or within the time to which the completion of the Contract may have been extended, as hereinabove provided, the Engineer acting in behalf of the Owner may, by written notice, instruct the Contractor to suspend the operation of all or any part of the Contract, and the Contractor shall do so and shall resume the same only upon written instruction by the Engineer.

(b) Upon such suspension of the Contract, the Owner may procure the equipment and/or materials, and/or performance of the work necessary to fulfill the contract requirements in such manner as it may deem proper. In so doing, the Owner may take possession of and use any of the materials, plant, tools, equipment, supplies, and property of every kind which may be provided by the Contractor upon the Owner's property for the purposes of his work. The Owner may procure other equipment and/or materials and provide labor for the completion of the same, or contract therefore, and charge the expense of completion by either method to the Contractor.

These charges shall be deducted from such moneys as may be due or may at any time hereafter become due the Contractor under and by virtue of this Contract or any part thereof. In case such expense shall exceed the amount which would have been due the Contractor under the Contract if the same had been completed by him, the Contractor shall pay the amount of such excess to the Owner; and in case such expense shall be less than the amount which would have been payable under this Contract if the same had been completed by the Contractor, he shall have no claim to the difference, except to the extent as may be necessary, in the opinion of the Engineer, to reimburse the Contractor or the Contractor's sureties for any expense properly incurred for plant, camp, equipment, materials, supplies, and labor devoted to the prosecution of the work of which the Owner shall have received the benefits and which shall not have been otherwise paid for by the Owner. In computing such expense so far as it shall relate to plant and equipment taken over by the Owner, and the salvage value of such plant and equipment at completion of the work shall be deducted from the depreciated value thereof at the time taken over by the Owner, and the difference shall be considered as an expense. Evidence of such expense, satisfactory to the Engineer, shall be required, and all necessary estimates and appraisements shall be made by him. When any particular part of the work is performed by the Owner, by contract or otherwise, under the provisions of this section, the Contractor shall continue the remainder of the work in conformity with the terms of his Contract and in such manner as in nowise to hinder or interfere with the persons or workmen employed, as above provided, by the Owner, by contract or otherwise, to do any part of the work or to complete the same under the provisions of this section.

(c) To determine if there has been such noncompliance with the Contract as to warrant its suspension or the procurement of the material elsewhere by the Owner as herein provided, the decision of the Engineer shall be final. Suspension of the Contract of any portion thereof shall operate only to terminate the right of the Contractor to proceed with the furnishing of equipment and/or material, or performing the work covered by the Contract or the suspended portions thereof. All other stipulations of the Contract, shall be and remain in full force and effect after such suspension and until the Contract shall have been completed and final payment or final adjustment of accounts made.

7.11 ADDITIONAL SURETY.

If, during the continuance of the Contract, any of the sureties upon the performance bond, in the opinion of the Engineer, are or become insufficient, the Engineer may require additional sufficient sureties, which the Contractor shall furnish to the satisfaction of the Engineer within fifteen (15) days after notice, and in default thereof the Contract may be suspended with the same force and effect as provided in the above section.

7.12 USE OF COMPLETED PORTIONS.

The owner shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding the time for completing the entire work or such portions as may not have expired; but such taking possession and use shall not be deemed an acceptance of the work not completed in accordance with the Contract Documents.

8.0 WORKMANSHIP, MATERIALS AND EQUIPMENT.

8.1 GENERAL QUALITY.

Materials and equipment shall be new and of a quality equal to that specified or approved. Mechanical or electrical equipment shall be the products of manufacturers of established good reputations regularly engaged in the fabrication of such equipment. Unless otherwise noted, any equipment offered shall be current modifications which have been in successful regular operation under comparable conditions for a period of at least two (2) years. This time requirement, however, does not apply to minor details not to thoroughly demonstrated improvements in design of in material of construction. Work shall be done and completed in a thorough and workmanlike manner.

8.2 QUALITY IN ABSENCE OF DETAILED SPECIFICATIONS.

Whenever under this Contract it is provided that the Contractor shall furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market from firms of established good reputation, or if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required, with due consideration of the use to which they are to be put. In general, the work performed shall be in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.

8.3 MATERIALS AND EQUIPMENT SPECIFIED BY NAME.

Whenever any material or equipment is indicated or specified by patent or proprietary name or by the name of the manufacturer, such specification shall be considered as followed by the words, “or approved equal.” The Contractor may offer any material or equipment which shall be equal in every respect to that specified provided, however, that written approval first is obtained from the Engineer.

8.4 SOURCE OF MATERIALS.

Only unmanufactured materials produced in the United States, and only manufactured materials made in the United States substantially all from material produced in the United States, shall be employed in the performance of this Contract, in accordance with the provisions of Section 4300 through 4305 and of Section 4330 through 4334 (Articles 1 and 2, Chapter 4, Division 5) of the Government Code of the State of California and any acts amendatory thereof except to the extent, if any, that such provisions may be superseded by any law or treaty of the United States.

8.5 STORAGE OF MATERIALS.

Materials shall be so stored as to insure the preservation of their quality and fitness for the work. They shall be so located and disposed that prompt and proper inspection thereof may be made.

8.6 DRAWINGS, SAMPLES AND TESTS.

As soon as possible after execution of the Contract, the Contractor shall submit to the Engineer, in sextuple, sufficient information including, if necessary, assembly and detail drawings to demonstrate fully that the equipment and materials to be furnished comply with the provisions and intent of the Specifications and Drawings. If the information thus submitted indicates the equipment or material is acceptable, the Engineer will return three (3) copies stamped with his approval; otherwise one copy will be returned with an explanation of why the equipment or material is unsatisfactory. The Contractor shall have no claim for damages or extension of time on account of any delay due to the revision of drawings or rejection of material. Fabrication or other work performed in advance of approval shall be done entirely at the Contractor’s risk. After approval of equipment or material, the Contractor shall not deviate in any way from the design and Specifications given, without the written notice by the Engineer.

When requested by the Engineer, sample of test specimens of the materials to be used or offered for use in connection with the work shall be prepared at the expense of the Contractor and furnished by him in such quantities and sizes as may be required for proper examinations and tests, with all freight charges prepaid and with information as to their sources.

All samples shall be submitted before shipment and in ample time to permit the making of proper tests, analysis, or examination before the time at which it is desired to incorporate the material into the work. All tests of materials furnished by the contractor shall be made by the Engineer in accordance with recognized standard practice. No material shall be used in the work unless or until it has been approved by the Engineer. Samples will be secured and tested whenever necessary to determine the quality of the material.

8.7 OPERATING AND MAINTENANCE INSTRUCTIONS.

Before final acceptance of the work, the Contractor shall deliver to the Engineer suitable operating instructions covering each piece of equipment assembly. Instructions shall be bound together with suitable cover and furnished in triplicate.

8.8 FIELD TESTS, ADJUSTMENTS AND OPERATIONS.

After the work is completed, the Contractor, as necessary shall arrange during the succeeding thirty (30) day period for the presence of the manufactures of all the various pieces of equipment and parts of installation, or other qualified persons. The Contractor shall make such changes, adjustments, or replacements of equipment as may be required to make the same comply with the Specifications, or to replace any defective parts or material.

8.9 COMPLIANCE WITH STATE SAFETY CODE.

All necessary machinery guards, railings and other protective devices shall be provided as specified by the State Division of Industrial Safety.

8.10 EQUIPMENT AND METHODS.

The work under this Contract shall be prosecuted with all materials, tools, machinery, apparatus, and labor and by such methods as are necessary to complete execution of everything described, shown or reasonably implied. If at any time before the beginning or during the progress of the work, any part of the Contractor's plant, or equipment or any of his methods of execution of the work, appear to the Engineer to be unsafe, inefficient or inadequate to insure the required quality or rate of progress of the work, he may order the Contractor to increase or improve his facilities or methods, and the Contractor shall comply promptly with such orders; but neither compliance with such orders nor failure of the Engineer to issue such orders shall relieve the Contractor from his obligation to secure the degree of safety, the quality of the work, and the rate or progress required of the Contractor. The Contractor alone shall be responsible for the safety, adequacy, and efficiency of his plant, equipment and methods.

9.0 COMPLETION DATE, TIME EXTENSIONS, DELAYS.

9.1 TIME OF COMPLETION.

Unless otherwise provided in this Contract, the Contractor shall commence construction of the work within ten (10) days after the Owner's written Notice to Proceed and shall complete the same within the time specified in the Proposal, it being expressly understood and agreed that the time of beginning, rate of progress and time of completion of the work are essential conditions under this Contract.

No material shall be delivered and no on-site work shall be commenced under the Contract until the Contractor has been given such written notice. It is understood and agreed by the Contractor that his performance hereunder must be coordinated by the Owner with other work in progress in the immediate vicinity, that unavoidable delays may occur and that the time schedules set forth on the bidding documents shall be subject to adjustment by the Owner, all at no additional cost to the Owner.

9.2 AVOIDABLE DELAYS.

Avoidable delays in the prosecution or completion of the work shall include all delays which might have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor.

Delays in the prosecution of parts of the work, which may in themselves be unavoidable but do not necessarily prevent or delay the prosecution of other parts of the work nor the completion of the whole work within the time herein specified, reasonable loss of time resulting from the necessity of submitting plans to the Engineer for approval and from the making of surveys, measurements, and inspections, and such interruptions of the work on account of reasonable interference of the other contractors employed by the Owner, which do not necessarily prevent the completion of the whole work within the time herein specified, will be considered by the Owner as avoidable delays within the meaning of this Contract.

9.3 UNAVOIDABLE DELAYS.

Unavoidable delays in the prosecution or completion of the work under this contract shall include all delays which may result from or are caused by acts of God or of the public enemy, fire, floods, epidemics, quarantine restrictions, strikes, labor disputes, shortages of materials and freight embargoes. Orders issued by the Owner changing the amount of work to be done, the quality of material to be furnished or the manner in which the work is to be prosecuted, and the unforeseen delays in the completion of the work of other contractors under contract with the Owner will be considered unavoidable delays, so far as they necessarily interfere with the Contractor's completion of the whole of the work. Delays due to extreme weather conditions will be regarded as unavoidable delays.

9.4 NOTICE OF DELAYS.

Whenever the contractor foresees any delay in the prosecution of the work, and in any event within fifteen (15) days of the occurrence of any delay which the Contractor regards as unavoidable, he shall notify the Engineer in writing of the probability of the occurrence of such delay and its occurrence or continuance of the delay or, if this cannot be considered unavoidable or avoidable, how long it continues, and to what extent the prosecution and completion of the work are to be delayed thereby.

After the completion of any part or the whole of the work, the Engineer, in estimating the amount due the Contractor will assume that any and all delays which have occurred in its prosecution and completion have been avoidable delays, except such delays as shall have been called to the attention of the Engineer at the time of their occurrence and found by him to have been unavoidable. The Contractor will make no claims that any delay not called to the attention of the Engineer at the time of its occurrence has been an unavoidable delay. The Engineer shall ascertain the facts and the extent of the delay and his findings thereon shall be final and conclusive.

9.5 EXTENSION OF TIME.

Should any delays occur which the Engineer may consider unavoidable, as herein defined, the Contractor shall, pursuant to his application, be allowed an extension of time, beyond the time herein set forth, proportional to said delay shall not be enforced against the Contractor by the Owner during an extension of time granted because of unavoidable delay or delays.

9.6 UNFAVORABLE WEATHER AND OTHER CONDITIONS.

During unfavorable weather and other conditions, the Contractor shall pursue only such portions of the work as shall not be damaged thereby. No portions of the work whose satisfactory quality of efficiency will be affected by any unfavorable conditions shall be constructed while these conditions exist unless, by special means or precautions approved by the Engineer, the Contractor shall be able to overcome them.

9.7 SATURDAY, SUNDAY, HOLIDAY AND NIGHT WORK.

No work shall be done between the hours of 7:00 p.m. and 6:00 a.m. nor on Saturdays, Sundays or legal holidays except such work as is necessary for the proper care and protection of the work already performed, or except in case of emergency, and in any case only with the written notice of the Engineer.

9.8 HOURS OF LABOR.

Eight (8) hours of labor shall constitute a legal day's work, and the Contractor or any subcontractor shall not require or permit more than eight (8) hours of labor in a day, or forty (40) hours per week from any person employed by him in the performance of the work under this Contract. The Contractor shall forfeit to the Owner, as a penalty, the sum of twenty-five dollars ($25.00) for each workman employed in the execution of the Contract by him or by any subcontractor, for each calendar day during which such laborer, workman, or mechanic is required or permitted to labor more than eight (8) hours in violation of the provisions of Section 1810 to 1816, inclusive (Article 3, Chapter 1, Part 7, Division 2) of the Labor Code of California and any acts amendatory thereof.

9.9 PENALTY CLAUSE.

Pursuant to the provisions of Government Code Section 53067.85 in case all the work called for under the Contract in all parts and requirements is not finished or completed within the number of calendar days as set forth in the proposals, the Contractor shall forfeit and pay to the Owner a specified sum of money, to be deducted from any payments due or to become due to the Contractor. A prearranged conference prior to award of the Contract will be held to fix the amount of this penalty.

It is further agreed that in case the work called for under the Contract is not finished and completed in all parts and requirements within the number of calendar days specified, the Board of Supervisors shall have the right to increase the number of calendar days or not, as they may deem best to serve the interest of the Owner, and if they decide to increase the said number of calendar days, they shall further have the right to charge to the Contractor, his heirs, assigns or sureties or to deduct from the final payment for the work all or any part, as they may deem proper of the actual cost of engineering, inspection, superintendence, and other overhead expenses which are directly chargeable to the Contract and which accrue during the period of such extension, except that cost of final surveys and preparation of final estimate shall not be included in such charges. If the Board elects to grant the extension of the time under this paragraph, the penalty clause as above set forth will not apply to the time as granted in the time extension.

10.0 PAYMENT

10.1 CERTIFICATION BY ENGINEER.

All payments under this Contract shall be made upon the presentation of certificates in writing from the Engineer and shall show that the work covered by the payments has been done and the payments therefore are due in accordance with this Contract.

10.2 PROGRESS ESTIMATES AND PAYMENTS.

The engineer shall, within the first ten (10) days of each month, make an estimate of the value of the work performed in accordance with this contract during the previous calendar month.

The first estimate shall be of the value of the work done and of materials, proposed and suitable for permanent incorporation in the work, delivered and suitably and safely stored at the site of the work since performance of this Contract, and every subsequent estimate, except the final estimate, shall be of the value of the work done and materials delivered and suitably stored at the site of the work since the last preceding estimate was made: provided, however that should the Contractor fail to adhere to the program of completion fixed in this contract, the Engineer shall deduct from the next and all subsequent estimates the full calculated accruing amount of liquidated damages to the date of said estimate, until such time as the compliance with the program has been restored: and provided that materials so delivered and estimated shall not be removed from the site of the work prior to its completion without the written consent of the Engineer.

The estimates shall be signed by the Engineer and after approval, the Owner shall pay or cause to be paid to the Contractor in the manner provided by law, an amount equal to ninety percent (90%) of the estimated value of the work performed and of the value of the materials furnished and delivered and unused, such materials to be those which are proposed and suitable for permanent incorporation in the work.

Progress payments will be processed and payment made within thirty (30) days of receipt by the Owner of a satisfactory progress payment request.

The Owner may at any time refuse progress payments until satisfactory labor, material and lien releases have been signed by laborers, subcontractors and material men and delivered to the Engineer.

10.3 ACCEPTANCE.

The Owner by written notice will accept the work when the whole shall have been completed satisfactorily, as determined by the Engineer. The Contractor shall notify the Engineer by written notice, of the completion of the work, whereupon the Engineer shall promptly, by personal inspection, satisfy himself as to the actual completion of the work in accordance with the terms of the Contract, and shall thereupon recommend acceptance to the Owner.

Neither the acceptance by the Owner or its Engineer or any of its employees, nor any order, measurements, or certificates by the Engineer, nor any payment of money by the Owner or any of its offices, nor any payment for or acceptance of the whole or any part of the work by the Engineer or the Owner, nor any extension of time, nor any possession taken by the Owner or its employees shall operate as a waiver of any power herein provided; nor shall any waiver of any breach of this Contract be held to be a waiver of any other subsequent breach.

10.4 FINAL PAYMENT TERMINATES OWNER'S LIABILITY

No claim shall be made or be filed and neither the Owner nor any employee of the Owner nor any of its agents shall be liable or held to pay any money, except as specifically provided in the Contract. The acceptance by the Contractor of the final payment aforesaid shall operate as, and shall be a release to the Owner, the Board of Supervisors, and each member of the Board and their agents, from all claim by and liability to the Contractor for any act or neglect of the Owner or of any person relating to or affecting the work, except the claim against the Owner for the remainder, if any there be, of the amounts kept or retained as provided in the section herein involving unpaid claims.

10.5 FINAL ESTIMATE AND PAYMENT.

The Engineer shall, as soon as practicable after the final acceptance of the work done under this Contract, make a final estimate of the amount of work done there under and the value thereof.

Such final estimate shall be signed by the Engineer, and after approval, the Owner shall pay or cause to be paid the Contractor in the manner provided by law, the entire sum so found to be due hereunder, after deducting there from all previous payments and such other lawful amounts as the terms of this Contract prescribe.

In no case will final payment be made in less than thirty-five (35) days after the completion of the work and its acceptance by the Owner.

The final payment may be deferred until satisfactory labor, materials and lien releases have been delivered by Contractor to the Engineer.

10.6 DELAYED PAYMENTS.

Should any payment due the Contractor or any estimate be delayed through default of the Owner beyond the time stipulated, such delay shall not constitute a breach of Contract or be the basis for a claim for damages.

10.7 CHANGES IN WORK.

The owner reserves the right to make such alteration, deviations, additions to, or omissions from the Plans and Specifications, including the right to increase or decrease the quantity of any item or portion of the work or to omit any item or portion of the work, as may be deemed by the Engineer to be necessary or advisable and to require such extra work as may be determined by the Engineer to be required for the proper completion or construction of the whole work contemplated.

Any such changes will be set forth in a Contract Change Order which will specify, in addition to the work to be done in connection with the change made, adjustment of Contract time, if any and the basis of compensation for such work. A Contract Change Order will not become effective until approved by the Owner and Engineer.

Should the Contractor disagree with any terms or conditions set forth in an approved Contract Change Order which he has not executed, he shall submit a written notice to the Engineer within fifteen (15) days after the receipt of such approved Contract Change Order. The notice shall state the points of disagreement, and, if possible, the Contract specification references, quantities, and costs involved. If a written notice is not submitted, payment will be made as set forth in the approved Contract Change Order and such payment shall constitute full compensation for all work included therein or required thereby.

10.8 EXTRA WORK.

New and unforeseen work will be classed as extra work when it is determined by the Engineer that such work is not covered by any of the various items, except that changes of lump-sum items shall be considered extra work. In the event portions of such work are determined by the Engineer to be covered by some of the various items for which there is a bid price or combinations of such items, the remaining portion of such work will be classed as extra work. The Contractor shall do such extra work and furnish labor, material and equipment there for upon receipt of an approved Contract Change Order or other written order of the Engineer. He shall not be entitled to payment for such extra work.

10.9 INCREASE, DECREASE, AND ELIMINATION OF CONTRACT ITEMS.

When changes increase or decrease estimated pay quantities of any item of work by twenty-five percent (25%) or less, payment will be made for the quantity of work of said item performed at the Contract unit price there for and no additional adjustment compensation will be allowed. Should the total pay quantity of any item of work required under the Contract exceed the Engineer's Estimate there for by more than twenty-five (25%), work in excess of one hundred and twenty-five percent (125%) of such Estimate shall be paid for on the basis of force-account of by adjusting the Contract unit price at the option of the Engineer.

Should the total pay quantity of any item of work required under the Contract be less than seventy-five percent (75%) of the Engineer's Estimate there for, the quantity of said item performed will be paid for by adjusting the Contract unit price or on the basis of force-account at the option of the Engineer.

Should any Contract item of work be eliminated in its entirety, no compensation will be made in any case for loss of anticipated profits.

10.10 PAYMENT FOR EXTRA WORK.

Payment for extra work will be made by (1) force-account, or (2) agreed to by the Contractor and the Engineer (Lump Sum). When extra work in to be paid for on a force-account basis, compensation will be determined as follows:

(a) **LABOR** - The actual wages paid to the workmen, including foremen, used in the actual and direct performance of the work.

(b) **LABOR SURCHARGE** - To the actual wages will be added the cost of Workman's Compensation, insurance premiums, State Unemployment, Federal Social Security payments, health and warfare, pension, vacation and other payments made to or on behalf of the workmen.

(c) **SUBSISTENCE AND TRAVEL ALLOWANCE**- Subsistence and travel allowance paid to such workmen as required by collective bargaining agreements.

(d) **MATERIALS** - Only materials furnished by the Contractor and necessarily used in the performance of the work will be paid for. The cost of such materials will be the cost to the purchaser from the supplier thereof. If the materials are obtained from a supply or source owned wholly or in part by the purchaser, payment therefore will not exceed the current wholesale price for such materials delivered to the job site.

(e) **EQUIPMENT** - The Contractor will be paid for the use of the equipment at established rental rates in the area. The rental rates shall include the cost of fuel; oil; lubrication; supplies; small tools; necessary attachments; repairs and maintenance of any kind; depreciation; storage; insurance; and all incidentals. Rental time will not be allowed while equipment is inoperative due to breakdown.

(f) **OTHER EXPENSES AND PROFITS** - Fifteen percent (15%) of the sums of items (a), (b), (c), (d), and (e), shall be considered as covering all other expenses and profits.

10.11 EXTRA WORK RECORDS.

The Contractor shall maintain his records in such a manner as to provide a clear distinction between the direct costs of extra work paid for on a force-account basis and the costs of other operations.

The Contractor shall furnish the Engineer daily report sheets of each day's work paid for on a force-account basis no later than seven (7) days following the performance of said work. The daily report sheets shall itemize the materials use and shall cover the direct cost of labor and the charges for equipment rental. The daily report sheets shall provide names or identification and classifications of workmen, the hourly rate of pay and hours worked and also the size and type of equipment and hours operated.

Material charges shall be substantiated by valid copies of vendor's invoices.

When these daily extra work reports are agreed upon and signed by both parties, they shall become the basis of payment for the work performed, but shall not preclude subsequent adjustment based on a later audit by the Owner.

The Contractor's cost records pertaining to work paid for on a force-account basis shall be open to inspection or audit by representatives of the Owner during the life of the Contract and for a period of not less than three (3) years after the date of acceptance.

10.12 NOTICE OF POTENTIAL CLAIM.

The Contractor shall not be entitled to the payment of any additional compensation for any cause, including any act, or failure to act, by the Engineer, or the happening of any event, thing or occurrence, unless he shall have given the Engineer due written notice of potential claim as hereinafter specified.

The written notice of potential claim shall set forth the reasons for which the Contractor believes additional compensation will or may be due, the nature of the costs involved, and insofar as possible, the amount of potential claim. The said notice as above required must have been given to the Engineer prior to the time that the Contractor shall have performed the work giving rise to the potential claim for additional compensation, if based on an act of failure to act by the Engineer, or in all other cases within fifteen (15) days after the happening of the event, thing or occurrence giving rise to the potential claim.

When the Contractor considers that any changes ordered involve extra work, he shall immediately notify the Engineer in writing and subsequently keep him informed as to when and where extra work is to be performed and shall make claim for compensation therefore each month not later than the first day of the month following that in which the work claimed to be extra work was performed, and he shall submit records as outlined in Section 10.11 of there General Conditions.

All such claims, in the absence of an approved Contract Change Order, shall state the date of the Engineer's written order and the date of approval by the Owner authorizing the work on which the claim is made.

11.0 CONFLICT.

11.1 CONTROLLING CONTRACTUAL DOCUMENTS.

If there be a conflict between Contractual Drawings and the Specifications, the provisions of the Specifications shall control.

An addendum can modify any of the Contractual Documents and shall control.

11.2 CONTROLLING PARTS OF THE SPECIFICATIONS.

In case of conflict between the Special Conditions and the General Conditions or between the Special Conditions and the Technical Specifications, the Special Conditions shall control in each case. If there is a conflict between the General Conditions and the Technical Specifications, the Technical Specifications shall control.

COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT

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COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT

PREFACE TO THE TECHNICAL SPECIFICATIONS SEWERS

1. SUPPLEMENTAL DEFINITIONS TO THE TECHNICAL SPECIFICATIONS.

Whenever in these Technical Specifications the following terms, or pronouns in place of them, are used, the intent and meaning shall be interpreted as defined in the Ordinance and Rules and Regulations of the District which regulate the use and construction of sewerage facilities. These supplemental definitions shall apply only to interpretation of these Technical Specifications.

CONTRACT - The written agreement covering the performance of the work and the furnishing of labor, materials, tools and equipment in the construction of the work. The Contract shall include the Notice to Contractors, Proposal, plans, specifications and contract bonds; also, any and all written supplemental agreements amending or extending the work in a substantial and acceptable manner, Supplemental agreements covering alterations, amendments or extensions to the Contract and include Contract change orders.

PLANS - The official project plans, profiles, typical cross sections, working drawings and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed, and which are to be considered as part of the Contract.

CONTRACTOR - The individual, partnership, corporation, joint venture or other legal entity entering into a contract with the District to perform the work. In case of the work being done under permit issued by the District, the Permittee shall be construed to be the Contractor.

SPECIFICATIONS, TECHNICAL SPECIFICATIONS - The directions, provisions and requirements contained in the Technical Specifications for the District.

WORK - All the work specified, indicated, shown or contemplated in the Contract to construct the improvement, including all alterations, amendments or extensions thereto, made by supplemental agreements or written orders of the District.

2. WORK SCHEDULE.

One (1) week prior to starting construction, the Contractor shall submit to the District, Engineer and Inspector a written work schedule which shall describe the sequence, time and method of operation that he plans to use on the job. The Contractor shall also provide a mobilization schedule, pipe installation schedule, pipe installation crews, and repair and cleaning crews. The Engineer reserves the right to require the Contractor to schedule the work forces necessary to repair damage due to the construction and restore the area of work to its original condition upon completion of any portion of the pipeline installation. The Engineer reserves the right to alter the schedule to permit the possible activation of certain sewers prior to the completion of the work.

The Contractor shall update this schedule once a month, showing work completed and work in progress. The Contractor shall provide the District, Engineer and Inspector copies of this updated schedule.

3. NOTIFICATION.

The Contractor shall notify the District, Engineer and Inspector one (1) week in advance of when he plans to start construction. The Contractor shall immediately notify all involved agencies when intermittent construction, end of construction, or stoppage in construction occurs.
Minimum of 48 hours notice

4. SAFETY REQUIREMENTS.

All construction and design shall comply in full with all pertinent provisions of current safety laws and codes of OSHA and other Federal, State and Municipal regulatory agencies.

5. REFERENCED STANDARDS AND SPECIFICATIONS.

All references to other standards and specifications in these Technical Specifications shall imply the latest revision thereto.

6. CONNECTIONS TO EXISTING SYSTEMS.

Sewer construction shall start a minimum of five (5) feet from any existing sewer or manhole. The closing section shall not be installed until all mains and manholes have been cleaned, tested and tentatively accepted, in writing by the District.

COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT
TECHNICAL SPECIFICATIONS

SECTION 1
EARTHWORK

1.1 GENERAL.

Earthwork includes all plant labor, equipment, appliances and materials as required or necessary to clear, grub, excavate, trench, fill, backfill and grade for the construction of all structures, pipe lines, ditches, embankments and graded areas shown and specified.

1.2 OBSTRUCTIONS.

All shrubs and brush, stumps and roots, fences, rock, stones, debris, and all obstructions of whatsoever kind or character whether natural or artificial, encountered in the construction of the work shall be removed unless otherwise specified on the construction plans.

In the installation of pipe lines outside of public rights of way or in easements, trees shall not be removed unless otherwise authorized in writing by the Engineer, and all fences, structures and landscaping which are removed or damaged by the Contractor shall be restored to their original condition and/or repaired to the satisfaction of the Engineer as soon as that portion of the work is installed, at the Contractor's expense without any compensation there-for. Any damage done to private property by reason of work on easements shall be the responsibility of the Contractor.

The Contractor shall restore all areas and objects that were damaged or disrupted due to construction activities, to the condition which existed prior to construction. Said restoration shall be completed by the Contractor as a continuing follow-up of any portion of pipe-line construction.

Material that is removed as specified herein is not to be incorporated in the improvement being constructed, shall be disposed of away from the construction site at the Contractor's expense.

The Contractor's attention is directed to the possible existence of pipe and other underground improvements which may or may not be shown on the plans. All reasonable precautions shall be taken to preserve and protect any such improvements whether shown on the plans or not. All improvements necessary to prosecute the work, shall be removed, maintained and permanently replaced at no expense to the District.

1.3 EARTHWORK IN CITY, COUNTY, STATE AND RAILROAD RIGHTS OF WAY.

Earthwork within the rights of way of the State of California, Department of Transportation, County Road Department, and City or other governmental agency having jurisdiction, shall be done in accordance with the requirements and provisions of the permits issued by those agencies for the construction within their respective rights of way. Such requirements and provisions, where applicable shall take precedence and supersede the provisions of these specifications. The requirements of these technical specifications shall be the minimum requirement.

1.4 SAFETY PRECAUTIONS.

All excavations shall be performed, protected and supported as required for safety and in the manner set forth in the operating rules, orders and regulations prescribed by the Division of Industrial Safety of the Department of Industrial Relations of the State of California. Barriers shall be placed at each end of all excavations and at such places as may be necessary along excavations, from sunset each day to sunrise of the next day until such excavation is entirely refilled. The contractor shall submit to the Engineer for approval a safety barrier and traffic control plan prior to construction.

1.5 EXCAVATED MATERIAL.

Arrangements for disposing of excess excavated material shall be made by the Contractor. Excavated material suitable for backfill shall be stored temporarily in such a manner as will facilitate work under the Contract.

1.6 SHORING, SHEETING AND BRACING.

Sheet piling, shoring, sheeting, bracing, or other supports, where necessary, shall be furnished, placed, maintained and removed by the Contractor. Sheet piling and other supports shall be withdrawn in such a manner as to prevent additional backfill on pipe lines which might cause overloading. At all times, rules of the Division of Industrial Safety of the Department on Industrial Safety of the Department of Industrial Relations of the State of California, with respect to excavations and construction, shall be strictly observed.

In advance of any excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall submit for acceptance of the Owner, or by a registered civil or structural engineer employed by the Owner, to whom the authority to accept has been delegated, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer. Nothing herein contained shall be deemed to allow the use of shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the State Division of Industrial Safety. Shoring shall be in compliance with Section 6707 of Chapter 9, Part 1, Division 5 of the Labor Code of the State of California.

Nothing contained in this specification shall be construed to impose tort liability on the Owner, Engineer, or any of their employees.

Section 6500 of the Labor Code requires a permit for trenches five (5) feet or more in depth. **The Owner will not issue a permit for trenching operations under this Contract.** The Contractor, prior to beginning construction, shall obtain from the State Division of Industrial Safety, a permit authorizing said construction.

1.7 CLEARING AND GRUBBING.

Areas where construction is to be performed shall be cleared of all trees, shrubs, brush, rubbish, and other objectionable material of any kind which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or form obstructions therein. Trees and other natural growths outside the actual lines of construction operations shall not be destroyed, and such measures as are necessary shall be taken by the contractor for the protection thereof.

Organic material from clearing and grubbing operations will not be permitted for use as excavation backfill.

It shall be the Contractor's responsibility, at his own expense, to remove and dispose of all excess material resulting from clearing and grubbing operations. The Contractor shall make his own arrangements for disposal sites, where said material may be wasted.

1.8 CONTROL OF WATER.

The Contractor shall provide and maintain at all times during construction, ample means and devices with which to promptly remove and dispose of all water entering the excavations or other parts of the work. No concrete footings or floors shall be laid in water nor shall water be allowed to rise over them until the concrete or mortar has set at least eight (8) hours. Water shall not be allowed to rise unequally against walls for a period of twenty-eight (28) days. Groundwater shall not be allowed to rise around pipe installations until jointing compound in the joints has set.

The Contractor shall dispose of water from the work in a suitable manner, without damage to adjacent property. No water shall be drained into work built or under construction. Water shall be disposed of in such a manner as not to be a menace to public health. Contaminated waters, which require special handling, treatment or disposal methods, or that necessitate disposal away from the construction site will be at the Contractor's expense.

Dewatering for structures and pipe lines shall commence when groundwater is first encountered, and shall be continuous until such times as water may be allowed to rise in accordance with the provisions of this section.

1.9 PIPELINE EXCAVATION.

1.9.01 Excavation. - Excavation for pipelines, fittings, valves, and appurtenances shall be open trench to the depth and in the direction necessary for the proper installation of the same as shown on the plans or as otherwise directed by the Engineer, except where another method is specifically called for in the plans or in these specifications.

1.9.02 Limit of Excavation. - Except with specific approval of the Engineer, no more than four hundred (400) feet of open trench shall be excavated in advance of laying of pipe. All operations shall be carried out in an orderly fashion. Backfilling and clean-up work shall be accomplished as sections of the pipe installation are approved. Public travel through the work shall be impeded or obstructed as little as possible. The remainder of the trench excavated that day shall be backfilled, compacted, and the roadway opened to the public.

At the end of each week, all trenches, including manhole excavations shall be backfilled, compacted, and the roadway opened to the public on Saturday, Sunday, and holidays.

The Contractor shall make the necessary arrangements for, and shall remove and dispose of all excess waste material from the site of the work as portions of the pipe line and appurtenances are installed.

1.9.03 Tunneling - Tunneling will be permitted only where native earth is of such firmness that it will remain in its original position without sloughing off, throughout the work of excavation and backfilling. If sloughing occurs, the roof of the tunnel shall be broken down and the trench excavated as an open trench as herein specified.

1.9.04 Trench Width. - Banks of open cut trenches shall be kept as nearly vertical as possible. Where necessary in order to maintain the banks nearly vertical, the trench shall be properly sheeted and braced. The over-all trench width shall not be more than sixteen (16) inches or less than twelve (12) inches wider than the largest outside diameter of the pipe to be laid therein, measured at a point twelve (12) inches above the top of the pipe exclusive of the branches. Excavation and trenching shall be true to line so that a clear space of not more than eight (8) inches or less than six (6) inches in width is provided on each side of the largest outside diameter of the pipe in place. For the purpose of this section, the largest outside diameter shall be the outside diameter of the coupling.

1.9.05 Correction of Faulty Grades. - Should the excavation for the pipe line be carried below grade without instruction from the Engineer, it shall be refilled to proper grade with pipe-zone material compacted to ninety percent (90%) or crushed rock, at the expense of the Contractor. If compaction tests are required, they shall be at the expense of the Contractor.

1.10 PIPE FOUNDATION AND/OR SUBGRADE.

1.10.01 Foundations in Good Soil. - The trench shall have a flat or semi-circular bottom conforming to the grade to which the pipe is to be laid.

1.10.02 Foundations in Poor Soil. - All soft, spongy, or unstable material in the bottom of the trench shall be removed and replaced with approved material to a depth as determined in the field by the Engineer. The approved material shall be compacted to ninety percent (90%) to provide an unyielding foundation for the pipe. The removal and replacement of material from depths greater than two (2) feet below the grade shown on the plans, will be considered as Extra Work.

1.10.03 Foundation in Rock - Where rock is encountered, it shall be removed below grade and the trench backfilled with suitable material to provide a compacted earth cushion with a thickness under the pipe of not less than one-half (1/2) inch per inch of nominal diameter of the pipe to be installed, with a minimum allowable thickness of six (6) inches.

1.11 TRENCH BACKFILL.

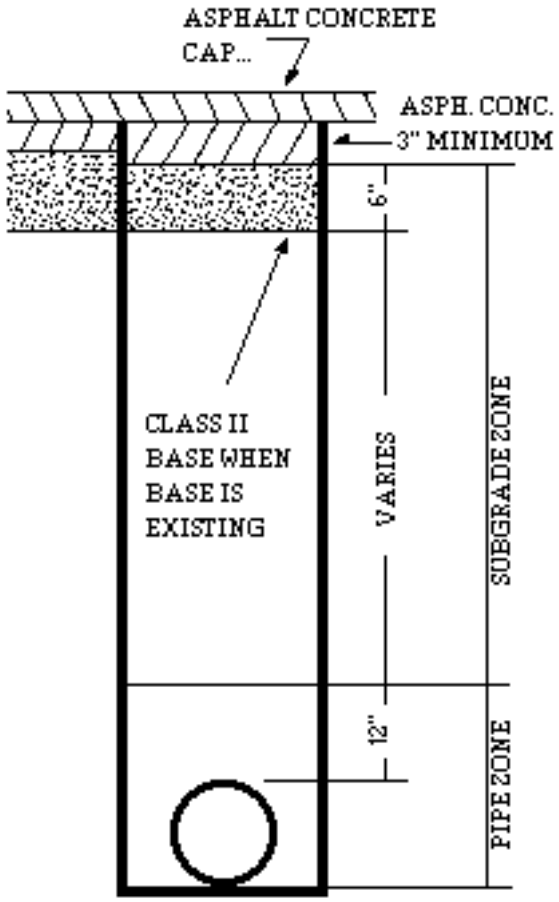
1.11.01 General. - All trenches shall be backfilled after pipe, fittings, valves and appurtenances have been installed. Whenever a relative compaction requirement value is specified hereunder, the optimum moisture content and density shall be determined in accordance with the State of California, Department of Transportation, Test Method No. California 216 or ASTM D1557.

All wood and waste material shall be removed from excavation preparatory to Backfilling. Backfill material shall be approved in all cases by the Engineer and shall be free of trash, wood, large rock, or other objectionable debris. Backfilling shall include the refilling and compacting of the fill in trenches or excavations up to the sub-grade of the street or to the street or to the existing ground surface.

1.11.02 Procedure in Pipe Zone. - Selected backfill material consisting of granular material free form stone, clods, clay, or other deleterious material shall be placed in the trench simultaneously on each side of the pipe for the full width of the trench, in layers of about six (6) inches in depth. Granular backfill with a minimum sand equivalent of 30, when tested in accordance with the California Department of Transportation, test Method No. California 217, will be required in the pipe zone, and the water densification method shall be used to densify the material in the pipe zone. When the excavated material in not granular as mentioned above, the Contractor shall import, at their own expense, and place a suitable granular backfill material. Particular attention is to be given to the underside of the pipe and fittings to provide a firm bedding support along the full length of the pipe. Care shall be exercised in backfilling to avoid damage to the pipe. The pipe zone shall be considered to extend to twelve (12) inches above the top of the pipe.

1.11.03 Procedure Above Pipe Zone. - From the top of the pipe-zone backfill to ground surface, the material for backfill may contain stones ranging in size up to six (6) inches in diameter, in quantity not exceeding forty percent (40%) of the volume when said coarse materials are well distributed throughout the finer materials and the specified compaction may be attained.

1.11.04 Compaction Above Pipe Zone. - Where it is important that the backfill be made safe for vehicular traffic of for the support of structures, the backfill shall be compacted to the densities indicated below in conformance with approved compaction methods.



Sub grade Zone. - This zone is between the sub grade of the aggregate base or the surfacing, and the pipe zone. Backfill in this zone shall be compacted to ninety percent (90%) relative compaction except the upper six (6) inches which shall be compacted to ninety-five percent (95%) relative compaction.

1.11.05 Compaction in Easements. - In easements and open terrain where the degree of compaction is less important, the backfill, if sufficiently granular in nature (sand equivalent of 20 or greater), shall be consolidated by a water densification method. If the backfill is not sufficiently granular in nature, the backfill shall be consolidated by a method approved by the Engineer. Backfill in easements and open terrain shall be compacted to eighty-five percent (90%) relative compaction.

1.11.06 Mechanically Compacted Backfill. - Mechanically compacted backfill shall be placed in horizontal layers of depths compatible to the material being placed and the type of equipment being used. All such equipment shall be of a size and type approved by the Engineer. Each layer shall be evenly spread, moistened (or dried, if necessary), and then tamped or rolled until the specified relative compaction has been attained. Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage to adjacent ground, existing improvements, or improvements installed under the contract. The Contractor shall make his own determination in this regard. Any damage which results shall be the responsibility of the Contractor and shall be repaired or replaced at the Contractor's expense.

1.11.07 Water Densified Backfill. - As used in these specifications, flooding shall mean the inundation of backfill with water, puddled with poles or bars to insure saturation of the backfill material for its full depth. Jetting shall be accomplished by the use of a jet pipe to which a hose is attached, carrying a continuous supply of water under pressure.

1.11.08 Requirements for Densification by Jetting. - Densification by jetting shall be subject to all of the following requirements:

(a) Application of Water. - The Contractor shall apply water in a quantity and at a rate sufficient to thoroughly saturate the entire thickness of the lift being densified. Water for jetting shall be from a continuous supply of water under pressure.

(b) Use of Vibration. - Where densities are required which cannot be attained by jetting alone, the Engineer may direct the Contractor to supplement the jetting process with the application of vibrating compacting equipment to the backfill.

(c) Lift Thickness. - The lift of the backfill shall not exceed that which can be readily densified by the jetting procedure, but in no case shall the undensified lift exceed ten (10) feet for jetting.

(d) Character of Material. - The material being used with the water-settling methods to backfill the trenches in street rights of way shall have a sand equivalent of at least 20 when tested in accordance with the State of California, Department of Transportation Test Method No. California 217. Where the nature of the material excavated from the trench is generally unsuitable for densification with water, the Contractor may, at no cost to the District, import suitable material for jetting, or densify the excavated material by other methods. If water densification methods are employed, the Contractor shall, at his expense, provide a sump and pump to remove the accumulated water from the downstream end of the construction.

(e) Damage to Adjacent Improvements. - The Contractor shall make his own determination that the use of flooding or jetting methods will not result in damage to existing improvements. Permission to use such methods in densifying backfill shall not be construed as guaranteeing or implying that adjacent ground and improvements will be unaffected.

1.11.09 Compaction Test. - Compaction shall be tested in accordance with the methods specified by the State of California Department of Transportation Method No. California 216, or ASTM D1557.

Compaction test of the backfill will be required approximately every three hundred (300) feet, or more often if tests indicate the need, along the alignment on the main pipe line and, in addition, of approximately twenty percent (20%) of all laterals within the street rights of way. The tests shall be made at varying depths.

The Contractor, at his expense, shall excavate the holes for all of the tests, backfill the holes and compact this backfill, and pave the surface, if required, after the test.

1.11.10 Excess Excavated Material. - The Contractor shall make the necessary arrangements for and shall remove and dispose of all excess of waste material. All costs for the disposal of excess of waste material shall be borne by the Contractor.

It is the intent of these specifications that all surplus material not required for backfill shall be disposed of by the Contractor outside the limits of the public rights of way and in accordance with the requirements of the County Code, Title 6, Division 8, or ordinance of any other agencies having jurisdiction, at no cost to the District.

Excavated material shall not be deposited on private property unless written permission from the owner thereof is secured by the contractor. Copies of said written permission, duly signed by the owner of the private property involved, shall be furnished to the Engineer by the Contractor before such material is placed on private property.

1.11.11 Imported Backfill Material. - Whenever the excavated material is unsuitable for backfill, the Contractor shall arrange for and furnish imported backfill material per Sections 1.11.02 and 1.11.08 (d) of this specification, at his own expense. He shall dispose of the excess trench excavation as specified in the preceding paragraph. The backfilling with imported material shall be done in accordance with the methods described.

1.11.12 Completion of Cleanup. - The Contractor shall restore all areas and objects that were damaged or disrupted due to construction activities to a condition equal to that prior to construction. All fences, walls, shrubs, sprinkler systems, substructures or any other improvement removed or disturbed by the Contractor during construction, shall be replaced and/or repaired to the satisfaction of the Engineer immediately as that portion of the pipe line is installed, at the Contractor's expense. Said restoration shall be completed by the Contractor as an immediate follow-up to any portion of the pipe line installation.

1.12 STRUCTURAL EARTHWORK.

1.12.01 Structural Excavation. - The site shall be cleared of all natural obstructions, pavements, utilities and other items which will interfere with construction. Any method of excavation may be employed which, in the opinion of the Contractor, is considered best. Ground shall not be dug by machinery nearer than three (3) inches from any finished subgrade without the express approval of the Engineer. The last three (3) inches shall be removed without disturbing the subgrade. Should the excavation be carried below the lines and grades indicated on the plans, the Contractor shall, at his own expense, refill such excavated space to the proper elevation in accordance with the procedures specified for backfill, or, if under footings, the space shall be filled with concrete.

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

1.12.02 Structural Backfilling. - After completion of foundation footings and walls, and of other construction below the elevation of the final grade, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all debris. Unless otherwise shown, material or imported sand, gravel, or other material approved by the Engineer, and shall be free of lumps, hard material exceeding six (6) inches in greatest dimension, trash, lumber, or other debris. Backfill shall be placed in horizontal layers not exceeding nine (9) inches in thickness, and shall have a moisture content such that the required degree of compaction may be obtained. Each layer shall be compacted by hand or machine tampers or by other suitable equipment or means, to a relative compaction of at least ninety percent (90%). Dewatering shall be maintained during the placement of compacted, clayey backfill.

1.12.03 Stripping. - All vegetation, such as roots, brush, heavy sods, heavy growths of grass and all decayed vegetable matter, rubbish, and other unsuitable material within the area of work, shall be stripped or otherwise removed before fill is started.

1.12.04 Grading. - After stripping has been done, excavation of every description and of whatever substance encountered within the grading limits of the work, shall be performed to the lines and grades indicated on the drawings. All suitable excavated material shall be transported to and placed in the fill area within the limits of the work. All excavated materials which are considered unsuitable by the Engineer and any surplus of excavated material which is not required for fill, shall be known as waste and shall be disposed of as directed in Section 1.11.10 of this specification. Construction, excavation and filling shall be performed in a manner and sequence that will provide drainage at all times.

Ditches shall be cut accurately to the cross sections and grades indicated. Any excessive ditch excavation shall be backfilled to grade either with suitable, thoroughly compacted material, or with suitable stone or cobble to form an adequate paving.

Surfaces under paved areas, dikes and elsewhere as directed by the Engineer, shall be wetted and compacted prior to placing fill.

1.12.05 Fill. - Fills or embankment shall be constructed at the locations and to the lines and grades indicate on the plans. Suitable material from excavations may be used for fill. Material shall be placed in horizontal layers from eight (8) to twelve (12) inches in loose depth for the full width of the cross section and compacted as specified.

For general fill areas, the fill shall be compacted to ninety percent (90%) relative compaction.
For roadways and all areas to be paved, the fill shall be compacted, by means of a tamping roller or three-wheel power roller, to at least ninety percent (90%) relative compaction.

Dikes and embankments shall be compacted by the use of compaction rollers or three-wheel power rollers to ninety percent (90%) compaction.

Relative compaction shall be as determined in accordance with the State of California Department of Transportation, Test Method No. California 215, or ASTM D1557.

1.12.06 Finish grading. - All areas covered by the work, including excavated and filled sections and transition areas, shall be graded uniformly to the elevations shown on the plans. The finished surface shall be reasonably smooth, compacted, and free from any irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations. The finished surface shall not be more than two- tenths (0.2) foot above or below the established grade. Ditches shall be paved to drain readily. The surface of areas to be paved, on which a surface course is to be placed, shall not vary more than five-hundredths (0.05) foot from established grade and approved cross section.

1.12.07 County and City Grading Ordinances. - In addition to the requirements herein set forth for structural earthwork, all work shall be in accordance with the requirements of the County Code, Title 6, Division 8, or ordinance of any other agencies having jurisdiction.

1.13 DRILLING AND BLASTING.

1.13.01 Use of Explosives. - All operations, storage and handling of explosives shall be according to provisions of Division II, Part I, of the Health and Safety Code, State of California, and shall comply with all State, County and local laws.

1.13.02 Skilled workmen. - Drilling and blasting are to be done only by personnel skilled in rock techniques.

1.13.03 Safety. - All necessary precautions shall be taken for protection of life and property. Warnings shall be given to nearby property owners that blasting is in progress. Safety mats shall be used to restrict flying particles. The Contractor shall size each “shot” to minimize nuisance and reduce the possibility of damage to local structures.

1.14 FINAL CLEANUP.

After all earthwork operations have been completed, the right of way and all other areas shall be dressed smooth and left in a neat and presentable condition to the satisfaction of the Engineer and Owner.

COUNTY OF SAN BERNARDINO
SPECIAL DISTRICTS DEPARTMENT
TECHNICAL SPECIFICATIONS

SECTION 2
CONCRETE CONSTRUCTION

2.1 SCOPE.

The Contractor shall furnish all labor, equipment, materials and appliances necessary to complete construction of Portland cement concrete as shown on the drawings and as specified herein.

2.2 COMPOSITION.

Concrete shall be composed of Portland cement, sand, coarse aggregate, waste, and admixtures as specified or approved, all well mixed and brought to the proper consistency suitable for the specific conditions of placement and in accordance with the requirements of this specification.

2.3 CLASSES OF CONCRETE.

All Portland cement used on the work shall be one of the classes described below. Unless otherwise stated, each class shall be used in the locations as listed:

(a) **Class I.** - Compressive Strength - 3,000 psi min.

Mix - 6-sack minimum test required (Type II cement)

7-sack, Test not required, (trial batch)

Uses: Walls, beams, slabs, footings. Class I. is Equivalent to California State Department of Transportation, Class D (for 7-sack mix).

(b) **Class II.** - Compressive Strength - 3.000 psi min.

Mix - 6 -sack minimum, test required (Type V cement)

Uses: Walls, beams, slabs, footings. Class II is (Where specified.) Equivalent to California State Department of Transportation, Class D.

(c) **Class III.** - Compressive Strength - 2,500 psi min.

Mix - 6-sack, test not required.

Uses: Slabs, footings, walls (where specified). Class III. is Equivalent to California State Department of Transportation, Class A.

(d) **Class IV.** - Compressive Strength - 2.500 psi min.

Mix - 5-sack, test not required.

Uses: Paving, cradles, curbs, gutters, sidewalks, thrust blocks, manhole bases, pipe easements, or where specified. Class IV is Equivalent to California State Department of Transportation, Class B.

2.4 PORTLAND CEMENT.

Unless otherwise specified, Portland Cement shall be Type I, Type II, or Type V, complying with ASTM C 150, and shall have a total alkali content not exceeding six-tenths percent (0.6%) when calculated as sodium oxide as determined by methods given in ASTM C 114. There shall not be a change of brand of cement during course of work without prior written approval of the Engineer.

2.5 SAND.

Sand shall be a washed natural sand having hard, strong, and durable particles, and which does not contain more than two percent (2%) by weight or such deleterious substances as clay lumps, shale, schist, alkali, mica, coated grains, or soft and flaky particles. Sand shall be graded uniformly from fine to coarse, such that the combined grading of coarse aggregate and sand set forth in Paragraph 2.6 will be met. Not more than three percent (3%) shall pass the No. 200 screen as determined by ASTM C 117.

2.6 COARSE AGGREGATE.

Coarse aggregate shall be a clean, hard, fine grained, uncoated, sound crushed rock, or washed gravel or combination of both. It shall be free from oil, organic matter or other deleterious substances and shall not contain more than two percent (2%) by weight of shale or cherty material; and shall show a loss of not more than ten percent (10%) when tested for soundness in sodium sulfate solution in accordance with ASTM C 88. Coarse aggregate shall be graded uniformly from one-quarter (1/4) inch size to maximum size. The Combined grading of coarse and fine aggregate shall fall within the following percentages by weight:

Percentage Passing Sieves

Sieve Size	1-1/2 In. Max.	1 In. Max.	3/4 In. Max.
2 Inch	100	-	-
1- 1/2 Inch	90-100	100	-
1 Inch	50-86	90-100	100
3/4 Inch	45-75	80-90	90-100
3/8 Inch	38-55	65-85	60-80
No. 4	30-45	35-50	40-60
No. 8	23-35	25-40	30-45
No. 16	12-27	19-30	20-35
No. 30	10-17	12-20	13-23
No. 50	4-9	5-10	5-15
No. 100	1-3	1-4	1-5
No. 200	0-2	0-2	0-2

2.7 MIXING WATER.

Mixing water shall be clean and free from deleterious amounts of acids, alkalies, salts or organic materials.

2.8 ADMIXTURES.

Unless otherwise specified or directed by the Engineer, water-reducing admixtures shall be used to reduce the required mixing water, for equivalent slump in plain concrete, at least ten percent (10%). If the admixture used entrains more than two percent (2%) air, the water reduction shall be an additional two percent (2%) for each percent of air entrained over two percent (2%), but in no case shall air entrained exceed five percent (5%).

Air-entraining admixtures shall be included in the mix design. The combined admixtures shall entrain five percent (5%) plus or minus one percent (1%). Acceptable admixtures are those manufactured by Master Builders, Superior Concrete Emulsions and Sika Chemical Corporation. Admixtures containing calcium chloride will not be approved.

2.9 OTHER ADMIXTURES.

No other admixtures shall be used without the Engineer's approval.

2.10 REINFORCING STEEL.

Reinforcing steel shall consist of deformed bars of the size called for in the drawings. Reinforcing steel shall conform to ASTM A 615, and shall be either Grade 40 or Grade 60. Deformations shall conform to ASTM A 615. If specified, mill certificates shall be furnished to the Engineer for each melt if so requested. Wire reinforcement shall conform to ASTM A 82. Placing sheets and bending schedules shall be submitted to the Engineer before placing.

2.11 TEST ON CONCRETE.

Test cylinders of all concrete shall be made in accordance with ASTM C 31 and C 39. A minimum of three (3) cylinders per each one hundred (100) cubic yards of concrete or portion thereof shall be made. One (1) cylinder shall be tested at seven (7) days and one (1) cylinder at twenty-eight (28) days. If test cylinders fail to indicate required strength as specified, cores shall be taken as required by the Engineer and tested in accordance with ASTM C 42, all at Contractor's expense.

If more than one in ten (1 in 10) laboratory control strength test cylinders or any structure fall below the specified compressive strength, the Engineer shall have the right to order a change in proportions or the water content of the concrete for the remaining structures. If the strength of any cured cylinders falls below the specified compressive strength, assuming they have received protection and curing equivalent to concrete in the structure, the Engineer shall have the right to require new mix design with trial batch necessary to secure the required strength and may require tests in accordance with ASTM C 42, or order load tests to be made on the structures so affected.

2.12 MIX DESIGN.

Before beginning concrete work, the proper proportions of materials for each class of concrete shall be determined by the Contractor and/or his supplier. The mix design shall be prepared at the Contractor's expense, by a recognized inspection and testing laboratory approved by the Engineer, and shall show the expected strengths and corresponding slumps, and all ingredient weights and other physical properties necessary to check the design mix. A trial batch shall be made for Class I, II and III concrete to be used on the job, and from each batch, four (4) standard test cylinders shall be cast, cured and tested, as specified for the job concrete. Certified copies of all laboratory reports shall be sent promptly to the Engineer directly from the testing laboratory, stating whether the items reported meet the specifications. A final report shall be submitted at the completion of all concreting, summarizing all findings concerned with concrete used in the project.

If more than one (1) supplier of concrete is used by the Contractor, each shall submit his mix design as described above. When concrete is used for architectural work, only one (1) supplier will be allowed.

2.13 JOINT FILLER.

Preformed fillers shall be of the type indicated on the drawings and shall be as indicated on the drawings.

2.14 WATERSTOPS.

Waterstops shall be installed where so indicated on the drawings. Waterstops shall be of polyvinyl chloride plastic, “Burke Vinylok” type RB 316-4, medium duty or approved equal. Proper care in placing of waterstops in forms shall be exercised so that the center bulb coincides with the construction joint. When concrete is being placed, it shall be properly vibrated to insure density at water stops location. Waterstops shall be made continuous at splices and intersections (horizontal and/or vertical) by “welding” with a polyvinyl chloride splicing iron.

2.15 MIXING.

(a) Job mining of structural concrete will not be permitted unless otherwise specified. When allowed, concrete shall be mixed in a batch mixer of approved type which will insure a uniform distribution of the materials throughout the mass, so than the mixture is uniform in color and homogeneous. All concrete shall be placed within one (1) hour after water is first added to the batch. The mixer shall be equipped with a suitable charging hopper, water storage, and water-measuring device controlled from a case which may be kept locked and so constructed that the water may be discharged only while the mixer is being charged. The entire contents or the mixing drum shall be discharged before recharging. The mixer shall be cleaned at frequent intervals while in use. The volume of mixed materials per batch shall not exceed the rated capacity of the mixer.

(b) Transit-mixed concrete shall be batched, mixed and delivered in accordance with ASTM C 94, except that truck agitators may not be used. All concrete shall be deposited in place not more than forty-five (45) minutes after water is added when the temperature of the concrete exceeds 85 Degrees F. Certified, public weighmaster tickets shall be delivered to the Engineer or his representative in the field prior to placing the concrete to which the ticket applies.

2.16 CONSISTENCY.

The quantity of water required for proper consistency of the concrete shall be determined by the slump test, in accordance with ASTM C 143. Unless otherwise stated, slump allowances shall be as follows:

Vertical Wall Sections, Columns. - Maximum four (4) inches (+ -) one (1) inch.

Floor Slabs, Beams, Footings. - Maximum three (3) inches (+ -) one-half (1/2) inch.

2.17 RETEMPERING.

Retempering of concrete which has partially hardened: that is, mixing with or without additional cement, aggregate, or water, will not be permitted.

2.18 DEPOSITING.

Concrete shall not be placed until the forms and reinforcement have been approved by the Engineer. Concrete shall be conveyed from the mixer to the place of final deposit as rapidly as possible by methods which will prevent the separation of loss of ingredients. It shall be deposited in the forms as nearly as practicable in its final position with lifts not over one and one-half (1 1/2) feet high, so as to maintain a plastic surface approximately horizontal. Concrete shall not be dropped more than eight (8) feet unless a suitable chute or tube is used. Forms for walls, or other sections of considerable height, shall be provided with openings, or other devices shall be used which will avoid accumulations of hardened concrete on the forms or metal reinforcement. Under no circumstances shall concrete that has partially hardened be deposited in the work. Temporary joints shall not remain exposed for more than forty-five (45) minutes before adjacent concrete is placed. Concrete shall be continuously inspected by the inspector, who shall be afforded an opportunity to check the forms for accuracy, cleanliness and position of reinforcing before the placing is started. Concrete shall not be placed in the forms unless the Engineer has been notified twenty-four (24) hours in advance of concrete placement.

2.19 SUBGRADE PREPARATION.

Subgrade for slabs over native earth or fill shall be finished to exact location and section of bottom of slab and shall be maintained in a smooth, compacted condition, until concrete is placed. Subgrade shall be thoroughly moistened but not muddy, at time concrete is placed.

2.20 COMPACTING.

Concrete, during and immediately after depositing shall be thoroughly worked around the reinforcement and embedded fixtures and into corners of the forms. Internal vibrators shall be used for all walls, and self-supporting beams or slabs. Vibrators shall be handled by experienced workmen and care shall be taken to avoid separation of aggregate due to over vibration. At least one (1) vibrator shall be used for each fifteen (15) cubic yards per hour of concrete placed. Standby vibrators shall be kept on hand.

2.21 CONSTRUCTION JOINTS.

Concrete in each unit of construction shall be placed continuously, and the Contractor shall not be permitted to begin work on any part unless his facilities and forces are sufficient to complete the unit without interruption. All joints in concrete shall be located as indicated on the drawings and as approved by the Engineer. The Contractor shall submit to the Engineer for approval, drawings marked to show the location and sequence of pours.

All construction joints shall be made as watertight as possible. A waterstop shall be provided where called for on the drawings or where deemed necessary by the Engineer. Where these methods fail, the joint shall be grouted under pressure after the concrete has set and forms have been removed.

The surface of construction joints in any location shall be thoroughly cleaned and roughened by dry method sandblasting to remove all laitance and expose aggregate solidly embedded in the mortar matrix.

2.22 BONDING.

Before new concrete is deposited on or against concrete which has set, the forms shall be retightened, the surface of the set concrete shall be roughened, thoroughly cleaned of foreign matter and laitance as specified under Section 2.21 “Construction Joints,” and sprayed with water so that the concrete is saturated but no free water is left on the surface. The new concrete placed in contact with hardened or partially hardened concrete, shall contain an excess of mortar to insure bond. To insure this excess mortar at the juncture of the hardened and newly deposited concrete on vertical and inclined surfaces, the cleaned and saturated surfaces of the hardened concrete shall first be slushed with a coating of neat cement grout against which the new concrete shall be places before the grout has attained its initial set. For horizontal surfaces, a layer at least one (1) inch thick of cement mortar composed of one (1) part cement and two (2) parts sand shall be placed before depositing the concrete.

2.23 CURING.

(a) Water Curing. - Uniformed concrete surfaces shall be covered with wet burlap mats as soon as the concrete has sufficiently set, and shall thereafter be kept wet under wet burlap until backfilled or for fourteen (14) days after the concrete is placed. Where drying conditions are severe, as determined by the Engineer, fog sprays shall be employed to prevent checking of the fresh concrete surface. Immediately following the first leveling, the fog spray will absorb moisture and shall be discontinued when the applied moisture is rejected. Fog spraying shall be continued as specified until the finished surface has attained sufficient strength to permit flooding or covering with burlap mats.

Formed surfaces, both interior and exterior, shall be water cured under burlap mats or by water sprays beginning as soon as the forms are stripped. Prior to stripping of forms, the concrete shall be kept moist by the water sprays.

(b) Curing Compounds. - With the approval of the Engineer, concrete surfaces may be cured by curing compound as defined below. Any concrete curing compound shall be of a nature and composition not deleterious to concrete, and thinned to a working consistency either with a volatile solvent or by emulsification with water. The curing compound shall be of a standard and uniform quality ready for use as shipped by the manufacturer.

Curing compound shall form a continuous, unbroken membrane which shall adhere to moist concrete and which will neither disintegrate, check, peel from the surface, nor show signs of such deterioration within thirty (30) days after application under actual working conditions. The compound shall be sufficiently transparent and free from color that there will be no permanent change in the color of the concrete. The compound shall contain, however, a temporary dye of sufficient color to make the membrane clearly visible for a period of at least four (4) hours after application. If the Contractor applies a deleterious compound to paint, plaster, gunite, or other surface treatment, the surface shall be thoroughly sandblasted to remove all vestiges of the compound at the Contractor’s expense.

2.24 PROTECTION OF CONCRETE CONSTRUCTION.

All surfaces shall be protected against injury. wheeling, working, or walking on the concrete shall not be permitted during the first seventy-two (72) hours after placing. All slabs subject to wear shall be covered with a layer of sand or other suitable material as soon as the concrete has set, and shall either be cured by the use of a curing compound or shall be kept wet for not less than fourteen (14) days, or shall be kept covered for the same period with Sisalcraft paper or other similar tough water proof paper. All joints between adjacent strips of paper shall be sealed.

No concrete shall be placed during rain; and during such weather, all concrete placed within the preceding twelve (12) hours shall be protected with waterproof canvas or other suitable coverings. These coverings shall be provided and kept ready at hand.

All concrete construction shall be protected from excessive loadings.

2.25 REPAIR AND PATCHING.

After removing forms and before the concrete is thoroughly dry, any poor joints, voids, stone pockets or other defective areas and all tie holes shall be patched. Defective areas shall be chipped away to a depth of not less than one (1) inch with the edges perpendicular to the surface. The area to be patched with a space of at least six (6) inches wide entirely surrounding it shall be wetted to prevent adsorption of water from the patching mortar. The patch shall be made of the same materials and proportions as used for the concrete, except that the coarse aggregate shall be omitted and white Portland cement substituted for a part of gray Portland cement. The amount of mixing water shall be as little as consistent with the requirements of handling and placing.

The mortar shall be thoroughly compacted into place slightly higher than the surrounding surface. After being undisturbed for one to two (1 to 2) hours to permit initial shrinkage, the patch shall be finished to match the adjoining surface.

Tie holes left by the withdrawal of form clamp rods or holes left by removal of snap ties shall be filled solid with mortar. For holes passing entirely through the wall, a plunger-type grease gun or other device shall be used to force mortar through the wall, starting at the back face. When the hole is completely filled, the excess mortar shall be struck off with a cloth, flush with the surface. Holes not passing entirely through the wall shall be filled with a small tool that will permit packing the hole solid with mortar, any excess mortar being struck off flush with the surface.

2.26 PLACING REINFORCING STEEL.

Reinforcing steel, before being positioned, shall be cleaned thoroughly of mill and rust scale or other coating that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. Where there is delay in deposition the concrete, reinforcement shall be re-inspected and when necessary, cleaned.

Reinforcement shall be carefully formed as indicated on the drawings. Stirrups and tie bars shall be bent around a pin having a diameter of not less than three (3) times the diameter of the bar. Except where specifically indicated otherwise on the drawings, bends for other bars shall be made around a pin having a diameter of not less than six (6) bar diameters. All bars shall be bent cold. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the drawings shall not be used. Heating of bars will be permitted only when the entire operation is approved by the Engineer.

Reinforcing steel shall be positioned accurately and secured against displacement by using annealed iron wire or suitable clips at intersections and shall be supported by concrete chairs or spacers, or metal hangers.

In slabs, beams, and girders, and walls subject to lateral pressure, splices of reinforcement shall not be made at points of maximum stress without the express approval of the Engineer. Splices, where permitted, shall provide sufficient lap to transfer the stress between bars bond and shear. Adjacent bars shall not be spliced at the same point. The minimum allowable lap at points of maximum stress shall be thirty (30) times the diameter of the larger bar of the splice, but in no case shall the lap be less than eighteen (18) inches.

2.27 FORM MATERIAL.

The following classification shall be used for all concrete form work:

Class I. - For permanent exposed concrete surfaces where architectural appearance is important. Class I forms shall be constructed with particular care to assure a high type of architectural finish of uniform texture free from visible irregular ties, patch marks and discoloration's. Forms shall be of synthetic resin bonded plywood specially made for concrete work or non-warping hardboard. The entire surface shall be lightly sanded if necessary.

Class II. - For un-plastered interior of all rooms and for all surfaces in contact with water, such as interior walls of channels and tanks. These forms shall be of hardboard, steel or waterproof synthetic resin bonded plywood specially made for concrete work.

The Contractor will be permitted to use the most advantageous panel sizes and panel joint locations. Class II forms for painted concrete surfaces shall be free of all surface imperfections. Neat patches and minor surface imperfections will be permitted in forms for unpainted concrete provided the finished surface conforms to the requirements specified hereunder.

Class III. - For formed surfaces not exposed to view such as footings, backfilled walls and pipe trenches. These forms shall be of metal or of smooth planed boards in good condition, free from large or loose knots.

2.28 FORM CONSTRUCTION.

Exposed edges of concrete on the outside of structures and all those in the inside of structures shall be chamfered or beveled at an angle of 45 degrees, bevel being one (1) inch on a side. If so directed by the Engineer, however, the Contractor shall provide square edges for any portion of the work.

All dirt, chips, sawdust and other foreign matter shall be removed from within the forms before any concrete is deposited therein. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being used. Before concrete is deposited within the forms, all inside surfaces of the forms shall be thoroughly coated with an approved oil.

Bolts, rods or single wires shall preferably be used for internal ties, and if so used, shall be so arranged that when the forms are removed, no metal shall be within one (1) inch of any surface. Twisted wire ties will not be permitted in the forms for any wall later to be subjected to water pressure. The Contractor shall take due precaution to prevent future leakage or seepage along ties in all walls which will be subjected to water pressure. Ties used in all such walls must be cut back into the face of the wall at least one (1) inch and the resulting holes pointed up with one to three (1:3) mortar.

Temporary openings shall be provided at the base of the column and wall forms and at other points where necessary to facilitate cleaning and inspection before depositing concrete.

Forms, bracing and shores shall be kept in place until removal is approved by the Engineer and in no case shall removal commence earlier than the following schedule:

Sides of footings and rafters		1	days
Walls above ground		3	days
Walls below ground		7	days
Columns	10	days	
Slabs		14	days
Beams		21	days

Members subject to additional loads during construction shall be adequately shored to support both member and construction loads in a manner that will protect member from damage.

2.29 FINISH OF FORMED SURFACES.

All finished or formed surfaces shall conform accurately to the shape, alignment, grades and sections as shown on the drawings or prescribed by the Engineer. Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing or roughness of any kind, and shall present a finished, smooth, continuous, hard surface. All sharp angles, where required, shall be rounded or beveled.

In case of floor and flat roof surfaces where drains are provided, all exterior concrete floor, sidewalk and flat surfaces, the Contractor shall be particularly careful to provide and adequate slope to the drains or to suitable points of disposal. The direction of slope and the amount of crowning generally are shown on the drawings, otherwise they shall be subject to the approval of the Engineer.

Where Class I forms are required, the surface of the concrete shall be given the following finish: After wetting the surface, a grout shall be rubbed in using a rubber float or burlap. The grout shall be made by mixing one (1) part of cement and one and one-half (1 1/2) parts of fine sand with sufficient water to give it the consistency of thick paint. After the grout hardens sufficiently, it shall be scraped from the surface with the edge of a steel trowel without disturbing the grout in the air holes. After further drying, the surface shall be rubbed with burlap to remove all surface grout. The entire surface shall be finished to secure a uniform texture.

2.30 FINISH OF SLABS.

(a) **Wood Float Finish. -** The forms shall be completely filled with concrete with as little working as possible. All high or low spots exceeding one-fourth (1/4) inch in ten (10) feet shall be eliminated. The surface shall then be wood-floated until it is smooth and free from blemishes.

(b) **Broomed Finish. -** Surfaces to receive a broomed finish shall be wood-floated as specified above, followed by steel troweling. After steel troweling and before initial set, the surface shall then be slightly roughened by means of a broom or a burlap mat to produce an even textured surface finish.

2.31 INSERTS.

Where pipes, castings or conduits are to pass through the walls, the contractor shall place such pipes or castings in the forms before pouting the concrete, or in special cases, with the express consent and approval of the Engineer or as specified herein, shall build approved boxes in the forms to make openings for subsequent insertion of such pipes, castings, or conduits. To withstand water pressure and to insure watertightness around the openings so formed, the boxes or cores shall be provided with continuous keyways all the way around, and shall have a slight flair to facilitate grouting and the escape of entrapped air during grouting. The grout shall contain Embeco or similar material and shall be mixed and placed in accordance with manufacture's instruction.

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

The Contractor shall set accurately and hold in exact position in the forms until the concrete is poured and set, all gate frames, gate thimbles, special castings, channels, or other metal parts that are to be embedded in concrete, and shall furnish and set accurately all inserts and anchor or other bolts necessary for the attaching of piping, valves, metal sash, and equipment. All nailing blocks, plugs, strips and the like, necessary to the attachment of trim, finish, and similar work, and all wires for suspending ceilings will be furnished and placed by the Contractor.

2.32 GUNITE.

When the Contractor elects or the Engineer specifies the use of gunite, the Contractor shall furnish and install such gunite according to the special technical provisions of the specifications.

2.33 PRESTRESSED CONCRETE.

When prestressed construction is specified by the Engineer, or is submitted as an acceptable alternate by the Contractor, it shall be according to the special technical provisions of these specifications.

2.34 MISCELLANEOUS CONCRETE MIXES.

Miscellaneous concrete mixes shall be as listed as follows:

Use	28 - day Strength	Mix
Grout	2,000	Seven (7) sack Portland cement with pea gravel.
Mortar	1,800	One (1) part Portland cement, one-fourth (1/4) to one half (1/2) part hydrated lime or lime putty, aggregate not less than two and one-fourth (2 1/4) and not more then three (3) times the sum of the volumes of the cement and lime used.
Coarse grout for filling masonry blocks and for bond beams	2.000	One (1) part Portland cement to which may be added not more than one-tenth (1/10) part hydrated lime or lime putty, and two (2) to three (3) parts sand, and not more than two (2) parts pea gravel.

2.35 COLD WEATHER REQUIREMENTS.

Adequate equipment shall be provided for heating the concrete during freezing or near freezing weather. No frozen materials or materials containing ice shall be used.

All concrete materials and all reinforcement, forms, fillers and ground which the concrete is to come in contact with shall be free from ice and frost. Whenever the temperature of the surrounding air is below 40 degrees F, all concrete placed in the forms shall have a temperature between 70 degrees F and 80 degrees F and an adequate means shall be provided for maintaining a temperature between 50 degrees F and 80 degrees F during the curing period.

The housing, covering or other protection used in connection with curing, shall remain in place and intact at least twenty-four (24) hours after the artificial heating is discontinued. The use of salt or chemicals for the prevention of freezing is prohibited.

When heating of concrete materials in required, the mixing of water and aggregate shall be heated to not more than 90 degrees F prior to being placed in the mixer, so that the temperature of the mixed concrete shall not be less than 70 degrees F not more than 80 degrees F. Aggregates shall be heated either by steam or by dry heat, and the heating apparatus shall be of a type which will heat the mass uniformly and in such a manner as to preclude areas, or hot spots, which will burn the material. Flame throwers, or other, similar direct heating devices will not be allowed.

SECTION 3
PIPELINE MATERIALS AND SPECIFICATIONS

3.1 GENERAL.

This portion of the work shall include the furnishing and installation in conformance with the plans and specifications, true to line and grade, and free from leaks, cracks, and obstructions. Where choices are allowed, the Contractor shall select such materials and construction methods as will result in a satisfactory completed project. Materials and equipment used in the work shall be **New** and **Unused** unless otherwise specified. In case a reference is not clear as to which of several grades is desired, the highest quality material shall be used. Materials and strength of pipe shall be as shown on the plans. Unless two (2) or more materials are approved as equals, the Contractor shall not substitute another material for the one specified.

3.2 VITRIFIED CLAY PIPE (VCP) AND CLAY FITTINGS

3.2.01 Materials. - Vitrified Clay Pipe (VCP) and Clay Fittings shall be extra strength, durable, first quality, well-burned clay pipe in accordance with the Western Regional Standards of the National Clay Pipe Institute. Crushing strength shall be determined by the three (3) edge bearing method of ASTM C 301, and hydrostatic testing shall be at ten (10) psi as described in the Clay Pipe Engineering Handbook.

Each pipe and fitting shall be marked with the name of the manufacturer or his trademark.

The Engineer or Inspector may reject any pipe or fitting which contain excessive dimensional distortion as defined by the West Coast Standards of the National Clay Pipe Institute, foreign matter fused into the pipe, breaks which would affect the watertightness of the pipe and cracks which extend through the entire thickness of the pipe barrel.

3.2.02 COMPRESSION JOINT FOR VCP.

(a) Molded Compression joint. - When molded compression-type joints are used to join VCP, the joint shall be manufactured in accordance with ASTM C 425. The joints shall be "Wedge-Lock," Speed Seal," or approved equal.

(b) Mechanical Compression Joint. - When mechanical compression-type joints are used to join VCP, the joint shall be manufactured in accordance with ASTM C 594, "Test Condition II." The joint shall be as manufactured by Mission Clay Products Corp., "Band-Seal Type II Mainline Joint," with a stainless steel shear ring, or approved equal.

3.2.03 Hot-pour Joints. - Hot-pour joints will not be permitted.

3.3 ASBESTOS-CEMENT SEWER PIPE (ACP). - Due to the carcinogenic properties of asbestos fibers. Asbestos Cement pipe shall not be used in sanitary sewer systems.

3.4 REINFORCED PLASTIC MORTAR PIPE (RPM).

(Not permitted)

3.5 CAST-IRON PIPE (CIP) SEWER MAIN AND LATERAL.

All cast-iron pipe shall be Class 22, Class 23, or Class 24, manufactured in accordance with American National Standards Institute, Inc. Standards ANSI Specification A 21.6 and Federal Specification WW-P-421. Cast-iron pipe may, at the Contractor's option have mechanical joints or be jointed by the use of one hundred twenty-five (125) pound ANSI flanges or Victaulic-type couplings. Where flexibility of joints is a factor, such as at connection between inside and outside piping, a flexible-type joint such as Victaulic-type couplings shall be used.

3.5.01 Flanged Joints. - Bolts, nuts and washers for flanged joints shall conform to the recommendations of the pipe manufacturer and shall be uniformly tightened. Ring gaskets shall be one-sixteenth (1/16) inch rubber or neoprene lubricated and installed in accordance with the manufacturer's recommendations.

3.5.02 Mechanical Joints. - Mechanical joints shall consist of a stuffing box into which an endless rubber ring is compressed by a follower gland. The gasket must be fully confined and under constant compression. Mechanical-joint pipe shall be installed in accordance with manufacturer's recommendations. Gasket shall conform to American National Standards Institute Specification A 21,11.

3.5.03 Victaulic-type Couplings. - Cast-iron pipe for Victaulic-type couplings shall have either grooved or shouldered ends. An endless rubber gasket of C-shaped cross section shall be used in each coupling. Couplings shall be installed in accordance with manufacturer's recommendations.

3.6 POLYVINYL CHLORIDE (PVC) SEWER MAIN AND LATERAL.

3.6.01 Scope. - Polyvinyl Chloride (PVC) sewer pipe material for sizes up to and including twelve (12) inch diameter pipe.

3.6.02 Material. - Pipe and fittings shall be made from PVC compound as defined in ASTM D 1784. Pipe and fittings shall meet the requirements of ASTM D 3034 with the following exception:

All pipe and fittings shall have rubber joints capable of withstanding an internal pressure conforming to pipe manufacturer's recommendations. The rubber ring shall be made of a natural or synthetic rubber base compound, conforming to the requirement of ASTM D 1869. The compound shall be resistant to acids, alkalies, solvents and greases encountered in sanitary sewers. Solvent weld connections will be allowed only for end caps, repairs, saddles, and factory-fabricated fittings.

The pipe shall have a minimum "pipe stiffness" of F/Y=46 measured at five percent (5%) deflection.

This pipe stiffness shall be measured in accordance with ASTM Designation D 2412, Test for External Loading Properties of Plastic Pipe by Parallel-Plate loading. The pipe shall have a maximum Standard Dimension Ration (SDR) of thirty-five (35).

3.6.03 Fittings. - All fittings and accessories shall be as manufactured and furnished by the pipe suppliers or approved equal.

3.6.04 Installation. - Pipe and fittings shall be delivered and installed in accordance with the pipe manufacturer's recommendation and ASTM D 21321, except only Class I, II, and III embedment materials will be considered suitable for PVC installations. PVC sewer pipe shall not be installed where soil conditions preclude a firm stable trench wall.

3.6.05 Connections to Concrete Structures. - Connections to concrete structures, such as manhole bases, shall be watertight. An asbestos-cement connection coupling, as approved by the Engineer, shall be precast directly into the manhole base so that the PVC sewer pipe is not in contact with the concrete, thus providing a flexible joint.

3.6.06 Allowable Vertical Deflection. - The allowable initial (after backfilling and compaction) vertical deflection shall not exceed five percent (5%) of the average inside diameter of the pipe in an unloaded condition.

Due to the flexible characteristics of PVC pipe, the Contractor may have to exceed the specification requirements for backfill material and minimum depths on rigid pipes. Any additional costs incurred for the installation of flexible pipe shall be borne by the Contractor.

3.6.07 Testing. - Testing shall be done in accordance with Sections 3.8 and 6.0 of these specifications.

3.6.08 Marking. - Each length of pipe shall be marked at least once by the manufacturer, with trade name, lot identification, nominal size, the ASTM number, and the type and grade.

3.7 ACRYLONITRILE BUTADIENE STYRENE (ABS) SEWER MAIN AND LATERAL.

3.7.01 Scope. - Acrylonitrile butadiene styrene (ABS) truss pipe as herein specified is defined as an internally braced, double-wall pipe for use in gravity sanitary sewers. Six (6) inch diameter and smaller shall be solid-wall pipe.

3.7.02 Material. - Truss sewer pipe shall be manufactured by extruding ABS thermoplastic into a truss with inner and outer walls connected by webs.

The pipe and joints shall conform to the requirements of ASTM D 2680.

3.7.03 Joints. - Chemically welded joints shall be made in conformance with the pipe manufacturer's recommendations. Both a primer and a cement shall be of the composition recommended by the manufacturer. The primer and cement shall be of the composition recommended by the pipe manufacturer.

3.7.04 Physical Requirements. - The tests contained herein are quality-control tests. Pipe meeting these quality-control requirements will be acceptable for use in sanitary sewers.

(a) Truss Pipe. - A six (6) inch long piece, when tested by ASTM D 2412, shall equal or exceed the following values even after twenty-four (24) hours immersion in five percent (5%) solutions by weight of H2SO4 (Sulfuric Acid) when deflection reaches five percent (5%):

Nominal Diameter (Inches)	Minimum Diameter (Inches)	Minimum EL-Lb./In.	F/Y Lb/SqIn.
8	7.75	2,400	200
10	9.75	4,600	200
12	11.75	8,100	200
15	14.75	15,900	200

The F/Y shall be computed by dividing the load in (Lbs./In.) at five percent (5%) by the deflection in inches. Pipe shall not fail when deflected ten percent (10%).

(b) Solid Wall Pipe. - Pipe and joints shall confirm to ASTM 2751-75. The pipe shall have a maximum Standard Dimension Ratio of thirty--five (35).

3.7.05 Couplings and Fittings. - Couplings and fittings shall be manufactured or materials having equal or superior chemical and physical characteristics as the pipe itself. Each solvent weld-type coupling shall be accurately formed so as to have the proper dimension necessary to assure a leak-proof joint. One (1) coupling shall be furnished with each standard length of pipe.

3.7.06 Installation. - Pipe and fittings shall be delivered and installed in accordance with the pipe manufacturer's recommendations. The pipe manufacturer's field manager shall be present during the first day of pipe-laying operations to instruct personnel in the installation of the pipe.

3.7.07 Manholes and Special Structures. - An O-ring coupling and water stop shall be installed at the point of entry and exit of the sewer, through manholes and special structures. The coupling shall be placed so that the flared end will be flush with the outside wall of the structure. No concrete shall be placed past the flared end of the coupling.

3.7.08 Allowable Vertical Deflection. - The allowable initial (after backfilling and compaction) vertical deflection shall not exceed five percent (5%) of the average inside diameter of the pipe in an unloaded condition.

3.7.09 Marking. - Each length of pipe shall be marked at least once by the manufacturer, with trade name, lot identification, nominal size, the ASTM number, and the type and grade.

3.9.02 PVC Fittings.

(a) General. - Fittings shall be of the same material as the pipe, and in no case shall have thinner walls than that of the pipe furnished. Where molded fittings are used, they shall be made of NSF-approved material.

Samples of each type of fitting shall be submitted for the Engineer's approval.

The dry fit of fittings and coupling sockets shall be snug. Building up the joint to overcome a loose fit with multiple layers of filler solvent shall not be permitted.

(b) PVC Couplings. - Couplings shall be of the extruded type, designed to be interference fit for at least one-half (1/2) of the socket depth. They shall have a beveled entrance to permit the wiping off of the solvents on male end while being installed. The following will be considered the minimum socket depth for PVC couplings:

Size (Inches)	Socket Depth (Inches)
6	5.000
8	6.000

The wall thickness of the PVC couplings shall be equal to SDR 17 pipe or shall be one-tenth (1/10) of and inch thick, whichever is greater.

(c) Elbows. - Elbows shall be long radius bends with minimum walls equal to that of the pipe joining or shall be one-tenth (1/10) of an inch thick, whichever is greater. Tapered-welding sockets shall be equal to those required for couplings. Standard elbows, as manufactured by NSF Standards, shall be acceptable but are subject to special blocking and bedding at no extra cost, unless deep-socket adapters have been properly installed.

(d) Tees. - Tees shall be a molded fitting with NSF approval. A deep-socked adapter shall be installed in each outlet by the pipe manufacturer or by the Contractor at least twenty-four (24) hours before field installation. The deep-socket adapter shall have a socket depth and wall equal to the coupling.

3.9.03 PVC Welding Solvents. - PVC welding solvent shall be purchased from the manufacturer of the pipe.

The PVC welding solvent shall be compounded to conform with the socked fit and the weather conditions at the time of installation.

3.9.04 PVC Pipe Laying. - The pipe, fittings, and valves shall be placed in the trench with care. Under no circumstances shall pipe or other material be dropped or dumped into the trench. The pipe shall not be dragged in a manner that would cause scratching of the pipe surface. An excessive amount of scratching on the surface of the pipe will be considered cause for rejection.

The pipe shall be snaked into the trench, either employing the natural snaking tendency or the pipe shall be laid from one side to the other on alternate lengths.

3.10 PIPE JOINTS.

Upon the District's request, the Contractor shall furnish for approval, the pipe manufacturer's drawings showing dimensions and manufacturing tolerances of pipe and joint to be used on the work.

3.11 TESTING FREQUENCY AND FINAL ACCEPTABILITY OF PIPE.

The District may call for crushing and hydrostatic testing of up to one-half percent (0.5%) of the total pieces of nonmetallic pipe of each size to be used in the work. If any of these tests fail to meet the tabulated design strength and/or the listed hydrostatic test, the testing frequency shall be increased so that two percent (2%) of the total pieces of each size are being tested for bearing and bursting strength. If consistent failures occur, the entire lot of pipe which the samples represent shall be rejected.

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

3.12 INSTALLATION OF PIPELINES.

Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe pointing in the direction of the flow. Each pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe, following manufacturer's instructions for the specific joining method being used. All pipe and fittings shall be placed in the trench with care.

3.13 Cleanouts.

The pipe for the cleanout shall be of the same size and material as the sewer main. The cleanouts shall be constructed as shown on the District's Standard Drawing No. E-8 and installed at the locations indicated on the plans.

3.14 Tees.

Tees shall be of the same materials as the sewer main, and the longitudinal barrel of the tee shall be of the same size as the sewer main. Tees of the size called for in the plans shall be installed at approximately the locations shown on the plans. The exact location will be determined in the field by the Engineer, to best service the property in question. a suitable plug shall be provided and installed prior to backfilling operations to provide a watertight joint.

The Contractor shall reference each tee connection in the field with a surface marker. The surface marker shall be as specified on the District's Standard Drawing No. E-9 or No. E-10.

3.15 Sewer Laterals.

The sewer laterals shall be constructed as shown on the District's Standard Drawings No. E-9, No. E-10, and No. E-11.

Sewer laterals of the size called for on the plans shall be installed at approximately the locations shown on the plans. The exact location will be determined in the field by the Engineer, to best service the property in question. A suitable plug shall be provided and installed prior to backfilling operation to provide a watertight joint. Sewer lateral and building sewer pipe material shall be as specified in Section 3, "Pipe Line Materials and Installation," of these specifications.

The Contractor shall reference each sewer lateral connection point in the field with a surface marker. The surface marker shall be as specified on the District's Standard Drawing No. E-9 and E-10.

Sewer laterals in waterways, easement, and deep cuts should have the house sewer service brought to a minimum depth of five (5) feet. Sewer laterals in waterways will be constructed of cast iron exclusively, cast iron construction will extend up and out of the waterway ten (10) feet, or too the One-Hundred Year (100) flood level.

3.16 Bedding.

Unless otherwise called for in the plans and specifications, "normal bedding" material to provide special or normal bedding shall mean coarse granular material acceptable to the Engineer with a maximum particle size of 1/2 - Inch. Reference is made to Standard Drawing No. E-18.

Plastic pipe shall be bedded as shown in the following table:

Type of Pipe	Depth of Cover in Feet	Bedding Required
traffic	less than 4	Concrete blanket per Standard Drawing E-19 for or Special Design
Solid Wall (ABS and PVC) 4-Inch to 15-Inch size	4 to 17	Crushed rock bedding to spring line of pipe
	17 to 30	Concrete cradle per Standard Drawing E-18
	Greater than 30	Special Design

traffic	Less than 4	Concrete blanket per Standard Drawing E-19 for or Special Design
ABS composite 8-Inch or larger or ABS solid wall 4-Inch to 6-inch diameter	4 or 9	Normal bedding per Standard Drawing E-18
	9 to 20	Crushed rock bedding to spring line
	20 to 30	Encasement per Standard Drawing E-18 or
	Greater than 30	Special Design

3.17 Excavation and Backfill.

The Contractor is directed to section 1, “Earthwork,” of these specifications for all items pertaining to excavation and backfill.

3.18 Pavement Removal and Replacement.

The Contractor is referred to Section 8, “Removal and Replacement of Paved Surfaces,” of these specifications.

3.19 Leakage Tests.

Leakage tests shall be in accordance with Section 6, “Cleaning and Testing,” of these specifications.

3.20 Pipeline in Casing.

The Contractor is referred to Section 5, “Concrete Blankets and Conductor Pipe,” of these specifications.

3.21 Pipe Joint Deflections.

Short lengths of pipe shall be required to make curved alignments of the sewer without exceeding the manufacturer’s recommendations for joint deflections.

3.22 Grease Interceptors.

Need for and sizing of, will be determined through the “Feasibility Study” process for new installations. In all installations, clear visibility, from above, of both the inlet and outlet pipes will be provided for by incorporating standard manhole ring and covers in the design. Sizing may be recommended by the “Feasability Study” but will be set by San Bernardino County, Department of Environmental Health Services.

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SECTION 4
MANHOLES AND CLEANOUTS

4.1 GENERAL

All manholes shall be constructed in conformance with the District's Standard Drawing No. E-18, No. E-2, E-6. All such structures shall be built into the sewer lines at the locations shown on the plans. Pipe for future lateral sewer lines shall be built into the structures as shown on the plans, and the outer ends closed with a cap securely fixed in place. The caps shall be so fixed as to be easily removed in the future and shall be watertight.

4.2 PRECAST MANHOLES.

Precast manhole sections will be manufactured in a plant designed for this type of work. All units will conform to the details on the above-referenced drawings with eccentric cone top sections. Concrete used in the precast section shall be manufactured of approved and selected materials in such proportions as per Section 2, "Concrete Construction," of these specifications, with a minimum compressive strength of 3000 psi. Sections will be compacted by vibration or centrifugal force and steam, sprinkling, membrane solution or a combination of these methods. Manholes shall conform with ASTM C 478.

4.2a PREFABRICATED ABS MANHOLES.

Prefabricated ABS manholes will be manufactured in a plant designed for this type of work. All units will confirm to the details on the above-referenced drawings. Installation will be per manufactures recommendations. Bedding will be Class 1: angular, 1/2 to 3/4 inch maximum size, well graded crushed stone, coal, slag, cinders or crushed shells (ASTM D 2321 allows the use of such large sizes in not consistent with the requirements for uniform haunching and embedment, particularly for small pipe).

4.3 MANHOLE BASE.

Manhole bases shall be monolithic construction of Class IV concrete and shall be poured to the size, line and grade as shown on the standard drawings and plans. Drop-manhole bases shall be constructed as detailed on the District's Standard Drawing E-2. The Contractor is referred to Section 2, "Concrete Construction," of these specifications.

In laying the pipe up to structures, no pipe shall be allowed to project beyond the inside of the wall of the structure. Flexible joints shall be provided in all sewer pipes outside of manholes, but within twelve (12) inches of concrete base. If required by district engineer.

A notch or groove confirming to the precast manhole section shall be formed on top of the base section.

4.4 PRECAST MANHOLE JOINTS.

Precast manhole sections shall be tongue and groove alternately on both ends of the sections, and shall be laid with the grooved portion facing up. Each section shall be set to enable the manhole to rise vertically above the base.

A concrete waterproof mortar shall be placed on the top of each ring, completely covering the grooved portion prior to the installation of the next precast section. Excess mortar shall flow out equally on both sides of the joint for the complete circumference of the ring. Finish mortar joint should have a minimum thickness of one-fourth (1/4) inch.

Mortar shall consist of one (1) part by volume of cement and three parts by volume of sand. Mortar shall be mixed in a suitable mixer in a watertight mixing box. The materials must be thoroughly mixed dry until the mass assumes a uniform color and then sufficient water should be added to bring the mixture to a workable consistency. No mortar which has begun to set shall be used and no retempering thereof will be permitted. Mortar shall conform to Section 2.34 of these specifications.

4.5 GRADE RINGS.

Precast grade rings shall be used to reach desired height of the manhole cover ref. drawing E-2. A maximum vertical adjustment using grade rings is twenty (20) inches, adjustments greater than this require the replacement of a barrel section. Minor adjustment to the ring and cover shall be made by the use of "Shims" under the frame. Grade rings are not required for manholes constructed in easements unless needed for adjustment to finish grade.

4.51 HIGH DENSITY POLYETHYLENE GRADE RINGS

High density polyethylene grade rings used in lieu of precast concrete ring must be approved by the district engineer before installation. The adjustment rings shall be manufactured from polyethylene plastic as ASTM Specification D-4976. The material properties shall be tested and qualified for use per the ASTM test method referenced in the above ASTM standard. The annular space between the rings and cone basin, the rings, and the rings and cover frame shall be sealed utilizing an approved butyl sealant. All adjustment for matching road grade shall be made utilizing a molded and indexed slope ring.

4.6 MANHOLE STEPS.

Manhole steps will not be allowed except for manholes constructed within the City of Big Bear Lake where steps are required

4.7 **BRICK MANHOLES.** Brick manholes are not acceptable for new construction.

4.8 CLEANOUTS.

Cleanouts shall be constructed as shown on the District's Standard Drawing No. E-15, and in conformance with the notes contained therein.

4.9 CASTINGS.

All castings shall be of tough gray iron, free from cracks and swells. The iron shall conform to the requirements of ASTM A 48, Class 30.

4.9.01 Manhole Frames and Covers. - Manhole frames and covers to be constructed in easements shall be Long Beach Iron Works No. X 103 D, or approved equal. All other frame and covers shall be Long Beach Iron Works No. X-106E, or approved equal. In no case shall the diameter of a manhole be less than twenty four (24) inches, inside diameter. Covers shall be diamond tread finish and shall be provided with a "lifting receptacle" per District's Standard Drawing No. E-5. All frames and covers are to be machined to fit (non-rocking).

4.9.02 Cleanout Frames and Covers. - Cleanout frames and covers shall be Long Beach Iron Works No. X-508B, or approved equal. Covers shall be diamond tread with the letter "S" stamped or integrally cast into the cover.

4.9.03 Nameplate. - The nameplate on each and every sanitary sewer manhole cover shall read as follows: "Sanitary Sewer."

4.9.04 Bolt-Down Frames and Covers. - Manhole frames and covers shall be drilled to match. Covers shall be counter bored to accept standard socket wrench and permit bolt heads to be flush with cover.

SECTION 5
CONCRETE BLANKETS AND CONDUCTOR PIPE

5.1 CONCRETE BLANKET.

5.1.01 General. - Concrete blankets shall be constructed at the locations shown on the plans and in accordance with the District's Standard Drawing No. E-19. Concrete shall be of Class IV Portland cement concrete.

5.2 EXCAVATION AND BACKFILL.

The Contractor is referred to Section 1, "Earthwork," of these specifications.

5.3 STEEL CONDUCTOR TUBE.

5.3.01 Materials. - Steel conductor tube shall be butt welded of sheets conforming to ASTM A 283. Conductor tube used shall not have a thickness of less than one-fourth (1/4) inch. All field joints shall be butt welded in full circumference.

5.3.02 Installation. - Steel conductor tube of the size and thickness specified on the plans shall be installed in place by jacking methods without the use of water or air, at the locations shown on the plans, and to grades required to install the sewer pipes and/or force mains. Should voids or loss of ground occur during jacking operations, said voids shall be filled with grout consisting of a lean mixture of cement and sand.

Pipes lines shall be installed within the conductor tube to the lines and grades shown on the plans. The sewer pipe shall be supported on lined steel casing insulators with plastic runners or skids. The size, type, spacing installation and manufacture of these insulators shall be per the manufacturer's recommendations and specifications. The annular space between the conductor tube and pipe shall be filled with sand. The pipe lines shall pass a successful test for leakage as provided in Section 6, "Cleaning and Testing," of these specifications.

5.4 CONCRETE CONSTRUCTION.

The Contractor is referred to Section 2, "Concrete Construction," of these specifications.

SECTION 6
CLEANING AND TESTING

6.1 GENERAL.

It is the intent of the plans and specifications that the completed sewer pipes of all types, along with manholes and other appurtenances, shall be watertight and clean.

6.2 INFILTRATION AND EXFILTRATION TEST.

Each section of sewer between two (2) successive manholes shall be tested for leakage or, at the option of the Engineer, for infiltration. In general, the leakage test shall be made on all sections of sewer except those where, in the Opinion of the Engineer, excessive ground water is encountered, the infiltration test shall be made.

Even though a section may have previously passed the leakage or infiltration test, each section of sewer shall be tested subsequent to the last backfill compacting operation in connection therewith, and upon approval and acceptance of necessary soils tests; wherein, in the opinion of the Engineer, heavy compaction of the Contractor or others may have damaged or affected the required watertight integrity of the pipe, structure, and appurtenances. The Contractor shall furnish all materials required for the tests and bear all costs in connection therewith. Tests shall be made in the presence of the Engineer.

If the exfiltration or infiltration rate as shown by the tests specified herein is greater than the amount specified, the pipe joints shall be repaired or, if necessary, the pipe shall be removed and re-laid by the Contractor at his expense. The sewer will not be considered acceptable until the leakage or infiltration rate, as determined by the test, is less than the allowable.

Air testing described in Section 6.3 may be used in lieu of water testing when approved by the District.

Exfiltration Test (water test)

Unless excessive ground water is encountered, each section of sanitary sewer, between two (2) successive structures, shall be tested by closing the lower end of the sewer to be tested and the inlet sewer of the upper structure with plugs or stoppers, and filling the pipe and structure with water to a point four (4) feet above the invert of the open sewer in the upper structure.

Where the difference in elevation between the invert of the upper structure and the invert of the lower structure is more than fifteen feet, an air test per Section 6.3 hereof shall be used in lieu of the water test.

The total leakage shall be the decrease in volume of water in the upper structure. The leakage shall not exceed four-tenths (0.40) gallons per two (2) hour test period per inch of nominal diameter of pipe per one hundred (100) feet of sewer pipe being tested.

If the leakage, as shown by the test, is greater than allowed, the pipe shall be overhauled and, if necessary, replaced and re-laid until the joints and pipe shall hold satisfactorily under this test. All tests must be completed before street or trench is resurfaced, unless otherwise directed by the Engineer. The Contractor shall furnish all labor and materials for making the tests required, at his own expense.

Infiltration Test

If, in the construction of a section of the sewer between structures, excessive ground water is encountered, the test for leakage described above shall not be used, but instead, the end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water. Pumping of ground water shall be discontinued for at least three (3) days after which the section shall be tested for infiltration. The infiltration shall not exceed four-tenths (0.40) gallons per two (2) hour test period per inch of diameter, per one hundred (100) feet of main line sewer being tested, and does not include the length of house laterals entering that section. Where any infiltration in excess of this amount is discovered before completion and acceptance of the sewer, the sewer shall be immediately uncovered and the amount of infiltration reduced to a quantity within the specified amount of infiltration before the sewer is accepted, at the expense of the Contractor. Should, however, the infiltration be less than the specified amount, the Contractor shall stop any individual leaks that may be observed when ordered to do so by the Engineer. The Contractor shall furnish all labor, materials, equipment and water for making the test required, at his own expense. All tests must be completed before street or trench is resurfaced, unless otherwise directed by the Engineer.

6.3 AIR TESTING.

The Contractor shall test all sewers that cannot be tested hydrostatically by means of the air test specified herein, unless otherwise directed by the Engineer. The length of the line tested at one time shall be limited to the length between adjacent manholes. Air test procedure shall be as follows;

Pressurize the test section to four (4) psi and hold at four (4) psi for not leas than two (2) minutes. Add air if necessary to keep the pressure at four (4) psi. Disconnect air supply. When pressure decreases to three and one-half (3.5) psi, start stopwatch. Determine the time in seconds that is required for the internal pressure to reach two and one-half (2.5) psi. This time interval shall be greater than time given in the following table. The section of pipe shall not have passed if the time is less than shown. Release air from the opposite end of the section.

Sewer Size (in Inches)	Minimum Time (in Seconds)	Minutes & Sec.
4	113	1-53
6	170	2-50
8	226	3-46
10	283	4-43
12	340	5-40
15	425	7-5
18	510	8-30
21	595	9-55
24	680	11-20

When the prevailing ground water is above the sewer being tested, air pressure shall be increased forty-three hundredths (0.43) psi for each foot the water table is above the flow line of the sewer.

If the test is not passed, the leak shall be found and repaired to the satisfaction of the Engineer.

Sewer Building laterals shall be considered part of the MAIN sewer lateral to which they are connected and no adjustment of test time shall be allowed to compensate for the smaller diameter of the house sewers sewer lateral.

The pressure gauge used shall be supplied by the Contractor, shall have minimum divisions of one-tenth (0.10) psi, and shall have an accuracy of four hundredths (0.04) psi. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six (6) month intervals or when requested by the Engineer.

When the air-pressure test is used for testing of the pipe, the manholes shall be water tested. Each manhole shall be filled with water four (4) feet above flow line of the manhole with the inlet and outlet of each manhole plugged. The maximum leakage rate shall be ten (10) gallons per hour per manhole test to be run for a minimum of thirty (30) minutes.

6.4 TESTING - FORCE MAIN.

After trenches are backfilled and compacted, the force main shall be subjected to a hydrostatic pressure test of the specified operating pressure for the class of pipe to be tested for a period of four (4) hours.

Care shall be taken to expel all air from the pipe line as the line is filled with water for the test. The water necessary to maintain this pressure shall be measured by means satisfactory to the Engineer. The leakage shall be considered as the amount of water entering the pipe during the test, less the measured leakage through the valves and bulkheads. Leakage shall not exceed the rate of twelve (12) gallons per inch of diameter per twenty--four (24) hours per mile of pipe. Any noticeable leaks shall be stopped and any defective pipe shall be repaired or replaced with new sections and retested as specified above before final approval and acceptance of the work by the Engineer. All labor, materials, equipment and water for tests, shall be furnished by the Contractor.

6.5 CLEANING.

Prior to putting any sewer into service, or before final acceptance, all sewer facilities shall be visually checked and all foreign objects, materials or obstructions removed from the facilities. If dirt, silt or other materials are found, the Engineer may require that the facilities be cleaned by flushing, balling, rodding or other means so that the materials may be removed from the system.

6.6 PIPE TESTING.

Tests of pipe for strength, straightness and durability shall be as required in Section 3, “Pipe Line Materials and Installation,” of these specifications.

6.7 TESTING OF FLEXIBLE SEWER PIPE.

All sections of pipe shall be tested for water-tightness in accordance with Sections 6.2 and 6.3 of these specifications, after installation has been completed.

Prior to the above test, all sections shall be subject to a deflection performance test as follows:

All flexible sanitary sewer pipe (PVC and ABS, etc.) shall be tested for excessive deflections after back-fill has been placed and compacted but before leak testing and final paving operations.

A rigid mandrel, with a circular cross section having a diameter of at least ninety-five percent (95%) of the specified average inside diameter, shall be pulled through the pipe by hand. The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. Obstructions encountered by the mandrel shall be corrected by the Contractor. All material, equipment and labor to perform the test shall be provided by the Contractor at no cost to the Owner.

The testing device shall be pulled through the completed pipe lines. If the device sticks in the pipe at any point, the pipe shall be repaired and retested. For acceptance, the device must pass through the entire section of line between structures in one pass without the use of excessive force.

6.8 TELEVISION INSPECTION.

For projects that exceed 5,000 lineal feet of main line pipe, television inspection shall be performed as described herein: All newly installed commercial 6" and larger sewer laterals will have a television inspection performed.
The Contractor shall secure the services of a firm or agency for viewing and recording on video tape, newly installed sewer pipelines. The total length of pipeline to be inspected by television shall be one hundred percent (100%).

Any defective pipe detected by the television inspection shall be removed and replaced by the Contractor, and an additional section of the sewer main between manholes shall be added to the total length of pipeline to be tested. Television testing shall include (1) a verbal tape describing the condition of the pipe inspected at various locations along the pipeline and (2) a digital readout of the locations of all laterals or tees.

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SECTION 7
EROSION CONTROL SEEDING

7.1 GENERAL.

The Contractor shall provide erosion-control measures as defined herewith on all areas where the natural vegetation has been disturbed by the installation of sanitary facilities. If a ground cover other than natural vegetation has been disturbed, this section does not apply and the Contractor shall replace said ground cover in kind.

7.2 PREPARATION.

After the backfill has been compacted and the pipeline tested, the Contractor shall remove and dispose of rocks and debris from the area to be reseeded. No seeding shall be performed during windy weather or when the ground is too wet or in an untillable condition. The fertilizer and seed shall be spread before the straw cover material is applied. Commercial fertilizer shall not be applied until after the seed has been sown.

7.3 MATERIAL.

Materials shall consist of the following:

7.3.01 Seed. - The seed shall consist of the following mixture: Crested Wheatgrass, forty-seven percent (47%); Intermediate Wheatgrass, twenty-seven percent (27%); Wimmera Ryegrass, thirteen percent (13%); Blando Ryegrass, thirteen percent (13%). The seed shall be spread at the rate of one hundred (100) pounds per acre and shall be applied by the use of a “Cyclone Seed Sower” or equal.

7.3.02 Fertilizer. - The fertilizer shall be Ammonium Phosphate (16-20-0) spread at the rate of three hundred (300) pounds per acre and shall be applied by the use of a “Cyclone Seed Sower” or equal.

7.3.03 Mulch. - After the application of the seed and fertilizer, new straw (stable bedding straw shall not be used) shall be uniformly spread at the approximate rate of four (4) tons per acre. The straw shall then be “mulched” into the ground by the use of a “wire” roller or other approved equipment.

7.4 PROTECTION FOR STEEP SLOPES.

In cases where the grade over the pipeline exceeds twenty-five percent (25%) slope, the Contractor shall provide additional erosion-control measures to stabilize the backfill material. The Contractor shall submit to the District for its approval, special engineering details of the method to be used.

7.5 LATERALS & OFF-SITE SEWER INSTALLATIONS.

Off-Site (private) sewers may be handled as in Sections 7.1 through 7.4 Alternatively laterals and or Off-Site sewers exceeding twenty-five percent (25%) slope, or in areas judged by the District to require additional erosion protection will be handled as follows. Ref. Standard Drawing E-18.

7.5.01 Cut-Off Walls. - Cut-Off walls can be constructed of scrap lumber or masonry block. Cut-Off walls are to be installed in a transverse direction accoss trenches as they are backfilled. The walls must be flush with the finished grade and extend downward into the trench seven and one half (7 1/2) inches below the finished grade.

7.5.01 Jute. - Jute covering will be laid over all disturbed soil areas and pinned down with appropriate fasteners.

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SECTION 8
REMOVAL AND REPLACEMENT OF PAVED SURFACES

8.1 GENERAL.

Street pavement and surfaces shall be removed and replaced in all areas of construction excavation in conformance with details shown on the plans and as specified herein. Resurfacing of existing pavement and surfaces damaged or removed in connection with construction of improvements, including all appurtenances, shall conform to the provisions of permits issued by the State of California Department of Transportation, the County Transportation Department under whose jurisdiction the road falls, and/or the city for the work within the rights of way of these respective agencies.

8.2 EXCAVATION AND BACKFILL.

The Contractor is directed to Section 1, "Earthwork," of these specifications, for all items pertaining to excavation and backfilling.

8.3 PAVEMENT REMOVAL.

8.3.01 General. - Street pavement, existing road surfacing or other surfaced areas shall be removed within the limits of all construction excavations prior to proceeding with excavation operations of any nature. Surplus material shall be removed as provided in Section 1, "Earthwork," in these specifications. Prior to removal of existing surfacing, pavement cuts shall be made as shown on the plans and as specified herein. All pavement cuts shall be neat and straight along both sides of the trench, and approximately parallel to the alignment to the pipe, to provide an unfractured and level pavement joint for bonding existing surfacing with pavement replacement. Where large irregular surfaces are removed, such trimming or cutting as hereinafter provided shall be parallel with roadway centerline or at right angles to the same. All cut edges shall provide clean, solid, vertical faces, free from all loose material.

8.3.02 Plant-Mix Surfacing (Asphalt-Concrete Pavement). - Streets and alleys surfaced with asphalt-concrete pavement shall be cut at the limits of the trench and/or excavation prior to removal of existing surfacing. Cuts shall be made with pneumatic tools or other approved equipment.

8.3.03 Road-Mixed Surfacing. - Streets and alleys surfaced with road-mixed surfacing shall be cut at the limits of the trench and/or excavation prior to removal of existing surfacing. Cuts shall be made with pneumatic tools or other approved equipment.

8.4 REPLACEMENT.

8.4.01 General. - In all streets or areas in which the surface is removed, broken or damaged by equipment, or in which the ground has caved in or settled due to the installation of the improvements, the surface shall be restored to the original grade and crown section by the Contractor. In absence or specific designation on the plans, and where the street has been improved with roadway surface, base course, curb, sidewalk or gutter, trenches or damaged sections shall be restored with the type or improvement conforming to that which existed at the time the Contractor entered upon the work.

Prior to resurfacing, the existing surfacing shall be removed as provided above. All work shall match the appearance of the existing improvements and finished pavement shall not deviate from existing grade by more than one-eighth (1/8) inch in ten (10) feet and shall be free from ruts, depressions and irregularities.

8.4.02 State Highway Right of Way. - Construction of sewer lines within State Highway right of way shall be subject to Department of Transportation utility encroachment permit, which will be provided by the District. All work done within highway rights of way shall conform to the "Terms and Conditions Relating to Utility Encroachments," as issued by the State Department of Transportation, and as to details as indicated on the plans.

8.4.03 County Roads. The Contractor's attention is directed to the requirements of the County Transportation department regarding resurfacing of excavations in County roads. The specification, policies and procedures of said County Transportation Department shall supersede all other provisions of this Section within the jurisdiction of the County Transportation Department, but only if such specifications exceed the requirements of these specifications.

8.4.04 Base Material. - Base material shall be furnished, placed and compacted in the trench excavation when required by the agency having jurisdiction.

8.4.05 Plant-Mix Surfacing (Asphalt-Concrete Pavement). - All asphalt-concrete surfaces, including but not limited to pavements, curbs, driveways, and sidewalks, which are removed, damaged or broken by the Contractor's installation of improvement under this contract, shall be replaced and/or reconstructed. All asphalt-concrete shall be placed on compacted fills or base material as herein before specified, and replacement and/or reconstruction shall be to the same dimensions as existing surfaces unless otherwise stated herein or required by the agency having jurisdiction over the road.

Materials and workmanship for asphalt-concrete replacement and/or reconstruction shall conform to the requirements of Section 39 of the State of California Department of Transportation Standard Specifications.

Plant-mix surfacing shall be Type B asphalt-concrete and shall conform to the grading specified for one half (1/2) inch maximum, medium size, as specified in Section 39 of the above-mentioned specifications.

Paving asphalt to be mixed with the mineral aggregate shall be steam-refined asphalt and shall conform to the provisions in Section 92 in the above-named specifications, with the viscosity range of AR 1,000, 2,000 or 4,000 as specified by the Engineer.

Paint binder shall be grade RS-1 emulsified asphalt unless otherwise designated by the Engineer.

8.4.06 Road-Mix Surfacing. - All road-mix surfaces including but not limited to pavements, curbs, driveways, and sidewalks, which are removed, damaged or broken by the Contractor's installation of improvements under this contract, shall be replaced and/or reconstructed. All road-mix surfacing shall be placed on compacted fills or base material as herein before specified and replacement and/or reconstruction shall be to the same dimensions as existing surfaces unless otherwise stated herein or required by the agency having jurisdiction over the road.

Materials and workmanship for road-mix resurfacing and/or reconstruction shall conform to the requirements of Section 38 of the State Department of Transportation Standard Specifications.

Mineral aggregate may be either selected material from the roadway excavation of selected material obtained from other sources. All material shall first meet the approval of the agency involved and the Engineer.

Bituminous binder to be mixed with the mineral aggregate shall be a liquid asphalt, grade SC-800, and shall conform to the provisions in Section 93 in the above-named specifications. In no case shall the quantity of bituminous binder be less than five (5%) by weight of the dry mineral aggregate.

8.4.07 Temporary Resurfacing. - The Contractor shall furnish, place, and maintain temporary resurfacing as herein specified, over backfill in paved dedicated streets wherever so ordered in writing by the Engineer, or as specified by State, County or City permits.

Temporary resurfacing shall be placed at the locations and of the thickness required by the permit and/or by the Engineer and shall consist of a cold-mix asphalt concrete. Binder shall be liquid, grade SC-800 or approved equal.

Temporary resurfacing shall be placed to the grade of existing surfaces and rolled and compacted as soon as the condition of the backfill is considered, by the Engineer, to be suitable to receive such surfacing. The Contractor shall maintain all temporary resurfacing in proper, usable condition until the permanent resurfacing operations are to be commenced. Temporary resurfacing shall be removed and disposed of by the Contractor before permanent resurfacing is placed in conformance with the plans and specifications.